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Animal Welfare Information Center

Information Resources on the Care and Welfare of Rodents

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Updates Housing, Husbandry, and Welfare of Rodents, 1997

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Introduction

INTRODUCTION

This publication updates and expands AWIC's 1997 bibliography on the Housing, Husbandry and Welfare of Rodents. It is estimated that rats and mice could make up 90% or more of all animals currently used in research, teaching and testing in the United States. The exact number of these animals used for research is unknown because USDA does not collect data on non-regulated species. Under the current Animal Welfare Act, animal is defined as "any live or dead dog, cat, nonhuman primate, guinea pig, hamster, rabbit, or any other warmblooded animal, which is being used, or is intended for use for research, teaching, testing, experimentation, or exhibition purposes, or as a pet". It specifically excludes rats of the genus *Rattus* and mice of the genus *Mus*, bred for use in research, among other species.

Although USDA does not require reporting of numbers and does not set minimum standards for non-regulated animals, facilities that are AAALAC accredited and thus adhere to the *Guide for the Care and Use of Laboratory Animals*, or receive Public Health Service (PHS) funding and abide by the *PHS Policy on Humane Care and Use of Laboratory Animals*, are required to apply standards to all activities involving live vertebrate animals, including rats and mice. In fact, while environmental enrichment for nonhuman primates was a rather novel idea in 1985; by 2006, many facilities also developed enrichment programs for their rodents. The concern for humane treatment of animals and animal well-being in biomedical research thus extends beyond the Animal Welfare Act definition of animal.

This information resource was developed to help researchers provide better conditions for their animals and their research, and to assist in complying with the requirements of the Animal Welfare Act. It consists of over 1300 records from multiple sources and is divided into ten different groups as follows: Alternatives, Teaching/ Bedding, Caging, Housing, Facilities/ Blood, Bleeding, Biology/ Feed, Nutrition, Guidelines/ Gavage/ General/ Husbandry, Care, Handling, Enrichment/ Noise, Lighting, Temperature, Humidity/ Occupational Considerations/ Welfare, Wellbeing, Fasting, Behavior.

Information on how to request materials that are included in the collection of the National Agricultural Library (NAL) may be found on the Collection Services Branch Web site at http://www.nal.usda.gov/services/request.shtml. Please read carefully as there are certain restrictions on media and document types.

Information Resources on the Care and Welfare of Rodents

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General

Akimau, P., K. Yoshiya, H. Hosotsubo, T. Takakuwa, H. Tanaka, and H. Sugimoto (2005). **New experimental model of crush injury of the hindlimbs in rats**. *Journal of Trauma Injury Infection and Critical Care* 58(1): 51-58. ISSN: 1079-6061.
Descriptors: rats, new experimental model, crush injury, hindlimbs, muscles, repefusion, ischemia, traumatized muscle, volume.

Akita, M., K. Ishii, M. Kuwahara, and H. Tsubone (2001). **The daily pattern of heart rate, body temperature, and locomotor activity in guinea pigs**. *Experimental Animals (Tokyo)* 50(5): 409-415. ISSN: 1341-1357.
Abstract: The characteristics of the rhythmicity of heart rate (HR), body temperature (BT), and locomotor activity (LA) in conscious and unrestrained guineapigs were studied using a telemetry system. 11 male Hartley guineapigs were used in the study. HR and/or LA in some guineapigs clearly showed circadian rhythms, but in others there were no significant daily patterns. BT did not show significant daily rhythms. These results suggest that guineapigs may have different individual characteristics of rhythmicity. Therefore, one should be careful when using guineapigs in chrono-biomedical research. The results of this study may be useful for future biomedical studies using guineapigs.
Descriptors: guinea pigs, daily pattern, body temperature, heart rate, locomotor activity, biomedical studies.

Albrecht, W. and M. De Santis (2005). **Innovative mouse model for postchemotherapy fertility evaluation**. *Journal of Andrology* 26(2): 169. ISSN: 0196-3635.
Descriptors: mouse, inovative model, fertility evaluation, postchemotherapy.

Aldred, A.J., M.C. Cha, and K.A. Meckling Gill (2002). **Determination of a humane endpoint in the L1210 model of murine leukemia.** *Contemporary Topics in Laboratory Animal Science* 41(2): 24-27. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory mammals, experimental design, leukemia, animal models, animal welfare, posture, animal behavior, mortality, euthanasia, animal husbandry, animal testing alternatives, animal use refinement.

Anderson, D.K. (1999). **Paramyid rodent taxonomy: an illustrated guide to taxonomically significant characters**. *Journal of Vertebrate Paleontology* 19(Supplement 3): 29A.
Descriptors: rodent, taxonomy, illustrated guide, characters.
Notes: Meeting Information: Fifty-Ninth Annual Meeting of the Society of Vertebrate Paleontology, October 20-23, 1999, Denver, Colorado, USA.

Arai, S., T. Hanaya, T. Sakurai, M. Ikeda, and M. Kurimoto (2005). **A novel phenomenon predicting the entry into a**

state of hibernation in Syrian hamsters (*Mesocricetus auratus*). *Journal of Veterinary Medical Science* 67(2): 215-217. ISSN: 0916-7250.
Abstract: When Syrian hamsters (*Mesocricetus auratus*) are bred in a cold and short-day environment, most animals go into hibernation after a certain period of time. However, to date it has not been possible to predict which hamster will enter hibernation. In this study, we subcutaneously implanted thermo-loggers in hamsters bred in the cold environment, and recorded the subcutaneous temperature at short intervals until they went into hibernation. A time series analysis of temperature disclosed that a fall of 0.4 to 0.8degreeC in subcutaneous temperature was seen 5 to 16 days before entering hibernation, and this phenomenon continued for three days or more. No hamster went into the hibernation without displaying this signal. Although the mechanism by which this phenomenon takes place is not clear, it is a sign from the body, which is useful for indicating if a hamster will enter hibernation shortly.
Descriptors: neural coordination, reproduction, telemetry, applied and field techniques, thermal recording implant, prosthetic, time series analysis, mathematical and computer techniques, breeding season, environmental temperature, hibernation, subcutaneous temperature, thermoregulation.

Arras, M., P. Autenried, A. Rettich, D. Spaeni, and T. Rulicke (2001). **Optimization of intraperitoneal injection anesthesia in mice: drugs, dosages, adverse effects, and anesthesia depth.** *Comparative Medicine* 51(5): 443-456. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Purpose: The goals of the study were to find a safe intraperitoneal injection anesthesia protocol for medium-duration surgery in mice (e.g., embryo transfer/vasectomy) coupled with a simple method to assess anesthesia depth under routine laboratory conditions. Methods: Eight anesthetic protocols consisting of combinations of dissociative anesthetics (ketamine, tiletamine), alpha2 agonists (xylazine, medetomidine), and/or sedatives (acepromazine, azaperone, zolazepam) were compared for their safety and efficacy (death rate, surgical tolerance), using observations and reflex tests. The four best protocols were further evaluated during vasectomy: physiologic measurements (respiratory rate, electrocardiogram, arterial blood pressure, body temperature, blood gas tensions, and acid-base balance) were used to characterize the quality of anesthesia. The reactions of physiologic parameters to surgical stimuli were used to determine anesthesia depth, and were correlated with reflex test results. Results: The protocol with the highest safety margin and the longest time of surgical tolerance (54 min) was ketamine/xylazine/acepromazine. Three further anesthetic combinations were associated with surgical tolerance: ketamine/xylazine, ketamine/xylazine/azaperone, and tiletamine/xylazine/zolazepam (Telazol/xylazine). The protocols consisting of ketamine/medetomidine and ketamine/azaperone were not associated with clearly detectable surgical tolerance. The most reliable parameter of surgical tolerance under routine laboratory conditions was the pedal withdrawal reflex. Conclusions: The best intraperitoneal injection anesthesia regimen consisted of ketamine/xylazine/acepromazine. The dose must be. adapted to the particulars of each experimental design (mouse strain, sex, age, mutation). This is best done by measuring surgical tolerance, using the pedal withdrawal reflex.
Descriptors: mice, laboratory mammals, anesthesia, injectable anesthetics, ketamine, xylazine, medetomidine, acepromazine, azaperone, neuroleptics, reflexes, dosage, intraperitoneal injection, electrocardiograms, respiration rate, blood pressure, adverse effects, body temperature, blood gases, animal welfare, indicators, tiletamine, zolazepam, depth of anesthesia.

Battles, A.H. (1997). **The biology, care, and diseases of the Syrian hamster**. In: K.L. Rosenthal (Editor), *Practical Exotic Animal Medicine,* Veterinary Learning Systems: Trenton, N.J. (USA), p. 145-154. ISBN: 18-842-54330.
Descriptors: hamsters, pet care, animal husbandry, animal diseases, mammals, Rodentia, biology.

Bauer, D.J., T.J. Christenson, K.R. Clark, S.K. Powell, and R.A. Swain (2003). **Acetaminophen as a postsurgical analgesic in rats: a practical solution to neophobia.** *Contemporary Topics in Laboratory Animal Science* 42(2): 20-25. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory animals, postoperative care, acetaminophen, analgesia, oral administration, drinking water, drinking, palatability, preoperative care, preanesthetic medication, body weight, feed intake, animal use refinement, veterinary drugs, water intake.

Baumans, V. and E. Kaliste (2004). **The welfare of laboratory mice**. In: E. Kaliste (Editor), *The Welfare of Laboratory Animals*, Animal Welfare, Vol. XIII, No. 2, Kluwer Academic: Dordrecht, Netherlands, p. 119-152. ISBN: 1402022700.

Descriptors: laboratory animals, mice, *Mus musculus*, animal welfare, animal experiments, mammals, Rodentia, useful animals.

Bearden, S.E. and S.S. Segal (2005). **Neurovascular alignment in adult mouse skeletal muscles**. *Microcirculation (New York)* 12(2): 161-167. ISSN: 1073-9688.

Abstract: Muscle blood flow increases with motor unit recruitment. The physical relationships between somatic motor nerves, which control muscle fiber contraction, and arterioles, which control microvascular perfusion, are unexplored. The authors tested the hypothesis that motor axons align with arterioles in adult skeletal muscle.Transgenic mice (C57BL/6 background, n = 5; 10 months of age) expressing yellow fluorescent protein in all motor nerves underwent vascular casting (Microfil). Excised epitrochlearis, gracilis, gluteus maximus, and spinotrapezius muscles were imaged at 380x and 760x and a computer-integrated tracing system (Neurolucida) was used to acquire 3-dimensional digital renderings of entire arteriolar and neural networks within each muscle. Arteriolar networks were typically similar to 3-fold longer than neural networks. Nerves coursed with arterioles until terminating at motor endplates. Across muscles, proximity analyses revealed that similar to 75% of total nerve length (9.8-48.8 mm) lay within 200 mu m of the nearest arteriole (diameters of 15-60 mu m).

Descriptors: mouse, adult, skeletal muscles, blood flow, neurovascular alignment, arterioles, muscle fiber contraction, nerves.

Bersztel, A., C. Johnsson, A. Bjoerkland, and G. Tufveson (2003). **Pretransplant xenogeneic blood transfusions reduce the humoral response in a mouse-to-rat heart transplantation model**. *Scandinavian Journal of Immunology* 57(3): 246-253. ISSN: 0300-9475.

Abstract: A mouse heart transplanted to a rat is rejected promptly 3 days after transplantation, independent of whether cyclosporin A (CyA) is used as an immunosuppressant or not. Adding a short course of deoxyspergualin (DSG) initially, in addition to continuous CyA treatment, results in long-term graft survival and permits retransplantation during CyA monotherapy. In this paper, we have explored the possibility of substituting the initial heart transplant with blood transfusions. Lymphocyte-enriched blood transfusions combined with CyA and an initial course of DSG proved to lower or eliminate the haemagglutinating antibody titre normally seen in acute vascular xenorejection. The therapy, however, did not prolong the mean survival of the cardiac xenograft, but the same treatment protocol could result in either hyperacute rejection or prolonged survival of up to 11 days. In conclusion, this and earlier studies propose that a humoral unresponsiveness can be induced if the recipient vascular circulation is exposed to a xenoantigen in a mouse-to-rat combination.

Descriptors: immunosuppressive agents, heart, xenografts, blood transfusion, immune response, lymphocytes, Cyclosporin A, rats, mice.

Biardi, J.E., R.G. Coss, and D.G. Smith (2000). **California ground squirrel (*Spermophilus beecheyi*) blood sera inhibits crotalid venom proteolytic activity.** *Toxicon* 38(5): 713-21. ISSN: 0041-0101.

NAL Call Number: 391.8 T66

Abstract: Some California ground squirrels (*Spermophilus beecheyi*) show limited necrosis following envenomation by northern Pacific rattlesnakes (*Crotalus viridis oreganus*). This study demonstrates that *S. beecheyi* blood sera inhibits venom proteases. Sera from rattlesnake-abundant habitats inhibited *C. v. oreganus* venom more effectively than venom from two allopatric rattlesnake species, *C. v. viridis* and *C. atrox*, suggesting evolutionary specialization. The pattern of inhibition among squirrel populations corresponds best with history of rattlesnake predation, in contrast to current rattlesnake density.

Descriptors: ground squirrel, antivenins physiology, crotalid venoms enzymology, Sciuridae blood, blood serum inhibits venom.

Bishnupuri, K.S. and C. Haldar (2000). **Profile of organ weights and plasma concentrations of melatonin, estradiol and progesterone during gestation and post-parturition periods in female Indian palm squirrel *Funambulus pennanti.*** *Indian Journal of Experimental Biology* 38(10): 974-81. ISSN: 0019-5189.

Abstract: To date, report about the role of pineal gland in maintaining the normal physiology of gestation is scanty. Present study is the first of its kind giving a detail profile of organ weights and plasma concentration of

melatonin, estradiol and progesterone to suggest a possible role of pineal gland in maintaining normal physiology during gestation and post-parturition periods of female Indian palm squirrel *F. pennanti*. Inspite of, inverse pineal-gonadal/melatonin-steroids interrelationship in adult (non-pregnant) females, the present results study suggest a direct relationship of pineal gland activity with ovarian steroids especially during the gestation period. The inverse relationship of melatonin and ovarian steroids is again established after parturition and maintained throughout the life. Thus the pineal gland (activity as judged by its weight, biochemical contents i.e. protein and cholesterol and plasma melatonin level) maintained ovarian/uterine physiology and regulated plasma concentrations of estradiol and progesterone during gestation and post-parturition periods. It is suggested that the pineal gland and its hormone melatonin play an important role to maintain the normal physiology of gestation and the post-partum recovery in Indian palm squirrel *F. pennanti*.
Descriptors: estradiol blood, melatonin blood, postpartum period, progesterone blood, Sciuridae physiology, organ size, pregnancy, animal blood.

Bouwknecht, J.A. and R. Paylor (2002). **Behavioral and physiological mouse assays for anxiety: a survey in nine mouse strains.** *Behavioural Brain Research* 136(2): 489-501. ISSN: 0166-4328.
Descriptors: anxiety genetics, anxiety psychology, behavior, animal physiology, body temperature physiology, darkness, exploratory behavior physiology, fever genetics, fever physiopathology, light, mice, inbred mice strains, reproducibility of results, species specificity, stress, psychological genetics, psychological physiopathology, psychological psychology.

Briese, E. (1998). **Normal body temperature of rats: the setpoint controversy**. *NeuroScience and Biobehavioral Reviews* 22(3): 427-436. ISSN: 0149-7634.
Descriptors: rats, normal body temperature, set point, controversy, thermoregulation, circadian rhythm.

Burman, O.H.P. and M. Mendl (2000). **Short-term social memory in the laboratory rat: its susceptibility to disturbance.** *Applied Animal Behaviour Science* 67(3): 241-254. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: rats, memory, duration, animal welfare, aggressive behavior, experimental design.

Chang, C.C., J.S. Hwang, C.C. Chan, P.Y. Wang, T.H. Hu, and T.J. Cheng (2004). **Effects of concentrated ambient particles on heart rate, blood pressure, and cardiac contractility in spontaneously hypertensive rats**. *Inhalation Toxicology* 16(6-7): 421-429. ISSN: 0895-8378.
Abstract: Epidemiological studies have shown that particulate matter (PM) air pollution is associated with cardiovascular mortality and morbidity, especially for particles with aerodynamic diameters under 2.5 mu m (PM sub(2.5)). Recent studies have revealed an association between PM pollution and autonomic functions including heart rate (HR), blood pressure (BP), and heart-rate variability. However, the association and linking mechanisms have not been clearly demonstrated in animal studies. Utilizing a novel approach that employs a mixed-effects model to overcome the problems of variations in diseased animals and circadian cycles, we have previously demonstrated an association between concentrated PM sub(2.5) and changes of HR and BP in pulmonary hypertensive rats. The objective of this study is to test the plausibility of this methodology and to demonstrate the particle effects under different pathophysiology. The feasibility of cardiac contractility (measured as QA interval, QAI) as an indicator for PM toxicology was also explored. Four spontaneously hypertensive (SH) rats were repeatedly exposed to concentrated PM sub(2.5) during spring and summer. The mass concentration of particles during the 5 h of exposure was 202.0 plus or minus 68.8 (mean plus or minus SE) and 141.0 plus or minus 54.9 mu g/m super(3) for spring and summer experiments, respectively. During spring exposures, the maximum increase of HR and mean BP noted at the end of exposure were 51.6 bpm ($p < .001$) and 8.7 mm Hg ($p = .002$), respectively. The maximum decrease of QAI noted at the same time was 1.6 ms ($p = .001$). Though a similar pattern was demonstrated during summer exposures, the responses were less prominent. We conclude that concentrated PM sub(2.5) may increase HR and mean BP and decrease QAI in SH rats. Our results also show that QAI may be used as an indicator in PM toxicology.
Descriptors: air pollution, hypertension, heart rate, blood pressure, airborne particulates, rats.

Chang, F.T. and L.A. Hart (2002). **Human-animal bonds in the laboratory: how animal behavior affects the perspective of caregivers.** *ILAR Journal* 43(1): 10-18. ISSN: 1084-2020.

NAL Call Number: QL55.A1I43
Descriptors: laboratory animals, dogs, mice, laboratory workers, anthropology, animal welfare, animal husbandry, training of animals, stress, enrichment, safety at work, work satisfaction, human animal relations, animal technicians, environmental enrichment.

Chickering, J.G. and A.J. Sokoloff (1996). **Innervation of propatagial musculature in a flying squirrel, *Glaucomys volans* (Rodentia, Sciuridae).** *Brain, Behavior and Evolution* 47(1): 1-7. ISSN: 0006-8977.
Abstract: The propatagium of gliding and flying mammals is of both functional and phylogenetic interest. The innervation of the propatagial muscle, platysma II, was studied with the axonal tracer wheat germ agglutinin-conjugated horseradish peroxidase (WGA-HRP) in a flying squirrel, *Glaucomys volans*. Injections of WGA-HRP into the proximal third of platysma II labeled motoneurons in the lateral part of the medial subdivision of the ipsilateral facial nucleus and in the ipsilateral ventral horn of the brachial enlargement. Injections into distal regions of platysma II labeled motoneurons in the ipsilateral ventral horn of spinal segments C5-C8 but not in the facial nucleus. Injections along the whole length of the muscle labeled afferent axons in the ipsilateral dorsal horn of spinal segments C4-T1. These results demonstrate a mixed facial and spinal motor innervation of propatagial musculature in the flying squirrel and indicate that this pattern of mixed innervation is more widespread among flying and gliding mammals than previously reported. Mixed facial and cervical propatagial innervation, independently derived in different flying and gliding mammals, may represent a common solution in the design of the propatagium. These findings complicate the use of propatagial muscle innervation patterns for the establishment of phylogenetic relationships among flying and gliding mammals.
Descriptors: evolution, flight, animal physiology, forelimb innervation, motor neurons ultrastructure, neck muscles innervation, phylogeny, Sciuridae anatomy and histology, afferent pathways anatomy and histology, axons ultrastructure, facial nerve anatomy and histology, ganglia, spinal anatomy and histology, laterality physiology, muscle, skeletal innervation.

Chovan, J.P., E. Yu, and S.C. Ring (2004). **Comparison of metabolism between nude (athymic) and CD1 mice**. *Drug Metabolism Reviews* 36(Supplement 1): 240. ISSN: 0360-2532.
Descriptors: biochemistry and molecular biophysics, pharmacology, drug metabolism, mouse strain comparison, nude, CD1.
Notes: Meeting Information: 7th International Meeting of the International Society for the Study of Xenobiotics, August 29-September 02, 2004, Vancouver, BC, Canada.

Coatney, R.W. (2001). **Ultrasound imaging: principles and applications in rodent research.** *ILAR Journal* 42(3): 233-247. ISSN: 1084-2020.
NAL Call Number: QL55.A1I43
Descriptors: ultrasonography, mice, rats, animal experiments, impedance, tissues, transducers, imagery, heart, animal welfare, literature reviews, ultrasound biomicroscopy, animal use refinement.

Compton, S.R. and L.K. Riley (2001). **Detection of infectious agents in laboratory rodents: traditional and molecular techniques.** *Comparative Medicine* 51(2): 113-119. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Methods to detect infectious agents in laboratory animals have traditionally been serological and culture based. Molecular methods to detect infectious agents in laboratory animals are being used more routinely. Confusion as to when and how to use molecular methods abounds. In this review, we present a guide to the weaknesses and strengths of using traditional and molecular methods for the detection of infectious agents in laboratory animals.
Descriptors: laboratory mammals, immunodiagnosis, diagnostic techniques, diagnostic value, polymerase chain reaction, mice, murine hepatitis virus, outbreaks, disease control, helicobacter, bacterial diseases, rapid methods, feces, tissue cultures, microbial contamination, pathogenicity, epidemiology, sampling, sample processing, accuracy, false positive results, specificity.

Crawley, J.N. (2003). **Behavioral phenotyping of rodents.** *Comparative Medicine* 53(2): 140-146. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Established methods for analyzing behavioral traits in mutant lines of mice allow researchers to

understand the outcomes of genetic manipulations in the nervous system. A rigorous six-tiered behavioral phenotyping strategy is described. Recommendations are offered for the design of mouse behavioral testing suites in animal housing facilities.
Descriptors: mice, laboratory animals, animal behavior, phenotype, phenotypic variation, transgenic animals, knockout mutants, fearfulness, avoidance conditioning, conditioned behavior, neurophysiology, statistical analysis, experimental design, working conditions, research facilities.

Davis, J.A. (1999-2000). **The triple A approach to ensuring animal welfare.** *Animal Welfare Information Center Bulletin* 10(3-4): 1-2, 20-22. ISSN: 1522-7553.
Online: http://www.nal.usda.gov/awic/newsletters/v10n3/10n3davi.htm
NAL Call Number: aHV4701.A952
Descriptors: laboratory animals, mice, animal welfare, pain, mental stress, clinical aspects, disease course, weight losses, body weight, euthanasia, clinical examination, gait, body temperature, experimental design, animal handling, endpoints, animal use refinement.

Davisson, M.T. (1999). **The future for animal models.** *Lab Animal* 28(10): 53-56. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: mice, animal experiments, medical research, transgenic animals, genetic disorders, gene expression, genetic markers, barrier husbandry, costs, animal welfare.

De Angelis, K., V.M. Gama, V.A.M. Farah, and M.C. Irigoyen (2005). **Blood flow measurements in rats using four color microspheres during blockade of different vasopressor systems**. *Brazilian Journal of Medical and Biological Research* 38(1): 119-126. ISSN: 0100-879X.
Descriptors: rats, blood flow, microspheres, four color, vasopressor systems, measurements, blockade.

De Vries, C.R., P.E. Sizemore, P.A. De Vries, and H. Xin (1998). **Scanning EM and light microscopic study of normal urethral development in the rat**. *Pediatrics* 102(3, Part 2): 846. ISSN: 0031-4005.
Descriptors: rat, normal urethral development, study, light microscope, scanning EM.
Notes: Meeting Information: Annual Meeting of the American Academy of Pediatrics, October 16-21, 1998, San Francisco, California, USA.

Dedja, A., L. Dall'olmo, R. Cadrobbi, N. Baldan, F. Fante, F. Calabrese, P. Rigotti, M. Ferraresso, L. Delriviere, E. Cozzi, and E. Ancona (2005). **Heterotopic cardiac xenotransplantation in rodents: report of a refined technique in a hamster-to-rat model**. *Microsurgery* 25(3): 227-234. ISSN: 0738-1085.
Descriptors: methods and techniques, cardiovascular system, transport and circulation, xenotransplantation, laboratory techniques, cardiac xenotransplantation, xenograft rejection, immunosuppressive strategies, organ preservation.

Demir, S.S. (2004). **Computational modeling of cardiac ventricular action potentials in rat and mouse: review**. *Japanese Journal of Physiology* 54(6): 523-530. ISSN: 0021-521X.
Abstract: Little is known about the ionic mechanisms underlying the action potential heterogeneity in ventricle-associated healthy and disease conditions, even though five decades of histological, electrophysiological, pharmacological, and biochemical investigations exist. The computational modeling in murine ventricular myocytes can complement our knowledge of the experimental data and provide us with more quantitative descriptions in understanding different conditions related to normal and disease conditions. This paper initially reviews the theoretical modeling for cardiac ventricular action potentials of various species and the related experimental work. It then presents the progress of the computational modeling of cardiac ventricular cells for normal, diabetic, and spontaneously hypertensive rats. The paper also introduces recent modeling efforts for the action potential heterogeneity in mouse ventricular cells. The computational insights gained into the ionic mechanisms in rodents will continue to enhance our understanding of the heart and provide us with new knowledge for future studies to treat cardiac diseases in children and adults. Because the dissemination of computational models is very important, we continue to disseminate these models by iCell, the interactive cell modeling resource. iCell (http://ssd1.bme.memphis.edu/ icell/) has been developed as a simulation-based teaching and learning tool for electrophysiology and contains JAVA applets that present models of various

cardiac cells and neurons and simulation data of their bioelectric activities at cellular level.
Descriptors: cardiovascular system, transport and circulation, models and simulations, computational biology, computational modeling, mathematical and computer techniques, action potential, iCell.

Deng, J., M. St. Clair, C. Everett, M. Reitman, and R.A. Star (2000). **Buprenorphine given after surgery does not alter renal ischemia/reperfusion injury.** *Comparative Medicine* 50(6): 628-632. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Background and Purpose: Potential drugs for human acute renal failure are often tested in an animal model of renal ischemia/reperfusion injury. Analgesics are often not given after surgery because of concerns that they would alter renal function. Therefore, we tested whether postoperative analgesia would alter animal health or affect the degree of renal injury. Methods: Mice were subjected to either 32 or 37 minutes of renal ischemia, given two or six doses of buprenorphine or vehicle at 12-hour intervals, and followed for 72 hours. In some animals, we measured body temperature and physical activity by use of telemetry. Results: Animals treated with buprenorphine recovered more rapidly from surgery based on postoperative activity, and had a small but not significant tendency for faster restoration of normal body temperature. Animals treated with buprenorphine had less weight loss after 37 minutes of ischemia. Buprenorphine given after surgery did not influence the degree of renal injury after ischemia/reperfusion. Conclusions: Buprenorphine should be given after renal ischemia-reperfusion surgery because administration of the proper analgesic improved animal health without interfering with the renal ischemia/reperfusion model. Analgesic treatment at the time of the operation and 12 hours after was sufficient. Buprenorphine may reduce the post-surgical stress response, and thus potentially improve the specificity of testing for drugs that reduce or treat renal injury.
Descriptors: mice, laboratory mammals, animal models, analgesics, postoperative care, kidneys, ischemia, renal function, body temperature, physical activity, body weight, pain, histopathology, animal welfare.

Dennis Jr., M.B. (2002). **Welfare issues of genetically modified animals.** *ILAR Journal* 43(2): 100-109. ISSN: 1084-2020.
NAL Call Number: QL55.A1I43
Descriptors: mice, laboratory animals, transgenic animals, animal models, animal welfare, morbidity, mortality, genetic engineering, animal use alternatives, phenotype, animal use refinement, animal use reduction, Institutional Animal Care and Use Committee, committees.

Diven, K. (2003). **Inhalation anesthetics in rodents.** *Lab Animal* 32(3): 44-47. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: rats, mice, guinea pigs, hamsters, gerbils, laboratory animals, general anesthetics, intranasal administration, depth of anesthesia, veterinary equipment, animal welfare, researchers.

Dong, G.H., B. Xu, C.T. Wang, J.J. Qian, H. Liu, G. Huang, and H. Jing (2005). **A rat model of cardiopulmonary bypass with excellent survival**. *Journal of Surgical Research* 123(2): 171-175. ISSN: 0022-4804.
Descriptors: methods and techniques, blood and lymphatics, transport and circulation, cardiovascular system, transport and circulation, cardiopulmonary bypass, therapeutic and prophylactic techniques, clinical techniques, blood gas analysis, clinical techniques, membrane oxygenator, medical equipment, roller pump, medical equipment, hemodynamic investigation, clinical techniques, survival.

Duff, J.P., R.J. Higgins, A.W. Sainsbury, and S.K. Macgregor (2001). **Zoonotic infections in red squirrels.** *Veterinary Record* 148(4): 123-4. ISSN: 0042-4900.
NAL Call Number: 41.8 V641
Descriptors: rodent diseases epidemiology, Sciuridae, zoonoses epidemiology, zoonoses microbiology, zoonoses parasitology, bacterial infections epidemiology, bacterial infections veterinary, Great Britain epidemiology, helminthiasis, animal epidemiology, parapoxvirus, poxviridae infections epidemiology, poxviridae infections veterinary, rodent diseases microbiology, rodent diseases parasitology, toxoplasmosis, animal epidemiology.

Duke, J.L., T.G. Zammit, and D.M. Lawson (2001). **The effects of routine cage-changing on cardiovascular and behavioral parameters in male Sprague-Dawley rats.** *Contemporary Topics in Laboratory Animal Science*

40(1): 17-20. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory mammals, animal husbandry, cleaning, blood pressure, heart rate, telemetry, data collection, physical activity, animal behavior, duration, frequency, fearfulness, stress, arousal behavior.

Emond, M., S. Faubert, and M. Perkins (2003). **Social conflict reduction program for male mice.** *Contemporary Topics in Laboratory Animal Science* 42(5): 24-6. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Abstract: Aggression within caged groups of unfamiliar male mice can be a serious welfare problem for maintaining mice in the laboratory. At our Center, two observation periods were set aside daily in order to identify, according to previously described behaviors, dominant mice and separate these when indicated. By reducing or eliminating the number of aggressive acts between group members in the same cage, our social conflict reduction program has led to a 57% reduction of mice being reported for clinical signs, death, and euthanasia. Welfare concerns seemed to be addressed. Therefore the program we implemented to reduce social conflict was effective in decreasing injuries and loss due to fighting. Minimizing aggression will have the additional benefit of reducing the confounding effect of stress on an animal's performance in experimental situations. This simple yet humane program can be applied easily to other animal facilities where male Crl:CD-1 mice (and possibly other stocks or strains) are used and fighting is a concern.
Descriptors: aggression psychology, conflict psychology, housing, animal, sex behavior, animal, animal welfare, hostility, mice, inbred mice strains, social dominance.

Essner Jr., R.L. (2002). **Three-dimensional launch kinematics in leaping, parachuting and gliding squirrels.** *Journal of Experimental Biology* 205(Part 16): 2469-77. ISSN: 0022-0949.
Abstract: Leaping, parachuting and gliding are the primary means by which arboreal squirrels negotiate gaps in the canopy. There are notable differences among the three locomotor modes with respect to mid-air postures and aerodynamics, yet it is unclear whether variation should also be expected during the launch phase of locomotion. To address this question, launch kinematic profiles were compared in leaping (*Tamias striatus*), parachuting (*Tamiasciurus hudsonicus*) and gliding (*Glaucomys volans*) squirrels. Animals were filmed launching to the ground from a platform using high-speed video. Statistical comparisons among taxa indicated that only six out of 23 variables were significantly different among the three species. Two were associated with tail kinematics and were a consequence of tail morphology. Two were forelimb-related and discriminated gliding from non-gliding taxa. The remaining two variables were performance attributes, indicating significant variation among the species in take-off velocity and horizontal range. The absence of significant differences in hindlimb kinematics indicates that propulsion is essentially identical in leaping, parachuting and gliding squirrels.
Descriptors: flight, gliding squirrels, leaping, parachuting, three dimensional kinematics, locomotor modes, propulsion.

Farriol, M., J. Rossello, and S. Schwartz (1997). **Die Messung der Koerperoberflaeche bei Sprague-Dawley Ratten. [Body surface area in Sprague-Dawley rats].** *Journal of Animal Physiology and Animal Nutrition* 77(2): 61-65. ISSN: 0931-2439.
Abstract: Die Koerperoberflaeche von Sprague-Dawley Ratten wurde gemessen und mit aus vier mathematischen Formeln abgeleiteten Werten verglichen. Die Werte aus den Gleichungen der Autoren MEEH, RUBNER und SAN ROMAN unterschieden sich sign. von den gemessenen Werten. Bei der Formel von VALLOIS wurden keine sign. Unterschiede gefunden. Mit der Formel von VALLOIS wird die Koerperoberflaeche kleiner Tiere unterschaetzt und die grosser Tiere um durschnittl. 20 qcm ueberschaetzt.
Descriptors: rats, body conformation, body measurements, methods, mathematical models, mammals, models, Rodentia.
Language of Text: German summary.

Federation of European Laboratory Animal Science Associations (1996). **FELASA recommendations for the health monitoring of mouse, rat, hamster, gerbil, guineapig and rabbit experimental units. Report of the Federation of European Laboratory Animal Science Associations (FELASA) Working Group on Animal Health accepted by the FELASA board of management, November 1995**. *Laboratornye Zhivotnye* 6(3):

168-176.
Descriptors: mouse, rat, gerbil, hamster, rabbit, guinea pig, health monitoring, recommendations, FELSA, Federation of European Laboratory Animal Science Associations.

Fehr, M. (2002). **Nyulak, tengerimalacok, kisragcsalok es hullok allatvedelmi kovetelmenyeknek megfelelo eutanaziaja. [Euthanasia of rabbits, guineapigs, rodents and reptiles, respecting animal welfare requirements].** *Magyar Allatorvosok Lapja* 124(5): 307-311. ISSN: 0025-004X.
Descriptors: animal welfare, euthanasia, guinea pigs, mice, rabbits, rats, reptiles.
Language of Text: Hungarian.

Feoktistova, N.Y. and I.G. Meschersky (2005). **Seasonal changes in desert hamster *Phodopus roborovskii* breeding activity**. *Acta Zoologica Sinica* 51(1): 1-6. ISSN: 0001-7302.
Abstract: Data on desert hamster *Phodopus roborovskii* winter activity and seasonal patterns of reproduction are scarce. During 9 years we maintain a colony of desert hamsters under natural temperature and light regimes. These natural conditions suggest that the data on breeding activity may be in a good accordance with that in the wild. None of observed animals showed signs of torpor or hibernation in winter - even at about 40 degrees C below zero. The first peak of breeding (2.4 litters born per 10 pairs and 3.5 pups per litter in average) occurs in April and the second one (2.9 - 2.6 litters per 10 pairs and 3.9 - 3.6 pups per litter in average) in June - July. In autumn and early winter, the intensity of breeding declines to 0.1 - 0.4 litters per 10 pairs but does not cease completely. All adult males have visible testes and all adult females have opened vaginas entries through the year. The averaged males' plasma level of testosterone, being maximal in summer, declines in autumn and early winter, but single hamsters keep their testosterone high even under shortest photoperiod and during cold months. In spring, average testosterone level significantly increases but does not reach summer values.
Descriptors: behavior, endocrine system, chemical coordination and homeostasis, reproductive system, reproduction, seasonal change, winter activity, breeding activity.

Fernandez, M.L. (2001). **Guinea pigs as models for cholesterol and lipoprotein metabolism.** *Journal of Nutrition* 131(1): 10-20. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Abstract: Guinea pigs carry the majority of their plasma cholesterol in LDL, making them a unique animal model with which to study hepatic cholesterol and lipoprotein metabolism. In this review, the benefits and advantages of using this particular model are discussed. How dietary factors such as soluble fiber, cholesterol and fatty acids that vary in saturation and chain length affect hepatic cholesterol homeostasis and influence the synthesis, intravascular processing and catabolism of lipoproteins is reviewed. In addition, alterations in hepatic cholesterol metabolism and plasma lipoproteins as affected by treatment with cholestyramine or 3-hydroxyl-3-methylglutaryl coenzyme A reductase inhibitors, exercise, marginal intake of vitamin C, ovariectomy (a model for menopause) and similarities to the human situation are addressed. A review of guinea pigs as models for early atherosclerosis development is also presented.
Descriptors: guinea pigs, animal models, cholesterol metabolism, lipoproteins, lipid metabolism, blood lipids, blood plasma, liver, nutrition research, enzyme activity, aminoacyltransferases, cholesterol 7alpha monooxygenase, low density lipoprotein, cholesteryl esters, animal proteins, receptors, high density lipoprotein, dietary fat, exercise, drug therapy, biological development, ascorbic acid, cardiovascular diseases, atherosclerosis, diet related diseases, acyl coenzyme a cholesterol acyltransferase, cholesteryl ester transfer protein.

Flecknell, P. (1998). **Developments in the veterinary care of rabbits and rodents**. *In Practice* 29(6): 286-295. ISSN: 0263-841X.
Descriptors: treatment, pets, anesthesia, antibiotics, drug therapy, rabbits, rodents.

Foden, N.D., G. Lees, and R.M. Jones (1998). **Effects of temperature and isoflurane GABAA receptor function in cultured rat neurones: contribution to reduced anaesthetic requirement**. *British Journal of Anaesthesia* 80(4): 547. ISSN: 0007-0912.
Descriptors: rat neruones, temperature, isoflurane, effects, GABAA receptor function, anesthetic.
Notes: Meeting Information: Proceedings of the Anaesthetic Research Society, November 20-22, 1997, London,

England, UK.

Galsworthy, M.J., I. Amrein, P.A. Kuptsov, I.I. Poletaeva, P. Zinn, A. Rau, A. Vyssotski, and H.P. Lipp (2005). **A comparison of wild-caught wood mice and bank voles in the Intellicage: assessing exploration, daily activity patterns and place learning paradigms.** *Behavioural Brain Research* 157(2): 211-217. ISSN: 0166-4328.

Abstract: Our previous work has revealed very high baseline neurogenesis in the dentate gyrus of wood mice as compared particularly to bank voles; a difference which may be related to learning capacity. This study explored whether the newly-developed Intellicage system could be used to compare these species in simple spatial learning paradigms. The Intellicage is essentially a group-housing cage that also allows continuous automatic recording of each individual's behaviour. Seven wild-caught bank voles (*Clethrionomys glareolus*) were compared with seven wild-caught long-tailed wood mice (*Apodemus sylvaticus*) in the Intellicage system over 9 days. During the first 90 min after entering the cage, the wood mice were substantially more exploratory than the bank voles (P = 0.003). Over subsequent days, both species showed nocturnal activity increases with voles being 3.7 times more active overall. In the spatial learning paradigms, there were significant species-by-time interactions with wood mice outperforming bank voles on both place learning (P = 0.027) and subsequent reversal (P = 0.006). Conclusions are firstly that the wood mice show superior learning abilities in this paradigm, and secondly that the Intellicage serves as a valuable cognitive testing arena for small wild rodents, or for circumstances where cognition must be compared independent of different responses to handling or novel environments.

Descriptors: wood mice, bank voles, exploration, wild caught, activity patterns, learning, Intellicage.

Gillingham, M.B., M.D. Clark, E.M. Dahly, L.A. Krugner Higby, and D.M. Ney (2001). **A comparison of two opioid analgesics for relief of visceral pain induced by intestinal resection in rats.** *Contemporary Topics in Laboratory Animal Science* 40(1): 21-26. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory mammals, opioids, analgesics, pain, morphine, thebaine, pharmacology, intestine resection, postoperative care, animal behavior, posture, grooming, intravenous injection, infusion, urination, adverse effects, animal welfare, oxymorphone, buprenorphine, bolus injection, continuous infusion, animal use refinement.

Gos, T., R. Hauser, and M. Krzyzanowski (2002). **Regional distribution of glutamate in the central nervous system of rat terminated by carbon dioxide euthanasia.** *Laboratory Animals* 36(2): 127-133. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Carbon dioxide euthanasia is an established method for the termination of small laboratory animals. It has also been employed by the authors in neurobiological research on the postmortem glutamate concentration in the structures of rat brains. The following investigations were aimed at optimizing the termination procedure based on the CO2 saturation rate of the inhaled air. Two rates of CO2 flow were applied, and the higher one significantly augmented the glutamate level in the hippocampus and cerebellum. The relationship between this finding and signs of central fear reaction is discussed. The authors conclude that lower rather than higher CO2 flow in euthanasia procedures is gentler and is therefore preferable for use with laboratory animals.

Descriptors: rats, euthanasia, carbon dioxide, dosage, fearfulness, animal welfare, amygdala, hippocampus, cerebellum, glutamic acid, animal use refinement.

Gupta, R.P., P.C. Verma, and G.C. Chaturvedi (1999). **Experimental salmonellosis in guinea-pigs: haematological and biochemical studies.** *Veterinary Research Communications* 23(7): 415-424. ISSN: 0165-7380.

NAL Call Number: SF601.V38

Descriptors: guinea pigs, *Salmonella*, hematology, biochemistry, pathogenesis, blood chemistry, experimental infections, animal models, body temperature, body weight, weight losses, symptoms, depression, leukocytes, erythrocytes, hemoglobin, volume, anemia, alanine aminotransferase, creatinine, urea, globulins, albumins, triiodothyronine, thyroxine, enzyme activity.

Hackbarth, H., N. Kuppers, and W. Bohnet (2000). **Euthanasia of rats with carbon dioxide--animal welfare aspects.** *Laboratory Animals* 34(1): 91-96. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3
Descriptors: rats, euthanasia, carbon dioxide, animal welfare, respiration rate, blood sugar, blood serum, corticosterone, corticotropin, death, distress.

Harkin, A., T.J. Connor, J.M. O'Donnell, and J.P. Kelly (2002). **Physiological and behavioral responses to stress: What does a rat find stressful.** *Lab Animal* 31(4): 42-50. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: rats, laboratory animals, stress, animal behavior, stress factors, telemetry, transponders, responses, duration, heart rate, body temperature, locomotion, physical activity, cage density, litter, feces, subcutaneous injection, escape responses, lighting, odors, cage size, animal testing alternatives, animal handling, pair housing, confinement, stroboscopic lighting, animal use refinement.

Harris, M.B. and W.K. Milsom (2001). **Vagal feedback is essential for breathing in unanesthetized ground squirrels.** *Respiration Physiology* 125(3): 199-212. ISSN: 0034-5687.
Abstract: The roles of vagal afferent feedback in terminating inspiration and modulating breathing pattern and ventilatory responses to hypoxia and hypercapnia were assessed in the golden-mantled ground squirrel, *Spermophilus lateralis*, during wakefulness and urethane anesthesia. Hypoxia increased ventilation primarily through increases in breathing frequency (f(R)) while hypercapnia increased ventilation primarily through increases in tidal volume (V(T)) in both anesthetized and unanesthetized animals. Vagotomy resulted in an increase in tidal volume, a decrease in breathing frequency and ventilation, and depressed ventilatory responses to both hypoxia and hypercapnia in anesthetized animals. In unanesthetized animals vagotomy produced a transient 'gasp-like' breathing pattern that rapidly progressed to a non-obstructive central apnea. These data indicate that vagal feedback shapes ventilation on a breath-by-breath basis during anesthesia and is essential for ventilation in unanesthetized animals. The mechanisms that transform the influences of vagal input on breathing between anesthetized and unanesthetized states remain unclear. Changes in breathing pattern induced by the removal of vagal feedback compromise chemoreflexes.
Descriptors: ground squirrels, inspiration, breathing pattern, vagal feedback, breathing, vagotomy.

Hascoet, M. and M. Bourin (1998). **A new approach to the light/dark test procedure in mice**. *Pharmacology Biochemistry and Behavior* 60(3): 645-653. ISSN: 0091-3057.
Descriptors: mice, light-dark test, anxiolytic agents, diazepam, computer integrated, strain differences, locomotor activity.

Hascoet, M., M. Bourin, and B.A. Dhonnchadha (2001). **The mouse light-dark paradigm: a review**. *Progress in Neuro Psychopharmacology and Biological Psychiatry* 25(1): 141-166. ISSN: 0278-5846.
Descriptors: mouse, light, dark, behavior, nervous system, neural coordination, stressors, rodents, anxiolytic, black and white test.

Hawkins, P., M. Berdoy, R. Deacon, P. Morrison, B. Sandells, A. Peters, R. Lewis, K. Harding, D. Jones, M. Jennings, and R. Hubrecht (2001). **Report of the 2000 RSPCA/UFAW Rodent Welfare Group meeting**. *Animal Technology* 52(1): 29-42. ISSN: 0264-4754.
NAL Call Number: QL55.I5
Descriptors: animal behavior, animal housing, animal welfare, environmental factors, rodent welfare, mice, rats, UFAW.

Hawkins, P., M. Heath, C. Dickson, D. Wrightson, P. Brain, G. Grant, and R. Hubrecht (1999). **Report of the 1998 RSPCA/UFAW Rodent Welfare Group meeting**. *Animal Technology* 50(1): 41-49. ISSN: 0264-4754.
NAL Call Number: QL55.I5
Descriptors: animal welfare, laboratory animals, cages, housing, stress, diets, behavior, transgenic animals, rodents, rats, mice.

Hawkins, P., R. Reid, C. Nevison, M. Leach, J. Higgins, D. Eagle, S. Redrobe, D. Robertson, D. Smith, M. Jennings, and R. Hubrecht (1999). **Report of the 1999 RSPCA/UFAW Rodent Welfare Group meeting**. *Animal Technology* 50(3): 173-180. ISSN: 0264-4754.

NAL Call Number: QL55.I5
Descriptors: animal welfare, laboratory animals, animal experiments, animal housing, rodents, UFAW.

Hawkins, P., J. Roughan, A. Wilson, J. Sales, K. Clarke, P. Warn, P. Thornton, M. Jennings, and R. Hubrecht (2002). **Assessing rodent wellbeing: report of the 2001 RSPCA/UFAW Rodent Welfare Group meeting**. *Animal Technology and Welfare* 1(1): 3-12. ISSN: 0264-4754.
NAL Call Number: SF757.A62
Descriptors: rodent wellbeing, assessing, animal welfare, mice, rats, UFAW, report.
Language of Text: French, Spanish, and Italian summaries.

Hayes, K.E., J.A. Raucci Jr., N.M. Gades, and L.A. Toth (2000). **An evaluation of analgesic regimens for abdominal surgery in mice.** *Contemporary Topics in Laboratory Animal Science* 39(6): 18-23. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory animals, postoperative care, analgesics, dosage, acetaminophen, feed intake, water intake, animal experiments, animal welfare, ibuprofen, buprenorphine, animal use refinement.

Hayssen, V. (2001). **Body and organ mass in agouti and non-agouti deer mice (*Peromyscus maniculatus*).** *Comparative Biochemistry and Physiology, Part A, Molecular and Integrative Physiology* 130(2): 311-21. ISSN: 1095-6433.
NAL Call Number: QP1.C6
Abstract: Body, adrenal, brain, heart, liver, kidney, spleen and testis masses were determined for agouti and non-agouti deer mice (*Peromyscus maniculatus gracilis*) of both sexes. Body mass was highest for non-agouti females and lowest for agouti females; and sex differences in body mass were significant for agouti, but not non-agouti, deer mice. Adrenal, brain and liver masses were similar between color morphs; heart mass was greater in agouti males; and kidney, spleen and testis masses were all significantly greater for non-agouti deer mice. Splenomegaly in non-agouti deer mice was prominent, as spleens of non-agouti deer mice were 50% larger than those of agouti animals. Sex differences varied across organs and color morphs. For both color morphs, males had heavier adrenals and brains, whereas females had heavier livers and spleens. Kidney and heart mass was greater for female non-agouti deer mice, but for agouti animals, heart mass was greater in males and kidney mass differed little between the sexes. For both color morphs, testes and spleen mass was altered by photoperiod in 72 deer mice housed under short- or long-day conditions and the effect was stronger in non-agouti animals. This is the first report of splenomegaly and sex-specific body mass differences associated with the non-agouti allele.
Descriptors: deer mice, body weight, anatomy, agouti, non agouti, histology, organ size, body mass, organ mass, sex differences.

Hayton, S.M., A. Kriss, and D.P.R. Muller (1999). **Comparison of the effects of four anaesthetic agents on somatosensory evoked potentials in the rat.** *Laboratory Animals* 33(3): 243-251. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Electrophysiological techniques provide an objective and non-invasive measure of neurological function. In order to undertake detailed evoked potential studies in rats on repeated occasions, it is necessary to find an appropriate anaesthetic agent which has minimal and reproducible effects on the parameters to be studied and also has a minimal effect on the general welfare of the animals. In this study we compared the effects of four common anaesthetic agents (ketamine-xylazine, medetomidine, isoflurane and fentanyl/fluanisone-midazolam) on somatosensory evoked potentials (SEPs) in rats following electrical stimulation of the fore- and hind-paw. Fentanyl/fluanisone-midazolam was found to be well tolerated by the animals and to have, in general, the least deleterious effect on SEPs. For example, the response recorded at the level of the somatosensory cortex (P1), following forelimb stimulation, appeared on average 1.80 ms earlier with fentanyl/fluanisone-midazolam than with the other agents and the peak-to-peak amplitude (CI to CII) of the response recorded at the cervical (C3) level was on average 5.86 microvolt greater with fentanyl/fluanisone-midazolam. Fentanyl/fluanisone-midazolam is, therefore, recommended as the anaesthetic of choice for longitudinal studies of SEPs in the rat.
Descriptors: rats, anesthesia, ketamine, xylazine, medetomidine, isoflurane, fentanyl, electrical stimulation, responses, injectable anesthetics, cerebral cortex, fluanisone, midazolam.

Heinrichs, S.C. (2001). **Mouse feeding behavior: ethology, regulatory mechanisms and utility for mutant phenotyping**. *Behavioural Brain Research* 125(1-2): 81-88. ISSN: 0166-4328.
Descriptors: mouse, feeding behavior, regulatory mechanisms, mutant phenotyping, ingestive behavior, genetically obese.

Hopley, R. and A. Zimmer (2001). **Mousebank: a database application for managing transgenic mouse breeding programs**. *Biotechniques* 30(1): 130-132. ISSN: 0736-6205.
Descriptors: mousebank, database, transgenic mouse, breeding programs, managing, computers, application.

Hosokawa, M., T. Abe, K. Higuchi, K. Shimakawa, Y. Omori, T. Matsushita, K. Kogishi, E. Deguchi, Y. Kishimoto, K. Yasuoka, and T. Takeda (1997). **Management and design of the maintenance of SAM mouse strains: an animal model for accelerated senescence and age-associated disorders**. *Experimental Gerontology* 32(1-2): 111-116. ISSN: 0531-5565.
Descriptors: SAM mouse, strains, management, design, animal model, maintenance, age, associated disorders, senescence.

Howroyd, P., R. Hoyle Thacker, O. Lyght, D. Williams, and E. Kleymenova (2005). **Morphology of the fetal rat testis preserved in different fixatives**. *Toxicologic Pathology* 33(2): 300-304. ISSN: 0192-6233.
Abstract: Histopathological examination of the testes of exposed fetuses and neonates is important in assessing the developmental effects of environmental toxins, including sex hormone modulators. Modified Davidson's fluid (mDF) has been suggested as a superior substitute for Bonin's fluid for fixation of adult animal testes. We compared the morphology of fetal rat testes stained with hematoxylin and eosin (H&E) or immunochemically after fixation in 10% neutral buffered formalin (NBF), Boom's fluid, or mDF. Fixation in mDF resulted in more sharply defined nuclear detail and better preservation of cellular cytoplasm on H&E-stained sections of rat testes on gestation day 19. Use of Boom's fluid did not allow satisfactory detection of apoptotic cells by fluorescent terminal deoxynucleotide transferase-mediated deoxy-UTP nick labeling. Staining with the immunoperoxidase system and the conventional chromogen diaminobenzidine tetrahydrochloride to visualize 5-bromo-2-deoxyuridine-positive cells demonstrated that the number of positive nuclei and intensity of staining were similar with all 3 fixatives. Immunostaining for cytoskeletal protein vimentin was more intense and provided better details of the Sertoli cell cytoplasm with formalin fixation than with mDF. Our study demonstrates that fixation in mDF provided better morphologic detail in the fetal rat testis compared with 10% NBF and Bonin's fluid and illustrates the importance of establishing the correct fixation conditions for each immunostaining protocol.
Descriptors: methods and techniques, reproduction, fluorescent terminal deoxynucleotide transferase mediated deoxy-UTP nick labeling, laboratory techniques, immunochemistry, immunologic techniques, laboratory techniques.

Ignat'ev, D.A., R.Y. Gordon, V.V. Vorob'ev, and V.V. Rogachevsky (2005). **A comparative analysis of restoration of electroencephalographic and protein-synthesizing activities in neocortex and hippocampus in hibernating (ground squirrels) and nonhibernating (rats) animals during exit from hypothermia**. *Biofizika* 50(1): 140-151. ISSN: 0006-3029.
Abstract: A similarity in the sequence of restoration of the EEG spectrum between ground squirrels arousing from torpor and rats passing out of artificial hypothermia (17-18degreeC) was shown. First of all, the low-frequency part of the EEG spectrum was restored. As animals warmed up, their breathing became hurried, cold shivering appeared, and the theta- and alpha-rhythms increased. During the exit from hypothermia, the activity of the protein-synthesizing system in both rats and ground squirrels was almost entirely restored when the animal body temperature achieved 21-22degreeC. In ground squirrel, the rate of protein synthesis in the neocortex was lower than in hippocampus CA1 and CA3 areas, whereas in rats, on the contrary, it was higher in the neocortex in comparison with the CA3 area.
Descriptors: rats, ground squirrels, biochemistry and molecular biophysics, metabolism, nervous system, neural coordination, electroencephalography, EEG, clinical techniques, diagnostic techniques, hibernation, hypothermia.

Inoue, T., Y. Adachi, S. Ninomiya, Y. Soeno, C. Tateno, H. Toru, T. Sudo, and K. Yoshizato (2004). **Ultimate**

predictability for human drug disposition using chimera mice. *Drug Metabolism Reviews* 36(Supplement 1): 241. ISSN: 0360-2532.

Descriptors: chimera mice, predictability, human drug disposition, metabolism, pharmaceuticals, pharmacology.

Notes: Meeting Information: 7th International Meeting of the International Society for the Study of Xenobiotics, August 29-September 02, 2004, Vancouver, BC, Canada.

Jablonski, P. and B.O. Howden (2002). **Oral buprenorphine and aspirin analgesia in rats undergoing liver transplantation.** *Laboratory Animals* 36(2): 134-143. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: The objective of this study was to establish effective postoperative analgesia for Dark Agouti rats undergoing liver transplantation with minimal additional stress due to handling and no adverse effect on transplant outcome. Oral administration of buprenorphine (0.5 mg/kg/dose) or aspirin (100 mg/kg/dose) in raspberry-flavoured gelatine were compared to controls receiving no treatment or plain gelatine. The drugs were presented five times: immediately on recovery from anaesthesia and at 12 h intervals thereafter. All rats underwent right nephrectomy and replacement of their liver by an arterialized liver isograft preserved optimally for 24 h. All groups had reversible hepatic damage, lost weight and demonstrated severely reduced dark cycle activity after surgery. Neither treatment appeared to ameliorate the loss of body weight that probably reflected hepatic insufficiency during the first week as well as pain and surgical stress. In the second week, when liver function was 'normal', rats began to regain weight at the pre-transplant rate. Aspirin treatment significantly increased activity during the first and second dark cycles after surgery, whereas buprenorphine significantly increased activity during the second dark cycle only. Neither drug had any apparent adverse effects on the rats or on graft function. Postoperative oral administration of aspirin should be incorporated into future programmes of liver transplantation in rodents. More effective treatment in the immediate postoperative period may require oral administration of analgesia prior to surgery or a single subcutaneous injection of an analgesic agent on completion of surgery in addition to postoperative oral. administration of aspirin.

Descriptors: rats, postoperative care, aspirin, opium alkaloids, body weight, liver, weight, blood plasma, aspartate aminotransferase, alkaline phosphatase, enzyme activity, creatine, bilirubin, physical activity, animal welfare, animal use refinement.

Jablonski, P., B.O. Howden, and K. Baxter (2001). **Influence of buprenorphine analgesia on post-operative recovery in two strains of rats.** *Laboratory Animals* 35(3): 213-222. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: The objective of this study was to establish an effective post-operative analgesic regimen for Sprague-Dawley (SD) and Dark Agouti (DA) rats. Buprenorphine (0.01 or 0.05 mg/kg), a partial mu opioid agonist, was administered subcutaneously immediately on completion of a standardized surgical procedure, involving anaesthesia, laparotomy and visceral manipulation. Two of the four treatment groups and the saline control group received a second injection 9 h later. Behavioural observations by three independent observers provided no information in assessing pain in this model. All rats lost weight, consumed less food and water after surgery. On the first day, both SD and DA rats receiving buprenorphine lost less weight than untreated control groups. Using weight loss as an efficacy criterion, low-dose buprenorphine, given once or twice, provided effective analgesia in SD rats. A higher single dose provided no additional benefit and a second dose was detrimental, reducing body weight and food intake. In DA rats, the high dose, given twice, appeared to be more effective than the lower dose. All DA cage cohorts consumed <10% pre-operative food despite buprenorphine treatment, suggesting a higher dosage may be necessary. However, all SD and 80% DA rats who received no buprenorphine gained body weight on the second day, whereas most of the buprenorphine-treated rats continued to lose weight for another 2 days, despite increased food consumption by both strains. Buprenorphine may adversely affect intestinal function over a number of days due to its enterohepatic circulation; this effect may be more severe in DA rats. Adverse metabolic effects of buprenorphine and other opioids may preclude their use. in the future if it can be shown that non-steroidal anti-inflammatory drugs (NSAIDs) provide equally effective analgesia.

Descriptors: rats, strain differences, laboratory mammals, postoperative care, analgesics, pain, weight losses, feed intake, water intake, dosage, adverse effects, drug effects, pharmacokinetics, animal welfare, animal testing alternatives, animal use refinement.

Jackson, R.K. (1997). **Unusual laboratory rodent species: research uses, care, and associated biohazards**. *ILAR Journal* 38(1): 13-21. ISSN: 1084-2020.
NAL Call Number: QL55.A1I43
Descriptors: rodents, voles, Rodentia, squirrels, laboratory animals, animal models, experimentation, medical sciences, research, mammals, noxious animals, noxious mammals, pests, Rodentia, useful animals, *Octodon degus*, microtus, clethrionomys, peromyscus, *Sigmodon hispidus*, spermophilus, praomys, marmota.

Jankovic, J. and J.L. Noebels (2005). **Genetic mouse models of essential tremor: are they essential?** *Journal of Clinical Investigation* 115(3): 584-586. ISSN: 0021-9738.
Descriptors: mouse models, genetic, essential tremor, ET, neurological disorder, phenotype, clinical characteristics, human condition.

Jegstrup, I., R. Thon, A.K. Hansen, and M.R. Hoitinga (2003). **Characterization of transgenic mice - a comparison of protocols for welfare evaluation and phenotype characterization of mice with a suggestion on a future certificate of instruction**. *Laboratory Animals* 37(1): 1-9. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: transgenic mice, characterization, welfare evaluation, phenotype, protocols, special needs, humane endpoints.

Jenkins, E.S. and R.D. Combes (1999). **Transgenic models for prion disease: have they outlived their useful purpose.** *ATLA, Alternatives to Laboratory Animals* 27(Supplement 1): 827-838. ISSN: 0261-1929.
NAL Call Number: Z7994.L3A5
Abstract: Prions are a recently identified class of proteinaceous pathological agents. Prion diseases are fatal neurological disorders, the importance of which is exemplified by the recent emergence of a novel variant of Creutzfeldt-Jacob disease (CJD) in humans. During pathogenesis, prion proteins undergo a conformational change, which converts the normal isoform to a pathogenic isoform. Several approaches are available for studying prion disease. The predominant approach has involved in vivo studies, especially involving transgenic mice. In vitro alternatives available for studying prion disease include a cell-free conversion assay, cell culture systems, and an immunoassay for the pathogenic form of the prion protein. Prion-like proteins have been identified in yeast, and therefore this constitutes another non-animal approach. Four main areas of prion research are discussed in this paper, to illustrate the potential applications and limitations of the in vivo and alternative systems. From this study, we conclude that, while current in vitro approaches can be used initially, in vivo studies are still needed to confirm data obtained in vitro. Priority should be given to the non-animal alternatives, as well as to developing new methods, and these should be given primary consideration at the outset of a project.
Descriptors: transgenic animals, animal welfare, mice, prion diseases, cell cultures, immunoassay, bioassays, yeasts, molecular conformation, host range, experimental infection, animal models, animal testing alternatives, nonanimal tests, animal use reduction, animal use replacement.

Jenkins, E.S. and R.D. Combes (1999). **The welfare problems associated with using transgenic mice to bioassay for bovine spongiform encephalopathy**. *Animal Welfare* 8(4): 421-431. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: transgenic mice, bioassay, bovine spongiform encephalopathy, welfare problems, prion disease, Porter ethical score system, evaluation method, distress, pain.

Jenkins, E.S., S. Gray, and R.D. Combes (2001). **Mutagenesis screens: can they be justified.** *ATLA, Alternatives to Laboratory Animals* 29(1): 63-68. ISSN: 0261-1929.
NAL Call Number: Z7994.L3A5
Descriptors: mice, laboratory mammals, mutagenesis, screening, animal models, phenotypes, dominance, cost benefit analysis, animal welfare, blood sampling, anesthesia, ethyl ether, animal use reduction, animal use refinement.

Jevtovic Todorovic, V. and L.B. Carter (2005). **The anesthetics nitrous oxide and ketamine are more neurotoxic to old than to young rat brain**. *Neurobiology of Aging* 26(6): 947-956. ISSN: 0197-4580.

Descriptors: rat, brain, anesthetics, young, aging, neurotoxic, nitrous oxide, ketamine, nervous system, pharmacology, toxicology.

Jones, G.L.A.H., E. Sang, C. Goddard, R.J. Mortishire Smith, B.C. Sweatman, J.N. Haselden, K. Davies, A.A. Grace, K. Clarke, and J.L. Griffin (2005). **A functional analysis of mouse models of cardiac disease through metabolic profiling**. *Journal of Biological Chemistry* 280(9): 7530-7539. ISSN: 0021-9258.
NAL Call Number: 381 J824
Descriptors: mouse model, cardiac disease, heart disease, cardiac arrhythmia, metabolic profiling, laboratory techniques, functional analysis.

Jong, W.M.C., C.J. Zuurbier, R.J. De Winter, D.A.F. Van den Heuvel, P.H. Reitsma, and H.I.C. Ten Cate (2002). **Fentanyl-fluanisone-midazolam combination results in more stable hemodynamics than does urethane-alpha-chloralose and 2,2,2-tribromoethanol in mice.** *Contemporary Topics in Laboratory Animal Science* 41(3): 28-32. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory mammals, animal models, anesthesia, fentanyl, intraperitoneal injection, benzodiazepines, neuroleptics, drug combinations, urethane, chloralose, ethanol, blood pressure, heart rate, drug toxicity, cardiovascular system, animal welfare.

Khan, A., G.I. Jallo, Y.J. Liu, B.S. Carson, and M. Guarnieri (2005). **Infusion rates and drug distribution in brain tumor models in rats**. *Journal of Neurosurgery* 102(1, Supplement S): 53-58. ISSN: 0022-3085.
Descriptors: rats, brain tumor, models, drug distribution, infusion rate, cental nervous system, delivery rates, chemotherapy, toxicity.

Kimura, T., T. Yamamoto, A. Sone, A. Takenaka, and M. Fujisawa (2005). **Assessment of microheterogeneity of blood flow in the rat urinary bladder by high-resolution digital radiography**. *BJU International* 95(6): 895-897. ISSN: 1464-4096.
Abstract: To assess high-resolution digital radiography for measuring blood flow and thus examine the microheterogeneity of bladder microcirculation in a rat model. Microheterogeneity of blood flow in both mucosa and detrusor muscle of eight anaesthetized rats was investigated using an imaging technique with very high spatial resolution (0.1 x 0.1 mm2) using digital radiography combined with the deposition of 3H-labelled desmethylimipramine. The spatial pattern of blood flow was quantified by the coefficient of variation of the regional flow (CV = sd/mean). Muscle blood flow was less than mucous blood flow (muscle : mucosa, 2.9 : 5) in the empty bladder. In the muscle layer the blood flow distribution was more heterogeneous than that in the mucosa, with a mean (smallcapitals>sd/smallcapitals>) CV in muscle and mucosa of 0.33 (0.033) and 0.16 (0.019), respectively (P < 0.001) at the capillary level. There was a heterogeneous distribution of blood flow in the microcirculation to capillary vessels in the muscular layer, possibly reflecting a difference in dynamic blood flow of regional perfusion of the emptied bladder.
Descriptors: cardiovascular system, transport and circulation, methods and techniques, muscular system, movement and support, urinary system, chemical coordination and homeostasis, high resolution digital radiography, laboratory techniques, blood flow microheterogeneity.

Kittel, B., F.C. Ruehl, G. Morawietz, J. Klapwijk, M.R. Elwell, B. Lenz, M.G. O'Sullivan, D.R. Roth, and P.F. Wadsworth (2004). **Revised guides for organ sampling and trimming in rats and mice. Part 2. A joint publication of the RITA and NACAD groups**. *Experimental and Toxicologic Pathology* 55(6): 413-431. ISSN: 0940-2993.
Descriptors: rats, mice, organ sampling, trimming, tissues, toxicity studies, regulatory, RITA, NACAD, revised guidelines.

Korystov, Y.N., A.V. Kulikov, L.V. Arkhipova, G.N. Smirnova, V.V. Shaposhnikova, M.K. Levitman, and L.M. Chailakhyan (2003). **Social stress in groups of mice: methods for recording conflicts and their consequences.** *Doklady Biological Sciences Proceedings of the Academy of Sciences of the USSR* 390: 271-3. ISSN: 0012-4966.
Descriptors: conflict psychology, mice, inbred strains physiology, social behavior, stress, psychological

metabolism, age factors, body weight, cell count, animal housing, mice, inbred mice strains psychology, tape recording, thymus gland cytology, time factors.
Notes: Biological sciences sections translated from Russian.

Kramer, K., L. Kinter, B.P. Brockway, H.P. Voss, R. Remie, and B.L.M. Van Zutphen (2001). **The use of radiotelemetry in small laboratory animals: recent advances.** *Contemporary Topics in Laboratory Animal Science* 40(1): 8-16. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: laboratory animals, rats, mice, telemetry, radio waves, data collection, blood pressure, electrocardiograms, heart rate, electrodes, body temperature, circadian rhythm, stress, normal values, animal welfare, literature reviews, animal use refinement, animal use reduction.

Kristan, D.M. and K.A. Hammond (1999). **Body composition, nutrient transport, and resting metabolic rate of energy restricted, parasitized mice**. *American Zoologist* 39(5): 94A. ISSN: 0003-1569.
Descriptors: mice, parasitized, body composition, metabolic rate, energy restricted, nutrient transport, resting.
Notes: Meeting Information: Annual Meeting of the Society for Integrative and Comparative Biology, January 04-08, 2000, Atlanta, Georgia, USA.

Krohn, T.C., K. Hejgaard, and A.K. Hansen (2001). **Methods for general assessment of the welfare of laboratory rats**. *Acta Agriculturae Scandinavica Section A, Animal Science* 51(Supplement 30): 118-123. ISSN: 0906-4702.
Descriptors: animal welfare, behavior assessment, laboratory animals, physiology, reviews, methods, rats.

Krol, E., P. Redman, P.J. Thomson, R. Williams, C. Mayer, J.G. Mercer, and J.R. Speakman (2005). **Effect of photoperiod on body mass, food intake and body composition in the field vole, *Microtus agrestis***. *Journal of Experimental Biology* 208(3): 571-584. ISSN: 0022-0949.
Abstract: Many small mammals respond to seasonal changes in photoperiod by altering body mass and adiposity. These animals may provide valuable models for understanding the regulation of energy balance. Here, we present data on the field vole (*Microtus agrestis*) - a previously uncharacterised example of photoperiod-induced changes in body mass. We examined the effect of increased day length on body mass, food intake, apparent digestive efficiency, body composition, de novo lipogenesis and fatty acid composition of adipose tissue in cold-acclimated (8degreeC) male field voles by transferring them from a short (SD, 8 hours:16 hours L:D) to long day photoperiod (LD, 16 hours:8 hours L:D). During the first 4 weeks of exposure to LD, voles underwent a substantial increase in body mass, after which the average difference between body masses of LD and SD voles stabilized at 7.5 g. This 24.8% increase in body mass reflected significant increases in absolute amounts of all body components, including dry fat mass, dry lean mass and body water mass. After correcting body composition and organ morphology data for the differences in body mass, only gonads (testes and seminal vesicles) were enlarged due to photoperiod treatment. To meet energetic demands of deposition and maintenance of extra tissue, voles adjusted their food intake to an increasing body mass and improved their apparent digestive efficiency. Consequently, although mass-corrected food intake did not differ between the photoperiod groups, the LD voles undergoing body mass increase assimilated on average 8.4 kJ day-1 more than animals maintained in SD. The majority (73-77%) of the fat accumulated as adipose tissue had dietary origin. The rate of de novo lipogenesis and fatty acid composition of adipose tissue were not affected by photoperiod. The most important characteristics of the photoperiodic regulation of energy balance in the field vole are the clear delineation between phases where animals regulate body mass at two different levels and the rate at which animals are able to switch between different levels of energy homeostasis. Our data indicate that the field vole may provide an attractive novel animal model for investigation of the regulation of body mass and energy homeostasis at both organism and molecular levels.
Descriptors: field vole, biosynchronization, digestive system, ingestion, assimilation, nutrition, reproduction, body mass, daylight exposure, digestive efficiency, fat deposition, food intake, photoperiod, seasonal variation.

Krugner Higby, L., L. Smith, M. Clark, T.D. Heath, E. Dahly, B. Schiffman, S. Hubbard Van Stelle, D. Ney, and A. Wendland (2003). **Liposome-encapsulated oxymorphone hydrochloride provides prolonged relief of postsurgical visceral pain in rats.** *Comparative Medicine* 53(3): 270-279. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Adequate pain control is necessary for optimal postsurgical recovery and humane treatment of laboratory and companion animals. Opioid drugs are currently the most potent analgesic agents available in human and veterinary medicine. Long-acting formulations of opioid drugs confer several important advantages over standard pharmaceutical preparations, especially for use in animals. A long-acting formulation of oxymorphone hydrochloride was produced by encapsulation into liposomes. Liposome-encapsulated (LE) oxymorphone was tested in a rat model of visceral postoperative pain. Rats were given one subcutaneous injection of LE oxymorphone (1.2 or 1.6 mg/kg of body weight) or standard oxymorphone (0.3 mg/kg) at the time of intestinal transection or resection. A single administration of LE oxymorphone hydrochloride was as effective for relief of postoperative pain in rats (P = 0.18), as were multiple (q4 h or q8 h) injections of 0.3 mg/kg of the standard pharmaceutical preparation. The rats given LE oxymorphone prior to intestinal resection also had significantly higher body weight at three and seven days after surgery than did rats that were given standard oxymorphone. In conclusion, LE oxymorphone was effective in treating visceral pain associated with intestinal surgery in rats. On the basis of body weight gain, rats treated with LE oxymorphone had improved recovery outcome, compared with rats treated with repeated injections of standard oxymorphone.

Descriptors: rats, laboratory animals, postoperative care, pain, analgesia, morphine, adverse effects, liposomes artificial, drug delivery systems, weight loss, voluntary intake, dose response, animal welfare.

Krupke, D.M., D. Naf, M.J. Vincent, T. Allio, I. Mikaelian, J.P. Sundberg, C.J. Bult, and J.T. Eppig (2005). **The mouse tumor biology database: integrated access to mouse cancer biology data**. *Experimental Lung Research* 31(2): 259-270. ISSN: 0190-2148.

Descriptors: mouse, cancer biology data, tumor, neoplastic disease, tumor biology database, genetic models, human cancer, computer techniques, imaging, tumor biology.

Kudo, H., K. Fukuta, S. Imai, I. Dahlan, N. Abdullah, Y.W. Ho, and S. Jalaludin (1997). **Establishment of lesser mouse deer (*Tragulus javanicus*) colony for use as a new laboratory animal and/or companion animal: Behavior, hematological characteristics, reproductive physiology, rumen microbiology in relation to feed digestibility and metabolic activities**. *Jircas Journal for Scientific Papers* (4): 79-88. ISSN: 1340-7686.

Descriptors: Cervidae, laboratory animals, behavior, reproduction, herds, pet animals, blood cells, rumen digestion, metabolism, blood, cells, digestion, mammals, physiological functions, ruminants, useful animals.

Language of Text: English and Japanese summaries.

Kunzl, C. and N. Sachser (1999). **The behavioral endocrinology of domestication: A comparison between the domestic guinea pig (*Cavia aperea* f. *porcellus*) and its wild ancestor, the cavy (*Cavia aperea*).** *Hormones and Behavior* 35(1): 28-37. ISSN: 0018-506X.

Descriptors: domestic animals physiology, wild animals physiology, neurosecretory systems physiology, pituitary adrenal system physiology, sympathetic nervous system physiology, adaptation, physiological physiology, adrenal glands chemistry, adrenal glands enzymology, aggression physiology, body weight, cortisone blood, epinephrine blood, guinea pigs, ovary physiology, sex behavior, animal physiology, testis physiology, testosterone blood, tyrosine 3 monooxygenase analysis.

Lawson, D.M., J.L. Duke, T.G. Zammit, H.L. Collins, and S.E. Dicarlo (2001). **Recovery from carotid artery catheterization performed under various anesthetics in male, Sprague-Dawley rats.** *Contemporary Topics in Laboratory Animal Science* 40(4): 18-22. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory mammals, anesthesia, pentobarbital, halothane, ketamine, xylazine, acepromazine, catheterization, arteries, body weight, feed intake, water intake, physical activity, blood pressure, heart rate, circadian rhythm, animal welfare, animal use refinement.

Leach, M.C., V.A. Bowell, T.F. Allan, and D.B. Morton (2002). **Aversion to gaseous euthanasia agents in rats and mice.** *Comparative Medicine* 52(3): 249-257. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Despite euthanasia being the most common of all procedures carried out on laboratory animals, the potential distress associated with gaseous agents has received little interest until recently, with growing concern

over use of carbon dioxide as a humane method of euthanasia. The distress associated with exposure to carbon dioxide, argon, and carbon dioxide-argon mixtures was investigated in rats and mice by measuring the degree of aversion on exposure to low, medium, and high concentrations of these agents. Animals were exposed to the various concentrations in a test chamber containing air or gas mixtures that they were able to enter and leave at will. Aversion was assessed, using measurements of initial withdrawal time and total dwelling time in the test chamber, as they were the most sensitive measurements of aversion. Comparisons between euthanasia agent and control (air) treatments indicated that concentrations of agents recommended for rapid and efficient induction are associated with some degree of aversion. Carbon dioxide and the carbon dioxide-argon mixtures were more aversive than was argon for rats and mice. These findings suggest that induction with carbon dioxide either alone or in combination with argon is likely to cause considerable distress before the loss of consciousness in rodents, which is unacceptable considering that effective and more humane alternatives are available.

Descriptors: rats, mice, laboratory mammals, euthanasia, hypoxia, carbon dioxide, argon, mixtures, escape responses, animal welfare, distress, animal use refinement.

Leach, M.C., V.A. Bowell, T.F. Allan, and D.B. Morton (2002). **Degrees of aversion shown by rats and mice to different concentrations of inhalational anaesthetics.** *Veterinary Record* 150(26): 808-815. ISSN: 0042-4900.

NAL Call Number: 41.8 V641

Descriptors: inhaled anesthetics, halothane, isoflurane, carbon dioxide, concentration, rats, mice, animal behavior, animal welfare, enflurane.

Lee, C.M., J.D. Lederman, N.E. Hofmann, and J.W. Erdman Jr. (1998). **The Mongolian gerbil (*Meriones unguiculatus*) is an appropriate animal model for evaluation of the conversion of beta-carotene to vitamin A**. *Journal of Nutrition* 128(2): 280-286. ISSN: 0022-3166.

NAL Call Number: 389.8 J82

Abstract: Vitamin A (VA) deficiency is the leading cause of blindness in children in developing countries. Dietary intervention with foods rich in provitamin A carotenoids, such as beta-carotene (beta C), has been suggested as one solution to this problem. The objective of the two studies described in this paper was to examine the utilization of beta C as a source of VA at different stages of VA depletion using the Mongolian gerbil as a model. Male 4- to 5-wk-old Mongolian gerbils were fed powdered beta C-free semipurified diets either with or without VA for 26 d (Study 1), or without VA for 8-10 wk (Study 2). Gerbils were then fed diets with or without VA (20.9 nmol/g diet) and/or beta C [67.0 micromol/g diet (Study 1) and 145.9 micromol/g diet (Study 2)] for variable periods. Two (Study 1) or three (Study 2) days before termination of the study, 3-4 gerbils per group were dosed orally with 14C-beta C. Tissues were evaluated for VA and beta C content by HPLC. Liver was extracted with and without saponification to evaluate 14C-beta C and 14C-VA content. The results demonstrate the following: (1) the gerbil is an appropriate animal model to study beta C utilization; (3) the daily VA utilization rate for this species is calculated to be 3.1 micrograms/100 g body weight; (4) a highly bioavailable source of beta C at a 6:1 weight ratio of beta C:VA is sufficient to reverse marginal VA status in this model; and (5) a highly bioavailable source of beta C fed between a 6:1 and 13:1 weight ratio to VA provides equivalent VA status as preformed VA in Mongolian gerbils.

Descriptors: carotenoids, retinol, metabolism, gerbils, animal models, species, trial methods, nutrition physiology, diet, experimentation, vitamin deficiencies, bioavailability, nutritional status, vitamins, supplements, liver, blood serum, kidneys, adrenal glands, nutrients, nutrient reserves, recovery.

Leenaars, P.P.A.M., M.A. Koedam, P.W. Wester, V. Baumans, E. Claassen, and C.F.M. Hendriksen (1998). **Assessment of side effects induced by injection of different adjuvant/antigen combinations in rabbits and mice.** *Laboratory Animals* 32(4): 387-406. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: We evaluated the side effects induced by injection of Freund's adjuvant (FA) and alternative adjuvants combined with different antigens. Rabbits and mice were injected subcutaneously, intramuscularly (rabbits) and intraperitoneally (mice) with different adjuvants (FA, Specol, RIBI, TiterMax, Montanide ISA50) in combination with several types of antigens (synthetic peptides, autoantigen, glycolipid, protein, mycoplasma or viruses). The effects of treatment on the animals' well-being were assessed by clinical and behavioural changes (POT and LABORAS assays) and gross and histopathological changes. In rabbits, treatment did not appear to

induce acute or prolonged pain and distress. Mice showed behavioural changes immediately after (predominantly secondary) immunization. Injection of several adjuvant/antigen mixtures resulted in severe pathological changes, depending on adjuvant, type of antigen, animal species used and route of injection. Both rabbits and mice showed pathological changes ranging from marked to severe after injection of FA, and ranging from minimal to marked after Specol and Montanide injections. Pathological changes after RIBI injections were severe in rabbits, though slight in mice. After TiterMax injections, pathological changes were moderate in rabbits, though severe in mice. In conclusion, injection of FA according to present guidelines resulted mostly in severe pathological changes, whereas only very few clinical and behavioural signs indicated prolonged severe pain. Our findings indicate that Montanide ISA50 and Specol induce acceptable antibody titres, and cause fewer pathological changes than FA. Thus they are effective alternatives to FA.

Descriptors: rabbits, mice, adverse effects, adjuvants, antigens, animal welfare, species differences, immune response, intramuscular injection, intraperitoneal injection, subcutaneous injection, pain, antibody formation, immunization, lesions, histopathology.

Liou, G.I., S.E. Nozell, and S.B. Smith (1999). **Rhodopsin regeneration after 70% light bleaching in the IRBP-/- mouse, a new model for retinal degeneration**. *IOVS* 40(4): S209.

Descriptors: mouse, new model, retinal degeneration, rhodopsin, light bleaching, IRBP, meeting abstract.

Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 9-14, 1999, Fort Lauderdale, Florida, USA.

Lorenz, J.N. (2002). **A practical guide to evaluating cardiovascular, renal, and pulmonary function in mice**. *American Journal of Physiology* 282(6, Part 2): R1565-R1582. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3

Descriptors: mice, guide, evaluating, cardiovascular, renal, pulmonary, function, genetically altered mice, techniques.

MacPherson, B.R. and R.S. Pemsingh (1997). **Ground squirrel model for cholelithiasis: role of epithelial glycoproteins.** *Microscopy Research and Technique* 39(1): 39-55. ISSN: 1059-910X.

Abstract: The cholesterol-fed Richardson's ground squirrel (*Spermophilus richardsonii*) has proven to be an effective animal model in which to study factors that influence cholesterol gallstone formation and associated alterations in the gallbladder epithelium. Ground squirrels of either sex, fed a 2% cholesterol-enriched diet, exhibit cholesterol monohydrate crystal precipitation within 24 hours and macroscopically visible cholesterol stones by 3 weeks. Data on bile chemistry, biliary cholesterol precipitation, and various mucosal alterations occurring prior to, during, and after stone formation were collected using sampling intervals from 6 hours to 20 weeks on the diet. The results indicate that mucin hypersecretion appears to be more closely related to the initiation of nucleation than does either bile calcium of pH. Mucus hypersecretion begins within 18 hours of diet initiation and continues throughout the 20 week experimental period. Apical excrescences became more common and were larger in size during the early stages of cholelithiasis. Administration of aspirin during the experimental period demonstrated an inhibition of mucin synthesis and release. Gallstones were not formed in these aspirin-treated animals. A lectin-binding panel for 10 epithelial glycoprotein-related sugars indicated the mucin secreted by the gallbladder epithelium of 7 day experimental animals differed from that of controls. The most obvious difference was the abolition of WGA binding in the experimental animals, suggesting an absence of sialic acid expression in the mucin during the lithogenic process. Ultrastructural histochemistry indicated that both sulphomucin and sialomucin were present in the secretory granules and within the surface mucus layer of both experimental and control animals. Experimental animals, however, exhibited a significant predominance for sulphomucin. This pattern varies from that typically seen in other regions of the gastrointestinal tract where sialomucins predominate during pathologic processes.

Descriptors: cholelithiasis metabolism, cholelithiasis pathology, glycoproteins metabolism, animal feed, anti inflammatory agents, non steroidal pharmacology, aspirin pharmacology, bile chemistry, calcium metabolism, cholelithiasis prevention and control, cholelithiasis ultrastructure, cholesterol metabolism, dietary supplements, epithelium metabolism, epithelium pathology, epithelium ultrastructure, gallbladder metabolism, gallbladder pathology, gallbladder ultrastructure, histocytochemistry, lectins metabolism, lectins ultrastructure, microscopy, electron, microscopy, electron microscopy scanning, fluorescence, mucins drug effects, mucins metabolism, mucins secretion, mucus metabolism, n acetylneuraminic acid biosynthesis, Sciuridae.

Maltais, L.J., J.A. Blake, J.T. Eppig, and M.T. Davisson (1997). **Rules and guidelines for mouse gene nomenclature: a condensed version**. *Genomics* 45(2): 471-476. ISSN: 0888-7543.
Descriptors: mouse, genes, nomenclature, DNA, loci, transgenics, chromosome aberrations, biotechnology, mice, guidelines.

Maltais, L.J., J.A. Blake, T. Chu, C.M. Lutz, J.T. Eppig, and I. Jackson (2002). **Rules and guidelines for mouse gene, allele, and mutation nomenclature: a condensed version**. *Genomics* 79(4): 471-474. ISSN: 0888-7543.
Descriptors: mouse, gene, allele, mutation nomenclature, rules, guidelines, condensed version.

Martin Caballero, J., A. Naranjo, and E. De la Cueva (2003). **Genetically modified mouse health reporting: a need for global standardization.** *Lab Animal* 32(8): 38-45. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Abstract: The distribution of GM mice between facilities has raised new problems because of variable microbiological quality. One of the most important management issues concerns the methods of reporting laboratory animal health surveillance results. The authors evaluated the format and content of 380 health reports of mice received from 55 institutions in Europe and North America. Their results suggest that a standardized rodent health form would facilitate the management of laboratory mouse distribution and infection control.
Descriptors: disease notification standards, transgenic mice, rodent diseases diagnosis, veterinary medicine standards, disease transmission prevention and control, Europe, infection control, mice, North America, population surveillance methods, quality control, rodent diseases microbiology, rodent diseases transmission, world health.

Martinic, G. (2004). **Procedural guidelines for the maintenance and management of small animal surgical facilities within a research laboratory, including recommendations for the application and conduct of aseptic surgery on rodents and lagomorphs**. *Animal Technology and Welfare* 3(1): 3-14. ISSN: 0264-4754.
NAL Call Number: SF757.A62
Descriptors: rodents, lagomorphs, aseptic surgery, surgical facilities, procedural guidelines, management, conduct, research.

Mason, G. and K.E. Littin (2003). **The humaneness of rodent pest control.** *Animal Welfare* 12(1): 1-37. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, mice, rodent control, vermin, coumarin rodenticides, zinc phosphide, hydrogen cyanide, chloralose, bait traps, traps, electrocution, death, stickiness, ergocalciferol, poisoning of animal pests, nontarget organisms, animal welfare, anticoagulants, pain, fumigants, pesticide residues, distress, sticky boards.

Mccally, R.L. and M. Matsuzawa (2000). **Technique to measure light scattering from mouse cornea**. *IOVS* 41(4): S692.
Descriptors: mouse, cornea, light scattering, measure, technique, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 30-May 05, 2000, Fort Lauderdale, Florida, USA.

Mertens, C. (2000). **Phenotype characterization and welfare assessment of transgenic rodents (mice).** *Journal of Applied Animal Welfare Science* 3(2): 127-139. ISSN: 1088-8705.
NAL Call Number: HV4701.J68
Descriptors: mice, transgenic animals, progeny testing, screening, phenotypes, strain differences, animal welfare, congenital abnormalities, postnatal development, animal health, data collection.

Miki, H., K. Inoue, T. Kohda, A. Honda, N. Ogonuki, M. Yuzuriha, N. Mise, Y. Matsui, K. Abe, F. Ishino, and A. Ogura (2005). **Birth of mice produced by germ cell nuclear transfer**. *Genesis The Journal of Genetics and Development* 41(2): 81-86. ISSN: 1526-954X.
Descriptors: methods and techniques, reproductive system, reproduction, nuclear transfer, laboratory techniques, genetic techniques, DNA methylation analysis, cell differentiation, genome.

Miller, P.S., M.K. Nielsen, and H.Y. Chen (1998). **Growth curves, feed intake, water intake, organ weights, and heat production of mice selected for high or low heat loss**. *Journal of Dairy Science* 81(Supplement 1): 134.
Descriptors: mice, heat loss, growth curves, feed intake, organ weights, heat production, water intake.
Notes: Meeting Information: Joint Meeting of the American Dairy Science Association and the American Society of Animal Science, July 28-31, 1998, Denver, Colorado, USA.

Moore, H.D., N.M. Jenkins, and C. Wong (1997). **Immunocontraception in rodents: a review of the development of a sperm-based immunocontraceptive vaccine for the grey squirrel (*Sciurus carolinensis*).** *Reproduction, Fertility, and Development* 9(1): 125-9. ISSN: 1031-3613.
Abstract: The strategy for developing contraceptive vaccines for wild rodents will depend on the species. In rats and mice, high all-year birth rates, high levels of dispersal and promiscous mating systems suggest that, if immunocontraception was used alone, > 90% of the population would have to sterilized to achieve the desired control. In Britain, the grey squirrel (*Sciurus carolinensis*) may be a better candidate to investigate the feasibility of a contraceptive vaccine in rodents. This introduced species is a seasonal breeder with a much lower population turnover than rats or mice. As well as causing damage to woodland, it has ousted the native red squirrel (*S. valgaris*) from most of the UK. A human and selective method for the control of grey squirrels is therefore highly desirable. Numerous sperm-specific antigens have been identified on rodent spermatozoa. Monoclonal antibodies to particular components block sperm-egg interactions in laboratory animals and cross-react with grey squirrel spermatozoa. In vitro fertilization assays indicate that squirrel sperm-egg binding may be inhibited also. Currently, a cDNA library obtained from grey squirrel testis is being screened to identify genes encoding specific sperm antigens involved in fertilization. Methods of enhancing immunogenicity after oral immunization using microparticle carriers and immune-stimulating complexes are currently under investigation.
Descriptors: contraception, immunologic veterinary, pest control methods, Sciuridae, spermatozoa immunology, vaccines administration and dosage, administration, oral, antigens genetics, antigens immunology.

Moraes, C. and F. Diaz (2004). **Mouse models of isolated cytochrome oxidase deficiency**. *Biochimica Et Biophysica Acta* 1657: 15. ISSN: 0005-2728.
NAL Call Number: 381 B522[G]
Descriptors: neural coordination, enzymology, biochemistry and molecular biophysics, molecular genetics, myopathy, muscle disease, Leigh syndrome, nervous system disease, cytochrome oxidase deficiency, genetic disease.
Notes: Meeting Information: 6th European Meeting on Mitochondrial Pathology, July 01 -04, 2004, Nijmegen, Netherlands.

Morawietz, G., F.C. Ruehl, B. Kittel, A. Bube, K. Keane, S. Halm, A. Heuser, and J. Hellmann (2004). **Revised guides for organ sampling and trimming in rats and mice. Part 3. A joint publication of the RITA and NACAD groups**. *Experimental and Toxicologic Pathology* 55(6): 433-449. ISSN: 0940-2993.
Descriptors: rats, mice, organ sampling, tissue preparation, trimming, methods, techniques, toxicology, RITA, NACAD, sample size, urinary, nervous, musculoskeletal, cardiovascular, lymphoreticular, guidelines.

Mulder, G.B. and K. Pritchett (2003). **The Morris water maze.** *Contemporary Topics in Laboratory Animal Science* 42(2): 49-50. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, mice, laboratory animals, animal behavior, memory, test rigs, laboratory equipment, training animals, animal welfare, strain differences, inbred lines.

Nachman, M.W. (2005). **The genetic basis of adaptation: lessons from concealing coloration in pocket mice**. *Genetica (Dordrecht)* 123(1-2): 125-136. ISSN: 0016-6707.
Abstract: Recent studies on the genetics of adaptive coat-color variation in pocket mice (*Chaetodipus intermedius*) are reviewed in the context of several on-going debates about the genetics of adaptation. Association mapping with candidate genes was used to identify mutations responsible for melanism in four different populations of *C. intermedius*. Here, I review four main results (i) a single gene, the melanocortin-1-receptor (Mc1r), appears to be responsible for most of the phenotypic variation in color in one population, the Pinacate site; (ii) four or fewer nucleotide changes at Mc1r appear to be responsible for the difference in

receptor function; (iii) studies of migration-selection balance suggest that the selection coefficient associated with the dark Mc1r allele at the Pinacate site is large; and (iv) different (unknown) genes underlie the evolution of melanism on three other lava flows. These findings are discussed in light of the evolution of convergent phenotypes, the average size of phenotypic effects underlying adaptation, the evolution of dominance, and the distinction between adaptations caused by changes in gene dosage versus gene structure.
Descriptors: molecular genetics, biochemistry and molecular biophysics, evolution and adaptation, association mapping, laboratory techniques, genetic techniques, adaptation, melanism, concealing coloration.

Nevo, E. (1998). **Evolution of a visual system for life without light: optimization via tinkering in blind mole rats**. In: *Principles of Animal Design: The Optimization and Symmorphosis Debate*, p. 288-298.
Descriptors: blind mole rats, visual system, evolution, light, without light, life.

Nicklas, W., P. Baneux, R. Boot, T. Decelle, A.A. Deeny, M. Fumanelli, and W.B. Illgen (2003). **Recommendations for the health monitoring of rodent and rabbit colonies in breeding and experimental units: recommendations of the Federation of European Laboratory Animal Science Associations (FELASA) Working Group on Health Monitoring of Rodent and Rabbit Colonies accepted by the FELASA board of management, 9 June 2001.** *Baltic Journal of Laboratory Animal Science* 13(4): 226-251. ISSN: 1407-0944.
Descriptors: rodent, rabbit, colonies, animal care, health monitoring, methods, techniques, breeding units, experimental units, Federation of European Laboratory Animal Science Associations, FELASA.

Nielsen, M.K., B.A. Freking, L.D. Jones, S.M. Nelson, T.L. Vorderstrasse, and B.A. Hussey (1997). **Divergent selection for heat loss in mice. II. Correlated responses in feed intake, body mass, body composition, and number born through fifteen generations**. *Journal of Animal Science* 75(6): 1469-1476. ISSN: 0021-8812.
NAL Call Number: 49 J82
Descriptors: heat loss, mice, feed intake, body mass, generations, number born, body composition, responses.

Ninomiya, H. and T. Inomata (2005). **Microvasculature of the hamster eye: scanning electron microscopy of vascular corrosion casts**. *Veterinary Ophthalmology* 8(1): 7-12. ISSN: 1463-5216.
Abstract: The architecture of the retina, choroid and anterior eye segment was investigated in 12 Syrian hamsters using scanning electron micrographs of methylmethacrylate corrosion casts. The hamster eye receives its primary blood supply from the long posterior ciliary artery, which directly enters the optic nerve head, and divides into three branches: the central retinal artery and medial and lateral long posterior ciliary arteries. In the retina the central retinal artery divides into six radiating branches. Retinal arterioles form a slender and long course to capillaries. Retinal capillaries are extremely thin in diameter and form a sparse capillary network. The choroid is supplied by the long posterior ciliary arteries. Choroidal arterioles exhibit a thick and short course to the choriocapillaris. The choriocapillaris is thick and sinusoid-like, forming a dense network in the choroid. The ciliary body, iris and bulbar conjunctiva are supplied by the anterior ciliary arteries, which are branches of the long posterior ciliary arteries. Capillaries supplying the anterior margin of the ciliary process are large in diameter with an irregular bore, forming a thoroughfare channel draining blood in the ciliary arterioles into the pars plana vessels. Blood from the retina is drained by the central retinal veins. Venules from the anterior eye segment empty into the vortex veins via the pars plana vessels. Venous blood from the choroid is drained only by vortex veins via the choroidal veins. The functional significance of the vascular architecture and species differences are discussed.
Descriptors: biochemistry and molecular biophysics, sense organs, sensory reception, transport and circulation, veterinary medicine, medical sciences, scanning electron microscopy, imaging and microscopy techniques, laboratory techniques, vascular corrosion casts.

Nishioka, K., M. Okano, Y. Ichihara, N. Ichihara, and K. Nishizaki (2005). **Immunosuppressive effect of restraint stress on the initiation of allergic rhinitis in mice**. *International Archives of Allergy and Immunology* 136(2): 142-147. ISSN: 1018-2438.
Descriptors: mice, allergic rhinitis, initiation, restraint stress, immunosuppressive effect, acute stress, antibody production, inhibits.

Oh, H.S. and T. Mori (1998). **Growth, development and reproduction in captive of the large Japanese field mouse,**

***Apodemus speciosus* (Rodentia, Muridae)**. *Journal of the Faculty of Agriculture Kyushu University* 42(3-4): 397-408. ISSN: 0023-6152.

Abstract: The large Japanese field mice (*Apodemus speciosus*) were captured and kept in stainless cages under a constant condition at 23 degrees C and 14 L: 10 D photoperiod, and the growth. development and reproduction were investigated in this species. Modification of feeding condition and nest materials and introduction of a chamber and a running wheel apparatus into each cage first enabled this species to breed under captivity. In our breeding colony, A. speciosus produced the pups throughout the year. Concerning sexual maturation of the males, the descended testes and spermiogenesis were observed at 50 days old, copulatory behaviour was performed at about 60 days old, and active breeding started at 70-80 days old. On the other hand, in the females, the vaginas opened and mature follicle sells appeared at 60-70 days old at which active breeding began the females. The mean litter size was 4.29 (n=27), ranging from 3-6, and the gestation period was 19-21 days in this species. Significant sexual difference were detected in each increase in body weight, head and body length, tail length foot length and ear length. These growth rate constants were similar to each other among the four compared species that belong to genus Apodemus; the Korean striped field mouse, *A. agrarius chejuensis*, the small Japanese field mouse, *A. argenteus*, the Formosan wood mouse, *A. semotus* and the large Japanese field mouse, *A. speciosus*.

Descriptors: Rodentia, growth, reproduction, Japan, wild animals, animal developmental stages, captivity, growth rate, species, Asia, biological development, east Asia, mammals, physiological functions, taxa, wildlife.

Ohtsuka, H. (2004). **Circadian rhythm of the electroretinogram and the control system in rats**. *Medical Journal of Hiroshima University* 52(4-6): 47-56. ISSN: 0018-2087.

Abstract: Circadian rhythm in the electroretinogram (ERG) in continuous darkness (DD) over a long period were examined to find whether a free-running rhythm in retinal function exists in rats and if the rhythm is related to the circadian control system in the suprachiasmatic nucleus (SCN) in SCN lesioned rats. ERGs were recorded every 4 hours over 48 hours under a 12-hour light/dark cycle (LD) in SCN non-lesioned or lesioned rats, and on days 61, 85, 97 and 117 in DD in SCN non-lesioned rats. Locomotor activities were examined concurrently to compare the rhythms in the ERG. The amplitudes of the a- and b-waves changed in a circadian fashion in both LD and DD in the SCN nonlesioned rats. The acrophases shifted for every measurement in DD. The mean free-running period in the ERG and locomotor activity rhythms were 24.50 hours. However, no circadian rhythm was observed in the ERG or locomotor activity in the SCN lesioned rats. These results indicated that a circadian rhythm exists in the rat retinal function, in which the rhythm free-runs with the same periodicity as that for locomotor activity, and a circadian rhythm for retinal function was confirmed to be associated with the SCN.

Descriptors: nervous system, neural coordination, sense organs, sensory reception, electroretinography, clinical techniques, diagnostic techniques, locomotor activity examination, laboratory techniques, circadian rhythm, continuous darkness.

Opitz, O.G., M. Quante, A. Von Werder, S. Heeg, and H.E. Blum (2005). **A mouse model of oral-esophageal carcinogenesis**. *Onkologie* 28(1): 44-48. ISSN: 0378-584X.

Descriptors: mouse model, oral esophageal carcinogenesis, squamous cancers, animal model, molecular changes, oral cavity.

Orme, I.M. (2005). **Mouse and guinea pig models for testing new tuberculosis vaccines**. *Tuberculosis (Amsterdam)* 85(1-2): 13-17. ISSN: 1472-9792.

Descriptors: infection, pharmacology, respiratory system, respiration, pulmonary tuberculosis, bacterial disease, respiratory system disease, prevention and control, vaccination, clinical techniques.

Patterson Kane, E.G., M. Hunt, and D. Harper (2002). **Rats demand social contact.** *Animal Welfare* 11(3): 327-332. ISSN: 0962-7286.

NAL Call Number: HV4701.A557

Descriptors: rats, laboratory animals, cages, cage size, animal housing, motivation, animal welfare, environmental enrichment, group housing, animal preferences.

Pecaut, M.J., A.L. Smith, T.A. Jones, and D.S. Gridley (2000). **Modification of immunologic and hematologic**

variables by method of CO2 euthanasia. *Comparative Medicine* 50(6): 595-602. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Background and Purpose: The major goal was to determine whether variations in the method of CO2 euthanasia would induce significant immunologic differences. Methods: Young adult C57BL/6 mice (n = 40) were euthanized, using four regimens: 70% CO2/30% O2; 70% CO2/30% O2 leads to 100% CO2; 100% CO2-naive chamber; and 100% CO2 pre-charged chamber. Time to recumbency and euthanasia and body, liver, lung, spleen, and thymus masses were determined. Blood and spleen were further evaluated for leukocyte, lymphocyte, and thrombocyte counts, erythrocyte characteristics, distribution of lymphocyte subpopulations, spontaneous and mitogen-induced blastogenesis, complement activity, and cytokine production. Results: Time to euthanasia was five- to eightfold longer in mice exposed to 70% CO2/30% O2 than that for any other group. There were slight increases in mean erythrocyte volume (MCV) and mean erythrocyte hemoglobin (MCH) for all groups, compared with those for the 100% CO2 pre-charged group. Circulating cytotoxic T (CD8(+)) lymphocyte percentages and numbers, and spontaneous blastogenesis of leukocytes in blood and spleen, also were affected by euthanasia method. Conclusions: The method of CO2 euthanasia can result in significant differences in immunologic/hematologic variables. Thus, consistency in euthanasia procedures may be important in accurate interpretation of research data.
Descriptors: mice, euthanasia, carbon dioxide, mixtures, oxygen, blood picture, lymphocytes, leukocyte count, spleen, lymphocyte transformation, complement activation, blood serum, blood plasma, transforming growth factor, interleukin 2, tumor necrosis factor, experimental design, animal welfare, distress.

Pelissier, A.L., M. Gantenbein, F. Prudian, and B. Bruguerolle (1998). **Influence of general anaesthetics on circadian rhythms of heart rate, body temperature and locomotor activity in rats**. *STAL, Sciences Et Techniques De L' Animal De Laboratoire* 23(2): 95-98. ISSN: 0339-722X.
Descriptors: rats, locomotor activity, heart rate, body temperature, circadium rhythms, general anesthetics, influence, ketamine.

Pelissier, A.L., M. Gantenbein, and B. Bruguerolle (1998). **Nicotine-induced perturbations on heart rate, body temperature and locomotor activity daily rhythms in rats**. *Journal of Pharmacy and Pharmacology* 50(8): 929-934. ISSN: 0022-3573.
Descriptors: rats, locomotor activity, daily rhythms, heart rate, body temperature, nicotine induced, perturbations.

Perrin, M.R. and E.J. Richardson (2005). **Factors affecting average daily metabolic rate of the fat mouse *Steatomys pratensis* (Dendromurinae)**. *Journal of Thermal Biology* 30(2): 103-109. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Descriptors: metabolism, circadian rhythm, metabolic rate, torpor, ambient temperature.

Peterson, N.C. and J.E. Peavey (1998). **Comparison of in vitro monoclonal antibody production methods with an in vivo ascites production technique.** *Contemporary Topics in Laboratory Animal Science* 37(5): 61-66. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, monoclonal antibodies, ascites, tissue culture, animal welfare, production costs, labor requirements, antibody formation, laboratory equipment.

Pickhardt, P.J., R.B. Halberg, A.J. Taylor, B.Y. Durkee, J. Fine, F.T.J. Lee, and J.P. Weichert (2005). **Microcomputed tomography colonography for polyp detection in an in vivo mouse tumor model**. *Proceedings of the National Academy of Sciences of the United States of America* 102(9): 3419-3422. ISSN: 0027-8424.
Descriptors: mouse, tumor model, polyp detection, tomography, colonography, microcomputed.

Piersma, F.E., M.A.R.C. Daemen, A.E.J.M. Bogaard, and W.A. Buurman (1999). **Interference of pain control employing opioids in in vivo immunological experiments.** *Laboratory Animals* 33(4): 328-333. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Pain control (PC) in laboratory animals is supported by ethical as well as methodological

considerations, aimed at preventing an interfering reduction in food and water intake and normalizing stress hormone levels. However, little is known about the immunomodulatory attributes of analgesics, which putatively prevents the routine implementation of PC in immunological research. In an established murine model of endotoxemia we investigated the immunomodulatory properties of common clinical analgesics (the opioids fentanyl and buprenorphine). Additionally, a literature study was conducted to investigate the frequency of PC in laboratory animals used for immunological experimentation. In line with various reports, we observed interactions between the opioid analgesics and the immune system that altered the outcome of performed in vivo immunological experiments. Of 100 evaluated publications, none mentioned the use of PC, indicating its uncommon implementation. In conclusion, more studies on the interactions between the immune system and analgesics are needed to establish better criteria for adequate implementation. Finally, we propose that methodological sections in scientific journals should clearly document whether or not PC was employed. If PC is not used, the reason for not using it should be stated.

Descriptors: laboratory animals, pain, analgesics, animal welfare, mice, lipopolysaccharides, tumor necrosis factor, fentanyl, opioids, dosage effects, immunosuppressive agents, antiinflammatory agents, experimental design, buprenorphine.

Pinkert, C.A. (2003). **Transgenic animal technology: alternatives in genotyping and phenotyping.** *Comparative Medicine* 53(2): 126-139. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Over the past decade, breakthrough technologies in transgenic animal technology and functional genomics have played a central role in the explosive growth of rodent modeling and in scientific innovation. Various noninvasive alternatives to routine surgical biopsy have been described for genotypic and phenotypic analyses of laboratory animals. A number of options are available to refine or replace potentially painful and invasive procedures ranging from tissue biopsies (including tail biopsies and toe docking) to several blood sampling techniques. Unfortunately adoption of many non- or minimally invasive alternatives has proven difficult on a number of fronts ranging from historical reservations to procedural expectations and actual experimental productivity. Similarly, a variety of phenotyping considerations have addressed throughput efficiencies and the health and well being of research animals. From an animal welfare perspective, marked increases in laboratory animal populations have accompanied rapid advancements spanning the life sciences. As described for rodent modeling, but with applications across many laboratory animal species, diverse procedural refinements are available that will readily aid in the analysis of whole animal models. Ultimately, non-invasive technologies and complementary refinements have bearing on the quality and reproducibility of data that are reported, as well as of critical importance to the well being and ethical management of animals at all developmental stages: from fetal existence, to the neonatal period, and on through adulthood.

Descriptors: transgenic animals, laboratory animals, biopsy, animal use refinement, mice, gene expression, phenotype, phenotypic variation, polymerase chain reaction, animal identification, sampling, feces, saliva, microarray technology, genomics.

Pohorecky, L.A. (1999). **Testing the genetics of behavior in mice.** *Science* 285(5436): 2067-8; Author Reply 2069-70. ISSN: 0036-8075.

Descriptors: behavior, animal, genetics, behavioral methods, housing, animal, animals, laboratory, confounding factors epidemiology, handling psychology, mice, rats.

Notes: Comment On: *Science*. 1999 Jun 4;284(5420):1670-2.

Prendergast, B.J., S.D. Bilbo, and R.J. Nelson (2005). **Short day lengths enhance skin immune responses in gonadectomised Siberian hamsters**. *Journal of Neuroendocrinology* 17(1): 18-21. ISSN: 0953-8194.

Abstract: In Siberian hamsters and other photoperiodic rodents, exposure to short photoperiods simultaneously inhibits gonadal hormone secretion and enhances some measures of immune function. The present study tested whether gonadal hormones mediate the effects of short days on skin immune function (delayed-type hypersensitivity reactions) in male Siberian hamsters. The magnitude of delayed-type hypersensitivity reactions was greater in hamsters exposed to short days relative to those in long days. Comparable effects of photoperiod were obtained in castrated hamsters bearing empty or testosterone-filled implants. The data suggest that contemporary gonadal hormone secretion is neither necessary, nor sufficient to mediate the effects of short photoperiods on skin immune function.

Descriptors: Siberian hamsters, endocrine system, chemical coordination, homeostasis, immune system, integumentary system, gonadectomy, testosterone implant, delayed type hypersensitivity reaction, immune function, photoperiodic rodents, short days, skin immune function.

Pribenszky, C., M. Molnar, S. Cseh, and L. Solti (2004). **Survival of mouse blastocysts after low-temperature preservation under high pressure**. *Acta Veterinaria Hungarica* 52(4): 479-487. ISSN: 0236-6290.
Descriptors: mouse, blastocytes, survival, low temperature preservation, high pressure, cryoinjuries, embryos, hydrostatic pressure.

Price, H. (2002). **Veterinary role in laboratory mouse welfare**. *Veterinary Times* 32(33): 14. ISSN: 1352-9374.
Descriptors: mouse, welfare, laboratory animals, veterinary role.

Prostran, M., Z. Nesic, S. Vuckovic, Z. Todorovic, R. Stojanovic, and M. Ivanovic (2003). **Acute exposure to higher ambient temperature potentiates cataleptic and hyperthermic effects of fentanyl in female rats.** *European Neuropsychopharmacology* 13(Supplement 4): S442. ISSN: 0924-977X.
Descriptors: female rats, acute exposure, higher ambient temperature, potentiates, hyperthermic, cataleptic, effects, fentanyl.
Notes: Meeting Information: 16th Congress of the European College of Neuropsychopharmacology, September 20-24, 2003, Prague, Czech Republic.

Pulawa, L.K. and G.L. Florant (2000). **The effects of caloric restriction on the body composition and hibernation of the golden-mantled ground squirrel (*Spermophilus lateralis*).** *Physiological and Biochemical Zoology* 73(5): 538-46. ISSN: 1522-2152.
Abstract: In preparation for hibernation, golden-mantled ground squirrels (*Spermophilus lateralis*) must deposit sufficient amounts of lipid during the summer to survive winter hibernation. We conducted an experiment from May 1998 to February 1999 to examine the effects of caloric restriction on the body composition (lipid and fat-free mass) and hibernation of golden-mantled ground squirrels. Ground squirrels were either provided with food ad lib. (controls) or with only enough food to maintain a constant body mass throughout the experiment (calorically restricted). Changes in body composition were followed using total body electrical conductivity (TOBEC). Implanted data loggers that recorded body temperature were used to determine when ground squirrels entered their first torpor bout and the lengths of torpor bouts. Body composition did not change in the calorically restricted ground squirrels between May and September, while both lipid and fat-free mass increased in the controls. However, from September to February, calorically restricted ground squirrels lost only fat-free mass, not lipid mass, but controls lost both lipid and fat-free mass. Calorically restricted ground squirrels entered their first torpor bout about 4 wk after controls, but the torpor bout duration (or length) during hibernation did not differ between the two groups. These results show that ground squirrels maintain body composition during caloric restriction, and the limited quantities of stored lipid have an effect on when hibernation begins but not on torpor bout length.
Descriptors: body composition, physiology, eating, hibernation physiology, Sciuridae, diet, dietary fats, lipids blood, seasons.

Pullinger, V.J. and N. Dawson (2003). **Animal welfare dentistry: modernising dental care in rodents 'a cut in the right direction'**. *Animal Technology and Welfare* 2(3): 189-191. ISSN: 0264-4754.
NAL Call Number: SF757.A62
Descriptors: animal welfare, dental care, laboratory animals, techniques, teeth, rodents.

Rabehl, N., P. Wolf, and J. Kamphues (1998). **Basic data for feeding hamsters**. *Journal of Animal Physiology and Animal Nutrition* 80(2-5): 220-225. ISSN: 0931-2439.
Descriptors: hamsters, feeding, nutrition, physiology, digestive system, feed intake, water uptake, behavior, excreta, physiological functions, Rodentia.

Rastan, S., T. Hough, A. Kierman, R. Hardisty, A. Erven, I.C. Gray, S. Voeling, A. Isaacs, H. Tsai, M. Strivens, R. Washbourne, C. Thornton, S. Greenaway, M. Hewitt, S. McCormick, R. Selley, C. Wells, Z. Tymowska Lalanne, P. Roby, P. Mburu, D. Rogers, J. Hagan, C. Reavill, K. Davies, P. Glenister, E.M. Fisher, J. Martin, L.

Vizor, M. Bouzyk, D. Kelsell, J.L. Guenet, K.P. Steel, S. Sheardown, N. Spurr, I. Gray, J. Peters, P.M. Nolan, and A.J. Hunter (2004). **Towards a mutant map of the mouse - new models of neurological, behavioural, deafness, bone, renal and blood disorders**. *Genetica* 122(1): 47-49. ISSN: 0016-6707.
Abstract: With the completion of the first draft of the human genome sequence, the next major challenge is assigning function to genes. One approach is genome-wide random chemical mutagenesis, followed by screening for mutant phenotypes of interest and subsequent mapping and identification of the mutated genes in question. We (a consortium made up of GlaxoSmithKline, the MRC Mammalian Genetics Unit and Mouse Genome Centre, Harwell, Imperial College, London, and the Royal London Hospital) have used ENU mutagenesis in the mouse for the rapid generation of novel mutant phenotypes for use as animal models of human disease and for gene function assignment (Nolan et al., 2000). As of 2003, 35,000 mice have been produced to date in a genome-wide screen for dominant mutations and screened using a variety of screening protocols. Nearly 200 mutants have been confirmed as heritable and added to the mouse mutant catalogue and, overall, we can extrapolate that we have recovered over 700 mutants from the screening programme. For further information on the project and details of the data, see http://www.mgu.har.mrc.ac.uk/mutabase.
Descriptors: mouse, animal models, blood, gene mapping, deafness, bone dysplasia, kidney diseases, bone, renal, blood, disorders.

Rocchetti, M., I. Poggesi, M. Germani, F. Fiorentini, C. Pellizzoni, P. Zugnoni, E. Pesenti, M. Simeoni, and G. De Nicolao (2005). **A pharmacokinetic-pharmacodynamic model for predicting tumour growth inhibition in mice: a useful tool in oncology drug development**. *Basic and Clinical Pharmacology and Toxicology* 96(3): 265-268. ISSN: 1742-7835.
Descriptors: mice, model, tumor growth, inhibition, pharmcokinetic, pharmacodynamic, predicting, tool, drug development, oncology.

Rollo, C.D., L.J. Kajiura, B. Wylie, and S. D'Souza (1999). **The growth hormone axis, feeding, and central allocative regulation: lessons from giant transgenic growth hormone mice**. *Canadian Journal of Zoology* 77(12): 1861-1873. ISSN: 0008-4301.
Descriptors: mice, giant transgenic growth hormone axis, feeding, alocative regulation.

Roughan, J.V. and P.A. Flecknell (2002). **Buprenorphine: a reappraisal of its antinociceptive effects and therapeutic use in alleviating post-operative pain in animals.** *Laboratory Animals* 36(3): 322-343. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Buprenorphine has been widely used for post-operative analgesia in laboratory animals. Clinical efficacy has been demonstrated in both subjective and objective pain assessment schemes, however doubts have been expressed as to its value as an analgesic. Initial dosage recommendations were based on analgesiometric studies. It is unlikely, however, that the pain elicited in analgesiometric tests is comparable to post-operative pain. This has resulted in recommendations of excessive dose rates and inappropriate clinical indications. Studies involving tests of the efficacy of buprenorphine for alleviating behavioural or other signs of tonic (post-surgical) pain provide a more appropriate estimation of the analgesic capabilities of the drug. However, buprenorphine also has major effects upon the behaviour of normal (unoperated) animals, and this makes assessments of efficacy difficult with some of the systems used for scoring clinical pain. Nevertheless, our most recent studies of the effects of buprenorphine upon pain-related behaviours in rats support the view that it is an effective post-operative analgesic. This short review critically reappraises the role of buprenorphine in this capacity and discusses a rational approach to the relief of pain in laboratory animals. We conclude that buprenorphine remains a valuable agent for pain relief in a wide range of animal species when used in an appropriate manner.
Descriptors: laboratory animals, rats, mice, postoperative care, analgesics, opium alkaloids, dosage, pain, animal behavior, drug effects, pica, animal welfare, literature reviews, animal use refinement.

Russell, W.H.S. (2004). **Transgenesis, welfare and humane technique.** *Animal Welfare Information Center Bulletin* 12(1-2): 3-4. ISSN: 1522-7553.
Online: http://www.nal.usda.gov/awic/newsletters/v12n1/vol12no1final.pdf
NAL Call Number: aHV4701.A952

Descriptors: laboratory animals, transgenic animals, mice, phenotype, animal welfare, animal use replacement, animal genetic resources.

Salas, S.P., A. Giacaman, and C.P. Vio (2004). **Renal and hormonal effects of water deprivation in late-term pregnant rats**. *Hypertension (Baltimore)* 44(3): 334-339. ISSN: 0194-911X.
Descriptors: pregnant rats, late term, water deprivation, renal effects, hormonal efects, plasma volume, food intake, body weight.

Salemi, V.M., A.M. Bilate, F.J. Ramires, M.H. Picard, D.M. Gregio, J. Kalil, E.C. Neto, and C. Mady (2005). **Reference values from M-mode and Doppler echocardiography for normal Syrian hamsters.** *European Journal of Echocardiography* 6(1): 41-6. ISSN: 1525-2167.
Abstract: Echocardiography has recently been introduced to small animal research, allowing serial measurements of cardiac diseases. In addition, the hamster model has been increasingly used, as it mimics many human heart conditions. However, no reference range of echocardiographic values reflecting normal left ventricular (LV) function exists for hamsters. The purpose of this study was to provide one. The study group consisted of 118 10-week-old, female, Syrian golden hamsters, which underwent high-resolution echocardiography. LV mass was calculated using the corrected cube formula, and LV systolic and diastolic function were assessed by fractional shortening and mitral inflow pulsed-wave Doppler, respectively. The myocardial performance index (MPI) measured the time spent in isovolumic activity and reflected both systolic and diastolic function. The mean+/-SD LV mass, fractional shortening, and MPI were 0.19+/-0.04 g, 44.7+/-6.6%, and 0.39+/-0.1, respectively. E and A waves were differentiated in 52% of all animals. Logistic regression adjusted with a cutoff of 378 bpm revealed that the risk of E/A wave fusion was 35 times greater (95% CI: 12.6; 98.4) in animals with a heart rate >378 bpm. This study documents echocardiographic characteristics in normal Syrian hamsters, which can be used as control values for future studies.
Descriptors: echocardiography standards, *Mesocricetus*, animal models, ventricular function, diastole physiology, echocardiography, Doppler standards, hamsters, heart rate, heart ventricles anatomy and histology, heart ventricles ultrasonography, reference values, systole physiology.

Salmon, P.L., E.G.G. Buelens, and A. Sasov (2003). **Performance and limits of in vivo micro-CT imaging of trabecular bone in rats and mice, with consideration of animal welfare and tissue-weighted dosimetry.** *Calcified Tissue International* 72(4): 410. ISSN: 0171-967X.
Descriptors: rats, mice, skeletal system, movement, imaging, trabecular bone, micro computed tomography, animal welfare.
Notes: Meeting Information: 30th European Symposium on Calcified Tissues, May 8-12, 2003, Rome, Italy.

Salomon, L.J., N. Siauve, D. Balvay, C.A. Cuenod, C. Vayssettes, A. Luciani, G. Frija, Y. Ville, and O. Clement (2005). **Placental perfusion MR imaging with contrast agents in a mouse model**. *Radiology* 235(1): 73-80. ISSN: 0033-8419.
Descriptors: biochemistry and molecular biophysics, radiology, reproductive system, reproduction, 1.5 T single section T1 weighted two dimensional fast spoiled gradient echo sequential magnetic resonance imaging, imaging and microscopy techniques, diagnostic techniques, clinical techniques, placental perfusion.

Sankai, T., H. Tsuchiya, and N. Ogonuki (2001). **Short-term nonfrozen storage of mouse epididymal spermatozoa.** *Theriogenology* 55(8): 1759-1768. ISSN: 0093-691X.
NAL Call Number: QP251.A1T5
Abstract: Six simple methods for short-term (up to 8 d), nonfrozen (5 to 20 degrees C) storage of mouse epididymides were compared with respect to the motility and fertility of spermatozoa. A high percentage of progressively motile spermatozoa was obtained from epididymis stored for 8 d at 5 degrees C in mineral oil (78.3%), covered with body fat (80.0%), or stored in the intact body of the euthanized donor animal (77.5%). Fertilized eggs (6.4% fertilization rate) were obtained by IVF using spermatozoa that had been stored in mineral oil at 5 degrees C for at least 8 d, and offspring were obtained from 77.5% of transferred eggs that were fertilized by spermatozoa stored for 2 d. These methods inhibited moisture loss from the preserved epididymal spermatozoa, thereby allowing spermatozoa to be stored for a few days without loss of either motility or fertility. These methods make possible such wide-ranging applications as the long-distance transport of

epididymis spermatozoa. While in storage at 5 degrees C, the tail of each recovered spermatozoon was bent midway along the tail, possibly owing to damage to the plasma membranes and due to the spermatozoa's hardening in the phospholipid by exposure to the low temperature.

Descriptors: mice, spermatozoa, cold storage, duration, epididymis, motility, fertility, fecundity, body fat, mineral oils, postmortem changes, ova, moisture content, plasma membranes, phospholipids, techniques, evaluation.

Sato, J., H. Morimae, K. Takanari, Y. Seino, T. Okada, M. Suzuki, and K. Mizumura (2000). **Effects of lowering ambient temperature on pain-related behaviors in a rat model of neuropathic pain**. *Experimental Brain Research* 133(4): 442-449. ISSN: 0014-4819.

Descriptors: rat model, neuropathic pain, pain related behaviors, ambient temperature, lowering, effects, aggravated pain related behaviors.

Schwab, C.L., R. Fan, Q. Zheng, L.P. Myers, P. Hebert, and S.B. Pruett (2005). **Modeling and predicting stress-induced immunosuppression in mice using blood parameters**. *Toxicological Sciences* 83(1): 101-113. ISSN: 1096-6080.

Abstract: Previous studies have shown that the area under the corticosterone concentration vs. time curve (AUC) can be used to model and predict the effects of restraint stress and chemical stressors on a variety of immunological parameters in the mouse spleen and thymus. In order to complete a risk assessment parallelogram, similar data are needed with blood as the source of immune system cells, because this is the only tissue routinely available from human subjects. Therefore, studies were conducted using treatments for which the corticosterone AUC values are already known: exogenous corticosterone, restraint, propanil, atrazine, and ethanol. Immunological parameters were measured using peripheral blood from mice treated with a series of dosages of each of these agents. Flow cytometry was used to quantify MHC II, B220, CD4, and CD8 cells. Leukocyte and differential counts were done. Spleen cell number and NK cell activity were evaluated to confirm similarity to previous studies. Immune parameter data from mouse blood indicate that MHC II expression has consistent quantitative relationships to corticosterone AUC values, similar to but less consistent than those observed in the spleen. Other immune parameters tended to have greater variability in the blood than in the spleen. The pattern observed in the spleen in which the chemical stressors generally produced very similar effects as noted for restraint stress (at the same corticosterone AUC values) was not observed for blood leukocytes. Nevertheless, MHC class II expression seems to provide a reasonably consistent indication of stress exposure in blood and spleen.

Descriptors: spleen, corticosterone, stress, major histocompatibility complex, CD4 antigen, propanil, flow cytometry, peripheral blood, ethanol, atrazine, CD8 antigen, natural killer cells, cell number, immunosuppression, animal models, B220 antigen, risk assessment, immune system, mice.

Sharp, J., T. Azar, and D. Lawson (2005). **Selective adaptation of male rats to repeated social encounters and experimental manipulations.** *Contemporary Topics in Laboratory Animal Science* 44(2): 28-31. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Abstract: The objective of the present study was to determine how rats adapt to repeated encounters with an unfamiliar male or group of males and to experimental manipulations. Male rats were instrumented with radiotelemetry transmitters to monitor heart rate (HR), mean arterial blood pressure (MAP), and movements in the home cage as indices of arousal and stress. Groups of eight singly housed rats were exposed in their home cages to encounters with an unfamiliar rat or a group of three rats of the same strain, age, and sex for a period of 18 h (1600 to 1000 h) on four consecutive days. On separate occasions, the instrumented rats were given a subcutaneous injection of sterile saline in the animal room or were transported from the animal room to the laboratory and then injected at 1000 h on four consecutive days. Exposure to an unfamiliar rat or a group of 3 rats induced significant ($P < 0.05$) increases in HR, MAP, and movement in the first 30 min of exposure, and these responses partially but significantly ($P < 0.05$) adapted by the second or third day. Nocturnal movement in the home cage also was significantly ($P < 0.05$) increased on the first night and partially reduced on subsequent nights, but nocturnal HR responses were absent or significantly blunted. Nocturnal MAP was not increased. Subcutaneous injection in the animal room or after transport to the laboratory produced significant ($P < 0.05$) increases in HR, MAP, and movement in the cage 30 min after the injection, and these responses did not adapt

over the four days of the experiment. We concluded that male Sprague-Dawley rats adapted quickly, albeit partially, to social encounters but did not adapt to repeated injections, suggesting selective adaptation depending on the type of stimulus used.
Descriptors: social encounters, male rats, adaptation, experimental manipulations, radiotelemetry, Sprague Dawley rats.

Sharp, J., T. Zammit, T. Azar, and D. Lawson (2003). **Are "by-stander" female Sprague-Dawley rats affected by experimental procedures.** *Contemporary Topics in Laboratory Animal Science* 42(1): 19-27. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, female animals, laboratory animals, animal stress, animal welfare, gender differences, group housing, animal behavior, euthanasia, animal use refinement, heart rate, animal handling, animal physiology, individual housing.

Sharp, J., T. Zammit, T. Azar, and D. Lawson (2003). **Stress-like responses to common procedures in individually and group-housed female rats.** *Contemporary Topics in Laboratory Animal Science* 42(1): 9-18. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory animals, animal stress, animal welfare, animal handling, group housing, gender differences, cages, heart rate, blood pressure, female animals, circadian rhythm, animal use refinement, restraint of animals, subcutaneous injection, odors, intravenous injection, animal behavior, animal physiology, individual housing.

Sharp, J.J., C.C. Linder, and L.E. Mobraaten (2001). **Genetically engineered mice. Husbandry and resources.** *Methods in Molecular Biology* 158: 381-96. ISSN: 1064-3745.
Descriptors: mice, mutant strains, animal husbandry, genetic engineering, mice, resources.

Sharp, J.L., T.G. Zammit, T.A. Azar, and D.M. Lawson (2002). **Stress-like responses to common procedures in male rats housed alone or with other rats.** *Contemporary Topics in Laboratory Animal Science* 41(4): 8-14. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory mammals, male animals, stress, stress factors, heart rate, blood pressure, group size, stocking density, cages, physical activity, restraint of animals, injection, odors, animal welfare, animal husbandry, telemetry, data collection, group housing, cage changing.

Shipp, K. and B.D. Woodward (1998). **A simple exsanguination method that minimizes acute pre-anesthesia stress in the mouse: evidence based on serum corticosterone concentrations.** *Contemporary Topics in Laboratory Animal Science* 37(5): 73-77. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, blood sampling, blood serum, hydrocortisone, anesthesia, carbon dioxide, normal values, stress response, transport of animals, methoxyflurane, animal welfare, inhaled anesthetics, circadian rhythm, communication between animals.

Sluyter, F. and G.A. Van Oortmerssen (2000). **A mouse is not just a mouse.** *Animal Welfare* 9(2): 193-205. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: mice, inbred lines, line differences, aggressive behavior, adaptability, genetic variation, nesting, biotopes, testing, wild animals, natural selection, genetic effects, age differences, experimental design, animal welfare, animal preferences.

Solomon, N.G. and T. Rumbaugh (1997). **Odor preferences of weanling and mature male and female pine voles.** *Journal of Chemical Ecology* 23(9): 2133-2143. ISSN: 0098-0331.
NAL Call Number: QD415.A1J6
Abstract: Olfactory cues from conspecifics have strong influences on behavior. Both female and male juveniles

are attracted to familiar odors while adults show preferences for odors of opposite-sex conspecifics. Females show an increased preference for male odors as they mature, but no study has examined whether change with age is seen in males. In this experiment, responses of weanling and mature male and female pine voles (*Microtus pinetorum*) to familiar odor cues from their family versus those of an unfamiliar, opposite-sex conspecific were examined. Voles were tested in a three-chambered cage with end chambers containing the stimuli. There was a significant difference in odor preference between weanling and mature females. Weanling females preferred odor cues from their families, and mature females preferred the odors of unfamiliar mature males. The pattern was similar in males but the effect was not as strong. The results support the hypothesis that responses to odor cues change with age in pine voles. At least for females, the change in response to odor cues may be involved in the timing of reproduction and thus dispersal.

Descriptors: voles, odors, olfactory stimulation, sex differences, age differences, sexual maturity.

Stewart, L.S.A. and W.J. Martin (2003). **Evaluation of postoperative analgesia in a rat model of incisional pain.** *Contemporary Topics in Laboratory Animal Science* 42(1): 28-34. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory animals, postoperative care, pain, analgesia, flunixin, acetaminophen, fentanyl, opioid peptides, dosage, dose response, liveweight gain, distress, animal use refinement, animal welfare, buprenorphine.

Suzuki, H., N. Nakagata, M. Anzai, K. Tsuchiya, M. Nakura, S. Yamaguchi, and Y. Toyoda (1996). **Transport of wild mice genetic material by in vitro fertilization, cryopreservation, and embryo transfer.** *Laboratory Animal Science* 46(6): 687-8. ISSN: 0023-6764.

NAL Call Number: 410.9 P94

Descriptors: cryopreservation, embryo transfer, fertilization in vitro, gene transfer techniques, mice genetics, mice microbiology, specific pathogen free organisms.

Swain, R.A., A.B. Harris, E.C. Wiener, M.V. Dutka, H.D. Morris, B.E. Theien, S. Konda, K. Engberg, P.C. Lauterbur, and W.T. Greenough (2003). **Prolonged exercise induces angiogenesis and increases cerebral blood volume in primary motor cortex of the rat**. *Neuroscience* 117(4): 1037-1046. ISSN: 0306-4522.

Abstract: Plastic changes in motor cortex capillary structure and function were examined in three separate experiments in adult rats following prolonged exercise. The first two experiments employed T-two-star (T sub(2)*)-weighted and flow-alternating inversion recovery (FAIR) functional magnetic resonance imaging to assess chronic changes in blood volume and flow as a result of exercise. The third experiment used an antibody against the CD61 integrin expressed on developing capillaries to determine if motor cortex capillaries undergo structural modifications. In experiment 1, T sub(2)*-weighted images of forelimb regions of motor cortex were obtained following 30 days of either repetitive activity on a running wheel or relative inactivity. The proton signal intensity was markedly reduced in the motor cortex of exercised animals compared with that of controls. This reduction was not attributable to alterations of vascular iron levels. These results are therefore most consistent with increased capillary perfusion or blood volume of forelimb regions of motor cortex. FAIR images acquired during experiment 2 under normocapnic and hypercapnic conditions indicated that resting cerebral blood flow was not altered under normal conditions but was elevated in response to high levels of CO sub(2), suggesting that prolonged exercise increases the size of a capillary reserve. Finally, the immunohistological data indicated that exercise induces robust growth of capillaries (angiogenesis) within 30 days from the onset of the exercise regimen. Analysis of other regions failed to find any changes in perfusion or capillary structure suggesting that this motor activity-induced plasticity may be specific to motor cortex. These data indicate that capillary growth occurs in motor areas of the cerebral cortex as a robust adaptation to prolonged motor activity. In addition to capillary growth, the vascular system also experiences heightened flow under conditions of activation. These changes are chronic and observable even in the anesthetized animal and are measurable using noninvasive techniques.

Descriptors: rat, motor cortex, cerebral blood flow, prolonged exercise, angiogenesis, brain, exercise, blood volume, blood flow.

Takahashi, M., N. Saka, H. Takahashi, Y. Kanai, R.M. Schultz, and A. Okano (1999). **Assessment of DNA damage in individual hamster embryos by comet assay.** *Molecular Reproduction and Development* 54(1): 1-7. ISSN:

1040-452X.
NAL Call Number: QP251.M64
Descriptors: hamsters, embryos, DNA, damage, assays, embryo culture, preimplantation period, ultraviolet radiation, hydrogen peroxide, light, visible light.

Tanaka, S., N. Tamaya, K. Matsuzawa, and O. Miyaishi (2000). **Differences in survivability among F344 rats.** *Experimental Animals (Tokyo)* 49(2): 141-5. ISSN: 1341-1357.
Abstract: Important parameters to identify and develop appropriate animal models for longevity science include survivability, age-related disorders, and easy handling of aged individuals. It is found that F334/Du and F344/N have distinctive strain difference in these parameters. The finding suggests F334/Du and F344/N, even though they are historically siblings, need clearly separate identification when used as animal models for aging science, in particular, longevity science.
Descriptors: aging physiology, inbred F344 rats physiology, survival rate, rats, species specificity.

Tankersley, C.G., R. Irizarry, S. Flanders, and R. Frank (2000). **Variations in circadian regulation of body temperature and heart rate among inbred mouse strains**. *FASEB Journal* 14(4): A610. ISSN: 0892-6638.
Descriptors: mouse, inbred strains, heart rate, body temperature, circadian regulation, variations, thermoregulation.
Notes: Meeting Information: Annual Meeting of Professional Research Scientists: Experimental Biology, April 11-15, 2003, San Diego, CA, USA.

Tasker, R.A.R., B.J. Connell, S.J. Ross, and C.M. Elson (1998). **Development of an injectable sustained-release formulation of morphine: antinociceptive properties in rats.** *Laboratory Animals* 32(3): 270-275. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: rats, drug formulations, controlled release, morphine, chitosan, gels, adverse effects, analgesics, pain, animal welfare.

Terrell, S.P. (2004). **Handling, diagnosis, and treatment of a "lumpy squirrel"**. *Small Animal and Exotics. Book Two: Pain Management Zoonosis. Proceedings of the North American Veterinary Conference, Orlando, Florida, USA*, Vol. 18, p. 1430-1431.
Descriptors: lumpy squirrel, case reports, diagnosis, handling, clinical aspects, parasites, drug therapy.

Tesh, R.B., D.M. Watts, E. Sbrana, M. Siirin, V.L. Popov, and S.Y. Xiao (2004). **Experimental infection of ground squirrels (S*permophilus tridecemlineatus*) with monkeypox virus.** *Emerging Infectious Diseases* 10(9): 1563-7. ISSN: 1080-6040.
Abstract: A proposed new small-animal (rodent) model for studying the pathogenesis and treatment of severe orthopoxvirus infections is described. Thirteen-lined ground squirrels (*Spermophilus tridecemlineatus*) were infected intraperitoneally and intranasally with monkeypox virus (MPXV). A fulminant illness developed in all animals, and they died 6-9 days after infection. Virus was cultured from the blood and oropharynx several days before death; at necropsy, all of the organs tested contained relatively high titers of MPXV. The major pathologic findings were in the liver, which showed centrilobular necrosis, steatosis, and basophilic inclusion bodies in hepatocytes. Splenic necrosis was also observed, as well as interstitial inflammation in the lungs. The pathologic features of MPXV in ground squirrels are similar to that described with MPXV in macaques and severe variola (smallpox) virus infection in humans.
Descriptors: monkeypox virus, Sciuridae virology, disease models, animal, disease susceptibility veterinary, hepatocytes pathology, hepatocytes ultrastructure, hepatocytes virology, liver pathology, liver virology, monkeypox immunology, monkeypox pathology, rodent diseases virology, spleen pathology, spleen virology.

Thompson, J.S., S.A. Brown, V. Khurdayan, A. Zeynalzadedan, P.G. Sullivan, and S.W. Scheff (2002). **Early effects of tribromoethanol, ketamine/xylazine, pentobarbitol, and isoflurane anesthesia on hepatic and lymphoid tissue in ICR mice.** *Comparative Medicine* 52(1): 63-67. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: We investigated the effects of various anesthetic agents on hepatic and splenic injury in mice. Three

and six hours after intraperitoneal injection of TBE, intramuscular injection of ketamine/xylazine combination (K/X), intraperitoneal injection of pentobarbital (PB), and inhalation of isoflurane (IF), or intraperitoneal and intramuscular injection of control saline, mice were exsanguinated and serum was obtained for measurement of hepatic aspartate transaminase (AST), alanine transaminase (ALT) and gamma-glutamyltransferase (GGT). The spleen and liver also were obtained, and sections were examined by use of routine light microscopy for pathologic changes and for apoptosis, as determined by use of the in situ terminal deoxynucleotidyl transferase-mediated dUPT nick-end-labeling (TUNEL) histochemical analysis. Three hours after TBE or K/X administration, AST activity increased three- to fourfold above that in untreated and saline-injected control animals, and remained high at six hours. Administration of PB did not effect AST activity at three hours, but there was a significant increase at six hours. Activity of ALT was non-significantly increased three hours after TBE and K/X, but not PB administration. Administration of IF had no effect on hepatic enzyme activities, and GET was not increased after administration of any of the agents. Markedly increased apoptosis was observed in splenic follicles and in hepatic Kupffer and endothelial cells at three hours after TBE and K/X administration, but apoptosis decreased to control levels by six hours. Increased apoptosis was not observed after IF administration. Administration of TBE and K/X causes injury to lymphocytes and to hepatic Kupffer and endothelial. cells within three hours, and PB administration induces changes within six hours. Thus, use of these anesthetic agents should be avoided when experiments are being designed to test short-term effects of an experimental intervention on the spleen and possibly on all lymphoid tissues. In addition, they also should be avoided in experiments testing effects on hepatic tissue.

Descriptors: mice, laboratory mammals, injectable anesthetics, ketamine, xylazine, analgesics, pentobarbital, isoflurane, inhaled anesthetics, ethanol, intraperitoneal injection, intramuscular injection, liver function, spleen, drug effects, alanine aminotransferase, aspartate aminotransferase, gamma glutamyltransferase, enzyme activity, apoptosis, drug combinations, adverse effects.

Thorington Jr., R.W. and K. Darrow (1996). **Jaw muscles of Old World squirrels.** *Journal of Morphology* 230(2): 145-65. ISSN: 0362-2525.

Abstract: The jaw, suprahyoid, and extrinsic tongue muscles were studied in 11 genera, belonging to five tribes, of Old World squirrels. Significant variation in most of the adductor muscles is evident. The most primitive state of sciuromorphy is seen in the African tree squirrels *Paraxerus* and *Funisciurus*, especially as reflected in the anterior deep masseter. A derived state of sciuromorphy is found in five genera of Old World squirrels and perhaps evolved independently in each. Reduction of the temporalis muscle was observed in three genera, distantly related to one another. A unique arrangement of the superficial masseter is reported in the Asian giant tree squirrels, *Ratufa*. The arrangement of the masseter in the African pygmy squirrel, *Myosciurus*, is very similar to that of the South American pygmy squirrel, *Sciurillus*. We present hypotheses about the functional significance of these differences. In the derived state of sciuromorphy, which is found in three cases in squirrels that feed extensively on hard fruits, the anterior deep masseter is well positioned to increase the strength of the power stroke of the incisor bite. Among the pygmy squirrels, the position of the anterior deep masseter suggests that it plays a more significant role in molar chewing.

Descriptors: masticatory muscles anatomy and histology, Sciuridae anatomy and histology, anatomy, artistic, masseter muscle anatomy and histology, medical illustration, temporal muscle anatomy and histology, tongue anatomy and histology.

Thorington, R.W.J. and K. Darrow (2000). **Anatomy of the squirrel wrist: bones, ligaments, and muscles.** *Journal of Morphology* 246(2): 85-102. ISSN: 0362-2525.

Descriptors: carpal bones anatomy and histology, ligaments, articular anatomy and histology, muscle, skeletal anatomy and histology, Sciuridae anatomy and histology, wrist anatomy and histology, comparative anatomy, phylogeny, radius anatomy and histology, ulna anatomy and histology.

Thorington, R.W.J., K. Darrow, and A.D. Betts (1997). **Comparative myology of the forelimb of squirrels (Sciuridae).** *Journal of Morphology* 234(2): 155-82. ISSN: 0362-2525.

Abstract: The musculature of the shoulder, arm, and forearm was studied in 19 genera of squirrels, representing the Pteromyinae (flying squirrels) and all 7 tribes of the Sciurinae (tree and ground squirrels). The objective was to locate derived anatomical features of functional or phylogenetic significance and to determine how much morphological variation underlies the diverse locomotor behavior of squirrels, which includes terrestrial and

arboreal bounding, climbing, digging, and gliding. The fossil evidence suggests that arboreality is primitive for squirrels, and in fact tree squirrels appear to represent the primitive sciurid morphology. Ground squirrels are less uniform and exhibit a few derived features, including a clavobrachialis muscle not seen in other squirrels. Pygmy tree squirrels, which have evolved independently in three tribes, exhibit convergence of forelimb anatomy, including the loss or reduction of several muscles in the shoulder and forearm. The forelimb anatomy of flying squirrels is the most derived and differs from that of tree squirrels in details of shoulder, arm, and forearm musculature. Some of these muscular differences among squirrels have phylogenetic significance, being shared by closely related genera, but none has significance above the tribal level. Many of the differences suggest a variety of changes in function that are amenable to further study.

Descriptors: forelimb anatomy and histology, muscle, skeletal anatomy and histology, Sciuridae anatomy and histology, back anatomy and histology, humerus anatomy and histology, neck muscles anatomy and histology, radius anatomy and histology, scapula anatomy and histology, shoulder anatomy and histology, species specificity, spine anatomy and histology, ulna anatomy and histology.

Tichias, K., J. Fentem, D. Basketter, P. Botham, P. Brooker, L. Bruner, P. Evans, S. Fairhurst, E. Rassold, and R. Fielder (1998). **Progress in toxicological testing: reduction and refinement issues.** *ATLA, Alternatives to Laboratory Animals* 26(5): 619-627. ISSN: 0261-1929.

NAL Call Number: Z7994.L3A5

Descriptors: rabbits, passive cutaneous anaphylaxis test, screening, guinea pigs, skin tests, animal welfare.

Torbati, D., J. Ramirez, E. Hon, M.T. Camacho, J.A. Sussmane, A. Raszynski, and J. Wolfsdorf (1998). **Ventilation and gas exchange in a rat model of critical care: gender differences**. *FASEB Journal* 12(4): A499. ISSN: 0892-6638.

Descriptors: rat model, critical care, ventilation, gas exchange, gender differences.

Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 98, Part 1, April 18-22, 1998, San Francisco, California, USA.

Trentini III, J.F., B. Thompson, and J.S. Erlichman (2005). **The antinociceptive effect of acupressure in rats**. *American Journal of Chinese Medicine* 33(1): 143-150. ISSN: 0192-415X.

Abstract: Acupuncture and acupressure points correlate well with sites on the body that have low transcutaneous electrical resistance (TER). Using lightly sedated, adult Sprague-Dawley rats, we identified an acupoint (i.e. site with low TER) located on the hind limb of the rat and compared the effects of acupressure at this site on the nociceptive threshold to an adjacent, non-acupoint site (i.e. site with high TER). Focal pressure (55.42 +/- 2.2 g) was applied to the site for 10 minutes and the tail flick response (TFR) was determined by draping the distal portion of the tail over a heated wire (75 +/- 5 degrees C). Three trials were performed during each of three randomized conditions (i.e. acupoint, placebo and control) and the trials were averaged. All rats tested (515) showed a statistically significant increase in TFR following 10 minutes of acupressure at the acupoint compared to placebo or control trials ($p = 0.007$). Acupressure at the placebo point resulted in a TFR that was not statistically different from the control. Systemic administration of naloxone completely abolished the tail-flick inhibition induced by acupressure at the acupoint. These data suggest that acupressure elicits an antinociceptive effect in rats that is mediated by the endogenous release of opioids.

Descriptors: behavior, nervous system, neural coordination, acupressure, therapeutic and prophylactic techniques, clinical techniques, tail flick response, laboratory techniques, acupuncture, antinociceptive effect, transcutaneous electrical resistance.

Van der Meer, M., P. Costa, V. Baumans, B. Olivier, and B. Van Zutphen (1999). **Welfare assessment of transgenic animals: behavioural responses and morphological development of newborn mice.** *ATLA, Alternatives to Laboratory Animals* 27(Supplement 1): 857-868. ISSN: 0261-1929.

NAL Call Number: Z7994.L3A5

Abstract: Four groups of mice of the same inbred strain, but with different transgenic backgrounds (no treatment; integration of a functional corticotrophin-releasing factor [CRF] gene construct; integration of a non-functional CRF gene construct; transgenic technique without integration of a DNA construct) were compared, in order to identify and quantify indicators of discomfort in transgenic animals. This approach enables us to differentiate between the effects of the technique of transgenesis and the effects caused by the expression of the

transgene. This paper emphasises the search for differences in the early post-natal development of the animals. To this end, newborn mice have been subjected to various behavioural tests; moreover, their growth and morphological characteristics were measured from birth up to the age of 3 weeks. The results indicate that the presence of the microinjected DNA-construct influences the survival rate during the first 2-3 days after birth. The average loss of pups was about 10%, in contrast to the groups without the DNA construct, in which none of the pups died. The increase in the relative body weight of pups with a functional CRF construct was significantly lower than in the other groups, but only during the first 11 days. No significant differences in morphological characteristics or behavioural development were observed between the four groups. This approach was found to be adequate for detecting a broad variety of behavioural and morphological characteristics. Before general conclusions about the extent to which the technique of transgenesis affects animal welfare can be drawn, more transgenic lines should be studied in this way.
Descriptors: mice, transgenic animals, animal welfare, inbred strains, gene expression, postnatal development, perinatal mortality, liveweight gain, body weight, animal behavior, locomotion, strength.

Van der Meer, M., A. Rolls, V. Baumans, B. Olivier, and L.F.M. Van Zutphen (2001). **Use of score sheets for welfare assessment of transgenic mice.** *Laboratory Animals* 35(4): 379-389. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The use of transgenic mice has increased dramatically in recent years and continues to increase further. However, because transgenesis may alter a balanced genotype and produce unpredictable effects, careful monitoring of health and welfare of the transgenic animal is advised. The present study assessed the feasibility of the use of score sheets for monitoring transgenic mice, as part of daily routine, in a transgenic unit. The score sheets used were based on parameters which are sensitive and easy to determine. The score sheets were used by two animal technicians and a thorough evaluation showed that the score sheets, as described in this paper, are useful for routine monitoring in a transgenic unit and may result in the early detection of animal welfare problems. However, notwithstanding the limited number of parameters included and the restricted age-span covered by the screening, the monitoring system was considered to be time consuming. Large-scale implementation of such a scoring system during the first weeks of life would increase daily care time by at least 15-20 min for an average litter of 4-6 pups. Nevertheless, the use of score sheets seems to be a prerequisite for monitoring the animal's welfare in the course of producing transgenic lines.
Descriptors: mice, transgenic animals, laboratory mammals, animal welfare, monitoring, mortality, morbidity, postnatal development, young animals, weaning, postweaning interval, animal husbandry, animal care, welfare assessment, score sheets, animal welfare problems, daily routine.

Van der Velde, P. and H.S. Koopmans (1998). **Regulation of gastric emptying in free-feeding Lewis rats**. *FASEB Journal* 12(5): A735. ISSN: 0892-6638.
Descriptors: gastric emptying, regulation, free feeding, Lewis rats.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 98, Part II, April 18-22, 1998, San Francisco, California, USA.

Van der Velde, P., I. Koslowsky, and H.S. Koopmans (1999). **Measurement of gastric emptying during and between meal intake in free-feeding Lewis rats**. *American Journal of Physiology* 276(2, Part 1): R597-R605. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: gastric emptying, meal intake, free feeding, Lewis rats, measurement.

Van Loo, P.L.P., A.C. De Groot, B.F.M. Van Zutphen, and V. Baumans (2001). **Do male mice prefer or avoid each other's company? influence of hierarchy, kinship, and familiarity.** *Journal of Applied Animal Welfare Science* 4(2): 91-103. ISSN: 1088-8705.
NAL Call Number: HV4701.J68
Descriptors: mice, male animals, laboratory mammals, social dominance, animal welfare, cages, group size, aggressive behavior, feed intake, water intake, nests, animal preferences.

Waggie, K.S. and P.L. Marion (1997). ***Demodex* sp. in California ground squirrels.** *Journal of Wildlife Diseases* 33(2): 368-70. ISSN: 0090-3558.

Abstract: An undescribed species of *Demodex* (Acari: Demodecidae) was observed in hair follicles and ducts of sebaceous glands in the ear canals of seven California ground squirrels (*Spermophilus beecheyi)* from Santa Clara County, California (USA). The animals had died of unrelated causes and were submitted for necropsy between September 1994 and February 1996. Similar mites were observed in the lumens of hair follicles and ducts of Meibomian glands in the eyelids of two of these squirrels. Microscopic changes in the epithelium and surrounding dermis, when present, were minimal. No associated clinical signs of disease or macroscopic lesions were observed. To our knowledge, this is the first report of *Demodex* sp. in a ground squirrel.
Descriptors: mite infestations veterinary, rodent diseases parasitology, Sciuridae parasitology, California epidemiology, ear canal parasitology, eyelids parasitology, hair parasitology, meibomian glands parasitology, mite infestations epidemiology, mite infestations parasitology, mites, rodent diseases epidemiology, sebaceous glands parasitology, skin parasitology.

Warburton, H.J. and C.J. Nicol (2001). **The relationship between behavioural priorities and animal welfare: a test using the laboratory mouse *Mus musculus.*** *Acta Agriculturae Scandinavica Section A, Animal Science* 51(Supplement 30): 124-130. ISSN: 0906-4702.
Descriptors: mouse, behavioral priorities, animal welfare, relationship, test.

Wright, A.J. and R.J. Phillpotts (1998). **Humane endpoints are an objective measure of morbidity in Venezuelan encephalomyelitis virus infection of mice.** *Archives of Virology* 143(6): 1155-1162. ISSN: 0304-8608.
NAL Call Number: 448.3 Ar23
Descriptors: acute course, symptoms, clinical aspects, animal welfare, equine encephalomyelitis virus.

Yasumura, S., I.E. Stamatelatos, C.N. Boozer, R. Moore, and R. Ma (1998). **In vivo body composition studies in rats: assessment of total body protein.** *Applied Radiation and Isotopes* 49(5-6): 731-2. ISSN: 0969-8043.
Abstract: The precision and accuracy of a prompt-gamma neutron activation facility developed to assess total body protein in rats is estimated. The coefficient of variation of nitrogen measurement, as estimated by repeated measurements on 15 rats, was 5.5% for an equivalent dose of 60 mSv (Q = 20). Good agreement was observed in comparing the results of in vivo neutron activation analysis and chemical carcass analysis performed by the Kjeldahl method. The application of the technique in comparing the effect of a low-fat and a high-fat diet on body protein in rats is demonstrated.
Descriptors: body composition, phantoms, imaging, proteins analysis, analysis of variance, diet, fat restricted, dietary fats, gamma rays, Monte Carlo method, neutron activation analysis methods, nitrogen analysis, rats, reproducibility of results.

Yigit, N., E. Colak, M. Sozen, S. Ozkurt, and R. Verimli (2001). **Observations on the feeding biology and behaviour of the fat dormouse, *Glis glis orientalis* nehring, 1903 (Mammalia: Rodentia) in captivity**. *Zoology in the Middle East* 22: 17-24. ISSN: 0939-7140.
Descriptors: fat dormouse, feeding biology, behavior, observations, captivity, gnawing patterns, hibernation, Rodentia.

Yoon, H., W.S. Chung, Y.Y. Park, and I.H. Cho (2005). **Effects of stress on female rat sexual function.** *International Journal of Impotence Research* 17(1): 33-8. ISSN: 0955-9930.
Abstract: This study was undertaken to investigate whether prolonged stress interferes with sexual behavior and changes biochemical and physiologic mechanisms. Experiments were repeated three times with different rats in each period. In all, 63 female Sprague-Dawley rats were employed, with 21 rats in each period, and the control group was maintained at room temperature with free access to food and water. The stress group was maintained under a scheduled stress condition for 10 days, and seven rats from the group were randomly selected and exposed to the control environment for 10 days as the recovery group. Sexual behavior, hormonal values, and neuronal and endothelial nitric oxide synthase (nNOS and eNOS) expressions of vaginal tissue were analyzed and compared. Serum testosterone levels were significantly elevated in the stress and recovery groups ($P<0.05$). Female rats in the stress group showed reduced receptivity to their male mates ($P<0.05$). Western blot analysis demonstrated that nNOS and eNOS expressions were significantly lower in the stress group ($P<0.05$) than in the other groups. We conclude that chronic physical stress modifies the sexual behavior of female rats through a mechanism believed to involve complex changes in sex hormones, endocrine factors, and neurotransmitters.

Descriptors: sex behavior, animal physiology, stress, psychological psychology, western blotting, cold, gonadal steroid hormones blood, hormones blood, muscle relaxation physiology, muscle, smooth physiology, nerve tissue proteins metabolism, nitric oxide synthase metabolism, rats, Sprague Dawley rats, restraint, physical, starvation psychology, vagina enzymology.

Yoshioka, M., H. Togashi, T. Yamaguchi, and M. Matsumoto (2005). **Emotional stress and functional development of the rat brain**. *Folia Pharmacologica Japonica* 125(2): 77-82. ISSN: 0015-5691.
Descriptors: rat, brain, functional development, emotional stress, behavior, nervous system, neural coordination, behavioral and mental disorders, fear conditioning, fear response.

Zeller, W., G. Meier, K. Burki, and B. Panoussis (1998). **Adverse effects of tribromoethanol as used in the production of transgenic mice.** *Laboratory Animals* 32(4): 407-413. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Tribromoethanol is widely used as an anaesthetic agent for embryo-transfer surgery for the generation of transgenic mice. Potential side effects such as local irritation, fibrous adhesions in the abdominal cavity, and mortalities of unknown cause have been reported. Mice of three different strains (CD-1, OF-1, NMRI) received intraperitoneal injections of pentobarbiturate (60 mg/kg, 0.4%), tribromoethanol (240 mg/kg, 1.2%), tribromoethanol (450 mg/kg, 2.5%), ketamine/xylazine (120 mg/kg, 1.2%/16 mg/kg, 0.16%) or saline (NaCl, 0.9%). After 24 h the animals were sacrificed and blinded histopathological examination of abdominal organs was performed by light microscopy. Tribromoethanol caused focal to diffuse necrosis primarily of subperitoneal muscle fibres of the abdominal wall, and, occasionally, necrotic changes on the surface of abdominal organs. These changes were associated with acute peritoneal inflammation and fibrinous serositis of the abdominal organs. The severity of the findings increased with the concentration of tribromoethanol. The use of ketamine/xylazine yielded a comparable success rate in embryo transfer without undesirable side effects. Further use of tribromoethanol is not recommended.
Descriptors: mice, transgenic animals, ethanol, injectable anesthetics, pentobarbital, ketamine, xylazine, serositis, necrosis, inflammation, embryo transfer.

Zhang, S., T. Amsteint, J. Shen, F.R. Brush, and H.K. Gershenfeldt (2005). **Molecular correlates of emotional learning using genetically selected rat lines**. *Genes Brain and Behavior* 4(2): 99-109. ISSN: 1601-1848.
Abstract: The genetic contributions to active avoidance learning in rodents have been well established, yet the molecular basis for genetically selected line differences remains poorly understood. To identify candidate genes influencing this active avoidance paradigm, we utilized the bidirectionally selected Syracuse high- and low-avoidance (SHA and SLA) rat lines that markedly differ in their two-way active avoidance behavior. Rats were phenotyped, rested to allow recovery from testing stress and then hippocampi were dissected for gene expression profiling (Affymetrix U34A chips; approximately 7000 known genes), comparing SLA to SHA. Next, a subset of differentially expressed genes was confirmed by real-time PCR (RT-PCR) in hippocampi. Additional studies at the protein level were performed for some genes. Using triplicate arrays on pooled hippocampal samples, differentially expressed genes were identified by MICROARRAY SUITE 5.0 and robust multi-array average analyses. By RT-PCR analysis in hippocampi, eight genes were nominated as potential candidate genes consistent with the differential expression from the microarray data. Four genes, Veli1 (mlin-7B), SLC3a1, Ptpro and Ykt6p, showed higher expression in SHA hippocampi than SLA. Four genes, SLC6A4, Aldh1a4, Id3a, and Cd74, showed higher expression in SLA hippocampi than SHA. The active avoidance behavioral difference between lines probably emerges from 'many small things'. These potential candidate genes generate hypotheses for future testing in human association and rodent studies. Differences in levels of a pleiotropic gene like Ptpro and SLC6A4 suggest that small differences over a lifespan may contribute to large behavioral differences.
Descriptors: behavior, nervous system, neural coordination, molecular genetics, biochemistry and molecular biophysics, gene expression profiling, laboratory techniques, genetic techniques, real time reverse transcriptase polymerase chain reaction, affymetriix U34A chip, laboratory equipment, microarray suite 5.0, computer software, emotional learning.

Zhu, M., D. Nehra, J.J.H. Ackerman, and D.A. Yablonskiy (2004). **On the role of anesthesia on the body/brain temperature differential in rats**. *Journal of Thermal Biology* 29(7-8): 599-603. ISSN: 0306-4565.

NAL Call Number: QP82.2.T4J6
Descriptors: rats, body, brain, temperature, anesthesia, role, blood flow, oxygen consumption, anesthetics, temperature gradients.

Zivkovic, I.P., A.K. Rakin, D.M. Petrovic Djergovic, D.J. Kosec, and M.V. Micic (2005). **Exposure to forced swim stress alters morphofunctional characteristics of the rat thymus**. *Journal of Neuroimmunology* 160(1-2): 77-86. ISSN: 0165-5728.
Descriptors: biochemistry and molecular biophysics, blood and lymphatics, transport and circulation, immune system, chemical coordination and homeostasis, endocrine system, chronic stress, behavioral and mental disorders, apoptosis.

Zolotareva, N.N., T.M. Agapkina, and A.N. Severtsov (2002). **Biochemical and physiological status of Mongolian gerbils under low temperature conditions.** *Advances in Ethology* 37: 177. ISSN: 0931-4202.
Descriptors: Mongolian gerbils, biochemical status, physiological status, low temperature conditions.
Notes: Meeting Information: 4th International Symposium on Physiology and Behaviour of Wild and Zoo Animals, September 29-October 02, 2002, Berlin, Germany.

Zwicker, G.M., J.D. Fikes, J.D. Thurman, B.A. Rogers, T.J. Bucci, A. Turturro, and R. Hart (1998). **Survival, body weight, and neoplastic lesions in brown Norway and F1BNF rats. A lifetime study of the effects of ad libitum and dietary restriction feeding**. *Toxicologic Pathology* 26(1): 169-170. ISSN: 0192-6233.
Descriptors: Norway rat, F1BNF rat, feeding, restriction, ad libitum, study, body weight, survival, neoplastic lesions, dietary.
Notes: Meeting Information: XVI International Symposium of the Society of Toxicologic Pathologists.

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Alternatives/Teaching

Brooks, W.W., C.H. Conrad, A.P. Nedder, O.H.L. Bing, and M.T. Slawsky (2003). **Thoracic massage permits use of echocardiography in unanesthetized rats.** *Comparative Medicine* 53(3): 288-292. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Purpose: The objective of the study reported here was to investigate whether massage-like stroking of the thorax and cranial portion of the abdomen might relax unanesthetized rats sufficiently to permit in vivo echocardiography. Methods: Nine-month-old spontaneously hypertensive rats (SHR) were first conditioned to being held by hand for 10 to 15 min twice a day for seven to 10 days. During each session, the animal was placed in supine position, and the thorax and cranial abdominal area were gently stroked (approx. 5 cm/s, 12 to 14 times/min). After the conditioning period, echocardiography was initiated. We obtained serial transthoracic two-dimensional (2-D) and M-mode echocardiograms from nine-month-old SHR that were treated with isoproterenol (60 mg/kg of body weight, s.c., x 1, followed by 30 mg/kg/d x3), and from old (20 to 24 months old) SHR, studied when labored breathing, suggestive of heart failure, was evident (SHR-F). Measurements included end-diastolic volume (EDV) and end-systolic volume (ESV). Results: In the isoproterenol-treated SHR, mean ½ SD echocardiographically derived EDV (2-D, 0.29 ½ 0.05; M-mode, 0.28 ½ 0.01 ml) was not significantly different from volume at necropsy (0.33 ½ 0.04 ml). Measurements of EDV and ESV by use of M-mode and 2-D echocardiography were significantly correlated (EDV R2 = 0.48, P = 0.05; ESV R2 = 0.39, P = 0.02). Echocardiography revealed pleuropericardial effusions (4/6), atrial thrombi (5/6), and left and right ventricular enlargement (6/6). The EDV and ESV were increased fivefold (P < 0.01) and threefold (P < 0.05), respectively, versus values for SHR not in heart failure (SHR-NF). Left ventricular ejection fraction of hearts from SHR-F was markedly decreased, compared with that in SHR-NF (44 ½ 7 versus 74 ½ 2%, respectively; P < 0.05). The presence or absence of left atrial thrombi and fluid in the thoracic cavity was confirmed at necropsy in SHR-F and SHR-NF. Conclusion: Thoracic massage permits use of echocardiography in unanesthetized rats, thereby providing a simple, non-invasive technique for assessment of cardiac structure and function in rats without the potentially adverse effects of anesthesia.
Descriptors: rats, laboratory animals, echocardiography, accuracy, training animals, animal handling, restraint of animals, massage, animal welfare.

Fitzgerald, A.L., P. Juneau, C. Cain, and K. Southwick (2003). **Development of a quantitative method for evaluation of the electroencephalogram of rats by using radiotelemetry.** *Contemporary Topics in Laboratory Animal Science* 42(1): 40-45. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory animals, telemetry, electroencephalography, radio waves, electrodes, atropine, caffeine, ketamine, pentobarbital, image analysis, animal use refinement, animal welfare, laboratory equipment, laboratory techniques, drug effects.

Gordon, C.J., E.T. Puckett, and B.K. Padnos (2001). **Noninvasive, continuous measurement of rat tail skin temperature by radiotelemetry**. *FASEB Journal* 15(4): A418. ISSN: 0892-6638.

Descriptors: rat, tail skin, temperature, noninvasive, monitoring, radiotelemetry, thermoregulatory status, stress, unrestrained.

Notes: Meeting Information: Annual Meeting of the Federation of American Societies for Experimental Biology on Experimental Biology 2001, March 31-April 04, 2001, Orlando, Florida, USA.

Hida, Y., N. Matsui, T. Kawada, and T. Fushiki (1999). **Ultrasonography evaluation of abdominal fat in live rats**. *Journal of Nutritional Science and Vitaminology* 45(5): 609-619. ISSN: 0301-4800.

Abstract: We have developed a new noninvasive method of estimating abdominal fat volume in live rats using ultrasonography. By this method, cross sections of perirenal (retroperitoneal) fat tissue, which is an abdominal fat, at the renal vein level could be identified and the area determined. The perirenal fat in Wistar rats (wide body weight range, 111.4 to 497.3 g; limited range, 300.1 to 337.9 g) measured by ultrasonography was compared with the actual fat tissue weight. The cross-sectional area of perirenal fat tissue was significantly correlated to the actual whole tissue weight. Using this procedure, we examined the changes of perirenal fat stores during fasting. Consequently, the cross-sectional area of perirenal fat and its actual height decreased in parallel. Total body electrical conductivity (TOBEC) is currently used to measure fat-free mass (FFM) and indirectly predicts total body fat mass of live laboratory animals. The body fat distribution, that is, the location of adipose tissue in the abdominal region, is closely associated with obesity-related diseases. Therefore, it is important to focus not only on the accumulation of total body fat, but also on that of abdominal fat. The present ultrasonographic method is considered to be useful for repeated noninvasive measurement of abdominal fat in the live rat.

Descriptors: abdominal fat, ultrasonics, evaluation, adipose tissues, rats, adipose tissues, animal tissues, body parts, connective tissues, mammals, radiation, Rodentia, sound.

Holden, H.E., R.E. Stoll, J.W. Spalding, and R.W. Tennant (1998). **Hemizygous Tg.AC Ttansgenic mouse as a potential alternative to the two-year mouse carcinogenicity bioassay: evaluation of husbandry and housing factors**. *Journal of Applied Toxicology* 18(1): 19-24. ISSN: 0260-437X.

Descriptors: transgenic mouse, two year mouse, alternative, husbandry, housing, bioassay, carcinogenicity.

Jenkins, E.S. and R.D. Combes (1999). **Transgenic models for prion disease: have they outlived their useful purpose.** *ATLA, Alternatives to Laboratory Animals* 27(Supplement 1): 827-838. ISSN: 0261-1929.

NAL Call Number: Z7994.L3A5

Abstract: Prions are a recently identified class of proteinaceous pathological agents. Prion diseases are fatal neurological disorders, the importance of which is exemplified by the recent emergence of a novel variant of Creutzfeldt-Jacob disease (CJD) in humans. During pathogenesis, prion proteins undergo a conformational change, which converts the normal isoform to a pathogenic isoform. Several approaches are available for studying prion disease. The predominant approach has involved in vivo studies, especially involving transgenic mice. In vitro alternatives available for studying prion disease include a cell-free conversion assay, cell culture systems, and an immunoassay for the pathogenic form of the prion protein. Prion-like proteins have been identified in yeast, and therefore this constitutes another non-animal approach. Four main areas of prion research are discussed in this paper, to illustrate the potential applications and limitations of the in vivo and alternative systems. From this study, we conclude that, while current in vitro approaches can be used initially, in vivo studies are still needed to confirm data obtained in vitro. Priority should be given to the non-animal alternatives, as well as to developing new methods, and these should be given primary consideration at the outset of a project.

Descriptors: transgenic animals, animal welfare, mice, prion diseases, cell cultures, immunoassay, bioassays, yeasts, molecular conformation, host range, experimental infection, animal models, animal testing alternatives, nonanimal tests, animal use reduction, animal use replacement.

Kamerman, P.R., Z.L.C. Di, and A. Fuller (2001). **Miniature data loggers for remote measurement of body temperature in medium-sized rodents**. *Journal of Thermal Biology* 26(3): 159-163. ISSN: 0306-4565.

NAL Call Number: QP82.2.T4J6

Descriptors: rodents, temperature, miniature data logger, body temperature, measurement, remote.

Kaufman, M.H., R.M. Brune, D.R. Davidson, and R.A. Baldock (1998). **Computer-generated three-dimensional reconstructions of serially sectioned mouse embryos.** *Journal of Anatomy* 193(Part 3): 323-36. ISSN: 0021-8782.

Abstract: We have been involved with a group of computer scientists and anatomists in the development of computer-based methodologies that not only combine the advantages of scanning electron microscopy and conventional histology, but provide the additional dimension of tissue recognition. The latter is achieved by the appropriate labelling of tissues and structures by delineation or 'painting'. Individually segmented anatomically defined tissues can be highlighted in a particular colour and viewed either in isolation or in combination with other appropriately labelled tissues and organs. Tissues can be shown in any orientation either as a transparent overlay on computer-generated histological sections or as 3-D images without the histological background. An additional feature of the system is that computer graphics technology combined with 3-D glasses now also allows the viewer to see the object under analysis in stereo. This facility has been found to be particularly helpful in drawing attention to topological relationships that had not previously been readily noted. As the mouse is now the mammalian model of choice in many areas of developmental research, it is of critical importance that a basic level of skill is available in the research community in the interpretation of serially sectioned material, for example, for the rapidly expanding field in which gene expression studies play a significant role. It is equally important that there is an understanding of the dynamic changes that occur in relation to the differentiation of the various organ systems seen in these early stages of development. What we emphasise here is the additional information that it is possible to gain from the use of this tool which, in our view, could not readily have been gained from the analysis of scanning electron micrographs or by studying conventional serial histological sections of similar stages of mouse embryonic development. The methodology has been developed as part of a large project to prepare a database of mouse developmental anatomy covering all stages from fertilisation to birth in order to allow the accurate spatial mapping of gene expression and cell lineage data onto the digital Atlas of normal mouse development. In this paper we show how this digital anatomical Atlas also represents a valuable teaching aid and research tool in anatomy.

Descriptors: embryo anatomy and histology, image processing, computer assisted, microscopy, electron, scanning, models, anatomic, anatomy, cross sectional, computer graphics, gestational age, mice, microtomy.

Kimber, I. (2002). **Reduction, refinement and replacement: putting the immune system to work.** *ATLA, Alternatives to Laboratory Animals* 30(6): 571-577. ISSN: 0261-1929.

NAL Call Number: Z7994.L3A5

Abstract: Many chemicals are known to be, or have been implicated as, contact allergens, and allergic contact dermatitis is an important occupational and environmental health issue. It is the responsibility of toxicologists to identify those chemicals that have the potential to induce skin sensitisation, and to assess the conditions under which there will exist a risk to human health. This article describes progress that has been made in the development of new approaches to the toxicological evaluation of skin sensitisation, and the benefits to animal welfare that such developments have already produced, and are likely to produce in the future. In this context, the local lymph node assay is described with regard to hazard identification and risk assessment, and possible strategies for the development of in vitro approaches to safety assessment are discussed.

Descriptors: animal use alternatives, cultured cells, cell culture, toxicology, toxicity testing, allergens, allergenicity, delayed hypersensitivity, atopic dermatitis, skin irritation, contact dermatitis, immunoglobulin E, T lymphocytes, mice, bioassays, laboratory animals, guinea pigs, skin tests, lymphocyte proliferation, Langerhans cells, asthma, occupational diseases, human health and safety, local lymph node assay.

Kramer, K., L. Kinter, B.P. Brockway, H.P. Voss, R. Remie, and B.L.M. Van Zutphen (2001). **The use of radiotelemetry in small laboratory animals: recent advances.** *Contemporary Topics in Laboratory Animal Science* 40(1): 8-16. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: laboratory animals, rats, mice, telemetry, radio waves, data collection, blood pressure, electrocardiograms, heart rate, electrodes, body temperature, circadian rhythm, stress, normal values, animal welfare, literature reviews, animal use refinement, animal use reduction.

Kramer, K., H.P. Voss, J. Grimbergen, and A. Bast (1999). **Circadian rhythms of heart rate, body temperature, and locomotor activity in freely moving mice measured with radio telemetry.** *Lab Animal* 27(8): 23-26. ISSN:

0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: mice, telemetry, circadian rhythm, heart rate, body temperature, locomotor activity.

Krarup, A., P. Chattopadhyay, A.K. Bhattacharjee, J.R. Burge, and G.R. Ruble (1999). **Evaluation of surrogate markers of impending death in the galactosamine-sensitized murine model of bacterial endotoxemia.** *Laboratory Animal Science* 49(5): 545-550. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Descriptors: mice, death, lethal dose, endotoxins, body temperature regulation, coat, posture, consciousness, locomotion, euthanasia, humane endpoints, distress, animal use refinement.

Krohn, T.C., A.K. Hansen, and N. Dragsted (2003). **Telemetry as a method for measuring the impact of housing conditions on rats' welfare.** *Animal Welfare* 12(1): 53-62. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, laboratory mammals, cages, floor type, grid floors, litter, floors, plastic panels, stress factors, heart rate, blood pressure, body temperature, telemetry, animal welfare, animal preferences.

Levine, S. and A. Saltzman (2002). **Acute uremia in rats: feeding sucrose overnight is preferable to starvation**. *Renal Failure* 24(2): 127-131. ISSN: 0886-022X.
Descriptors: rats, starvation, acute uremia, feeding sucrose, gastrointestinal tract, overnight fast, liver weight loss, alternative.

Mang'era, K., M. Krzyzelewski, S. Greaves, D. Greenberg, and M. Billinghurst (2005). **Molecular-size fractionation of pentastarch, radiolabelling with tc-99m, and evaluation of biological behaviour in mice**. *Nuclear Medicine Communications* 26(4): 375-381. ISSN: 0143-3636.
Descriptors: blood and lymphatics, transport and circulation, radiation biology, radiolabeling, laboratory techniques, behavior, stability, fractionation.

Murakoshi, K. and T. Noguchi (2005). **Simulation of rat behavior by a reinforcement learning algorithm in consideration of appearance probabilities of reinforcement signals**. *Biosystems* 80(1): 83-90. ISSN: 0303-2647.
Descriptors: behavior, models and simulations, computational biology, reinforcement learning algorithm, mathematical and computer techniques, reinforcement learning, reinforcement signal.

Peterson, N.C. and J.E. Peavey (1998). **Comparison of in vitro monoclonal antibody production methods with an in vivo ascites production technique.** *Contemporary Topics in Laboratory Animal Science* 37(5): 61-66. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, monoclonal antibodies, ascites, tissue culture, animal welfare, production costs, labor requirements, antibody formation, laboratory equipment.

Pickhardt, P.J., R.B. Halberg, A.J. Taylor, B.Y. Durkee, J. Fine, F.T.J. Lee, and J.P. Weichert (2005). **Microcomputed tomography colonography for polyp detection in an in vivo mouse tumor model**. *Proceedings of the National Academy of Sciences of the United States of America* 102(9): 3419-3422. ISSN: 0027-8424.
Descriptors: mouse, tumor model, polyp detection, tomography, colonography, microcomputed.

Pinkert, C.A. (2003). **Transgenic animal technology: alternatives in genotyping and phenotyping.** *Comparative Medicine* 53(2): 126-139. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Over the past decade, breakthrough technologies in transgenic animal technology and functional genomics have played a central role in the explosive growth of rodent modeling and in scientific innovation. Various noninvasive alternatives to routine surgical biopsy have been described for genotypic and phenotypic analyses of laboratory animals. A number of options are available to refine or replace potentially painful and invasive procedures ranging from tissue biopsies (including tail biopsies and toe docking) to several blood sampling techniques. Unfortunately adoption of many non- or minimally invasive alternatives has proven

difficult on a number of fronts ranging from historical reservations to procedural expectations and actual experimental productivity. Similarly, a variety of phenotyping considerations have addressed throughput efficiencies and the health and well being of research animals. From an animal welfare perspective, marked increases in laboratory animal populations have accompanied rapid advancements spanning the life sciences. As described for rodent modeling, but with applications across many laboratory animal species, diverse procedural refinements are available that will readily aid in the analysis of whole animal models. Ultimately, non-invasive technologies and complementary refinements have bearing on the quality and reproducibility of data that are reported, as well as of critical importance to the well being and ethical management of animals at all developmental stages: from fetal existence, to the neonatal period, and on through adulthood.

Descriptors: transgenic animals, laboratory animals, biopsy, animal use refinement, mice, gene expression, phenotype, phenotypic variation, polymerase chain reaction, animal identification, sampling, feces, saliva, microarray technology, genomics.

Reddy, A.K., G.E. Taffet, S. Madala, L.H. Michael, M.L. Entman, and C.J. Hartley (2003). **Noninvasive blood pressure measurement in mice using pulsed Doppler ultrasound**. *Ultrasound in Medicine and Biology* 29(3): 379-385. ISSN: 0301-5629.

Abstract: Existing tail-cuff pressure devices for mice use tail flow sensors that measure only systolic and mean pressure. We developed a method to obtain systolic and diastolic pressure in mice using a pulsed Doppler flow velocity sensor and a tail-cuff and validated the method against pressure signals obtained simultaneously from a fluid-filled catheter. The tail-cuff was pressurized to suprasystolic levels to completely occlude the tail artery and then released gradually. The pressure at which the tail flow reappeared was recorded as systolic and the pressure at which the tail flow became continuous was recorded as diastolic. Regression analysis of tail-cuff pressures over catheter pressures obtained from healthy mice (n = 16) showed a high degree of association (r sub(sys) = 0.95, r sub(dia) = 0.94, both at p < 0.001). Bland-Altman analysis showed good agreement between the two methods, with a mean difference of -13 (plus or minus 12 SD) mmHg and 3 (plus or minus 10 SD) mmHg in the systolic (58 to 250 mmHg) and diastolic (48 to 178 mmHg) pressure measurements, respectively. Bland-Altman plots of tail-cuff blood pressures of a second group of mice (n = 20) showed good agreement between repeated measurements obtained on the same day, but had higher variability between measurements made on different days.

Descriptors: ultrasound, Doppler waves, blood pressure, arteries, mice.

Remie, R. (2001). **The PVC-rat and other alternatives in microsurgical training.** *Lab Animal* 30(9): 48-52. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Descriptors: laboratory animals, animal welfare, surgery, medical education, anastomosis, suture techniques, science education, animal use replacement, animal use reduction, animals in education, microscopy.

Saegusa, Y. and H. Tabata (2003). **Usefulness of infrared thermometry in determining body temperature in mice**. *Journal of Veterinary Medical Science* 65(12): 1365-1367. ISSN: 0916-7250.

Abstract: The rectal temperature obtained using a standard electronic thermometer was compared with ear, back skin, tail skin and sole skin temperatures obtained using an infrared thermometer in B6C3F1 mice. Using both methods, we investigated baseline temperatures, diurnal and 2-week variations in temperatures, and ethanol-induced hypothermia in these body locations. Ear and back temperatures were shown to be close to and consistent with rectal temperatures in various situations, and measured temperatures at these sites were almost constant, with very similar diurnal variation. Conversely, tail and sole temperatures were lower and much more variable. These results indicate that ear and back skin temperatures obtained using a convenient and non-invasive infrared thermometer are as reliable, and should be safer and less stressful to animal subjects, compared to standard rectal temperature measurements.

Descriptors: body temperature, diagnosis, diagnostic techniques, infrared radiation, thermometers, mice.

Sailstad, D.M. (2002). **Murine local lymph node assay: An alternative test method for skin hypersensitivity testing.** *Lab Animal* 31(7): 36-41. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Descriptors: mice, laboratory animals, animal use reduction, delayed hypersensitivity, contact dermatitis,

endpoints, allergenicity, lymphocyte proliferation, governmental programs and projects, animal welfare.

Schmitteckert, E.M., C.M. Prokop, and H.J. Hedrich (1999). **DNA detection in hair of transgenic mice-a simple technique minimizing the distress on the animals.** *Laboratory Animals* 33(4): 385-389. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The breeding of transgenic animals requires that each individual offspring be analysed for integration of transgenic deoxyribonucleic acid (DNA), unless exclusively homozygous animals are mated. The standard protocol for identification of transgenic animals (Hogan et al. 1994) is based on tissue samples and preparation of chromosomal DNA including proteinase K digestion and phenol/chloroform extraction. The procedure described here represents a much simpler and faster method to screen offspring for the transgene DNA. It is based on the use of hair bulbs as sample material, which can be directly used for polymerase chain reaction (PCR) after alkaline lysis. This protocol allows large numbers of animals to be easily screened in a minimum amount of time. A unique advantage though, is the reduction of the distress caused to the animals. With respect to the 3Rs (Replacement, Reduction, Refinement), and because of technical advantages this method may replace ear or tail clipping.
Descriptors: mice, transgenic animals, hair analysis, polymerase chain reaction, hair, rapid methods, animal welfare, hair bulb.

Tichias, K., J. Fentem, D. Basketter, P. Botham, P. Brooker, L. Bruner, P. Evans, S. Fairhurst, E. Rassold, and R. Fielder (1998). **Progress in toxicological testing: reduction and refinement issues.** *ATLA, Alternatives to Laboratory Animals* 26(5): 619-627. ISSN: 0261-1929.
NAL Call Number: Z7994.L3A5
Descriptors: rabbits, passive cutaneous anaphylaxis test, screening, guinea pigs, skin tests, animal welfare.

Touma, C., R. Palme, and N. Sachser (2004). **Non-invasive monitoring of stress hormones in mice: a technique opening new perspectives in biomedical and animal welfare research.** *Animal Welfare* 13, Supplement: S256-S257. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: mice, animal welfare, stress hormones, monitoring, non invasive technique, new perspective, biomedical research.
Notes: Meeting Information: Universities Federation for Animal Welfare (UFAW) Symposium on Science in the Service of Animal Welfare, Animal Welfare, Edinburgh, UK, April 02-04, 2003.

Vonlaufen, N., C. Gianinazzi, N. Muller, F. Simon, C. Bjorkman, T.W. Jungi, S.L. Leib, and A. Hemphill (2002). **Infection of organotypic slice cultures from rat central nervous tissue with *Neospora caninum*: an alternative approach to study host-parasite interactions.** *International Journal of Parasitology* 32(5): 533-542. ISSN: 0020-7519.
NAL Call Number: QH547.I55
Abstract: *Neospora caninum* is an apicomplexan parasite which has emerged as an important cause of bovine abortion worldwide. Abortion is usually triggered by reactivation of dormant bradyzoites during pregnancy and subsequent congenital infection of the foetus, where the central nervous system appears to be most frequently affected. We here report on an organotypic tissue culture model for *Neospora* infection which can be used to study certain aspects of the cerebral phase of neosporosis within the context of a three-dimensionally organised neuronal network. Organotypic slice cultures of rat cortical tissue were infected with *N. caninum* tachyzoites, and the kinetics of parasite proliferation, as well as the proliferation-inhibitory effect of interferon-gamma (IFN-gamma), were monitored by either immunofluorescence, transmission electron microscopy, and a quantitative PCR-assay using the LightCycler instrument, respectively. In addition, the neuronal cytoskeletal elements, namely glial acidic protein filaments as well as actin microfilament bundles were shown to be largely colocalising with the pseudocyst periphery. This organotypic culture model for cerebral neosporosis provides a system, which is useful to study the proliferation, ultrastructural characteristics, development, and the interactions of *N. caninum* within the context of neuronal tissue, which at the same time can be modulated and influenced under controlled conditions, and will be useful in. the future to gain more information on the cerebral phase of neosporosis.
Descriptors: *Neospora caninum*, protozoal infections, tachyzoites, experimental infections, cytopathogenicity,

cytoskeleton, interferon, immunofluorescence, cerebral cortex, tissue culture, rats.

Warn, P.A., M.W. Brampton, A. Sharp, G. Morrissey, N. Steel, D.W. Denning, and T. Priest (2003). **Infrared body temperature measurement of mice as an early predictor of death in experimental fungal infections**. *Laboratory Animals* 37(2): 126-131. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Temperatures of mice were measured using an infrared high performance non-contact thermometer, after the device had been calibrated using implantable microchips containing temperature transponders. Mice were infected with three species of *Candida* (isolates) and the resultant disseminated infections monitored. Mouse temperatures could be reliably measured using the infrared device and this measurement caused little distress to the mice. We were further able to demonstrate that mice rarely recovered if their body temperature dropped below 33.3 degrees C (sensitivity 68%, specificity 97%). Adoption of a 33.3 degrees C endpoint in fungal sepsis experiments measured by infrared non-contact thermometer would significantly reduce the suffering in the terminal stages of this type of infection model.

Descriptors: body temperature, death, hypothermia, infrared imagery, measurement, mycoses, sepsis, thermometers, *Candida*.

Wictome, M., K. Newton, K. Jameson, B. Hallis, P. Dunnigan, E. MacKay, S. Clarke, R.G.J. Taylor, and K. Foster (1999). **Development of an in vitro bioassay for *Clostridium botulinum* type B neurotoxin in foods that is more sensitive than the mouse bioassay.** *Applied Environmental Microbiology* 65(9): 3787-3792. ISSN: 0099-2240.

NAL Call Number: 448.3 Ap5

Abstract: A novel, in vitro bioassay for detection of the botulinum type B neurotoxin in a range of media was developed. The assay is amplified by the enzymic activity of the neurotoxin's light chain and includes the following three stages: first, a small, monoclonal antibody-based immunoaffinity column captures the toxin; second, a peptide substrate is cleaved by using the endopeptidase activity of the type B neurotoxin; and finally, a modified enzyme-linked immunoassay system detects the peptide cleavage products. The assay is highly specific for type B neurotoxin and is capable of detecting type B toxin at a concentration of 5 pg ml(-1) (0.5 mouse 50% lethal dose ml(-1)) in approximately 5 h. The format of the test was found to be suitable for detecting botulinum type B toxin in a range of foodstuffs with a sensitivity that exceeds the sensitivity of the mouse assay. Using highly specific monoclonal antibodies as the capture phase, we found that the endopeptidase assay was capable of differentiating between the type B neurotoxins produced by proteolytic and nonproteolytic strains of *Clostridium botulinum* type B.

Descriptors: cod, cheeses, meat pastes, food contamination, microbial contamination, bacterial toxins.

Wright, A.J. and R.J. Phillpotts (1998). **Humane endpoints are an objective measure of morbidity in Venezuelan encephalomyelitis virus infection of mice.** *Archives of Virology* 143(6): 1155-1162. ISSN: 0304-8608.

NAL Call Number: 448.3 Ar23

Descriptors: acute course, symptoms, clinical aspects, animal welfare, equine encephalomyelitis virus.

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Information Resources on the Care and Welfare of Rodents

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Bedding/Caging/Housing/Facilities

Ago, A., T. Gonda, M. Takechi, T. Takeuchi, and K. Kawakami (2002). **Preferences for paper bedding material of the laboratory mice.** *Experimental Animals (Tokyo)* 51(2): 157-61. ISSN: 1341-1357.
Abstract: In order to identify indicators of the preferences for bedding materials, the paper bedding material preferences of laboratory mice were investigated in the present study. Four cages, each containing a different structure of paper bedding material were connected to allow free access to each cage. The preferences for paper bedding materials of laboratory mice were judged by the differences in the length of stay and sleep in each cage. The mice preferred the bedding material that allowed them to easily hide and build nests and was soft. We conclude that the comfort and well-being of laboratory mice can be increased through the appropriate selection of bedding material.
Descriptors: mice, animal husbandry, bedding material, paper, preference, comfort, well-being.

Andrade, C.S. and F.S. Guimaraes (2003). **Anxiolytic-like effect of group housing on stress-induced behavior in rats.** *Depression and Anxiety* 18(3): 149-52. ISSN: 1091-4269.
Descriptors: anti anxiety agents pharmacology, behavior, animal drug effects, diazepam pharmacology, social behavior, stress psychology, anti anxiety agents administration and dosage, diazepam administration and dosage, rats, Wistar rats.

Anonymous (2000). **Draft comparison of space allowance/stocking density and the EU draft recommendations.** *Animal Technology* 51(2): 101-109. ISSN: 0264-4754.
NAL Call Number: QL55.I5
Descriptors: laboratory animals, space requirements, floor space, mice, rats, hamsters, gerbils, guinea pigs, rabbits, dogs, cats, cages, cage size, group size, group housing.

Arakawa, H. (2005). **Age dependent effects of space limitation and social tension on open-field behavior in male rats.** *Physiology and Behavior* 84(3): 429-436. ISSN: 0031-9384.
Abstract: Cage stocking density can be manipulated by changing in cage size and group size in the cage. The effects of these two factors were investigated in three developmental stages in male rats: juvenile, post-pubertal, and adult. An open-field test was conducted to measure exploratory behavior which was influenced by levels of activity, anxiety, and exploration. When the cage size was decreased, juvenile rats displayed decreased locomotion and lower propensity for exploration, whereas such changes were not evident in post-pubertal rats. When the group size was increased, adult rats exhibited higher locomotion. However, these factors did not affect risk assessment behavior of rats in these developmental stages. Thus, it appears that the effect of stocking density differs depending on the developmental stage of the animal: Juvenile rats increased anxiety following limiting space, whereas adult rats increased activity following increase in social tension.
Descriptors: male rats, space limitation, effects, age, social tension, density, behavior, group size.

Baer, L.A., B.J. Corbin, M.F. Vasques, and R.E. Grindeland (1997). **Effects of the use of filtered microisolator tops on cage microenvironment and growth rate of mice.** *Laboratory Animal Science* 47(3): 327-329. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Descriptors: microenvironments, filters, cages, growth rate, body weight, mice.

Barrett, D., C. Keenan, J. Kimball, L. Smith, and W. Powers (1996). **The effect of ad libitum feeding, group housing, and moderate dietary restriction on longevity, body weight gain, and clinical pathology parameters of Sprague-Dawley (SD) rats**. *Toxicologic Pathology* 24(6): 788. ISSN: 0192-6233.
Descriptors: rats, feeding, group housing, adlibitum, dietary restriction, effect, weight gain, pathology.
Notes: Meeting Information: XV International Symposium of the Society of Toxicologic Pathologists, June 9-13, 1996, St. Louis, Missouri, USA.

Bartolomucci, A., P. Palanza, and S. Parmigiani (2002). **Group housed mice: are they really stressed?** *Ethology, Ecology and Evolution* 14(4): 341-350. ISSN: 0394-9370.
Descriptors: mice, group housing, stress, adrenal glands, behavior, male, group behavior, group interaction, social status, subordinate.

Bartolomucci, A., P. Palanza, P. Sacerdote, G. Ceresini, A. Chirieleison, A.E. Panerai, and S. Parmigiani (2003). **Individual housing induces altered immuno-endocrine responses to psychological stress in male mice.** *Psychoneuroendocrinology* 28(4): 540-58. ISSN: 0306-4530.
Abstract: Social isolation and lack of social support have deleterious effects on health, thus being regarded as one of the most relevant causes of diseases in human and other mammalian species. However, only few are the studies aimed at evaluating the psychoneuroimmunological functions of individually housed subjects. The present study was designed to understand how the behavior and the physiology of male house mice might be affected by individual housing. We first analyzed whether individual housing of different duration (1-42 days) would result in immuno-endocrine dysfunction (experiment 1). Then we investigated whether housing conditions would affect the reaction to an acute mild psychological stress (experiments 2 and 3). There were three main findings: first, individually housing mice for increasing time periods did not induce any major immuno-endocrine effects compared to a stable sibling group housing. Therefore, prolonged isolation does not seem to dramatically impair mice immuno-endocrine functions. Second, when exposed to a mild acute stress, i.e. forced exposure to a novel environment, isolated mice showed higher basal corticosterone and lower type 1 (IL-2) and type 2 (IL-4) cytokines as well as splenocytes proliferation compared to group housed male mice. Finally, when faced with a free choice between a novel environment and their home cage, individually housed mice showed reduced neophobic responses resulting in increased exploration of the novel environment, thus suggesting a low anxiety profile. Altogether, our findings suggest that individual housing in itself does not change immunocompetence and corticosterone level, but does affect reactivity to a stressor. In fact, individually housed mice showed high behavioral arousal, as well as altered immuno-endocrine parameters, when challenged with mild psychological novelty-stress.
Descriptors: neuroimmunomodulation physiology, social isolation psychology, psychological immunology, stress, psychological psychology, adaptation, physiological physiology, body weight physiology, corticosterone blood, dominance subordination, endocrine system physiology, housing, animal, interferon type II blood, interleukin 10 blood, mice, social environment.

Baumans, V., F. Schlingmann, M. Vonck, and H.A. Van Lith (2002). **Individually ventilated cages: beneficial for mice and men?** *Contemporary Topics in Laboratory Animal Science* 41(1): 13-9. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Abstract: Housing systems are an important element in the well-being of laboratory animals and, consequently, influence the outcomes of animal experiments. Individually ventilated cage (IVC) systems were developed to maintain low ammonia and CO(2) concentrations, to support a low relative humidity, and to reduce spread of infective agents and allergenic contaminants. However, the increased intracage ventilation rates (25 to 100 air changes/h) in these systems have animal welfare implications. In four preference studies involving a total of 36 pairs of female BALB/c mice and three different types of IVC racks, we tested the preference/avoidance of mice for the intracage ventilation rate, cage size, location of air supply, and presence of nesting material in a two-

cage system. In this system, the two cages were connected by a passage with a swing-door to allow mice to move freely between the cages. We found that the mice avoided high intracage ventilation rates but that providing nesting material could counteract this avoidance. In addition, the mice preferred larger cages and an air supply in the cover. We conclude that the location of the air supply in the cage, cage size, ventilation rate and the presence of nesting material in IVC systems influence the well-being of the animals.
Descriptors: mice, animal husbandry, methods, environment, housing, ventilation methods, animal welfare.

Bazille, P.G., S.D. Walden, B.L. Koniar, and R. Gunther (2001). **Commercial cotton nesting material as a predisposing factor for conjunctivitis in athymic nude mice.** *Lab Animal* 30(5): 40-2. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Abstract: Environmental enrichment for rodents is beneficial, but compatibility between the enrichment device and the rodent strain must also be considered. The authors present a case in which the use of a specific form of environmental enrichment--cotton bedding material--proved detrimental to the health of athymic nude mice, increasing the likelihood of conjunctivitis.
Descriptors: nude mice, animal husbandry, nesting material, cotton, conjunctivitis, adverse effects, predisposing factor, pathology.

Bell, L. (2003). **Concerns about mouse housing system.** *Contemporary Topics in Laboratory Animal Science* 42(1): 7. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: laboratory animals, housing, mice, concerns.

Benefiel, A.C. and W.T. Greenough (1998). **Effects of experience and environment on the developing and mature brain: implications for laboratory animal housing.** *ILAR Journal* 39(1): 5-11. ISSN: 1084-2020.
NAL Call Number: QL55.A1I43
Descriptors: laboratory mammals, postnatal development, stimuli, brain, nerve cells, learning, rats, pigs, environment, enrichment, adrenal glands, weight, stress response, animal housing, abnormal behavior, animal welfare, astrocytes.

Blum, C.A., A.K. Wilson, and M.H. Bhattacharyya (1999). **A nest box to facilitate excreta collection from mouse dams through pregnancy, parturition, and lactation.** *Contemporary Topics in Laboratory Animal Science* 38(3): 71-77. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, dams mothers, metabolism cages, nests, feces collection, maternal behavior, defecation, urination, lactation, mutants, cadmium, pregnancy, body weight.

Bochnowicz, S., R.R. Osborn, D.W.P. Hay, and D.C. Underwood (1997). **Hypoxia-induced pulmonary hypertension in an optimized environment for the guineapig.** *Laboratory Animals* 31(4): 347-356. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Prolonged exposure to hypoxia elicits a variety of time-related morphologic and physiologic changes in the pulmonary vasculature of mammals, including humans. The study of hypoxia-induced changes in rodents generally requires a prolonged exposure to 9% oxygen for a minimum of 10 days in an airtight chamber, which has only been generally described in the literature as large (200-400 l), sealed acrylic chambers. To assist in the search for better therapies for diseases associated with chronic hypoxia using animal models, we have custom-built an airtight chamber for hypoxic exposure of rodents, and characterized the effect of chronic hypoxia on functional and morphologic changes in the pulmonary vasculature of the guineapig using this system. This chamber has been designed to alleviate any unnecessary stress related to food or water intake, cleanliness and excess illumination to the animals during the hypoxic-exposure period. Chronic exposure of the guineapig to hypoxia (0-21 days) produced time-related physiologic, morphologic, and haematologic changes. For example, after 10 days in hypoxia (9% oxygen), pulmonary artery pressure was significantly increased from 13 +/- 1 mmHg in normoxic controls (day 0, n=6) to 26 +/- 0 mmHg (day 10, n=4, P<0.01). Right ventricular hypertrophy in hypoxic animals, presented as a ratio of right ventricle free wall weight to body weight, showed a significant increase from 0.054 +/- 0.004 (day 0) to 0.069 + 0.004 on day 10 (P < 0.05), while age-matched normoxic animals showed no changes in right ventricular weight (day 0=0.059; day 10=0.058; P>0.05). Red

blood cell count significantly increased over the same time period, from 5.9 +. 0.1 (day 0) to 6.4 +/- 0.1 (day 10, P < 0.05), as did haematocrit, 48 +/- 0.7 (day 0) to 61 +/- 0.9 (day 10, P < 0.05), and haemoglobin, 16 +/- 0.2 (day 0) to 20 +/- 0.1 (day 10, P<0.05). It is concluded that considerations for the well-being of the test animals (i.e. continuous water, ample food supplies, burrow-like hiding places, sanitation and protection from excess illumination) can easily be incorporated into a hypoxic chamber. The purpose of the present study was to explore modifications that may provide the animal with an optimized environment which will reduce anxiety and stress, as seen in their behaviour when inside the chambers, and to thoroughly characterize the morphologic and physiologic changes associated with chronic hypoxia which develop in a consistent time-related manner.
Descriptors: guinea pigs, hypoxia, hypertension, lungs, erythrocyte count, hematocrit, platelet count, animal housing, body weight, stress factors, animal welfare.

Borrello, P., E. D'Amore, A. Di Virgilio, G. Panzini, M. Valeri, and R.N. Lorenzini (1998). **The use of AGI as a method to measure microbial contamination in the cage microenvironment.** *Animal Technology* 49(2): 81-85. ISSN: 0264-4754.
NAL Call Number: QL55.I5
Abstract: The microenvironmental investigation is highly important to understand the profound relationship between laboratory animals and their environment. Until now there has been no dynamic method for air sampling inside cages that house laboratory animals. As our institutional responsibilities include air quality control in the animal facilities, a new sampling method was set up, through the use of the liquid impinger AGI 30, in order to evaluate the microbial count inside the laboratory animal cages. Temperature and the relative humidity were also monitored both inside the cages and in the animal facility room and the relationship between these two parameters and the microorganisms recovery were analysed.
Descriptors: laboratory animals, air quality, sampling, artificial ventilation, air flow, environmental temperature, relative humidity, plate count, microbial contamination, rats.

Boulukos, K.E. and P. Pognonec (2001). **MICE, a program to track and monitor animals in animal facilities**. *BMC Genetics* 2(4) ISSN: 1471-2156.
Descriptors: computerized, tracking, databases, mice, monitoring, animal facilities.

Bowen, H., T.D. Mitchell, and R.B.S. Harris (2003). **Method of leptin dosing, strain, and group housing influence leptin sensitivity in high-fat-fed weanling mice.** *American Journal of Physiology* 284(1, Part 2): R87-R100. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: high fat diet, food intake, energy intake, body weight, body composition, obesity, injection, group housing, strain differences, mice, weanlings, animal models, leptin resistance, juvenile diet induced obesity.

Brotto, L.A., B.B. Gorzalka, and L.A. Hanson (1998). **Effects of housing conditions and 5-HT2A activation on male rat sexual behavior.** *Physiology and Behavior* 63(4): 475-9. ISSN: 0031-9384.
Abstract: Adult male rats were housed individually or in groups for a period of 39 days. In Experiment 1, the effects of housing conditions on sexual behavior and concurrent spontaneous "wet dog shaking" (WDS) were investigated. Individual housing significantly impaired male sexual behavior and resulted in a trend toward increased WDS. In Experiment 2, the effects of housing conditions were examined following administration of the serotonergic type 2A (5-HT2A) agonist DOI. Individual housing significantly increased DOI-induced WDS. The implications of these findings are discussed in the context of stress-induced corticosterone secretion and the possible regulatory effect on 5-HT2A receptors.
Descriptors: male rats, sexual behavior, housing conditions, effects, serotonin physiology, social environment, Wistar rats, social isolation psychology.

Buda, L.A. and R.L. Corwin (2004). **Rats housed in large cages gain significantly more weight than rats housed in small cages**. *FASEB Journal* 18: 4-5 (Abst. 109.6). ISSN: 0892-6638.
Online: http://www.fasebj.org/
Descriptors: rats, housing, large cages, small cages, behavior, enrichment, food intake, body weight, social conspecifics.
Notes: Meeting Information: FASEB Meeting on Experimental Biology: Translating the Genome, April 17-21,

2004, Washington, D.C., USA.

Buddaraju, A.K.V. and R.W. Van Dyke (2003). **Effect of animal bedding on rat liver endosome acidification.** *Comparative Medicine* 53(6): 616-621. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Animal beddings, such as pine products, and environmental factors are known to induce liver drug-metabolizing cytochrome P450 enzymes. We observed that a change to pine-based rat bedding altered baseline and cAMP-stimulated rates of acidification in rat liver endosomes, apparently by decreasing ATP-dependent proton transport in the presence and absence of chloride. Although cAMP altered phosphorylation of protein kinase B and extracellular signal-regulated kinases 1 and 2 (ERK 1,2) and p38 mitogen-activated protein kinases, changes in housing conditions did not affect baseline or cAMP-stimulated values of these or other selected signaling molecules. We conclude that compounds in rat bedding may alter not only drug metabolism, but also aspects of endocytosis.
Descriptors: rats, litter bedding, wood chips, corn cobs, endosome acidification, effect, drug metabolism, pine.

Carissimi, A.S., L.C.A.A. Chaguri, M.A. Teixeira, C.M.C. Mori, M. Macchione, E.T.G. Sant'Anna, P.H.N. Saldiva, N.L. Souza, and J.B.L. Merusse (2000). **Effects of two ventilation systems and bedding change frequency on cage environmental factors in rats (*Rattus norvegicus*).** *Animal Technology* 51(3): 161-170. ISSN: 0264-4754.
NAL Call Number: QL55.I5
Descriptors: rats, laboratory animals, litter, cleaning, frequency, ventilation, ammonia, air flow, epithelium, nose, respiratory system, membrane potential, cilia, activity.

Carson, R. (1997). **Adult squirrel caging.** *Journal of Wildlife Rehabilitation* 20(2): 14. ISSN: 1071-2232.
Descriptors: squirrel, adult, caging, housing techniques, cage design.

Casey, A.M. and S.J. Casey (1998). **Simple things that make a difference: design and plans for a juvenile squirrel cage.** *Journal of Wildlife Rehabilitation* 21(2): 30-31. ISSN: 1071-2232.
Descriptors: squirrel, housing techniques, cage design, rehabilitation.

Chaguri, L.C.A.G., N.L. Souza, M.A. Teixeira, C.M.C. Mori, A.S. Carissimi, and J.L.B. Merusse (2001). **Evaluation of reproductive indices in rats (*Rattus norvegicus*) housed under an intracage ventilation system.** *Contemporary Topics in Laboratory Animal Science* 40(5): 25-30. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory animals, animal housing, artificial ventilation, air flow, wind speed, female fertility, fecundity, litter weight, litter performance, liveweight gain, weaning weight, mortality.

Champy, M.F., M. Selloum, L. Piard, V. Zeitler, C. Caradec, P. Chambon, and J. Auwerx (2004). **Mouse functional genomics requires standardization of mouse handling and housing conditions.** *Mammalian Genome* 15(10): 768-783. ISSN: 0938-8990.
Abstract: The study of mouse models is crucial for the functional annotation of the human genome. The recent improvements in mouse genetics now moved the bottleneck in mouse functional genomics from the generation of mutant mice lines to the phenotypic analysis of these mice lines. Simple, validated, and reproducible phenotyping tests are a prerequisite to improving this phenotyping bottleneck. We analyzed here the impact of simple variations in animal handling and housing procedures, such as cage density, diet, gender, length of fasting, as well as site (retro-orbital vs. tail), timing, and anesthesia used during venipuncture, on biochemical, hematological, and metabolic/endocrine parameters in adult C57BL/6J mice. Our results, which show that minor changes in procedures can profoundly affect biological variables, underscore the importance of establishing uniform and validated animal procedures to improve reproducibility of mouse phenotypic data.
Descriptors: mouse, handling, housing, standardization, genomics, genetics, changes, model.

Clark Jr., J.A., P.H. Myers, M.F. Goelz, J.E. Thigpen, and D.B. Forsythe (1997). **Pica behavior associated with buprenorphine administration in the rat.** *Laboratory Animal Science* 47(3): 300-303. ISSN: 0023-6764.
NAL Call Number: 410.9 P94

Abstract: Marked gastric distention was observed in rats 20 h after they underwent partial hepatectomy under isoflurane anesthesia and received buprenorphine (0-3 mg/kg of body weight) after surgery. Hardwood bedding comprised the bulk of the gastric contents. A study was undertaken to determine the cause of the pica behavior (consumption of non-nutritive substances) and resultant gastric distention. Ten-week-old male Sprague Dawley rats were randomly assigned to one of six groups. Group-1 rats (n = 11) underwent laparotomy under isoflurane anesthesia, with buprenorphine (0.03 mg/kg) administered after surgery. Group-2 rats (n = 12) underwent laparotomy under isoflurane anesthesia, with buprenorphine (0.05 mg/kg) administered after surgery. Group-3 rats (n = 24) underwent laparotomy under isoflurane anesthesia, with saline administered after surgery. Isoflurane was administered at the same rate, concentration, and duration for all groups that underwent laparotomy (groups 1 to 3). Buprenorphine or saline was administered subcutaneously as a single injection when anesthesia was discontinued (groups 1 to 3). Group-4 rats (n = 6) received buprenorphine (0.3 mg/kg) only. Group-5 rats (n = 6) received buprenorphine (0.05 mg/kg) only. Group-6 rats (n = 12) received saline only. Rats not undergoing laparotomy (groups 4 to 6) received buprenorphine or saline 18 to 20 h before euthanasia. Rats were housed individually in filter-topped polycarbonate cages containing hardwood bedding. A purified, pelleted diet and water were offered ad libitum. Food and water consumption were measured over the posttreatment period. Eighteen to 20 h after treatment, rats were euthanized, each stomach and its contents were weighed, contents. were examined grossly, and wet and dry gastric content weights were recorded. All weights were significantly ($P < 0.05$) increased in rats receiving buprenorphine administered after surgery (groups 1 and 2), compared with rats of the control group (group 3). Weights of the stomach and contents, wet gastric contents, and dry gastric contents were significantly ($P < 0.05$) increased in rats receiving 0.3 mg of buprenorphine/kg only (group 4), compared with values for their controls (group 6). Hardwood bedding comprised the bulk of the gastric contents in all groups receiving buprenorphine. Stomachs of rats not receiving buprenorphine contained the purified diet with little or no hardwood bedding. These results indicate that a single injection of buprenorphine at a dosage of 0.05 or 0.3 mg/kg resulted in rats ingesting hardwood bedding, leading to gastric distention. It was concluded that pica behavior associated with administration of buprenorphine should be considered when evaluating experimental data from rats housed on contact bedding.
Descriptors: analgesics, opioids, pica, litter, stomach, digesta, rats, hepatectomy, laparotomy, anesthetics, postoperative complications, opioid analgesics, gastric distention, isoflurane.

Compton, S.R., F.R. Homberger, F.X. Paturzo, and J.M. Clark (2004). **Efficacy of three microbiological monitoring methods in a ventilated cage rack.** *Comparative Medicine* 54(4): 382-392. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: The use of individually ventilated caging (IVC) to house mice presents new challenges for effective microbiological monitoring. Methods that exploit the characteristics of IVC have been developed, but to the authors- knowledge, their efficacy has not been systematically investigated. Air exhausted from the IVC rack can be monitored, using sentinels housed in cages that receive rack exhaust air as their supply air, or using filters placed on the exhaust air port. To aid laboratory animal personnel in making informed decisions about effective methods for microbiological monitoring of mice in IVC, the efficacy of air monitoring methods was compared with that of contact and soiled bedding sentinel monitoring. Mice were infected with mouse hepatitis virus (MHV), mouse parvovirus (MPV), murine rotavirus (agent of epizootic diarrhea of mice [EDIM]), Sendai virus (SV), or *Helicobacter* spp. All agents were detected using contact sentinels. Mouse hepatitis virus was effectively detected in air and soiled bedding sentinels, and SV was detected in air sentinels only. Mouse parvovirus and *Helicobacter* spp. were transmitted in soiled bedding, but the efficacy of transfer was dependent on the frequency and dilution of soiled bedding transferred. Results were similar when the IVC rack was operated under positive or negative air pressure. Filters were more effective at detecting MHV and SV than they were at detecting MPV. Exposure of sentinels or filters to exhaust air was effective at detecting several infectious agents, and use of these methods could increase the efficacy of microbiological monitoring programs, especially if used with soiled bedding sentinels. In contemporary mouse colonies, a multi-faceted approach to microbiological monitoring is recommended.
Descriptors: ventilated caging, mice, microbiological monitoring, filters, sentinals, IVC, bedding.

Crabbe, J.C. and D. Wahlsten (2003). **Of mice and their environments.** *Science* 299(5611): 1313-4. ISSN: 1095-9203.
Descriptors: mice, environment, housing, behavior, animal husbandry, mutant strains, species specificity.

D'Arbe, M., R. Einstein, and N.A. Lavidis (2002). **Stressful animal housing conditions and their potential effect on sympathetic neurotransmission in mice.** *American Journal of Physiology Regulatory, Integrative and Comparative Physiology* 282(5): R1422-8. ISSN: 0363-6119.

Abstract: Although the sympathetic nervous system (SNS) plays a major role in mediating the peripheral stress response, due consideration is not usually given to the effects of prolonged stress on the SNS. The present study examined changes in neurotransmission in the SNS after exposure of mice (BALB/c) to stressful housing conditions. Focal extracellular recording of excitatory junction currents (EJCs) was used as a relative measure of neurotransmitter release from different regions of large surface areas of the mouse vas deferens. Mice were either group housed (control), isolation housed (social deprivation), group housed in a room containing rats (rat odor stress), or isolation housed in a room containing rats (concurrent stress). Social deprivation and concurrent stressors induced an increase of 30 and 335% in EJC amplitude, respectively. The success rate of recording EJCs from sets of varicosities in the concurrent stressor group was greater compared with all other groups. The present study has shown that some common animal housing conditions act as stressors and induce significant changes in sympathetic neurotransmission.

Descriptors: mice, housing conditions, stress, potential effect, sympathetic nervous system, group housed, isolation housed.

Davey, A.K., J.P. Fawcett, S.E. Lee, K.K. Chan, and J.C. Schofield (2003). **Decrease in hepatic drug-metabolizing enzyme activities after removal of rats from pine bedding.** *Comparative Medicine* 53(3): 299-302. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Wood is often used as a contact bedding material for laboratory animals. It has been established that wood, particularly softwood, has the potential to induce hepatic drug-metabolizing enzymes. However, to the authors' knowledge, changes in enzyme activity after removal of animals from bedding have not been characterized. The purpose of the study reported here was to determine how hepatic ethoxyresorufin-O-deethylation and p-nitrophenol hydroxylation activities alter over time after removal of rats from pine bedding. Male rats, three to four months old, raised in cages containing pine bedding, were transferred to wire-bottomed cages. At various times thereafter (up to 84 days), groups of rats were euthanized and the liver was processed to obtain microsomes. The microsomal protein and total cytochrome P450 (CYP) content and enzyme activities were determined. Significant differences in total microsomal protein or total CYP values were not observed over the 84 days, but a decrease in ethoxyresorufin-O-deethylation and p-nitrophenol hydroxylation activities was detected. For p-nitrophenol hydroxylation, the decrease was exponential, with a half-life of approximately nine days, whereas for ethoxyresorufin-O-deethylation, a rapid decrease in activity in the first week was followed by a reduced rate of decrease thereafter. Enzyme activities did not stabilize for at least six weeks. Researchers using laboratory animals should, therefore, be aware that it takes several weeks for enzyme activities to stabilize once animals are removed from the bedding.

Descriptors: rats, laboratory animals, litter bedding, wood residues, gene induction, enzyme activity, cytochrome P450, liver microsomes, 7 ethoxyresorufin-O-deethylase, p-nitrophenol hydroxylation.

De Groot, M.H. and B. Rusak (2004). **Housing conditions influence the expression of food-anticipatory activity in mice.** *Physiology and Behavior* 83(3): 447-457. ISSN: 0031-9384.

Abstract: If food is presented for a limited duration once every 24 h, rats will gradually develop increased activity in the hours preceding mealtime, even if this is during a time of day when they are normally inactive. This food-anticipatory activity (FAA) is mediated by the entrainment of an endogenous self-sustaining circadian pacemaker. Mice are increasingly being used for the molecular analysis of behavior because of the large number of genetically manipulated mouse models available, but little is known about food entrainment in this species. This study assessed the impact of different housing conditions on the expression of FAA in a temporally restricted feeding paradigm. Wheel-running activity rhythms were recorded from mice (Mus musculus) undergoing food restriction while housed under one of two conditions. The results demonstrated that mice housed on open shelves showed robust FAA while those housed in isolation boxes did not. These results indicate that differences in susceptibility to food entrainment among mice (e.g., those with different genotypes) should be interpreted cautiously, since at least one strain is strongly affected by a relatively minor procedural difference that was not anticipated to have a significant impact.

Descriptors: mice, housing conditions, food anticipatory activity, influence, behavior, limited duration,

isolation.

De Jager, L., L. De Bruyn, and F.J. Potgieter (1997). **Effect of vermiculite bedding material on the incidence of lung malignancy: implications for case-control studies.** *Animal Technology* 48(1): 1-6. ISSN: 0264-4754.
NAL Call Number: QL55.I5
Abstract: With the use of small animals in long-term biological research studies the microenvironment plays an important role. Vermiculite, a widely used bedding material, conforms to all the requirements of a good bedding material, but histological changes in the lungs and lung tumors have been reported. To examine the alleged carcinogenic effect of vermiculite a case-control study was undertaken. An experimental group of mice, Mus musculus, strain BALB/c, was maintained on vermiculite bedding material and a control group, kept in the same room, on cotton wool as bedding material. Both groups were sacrificed at the age of 18 months, and the lungs were examined macroscopically at autopsy. Histological preparations of the lungs were studied to detect and identify lung tumors. The incidence of diagnosed malignant tumors in both groups was recorded. White oval masses, identified histologically as alveologenic tumors of type II alveolar cell origin, were recorded in both groups. A significantly higher incidence of lung tumors was found in the experimental group. The BALB/c strain is a useful animal model for screening lung carcinogenesis because of its susceptibility to lung tumor development. In this study a higher incidence of alveologenic lung tumors in the experimental group further proves the carcinogenic effect of vermiculite. These findings could implicate misinterpretation of results in life-span and carcinogenicity studies on mice as well as detrimental health effects for human beings working with the animals.
Descriptors: mice, strains, vermiculite, litter, carcinogens, lungs, neoplasms, histopathology, carcinogenesis, occupational health, laboratory workers.

Dorshkind, K., L. Welniak, R.A. Gault, J. Hixon, E. Montecino Rodriguez, N.D. Horseman, J.M. Gertner, and W.J. Murphy (2003). **Effects of housing on the thymic deficiency in dwarf mice and its reversal by growth hormone administration**. *Clinical Immunology* 109(2): 197-202. ISSN: 1521-6616.
Abstract: Abstract Initial studies on T cell development in the Snell Dwarf (dw/dw) strain of mice, which are deficient in the production of anterior pituitary hormones, have been interpreted to indicate a clear dependence of T cell development on endocrine system-derived factors. However, normal thymopoiesis in this strain has also been reported. The aim of the present study was to reconcile these contradictory data in order to define the role of anterior pituitary hormones in the thymus. The results indicated that if female dw/dw mice are housed together with their normal-sized littermates, thymic cellularity and the frequency of CD4 super(+)CD8 super(+) thymocytes are markedly reduced. However, administration of growth hormone could reverse these decreases seen in the double-positive T progenitor cells. Taken together, the data indicate that stress is the unifying parameter that can explain the disparate dw/dw mouse literature and suggest that endocrine effects on the T cell development can best be understood by interpreting the literature in this context.
Descriptors: dwarf mice, thymic deficiency, housing effect, reversal, growth hormone, housing.

Douglas, L.A., E.I. Varlinskaya, and L.P. Spear (2004). **Rewarding properties of social interactions in adolescent and adult male and female rats: impact of social versus isolate housing of subjects and partners**. *Developmental Psychobiology* 45(3): 153-162. ISSN: 0012-1630.
Descriptors: behavior, development, social conditioned place preference, social interaction.

Engleman, E.A., C.M. Ingraham, C.E. O'Brien, W.J. McBride, and J.M. Murphy (2004). **Effect of housing conditions on sulpiride-induced increases in extracellular dopamine (DA) levels in the nucleus accumbens of alcohol-preferring (P) rats.** *Brain Research* 1022(1-2): 247-250. ISSN: 0006-8993.
Abstract: The effect of housing conditions on sulpiride-induced increases in extracellular dopamine (DA) levels was investigated in the nucleus accumbens (NAC) of P rats. Rats were double-housed (DH) in plastic tubs, or single-housed (SH) in hanging wire cages for 12 weeks. Microdialysis in the NAC showed greater sulpiride-induced DA increases in the NAC of SH vs. DH rats, with no difference in basal levels. The data indicate that housing conditions can alter DA D(2) receptor function in the NAC.
Descriptors: housing conditions, effect, sulpiride-induced increases, extracellular dopamine, rats, alcohol preferring.

Eriksson, E., F. Royo, K. Lyberg, H.E. Carlsson, and J. Hau (2004). **Effect of metabolic cage housing on immunoglobulin A and corticosterone excretion in faeces and urine of young male rats.** *Experimental Physiology* 89(4): 427-33. ISSN: 0958-0670.

Descriptors: rats, corticosterone, urine, feces, housing, immunoglobulin A, stress, male, Sprague Dawley rats, metabolic cageing.

Eskola, S. and E. Kaliste Korhonen (1999). **Nesting material and number of females per cage: effects on mouse productivity in BALB/c, C57BL/6J, DBA/2 and NIH/S mice.** *Laboratory Animals* 33(2): 122-128. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Two different materials--aspen wood-wool and paper towel--were compared as nesting material for three inbred mouse strains (BALB/c, C57BL/6J and DBA/2) housed in barrier conditions. In addition, the effect of varying the number of females per cage (one to three per cage) of these three strains and with NIH/S outbred mouse stock was studied. The number of litters, litter size and neonatal mortality were determined, as well as age, sex and weight of weanlings. The type of nesting material did not affect the characteristics monitored. In all strains, the number of weanlings per female was greatest in singly-housed females. In terms of the number of weanlings per cage, two females per cage gave the best result. In DBA/2 mice, neonatal mortality increased when several females were caged together.

Descriptors: mice, female animals, nesting, cage density, wood wool, paper, litter, strain differences, barrier husbandry, female fertility, litter size, age at weaning, weaning weight, mortality, inbreeding depression, paper towels.

Eskola, S. and E. Kaliste Korhonen (1999). **Aspen wood-wool is preferred as a resting place, but does not affect intracage fighting of male BALB/c and C57BL/6J mice.** *Laboratory Animals* 33(2): 108-121. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Aspen wood-wool, provided as nesting material, was evaluated as a possible improvement of cage environment for 10-14-week-old inbred male mice maintained in groups of six (BALB/c n = 72 and C57BL/6J n = 36). The daily behaviour of mice was video recorded and their body weight, food consumption, weights of some organs and serum corticosterone concentrations were measured. Aggressive interactions between cage mates and against a strange intruder as well as the number of wounds on the back of the animals was monitored in order to evaluate the effect of nesting material on intermale aggression. Nesting material did not affect the daily active/passive behaviour patterns of mice, although animals clearly preferred it as a resting place. BALB/c mice given nesting material showed less weight gain and smaller brown adipose tissue weights than animals without nesting material. The other characteristics measured were not affected by the presence of nesting material in either strain. The presence of nesting material had no effect on fighting in cages. C57BL/6J mice were more aggressive than BALB/c mice according to the number of wounded animals in a cage. Wounded BALB/c mice had enlarged spleens and decreased epididymal adipose tissue weights. In conclusion, the nesting material used in this study did not adversely affect the animals. On the other hand, the material was clearly preferred to conventional bedding as a resting place. These findings suggest that nesting material may improve the cage environment of laboratory mice. Furthermore, there was an indication of strain differences in aggressive behaviour. It could be suggested that C57BL/6J mice are less tolerant towards intruders and. housing six mice per cage is not suitable for this strain.

Descriptors: mice, male animals, strain differences, cages, wood wool, physical activity, nesting, aggressive behavior, body weight, liveweight gain, adrenal glands, spleen, weight, brown fat, blood serum, corticosterone, body fat, cage density, epididymal fat.

Ewaldsson, B., B. Fogelmark, R. Feinstein, L. Ewaldsson, and R. Rylander (2002). **Microbial cell wall product contamination of bedding may induce pulmonary inflammation in rats.** *Laboratory Animals* 36(3): 282-290. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: To test the hypothesis that airborne microbial cell wall components could induce an inflammatory response in the lungs, measurements were made of the amounts of bacterial endotoxin and (1 leads to 3)-beta-D-glucan in laboratory animal bedding materials. Groups of rats were exposed by inhalation to airborne endotoxin,

(1 leads to 3)-beta-D-glucan or a combination of the two for 5 weeks. The results demonstrated that measurable amounts of endotoxin and (1 leads to 3)-beta-D-glucan could be detected in the different bedding materials. In contrast to animals at delivery, those kept on bedding for 5 weeks showed moderate inflammatory reactions in the lung. These were most pronounced among animals exposed to endotoxin and (1 leads to 3)-beta-D-glucan. The results suggest that further studies need to be undertaken to elucidate the role of microbial cell wall products in the development of inflammatory lung responses among research animals.

Descriptors: rats, laboratory mammals, air pollutants, aerosols, cell walls, glucans, endotoxins, litter, microbial contamination, lungs, inflammation, histiocytes, macrophages, histopathology, experimental design.

Francolin Silva, A.L. and S.S. Almeida (2004). **The interaction of housing condition and acute immobilization stress on the elevated plus-maze behaviors of protein-malnourished rats**. *Brazilian Journal of Medical and Biological Research* 37(7): 1035-1042. ISSN: 0100-879X.

Abstract: Protein malnutrition induces structural, neurochemical and functional alterations in the central nervous system, leading to behavioral alterations. In the present study, we used the elevated plus-maze (EPM) as a measure of anxiety to evaluate the interaction between acute immobilization and housing conditions on the behavior of malnourished rats. Pups (6 males and 2 females) were fed by Wistar lactating dams receiving a 6% (undernourished) or 16% (well-nourished) protein diet. After weaning, the animals continued to receive the same diets ad libitum until 49 days of age when they started to receive a regular lab chow diet. From weaning to the end of the tests on day 70, the animals were housed under two different conditions, i.e., individual or in groups of three. On the 69th day, half of the animals were submitted to immobilization for 2 h, while the other half were undisturbed, and both groups were tested 24 h later for 5 min in the EPM. Independent of other factors, protein malnutrition increased, while immobilization and social isolation per se decreased, EPM exploration. Analysis of the interaction of diet vs immobilization vs housing conditions showed that the increased EPM exploration presented by the malnourished group was reversed by acute immobilization in animals reared in groups but not in animals reared individually. The interaction between immobilization and housing conditions suggests that living for a long time in social isolation is sufficiently stressful to reduce the responses to another anxiogenic procedure (immobilization), while living in groups prompts the animals to react to acute stress. Thus, it is suggested that housing condition can modulate the effects of an anxiogenic procedure on behavioral responses of malnourished rats in the EPM.

Descriptors: rats, protein malnourished, housing condition, interaction, stress, behavior, diet, immobilization.

Gaertner, D.J., M. Batchelder, L.H. Herbst, and H.L. Kaufman (2003). **Administration of vaccinia virus to mice may cause contact or bedding sentinel mice to test positive for orthopoxvirus antibodies: case report and follow-up investigation.** *Comparative Medicine* 53(1): 85-88. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Routine testing of bedding sentinels from a barrier room revealed one mouse seropositive to ectromelia virus (EV). Results of hemagglutination-inhibition testing and western blot analysis were confirmatory for orthopoxvirus antibodies. Additional seropositive animals were not identified. Interviews indicated that replication-competent vaccinia virus (VV), Western Reserve strain (VV-WR), recently had been given to mice. Although VV-WR was not expected to spread by contact or via fomites, the case evidence suggested transmission of vaccinia via soiled bedding. In a follow-up experiment, 15 index mice were inoculated with 107 plaque-forming units of VV by either subcutaneous or intrarectal instillation. A dedicated contact sentinel and a bedding sentinel were provided for each index mouse. All 15 index mice were positive for antibodies when tested 22 days after inoculation. One mouse, inoculated by the subcutaneous route, appeared ill and developed lesions on the proximal portion of the tail. The contact sentinel mouse housed with this index mouse was the only sentinel to seroconvert. We conclude that VV-WR can spread to contact sentinels and potentially to bedding sentinels. The ability of other VV strains to be transmitted horizontally and the susceptibility of different mouse strains to infection merit further investigation. The use of VV in animal facilities must be managed carefully since the available serologic tests do not distinguish between VV and EV, an exotic agent of major concern to laboratory animal facilities.

Descriptors: mice, laboratory animals, vaccinia virus, sentinel animals, case reports, horizontal transmission, litter, feces, seroconversion, cross reaction, barrier husbandry, myobia, disease transmission, ectromelia virus.

Galani, R., E. Duconseille, O. Bildstein, and J.C. Cassel (2001). **Effects of room and cage familiarity on locomotor**

activity measures in rats. *Physiology and Behavior* 74(1-2): 1-4. ISSN: 0031-9384.

Abstract: Locomotor activity measures are often used in behavioral neuroscience. There is, however, a large variability in the protocols assessing locomotor activity which may, more or less, strongly be influenced by exploration and reactivity to novelty in unfamiliar situations. Using Long-Evans male rats, we investigated how far changes, such as placing rats in a cage physically identical to the home cage supplied with fresh sawdust but kept in a familiar room, or placing the familiar home cage with the rat inside in another (unfamiliar) room, may influence the level of locomotor activity. We showed that both changes resulted in significantly increased locomotion in the first 2 h after placing the rats in the respective test situation, but there is no significant additive effect. These changes performed right before the start of the test do not alter diurnal or nocturnal locomotor activity once the first 2 h have elapsed. The results illustrate that rats kept in an environment with stable proximal features (cage, sawdust) can react by increased activity in response to more distal novelty (experimental room), and conversely, that rats in a familiar environment react to proximal changes in the home cage.

Descriptors: Long Evans rats, cage familiarity, locomotor activity, effects, room, behavior, exploration.

Garey, J., L. Kow, W. Huynh, S. Ogawa, and D.W. Pfaff (2002). **Temporal and spatial quantitation of nesting and mating behaviors among mice housed in a semi-natural environment**. *Hormones and Behavior* 42(3): 294-306. ISSN: 0018-506X.

Descriptors: mice, nesting, mating, behavior, environment, natural, social interactions.

Garrett Beal, L.J. and S.L. Hoogstraten (2003). **Managing a mouse mutant resource center...this is not your father's transgenic core.** *Lab Animal* 32(8): 31-7. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Abstract: Genetically engineered mice are making an increasingly valuable contribution to biomedical research, and many institutions have begun to assemble dedicated facilities for the development of transgenic animals. The authors describe the structure, function, and management of the transgenic core at NHGRI.

Descriptors: mouse, mutant resource center, transgenic, veterinary medicine, methods, disease models, regional health planning.

Georgsson, L., J. Barrett, and D. Gietzen (2001). **The effects of group-housing and relative weight on feeding behaviour in rats**. *Scandinavian Journal of Laboratory Animal Science* 28(4): 201-209. ISSN: 0901-3393.

Descriptors: rats, group housing, weight, feeding behavior, effect.

Language of Text: Swedish summary.

Gil, M.C., J.A. Aguirre, A.P. Lemoine, E.T. Segura, M. Barontini, and I. Armando (1999). **Influence of age on stress responses to metabolic cage housing in rats.** *Cellular and Molecular Neurobiology* 19(5): 625-33. ISSN: 0272-4340.

Abstract: 1. We studied the effect of isolation stress in 3- and 12-month-old rats individually housed in metabolic cages for 7 days. Urine (24 hr) was collected daily from one group of animals of each age. The other group was tested in an open field and on a hot plate on days 1 and 7. 2. Total deambulation in the open-field test was lower in young than in older rats both on day 1 (54.7 +/- 9.9 vs 80 +/- 8.9 crossings/session; P < 0.04) and on day 7 (21 +/- 9 vs 48 +/- 7 crossings per session; P < 0.04) and decreased significantly in the two groups when tested on day 7 (P < 0.03). Latency to paw-licking in the hot-plate test was longer in young than in older animals on day 1 (14 +/- 2 vs 8 +/- 4 sec; P < 0.05) but was similar in the two groups on day 7. 3. Urinary excretions of norepinephrine (NE) and epinephrine (E) were determined by HPLC with electrochemical detection. Urinary NE in day 1 was similar in young and older animals (2627 +/- 828 vs 3069 +/- 598 ng/24 hr). In young animals NE excretion decreased along the study and was significantly (P < 0.02) lower than on day 1 during the last 3 days of the study. Conversely, in older animals urinary excretion of NE remained similar throughout the study. On day 7 urinary excretion of NE in older animals was about two fold that in young rats. Urinary E was similar in young and older rats (341 +/- 127 vs 532 +/- 256 ng/24 hr) on day 1 and showed a tendency to increase throughout the study. 4. Urinary monoamine oxidase inhibitory (IMAO) activity was determined by testing the ability of urine extracts to inhibit rat liver MAO activity in vitro and was higher in young than in older animals throughout the study (day 1, 54.8 +/- 4.2 vs 25.1 +/- 5.1%; P < 0.02). In young rats excretion of IMAO was significantly higher during the last 3 days of the study than on day 1 (P < 0.05). In older

animals urinary IMAO showed a tendency to increase at the end of the study. 5. Isolation stress caused by housing rats in metabolic cages results in different behavioral and metabolic responses in young and older animals. Young animals exhibit a lower locomotor and analgesic response and excrete lower amounts of NE and higher IMAO activity in the urine than older rats. The metabolic and behavioral responses to isolation stress are highly dependent on the age of the animals tested. These results should be taken into consideration when designing experiments requiring the use of metabolic cages.

Descriptors: metabolic cage housing, rats, age, influence, stress, factors, heat, social isolation, behavior.

Gordon, C.J. (2004). **Effect of cage bedding on temperature regulation and metabolism of group-housed female mice.** *Comparative Medicine* 54(1): 63-68. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Mice are generally housed in groups in cages lined with an absorbent bedding material at ambient temperature (Ta) of 20 to 24+C, which is comfortable for humans, but cool for mice. Little is known about the effects of bedding on thermoregulation of group-housed mice. To determine whether bedding material affects thermoregulatory stability, core temperature (Tc) and motor activity (MA) were monitored by use of radiotelemetry in female CD-1 mice housed in groups of four in a standard plastic cage at Ta of 23.5+C. Ten groups were tested using three types of bedding material: a deep layer of heat-treated wood shavings (DWS) that allowed mice to burrow, a thin layer of wood shavings (TWS) just covering the bottom of the cage floor, or a layer of beta chips (BC). Mice could not burrow in the TWS or BC. The Tc and MA were affected by bedding type and time of day. Mice housed with DWS maintained a significantly higher Tc (deltaTc = 1.0+C) during the day, compared with that in mice housed with TWS and BC. During the night, Tc and MA were high in all groups and there was no effect of bedding type on Tc or MA. Effect of bedding on metabolic rate (MR) was estimated by measuring oxygen consumption for six hours in groups of four mice at Ta of 23.5+C. The Tc was significantly reduced in mice housed on the TWS and BC, but MR was unaffected by bedding type. There was a trend for higher MR in mice on BC. Compared with use of other bedding materials, housing mice on DWS and comparable materials provides an environment to burrow, thus reducing heat loss. The effects of bedding material on temperature regulation may affect rodent health and well being. Moreover, bedding will affect variability in toxicologic and pharmacologic studies whenever an endpoint is dependent on body temperature.

Descriptors: laboratory animals, group housing, thermoregulation, litter bedding, ambient temperature, body temperature, mice, temperature regulation, housing, effect, female.

Gordon, C.J., P. Becker, and J.S. Ali (1998). **Behavioral thermoregulatory responses of single- and group-housed mice.** *Physiology and Behavior* 65(2): 255-62. ISSN: 0031-9384.

Abstract: The ambient temperature (Ta) to house and study laboratory rodents is critical for nearly all biomedical studies. The ideal Ta for housing rodents and other animals should be based on their thermoregulatory requirements. However, fundamental information on the behavioral thermoregulatory responses of single- and group-housed rodents is meager. To address this issue, thermoregulatory behavior was assessed in individual and groups of CD-1 mice housed in a temperature gradient. Mice were housed in groups of five or individually while selected Ta and motor activity were monitored. Single- and group-housed mice displayed a circadian oscillation of selected Ta and motor activity with relatively warm T(a)s of approximately 29 degrees C selected during the light phase; during the dark phase selected Ta was reduced by 4 degrees C, whereas motor activity increased. Selected Ta of aged (11 months old) mice housed individually was approximately 1.0 degrees C warmer than the group-housed mice. Thermal preference of younger mice (2 months old) was similar for single- and group-housed animals. The operative Ta of mice housed in standard facilities was estimated by measuring the cooling rate of "phantom" mice modeled from aluminum cylinders. The results show that the typical housing conditions for single- and group-housed mice are cooler than their Ta for ideal thermal comfort.

Descriptors: behavior, animal physiology, body temperature regulation physiology, social isolation, aging physiology, circadian rhythm physiology, housing, animal, mice, motor activity physiology, temperature, time factors.

Hasegawa, M., S. Kagiyama, M. Tajima, K. Yoshida, Y. Minami, and T. Kurosawa (2003). **Evaluation of a forced-air-ventilated micro-isolation system for protection of mice against *Pasteurella pneumotropica*.** *Experimental Animals (Tokyo)* 52(2): 145-51. ISSN: 1341-1357.

Abstract: Studies to date have established that the physical environment inside cages can be controlled adequately by setting the intra-cage ventilation at 60 air changes per hour in a forced-air-ventilated micro-isolation system (FVMIS). In this study, the capability of FVMIS to prevent inter-cage transmission of microorganisms was evaluated using *Pasteurella pneumotropica* as a reference microorganism. One FVMIS rack and a conventional rack were used, and cages with mice positive for *P. pneumotropica* and those with *P. pneumotropica*-free mice were housed on both racks. The mice were examined for P. pneumotropica contamination every 4 weeks after initiating the experiment for 12 weeks using a polymerase chain reaction method. Some *P. pneumotropica*-free mice housed in open air cages in the conventional rack became positive for *P. pneumotropica* (four of 28 animals after 4 weeks; eight of 28 animals after 12 weeks), but all P. pneumotropica-free mice housed in the FVMIS cages remained negative for the bacterium throughout the experiment. The results demonstrate that FVMIS can prevent inter-cage transmission of *P. pneumotropica* when proper cage handling practice is under taken.
Descriptors: mice, *Pasteurella* pathogenicity, ventilation, forced air, air changes, transmission, microorganisms.

Haseman, J.K., E. Ney, A. Nyska, and G.N. Rao (2003). **Effect of diet and animal care/housing protocols on body weight, survival, tumor incidences, and nephropathy severity of F344 rats in chronic studies.** *Toxicologic Pathology* 31(6): 674-81. ISSN: 0192-6233.

Abstract: Diet is an important environmental factor affecting body weight, survival, and age-related diseases of rodents. The NIH-07 open formula diet was the diet used in the National Toxicology Program's (NTPs) rodent carcinogenicity studies from 1980 to 1994. In 1994 the NTP began using a new diet designated the NTP-2000 diet. This paper compares body weight, survival, tumor incidence, and nephropathy severity in untreated control groups of Fischer 344 (F344) rats fed the NTP-2000 or NIH-07 diets, using data from 22 separate 2-year feed and inhalation studies. The feed studies were conducted in 3 different facilities, and all the inhalation studies were conducted in a single facility. During feed studies, rats were group housed in polycarbonate cages and fed diets in powder (mash) form, while in inhalation studies, rats were housed individually in wire mesh cages, and fed diets in pelleted form. Survival was significantly ($p<0.05$) higher in groups fed NTP-2000 diet compared to the corresponding groups fed NIH-07 diet, irrespective of sex or housing conditions. Use of the NTP-2000 diet was also associated with a decreased incidence of pituitary gland tumors in both sexes and decreased incidences of adrenal pheochromocytoma and preputial gland tumors in males. The incidence and severity of nephropathy was also decreased in animals receiving the NTP-2000 diet, especially males. The decreased nephropathy severity and the decreased incidence of pituitary gland tumors are likely the major factors contributing to the improved survival of rats receiving the NTP-2000 diet relative to those given the NIH-07 diet. These data also support earlier findings that decreased incidences of adrenal pheochromocytoma are associated with reduced nephropathy severity in male F344 rats. Throughout the two-year study female rats receiving the NTP-2000 diet were significantly ($p<0.05$) lighter than those receiving the NIH-07 diet. However, it is uncertain if this difference can be attributed to the NTP-2000 diet, since implementation of this diet by the NTP approximately coincided with changes in the F344 rat production colony that resulted in somewhat lighter animals being provided to the NTP. Controls from inhalation studies and feed studies differed significantly ($p<0.01$) in the incidence of a variety of tumors, irrespective of diet. This suggests that differences in animal care and housing protocols may impact tumor incidence in F344 rats, most notably pituitary gland and testis tumors.
Descriptors: animal feed analysis, animal husbandry methods, body weight physiology, kidney diseases pathology, longevity physiology, neoplasms epidemiology, toxicity tests, chronic methods, food, formulated analysis, housing, animal, neoplasms pathology, rats, inbred F344 rats.

Hawkins, P., D. Anderson, K. Applebee, D. Key, J. Wallace, G. Milite, J.M. Clark, R. Hubrecht, and M. Jennings (2003). **Individually ventilated cages and rodent welfare: report of the 2002 RSPCA/UFAW Rodent Welfare Group meeting**. *Animal Technology and Welfare* 2(1): 23-34. ISSN: 0264-4754.
NAL Call Number: SF757.A62
Descriptors: rodent, animal housing, animal welfare, individually ventilated cages, laboratory animals, mice, UFAW.

Heikkilae, M., R. Sarkanen, H.M. Voipio, and T. Nevalainen (2001). **Cage position preferences of rats**. *Scandinavian Journal of Laboratory Animal Science* 28(2): 65-74. ISSN: 0901-3393.
Descriptors: rats, laboratory animals, animal husbandry, cages, behavior, animal housing, preferences, position.

Hesler, J.R., J.R. Broderson, and C.S. King (1999). **Rodent quarantine: facility design and equipment for small animal containment facilities.** *Lab Animal* 28(8): 34-40. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: mice, rats, laboratory mammals, transgenic animals, animal health, disease transmission, quarantine, barrier husbandry, cages, animal housing, air flow, artificial ventilation, safety at work, autoclaving, animal cubicles, airlocks, air pressure.

Hobbs, B.A., S. Herrmann, J. Muzzicato, and M. Smith (1997). **Comparison of the effect of two automatic watering systems and environmental manipulations on frequency of wet bedding created by mice housed in solid-bottom suspended caging systems.** *Contemporary Topics in Laboratory Animal Science* 36(6): 69-71. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, cages, litter, water systems, automatic control, comparisons, strain differences, sex differences, age differences, in the cage automatic watering systems, out of cage automatic watering systems.

Hoglund, A.U. and A. Renstrom (2001). **Evaluation of individually ventilated cage systems for laboratory rodents: cage environment and animal health aspects.** *Laboratory Animals* 35(1): 51-57. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The use of individually ventilated cage (IVC) systems has become an attractive housing regime of laboratory rodents. The benefits of IVC systems are, reportedly, a high degree of containment combined with relative ease of handling, and a high degree of protection from allergenes. In the present study we tested whether two IVC systems (BioZone VentiRack, IVC1 and Techniplast SealSafe, IVC2S), in which we held mature male NMRI mice, were constructed to maintain a constant differential pressure, positive or negative, during a prolonged period of time. We also measured ammonia (NH3) concentrations after about 2 weeks of use, and CO2 build-up during a 60 min simulated power failure situation. In addition, animal weight development and bite-wound frequency were recorded (Renstrom et al. 2000). From the present study it is concluded that the IVC1 air handling system provides a more uniform and balanced differential pressure than the IVC2S. Both systems effectively scavenge NH3 when bedding material is not soaked by urine. Although the IVCs are dependent on the continual function of the fans to work properly, it seems unlikely that CO2 concentrations increase to hazardous levels, as a result of a one hour power failure, with the type of cages used in this study. Differences in weight development and bite-wound occurrence were noted between the two IVC systems. Causes for these differences could not be established and need more investigation.
Descriptors: mice, laboratory mammals, cages, design, artificial ventilation, animal husbandry, liveweight gain, bites, air pollution, ammonia, carbon dioxide, animal health, cage size, social dominance.

Hosokawa, M., T. Abe, K. Higuchi, K. Shimakawa, Y. Omori, T. Matsushita, K. Kogishi, E. Deguchi, Y. Kishimoto, K. Yasuoka, and T. Takeda (1997). **Management and design of the maintenance of SAM mouse strains: an animal model for accelerated senescence and age-associated disorders**. *Experimental Gerontology* 32(1-2): 111-116. ISSN: 0531-5565.
Descriptors: SAM mouse, strains, management, design, animal model, maintenance, age, associated disorders, senescence.

Hubrecht, R. (2000). **Advancing rabbit and rodent housing and husbandry research**. *Progress in the Reduction, Refinement and Replacement of Animal Experimentation: Proceedings of the 3rd World Congress on Alternatives and Animal Use in the Life Sciences, Bologna, Italy*, p. 1257-1267.
Descriptors: rabbit, rodent, housing, husbandry, animal welfare, enrichment, research.

Hurst, J.L., C.J. Barnard, R. Hare, E.B. Wheeldon, and C.D. West (1996). **Housing and welfare in laboratory rats: time-budgeting and pathophysiology in single-sex groups**. *Animal Behaviour* 52(2): 335-360. ISSN: 0003-3472.
NAL Call Number: 410 B77
Descriptors: rats, behavior, social behavior, single sex groups, biological differences, pathophysiology, animal welfare.

Hurst, J.L., C.J. Barnard, C.M. Nevison, and C.D. West (1998). **Housing and welfare in laboratory rats: the welfare implications of social isolation and social contact among females.** *Animal Welfare* 7(2): 121-136. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, cages, group size, welfare, females, housing, behavior, social isoloation, blood serum, corticosterone, aggressive behavior.

Hurst, J.L., C.J. Barnard, C.M. Nevison, and C.D. West (1997). **Housing and welfare in laboratory rats: welfare implications of isolation and social contact among caged males**. *Animal Welfare* 6(4): 329-347. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, animal welfare, housing, behavior, social behavior, males, behavior, isolation, social contact.

Hurst, J.L., C.J. Barnard, U. Tolladay, C.M. Nevison, and C.D. West (1999). **Housing and welfare in laboratory rats: effects of cage stocking density and behavioural predictors of welfare.** *Animal Behaviour* 58(Part 3): 563-586. ISSN: 0003-3472.
NAL Call Number: 410 B77
Descriptors: rats, stocking density, stress response, sex differences, physiopathology, animal welfare, aggressive behavior, grooming, physical activity, escape responses, kidneys, adrenal glands, IGG, thymus gland, corticosterone, blood serum, testosterone, blood picture, blood chemistry.

Ishii, T., K. Yoshida, M. Hasegawa, S. Mizuno, M. Okamoto, M. Tajima, and T. Kurosawa (1998). **Invention of a forced-air-ventilated micro-isolation cage and rack system. Environment within cages: temperature and ammonia concentration.** *Applied Animal Behaviour Science* 59(1-3): 115-123. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: rats, laboratory rearing, cages, environmental temperature, ammonia, animal welfare, artificial ventilation, air flow, litter, paper, wood chips.

Jensen, S.P., S.J. Gray, and J.L. Hurst (2003). **How does habitat structure affect activity and use of space among house mice?** *Animal Behaviour* 66(2): 239-250. ISSN: 0003-3472.
NAL Call Number: 410 B77
Descriptors: mice, activity, habitat structure, space use, open site, protected site, food.

Johnson, E.C., M.M. Lavail, W.O. Cepurna, L. Jia, K. Ackhavong, and J.C. Morrison (1999). **Housing in low level, constant light stabilizes circadian intraocular pressure (IOP) oscillations in brown norway rats, simplifying a glaucomatous neuropathy model**. *IOVS* 40(4): S672.
Descriptors: Norway rats, housing, low level constant light, intraocular pressure, glaucomatous, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 9-14, 1999, Fort Lauderdale, Florida, USA.

Karolewicz, B. and I.A. Paul (2001). **Group housing of mice increases immobility and antidepressant sensitivity in the forced swim and tail suspension tests.** *European Journal of Pharmacology* 415(2-3): 197-201. ISSN: 0014-2999.
Abstract: The forced swim test and tail suspension test are often used in laboratory practice to identify compounds that possess antidepressant-like activity. This experiment was conducted to determine whether housing conditions per se influence the response of mice in these antidepressant screening procedures. Male NIH Swiss mice were housed individually or in groups (five per cage) for 8 weeks prior to testing. After 8 weeks, the animals were exposed to the forced swim and tail-suspension tests. Group housed mice displayed high levels of immobility in the forced swim and tail suspension tests. Desipramine injection 60 min prior testing, in doses 7.5 and 15 mg/kg, produced significant reductions in the immobility time in forced swimming and tail suspension tests. Individually housed mice, when exposed to these tests, displayed lower levels of immobility with a magnitude comparable to the effect of desipramine in group housed mice. Desipramine given to individually housed mice did not reduce the duration of immobility either in the forced swim test or in the tail

suspension test. These results indicate that both tests are sensitive to housing conditions. This observation suggests that long lasting group housing may be critical to the behavioral response in these preclinical screening procedures in mice.

Descriptors: antidepressive agents, tricyclic pharmacology, behavior, animal drug effects, desipramine pharmacology, housing, animal, immobilization, stress drug therapy, antidepressive agents, tricyclic therapeutic use, desipramine therapeutic use, mice.

Kawakami, K., T. Takeuchi, S. Yamaguchi, A. Ago, M. Nomura, T. Gonda, and S. Komemushi (2003). **Preference of guinea pigs for bedding materials: wood shavings versus paper cutting sheet.** *Experimental Animals (Tokyo)* 52(1): 11-5. ISSN: 1341-1357.

Abstract: The preference of guinea pigs for bedding materials, wood shavings (WS) or paper cutting sheets (PS), was studied. Animals aged 8 weeks and 20 weeks showed a similar behaviour pattern during 30 min in the light, preferring WS to PS regardless of ages. Over both light and dark periods for 24 h, guinea pigs apparently preferred WS in the light, spending much more time resting in them than in PS. In the dark, the border-crossing was significantly more frequent than in the light, and the staying time was rather longer in PS than WS. The results suggest that guinea pigs prefer different bedding materials under light and dark conditions.

Descriptors: guinea pigs, housing, bedding materials, paper, wood, preference darkness, light.

Korz, V. and R. Gattermann (1999). **Housing conditions affect susceptibility to mercury in the golden hamster.** *Laboratory Animals* 33(3): 228-233. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Individually-housed and group-housed golden hamsters (*Mesocricetus auratus*), aged 8 weeks, were studied with regard to their susceptibility to a single gavage of mercuric chloride (10 mg/kg body weight). Body weight and food consumption were measured for 10 days (day-9 to day 0) in a pre-application period and for 13 days (day 1 to day 13) in a post-application period. Mercuric chloride administration significantly reduced body weight gain in both isolated and grouped hamsters at day 1 compared to vehicle controls. While the individually-housed treated hamsters recovered during the post-application period, the group-housed treated hamsters showed a reduced body weight gain over the whole post-application period. Results are discussed in relation to elevated susceptibility to intoxication in group-housed hamsters triggered by high social stress. This study highlights the need to carefully consider the housing conditions which can influence the results of teratological experiments.

Descriptors: golden hamsters, mercuric chloride, body weight, liveweight gain, toxicity, susceptibility, stress, cage density, group size, feed intake.

Krohn, T.C. and A.K. Hansen (2002). **Carbon dioxide concentrations in unventilated IVC cages.** *Laboratory Animals* 36(2): 209-212. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: The use of individually ventilated cage (IVC) systems has become more common worldwide. The various systems are becoming more and more sealed in order to protect the animals against infections and the staff against allergens; which, however, may lead to problematic CO2 concentrations, if the cages are left unventilated. In this study it is shown that, depending on how tight the cage is and the number of animals housed in each cage, CO2 inside the cage within 2 h will increase to levels of between 2 and 8%.

Descriptors: mice, cages, air flow, duration, carbon dioxide, group size, animal welfare.

Krohn, T.C., A.K. Hansen, and N. Dragsted (2003). **The impact of cage ventilation on rats housed in IVC systems.** *Laboratory Animals* 37(2): 85-93. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Today the use of individually ventilated cage systems (IVC systems) is common, especially for housing transgenic rodents. Typically, in each cage a ventilation rate of 40 to 50 air changes per hour is applied, but in some systems even up to 120 air changes per hour is applied. To reach this rate, the air is blown into the cage at a relatively high speed. However, at the animal's level most systems ventilate with an air speed of approximately 0.2 m/s. In the present paper, two studies were conducted, one analysing whether an air speed below 0.2 m/s or just above 0.5 m/s affects the rats, and another study analysing whether air changes of 50, 80 and 120 times per hour affect the rats. In both studies, monitoring of preferences as well as physiological

parameters such as heart rate and blood pressure, was used to show the ability of the animals to register the different parameters and to avoid them if possible. Air speeds inside the cage of as high as 0.5 m/s could not be shown to affect the rats, while the number of air changes in each cage should be kept below 80 times per hour to avoid impacts on physiology (heart rate and systolic blood pressure). Also the rats prefer cages with air changes below 80 times per hour if they have the opportunity of choosing, as shown in the preference test.
Descriptors: rats, animal husbandry, ventilation, IVC systems, impact, housing, ventilation methods, air movements, animal welfare, behavior.

Krohn, T.C. and A.K. Hansen (2004). **Reduction in the spread of rodent urinary allergens during cage changing by laminar air flow cabins. Reduction in rodent allergens by LAF cabins**. *Scandinavian Journal of Laboratory Animal Science* 31(3): 149-154. ISSN: 0901-3393.
Descriptors: rodent, urinary allergens, cage changes, laminar air flow, spread, reduction, staff protection.

Krohn, T.C. and A.K. Hansen (2002). **The application of traditional behavioural and physiological methods for monitoring of the welfare impact of different flooring conditions in rodents.** *Scandinavian Journal of Laboratory Animal Science* 29(2): 79-89. ISSN: 0901-3393.
Descriptors: rodents, flooring conditions, welfare, behavior, rats, mice, environmental impacts, grid housing.

Kuhnen, G. (1998). **Reduction of fever by housing in small cages.** *Laboratory Animals* 32(1): 42-45. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Housing conditions influence anatomy, physiology, and behaviour of animals. The aim of this study is to investigate whether the generation of fever, a defence response of the body, is also affected by housing conditions. Golden hamsters (*Mesocricetus auratus*) were housed in small cages, large cages, or large and enriched cages. After 9 weeks of exposure to their respective environments, the fever response to the administration of lipopolysaccharide (50 micrograms/kg from *Salmonella typhosa*) was tested. One hundred and twenty experiments in 30 hamsters demonstrated that housing in small cages diminished the fever responses (increase in core temperature and fever index) significantly by approximately 20%, and is likely to be due to a higher stress level. The findings demonstrate that the results of physiological experiments are not only influenced by the experimental design, but also by pre-experimental housing conditions.
Descriptors: golden hamsters, cages, size, enrichment, fever, lipopolysaccharides, *Salmonella*, stress, body temperature, *Salmonella typhosa*.

Latham, N. and G. Mason (2004). **From house mouse to mouse house: the behavioural biology of free-living *Mus musculus* and its implications in the laboratory**. *Applied Animal Behaviour Science* 86(3-4): 261-289. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Abstract: Understanding a species' behaviour in natural conditions can give insights into its development, responses and welfare in captivity. Here, we review research and pest control literatures on the free-living house mouse (*Mus musculus*), analysing its sensory world, developmental processes and behaviour to suggest how laboratory environments might affect mouse welfare, normalcy, test design, and behaviour. Mouse development from foetus to weaning is influenced by prenatal stress and nutrient levels, and post-natal litter size and other factors affecting maternal care, all with lasting effects on adult bodyweight, aggression, activity levels, stress responsiveness and masculinisation. These influences may well be important in the laboratory, for example unwittingly differing between facilities leading to site-differences in phenotype. Murine senses are dominated by olfactory, auditory and tactile cues. Their hearing extends into the ultrasonic, and vision, from mid-range wavelengths to the ultraviolet. In mouse facilities, behaviour and welfare may therefore also be affected by sensory stimuli unnoticed by humans. The physical and social environment and behaviour of wild mice differ greatly from those of laboratory mice. Dispersal age varies with resource-levels and social cues, and mice often either live alone or in family groups. Mice occupy territories/ranges measuring a few square meters to several square kilometers, and which allow running, climbing, and burrowing. Mice are often active during dawn/dusk, and spend their time patrolling their territories, investigating neighbours' odour cues, foraging, finding mates and rearing litters. The potential impact of these many differences and restrictions on laboratory mouse development, normalcy and welfare has only begun to be explored.

Descriptors: mouse, behavior, natural conditions, welfare, free living, stress, biology, laboratory, captivity.

Levine, S. and A. Saltzman (1999). **Effects of coprophagy on serum urea and the weight of the gastrointestinal tract of fed or fasted rats.** *Laboratory Animals* 33(3): 265-268. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Coprophagy can be minimized by fitting rat cages with metal grids which allow faecal pellets to pass through to the floor of the cage. When bedding was omitted overnight, the extent of coprophagy could be estimated from the weight of the droppings on the cage floor or the weight of the gastrointestinal (GI) tract removed from rats housed with or without grids. The effect of coprophagy was also demonstrated by the elevation of serum urea nitrogen in rats that consumed faeces. Therefore, precautions against coprophagy, or their absence, should be specified in all experimental protocols and reports.
Descriptors: rats, coprophagy, cages, floor type, starvation, body weight, urea, blood composition, digestive tract, weight, feces, collection.

Livingston, R.S., L.K. Riley, C.L. Besch Williford, R.R. Hook Jr., and C.L. Franklin (1998). **Transmission of *Helicobacter hepaticus* infection to sentinel mice by contaminated bedding.** *Laboratory Animal Science* 48(3): 291-2893. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Descriptors: mice, *Helicobacter*, horizontal transmission, litter, sentinel animals, antibody formation, polymerase chain reaction, blood serum, ELISA.

Luketich, J.D., K.E. Michel, P.G. Curcillo II, D.A. Rigberg, M.E. Weiss, I.D. Feurer, and J.L. Mullen (1998). **Automated, eight-cage indirect calorimetry in rats.** *Nutrition (Burbank)* 14(9): 672-7. ISSN: 0899-9007.
Abstract: We have constructed an automated, eight-cage indirect calorimeter (AIC) for the measurement of energy expenditure in rats. We compared the measurements of resting energy expenditure (REE) in rats during a 30-h fast obtained with the AIC with those obtained with a manual indirect calorimetry (MIC) system. There was both a high degree of correlation between the two techniques during the initial 18 h of the fast (r = 0.90, P < 0.05) and strong intertechnique agreement. REE (AIC) decreased during the final 12 h of the 30-h fast (79.6 +/- 2.7-72.0 +/- 4.4 kcal.kg-0.75.d-1 [mean +/- SD, P < 0.01]). REE (MIC) did not show a significant decrease during this part of the fast (79.7 +/- 2.6 - 75.2 +/- 4.7 kcal.kg-0.75.d-1 [P = NS]). During the final 12 h of the fast agreement between the two systems gradually dissipated and correlation was poor (r = 0.375, P < 0.05). The frequency of animal handling necessitated by MIC may have resulted in a stress-induced increase in metabolic work that would mask the animals' adaptive response to starvation. This investigation demonstrates the advantages of the AIC and calls into question the accuracy of manual methods under long-term starvation conditions.
Descriptors: rats, calorimetry, indirect, energy metabolism, eight cage, automated, exertion, fasting physiology.

Manser, C.E., D.M. Broom, P. Overend, and T.H. Morris (1998). **Operant studies to determine the strength of preference in laboratory rats for nest-boxes and nesting materials.** *Laboratory Animals* 32(1): 36-41. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Previous work has shown that laboratory rats preferred to use nest-boxes and nesting materials rather than empty parts of the cage. In preference tests, they chose opaque or semi-opaque nest-boxes and long strips of soft paper nesting material. Choice tests to demonstrate a preference between nest-boxes and nesting material were not possible because nesting materials were carried into the nest-boxes. Furthermore, preference tests did not show how important these items were to the animals. Accordingly, operant tests were conducted, in which the rats had to lift a weighted door in order to gain access to an empty cage, or one containing a nest-box, nesting material or both items. By progressively increasing the weight of the door in subsequent trials, it was shown that the rats would carry out more work to reach a nest-box, with or without nesting material, than to reach an empty cage.
Descriptors: rats, nests, cages, paper, tests, body weight, weight, preference tests.

Masuda, J., D. Mitsushima, and F. Kimura (2004). **Female rats living in small cages respond to restraint stress with both adrenocortical corticosterone release and acetylcholine release in the hippocampus**. *NeuroScience*

Letters 358(3): 169-172. ISSN: 0304-3940.
Descriptors: rats, female, stress, restraint, response, adrenocortical corticosterone, acetylcholine, hippocampus, small cages.

Matthews, D.A., N.A. Parkins, M. Underwood, and R.M. Santer (1997). **Establishing and maintaining a colony of aged male Wistar rats**. *Animal Technology* 48(2): 75-82. ISSN: 0264-4754.
NAL Call Number: QL55.I5
Descriptors: laboratory animals, rats, breeding methods, health, husbandry, maintaining, colony, aged, Wistar rats.

McGlone, J.J., D.L. Anderson, and R.L. Norman (2001). **Floor space needs for laboratory mice: BALB/cJ males or females in solid-bottom cages with bedding.** *Contemporary Topics in Laboratory Animal Science* 40(3): 21-5. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Abstract: Studies were initiated to determine the effects of restricted (32.2 cm2 per mouse), normal (96.8 cm2), or excess floor space (129.0 cm2) allowances by using a model of three mice per cage. BALB/cJ mice were bred on-site and weaned at 3 weeks of age into specially designed polycarbonate shoebox cages modified to each space allowance. Cages contained aspen shavings for bedding, and mice were fed and watered ad libitum. Body weight gains, feed and water use, and immunologic measures largely were not effected by floor space allowances. Female BALB/cJ mice were heavier and had increased lymphocyte blastogenesis to phytohemagglutinin (20 microg/mL) when given 32.2 cm2/mouse than when given 129 cm2/mouse. Female mice showed an increase in grooming and sitting behaviors when given 32.2 cm2/mouse, but male mice with restricted floor space spent more time lying down but showed no change in grooming or sitting behaviors compared to mice given more space. Among male mice, limited floor space did not significantly influence growth rates, but male mice given 32.2 cm2/mouse had less mortality than did mice given more space. We conclude that floor spaces as limited as 32.2 cm2/mouse did not cause behavior, health, immune or performance problems for BALB/cJ mice.
Descriptors: mice, male, female, floor space, bedding, solid bottom cages, space, restricted, normal, excess, effects.

Memarzadeh, F., P.C. Harrison, G.L. Riskowski, and T. Henze (2004). **Comparison of environment and mice in static and mechanically ventilated isolator cages with different air velocities and ventilation designs.** *Contemporary Topics in Laboratory Animal Science* 43(1): 7, 14-20. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Abstract: The purpose of this study was to compare environmental conditions and mice in cages with four different mechanical ventilation designs and a static isolator cage. Environmental conditions (air velocity, temperature, relative humidity, bedding weight change, airborne dust, NH3, and CO2) were compared for each cage type (n = 5 per cage). Bedding type was chipped hardwood. Mouse response in each cage type was evaluated by body weight, feed consumption, water intake, location of specific behaviors, and building of bedding mounds. Commercial polycarbonate mouse caging units (29.2 x 19.1 x 12.7 cm shoebox style, stainless-steel round wire bar lids, and 7-cm-deep isolator cage filter tops) were modified to fit the mechanical ventilation cage types and were used for the static isolator cages. Mechanically ventilated cages were fitted with forced air inlets centered 5 cm above the cage floor on the 19.1 cm-side of the cage. Inlet air velocity was either 40 or 200 feet/min (n = 10 cages each), and the air volume exchange rate was 9.3 L/min. In half of the mechanically ventilated cages, the exhaust air was forced through a filter in the isolator cage top, whereas in the remaining mechanically ventilated cages, the air was forced through a single exhaust port fixed in the narrow side of the cage top directly above the air inlet. Inlet air velocity but not exhaust design affected intracage air velocity distribution. Other environmental conditions were similar between the four mechanical ventilation designs. Relative to the mechanically ventilated cages, the static isolator cages had lower air velocities, higher relative humidities, higher NH3 levels, higher CO2 levels, lower body weight gain, and lower water consumption; temperatures, particulate levels, and feed consumption rates did not differ significantly between cage types. Locations of bedding mounds and behaviors were similar in all cage treatments.
Descriptors: mice, animal husbandry, caging, ventilation, static, mechanical, laboratory housing, eating, nesting behavior, temperature.

Notes: Comment.

Metzger, M.E. and M.K. Rust (2001). **Laboratory techniques for rearing the fleas (Siphonaptera: Ceratophyllidae and Pulicidae) of California ground squirrels (Rodentia: Sciuridae) using a novel nest box.** *Journal of Medical Entomology* 38(3): 465-70. ISSN: 0022-2585.

Abstract: Three species of fleas, *Oropsylla montana* (Baker), *Hoplopsyllus anomalus* (Baker), and *Echidnophaga gallinacea* (Westwood), occur seasonally on the California ground squirrel, *Spermophilus beecheyi* (Richardson). Few studies have focused on the biology and ecology of these fleas despite their importance in the epidemiology of sylvatic plague. To best duplicate a natural parasite-host relationship in the laboratory, a novel nest box was developed that facilitated housing wild-caught *S. beecheyi*, was conducive to rearing fleas, and met modern standards for laboratory animal hygiene. This flexible system allowed adult fleas with different feeding strategies to be colonized successfully while providing sufficient flea eggs for both colony maintenance and biological research. The techniques described could be adapted to work with other species of rodents and their fleas.

Descriptors: ground squirrels, fleas growth and development, techniques for rearing, nest box, biology, ecology feeding strategies.

Moragrega, I., M.C. Carrasco, P. Vicens, and R. Redolat (2003). **Spatial learning in male mice with different levels of aggressiveness: effects of housing conditions and nicotine administration**. *Behavioural Brain Research* 147(1-2): 1-8. ISSN: 0166-4328.

Abstract: The main aim of the present investigation was to evaluate the possible modulation of spatial learning ability by housing conditions and level of aggressiveness in mice, also testing whether differences in locomotion and anxiety could influence this relationship. Additionally, we have examined effects of nicotine in the acquisition and retention of a spatial learning task in groups of mice differing in these variables. NMRI male mice were either group-housed or individually housed for 30 days and then classified into mice with short (SAL) and long (LAL) attack latency after a pre-screening agonistic encounter. Locomotor activity and baseline levels of anxiety of these groups were evaluated in the actimeter and elevated plus-maze. Results indicated that SAL and LAL individually housed mice displayed higher locomotion activity than LAL group-housed mice. In the plus-maze test, SAL and LAL individually housed mice showed more total and open arm entries than group-housed LAL mice, confirming the hyperactivity of individually housed mice and suggesting that isolation had no clear anxiolytic or anxiogenic actions. In the water-maze, we compared the performance of individually housed SAL, individually housed LAL mice, and group-housed LAL mice treated with nicotine (0.35 and 0.175mg/kg) or vehicle. Nicotine did not improve acquisition in group-housed mice and even impaired it in individually housed mice. Retention of platform position was better in vehicle-treated individually housed mice in comparison with vehicle-treated group-housed mice. The present study demonstrates that housing conditions but not level of aggressiveness modify spontaneous locomotor activity and behaviors displayed on the elevated plus-maze test, and can also influence retention of a spatial learning task.

Descriptors: mice, spatial learning, housing conditions, aggressiveness, anxiety, nicotine, effect.

Morrell, J.M. (1999). **Techniques of embryo transfer and facility decontamination used to improve the health and welfare of transgenic mice.** *Laboratory Animals* 33(3): 201-206. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: 'Reduction' and Refinement' can be achieved in transgenic mouse studies by re-deriving transgenic mouse lines and subsequently maintaining them under high standards of husbandry in a unit with restricted access. This report describes the initial steps of a project to improve the health and welfare of transgenic mice at the European Molecular Biology Laboratory (EMBL), by re-deriving transgenic lines as microbiologically defined animals to be maintained in a barrier unit in a newly constructed animal facility. A pilot study showed that it was possible to transfer embryos obtained from contaminated donor mice in the old facility to specific pathogen free recipients housed in a ventilated cabinet in the new unit, without concomitant carry over of disease. The offspring born following embryo transfer were of high health status and did not show any evidence of contamination with any of the pathogens present in the mice in the old animal unit. Antibodies to various murine viruses (mouse hepatitis virus (MHV), rota virus, reo-3 virus, Theilers encephalomyelitis virus, adenovirus) and parasites were present in sentinel animals from the old animal house whereas the re-derived animals were found to be free of virus antibodies and parasites. Therefore the methods used were considered to

be successful in terms of disease prevention and enhancement of welfare. The barrier unit was sterilized without the use of formaldehyde or related substances, to minimize the risks to personnel and to the environment from using potentially dangerous substances. From the results of in vitro and in vivo screening, the protocol for sterilization described here was found to be effective in achieving. microbiological sterility of the barrier unit and was cost effective.

Descriptors: mice, transgenic animals, barrier husbandry, embryo transfer, livestock numbers, animal experiments, sterilants, nematicides, benzalkonium chloride, microbial contamination.

Morrison, J.C., W.O. Cepurna, E.C. Johnson, V. Ackhavong, and L. Jia (2000). **Loss of optic nerve axons in aged rats following chronic intraocular pressure (IOP) elevation due to constant light housing**. *IOVS* 41(4): S896.

Descriptors: rats, optic nerve axons, intraocular pressure, elevation, constant light, meeting abstract.

Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 30-May 05, 2000, Fort Lauderdale, Florida, USA.

Myers, D.D., E. Smith, I. Schweitzer, J.D. Stockwell, B.J. Paigen, R. Bates, J. Palmer, and A.L. Smith (2003). **Assessing the risk of transmission of three infectious agents among mice housed in a negatively pressurized caging system.** *Contemporary Topics in Laboratory Animal Science* 42(6): 16-21. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Abstract: Previous studies from our institution have shown that ventilated caging run at negative pressure to a mouse room dramatically reduced exposure of personnel to the major mouse allergen, Mus m 1. The current study was designed to determine whether negative cage ventilation posed an inordinate risk for spread of infectious agents between cages and/or racks. B6;129S-Tnfsf5(tm1Imx)/J (TNF) mice, which were naturally and persistently infected with *Pneumocystis carinii*, *Helicobacter bilis*, and *Pasteurella pneumotropica*, were used as the source of infections. Uninfected C3Smn.CB17-Prkdc(scid)/J (SCID) mice with severe combined immunodeficiency were used to detect transmission. The following methods were used to detect transmission of infections: polymerase chain reaction (PCR) amplification and histological examination of lungs for *P. carinii*; PCR of fecal specimens or cecal contents for *H. bilis*; and culture of oropharyngeal, tracheal, or vaginal swabs for *P. pneumotropica*. We determined whether transmission of the three agents occurred via direct contact (cohabitation), exposure to soiled bedding, and/or by handling naive SCID mice after handling infected TNF mice. During a 12-week period, all three infectious agents were readily transmitted to uninfected mice by cohabitation. Transmission was much less efficient and occurred later among mice exposed to contaminated bedding. Transmission did not occur as a result of handling. We then studied transmission of the three infectious agents among mice housed in individually ventilated cages run at negative pressure in a small, crowded mouse room. Transmission of *P. carinii* was detected at the end of the 12-month study in the densely populated room, probably because the exhaust from the changing station passed over soiled cages and caused aerosolization of particulates. Caging systems run at negative pressure effectively reduce personnel exposure to allergens and may also inhibit the transmission of infectious diseases.

Descriptors: mice, housing, infection, transmission, negative pressure, risk, control, exposure, ventilation.

Nagy, T.R., D. Krzywanski, J. Li, S. Meleth, and R. Desmond (2002). **Effect of group vs. single housing on phenotypic variance in C57BL/6J mice.** *Obesity Research* 10(5): 412-415. ISSN: 1071-7323.

NAL Call Number: RC628.O294

Descriptors: body composition, phenotypic variation, phenotypes, genotypes, environmental factors, animal housing, body fat, body lean mass, inbred mice strains, group housing.

Novak, G. (1997). **Individually ventilated microisolation cages.** *Lab Animal* 26(8): 54-57. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Descriptors: cages, ventilation, air flow, transgenic animals, mice.

Olsson, I.A.S., C.M. Nevison, E.G. Patterson Kane, C.M. Sherwin, H.A. Van de Weerd, and H. Wurbel (2003). **Understanding behaviour: the relevance of ethological approaches in laboratory animal science.** *Applied Animal Behaviour Science* 81(3): 245-264. ISSN: 0168-1591.

NAL Call Number: QL750.A6

Descriptors: mice, rats, laboratory animals, animal behavior, strain differences, animal housing, cages, environmental enrichment, smell, vision, hearing, taste, touch, validity.

Olsson, I.A.S., S. Olsson, and K. Dahlborn (2002). **Improving housing conditions for laboratory mice: a review of 'environmental enrichment'.** *Laboratory Animals* 36(3): 243-270. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Laboratory animal facilities have been designed to provide a standard environment where animals can be kept in good physical health at the same time as economic and ergonomic considerations are met. Recognizing the potential welfare problem associated with behavioural restriction in such housing systems, a number of attempts have been made to improve this environment, generally described under the term 'environmental enrichment'. Modifications of cages for mice usually consist of providing material for nest building and structures which can serve as hiding places and/or for climbing. We have reviewed 40 studies carried out between 1987 and 2000, in which preferences as well as the effect of housing modifications have been studied. Mice will work for access to nesting material and make use of this material to make nests in which they rest. They prefer a more complex cage to the standard cage and will also work for access to cages with shelter and raised platforms. On the basis of present knowledge, it is recommended that mice should have access to nesting material. Strategies for future research are outlined in the article.
Descriptors: mice, laboratory mammals, enrichment, animal welfare, nesting, stress, cages, design, litter, animal behavior, male animals, aggressive behavior, territoriality, strain differences, literature reviews, animal stress, animal use refinement.

Otto, G. and R.J. Tolwani (2002). **Use of microisolator caging in a risk-based mouse import and quarantine program: a retrospective study.** *Contemporary Topics in Laboratory Animal Science* 41(1): 20-27. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory mammals, quarantine, sentinel animals, mutants, cages, inbred strains, animal health, risk assessment, murine hepatitis virus, murine encephalomyelitis virus, *Pasteurella*, mites, syphacia, cost control.

Ouagazzal, A.M., J.L. Moreau, M. Pauly Evers, and F. Jenck (2003). **Impact of environmental housing conditions on the emotional responses of mice deficient for nociceptin/orphanin FQ peptide precursor gene.** *Behavioural Brain Research* 144(1-2): 111-7. ISSN: 0166-4328.
Abstract: Nociceptin/orphanin FQ (N/OFQ) is a newly discovered neuropeptide that has been implicated in the neurobiological regulation of the behavioral responses to stress and fear. To investigate the role of this peptide in the expression of stress/anxiety-related behaviors in mice, a gene targeting approach to disrupt N/OFQ in the pre-proN/OFQ gene was used. The impact of environmental housing conditions (single and social housing) was assessed on N/OFQ-knockout male and female mice in different experimental paradigms known to trigger distinctive types of stress and anxiety states. Neurological examination of homozygous mutant adult animals indicated that basic neurological functions (vision, audition, olfaction, tactile and pain sensitivity, motor performances) were normal. When housed individually, N/OFQ-knockout animals displayed responses similar to control animals in behavioral tests of emotional reactivity (behavioral despair, locomotor activity, light-dark preference, and acoustic startle tests). In contrast, increased emotional responses were detected when individually housed mice were crowded together (five per cage) under conditions of competitive access to food, water, space, and social contacts. Under those conditions, male mice deficient for N/OFQ developed greater home-cage aggression and increased fear/anxiety-like behaviors in the light-dark and acoustic startle tests, when compared to their wild-type littermates. Group-housed female mutants also showed higher level of anxiety in the acoustic startle test, but needed additional restrain stress to express detectable levels of anxiety in the light-dark test. These data indicate a clear environment-induced rise in fear reactions of N/OFQ-knockout mice. They further suggest that N/OFQ system is essential for development of adequate coping strategies to acute and chronic stress.
Descriptors: mice, environment, housing, conditions, impact, emotional responses, behavior, nociception orphanin, physiology, rats.

Pachowsky, U. (1999). ***Der Einfluss der Haltungsstandardisierung auf physiologische Merkmale bei Mausen. [The***

influence of the standardization of housing on physiological variants of mice]. Dissertation, Tierarztliche Hochschule Hannover: Hannover. 103 p.
NAL Call Number: DISS F1999303
Descriptors: housing, mice, varients, standardization, influence, physiology.
Language of Text: German.
Notes: Thesis (doctoral).

Patterson Kane, E.G. (2002). **Cage size preference in rats in the laboratory.** *Journal of Applied Animal Welfare Science* 5(1): 63-72. ISSN: 1088-8705.
NAL Call Number: HV4701.J68
Descriptors: rats, laboratory animals, cage size, animal behavior, group size, animal welfare, animal preferences, group housing.

Peace, T.A., A.W. Singer, N.A. Niemuth, and M.E. Shaw (2001). **Effects of caging type and animal source on the development of foot lesions in Sprague Dawley rats (*Rattus norvegicus*).** *Contemporary Topics in Laboratory Animal Science* 40(5): 17-21. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory mammals, cages, floor type, feet, lesions, wire netting, floors, body weight, sex differences, strain differences, age differences, ulcers, edema, nontarget effects, animal welfare, solid floors.

Perez, C., J.R. Canal, E. Dominguez, J.E. Campillo, M. Guillen, and M.D. Torres (1997). **Individual housing influences certain biochemical parameters in the rat.** *Laboratory Animals* 31(4): 357-361. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Individual housing has been reported to modify animal behaviour. The present study compares the plasma levels of glucose, triglycerides and total cholesterol, weight, and food and water intake in two groups of female rats. Group A: 10 rats who remained grouped in two cages for 21 days; and Group B: 10 rats housed in two cages for 7 days, then isolated in individual cages from day 8 to day 15, and finally grouped together again for the last 7 days of the study. The results showed that the plasma values of glucose declined (P<0.05) in the Group B rats when they had been returned to group condition (4.79 +/- 0.72 mM) than when they had been isolated (5.45 +/- 0.94 mM). Plasma triglyceride levels were lower (P<0.05) in isolated rats (0.70 +/- 0.26 mM) than in any determination of the grouped rats. Group B: 1st week 1.21 +/- 0.21 mM, 3rd week 0.88 +/- 0.20 mM; and Group A: 1.22 +/- 0.20, 0.96 +/- 0.16, and 0.96 +/- 0.36 mM, in the first, second, and third week, respectively. There were no statistically significant differences in total cholesterol values as a function of the individual housing of animals. While there was no weight difference between the two groups of rats that could be ascribed to individual housing, there was a statistically significant increase (P<0.05) in the food intake of isolated rats 117.5 +/- 3.2 g) with respect to values in the same Group B animals when they were housed together (1st week, 16.6 +/- 2.8 g; 3rd week, 16.8 +/- 3.1 g). These results therefore confirm that individual housing of female rats provoke variations in certain biochemical parameters, and that if this is not taken into account in performing different scientific studies, it could give rise to unreliable or even. dubious results.
Descriptors: rats, animal housing, animal behavior, blood plasma, blood sugar, blood lipids, triacylglycerols, feed intake, water intake.

Pham, T.M. and V. Baumans (2004). **Impact of group housing on post-operative recovery in mice.** *Animal Welfare* 13, Supplement: S253. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: mice, group housing, impact, post operative recovery, impact, animal welfare, behavior, cage enrichment.
Notes: Meeting Information: Universities Federation for Animal Welfare (UFAW) Symposium on Science in the Service of Animal Welfare, Animal Welfare, Edinburgh, UK, April 02-04, 2003.

Raje, S.S. and K.L. Stewart (2000). **Group housing female guinea pigs.** *Lab Animal* 29(8): 31-32. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: guinea pigs, female animals, group size, group housing, cages, space requirements, enrichment, behavior, husbandry, animal welfare.

Rao, G.N. and P.W. Crockett (2003). **Effect of diet and housing on growth, body weight, survival and tumor incidences of B6C3F1 mice in chronic studies.** *Toxicologic Pathology* 31(2): 243-50. ISSN: 0192-6233.

Abstract: Diet is one of the most important environmental factors influencing growth, body weight, survival, and age-related diseases of rodents in chronic studies. NIH-07 open formula diet was the selected diet for the NTP studies from 1980 to 1994. A new diet designated as NTP-2000 diet is the current diet for mice in the NTP studies beginning in 1994. This report is a summary of results of untreated control groups of B6C3F1 mice fed NTP-2000 or NIH-07 diet from several retrospective 2-year dosed-feed and inhalation studies for differences in growth, body weight, survival, and tumor incidences. The dosed-feed studies were conducted in 3 different facilities located in the United States, and all the inhalation studies were conducted in 1 facility. During dosed-feed studies, male and female mice housed in polycarbonate cages and fed the NTP-2000 diet had lower maximum body weights than those fed NIH-07 diet. However, during inhalation studies, mice housed in wire mesh cages and fed the NTP-2000 diet had higher maximum body weights than the mice fed NIH-07 diet. Survival was higher in groups fed NTP-2000 diet irrespective of sex, housing conditions, or body weight compared to the corresponding groups fed NIH-07 diet. Survival was higher in mice housed in polycarbonate cages irrespective of diet and sex compared to the respective sex and diet groups housed in wire mesh cages. During inhalation studies, survival of male and female mice fed NTP-2000 diet was higher than that of the groups fed NIH-07 diet, although the body weights of NTP-2000 diet groups were higher than those of the groups fed NIH-07 diet. When the NTP-2000 diet was used, male and female mice in dosed-feed studies and male mice in inhalation studies had markedly lower incidences of liver tumors than the corresponding groups fed NIH-07 diet. Significant decreases in the incidences of lung tumors were observed only in the male groups fed NTP-2000 diet during dosed-feed studies. These results suggest that body weight may not be the major contributing factor for mortality and liver tumors and that an interaction between diet and housing conditions appears to affect the growth, survival and tumor incidences of B6C3F1 mice.

Descriptors: animal feed, body weight physiology, diet, animal housing, neoplasms mortality, toxicity tests, chronic methods, carcinogenicity tests, food, formulated, mice, inbred mice strains, specific pathogen free organisms, survival rate.

Ras, T., M. Van de Ven, E.G. Patterson Kane, and K. Nelson (2002). **Rats' preferences for corn versus wood-based bedding and nesting materials.** *Laboratory Animals* 36(4): 420-5. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Corn by-products can be used as bedding and nesting products. Corn-cob bedding resists ammonia build-up and corn-husk nesting material resists dampness. It is not clear whether these advantages are at the expense of animal comfort. Corn cob was compared to aspen chip bedding, and corn husk to paper strip nesting material. Data from 20 rats with differential early bedding experience suggested that they prefer aspen chip, but are also biased towards the bedding they were raised on. Data from 10 rats with no prior nesting material experience suggested that paper strip was preferred over cornhusk. Thus, corn-cob products are not recommended except in situations where air quality and/or flooding are significant problems.

Descriptors: rats, nesting materials, corn, wood, preferences, husbandry, bedding, behavior.

Renstrom, A., G. Bjoring, and A.U. Hoglund (2001). **Evaluation of individually ventilated cage systems for laboratory rodents: occupational health aspects.** *Laboratory Animals* 35(1): 42-50. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: New ventilated caging systems for laboratory animals were compared with conventional caging regarding allergen distribution, ergonomic suitability, cage environment and animal welfare. This paper presents occupational health evaluations. Mice were placed in individually ventilated cage (IVC) systems, a ventilated cabinet, and in cages on open shelves (conventional husbandry). The IVC systems were studied at negative and positive airflow. Aeroallergens were sampled on filters (n=204, including controls) in undisturbed rooms and during cage changing. Concentrations of mouse urinary allergen (Mus m 1) in filter eluates were measured using sandwich ELISA. An ergonomic evaluation was performed with measurement of traction forces. Staff exposure during cage changing was high in all systems, range 116-4430 ng Mus m 1/m(3). In undisturbed animal rooms, allergen levels were orders of magnitude higher when using conventional caging compared with ventilated systems; $P < 0.001$. At positive pressure, both IVCs leaked allergen (median Mus m 1 concentration was < 0.08 ng/m(3) at negative, but 6.5 ng/m(3) (IVC 1) and 0.8 ng/m(3) (IVC2S) at positive pressure). The IVC systems had ergonomic disadvantages compared with the conventional husbandry and the ventilated

cabinet, for instance with cages in unsuitable working heights. Ventilated husbandry solutions reduce levels of airborne allergen substantially at negative pressure, but are ergonomically less suitable. To prevent allergen exposure during cage changing, we propose that this procedure should be performed under ventilated conditions. Producers and users must cooperate in optimizing animal caging systems for both animals and. staff.
Descriptors: mice, rodents, cages, design, artificial ventilation, husbandry, allergens, occupational hazards, ventilated cage system, welfare, safety at work, ergonomics.

Robinson, I., T. Dowdall, and T.F. Meert (2004). **Development of neuropathic pain is affected by bedding texture in two models of peripheral nerve injury in rats**. *NeuroScience Letters* 368(1): 107-111. ISSN: 0304-3940.
Descriptors: rats, neuropathic pain, nerve injury, models, bedding texture, chemical hypersensitivity, mechanical hyperalgesia.

Rock, F.M., M.S. Landi, H.C. Hughes, and R.C. Gagnon (1997). **Effects of caging type and group size on selected physiologic variables in rats**. *Contemporary Topics in Laboratory Animal Science* 36(2): 69-72. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, cages, group size, effects, housing, behavior, physiological variables, motor activity.

Royals, M.A., D.M. Getzy, and S. Vandewoude (1999). **High fungal spore load in corncob bedding associated with fungal-induced rhinitis in two rats.** *Contemporary Topics in Laboratory Animal Science* 38(1): 64-66. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, rhinitis, maize cobs, litter, autoclaving, fungal spores, *Aspergillus*, *Cladosporium*, *Acremonium*, *Penicillium*, *Fusarium*, *Basidiomycotina*, case reports.

Sanford, A.N., S.E. Clark, G. Talham, M.G. Sidelsky, and S.E. Coffin (2002). **Influence of bedding type on mucosal immune responses.** *Comparative Medicine* 52(5): 429-432. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: The mucosal immune system interacts with the external environment. In the study reported here, we found that bedding materials can influence the intestinal immune responses of mice. We observed that mice housed on wood, compared with cotton bedding, had increased numbers of Peyer's patches (PP) visible under a dissecting microscope. In addition, culture of lymphoid organs revealed increased production of total and virus-specific IgA by PP and mesenteric lymph node (MLN) lymphocytes from mice housed on wood, compared with cotton bedding. However, bedding type did not influence serum virus-specific antibody responses. These observations indicate that bedding type influences the intestinal immune system and suggest that this issue should be considered by mucosal immunologists and personnel at animal care facilities.
Descriptors: mice, wood chips, cotton, immune response, Peyer's patches, Rotavirus, lymph nodes, small intestine, immunoglobulin A, immunoglobulin G, lamina propria.

Schridde, U. and G. Van Luijtelaar (2005). **The role of the environment on the development of spike-wave discharges in two strains of rats.** *Physiology and Behavior* 84(3): 379-386. ISSN: 0031-9384.
Abstract: Recently, we demonstrated that Type 1 and 2 spike-wave discharges (SWD) in the EEG of juvenile WAG/Rij rats were affected differently by housing before the period at which SWD start to occur. Here we consider possible sensitive periods by analyzing strain and housing influences before and after age of SWD onset. The effects of environment in WAG/Rij and ACI rats were investigated by manipulating housing during the period in which SWD become fully manifested in WAG/Rij rats. Rats were first housed from weaning in either an impoverished or enriched environment. Housing changed for half of the rats at three months, while for the other half housing stayed the same. EEG recordings at six months showed that enriched housing led to a worsening of seizure activity. The occurrence, number and mean duration of both types of discharges were influenced differently by strain, housing and age. Our data strengthen the strong genetic dependence of Type 1 SWD, but the mean duration seems to remain sensitive to housing during development. Type 2 SWD are more sensitive to environmental influences, especially in WAG/Rij rats. Moreover, the period after three months seems a sensitive period for housing effects on Type 2 SWD in this strain. Finally, our data further support the idea that Type 1 and 2 SWD are different phenomena, with their number and mean duration controlled by

distinct mechanisms.
Descriptors: environment, spike waves, role, development, rats, strains, housing, influences.

Schridde, U. and G. Van Luijtelaar (2004). **The influence of strain and housing on two types of spike-wave discharges in rats.** *Genes Brain and Behavior* 3(1): 1-7. ISSN: 1601-1848.
Descriptors: rats, strain, housing, influence, spikewave discharges, epilepsy, convulsive seizures, enriched environment, housing influence.

Schwarting, R.K.W. and C.R. Pawlak (2003). **Individual differences of pre-weaning ultrasound vocalization and effects of transient post-weaning housing in isolation on plus-maze and open field behavior in adult Wistar rats.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 837.5.
Online: http://sfn.scholarone.com
Descriptors: rats, weaning housing, isolation, open field, behavior, individual differences, ultrasound vocalization.
Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Sherwin, C.M. (2004). **The influences of standard laboratory cages on rodents and the validity of research data.** *Animal Welfare* 13(Supplement): S9-15. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rodents, cage influence, husbandry, welfare, cages, stress, research data.

Sherwin, C.M. (1996). **Preferences of individually housed TO strain laboratory mice for loose substrate or tubes for sleeping**. *Lab Animal* 30(3): 245-251. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: laboratory animals, behavior, animal welfare, TO mice, sleeping, tubes, animal housing, loose substrate, preferences.

Sherwin, C.M. (2004). **The motivation of group-housed laboratory mice, *Mus musculus*, for additional space**. *Animal Behaviour* 67(4): 711-717. ISSN: 0003-3472.
NAL Call Number: 410 B77
Abstract: The limited amount of space that we provide for research animals can adversely influence the validity of behavioural data and animal welfare. Consumer demand studies have examined the strength of motivation that animals have for additional space; however, one problem of these studies is that the animals tested were generally of a gregarious species, but were tested in isolation. I trained a single mouse from each of six groups to perform an operant task to gain access to an additional 319, 777, or 1600cm super(2) while group-housed. As the cost of visits increased, the mice continued to gain access to the additional space, although the numbers of visits and the time in the additional space decreased. The slopes of the demand functions for the three amounts of additional space ranged between 0.64 and 0.44, indicating that the mice perceived additional space to be an important resource. The slopes of the demand functions, the areas under the demand functions and the Y-axis intercepts were not significantly different between the three sizes of additional space, thus corroborating previous similar work. These results indicate that group-housed laboratory mice in standard laboratory cages were highly motivated for additional space, but did not discriminate between the amounts offered.
Descriptors: mice, motivation, additional space, behavior, isolation, welfare, animal care, cage, space, group housing, single housing.

Sherwin, C.M. and E.F. Glen (2003). **Cage colour preferences and effects of home cage colour on anxiety in laboratory mice.** *Animal Behaviour* 66(6): 1085-1092. ISSN: 0003-3472.
NAL Call Number: 410 B77
Descriptors: mice, behavior, cage color, effects, preferences, anxiety, sensory reception, color vision, home cage.

Sherwin, C.M. and I.A.S. Olsson (2004). **Housing conditions affect self-administration of anxiolytic by laboratory mice**. *Animal Welfare* 13(1): 33-38. ISSN: 0962-7286.

NAL Call Number: HV4701.A557

Abstract: Tests of emotionality conducted outside the home-cage show that rodents from standard laboratory housing are more anxious than animals from enriched housing; however, it is not known if this also indicates increased anxiety within the home-cage. We used a novel method, recording the self-administration of a psychoactive anxiolytic, to examine home-cage anxiety levels of laboratory mice (three per cage) in Standard (n = 10 cages), Unpredictable (n = 10 cages) and Enriched (n = 6 cages) housing. The mice were given a choice of drinking either non-drugged water or a solution of the benzodiazepine Midazolam. There was a significant effect of housing on the proportion of total fluid consumed from the bottle containing Midazolam solution (P = 0.02). Mice from Standard and Unpredictable cages drank a greater proportion than mice from Enriched cages. This indicates that mice from the Standard and Unpredictable laboratory caging may have been experiencing greater anxiety than mice from the Enriched cages. There was also a significant effect of bottle position (P = 0.002). Mice from the Standard and Unpredictable cages drank a greater proportion of total fluid from the bottle containing Midazolam solution when this was toward the rear of the cage rack, ie in a location that was less susceptible to extraneous disturbance. Monitoring self-administration of psychoactive drugs as a method of welfare assessment could be applied to a wide variety of housing conditions, husbandry practices, or experimental procedures that putatively induce negative mental states. The major finding is that standard cages for laboratory rodents may induce greater anxiety than enriched cages. This is discussed in terms of animal welfare and the validity of data from animals housed in minimalistic environments.

Descriptors: mice, housing conditions, self administration, behavior, anxiety, anxiolytic, Midazolam, enrichment, welfare, midazolam, husbandry practices.

Silva, R.C., N.R. Santos, and M.L. Brandao (2003). **Influence of housing conditions on the effects of serotonergic drugs on feeding behavior in non-deprived rats.** *Neuropsychobiology* 47(2): 98-101. ISSN: 0302-282X.

Descriptors: rats, non deprived, housing conditions, serotonergic drugs, effects, feeding behavior, serotonin.

Skalicky, M., E. Narath, and A. Viidik (2001). **Housing conditions influence the survival and body composition of ageing rats.** *Experimental Gerontology* 36(1): 159-70. ISSN: 0531-5565.

Abstract: Ad libitum fed male Sprague-Dawley rats were randomly assigned to be housed individually (n=32) or four in each cage (n=32) from five to 23 months of age. Body weight and body composition by bioimpedance analysis were monitored longitudinally. An equation for analysis of body composition was developed. Deaths and causes of death were recorded. Of the individually housed animals (H1) 16 percent died, while 44 percent of those housed four in a cage (H4) died, the most common causes of death being circulatory failure, nephritis and tumours of the hypophysis.Body weight increased in both groups over time, significantly more for H4 from 6months of age. Both fat free mass and total body fat increased in both groups over time. Fat in percent of body weight increased up to an age of 14months. H4 animals had significantly more fat from 11 to 20 months of age but lost weight, mostly fat when approaching 23months of age. The occiput-sacrum length of the animals increased up to 11months of age and stayed then constant. Animals in both groups grew also in the cross-sectional dimension. The H1 animals continued to grow all the time, while the growth of the H4 animals stopped at the age of 17 months, when the mortality started to become pronounced.It is concluded that housing conditions can modulate the outcome of the ageing of sedentary and otherwise not treated rats in long-term experiments. Further, the feasibility of monitoring body composition longitudinally with bioimpedance analysis was demonstrated.

Descriptors: rats, aging physiology, body composition, housing conditions, survival, longevity.

Smith, A.L., S.L. Mabus, J.D. Stockwell, and C. Muir (2004). **Effects of housing density and cage floor space on C57BL/6J mice.** *Comparative Medicine* 54(6): 656-663. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: *The Guide for the Care and Use of Laboratory Animals* (The Guide) is widely accepted as the housing standard by most Institutional Animal Care and Use Committees. The recommendations are based on best professional judgment rather than experimental data. Current efforts are directed toward replacing these guidelines with data-driven, species-appropriate standards. Our studies were undertaken to determine the optimum housing density for C57BL/6J mice, the most commonly used inbred mouse strain. Four-week-old mice were housed for 8 weeks at four densities (the recommended approximately 12 in2 [ca. 77.4 cm2]/mouse down to 5.6 in2 [ca. 36.1 cm2]/mouse) in three cage types with various amounts of floor space. Housing density

did not affect a variety of physiologic parameters but did affect certain micro-environmental parameters, although these remained within accepted ranges. A second study was undertaken housing C57BL/6J mice with as little as 3.2 in2/mouse (ca. 20.6 cm2). The major effect was elevated ammonia concentrations that exceeded limits acceptable in the workplace at increased housing densities; however, the nasal passages and eyeballs of the mice remained microscopically normal. On the basis of these results, we conclude that C57BL/6J mice as large as 29 g may be housed with 5.6 in2 of floor space per mouse. This area is approximately half the floor space recommended in the Guide. The role of the Guide is to ensure that laboratory animals are well treated and housed in a species-appropriate manner. Our data suggest that current policies could be altered in order to provide the optimal habitation conditions matched to this species' social needs.

Descriptors: housing, density, cage floor space, mice, effects, *The Guide for the Care and Use of Laboratory Animals*, C57BL 6J mice, studies.

Smith, D., J. Pedro Botet, I. Cantuti Castelvetri, B. Shukitt Hale, E.J. Schaefer, J. Joseph, and J.M. Ordovas (2001). **Influence of photoperiod, laboratory caging and aging on plasma lipid response to an atherogenic diet among F1B hamsters.** *International Journal of Neuroscience* 106(3-4): 185-94. ISSN: 0020-7454.

Abstract: The effects and interactions of photoperiod, animal caging, aging and diet on plasma lipid levels in male F1B hamsters were examined in the current study. Sixteen young and sixteen old animals were housed one or four per cage. Eight young animals from each housing group were placed in an animal room with either 12/12 h (PT-12) or 10/14 h (PT-10) light/dark cycle while the sixteen old animals were maintained under a PT-12 light cycle. Plasma cholesterol and triglyceride concentrations were determined in all animals after a 2-week period of acclimation on chow diet and following 4-week intervention on atherogenic diet. Baseline total cholesterol (TC) levels were 131+/-25 mg/dl and 142+/-39 mg/dl for young and old animals, respectively, while baseline triglyceride (Tg) levels were 202+/-48 mg/dl and 160+/-37 mg/dl respectively for the same animals. Following 4-weeks on an atherogenic diet, single-caged PT 12 animals had elevated but significantly lower TC levels than group-caged animals (161+/-30 mg/dl and 240 +/-58 mg/dl, respectively) while single and group housed PT10 animals had TC levels of 296+/-75 mg/dl and 351+/-124 mg/dl, respectively. Similarly, plasma Tg levels rose to 330+/-100 mg/dl and 486+/-200 mg/dl in single and group housed PT12 animals (respectively) and to 668+/-270 mg/dl and 545+/-199 mg/dl in single and group housed PT10 animals (respectively). No significant changes related to atherogenic diet were observed in plasma TC or Tg levels in the older animals. Although caging conditions influence the cholesterol and triglyceride response to the atherogenic diet ($p<.05$), light cycle photoperiod seems to exert a greater effect ($p<.005$). In conclusion, photoperiod length dramatically affects diet-induced plasma lipid concentrations in young male F1B hamsters, and thus needs be considered in experimental designs of animal-housed lipid research.

Descriptors: aging physiology, cholesterol blood, diet, atherogenic, housing, animal, photoperiod, triglycerides blood, hamsters.

Smith, E., J.D. Stockwell, I. Schweitzer, S.H. Langley, and A.L. Smith (2004). **Evaluation of cage micro-environment of mice housed on various types of bedding materials.** *Contemporary Topics in Laboratory Animal Science* 43(4): 12-7. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: mice, animal husbandry, environment, bedding materials, micro environment, cage, ammonia levels, ventilation.

Spangenberg, E.M., H. Augustsson, K. Dahlborn, B. Essen Gustavsson, and K. Cvek (2005). **Housing-related activity in rats: effects on body weight, urinary corticosterone levels, muscle properties and performance.** *Laboratory Animals* 39(1): 45-57. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: The cage systems commonly used for housing laboratory rats often result in sedentary and overweight animals, as a consequence of restricted opportunities for physical activity combined with ad libitum feeding. This can have implications both for animal well-being and for the experimental outcome. Physical activity has several known positive effects on health and lifespan, and physical fitness might therefore be incorporated into the animal welfare concept. The aim of this study was to investigate if and how pen housing affects the physical activity and fitness of rats. Thirty-two juvenile male Sprague-Dawley rats were randomly assigned to two different housing systems for a 4-week period. Sixteen rats were kept individually in standard Makrolon type III

cages (42x26x18 cm) furnished with black plastic tubes (singly-housed, SI). The remaining rats were kept in groups of eight, housed in large floor pens (150x210 cm), which were furnished with various objects to increase environmental complexity (pen-housed, PH). The body weight gain, and food and water intake of the rats were measured. During weeks 3 or 4, home cage behaviour, urinary cortiosterone/creatinine ratios (CO/CR), and muscle strength on an inclined plane, were measured. Enzyme activities and glycogen content were measured in tissue samples from m. triceps brachii taken after euthanization at the end of the study. There were no significant differences between groups for food and water intake, but PH rats weighed 14% less than SI rats after 4 weeks, and PH rats also had a more diverse behavioural pattern than SI rats. PH rats had significantly higher oxidative capacity (28% more citrate synthase (CS)) and greater glycogen content (28%) in their muscle samples than SI rats. The PH rats performed significantly better on the inclined plane, both in the muscle strength test (mean angle 75+/-0.5 degrees for PH rats and 69+/-0.4 degrees for SI rats) and the endurance strength test (mean time 233+/-22 s for PH rats and 73+/-14 s for SI rats). There was a negative correlation between body weight and results on the inclined plane for the PH rats. There were no significant differences between housing types with respect to CO/CR ratios. In conclusion, the large pen represents an environment that stimulates physical activity and more varied behaviour, which should be beneficial for the welfare of the animal.

Descriptors: housing, activities, rats, effects, body weight, muscle properties, urinary corticosterone, performance.

Spani, D., M. Arras, B. Konig, and T. Rulicke (2003). **Higher heart rate of laboratory mice housed individually vs in pairs.** *Laboratory Animals* 37(1): 54-62. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Many studies have shown that housing mice individually over a long period significantly alters their physiology, but in most cases measurement has required human interference and restraint for sampling. Using a radio-telemetry system with implantable transmitters, we recorded heart rate (HR), motor activity (ACT) and body temperature (BT) of freely moving male mice (NMRI) housed either individually or in pairs with an ovarectomized female. Data for each parameter were collected at 5 min intervals for two consecutive 24 h periods. Even after several weeks of habituation to the social conditions, HR was increased in mice housed individually compared with mice housed in pairs, although their measured ACT did not differ. Additionally, BT tended to be reduced in individually-housed mice. When the data were analysed according to different ACT levels, HR was increased in individually-housed mice during phases of low and high, but not intermediate, motor activity. Furthermore, individually-housed mice had more, but shorter, resting bouts, indicating disruption of the normal circadian sleep pattern. Enhanced HR in individually-housed mice does not necessarily indicate stress, but might be an important physiological indicator of discomfort. The fact that individual housing alters basic physiological parameters in laboratory mice highlights the need to control for housing-dependent variation, especially in experiments that are sensitive to changes in these parameters.

Descriptors: mice, housing, pairs, individually, heart rate, telemetry, stress, physiological indicator.

Stark, D.M. (2001). **Wire-bottom versus solid-bottom rodent caging issues important to scientists and laboratory animal science specialists.** *Contemporary Topics in Laboratory Animal Science* 40(6): 11-14. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory mammals, cages, floor type, surveys, cost analysis, litter, hygiene, animal welfare, urine, feces, feet, lesions, labor costs, animal preferences, animal use refinement.

Stefanski, V., G. Knopf, and S. Schulz (2001). **Long-term colony housing in Long Evans rats: immunological, hormonal, and behavioral consequences.** *Journal of Neuroimmunology* 114(1-2): 122-30. ISSN: 0165-5728.

Abstract: The distribution pattern and the function of blood immune cells were investigated for 10 weeks in three mixed-sex colonies of Long Evans rats. After colony formation, a despotic dominance system was established between the males. This paper focuses on differences between subdominant colony and pair-housed control males. A reduced body mass development and hormonal status in subdominant males indicate stressful colony conditions. Subdominant males had lower numbers of CD4 and CD8 T cells, pronounced granulocytosis and reduced lymphocyte proliferation rates as compared with controls. The persistency of changes in subdominant males offers the opportunity to investigate the effects of long-term immuno-modulation on health.

Descriptors: Long Evans rats, colony housing, long term, behavior, immunological, pair housed, males.

Steyermark, A.C. and P.J. Mueller (2002). **Cage size affects feeding and energetics of captive rodents.** *Physiological and Biochemical Zoology* 75(2): 209-213. ISSN: 1522-2152.
Descriptors: captive rodents, cage size, effects on feeding and energetics, weight, body mass, energy expenditure.

Stub, C., H.M. Ritskes, A.K. Olsen, T.C. Krohn, and A.K. Hansen (2004). **Fluctuating asymmetry in relation to single housing versus group housing in three inbred mouse strains**. *Scandinavian Journal of Laboratory Animal Science* 31(4): 245-249. ISSN: 0901-3393.
Descriptors: environmental stress, fluctuating asymmetry, group housing, single housing, inbred mouse strains.

Tang, X. and L.D. Sanford (2005). **Home cage activity and activity-based measures of anxiety in 129P3/J, 129X1/SvJ and C57BL/6J mice.** *Physiology and Behavior* 84(1): 105-115. ISSN: 0031-9384.
Abstract: We investigated the home cage activity and emotional behavior in mouse strains used as background for many studies of altered genes [C57BL/6J (B6, n=20), 129X1/SvJ (X1, n=20) and 129P3/J (P3, n=19)]. In their home cages, X1 and P3 mice exhibited less locomotion than did B6 mice, and the X1 mice showed significantly greater rearing than B6 and P3 mice did. A battery of three tests conducted in an open field (open field, emergence and novel object) revealed strain rankings of B6>X1>P3 or B6>X1=P3 in most activity variables. Significant correlations were found between home cage activity and activity in each of three tests, but not in all observation periods. Strain rankings on the elevated zero maze test were B6=X1>P3 in the number of stretched-attend body postures (SAPS) during the initial 6-min exposure for naive mice. Naive and nonnaive mice showed significantly different behaviors on the elevated zero maze. The results suggest that rankings on anxiety are P3>X1>B6 and that B6 mice have greater exploration in a novel environment compared with X1 and P3 mice. However, anxiety-like behaviors differed among strains in open-field-based tests and in the zero maze, and testing experience impacted performance on the zero maze. The findings illustrate that test variations and experience can influence performance and suggest the need for the consideration of how these factors interact with background strains in assessing gene-altered mice.
Descriptors: mice, home cage activity, anxiety, locomotion, behavior, X1 mice, P3 mice, B6 mice.

Tang, X. and L.D. Sanford (2002). **Telemetric recording of sleep and home cage activity in mice.** *Sleep* 25(6): 691-9. ISSN: 0161-8105.
Abstract: STUDY OBJECTIVES: This study assessed differences in spontaneous sleep and locomotor activity in inbred and hybrid mouse strains and evaluated telemetry for recording sleep in mice. DESIGN: Uninterrupted recordings of sleep and home cage activity were obtained in four mouse strains. Pre-operative and post-operative home cage activity was obtained in two strains. SETTINGS: N/A PARTICIPANTS: The subjects were mice of three inbred (C57BL/6J (B6), n=25; BALB/cJ (C), n=24; DBA/2J (D2), n=30) strains and one hybrid (CB6F1/J (CB6: C x B6), n=19) strain. INTERVENTIONS: Electroencephalogram (EEG) and activity were recorded by telemetry, and behavioral states were visually scored based on EEG and activity records. Home cage activity was determined utilizing photobeam interruptions. MEASUREMENTS AND RESULTS: 1) Among the three inbred strains: C mice had the least sleep and the greatest amount of activity; D2 mice exhibited the least non-rapid-eye-movement (NREM) sleep, the longest average NREM-bout length, and the greatest diurnal ratio of sleep and were the most inactive; B6 mice had the most sleep and an intermediate activity level; no differences among inbred strains were observed in total REM. The CB6 mice exhibited intermediate levels of total sleep and activity and had greater amounts of REM compared to its parental strains. 2) Total operative mortality was 9.3%, with all deaths occurring within 3 to 9 days after the operation; significant reductions in activity were observed after the operation. CONCLUSION: Differences in spontaneous sleep and activity exist among inbred and hybrid mouse strains. Accurate determination of sleep states in mice can be achieved with telemetrically recorded EEG and activity.
Descriptors: mice, sleep, home cage activity, telemetric recording, locomotor activity, behavior, physiology, electrocardiography.

Teixeira, M.A., I.L. Sinhorini, N.L. Souza, and J.L.B. Merusse (1999). **Microenvironmental ventilation system for laboratory animal facilities with air distribution by means of plennum chambers.** *Animal Technology*

50(3): 187-194. ISSN: 0264-4754.
NAL Call Number: QL55.I5
Descriptors: mice, cages, artificial ventilation, air flow, animal welfare, air quality, ammonia.

Tsai, P.P., D. Oppermann, H.D. Stelzer, M. Mahler, and H. Hackbarth (2003). **The effects of different rack systems on the breeding performance of DBA/2 mice.** *Laboratory Animals* 37(1): 44-53. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Housing systems for laboratory animals have been developed over a long time. Micro-environmental systems such as positive, individually ventilated caging systems and forced-air-ventilated systems are increasingly used by many researchers to reduce cross contamination between cages. There have been many investigations of the impact of these systems on the health of animals, the light intensity, the relative humidity and temperature of cages, the concentration of ammonia and CO(2), and other factors in the cages. The aim of the present study was to compare the effects of different rack systems and to understand the influence of environmental enrichment on the breeding performance of mice. Sixty DBA/2 breeding pairs were used for this experiment. Animals were kept in three rack systems: a ventilated cabinet, a normal open rack and an individually ventilated cage rack (IVC rack) with enriched or non-enriched type II elongated Makrolon cages. Reproduction performance was recorded from 10 to 40 weeks of age. In all three rack systems there was a similar breeding index (pups/dam/week) in non-enriched groups during the long-term breeding period, but the coefficients of variation in the IVC rack were higher for most parameters. This type of enrichment seems to lead to a decrease in the number of pups born, especially in the IVC group. However, there was no significant difference in breeding index (young weaned/female/week).
Descriptors: mice, breeding performance, housing, rack systems, effects, aging, body weight, litter size, DBA 2 mice.

Van Loo, P.L., J.A. Mol, J.M. Koolhaas, B.F. Van Zutphen, and V. Baumans (2001). **Modulation of aggression in male mice: influence of group size and cage size.** *Physiology and Behavior* 72(5): 675-83. ISSN: 0031-9384.
Abstract: Aggression in group-housed male mice is known to be influenced by both cage size and group size. However, the interdependency of these two parameters has not been studied yet. In this study, the level of aggression in groups of three, five, or eight male BALB/c mice housed in cages with a floor size of either 80 or 125 cm(2)/animal was estimated weekly after cage cleaning for a period of 14 weeks. Furthermore, urine corticosterone levels, food and water intake, body weight, and number of wounds were measured weekly. At the end of the experiment, tyrosine hydroxylase (TH) activity, testosterone levels, and weight of spleen, thymus, testes, and seminal vesicles were determined. Results indicate a moderate increase of intermale aggression in larger cages when compared to the smaller cages. Aggression in groups of eight animals was considerably higher than in groups of three animals. The increase of agonistic behavior was observed both in dominant and subordinate animals. Physiological parameters indicate differences in stress levels between dominant and subordinate animals. It is concluded that aggressive behavior in group-housed male BALB/c mice is best prevented by housing the animals in small groups of three to five animals, while decreasing floor size per animal may be used as a temporary solution to decrease high levels of aggression in an existing social group.
Descriptors: mice, male, aggression, social environment, modulation, group housed, stress levels, group size, cage size.

Varlinskaya, E.I., L.P. Spear, and N.E. Spear (1999). **Social behavior and social motivation in adolescent rats: role of housing conditions and partner's activity.** *Physiology and Behavior* 67(4): 475-82. ISSN: 0031-9384.
Abstract: The present study investigated 1) the effects of individual and grouped housing on social investigation, social contact behavior, and play behavior in adolescent rats tested with low socially active (grouped) and high socially active (isolated) play partners; and 2) the effects of long-term (8 days) and short-term (24 h) isolation on social behavioral manifestations and social motivation in terms of preference or avoidance of play partners. Social isolation of adolescent rats activated play behavior and social behaviors different from play, but play was predominantly affected under the conditions of this study. Long-term isolation was more effective than short-term, and resulted in greater manifestation of play and social preference. Adolescent rats were able to modify their social behaviors in response to social activity of the play partner: in isolated animals exposed to low socially active group-housed partners, play behavior was transformed into social activities unrelated to play; exposure of group-housed adolescents to high socially active previously

isolated partners resulted in an increase of play behavior. Testing that allowed avoidance of social contacts revealed a dissociation between manifestations of play behavior and social motivation: group-housed play partners of isolated animals showed elevated levels of play behavior but a tendency to avoid their isolated pairmates.
Descriptors: rats, housing, social behavior, social environment, aging, activity, social isolation, play.

Waiblinger, E. and B. Konig (2004). **Refinement of gerbil housing and husbandry in the laboratory**. *ATLA, Alternatives to Laboratory Animals* 32(Supplement 1A): 163-169. ISSN: 0261-1929.
NAL Call Number: Z7994.L3A5
Descriptors: gerbil, housing, husbandry, behavior, stereotypic, digging, chewing, refinement, welfare.

Westenbroek, C., J.A. Den Boer, M. Gerrits, and G.J. Ter Horst (2003). **Chronic stress coping in isolated and socially housed male and female rats.** *Hormones and Behavior* 44(1): 83. ISSN: 0018-506X.
Descriptors: rats, male, female, housing, isolated, socially, chronic stress, coping, behavior.
Notes: Meeting Information: Society for Behavioral Neuroendocrinology Annual Meeting, June 25-28, 2003, Cincinnati, OH, USA.

Westenbroek, C., J.A. Den Boer, M. Veenhuis, and G.J. Ter Horst (2004). **Chronic stress and social housing differentially affect neurogenesis in male and female rats.** *Brain Research Bulletin* 64(4): 303-308. ISSN: 0361-9230.
Abstract: Stress plays an important role in the development of affective disorders. Women show a higher prevalence for these disorders than men. The course of a depression is thought to be positively influenced by social support. We have used a chronic stress model in which rats received foot-shocks daily for 3 weeks. Since rats are social animals we hypothesised that 'social support' might reduce the adverse effects of chronic stress. To test this hypothesis, male and female rats were housed individually or socially in unisex groups of four rats. The proliferation marker bromodeoxyuridine (BrdU) was injected 2 weeks before the sacrifice to investigate if stress and social housing influenced the survival of proliferating cells in the dentate gyrus (DG). To investigate changes in proliferation, another group of rats was sacrificed the day after the last BrdU injection. Stress significantly decreased BrdU labelling in individually housed males and not significantly in socially housed males. In individually housed females stress increased BrdU labelling, which was prevented by social housing. The increase found in females is most likely caused by differences in survival rate, since cell proliferation was not affected by stress or housing conditions. These results indicate that social support can affect neurogenesis in both female and male rats, however in a different way.
Descriptors: chronic stress, social housing, neurogenesis, effect, rats, male, female.

Westenbroek, C., G.J. Ter Horst, M.H. Roos, S.D. Kuipers, A. Trentani, and J.A. Den Boer (2003). **Gender-specific effects of social housing in rats after chronic mild stress exposure**. *Progress in Neuro Psychopharmacology and Biological Psychiatry* 27(1): 21-30. ISSN: 0278-5846.
Abstract: Stress plays an important role in the development of affective disorders. Women show a higher prevalence for these disorders then men. The course of a depression is thought to be positively influenced by social support. The authors have used a chronic mild stress model in which rats received footshocks daily for 3 weeks. Since rats are social animals we hypothesized that 'social support' might reduce the adverse effects of chronic stress. To test this hypothesis, male and female rats were housed individually or socially in unisex groups of four rats. An open field test was repeated four times during the 3 weeks of treatment. Neuronal activation in the paraventricular nucleus of the hypothalamus (PVN) and dorsal raphe nucleus (DRN) in response to stress was measured the last day with c-fos. Chronic stress exposure increased locomotor activity in the open field, especially during the first minute. This was most pronounced in the individually housed females. In females, social housing prevented the stress-induced increase of locomotor activity, while in males social housing had no effect. Fos immunoreactive (FOS-ir) in the PVN was increased in all stress-exposed groups, except for the socially housed females due to a higher FOS-ir in controls. Individually housed males and socially housed females showed increased FOS-ir in the DRN and the increase was almost significant in socially housed males. In conclusion: These results show that social housing can enhance coping with stress in female rats, whereas in male rats group housing did not have a positive influence on stress-sensitivity.
Descriptors: sex differences, social environment, housing, stress, rats, social housing, gender effects, female,

male.

Zenner, L. and J.P. Regnault (2000). **Ten-year long monitoring of laboratory mouse and rat colonies in French facilities: a retrospective study.** *Laboratory Animals* 34(1): 76-83. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: mice, rats, serological surveys, parainfluenza 1 virus, murine encephalomyelitis virus, parvovirus, murine hepatitis virus, murine pneumonia virus, coronavirus, SPF husbandry, disease prevalence, seroprevalence, France, Kilham's rat virus.

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Blood/Bleeding/Biology

Akita, M., K. Ishii, M. Kuwahara, and H. Tsubone (2001). **The daily pattern of heart rate, body temperature, and locomotor activity in guinea pigs**. *Experimental Animals (Tokyo)* 50(5): 409-415. ISSN: 1341-1357.
Abstract: The characteristics of the rhythmicity of heart rate (HR), body temperature (BT), and locomotor activity (LA) in conscious and unrestrained guineapigs were studied using a telemetry system. 11 male Hartley guineapigs were used in the study. HR and/or LA in some guineapigs clearly showed circadian rhythms, but in others there were no significant daily patterns. BT did not show significant daily rhythms. These results suggest that guineapigs may have different individual characteristics of rhythmicity. Therefore, one should be careful when using guineapigs in chrono-biomedical research. The results of this study may be useful for future biomedical studies using guineapigs.
Descriptors: guinea pigs, daily pattern, body temperature, heart rate, locomotor activity, biomedical studies.

Al Sarraf, H. and L. Philip (2003). **Effect of hypertension on the integrity of blood brain and blood CSF barriers, cerebral blood flow and CSF secretion in the rat**. *Brain Research* 975(1-2): 179-188. ISSN: 0006-8993.
Abstract: Hypertension has been related to the development of brain damage, dementia and other CNS dysfunctions. Disruption of the blood-brain barrier (BBB) is thought to contribute to these disorders. In this study, the integrity of both blood-brain and blood-CSF barriers during chronic hypertension was investigated. For this, the entry of [super(14)C]sucrose and of lanthanum into brain tissue, choroid plexus, and CSF was studied. Also brain regional blood flow and brain [super(14)C]sucrose volume of distribution were measured using indicator fractionation and ventriculo-cisternal perfusion methods, respectively. The above measurements were performed in normotensive (WKY) rats and in the spontaneously hypertensive rats (SHR). Choroid plexus and CSF uptakes of [super(14)C]sucrose were found to be significantly greater in SHR compared to WKY rats (P0.05). Intercellular entry of lanthanum was observed in choroidal tissue of SHR but not in that of WKY rats and at the BBB. Choroid plexus blood flow was significantly greater in SHR, 2.82 plus or minus 0.21 ml g super(-1) min super(-1), compared to 2.4 plus or minus 0.08 ml g super(-1) min super(-1) in WKY (P0.05). There were no significant differences (P>0.05) in brain % water content and extracellular fluid [super(14)C]sucrose volume of distribution between SHR and WKY rats. However, choroid plexus showed greater % water content in SHR (85.7 plus or minus 1.9%) compared to the WKY rats (81.5 plus or minus 1.7%). These results suggest that chronic hypertension in SHR may cause more pronounced defects in the integrity of the blood-CSF barrier than in the BBB.
Descriptors: rat, hypertension, effect, blood brain barrier, blood CSF barrier, cerebral blood flow.

Bao, G., N. Metreveli, and E.C. Fletcher (1999). **Acute and chronic blood pressure response to recurrent acoustic arousal in rats.** *American Journal of Hypertension* 12(5): 504-10. ISSN: 0895-7061.
Abstract: Repetitive episodic hypoxia every 30 sec administered chronically to Sprague-Dawley (SD) rats has been shown by previous studies to cause a sustained increase in daytime blood pressure (BP). Acoustic arousal

in humans during wake or sleep produces an acute BP rise. The question then arises as to whether chronic episodic acoustic arousal applied with the same frequency and duration as episodic hypoxia induces elevated BP. We exposed 14-week-old (N = 10) SD rats in individual cages to recurrent buzzer noise (500 Hz, 100 dB) 6 out of every 30 sec, 7 h/day for 35 days. Ten other rats were placed in similar cages daily but not exposed to noise, to provide a sham condition. An infrared beam with a detector was positioned at the end of each cage. This allowed us to quantify motion by registering the number of times the rat broke the beam per 7 h period. Mean intraarterial BP was measured in unrestrained conscious animals at baseline and at the end of 35 days of their respective conditions. Acute episodic acoustic stimulation caused an immediate response in BP and heart rate. Habituation occurred in that the movement response to 120 noises per hour was 75% in hour one and 20% in hours two through seven on day one. The movement response was further reduced by day 35 but remained significantly higher than in animals not stimulated by noise. The cardiovascular response to noise also showed signs of habituation. Chronic noise stimulation produced no sustained increases in BP after 35 days of exposure.
Descriptors: arousal physiology, blood pressure physiology, circadian rhythm physiology, acoustic stimulation, anoxia physiopathology, heart rate physiology, movement physiology, noise, Sprague Dawley rats.

Bearden, S.E. and S.S. Segal (2005). **Neurovascular alignment in adult mouse skeletal muscles**. *Microcirculation (New York)* 12(2): 161-167. ISSN: 1073-9688.
Abstract: Muscle blood flow increases with motor unit recruitment. The physical relationships between somatic motor nerves, which control muscle fiber contraction, and arterioles, which control microvascular perfusion, are unexplored. The authors tested the hypothesis that motor axons align with arterioles in adult skeletal muscle.Transgenic mice (C57BL/6 background, n = 5; 10 months of age) expressing yellow fluorescent protein in all motor nerves underwent vascular casting (Microfil). Excised epitrochlearis, gracilis, gluteus maximus, and spinotrapezius muscles were imaged at 380x and 760x and a computer-integrated tracing system (Neurolucida) was used to acquire 3-dimensional digital renderings of entire arteriolar and neural networks within each muscle. Arteriolar networks were typically similar to 3-fold longer than neural networks. Nerves coursed with arterioles until terminating at motor endplates. Across muscles, proximity analyses revealed that similar to 75% of total nerve length (9.8-48.8 mm) lay within 200 mu m of the nearest arteriole (diameters of 15-60 mu m).
Descriptors: mouse, adult, skeletal muscles, blood flow, neurovascular alignment, arterioles, muscle fiber contraction, nerves.

Bersztel, A., C. Johnsson, A. Bjoerkland, and G. Tufveson (2003). **Pretransplant xenogeneic blood transfusions reduce the humoral response in a mouse-to-rat heart transplantation model**. *Scandinavian Journal of Immunology* 57(3): 246-253. ISSN: 0300-9475.
Abstract: A mouse heart transplanted to a rat is rejected promptly 3 days after transplantation, independent of whether cyclosporin A (CyA) is used as an immunosuppressant or not. Adding a short course of deoxyspergualin (DSG) initially, in addition to continuous CyA treatment, results in long-term graft survival and permits retransplantation during CyA monotherapy. In this paper, we have explored the possibility of substituting the initial heart transplant with blood transfusions. Lymphocyte-enriched blood transfusions combined with CyA and an initial course of DSG proved to lower or eliminate the haemagglutinating antibody titre normally seen in acute vascular xenorejection. The therapy, however, did not prolong the mean survival of the cardiac xenograft, but the same treatment protocol could result in either hyperacute rejection or prolonged survival of up to 11 days. In conclusion, this and earlier studies propose that a humoral unresponsiveness can be induced if the recipient vascular circulation is exposed to a xenoantigen in a mouse-to-rat combination.
Descriptors: immunosuppressive agents, heart, xenografts, blood transfusion, immune response, lymphocytes, Cyclosporin A, rats, mice.

Biardi, J.E., R.G. Coss, and D.G. Smith (2000). **California ground squirrel (*Spermophilus beecheyi*) blood sera inhibits crotalid venom proteolytic activity.** *Toxicon* 38(5): 713-21. ISSN: 0041-0101.
NAL Call Number: 391.8 T66
Abstract: Some California ground squirrels (*Spermophilus beecheyi*) show limited necrosis following envenomation by northern Pacific rattlesnakes (*Crotalus viridis oreganus*). This study demonstrates that *S. beecheyi* blood sera inhibits venom proteases. Sera from rattlesnake-abundant habitats inhibited *C. v. oreganus* venom more effectively than venom from two allopatric rattlesnake species, *C. v. viridis* and *C. atrox*, suggesting evolutionary specialization. The pattern of inhibition among squirrel populations corresponds best

with history of rattlesnake predation, in contrast to current rattlesnake density.
Descriptors: ground squirrel, antivenins physiology, crotalid venoms enzymology, Sciuridae blood, blood serum inhibits venom.

Bishnupuri, K.S. and C. Haldar (2000). **Profile of organ weights and plasma concentrations of melatonin, estradiol and progesterone during gestation and post-parturition periods in female Indian palm squirrel *Funambulus pennanti.*** *Indian Journal of Experimental Biology* 38(10): 974-81. ISSN: 0019-5189.
Abstract: To date, report about the role of pineal gland in maintaining the normal physiology of gestation is scanty. Present study is the first of its kind giving a detail profile of organ weights and plasma concentration of melatonin, estradiol and progesterone to suggest a possible role of pineal gland in maintaining normal physiology during gestation and post-parturition periods of female Indian palm squirrel *F. pennanti.* Inspite of, inverse pineal-gonadal/melatonin-steroids interrelationship in adult (non-pregnant) females, the present results study suggest a direct relationship of pineal gland activity with ovarian steroids especially during the gestation period. The inverse relationship of melatonin and ovarian steroids is again established after parturition and maintained throughout the life. Thus the pineal gland (activity as judged by its weight, biochemical contents i.e. protein and cholesterol and plasma melatonin level) maintained ovarian/uterine physiology and regulated plasma concentrations of estradiol and progesterone during gestation and post-parturition periods. It is suggested that the pineal gland and its hormone melatonin play an important role to maintain the normal physiology of gestation and the post-partum recovery in Indian palm squirrel *F. pennanti.*
Descriptors: estradiol blood, melatonin blood, postpartum period, progesterone blood, Sciuridae physiology, organ size, pregnancy, animal blood.

Brand, P.H., N. Qi, P.J. Metting, and S.L. Britton (2000). **A self-powered constant infusion device for use in unrestrained rats.** *American Journal of Physiology, Heart and Circulatory Physiology* 278(6): H2157-62. ISSN: 0363-6135.
Abstract: We developed a device that delivers fluid through a catheter at a constant rate and can be used in conscious animals to solve a variety of problems. For example, this device can be used for delivering drugs and maintaining intravascular catheter patency. The device provides infusions at low flows (1.0-1.5 ml/day), so that experimental agents may be administered with minimal volume loading of the rat. Arterial and venous catheter patency is maintained by infusion of heparinized saline through indwelling catheters attached to the device. The catheters exit from the rat in the intrascapular area and are routed through a protective spring to the device, which is suspended above the cage. The catheters may be attached to pressure transducers, blood may be sampled, and injections or infusions may be made without disturbing the rat. Because the device is self-contained, it can be suspended by a fluid-free swivel that rotates through 360 degrees, providing minimal restraint. The device has been used successfully to measure arterial and central venous blood pressures in two studies using rats.
Descriptors: rats, unrestrained, infusion pumps, catheterization, equipment design, pressure, drug delivery, catheter patency.

Buzadzic, B., D. Blagojevic, B. Korac, Z.S. Saicic, M.B. Spasic, and V.M. Petrovic (1997). **Seasonal variation in the antioxidant defense system of the brain of the ground squirrel (*Citellus citellus*) and response to low temperature compared with rat.** *Comparative Biochemistry and Physiology, Part C, Pharmacology, Toxicology and Endocrinology* 117(2): 141-9. ISSN: 1367-8280.
Abstract: Seasonal variation in the activity of antioxidant enzymes (superoxide dismutase (EC 1.15.1.1.; SOD), catalase (EC 1.11.1.6; CAT), glutathione peroxidase (EC 1.11.1.9; GSH-Px), glutathione reductase (EC 1.6.4.2; GR), glutathione-S-transferase (EC 2.5.1.18; GST) and low-molecular-weight antioxidants: ascorbic acid (AsA), vitamin E (VIT E) and glutathione (CSH+GSSG) were examined in the brain of the ground squirrels (*Citellus citellus*) maintained at 30 degrees C during the whole year. The highest activity (per mg protein) of antioxidant defense (AD) enzymes was found in the spring and was much lower in the summer. A further decrease in activity of CAT, GSH-Px and GST was observed in the winter. The highest levels of AsA and glutathione were recorded in winter in comparison with spring and summer. AD system in the brain of the ground squirrel and rates (maintained at thermoneutrality) exposed to low temperature (4 degrees C) for 3, 6 or 24 hr during the summer was studied as well. Summer was chosen as a period of stable euthermia for ground squirrels and in thermoregulation similar to rats. Consumption of free fatty acid and glucose during the acute

exposure to low temperature was found to be species specific. In the ground squirrel, an increase in the specific activities of SOD, after 3, 6 and 24 hr, CAT after 3 and 6 hr and GR after 6 hr of exposure to low temperature was detected. When activities were expressed in U/g wet mass, an increase of SOD after 3, 6 and 24 hr ($P < 0.02$, $P < 0.02$, $P < 0.005$) and CAT and GSH-Px 3 hr ($P < 0.01$) upon exposure to low temperature was observed. In the rats, no changes in the specific activities of these enzymes after exposure to low temperature were recorded and only an increase in GST activity (U/g wet mass) after 6 hr exposure was registered. Low-molecular-weight AD components in both animal species were unchanged upon short-term exposure to low temperature. The species-specific differences in brain AD between the rats and the ground squirrels after short exposure to low temperature may be ascribed to seasonal changes of the brain activity in the latter.

Descriptors: rat, ground squirrel, seasonal variation, antioxident defense system, brain, temperature.

Callahan, M.F., M. Sosa, B. Mckee, and T.L. Smith (2004). **Regional blood flow in mice: effects of core body temperature**. *FASEB Journal* 18: 4-5 (Abst. 855.16). ISSN: 0892-6638.

Online: http://www.fasebj.org/

Descriptors: mice, regional blood flow, core body temperature, effects, lowered core temperature, rewarming, heart rate, cardiac output.

Notes: Meeting Information: FASEB Meeting on Experimental Biology: Translating the Genome, April 17-21, 2004, Washington, D.C., USA.

Carneiro, R.A., R. Serakides, C.M. Sousa, V.A. Nunes, and E.F. Nascimento (2000). **Perfil hematologico de ratas castradas e intactas induzidas experimentalmente ao hipertireoidismo. [Blood profile of intact and castrated female rats with experimentally induced hyperthyroidism].** *Arquivo Brasileiro De Medicina Veterinaria E Zootecnia* 52(3): 220-221. ISSN: 0102-0935.

Descriptors: rats, blood, castration, females, hyperthyroidism, glands, husbandry, gonadectomy, sterilization.

Chang, C.C., J.S. Hwang, C.C. Chan, P.Y. Wang, T.H. Hu, and T.J. Cheng (2004). **Effects of concentrated ambient particles on heart rate, blood pressure, and cardiac contractility in spontaneously hypertensive rats**. *Inhalation Toxicology* 16(6-7): 421-429. ISSN: 0895-8378.

Abstract: Epidemiological studies have shown that particulate matter (PM) air pollution is associated with cardiovascular mortality and morbidity, especially for particles with aerodynamic diameters under 2.5 mu m (PM sub(2.5)). Recent studies have revealed an association between PM pollution and autonomic functions including heart rate (HR), blood pressure (BP), and heart-rate variability. However, the association and linking mechanisms have not been clearly demonstrated in animal studies. Utilizing a novel approach that employs a mixed-effects model to overcome the problems of variations in diseased animals and circadian cycles, we have previously demonstrated an association between concentrated PM sub(2.5) and changes of HR and BP in pulmonary hypertensive rats. The objective of this study is to test the plausibility of this methodology and to demonstrate the particle effects under different pathophysiology. The feasibility of cardiac contractility (measured as QA interval, QAI) as an indicator for PM toxicology was also explored. Four spontaneously hypertensive (SH) rats were repeatedly exposed to concentrated PM sub(2.5) during spring and summer. The mass concentration of particles during the 5 h of exposure was 202.0 plus or minus 68.8 (mean plus or minus SE) and 141.0 plus or minus 54.9 mu g/m super(3) for spring and summer experiments, respectively. During spring exposures, the maximum increase of HR and mean BP noted at the end of exposure were 51.6 bpm ($p < .001$) and 8.7 mm Hg ($p = .002$), respectively. The maximum decrease of QAI noted at the same time was 1.6 ms ($p = .001$). Though a similar pattern was demonstrated during summer exposures, the responses were less prominent. We conclude that concentrated PM sub(2.5) may increase HR and mean BP and decrease QAI in SH rats. Our results also show that QAI may be used as an indicator in PM toxicology.

Descriptors: air pollution, hypertension, heart rate, blood pressure, airborne particulates, rats.

Chang, Y.L., H.S. Sohn, K.C. Chan, C.D. Berdanier, and J.L. Hargrove (1997). **Low dietary protein impairs blood coagulation in BHE/cdb rats**. *Journal of Nutrition* 127(7): 1279-1283. ISSN: 0022-3166.

NAL Call Number: 389.8 J82

Abstract: The influence of dietary protein on blood coagulation tests was evaluated in BHE/cdb rats. Three experiments were conducted in order to compare effects of diets with low (8 g/100 g diet) or high (38 g/100 g diet) protein, to establish values for coagulation tests at intermediate (12-30 g/100 g diet) concentrations of

dietary protein, and to compare feeding identical quantities of diets with 8 g protein/100 g diet vs. 18 g protein/100 g diet. After 4 wk of feeding the semipurified diets, bleeding time exceeded 15 min in the groups fed low protein diets, compared to a range of 3-6 min for the groups fed high protein diets. Several in vitro tests of coagulation were abnormal in the rats fed low protein diets. For example, prothrombin time averaged 27 +/- 8 s in rats fed 8 g protein/100 g diet plus beef tallow, but 17 +/- 1 s in rats fed 38 g protein/100 g diet plus tallow. The coagulation deficit in rats fed low protein was not affected by fat source (tallow vs. menhaden oil), but fibrinogen was elevated in rats fed diets with menhaden oil. Conversely, no differences in coagulation tests were observed among rats fed 12-30 g protein/100 g diet. Bleeding times ranged from 7 to 9 min, and prothrombin time was 17-18 s. Significant differences in plasma fibrinogen concentration and prothrombin time were observed in rats fed 8 vs. 18 g protein/100 g diet at a fixed rate of 6 g/100 g body weight. Platelet and blood cell numbers were unaffected by dietary protein. The evidence for multiple deficits in the coagulation system suggests that hepatic function in BHE/cdb rats may become impaired when the rats are fed low protein diets of the composition used here.

Descriptors: rats, low dietary protein, impairs, blood coagulation, prothrombin time, bleeding.

Chickering, J.G. and A.J. Sokoloff (1996). **Innervation of propatagial musculature in a flying squirrel, *Glaucomys volans* (Rodentia, Sciuridae).** *Brain, Behavior and Evolution* 47(1): 1-7. ISSN: 0006-8977.

Abstract: The propatagium of gliding and flying mammals is of both functional and phylogenetic interest. The innervation of the propatagial muscle, platysma II, was studied with the axonal tracer wheat germ agglutinin-conjugated horseradish peroxidase (WGA-HRP) in a flying squirrel, *Glaucomys volans*. Injections of WGA-HRP into the proximal third of platysma II labeled motoneurons in the lateral part of the medial subdivision of the ipsilateral facial nucleus and in the ipsilateral ventral horn of the brachial enlargement. Injections into distal regions of platysma II labeled motoneurons in the ipsilateral ventral horn of spinal segments C5-C8 but not in the facial nucleus. Injections along the whole length of the muscle labeled afferent axons in the ipsilateral dorsal horn of spinal segments C4-T1. These results demonstrate a mixed facial and spinal motor innervation of propatagial musculature in the flying squirrel and indicate that this pattern of mixed innervation is more widespread among flying and gliding mammals than previously reported. Mixed facial and cervical propatagial innervation, independently derived in different flying and gliding mammals, may represent a common solution in the design of the propatagium. These findings complicate the use of propatagial muscle innervation patterns for the establishment of phylogenetic relationships among flying and gliding mammals.

Descriptors: evolution, flight, animal physiology, forelimb innervation, motor neurons ultrastructure, neck muscles innervation, phylogeny, Sciuridae anatomy and histology, afferent pathways anatomy and histology, axons ultrastructure, facial nerve anatomy and histology, ganglia, spinal anatomy and histology, laterality physiology, muscle, skeletal innervation.

Cho, J.H., S.H. Jeong, H.O. Ku, H.G. Kang, J.M. Park, H.I. Yun, and Y.S. Lee (1997). **[Improved novel method of blood sample collection via jugular vein in unanesthetized rats]**. *Korean Journal of Laboratory Animal Science* 13(1): 117-120. ISSN: 1225-813X.

Descriptors: rats, laboratory animals, blood veins, blood sampling, methods, blood vessels, body parts, cardiovascular system.

Language of Text: Korean with English and Korean summaries.

Dark, J. and D.R. Miller (1997). **Metabolic fuel privation in hibernating and awake ground squirrels.** *Physiology and Behavior* 63(1): 59-65. ISSN: 0031-9384.

Abstract: The nature of metabolic fuel utilization during hibernation and periodic arousal is not completely understood. 2-Deoxy-D-glucose (2DG) and mercaptoacetate (MA) were administered to hibernating ground squirrels. These drugs disrupt glucose and fatty acid oxidation, respectively. Telemetrically recorded body temperature (Tb) was analyzed to determine rate of rewarming from hibernation, duration of euthermia during periodic arousal, and proportion of animals arousing after treatments. 2DG given during hibernation significantly increased latency to regain euthermia, especially during the initial phase of rewarming (from first Tb > 10 degrees C to first Tb > 15 degrees C), without affecting the duration or other features of the ensuing euthermic period; MA did not affect rate of rewarming. MA treatment during hibernation affected thermoregulation after the animals aroused, including an increased duration of euthermia and maintenance of erratic patterns of Tb. The percentage of animals that aroused from hibernation was increased in a dose-

dependent fashion by each drug. 2DG and MA treatments had little or no impact on nonhibernating ground squirrels in the cold. We suggest that glucose oxidation is important for rewarming from deep torpor; limited glucose availability cannot, however, support normal levels of euthermia when fatty acid oxidation is compromised. On the other hand, fatty acid oxidation may be less necessary for normal arousal from torpor, but critical for the maintenance of euthermia during the arousal phase.

Descriptors: ground squirrels, metabolic fuel, hibernating, awake, privation, arousal, drugs, thermoregulation.

De Angelis, K., V.M. Gama, V.A.M. Farah, and M.C. Irigoyen (2005). **Blood flow measurements in rats using four color microspheres during blockade of different vasopressor systems**. *Brazilian Journal of Medical and Biological Research* 38(1): 119-126. ISSN: 0100-879X.

Descriptors: rats, blood flow, microspheres, four color, vasopressor systems, measurements, blockade.

De Jong, W.H., A. Timmerman, and M.T.M. Van Raaij (2001). **Long-term cannulation of the vena cava of rats for blood sampling: local and systemic effects observed by histopathology after six weeks of cannulation.** *Laboratory Animals* 35(3): 243-248. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: A cannulation system with fixation by a metal cuff around the tail was used for blood sampling. The cannula was guided subcutaneously and positioned in the vena cava after entering the body via the femoral vein. Histopathology was performed after long-term cannulation of up to 35 and 45 days. The presence of the cannula in the vena cava induced endothelial hypertrophy and hyperplasia accompanied by stromal hypertrophy. The endothelial activation was not limited to the vena cava but was also observed in both the cannulated vena iliaca and the contralateral control vena iliaca, the latter showing only minor alterations. In the lung, thrombi were noted in the larger lung arteries; and foreign body emboli, probably situated in the alveolar septi, could be detected occasionally. Inflammatory reactions in the tail at the site of cuff fixation consisted of a mixture of acute and chronic inflammatory responses. The chronic inflammation extended into the tail muscles, as shown by the presence of fibrous tissue associated with muscle degeneration. In conclusion, prolonged venous cannulation in rats resulted in local alterations in the veins, small emboli in the lungs and a moderate to marked inflammation in the tail. However, the procedure itself was well tolerated by the animals.

Descriptors: rats, cannulation, blood sampling, vena cava, adverse effects, histopathology, tail, inflammation, embolism, lungs, endothelium, thrombosis, stress, animal welfare.

De Wilde, M.C., E. Hogyes, A.J. Kiliaan, T. Farkas, P.G. Luiten, and E. Farkas (2003). **Dietary fatty acids alter blood pressure, behavior and brain membrane composition of hypertensive rats**. *Brain Research* 988(1-2): 9-19. ISSN: 0006-8993.

Abstract: The beneficial effect of dietary n-3 polyunsaturated fatty acids (PUFAs) on developing hypertension has been repeatedly demonstrated. However, related changes in brain membrane composition and its cognitive correlates have remained unclear. Our study aimed at a comprehensive analysis of behavior and cerebral fatty acid concentration in hypertension after long-term PUFA-rich dietary treatment. Hypertensive and normotensive rats were provided a placebo, or one of two PUFA-enriched diets with a reduced (n-6) /(n-3) ratio for 75 weeks. Exploratory behavior and spatial learning capacity were tested. Systolic blood pressure (BP) was repeatedly measured. Finally, brain fatty acid composition was analyzed by gas chromatography. Hypertensive rats exhibited more active exploration but impaired spatial learning compared to normotensives. Both diets reduced BP, increased PUFA and monounsaturated fatty acid (MUFA) concentration, and reduced saturated fatty acid content in brain. The level of cerebral PUFAs and MUFAs was lower in hypertensive than in normotensive rats. Furthermore, BP positively, while spatial learning negatively correlated with cerebral (n-6)/(n-3) PUFA ratio. We concluded that regular n-3 PUFA consumption could prevent the development of hypertension, but reached only a very delicate improvement in spatial learning. Furthermore, we consider a potential role of metabolically generated MUFAs in the beneficial effects of PUFA supplementation.

Descriptors: rats, hypertensive, dietary fatty acids, blood pressure, behavior, brain membrane composition.

Demir, O., E. Yazar, V. Altunok, M. Elmas, and V. Ozdemir (2001). **Effet du phenobarbital sur les gaz du sang et des activites de systemes enzymatiques anti-oxydants chez la souris Balb/C. [Effect of phenobarbital on antioxidant enzyme activities and blood gas parameters in Balb/C mice].** *Revue De Medecine Veterinaire (France)* 152(10): 723-726. ISSN: 0035-1555.

Abstract: Dans cette etude, l' effet du phenobarbital a ete etudie sur des parametres d' activites enzymatiques antioxydantes et des gaz du sang chez des souris Balb/C. Quarante souris males Balb/C ont ete utilisees. Dix souris ont servi de groupe temoin, et trente souris ont recu du phenobarbital (80 mg/kg de poids corporel, per os, en administration unique). Des echantillons de sang, de cerveau et de foie ont ete pris a 6, 12 et 24 heures apres administration. Les activites cerebrales et hepatiques de superoxyde dismutase et de glutathion peroxydase ont ete mesurees par spectrophotometrie, et les parametres de gaz du sang ont ete mesures par l' analyseur de gaz de sang. Comme resultat, le phenobarbital a cause une acidose respiratoire provisoire et une diminution de l' activite de la superoxyde dismutase dans le cerveau.
Descriptors: mice, phenobarbital, side effects, blood gases, enzyme activity, barbiturates, blood, blood composition, chemicophysical properties, drugs, enzymes, mammals.
Language of Text: French with French and English summaries.

Di Petrillo, K., S.W. Tsaih, S. Sheehan, C. Johns, P. Kelmenson, H. Gavras, G.A. Churchill, and B. Paigen (2004). **Genetic analysis of blood pressure in C3H/HeJ and SWR/J mice**. *Physiological Genomics* 17(2): 215-220. ISSN: 1094-8341.
Abstract: Hypertension is a complex phenotype induced by multiple environmental and genetic factors. Quantitative trait locus (QTL) analysis is a powerful method for identifying genomic regions underlying complex diseases. We conducted a QTL analysis of blood pressure in mice using 217 F sub(2) progeny (males and females) from a cross between the normotensive C3H/HeJ and hypertensive SWR/J inbred strains. Our analysis identified significant QTL controlling blood pressure on chromosome 1 [Chr 1; Bpq8; peak 78 cM; 95% confidence interval 64-106 cM; logarithm of the odds ratio (LOD) 3.5; peak marker D1Mit105] and on Chr 16 (Bpq9; peak 56 cM; 95% confidence interval 46-58 cM; LOD 3.6; peak marker D16Mit158). Bpq8 was previously identified in a cross between C57BL/6J and A/J mice, and we narrowed this QTL from 42 to 18 cM (95% confidence interval 68-86 cM) by combining the data from these crosses. By examining Bpq8 for regions where ancestral alleles were conserved among the high allele strains (C57BL/6J, SWR/J) and different from the low allele strains (A/J, C3H/HeJ), we identified a 2.3-cM region where the high allele strains shared a common haplotype. Bpq8 is concordant with known QTL in both rat and human, suggesting that the causal gene underlying Bpq8 may be conserved as a disease gene in human hypertension.
Descriptors: mice, genetic analysis, blood pressure, alleles, hypertension, quantitative trait loci.

Douglass, R.J., A.J. Kuenzi, T. Wilson, and R.C. Van Horne (2000). **Effects of bleeding nonanesthetized wild rodents on handling mortality and subsequent recapture.** *Journal of Wildlife Diseases* 36(4): 700-704. ISSN: 0090-3558.
Descriptors: wild rodents, handling techniques, nonanesthetized handling, bleeding, effects, mortality, blood sampling, sedation, anesthetic, posthandling survival, Montana, blood sampling without anesthetic, recapture.

El Fazaa, S., L. Somody, N. Gharbi, A. Kamoun, C. Gharib, and G. Gauquelin Koch (1999). **Effects of acute and chronic starvation on central and peripheral noradrenaline turnover, blood pressure and heart rate in the rat**. *Experimental Physiology* 84(2): 357-368. ISSN: 0958-0670.
Descriptors: rat, starvation, acute, chronic, effects, blood pressure, heart rate, noradrenaline turnover.

Erdos, B., Z. Lacza, I.E. Toth, E. Szelke, T. Mersich, K. Komjati, M. Palkovits, and P. Sandor (2003). **Mechanisms of pain-induced local cerebral blood flow changes in the rat sensory cortex and thalamus**. *Brain Research* 960(1-2): 219-227. ISSN: 0006-8993.
Abstract: It is a well-known phenomenon that cerebral blood flow is coupled to neural activation induced by non-noxious somatosensory stimulation. However, basic questions related to pain-induced cerebral blood flow changes remain unanswered. In the present study, the sciatic nerve of anesthetized rats was subjected to electric stimulation with noxious and non-noxious parameters. Changes in local cerebral blood flow and neuronal activity were determined simultaneously in the sensory cortex and in the thalamus by laser-Doppler flowmetry and c-fos immunohistochemistry, respectively. The role of different vasoregulatory mechanisms and the pain-induced increase in mean arterial blood pressure (MABP) were examined with specific blocking agents and by means of rapid intra-arterial transfusion. Noxious stimulation resulted in significant enhancement of neuronal activity both in the thalamus and in the somatosensory cortex indicated by marked c-fos expression in these areas. Cortical and thalamic blood flow (cBF and tBF) increased by 47 plus or minus 4 and 44 plus or minus 3%

during the stimulation while the MABP elevated by 35 plus or minus 2%. Similar changes in MABP induced by intra-arterial transfusion had no effect on tBF, while cBF increased only by 18 plus or minus 5%. Blockade of ATP sensitive potassium channels (K super(+)ATP) and sympathetic beta -receptors significantly attenuated the pain-induced blood flow increases in both investigated areas, while inhibition of nitric oxide synthase was effective only in the thalamus. The blockade of the sympathetic alpha -receptors, opiate receptors, and the cyclooxygenase enzyme had no effect on the pain-induced cerebral blood flow elevations. These findings demonstrate that during noxious stimulation, cerebral blood flow is adjusted to the increased neural activity by the interaction of vasoconstrictor autoregulatory and specific vasodilator mechanisms, involving the activation of sympathetic beta -receptors, K super(+)ATP-channels and the release of nitric oxide.

Descriptors: rat, cerebral blood flow, pain induced changes, mechanism, sensory cortex, thalamus.

Essner Jr., R.L. (2002). **Three-dimensional launch kinematics in leaping, parachuting and gliding squirrels.** *Journal of Experimental Biology* 205(Part 16): 2469-77. ISSN: 0022-0949.

Abstract: Leaping, parachuting and gliding are the primary means by which arboreal squirrels negotiate gaps in the canopy. There are notable differences among the three locomotor modes with respect to mid-air postures and aerodynamics, yet it is unclear whether variation should also be expected during the launch phase of locomotion. To address this question, launch kinematic profiles were compared in leaping (*Tamias striatus*), parachuting (*Tamiasciurus hudsonicus*) and gliding (*Glaucomys volans*) squirrels. Animals were filmed launching to the ground from a platform using high-speed video. Statistical comparisons among taxa indicated that only six out of 23 variables were significantly different among the three species. Two were associated with tail kinematics and were a consequence of tail morphology. Two were forelimb-related and discriminated gliding from non-gliding taxa. The remaining two variables were performance attributes, indicating significant variation among the species in take-off velocity and horizontal range. The absence of significant differences in hindlimb kinematics indicates that propulsion is essentially identical in leaping, parachuting and gliding squirrels.

Descriptors: flight, gliding squirrels, leaping, parachuting, three dimensional kinematics, locomotor modes, propulsion.

Falkenberg, H., G. Kuhn, M. Langhammer, U. Renne, and H. Redel (1999). **Vergleich von Cholesterinparametern im Blut von Schweinen, Kaninchen und Mausen. [Comparison of blood cholesterol traits in pigs, rabbits and mice].** *Archiv Fuer Tierzucht* 42(4): 365-376. ISSN: 0003-9438.

Abstract: Untersuchungen an 434 Schweinen, 132 Kaninchen und 1096 Mausen zeigten, dass das Niveau der Cholesterinwerte tierartspezifisch ist und durch das Geschlecht beeinflusst wird. Bei Schweinen verringerten sich die Werte mit zunehmendem Lebendgewicht. Genetische Einflusse wie z.B. die Langzeitselektion nach verschiedenen Zuchtzielen bei Mausen beeinflusst die Konzentration der Cholesterinparameter (Gesamtcholesterin, HDL, LDL) sowie die Beziehungen untereinander.

Descriptors: swine, rabbits, mice, sex, weight, cholesterol, lipoproteins, blood plasma, genetics, selection, blood, breeding methods, domestic animals, isoprenoids, lagomorphs, livestock, mammals, proteins, Rodentia, steroids, sterols, Suidae.

Language of Text: German with an English summary.

Falkenberg, H., M. Langhammer, and U. Renne (2000). **Auswirkungen der divergenten Selektion nach lokomotorischer Aktivitt auf biochemische Blutmerkmale beim Modelltier Maus. [Comparison of biochemical blood traits after long-term selection on high or low locomotory activity in mice].** *Archiv Fuer Tierzucht* 43(5): 513-522. ISSN: 0003-9438.

Descriptors: mice, models, selection, movement, physical activity, metabolism, blood plasma, triglycerides, cholesterol, lipoproteins, enzymic activity, blood, breeding methods, chemicophysical properties, esters, glycerides, isoprenoids, lipids, mammals, physiological functions, proteins, Rodentia, steroids, sterols.

Language of Text: German summary.

Falkenberg, H., U. Renne, and M. Langhammer (2000). **Biochemische Charakterisierung von Stoffwechselkennwerten von LabormSusen nach Langzeitselektion auf Wachstum. [Biochemical characterisation of blood metabolic substances in mice after long-term selection on growth traits].** *Archiv Fuer Tierzucht* 43(4): 375-385. ISSN: 0003-9438.

Descriptors: mice, selection, growth, blood plasma, enzymic activity, metabolic profile tests, biological development, blood, breeding methods, biochemical characterisation, blood metabolic substances.
Language of Text: German summary.

Foley, P.L., C.H. Barthel, and H.R. Brausa (2002). **Effect of covalently bound heparin coating on patency and biocompatibility of long-term indwelling catheters in the rat jugular vein.** *Comparative Medicine* 52(3): 243-248. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Many physiologic and pharmacologic studies require long-term vascular access for repeated substance infusion and/or blood sample collection. The study reported here was undertaken to determine whether a functionally active heparin coating would improve long-term patency of venous catheters in rats. Uncoated or coated catheters were surgically placed in the jugular vein, and patency was evaluated twice weekly for a total of 30 days. Culturing of blood and catheters, and histologic examination were performed for all rats. All heparin-coated catheters remained patent for the study duration, with patency defined as ability to infuse saline and withdraw a blood sample. Median patency for uncoated catheters was 17.5 days, with a range of three to 30 days. Histologic evaluation of vessels revealed more advanced and severe lesions in rats with uncoated, compared with coated catheters. Furthermore, uncoated catheters had increased association with bacteremia (3/8), compared with coated (0/9) catheters. Taken together, these results indicate that coating catheters with covalently bound heparin molecules can significantly prolong patency and cause less pathologic damage to the catheterized vessel.
Descriptors: rats, catheters, polyurethanes, heparin, coatings, jugular vein, lesions, bacteremia, blood sampling, animal welfare, indwelling catheters, patency, biocompatibility.

Fukui, S., H. Nawshiro, K. Wada, K. Shima, and J.M. Hallenbeck (2001). **A new method to catheterize a femoral artery in mice using a nylon suture as a 'guide wire'**. *Neurological Research* 23(6): 655-656. ISSN: 0161-6412.
Descriptors: mice, catheter, femoral artery, nylon suture guide wire, new method.

Gattermann, R., P. Fritzsche, R. Weinandy, and K. Neumann (2002). **Comparative studies of body mass, body measurements and organ weights of wild-derived and laboratory golden hamsters (*Mesocricetus auratus*).** *Laboratory Animals* 36(4): 445-54. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: All laboratory golden hamsters originate from a sibling pairing back in 1930. To investigate possible differences between domesticated and wild conspecifics, descendants of both strains were maintained under standardized laboratory conditions individually and in unisexual groups. Body mass and food consumption were monitored from birth to 22 weeks of age. The animals were subsequently sacrificed, and body measurements and body composition were analysed. In addition, the absolute and relative masses of different organs were measured. Laboratory hamsters gained more body mass through higher food consumption. However, they did not get fatter, since relative fat values were the same for both strains. Body measurements revealed only minor differences (in body and ear lengths). As deducible from the body mass, the organs (spleen, kidneys, adrenal glands, testes, epididymis and ovaries) were seen to be heavier in laboratory hamsters. Furthermore, with the exception of the kidneys, the same went for the relative values. There were distinct sexual specific differences in both strains only for body fat (male symbol male symbol upward arrow) and adrenal glands (male symbol male symbol upward arrow). In females, group housing induced an elevated level of aggression. In general, these housing conditions led to social stress symptoms, such as heavier adrenal glands. Additionally, spleen, kidneys, ovaries, body length and mass, body water and body fat were increased in group-housed hamsters. In conclusion, no major differences between laboratory and wild-derived hamsters were observed.
Descriptors: hamster, body mass, body measurements, body composition, organ weights, comparative study, physiology, organ size, social environment, stress.

Godoy, H.M., G.C. Faifer, and V. Velazco (1997). **Effects of multiple doses of T-2 toxin on the erythroid response capacity of mice following an extensive experimental bleeding.** *Natural Toxins* 5(4): 152-156. ISSN: 1056-9014.
NAL Call Number: QP631.N37

Descriptors: bleeding, mice, extensive, T-2 toxin, erythroid response.

Goundasheva, D. (2000). **Effets de l' exercice physique sur les modifications de l' equilibre acide-base et sur les gaz sanguins chez des rats ayant une inflammation provoquee. [Effect of exercise on acid-base and blood gas changes in rats challenged with an inflammation agent].** *Revue De Medecine Veterinaire* 151(11): 1041-1046. ISSN: 0035-1555.

Abstract: L' etude a pour but de determiner l' effet du stress induit par l' exercice physique sur l' equilibre acide-base et les gaz sanguins de rats ayant une inflammation provoquee par du glycogene d' huitre. Les rats ayant une inflammation seule (groupe controle) ont developpe une acidose metabolique decompensee 72 heures plus tard. Dans le groupe experimental, le stress impose aux rats, ayant eu aussi une inflammation provoquee, a modifie la dynamique et le degre de l' acidose metabolique decompensee. Elle s' est manifestee plus tot - apres 3 heures - et etait caracterisee par des taux plus bas du pH, du bicarbonate plasmatique, de la teneur en CO2, de l' exces de base, de la base tampon, du bicarbonate standard, indiquant une regulation metabolique modifiee ainsi que par des taux plus bas des pressions partielles du CO2 et du O2; la saturation en oxygene et la capacite en oxygene, indiquant des changements lies au systeme respiratoire.

Descriptors: rats, inflammation, physical activity, stress, acid base equilibrium, blood, gases, disorders, fluids, homeostasis, mammals, physical states, Rodentia.

Language of Text: French with French and English summaries.

Guitart, R., V. Alfaro, J. Roca Acin, and L. Palacios (1996). **Blood sampled in rats from right ventricle may not always be truly representative of a mixed venous sample**. *Lab Animal* 30(3): 273-278. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Descriptors: blood, rats, sampling, heart, body parts, cardiovascular system, ventrical, methods, mixed venous sample, hematology, blood specimen collection.

Haemisch, A., G. Guerra, and J. Furkert (1999). **Adaptation of corticosterone--but not beta-endorphin--secretion to repeated blood sampling in rats.** *Laboratory Animals* 33(2): 185-191. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Effects of short-term repeated blood sampling on the secretion of corticosterone (CORT) and beta-endorphin (beta-END) were evaluated in male Wistar rats. Blood was drawn from the tail vein of conscious rats four times within 2 h both at the peak and trough period of the diurnal corticosterone secretion cycle. All rats were well accustomed to the procedure. The main findings were: (1) At both sampling intervals, CORT increased significantly in response to the first sampling and declined to baseline values in successive sample. (2) beta-END also increased significantly in response to the first sampling but remained elevated in successive samples. (3) Intensities of initial CORT and beta-END responses correlated positively with each other and with the baseline beta-END values. Feedback inhibition of CORT secretion with sustained elevation of beta-END titres suggests a moderate stress intensity of the repeated blood sampling procedures. In general, due to lack of short-term feedback inhibition, beta-END seems to reflect the effects of repeated administration of moderate intense stressors more closely than CORT.

Descriptors: rats, blood sampling, corticosterone, endorphins, hormone secretion, stress response, animal welfare, blood plasma, diurnal variation.

Hamaya, T., A. Ohta, T. Kono, R. Aono, and K. Horikoshi (1998). **Effect of magnetite on the hematocrit value in exsanguinated rats**. *Bioscience, Biotechnology and Biochemistry* 62(5): 993-995. ISSN: 0916-8451.

Abstract: Magnetite prepared by an enzyme-dependent reaction gradually released iron ion into the acidic-to-neutral buffer solution. A preparatory experiment was performed to examine the efficiency of magnetite as an iron supplement. Feeding exsanguinated rats with being magnetite resulted in the hematocrit value being recovered without any serious adverse effect on the digestive organs.

Descriptors: rats, hematocrit, anemia, iron, dosage effects, ferrous sulphate, magnetic properties, digestive system, exsanguinated, heavy metals, inorganic acid salts, mammals, metallic elements, Rodentia, salts, sulphates.

Han, J., M. Hosokawa, M. Umezawa, H. Yagi, T. Matsushita, K. Higuchi, and T. Takeda (1998). **Age-related changes in blood pressure in the senescence-accelerated mouse (SAM): aged SAMP1 mice manifest hypertensive**

vascular disease. *Laboratory Animal Science* 48(3): 256-263. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Abstract: Age-related changes in systolic blood pressure were assessed, using the senescence-accelerated mouse (SAM) model for aging research with strains SAMR1, SAMP1, and SAMP8. Each of the strains manifested a characteristic change in blood pressure with age. The SAMR1 strain, with normal aging, did not have chronologic changes from 2 to 27 months of age. The SAMP1 strain, with accelerated senescence, had a significant increase in blood pressure with age, and some (8 of 39) mice manifested hypertensive vascular disease characterized by high blood pressure, cardiac hypertrophy, and arteriolar fibrinoid necrosis at 11 to 14 months of age. The gradual increase in blood pressure after 8 to 16 months was considered to be preceded by progressive renal changes, from glomerulonephritis to contraction of the kidney, suggesting that the high blood pressure in the SAMP1 strain was of renal origin. Blood pressure in the SAMP8 strain, with age-related deficits in learning and memory, gradually decreased after 5 to 7 months of age, and was suggested to be due to the astrogliotic changes in response to spongiform degeneration in the medulla oblongata at 11 to 14 and 15 to 18 months of age.
Descriptors: mice, blood pressure, age, senescence, biological differences, kidneys, glomerulonephritis, aging, brain, spongiform encephalopathy, histopathology, biological development, blood circulation, body parts, central nervous system, developmental stages, encephalopathy, kidney diseases, mammals, nervous system, nervous system diseases, organic diseases, pathology, physiological functions, Rodentia, urinary tract, urinary tract diseases, urogenital system, age differences, strain differences, senility, medulla oblongata.

Harris, M.B. and W.K. Milsom (2001). **Vagal feedback is essential for breathing in unanesthetized ground squirrels.** *Respiration Physiology* 125(3): 199-212. ISSN: 0034-5687.
Abstract: The roles of vagal afferent feedback in terminating inspiration and modulating breathing pattern and ventilatory responses to hypoxia and hypercapnia were assessed in the golden-mantled ground squirrel, *Spermophilus lateralis*, during wakefulness and urethane anesthesia. Hypoxia increased ventilation primarily through increases in breathing frequency (f(R)) while hypercapnia increased ventilation primarily through increases in tidal volume (V(T)) in both anesthetized and unanesthetized animals. Vagotomy resulted in an increase in tidal volume, a decrease in breathing frequency and ventilation, and depressed ventilatory responses to both hypoxia and hypercapnia in anesthetized animals. In unanesthetized animals vagotomy produced a transient 'gasp-like' breathing pattern that rapidly progressed to a non-obstructive central apnea. These data indicate that vagal feedback shapes ventilation on a breath-by-breath basis during anesthesia and is essential for ventilation in unanesthetized animals. The mechanisms that transform the influences of vagal input on breathing between anesthetized and unanesthetized states remain unclear. Changes in breathing pattern induced by the removal of vagal feedback compromise chemoreflexes.
Descriptors: ground squirrels, inspiration, breathing pattern, vagal feedback, breathing, vagotomy.

Hayssen, V. (2001). **Body and organ mass in agouti and non-agouti deer mice (*Peromyscus maniculatus*).** *Comparative Biochemistry and Physiology, Part A, Molecular and Integrative Physiology* 130(2): 311-21. ISSN: 1095-6433.
NAL Call Number: QP1.C6
Abstract: Body, adrenal, brain, heart, liver, kidney, spleen and testis masses were determined for agouti and non-agouti deer mice (*Peromyscus maniculatus gracilis*) of both sexes. Body mass was highest for non-agouti females and lowest for agouti females; and sex differences in body mass were significant for agouti, but not non-agouti, deer mice. Adrenal, brain and liver masses were similar between color morphs; heart mass was greater in agouti males; and kidney, spleen and testis masses were all significantly greater for non-agouti deer mice. Splenomegaly in non-agouti deer mice was prominent, as spleens of non-agouti deer mice were 50% larger than those of agouti animals. Sex differences varied across organs and color morphs. For both color morphs, males had heavier adrenals and brains, whereas females had heavier livers and spleens. Kidney and heart mass was greater for female non-agouti deer mice, but for agouti animals, heart mass was greater in males and kidney mass differed little between the sexes. For both color morphs, testes and spleen mass was altered by photoperiod in 72 deer mice housed under short- or long-day conditions and the effect was stronger in non-agouti animals. This is the first report of splenomegaly and sex-specific body mass differences associated with the non-agouti allele.
Descriptors: deer mice, body weight, anatomy, agouti, non agouti, histology, organ size, body mass, organ

mass, sex differences.

Hem, A., A.J. Smith, and P. Solberg (1998). **Saphenous vein puncture for blood sampling of the mouse, rat, hamster, gerbil, guineapig, ferret and mink**. *Lab Animal* 32(4): 364-368. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: blood sampling, minks, mice, rats, methods, blood, sampling, animal welfare, hamsters, gerbils, guinea pigs, ferrets, blood specimen collection.

Hem, A. and P. Solberg (1998). **Blood collection using the saphenous vein: An alternative to retro-orbital collection.** *Laboratory Animals* 32: 364-368. ISSN: 0023-6772.
Online: http://www.uib.no/vivariet/mou_blood/Blood_coll_mice_.html
NAL Call Number: QL55.A1L3
Abstract: A step by step procedure with good photos and explanation of the procedure.
Descriptors: alternative, retro-orbital, blood collection, saphenous vein, web site.

Higuchi, H., A. Mitomi, T. Tsurumaki, T. Yamaguchi, and A. Hasegawa (2001). **Blood pressure, contraction of vascular smooth muscle and feeding behavior of npy-y1 receptor knock-out mice**. *Japanese Journal of Pharmacology* 85(Supplement 1): 161. ISSN: 0021-5198.
Descriptors: mice, blood pressure, feeding behavior, meeting abstract, smooth muscle, contraction.
Notes: Meeting Information: 74th Annual Meeting of the Japanese Pharmacological Society, March 21-23, 2001, Yokohama, Japan.

Hoff, J. (2000). **Methods of blood collection in the mouse.** *Lab Animal* 29(10): 47-53. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: mice, laboratory animals, blood specimen collection, veins, vena cava, jugular vein, heart, eyes, anesthesia, blood volume, tail, saphenous vein, dorsal pedal vein, orbital sinus, cardiac puncture, animal use refinement.

Ignat'ev, D.A., G.S. Sukhova, and V.P. Sukhov (2001). **The analysis of changes in heart rate and temperature of ground squirrel *Citellus undulatus* in various physiological states**. *Zhurnal Obshchei Biologii* 62(1): 66-77. ISSN: 0044-4596.
Descriptors: ground squirrel, heart rate, temperature, changes, hibernation, arousal, physiological state.

Ishida Kakizoe, Y., A. Wada, Y. Kannan, T. Mizuno, and M. Tsudzuki (1998). **Postnatal blood cell counts of Japanese house mice (*Mus musculus molossinus*): maintenance of low numbers of white blood cells**. *Laboratory Animal Science* 48(5): 533-534. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Descriptors: mice, young animals, leukocytes, cell counting, age, granulocytes, lymphocytes, erythrocytes, biological differences, biological analysis, blood, blood cells, cells, leukocytes, mammals, Rodentia, age differences, neutrophils, erythrocyte count, normal values, strain differences.

Ivanusa, T. (2001). **Merjenje pretoka krvi v SA-1 tumorjih misi z uporabo makromolekularnih kontrastnih sredstev pri slikanju z magnetno resonanco. [Blood flow evaluation in SA-1 tumours in mice using macromolecular contrast agents in magnetic resonance imaging].** *Slovenski Veterinarski Zbornik* 38(2): 161-170. ISSN: 1580-4003.
Abstract: Magnetic resonance imaging (MRI) is a diagnostic tool for soft tissue differentiation. This can be improved by the use of contrast media: low-molecular-weight media such as clinically approved Gd-DTPA (gadolinium(III)-diethilentriaminepentaacetic acid) and macromolecular contrast media. Macromolecular contrast agents are being developed to investigate blood pool, to specifically enhance the blood pool and to evaluate capillary-integrity. These agents are not available yet for clinical use. Two prototype macromolecular contrast media were used in this study: gadomer-17 and polylysine-Gd-DTPA and compared to Gd-DTPA. With their use the quality of tumor vessels was described, specifically blood volume (BV) and permeability (PS) of untreated tumors and tumors treated with vinblastine or electric pulses. The study has shown that both macromolecular contrast media are superior to Gd-DTPA in determining tumor vessels, i.e. BV and PS. With

the use of dynamic contrast-enhanced MRI the efficacy of both treatment was shown as a decrease in BV and PS values. Application of electric pulses was more effective than vinblastine. Amongst the three used contrast media, gadomer-17 is the most appropriate for the future clinical use. The results of the present research are new accomplishment in the use of macromolecular contrast media for evaluation of tumor blood pool and understanding of vinblastine or electric pulses action on tumor vessels.
Descriptors: mice, blood flow evaluation, neoplasms, diagnosis, imagery, therapy, stimuli, mammals, methods, organic diseases, magnetic resonance imaging, MRI.
Language of Text: Slovenian summary.

Jacobson, C. and M. Maslov (2001). **Effects of extruded or pelleted diet on blood glucose, body weight, feed and water consumption in rats**. *Scandinavian Journal of Laboratory Animal Science* 28(3): 129-139. ISSN: 0901-3393.
Descriptors: laboratory animals, diet, blood sugar, body weight, feed consumption, water uptake, pellets, blood, blood composition, consumption, formulations, nutrient uptake, nutrition physiology, physiological functions, useful animals.
Language of Text: Swedish summary.

Jareo, P.W., L.C. Preheim, M.U. Snitily, and M.J. Gentry (1997). **Use of magnetic cell sorting to isolate blood neutrophils from rats**. *Laboratory Animal Science* 47(4): 414-418. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Abstract: The difficulty in obtaining sufficient numbers of neutrophils from rat blood limits the usefulness of this species in studies involving neutrophil function. To increase the neutrophil yield from rats drinking alcohol on a long-term basis, which further decreases neutrophil yield, we developed a magnetic cell-sorting technique. The rats were exsanguinated and neutrophils were isolated, using either traditional density gradient centrifugation or magnetic cell sorting. In the latter method, the leukocytes were labeled with biotinylated anti-rat granulocyte antibodies, followed by addition of streptavidin-conjugated superparamagnetic microbeads. The labeled cell suspension was applied to a steel wool column suspended within a magnetic field. Unlabeled cells were washed through the column. Retained, labeled neutrophils were eluted after the column was removed from the magnetic field. Compared with density gradient centrifugation, magnetic cell sorting yielded two- to fivefold higher neutrophil numbers per rat with increased purity. Viability was comparable for neutrophils isolated by the two techniques. Magnetic cell sorting is a rapid, gentle method for isolation of rat blood neutrophils and enhances the potential usefulness of rats in neutrophil-related research.
Descriptors: granulocytes, grading, isolation techniques, centrifuging, blood, rats, blood, blood cells, cells, leukocytes, Rodentia, separating, magnetic separation, density gradient centrifugation, comparisons.

Johns, E.J. and G.D. Bristow (1998). **Cardiovascular responses to light and darkness in normotensive and hypertensive rats**. *Fundamental and Clinical Pharmacology* 12(Supplement 1): 77S.
Descriptors: rats, hypertensive, light, darkness, cardiovascular response, normotensive.
Notes: Meeting Information: Satellite Symposium to the 17th Scientific Meeting of the International Society of Hypertension on Blood Pressure Variability in Health and Disease, June 5, 1998, Nancy, Paris.

Jones, M.A., J.M. Vanness, and J.M. Overton (1997). **Short-term food deprivation reduces blood pressure in spontaneously hypertensive rats (shr)**. *FASEB Journal* 11(3): A467. ISSN: 0892-6638.
Descriptors: rats, hypertensive, blood pressure, food deprivation, short term, reduces.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 97, April 6-9, 1997, New Orleans, Louisiana, USA.

Jong, W.M.C., C.J. Zuurbier, R.J. De Winter, D.A.F. Van den Heuvel, P.H. Reitsma, and H.I.C. Ten Cate (2002). **Fentanyl-fluanisone-midazolam combination results in more stable hemodynamics than does urethane-alpha-chloralose and 2,2,2-tribromoethanol in mice.** *Contemporary Topics in Laboratory Animal Science* 41(3): 28-32. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory mammals, animal models, anesthesia, fentanyl, intraperitoneal injection, benzodiazepines, neuroleptics, drug combinations, urethane, chloralose, ethanol, blood pressure, heart rate, drug

toxicity, cardiovascular system, animal welfare.

Kerins, G.M. and A.D. MacNicoll (1999). **Comparison of the half-lives and regeneration rates of blood clotting factors II, VII, and X in anticoagulant-resistant and susceptible Norway rats (*Rattus norvegicus Berk*.)**. *Comparative Biochemistry and Physiology, Part C, Pharmacology, Toxicology and Endocrinology* 122(3): 307-316. ISSN: 1367-8280.
Descriptors: rodents, blood proteins, rats, blood plasma, pesticides, resistance to chemicals, vertebrates, noxious animals, rodenticides, chemical control, pest control, blood, blood composition, Chordata, control methods, mammals, noxious animals, noxious mammals, pesticides, pests, Rodentia, blood coagulation factors, *Rattus norvegicus*, resistance mechanisms.

Khan, K.N.M., W.J. Komocsar, I. Das, N.C. Lassaro, P.B. Senese, P. Hamilton, A. Roth, and P.F. Smith (1996). **Effect of bleeding site on clinical pathologic parameters in Sprague-Dawley rats: retro-orbital venous plexus versus abdominal aorta**. *Contemporary Topics in Laboratory Animal Science* 35(5): 63-66. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, arteries, blood composition, pathology, blood, blood vessels, retro orbital, cardiovascular system, bleeding site, effect, blood chemistry, physiopathology.

Kile, B.T., C.L. Mason Garrison, and M.J. Justice (2003). **Sex and strain-related differences in the peripheral blood cell values of inbred mouse strains**. *Mammalian Genome* 14(1): 81-85. ISSN: 0938-8990.
Descriptors: mouse, inbred strains, related differences, peripheral blood cell values, sex differences.

Kimura, T., T. Yamamoto, A. Sone, A. Takenaka, and M. Fujisawa (2005). **Assessment of microheterogeneity of blood flow in the rat urinary bladder by high-resolution digital radiography**. *BJU International* 95(6): 895-897. ISSN: 1464-4096.
Abstract: To assess high-resolution digital radiography for measuring blood flow and thus examine the microheterogeneity of bladder microcirculation in a rat model. Microheterogeneity of blood flow in both mucosa and detrusor muscle of eight anaesthetized rats was investigated using an imaging technique with very high spatial resolution (0.1 x 0.1 mm2) using digital radiography combined with the deposition of 3H-labelled desmethylimipramine. The spatial pattern of blood flow was quantified by the coefficient of variation of the regional flow (CV = sd/mean). Muscle blood flow was less than mucous blood flow (muscle : mucosa, 2.9 : 5) in the empty bladder. In the muscle layer the blood flow distribution was more heterogeneous than that in the mucosa, with a mean (smallcapitals>sd/smallcapitals>) CV in muscle and mucosa of 0.33 (0.033) and 0.16 (0.019), respectively (P < 0.001) at the capillary level. There was a heterogeneous distribution of blood flow in the microcirculation to capillary vessels in the muscular layer, possibly reflecting a difference in dynamic blood flow of regional perfusion of the emptied bladder.
Descriptors: cardiovascular system, transport and circulation, methods and techniques, muscular system, movement and support, urinary system, chemical coordination and homeostasis, high resolution digital radiography, laboratory techniques, blood flow microheterogeneity.

Kitching, A. (2000). **A refined method of repeated blood sampling in mice.** *Animal Technology* 51(1): 67-70. ISSN: 0264-4754.
NAL Call Number: QL55.I5
Descriptors: mice, blood sampling, veins, restraint of animals, environmental temperature, blood flow, animal use refinement, coccygeal vein, restraining cone, warming.

Klemetti, E., S. Rico Vargas, and P. Mojon (2005). **Short duration hyperbaric oxygen treatment effects blood flow in rats: pilot observations**. *Laboratory Animals* 39(1): 116-121. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: oxygen, hyperbaric, effects, blood flow, rats, observations, short, duration.

Kudo, H., K. Fukuta, S. Imai, I. Dahlan, N. Abdullah, Y.W. Ho, and S. Jalaludin (1997). **Establishment of lesser mouse deer (*Tragulus javanicus*) colony for use as a new laboratory animal and/or companion animal: Behavior, hematological characteristics, reproductive physiology, rumen microbiology in relation to feed**

digestibility and metabolic activities. *Jircas Journal for Scientific Papers* (4): 79-88. ISSN: 1340-7686.
Descriptors: Cervidae, laboratory animals, behavior, reproduction, herds, pet animals, blood cells, rumen digestion, metabolism, blood, cells, digestion, mammals, physiological functions, ruminants, useful animals.
Language of Text: English and Japanese summaries.

Kuriyama, T., K. Oishi, H. Kakazu, and K. Machida (1998). **[Changes of physiological functions in rats induced by immobilization stress]**. *Nippon Eiseigaku Zasshi [Japanese Journal of Hygiene]* 52(4): 647-53. ISSN: 0021-5082.
Abstract: A study was conducted on the changes of physiological function in rats due to immobilization stress. Male Fischer rats (SPF) of 32 weeks of age were housed in individual cages for 4 weeks. Then all rats were immobilized by stainless wire mesh for 6 hours daily for 3 days. Blood was collected before the 1st stress, immediately after the 1st stress, immediately after the 3rd stress and the day after the 3rd stress. The results of this experiment were as follows: (1) The total leukocyte counts in the blood of the rats after the 1st trial was significantly higher than that before the 1st trial. (2) The percentage of lymphocytes in the blood after the 1st trial was significantly lower than that before the 1st trial, whereas that of neutrophils was significantly higher. (3) Correlations between phagocytic activity and superoxide production of neutrophils by histochemical NBT reduction assay showed significantly a positive correlation before the 1st trial. However, no significant correlations were observed in immediately after the 1st trial and the 3rd trial. The day after the 3rd trial, a positive correlation was observed again. These correlations showed that an unsuitable state of the neutrophil function was induced by the immobilization stress. (4) Serum biochemical profiles were affected by the immobilization stress. Also, GOT, GPT, LDH, CK and UA were increased after the 1st trial, whereas, TG, TP, ALB and ALP were decreased after the 1st trial. T-CHO was increased only immediately after the 3rd stress. These results suggest that immobilization stress affected blood cells and serum components, and then the host defense and physiological functions were damaged respectively.
Descriptors: immobilization adverse effects, stress physiopathology, leukocyte count, neutrophils physiology, phagocytosis, inbred F344 rats, superoxides metabolism.
Language of Text: Japanese.

Lewis, R.M., A.J. Forhead, C.J. Petry, S.E. Ozanne, and C.N. Hales (2002). **Long-term programming of blood pressure by maternal dietary iron restriction in the rat.** *British Journal of Nutrition* 88(3): 283-290. ISSN: 0007-1145.
NAL Call Number: 389.8 B773
Abstract: We have reported that blood pressure was elevated in 3-month-old rats whose mothers were Fe-restricted during pregnancy. These animals also had improved glucose tolerance and decreased serum triacylglycerol. The aim of the present study was to determine whether these effects of maternal nutritional restriction, present in these animals at 3 months of age, can be observed in the same animals in later life. Pulmonary and serum angiotensin converting enzyme (ACE) concentrations were also measured to investigate whether the renin-angiotensin system was involved in the elevation of blood pressure observed in the offspring of Fe-restricted dams. Systolic blood pressure was higher in the offspring of Fe-restricted dams at 16 months of age. Heart and kidney weight were increased as a proportion of body weight in the offspring of Fe-restricted dams. The pulmonary ACE concentration was not significantly different between the groups. The serum ACE concentration was significantly elevated in the offspring of Fe-restricted dams at 3 but not 14 months of age. There was a strong correlation between serum ACE levels at 3 and 14 months of age. Glucose tolerance and serum insulin were not different between the maternal diet groups. Serum triacylglycerol tended to be lower in the offspring of Fe-restricted dams. There were no differences in serum non-esterified fatty acids or serum cholesterol between the maternal diet groups. This study provides further evidence that maternal nutrition has effects on the offspring that persist throughout life. At 16 months of age, the elevation of blood pressure in Fe-restricted offspring does not appear to be mediated via changes in ACE levels. Both. cardiac hypertrophy and decreased serum triacylglycerol have also been observed in Fe-restricted fetuses, suggesting that these changes may be initiated in utero.
Descriptors: iron, maternal nutrition, pregnancy, longitudinal studies, blood pressure, progeny, heart, kidneys, liver, lungs, weight, body weight, diet, experimental diets, rats, animal models, hemodynamics, hydrolases, blood serum, insulin, blood lipids, gender differences, blood glucose, long term effects, renin angiotensin system, angiotensin converting enzyme, animal organs.

Li, W. and S.C.S. Chung (2003). **Flow cytometric evaluation of leukocyte function in rat whole blood**. *In Vitro Cellular & Developmental Biology Animal* 39(10): 413-419. ISSN: 1071-2690.

Abstract: The aim of this study was to establish a standard flow cytometric method to measure the phagocytic function of and intracellular hydrogen peroxide (H2O2) production by rat leukocytes. Thirty-six adult, male Sprague-Dawley rats were included in this study. Whole-blood specimens from the inferior vena cava were collected in a heparinized tube and ethylenediaminetetraacetic acid (EDTA) anticoagulated tube. The phagocytic function of and intracellular H2O2 generation by leukocytes were measured with FACS Vantage registered flow cytometer (Becton Dickinson, San Jose, CA), using fluorescent microspheres and dihydrorhodamine-123 as probes, respectively. Several conditions were optimized in this study, including anticoagulants (heparin and EDTA), fluorescent probes (0.75- and 1.72- mu m-diameter microspheres), incubation time, and concentration of the chemicals used in the experiment. Neutrophils, monocytes, and lymphocytes could be clearly defined and separated in whole blood by flow cytometry and tested for phagocytosis and intracellular H2O2 generation without the need for further purification and handling of the cells. Intracellular H2O2 production by and phagocytic function of neutrophils and monocytes were inhibited in EDTA-anticoagulated blood compared with heparin- anticoagulated blood ($P < 0.01$). Neutrophils showed similar phagocytic function to 0.75- and 1.72- mu m microspheres, but monocytes showed weak phagocytic activity to 1.72- mu m beads compared with 0.75- mu m beads ($P < 0.01$). In conclusion, a flow cytometric method to measure the phagocytic function of and intracellular H2O2 production by rat leukocytes has been developed. Quantitative flow cytometric analysis of rat leukocyte function is convenient and feasible and provides a reliable and rapid assay to assess phagocytosis and intracellular H2O2 production by rat neutrophils and monocytes.

Descriptors: rat whole blood, leukocyte function, flow cytometry, evaluation, blood, phagocytic function.

Liu, J.Y., T.G. Diaz III, J.V. Vadagama, and J.P. Henry (1996). **Tail sectioning: a rapid and simple method for repeated blood sampling of the rat for corticosterone determination**. *Laboratory Animal Science* 46(2): 243-245. ISSN: 0023-6764.

NAL Call Number: 410.9 P94

Descriptors: blood sampling, blood plasma, glucocorticoids, methods, analytical methods, rats, adrenal cortex hormones, blood, corticoids, tail sectioning, repeated blood sampling, Rodentia, rapid methods.

Mang'era, K., M. Krzyzelewski, S. Greaves, D. Greenberg, and M. Billinghurst (2005). **Molecular-size fractionation of pentastarch, radiolabelling with tc-99m, and evaluation of biological behaviour in mice**. *Nuclear Medicine Communications* 26(4): 375-381. ISSN: 0143-3636.

Descriptors: blood and lymphatics, transport and circulation, radiation biology, radiolabeling, laboratory techniques, behavior, stability, fractionation.

Manni, L., A. Antonelli, N. Costa, and L. Aloe (2005). **Stress alters vascular-endothelial growth factor expression in rat arteries: role of nerve growth factor**. *Basic Research in Cardiology* 100(2): 121-130. ISSN: 0300-8428.

Abstract: The aim of this study was to investigate the role of stress and nerve growth factor (NGF) on the expression of vascular-endothelial growth factor (VEGF) and NGF high-affinity receptor (tyrosine kinase A, TrKA) in the ascending and abdominal aorta. Adult male rats were exposed to immobilization stress for one hour or injected with purified murine NGF. Four hours after treatments, rats were sacrificed and VEGF, NGF and TrkA expression in ascending and abdominal aorta evaluated. The effects of anti-NGF treatment on arterial VEGF expression and on stress-induced arterial cell proliferation were also studied in control and stressed rats. The data indicated that both stress and NGF injection induced a rapid increase of arterial VEGF associated with an elevated level of NGF and TrkA in arterial tissues. Blocking NGF action by neutralizing NGF-antibodies, results in down-regulation of stress-induced VEGF expression by arteries and in the blockade of stress-induced proliferation of cells from the arterial wall. Overall our data demonstrated that NGF is involved in the regulation of VEGF and in cardiac vessels response after emotional stress.

Descriptors: rat, arteries, nerve, growth factor, stress, vascular, endothelial, expression.

Martineau, L. and M.B. Ducharme (1998). **A chronic arterial cannula for blood sampling in conscious, unrestrained rats**. *Contemporary Topics in Laboratory Animal Science* 37(5): 67-72. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23
Descriptors: rats, blood sampling, cannulae, arteries, inflammation, body weight, restraint of animals, animal welfare, leukocyte count, cytokines.

Martinez, R.R., J.C. Perez, E.E. Sanchez, and R. Campos (1999). **The antihemorrhagic factor of the Mexican ground squirrel, (*Spermophilus mexicanus*).** *Toxicon* 37(6): 949-54. ISSN: 0041-0101.
NAL Call Number: 391.8 T66
Abstract: The Mexican ground squirrel (*Spermophilus mexicanus*) has a natural resistance to western diamondback rattlesnake venom (*Crotalus atrox*). The LD50 for the Mexican ground squirrel is 53 mg/kg body weight, which is 13 times higher than that of BALB/c mice. An antihemorrhagic factor from serum of the Mexican ground squirrel was isolated using Sephadex G-200 gel filtration, ion exchange A-50, G-75 gel filtration and HPLC DEAE 5PW ion exchange chromatography. The purified factor neutralized proteolytic and hemorrhagic activity of crude *C. atrox* venom. The results of this research suggest that the antihemorrhagic factor in the serum of the Mexican ground squirrel is not an antibody and neutralizes hemorrhagic activity of *C. atrox* venom.
Descriptors: antivenins blood, blood proteins isolation and purification, Sciuridae blood, antigen antibody complex immunology, antivenins isolation and purification, blood proteins immunology, chromatography, gel chromatography, ion exchange, dextrans, electrophoresis, polyacrylamide gel, enzyme inhibitors, hydrogen ion concentration, lethal dose 50, metalloendopeptidases antagonists and inhibitors, mice, inbred BALB c mice, rabbits.

Mattson, D.L. (1998). **Long-term measurement of arterial blood pressure in conscious mice.** *American Journal of Physiology* 274(2, Part 2): R564-70. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: This study describes a technique for the direct daily measurement of arterial blood pressure, sampling of arterial blood, and continuous intravenous infusion in free-moving, conscious, Swiss-Webster mice. Catheters were chronically implanted in the femoral artery and vein, tunneled subcutaneously, exteriorized at the back of the neck in a lightweight tethering spring, and attached to a swivel device at the top of the cage. Time-control experiments (n = 8) demonstrated stable values of mean arterial pressure (MAP, 116 +/- 1 mmHg) and heart rate (HR, 627 +/- 21 beats/min) for up to 35 days after catheter implantation. It was further observed that restraining mice (n = 7) increased MAP by 10 +/- 3 mmHg and HR by 78 +/- 8 beats/min from the values observed under free-moving conditions. To demonstrate the chronic use of the venous catheter, intravenous infusion of NG-nitro-L-arginine methyl ester (L-NAME, 8.6 mg.kg-1.day-1, n = 6) for 5 days significantly increased MAP from 117 +/- 4 to 131 +/- 4 mmHg without altering HR. In a final group of mice (n = 5), oral L-arginine (2% in drinking water) increased plasma arginine concentration from 90 +/- 7 to 131 +/- 17 microM and prevented L-NAME hypertension. These experiments illustrate the feasibility of long-term intravenous infusion, direct arterial blood pressure measurements, and arterial blood sampling in conscious mice.
Descriptors: mice, blood pressure determination methods, arteries, blood pressure drug effects, blood specimen collection methods, catheters, indwelling, longterm measurement, heart rate, infusions, intravenous.

Mohamed, A.S.M. (1998). ***Physiological studies on the effect of some stressful stimuli on blood coagulation in rats***. Dissertation, Cairo University: Cairo, Egypt. 89 p.
Descriptors: laboratory animals, rats, blood coagulation, functional disorders, stress, hypoglycemia, blood physiology, disorders, mammals, metabolic disorders, physiological functions, Rodentia.
Notes: Thesis (M.V.Sc. in Physiology).

Morimoto, Y., S. Kohyama, K. Nakai, H. Matsuo, F. Karasawa, and M. Kikuchi (2003). **Long-term effects of UV light on contractility of rat arteries in vivo.** *Photochemistry and Photobiology* 78(4): 372-376. ISSN: 0031-8655.
Descriptors: rat, arteries, contractility, UV light, long term, effects, smooth muscle cells, loss, contractile responses, reduced, endothelial function.

Mostafa, H.F.A. (1996). ***Bone marrow and blood immunohistochemical studies experimentally induced leukaemia in rat***. Dissertation, Assiut Univ.: Egypt. 220 p.

Descriptors: rats, laboratory animals, leukemia, bone marrow disorders, blood disorders, histopathology, disorders, functional disorders, mammals, neoplasms, organic diseases, pathology.
Notes: Thesis (Ph.V.D. in Pathology and Clinical Pathology).

Nico, B., G.P. Nicchia, A. Frigeri, P. Corsi, D. Mangieri, D. Ribatti, M. Svelto, and L. Roncali (2004). **Altered blood-brain barrier development in dystrophic MDX mice**. *Neuroscience* 125(4): 921-935. ISSN: 0306-4522.
Abstract: In order to ascertain whether the alterations of the bloodabrain barrier (BBB) seen in adult dystrophic mdx-mice [Glia 42 (2003) 235], a human model of Duchenne muscular dystrophy (DMD), are developmentally established and correlated with other dystrophin isoforms which are localized at the glialavascular interface, we used immunocytochemistry to investigate the expression of dystrophin isoforms (Dp71) during BBB development in mdx fetuses and in adult mice. Parallelly, we used Western blot, immunocytochemistry and immunogold electron microscopy to analyze the expression of the zonula occludens (ZO-1), aquaporin-4 (AQP4) and glial fibrillary acidic (GFAP) proteins as endothelial and glial markers, and we evaluated the integrity of the mdx BBB by means of intravascular injection of horseradish peroxidase (HRP). The results show reduced dystrophin isoforms (Dp71) in the mdx mouse compared with the control, starting from early embryonic life. Endothelial ZO-1 expression was reduced, and the tight junctions were altered and unlabeled. AQP4 and GFAP glial proteins in mdx mice also showed modifications in developmental expression, the glial vascular processes being only lightly AQP4- and GFAP-labeled compared with the controls. Confocal microscopy and HRP assays confirmed the alteration in vessel glial investment, GFAP perivascular endfoot reactivity being strongly reduced and BBB permeability increasing. These results demonstrate that a reduction in dystrophin isoforms (Dp71) at glial endfeet leads to an altered development of the BBB, whose no-closure might contribute to the neurological dysfunctions associated with DMD.
Descriptors: MDX mice, altered blood brain barrier, development, muscular dystrophy.

Nikolaishvili, L.S., L.S. Gobechiya, and N.P. Mitagvariya (2004). **The effects of fentanyl and morphine on local blood flow and oxygen tension in the frontoparietal cortex and nucleus accumbens of the brain in white rats**. *NeuroScience and Behavioral Physiology* 34(5): 467-471. ISSN: 0097-0549.
Abstract: Studies on white rats showed that intraperitoneal administration of small doses of fentanyl (0.005 mg/kg) and morphine (1 mg/kg) decreased local blood flow and increased partial pressure of oxygen (pO sub(2)) in the frontoparietal area of the cerebral cortex but had the opposite effects in the nucleus accumbens - where there was a significant increase in local blood flow and just as significant a decrease in pO sub(2). Analysis of the data led to the conclusion that these changes must result from significant changes in functional-metabolic activity in these structures, induced by intraperitoneal administration of fentanyl or morphine.
Descriptors: white rats, morphine, fentanyl, blood flow, effects, oxygen tension, brain.

Oh, S.H. and S.G. Do **[Reference values of body weight, blood pressure, hematology and serum biochemistry in the Sprague-Dawley (SD) rats from 24 to 30 months]**. *Korean Journal of Laboratory Animal Science* 17(4): 275-282. ISSN: 1225-813X.
Abstract: A reference values comprising body weight gain, blood glucose, blood pressure, heamatology, serum biochemistry and anatomopathological study in the Sprague-Dawley (SD) rats from 24 to 30 months is described. Comparisons between age and sex were analysed. Weight gain, blood glucose, blood pressure, and heamatology in both sexes followed patterns consistent with other studies.
Descriptors: rats, reference values, aging, blood pressure, body weight, hematology, blood circulation, serum biochemistry.
Language of Text: Korean with an English summary.

Overton, J.M., J.M. Van Ness, and R.M. Casto (1997). **Food restriction reduces sympathetic support of blood pressure in spontaneously hypertensive rats**. *Journal of Nutrition* 127(4): 655-660. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Abstract: We tested the hypothesis that food restriction would attenuate the development of hypertension in spontaneously hypertensive rats (SHR). Furthermore, we hypothesized that food restriction would reduce the tonic sympathetic nervous system support of blood pressure in the SHR. Male SHR (Charles River, age 5 wk) were randomly assigned to ad libitum (ADLIB, n=8) or food-restricted (FR, n = 9) groups. ADLIB rats were given free access to nonpurified diet and demineralized water. Food-restricted rats ate 60% of the amount of

nonpurified diet consumed by rats in the ADLIB group. After 8 wk of treatment, ADLIB rats were heavier than FR rats (ADLIB = 318 +/- 4 g; FR = 193+/- 5 g, P < 0.05). Blood pressure and heart rate (HR) were measured after chronic implantation of iliac arterial and jugular venous catheters. Food-restricted rats had lower mean arterial blood pressure (MAP) than ADLIB rats, measured in conscious, unrestrained state 4-6 h after catheterization (ADLIB = 162 +/- 3 mmHg; FR = 142 +/- 3 mmHg, P < 0.05) and measured on the day after surgery (ADLIB = 150 +/- 6 mmHg; FR = 130 +/- 3 mmHg, P < 0.05). There were no significant differences in resting HR on either day. Food-restricted rats exhibited augmented cardiac baroreflex-mediated bradycardia (bolus phenylephrine, 0.5-4.0 microgram/kg intravenously) as assessed by linear slope of the deltaHR/deltaMAP relationship (ADLIB = -0.73 beats/(min.mm Hg); FR = -1.62 beats/(min.mmHg), P < 0.05). Sympathetic support of blood pressure quantified by the depressor response to ganglionic blockade (hexamethonium 30 mg/kg; atropine 0.1 mg/kg intravenously), was greater in the ADLIB group (ADLIB: -59 +/- 8 mmHg; FR: -36 +/- 2 mmHg, P < 0.05). The results support the hypotheses that chronic food restriction reduces the development of hypertension and sympathetic support of MAP in spontaneously hypertensive rats.
Descriptors: starvation, blood pressure, hypertension, heart rate, restricted feeding, body weight, neurotropic drugs, rats, animal models, blood circulation, cardiovascular diseases, drugs, feeding, feeding systems, mammals, organic diseases, physiological functions, Rodentia, vascular diseases, arrhythmia, parasympatholytics.

Overton, J.M., L.M. Roberts, S.P. Gagnon, and T.D. Williams (2003). **Ambient temperature and blood pressure regulation in B6 mice.** *FASEB Journal* 17: 4-5 (Abstract No. 826.4). ISSN: 0892-6638.
Online: http://www.fasebj.org/
Descriptors: mice, B6 mice, blood pressure, ambient temperature, regulation, dark phase, light phase.
Notes: Meeting Information: FASEB Meeting on Experimental Biology: Translating the Genome, April 11-15, 2003, San Diego, CA, USA.

Pecaut, M.J., A.L. Smith, T.A. Jones, and D.S. Gridley (2000). **Modification of immunologic and hematologic variables by method of CO2 euthanasia.** *Comparative Medicine* 50(6): 595-602. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Background and Purpose: The major goal was to determine whether variations in the method of CO2 euthanasia would induce significant immunologic differences. Methods: Young adult C57BL/6 mice (n = 40) were euthanized, using four regimens: 70% CO2/30% O2; 70% CO2/30% O2 leads to 100% CO2; 100% CO2-naive chamber; and 100% CO2 pre-charged chamber. Time to recumbency and euthanasia and body, liver, lung, spleen, and thymus masses were determined. Blood and spleen were further evaluated for leukocyte, lymphocyte, and thrombocyte counts, erythrocyte characteristics, distribution of lymphocyte subpopulations, spontaneous and mitogen-induced blastogenesis, complement activity, and cytokine production. Results: Time to euthanasia was five- to eightfold longer in mice exposed to 70% CO2/30% O2 than that for any other group. There were slight increases in mean erythrocyte volume (MCV) and mean erythrocyte hemoglobin (MCH) for all groups, compared with those for the 100% CO2 pre-charged group. Circulating cytotoxic T (CD8(+)) lymphocyte percentages and numbers, and spontaneous blastogenesis of leukocytes in blood and spleen, also were affected by euthanasia method. Conclusions: The method of CO2 euthanasia can result in significant differences in immunologic/hematologic variables. Thus, consistency in euthanasia procedures may be important in accurate interpretation of research data.
Descriptors: mice, euthanasia, carbon dioxide, mixtures, oxygen, blood picture, lymphocytes, leukocyte count, spleen, lymphocyte transformation, complement activation, blood serum, blood plasma, transforming growth factor, interleukin 2, tumor necrosis factor, experimental design, animal welfare, distress.

Pedrazzini, T., J. Seydoux, P. Kuenstner, J.F. Aubert, V. Pasdrun, E. Grouzmann, F. Beermann, and H.R. Brunner (1998). **Cardiovascular response, feeding behaviour, and locomotor activity in NPY Y1 receptor-deficient mice**. *Society for Neuroscience Abstracts* 24(1-2): 2046. ISSN: 0190-5295.
Descriptors: feeding behavior, locomotor activity, cardiovascular response, deficient mice, NPY Y1 receptor.
Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 2, November 7-12, 1998, Los Angeles, California, USA.

Pelissier, A.L., M. Gantenbein, and B. Bruguerolle (1999). **Caffeine-induced modifications of heart rate,**

temperature, and motor activity circadian rhythms in rats. *Physiology and Behavior* 67(1): 81-88. ISSN: 0031-9384.
Abstract: The effects of repeated caffeine administration on the circadian rhythms of heart rate (H), body temperature (T) and motor activity (A) were examined in 8 unrestrained adult male Wistar rats (10 weeks old, mean weight 275 g) maintained under controlled conditions (LD 12:12, light from 0600 to 1800 h) by using radiotelemetry transmitters. The study was divided into three 7-day observation spans; a 1-week control span (P1), a 1-week treatment span (P2) and a 1-week recovery span (P3). P1 was performed for assessing baseline measurements of H, T and A. During P2, four rats received caffeine (25 mg/kg) at 0900 h, while 4 rats received saline in the same conditions every day of the observation span. H, T and A were continuously monitored and plotted every 10 min. For P1, P2 and P3, a power spectrum analysis (Fourier transform) was applied to determine the dominant period of rhythmicity. If H, T and A circadian rhythms were detected, the characteristics of these rhythms (mesors, amplitudes and acrophases) were determined by cosinor analysis, expressed as means +or- SEM and compared by analysis of variance. Caffeine did not suppress the circadian rhythmicity of H, T and A, but significantly increased mesors and decreased amplitudes of the 3 rhythms and advanced acrophases of temperature and activity compared to the control group.
Descriptors: heart, heart rate, temperature, body temperature, caffeine, circadian rhythm, rats.

Pelissier, A.L., M. Gantenbein, F. Prudian, and B. Bruguerolle (1998). **Effets d'une anesthesie generale a l'ether ou a la ketamine sur les rythmes circadiens de la temperature corporelle, de la frequence cardiaque et de l'activite locomotrice chez le rat. [Influence of general anaesthetics on circadian rhythms of heart rate, body temperature and locomotor activity in rats].** *STAL, Sciences Et Techniques De L' Animal De Laboratoire* 23(2): 91-98. ISSN: 0339-722X.
Descriptors: rats, anesthetics, influence, heart rate, temperature, locomotor activity, ketamine, ether, daily rhythm.
Language of Text: French with an English summary.

Pickard, C.L. and H.D. Mccarthy (1997). **The response of blood pressure to feeding composite diets of differing macronutrient composition in rats with hypertension of fetal origin**. *Proceedings of the Nutrition Society* 56(1A): 11A. ISSN: 0029-6651.
Descriptors: blood pressure, feeding, composite diets, macronutrients, rats, hypertension, response.
Notes: Meeting Information: Meeting of the Nutrition Society, June 24-28, 1996, Ulster, Coleraine.

Printz, M. (2000). **Radiotelemetry-based blood pressure, heart rate, and temperature analysis of recombinant inbred rat strains**. *Journal of Hypertension* 18(Supplement 4): S186. ISSN: 0263-6352.
Descriptors: rat, inbred strains, heart rate, temperature, blood pressure, radiotelemetry, recombinant.
Notes: Meeting Information: 18th Scientific Meeting of the International Society of Hypertension, August 20-24, 2000, Chicago, Illinois, USA.

Reddy, A.K., G.E. Taffet, S. Madala, L.H. Michael, M.L. Entman, and C.J. Hartley (2003). **Noninvasive blood pressure measurement in mice using pulsed Doppler ultrasound**. *Ultrasound in Medicine and Biology* 29(3): 379-385. ISSN: 0301-5629.
Abstract: Existing tail-cuff pressure devices for mice use tail flow sensors that measure only systolic and mean pressure. We developed a method to obtain systolic and diastolic pressure in mice using a pulsed Doppler flow velocity sensor and a tail-cuff and validated the method against pressure signals obtained simultaneously from a fluid-filled catheter. The tail-cuff was pressurized to suprasystolic levels to completely occlude the tail artery and then released gradually. The pressure at which the tail flow reappeared was recorded as systolic and the pressure at which the tail flow became continuous was recorded as diastolic. Regression analysis of tail-cuff pressures over catheter pressures obtained from healthy mice (n = 16) showed a high degree of association (r sub(sys) = 0.95, r sub(dia) = 0.94, both at p < 0.001). Bland-Altman analysis showed good agreement between the two methods, with a mean difference of -13 (plus or minus 12 SD) mmHg and 3 (plus or minus 10 SD) mmHg in the systolic (58 to 250 mmHg) and diastolic (48 to 178 mmHg) pressure measurements, respectively. Bland-Altman plots of tail-cuff blood pressures of a second group of mice (n = 20) showed good agreement between repeated measurements obtained on the same day, but had higher variability between measurements made on different days.

Descriptors: ultrasound, Doppler waves, blood pressure, arteries, mice.

Rogers, T.D., N.M. Gades, J.D. Kearby, C.K. Virgous, and J.T. Dalton (2002). **Chronic restraint via tail immobilization of mice: effects on corticosterone levels and other physiologic indices of stress.** *Contemporary Topics in Laboratory Animal Science* 41(1): 46-50. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory mammals, animal welfare, stress, blood sampling, immobilization, tail, blood serum, corticosterone, body weight, thymus gland, weight, spleen, adrenal glands, experimental design, animal use refinement.

Shipp, K. and B.D. Woodward (1998). **A simple exsanguination method that minimizes acute pre-anesthesia stress in the mouse: evidence based on serum corticosterone concentrations.** *Contemporary Topics in Laboratory Animal Science* 37(5): 73-77. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, blood sampling, blood serum, hydrocortisone, anesthesia, carbon dioxide, normal values, stress response, transport of animals, methoxyflurane, animal welfare, inhaled anesthetics, circadian rhythm, communication between animals.

Song, S.W., K.H. Kim, H.Y. Kim, S.J. Lee, and M.K. Chung (1996). **[The method of repeated blood collection in the lateral tail vein of rats using a needle catheter]**. *Korean Journal of Laboratory Animal Science* 12(2): 281-284. ISSN: 1225-813X.
Descriptors: rats, blood vessels, blood, collections, age, needle catheter, blood sampling, body parts, cardiovascular system, repeated blood collection, lateral tail vein.
Language of Text: Korean with an English summary.

Stout, R.W., D.Y. Cho, S.D. Gaunt, H.W. Taylor, and D.G. Baker (2001). **Transcutaneous blood gas monitoring in the rat.** *Comparative Medicine* 51(6): 524-533. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Transcutaneous blood gas (TCBG) analysis is a noninvasive alternative method of estimation of blood gas tensions. The objective of the study reported here was to validate this method against standard blood gas (STBG) analysis in adult and juvenile Sprague-Dawley rats. We sought to establish the optimal TCBG probe site and temperature, to establish probe temperatures that would not cause thermal burns, to evaluate correlations between blood gas values (PaCO2 and PaO2) determined by use of TCBG and STBG, and to evaluate the sensitivity of the TCBG unit to changes in arterial blood gas partial pressures. Our results indicated that: in general, the xyphoid area was the optimal site for probe placement, with 44.5 degrees C being the optimal probe temperature for the highest correlation, but thermal burns may be a problem; probe temperatures of 42.5 degrees C (adults) and 42.0 degrees C (juveniles) do not cause thermal burns when left in place for three hours; probe temperatures of 44 degrees C (adults) and 42 degrees C (juveniles) resulted in moderate correlation between PaCO2 and PtcCO2; and the TCBG unit adequately responded to changes in arterial blood gas partial pressures. Neither PtcCO2 or PtcO2 reflect actual values of PaCO2 or PaO2, respectively. We concluded that TCBG analysis may be used as an indicator of change in PaCO2 with sufficient animal numbers under tightly controlled conditions, but not as an indicator of change in PaO2 in adult and juvenile rats.
Descriptors: rats, blood gases, monitoring, validity, temperature, arteries, carbon dioxide, oxygen, animal testing alternatives, animal use refinement, animal use reduction, transcutaneous blood gas monitoring.

Suzuki, K., N. Koizumi, H. Hirose, R. Hokao, N. Takemura, and S. Motoyoshi (1997). **Blood sampling technique for measurement of plasma arginine vasopressin concentration in conscious and unrestrained rats**. *Laboratory Animal Science* 47(2): 190-193. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Abstract: A new technique for collecting blood from conscious and unrestrained rats is reported. Plasma arginine vasopressin (AVP) concentration has been known to be influenced by various procedures used for blood collection (e.g., manual contact and anesthesia). In the study reported here, the improvement of the routine jugular vein cannula method was undertaken by extending the connection tubing to allow use of a swivel mechanism. Plasma AVP, glucose, and corticosterone concentrations in virgin rats were measured in

blood samples collected by use of the new method and of two generally accepted methods (decapitation and routine jugular vein cannula methods). All values of the three parameters obtained were the lowest when the new method was used, suggesting that this new swivel method induced the least stress in the rats.
Descriptors: rats, unrestrained, blood sampling, blood vessels, methods, blood plasma, arginine, vasopressin, blood sugar, glucocorticoids, measuring instruments, adrenal cortex hormones, amino acids, blood, blood composition, cardiovascular system, corticoids, equipment, hormones, peptides, pituitary hormones, Rodentia, jugular vein, cannulation, catheters, corticosterone, hematocrit, stress.

Torous, D.K., N.E. Hall, F.G. Murante, S.E. Gleason, C.R. Tometsko, and S.D. Dertinger (2003). **Comparative scoring of micronucleated reticulocytes in rat peripheral blood by flow cytometry and microscopy**. *Toxicological Sciences* 74(2): 309-314. ISSN: 1096-6080.
Abstract: A flow cytometric technique for scoring the incidence of micronucleated reticulocytes in rat peripheral blood was compared to a standard microscopy-based procedure. For these studies, groups of five male Sprague-Dawley rats were treated with vehicle or a broad range of chemical genotoxicants: 6-thioguanine, N-methyl-N-nitro-N-nitrosoguanidine, vincristine, methylaziridine, acetaldehyde, methyl methanesulfonate, benzene, monocrotaline, and azathioprine. Animals were treated once a day for up to 2 days, and peripheral blood was collected between 24 and 48 h after the final administration. These samples were processed for flow cytometric scoring and microscopy-based analysis using supravital acridine orange staining, and the percentage of reticulocytes and micronucleated reticulocytes was determined for each sample. The resulting data demonstrate good agreement between these scoring methodologies, although careful execution of the flow cytometric method was found to enhance the micronucleus assay by reducing both scoring time and scoring error. These data add further support to the premise that the peripheral blood compartment of rats can be used effectively to detect genotoxicant-induced micronuclei.
Descriptors: rat, peripheral blood flow, cytometry, microscopy, reticulocytes, comparative scoring.

Torres, I.L.S., A. Buffon, G. Dantas, C.R. Fuerstenau, A.E. Boehmer, A.M.O. Battastini, J.J.F. Sarkis, C. Dalmaz, and M.B.C. Ferreira (2002). **Chronic stress effects on adenine nucleotide hydrolysis in the blood serum and brain structures of rats**. *Pharmacology Biochemistry and Behavior* 74(1): 181-186. ISSN: 0091-3057.
Abstract: We have previously observed that adenosine 5'-diphosphate (ADP) hydrolysis was decreased 25% in spinal cord synaptosomes of chronically stressed male rats, while no changes were observed in ATPase activity. In the present study, we investigated the effect of chronic stress on the hydrolysis of adenine nucleotides in two cerebral structures (frontal cortex and hypothalamus) and in the blood serum of male rats. Adult male Wistar rats were submitted to 1-h restraint stress/day for 45 days (chronic) and were sacrificed 24 h after the last session of stress. Adenosine 5'-triphosphate (ATP) or ADP hydrolysis was assayed in the synaptosomal fraction obtained from the frontal cortex and hypothalamus of control and chronically stressed animals. No effects on ADP or ATP hydrolysis were observed in any of the cerebral structures analyzed after chronic stress. On the other hand, reduced ADP hydrolysis was observed in the blood serum of chronic stressed rats. It is possible that the effects observed in the blood serum may represent an adaptation to chronic stress and may reflect different functions of nucleotides and/or enzymes in these tissues. It is possible that altered levels of ADPase activity in the serum may be a biochemical marker for chronic stress situations.
Descriptors: rats, chronic stress, effects, blood serum, brain structure, adenine nucleotide hydrolysis, biochemical marker.

Tsukahara, C., F. Sugiyama, B. Paigen, S. Kunita, and K. Yagami (2004). **Blood pressure in 15 inbred mouse strains and its lack of relation with obesity and insulin resistance in the progeny of an NZO/HILtJ x C3H/HeJ intercross**. *Mammalian Genome* 15(12): 943-950. ISSN: 0938-8990.
Descriptors: blood pressure, inbred mouse strains, obesity, insulin resistance, NZO HILtJ, C3H HeJ intercross mice, relation.

Vachon, P. and J.P. Moreau (2001). **Serum corticosterone and blood glucose in rats after two jugular vein blood sampling methods: comparison of the stress response.** *Contemporary Topics in Laboratory Animal Science* 40(5): 22-24. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, blood sampling, anesthesia, cannulation, stress response, blood sugar, blood serum,

corticosterone, animal welfare, comparison.

Van den Buuse, M. (1999). **Circadian rhythms of blood pressure and heart rate in conscious rats: effects of light cycle shift and timed feeding**. *Physiology and Behavior* 68(1-2): 9-15. ISSN: 0031-9384.
Abstract: Eight mature male rats were subjected to varying light cycles with ad lib. or restricted access to food and blood pressure, heart rate, and behavioural activity were measured using radiotelemetry. In rats that were fed ad lib., a shift of the light cycle by 6 h (from lights on 07.00-19.00 h to lights on 13.00 to 01.00 h) induced an immediate, but from then on gradual, shift of the circadian rhythms of blood pressure, heart rate, and behavioural activity, which took 4-5 days to fully synchronize with the new light cycle. Rats on a normal light cycle receiving feeding for 1 h only during the light period rather than ad lib. feeding, showed a suppressed circadian rhythm, with the dark period values reduced to values not significantly different from those observed in the light period. During the 1 h timed feeding, blood pressure, heart rate, and behavioural activity peaked to levels that were normally seen during the dark period.
Descriptors: rats, blood pressure, heart rate, circadian rhythms, light cycle, timed feeding, ad lib, restricted.

Van Herck, H., V. Baumans, H.A.G. Boere, A.P.M. Hesp, H.A. Van Lith, and A.C. Beynen (2000). **Orbital sinus blood sampling in rats: effects upon selected behavioural variables.** *Laboratory Animals* 34(1): 10-19. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: rats, blood sampling, anesthesia, orbital sinus blood, behavior, locomotion, physical activity, sinuses, eyes, pain, animal welfare.

Van Herck, H., V. Baumans, C.J.W.M. Brandt, H.A.G. Boere, A.P.M. Hesp, H.A. Van Lith, M. Schurink, and A.C. Beynen (2001). **Blood sampling from the retro-orbital plexus, the saphenous vein and the tail vein in rats: comparative effects on selected behavioural and blood variables.** *Laboratory Animals* 35(2): 131-139. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: We compared the behaviours of rats, and measured various blood parameters, after three blood sampling techniques: orbital puncture while they were under diethyl-ether anaesthesia, blood collection by tail vein puncture under O2-N2O-halothane anaesthesia and puncture of the saphenous vein without anaesthesia. Twelve rats were subjected to the three treatments according to a Latin square design. After each treatment, the behaviour of the rats was automatically monitored using the so-called LABORAS method, which discriminates between grooming, locomotion and inactivity in rats. Based on excitation scores and urine production, it was found that induction of diethyl-ether anaesthesia combined with orbital puncture caused more distress than did the other two blood sampling techniques. The three techniques had no differential effects on the behaviours of grooming, locomotion and inactivity. Collecting 0.5 ml of blood by orbital puncture was +/-7 times faster than doing so by saphenous vein puncture and +/-15 times faster than collecting blood by tail vein puncture while the rats were under O2-N2O-halothane anaesthesia. The levels of some haematological and plasma variables differed significantly between the three blood collection techniques. These observations may help to select the most appropriate technique of blood sampling with respect to anticipated discomfort in the animals.
Descriptors: rats, blood sampling, veins, eyes, anesthesia, stress, animal behavior, animal welfare, pain, tail, blood chemistry, blood picture, restraint of animals, orbital puncture.

Van Herck, H., V. Baumans, C.J.W.M. Brandt, A.P.M. Hesp, J.H. Sturkenboom, H.A. Van Lith, G. Van Tintelen, and A.C. Beynen (1998). **Orbital sinus blood sampling in rats as performed by different animal technicians: the influence of technique and expertise**. *Lab Animal* 32(4): 377-386. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: rats, blood sampling, animal welfare, laboratory animals, methods, lesions, blood specimen collection, animal technicians, technique, expertise, orbital sinus blood sampling.

Van Herck, H., S.F. De Boer, A.P.M. Hesp, H.A. Van Lith, V. Baumans, and A.C. Beynen (1997). **Orbital bleeding in rats while under diethylether anaesthesia does not influence telemetrically determined heart rate, body temperature, locomotor and eating activity when compared with anaesthesia alone.** *Laboratory Animals* 31(3): 271-278. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: The question addressed was whether orbital bleeding in rats, while under diethylether anaesthesia, affects their locomotor activity, body core temperature, heart rate rhythm and eating pattern. Roman High Avoidance (RHA) and Roman Low Avoidance (RLA) rats were used to enhance generalization of the results. Orbital bleeding when the rats were under diethylether anaesthesia was compared with diethylether anaesthesia alone. To take into account any effects of handling, the rats were also subjected to sham anaesthesia. The RHA rats urinated more during anaesthesia, needed more time to recover from the anaesthesia and showed a greater endocrine stress response to diethylether anaesthesia when compared with the RLA rats. During anaesthesia, the RHA rats showed a greater fall of body temperature and bradycardia than did the RLA rats. Diethylether anaesthesia reduced locomotor activity in the RHA rats, but had no effect in the RLA rats. In neither RHA nor RLA rats did anaesthesia plus orbital puncture, versus anaesthesia alone, influence body temperature, heart rate rhythm, locomotor and eating activity. The lack of effect of orbital puncture occurred both in the short term (within 2h) and long term (within 48 hours) and thus this study indicates that orbital puncture had, at least with respect to variables measured in the present study, no effect superimposed on that of diethylether anaesthesia.

Descriptors: rats, lines, anesthesia, ethyl ether, hemorrhage, orbits, heart rate, body temperature, locomotion, eating patterns, behavior patterns, stress, animal experiments, orbital bleeding.

Viscor, G., J.R. Torrella, V. Fouces, and T. Pages (2003). **Hemorheology and oxygen transport in vertebrates. A role in thermoregulation?** *Journal of Physiology and Biochemistry* 59(4): 277-286. ISSN: 1138-7548.

Descriptors: vertebrates, thermoregulation, blood, hemorheology, oxygen transport, temperature effect, turtles, pigeons, rats.

Wagner, S., A. Helisch, G. Bachmann, and W. Schaper (2004). **Time-of-flight quantitative measurements of blood flow in mouse hindlimbs**. *Journal of Magnetic Resonance Imaging* 19(4): 468-474. ISSN: 1053-1807.

Abstract: To evaluate the feasibility of using time-of-flight (TOF) imaging to directly measure hindlimb blood flow in a mouse model of peripheral vascular disease. Four tubes were imaged simultaneously (diameters = 0.39 mm, 0.59 mm, and two at 1.46 mm) with a 1.0 mM copper sulfate solution for 19 flow velocities. In vivo measurements were performed in the hindlimbs of three mouse strains-C57BL/6 (N = 5), BALB/c (N = 5), and 129S2/Sv (N = 5)- three weeks after femoral artery ligation with a calibration standard. The flow phantom showed that the intensity was linear (r super(2) = 0.92) over the pertinent blood flow velocities in the mouse hindlimbs. Measurements of the blood flow in the distal hindlimbs in different strains of mice (combination of both the venous and arterial flows) were obtained 21 days after right-sided femoral artery occlusion. The results showed that under similar conditions of anesthesia and temperature, SV129 mice on the nonligated side had the highest flows (0.50 +/- 0.07 mL/minute), followed by C57BL/6 (0.28 +/- 0.04 mL/minute) and BALB/c (0.23 +/- 0.05 mL/minute), P < 0.02. The ligated side measurements (SV129, 0.31 +/- 0.05 mL/minute (P = 0.02); C57BL/6, 0.21 +/- 0.02 mL/minute (P = 0.13); and BALB/c, 0.12 +/- 0.02 mL/minute (P= 0.06)) showed a trend in BALB/c and C57BL/6 and significant differences in SV129 for incomplete recovery three weeks after surgery, compared to the nonligated side. Two-dimensional TOF imaging permits quantitative in vivo measurements of hindlimb blood flow in a mouse model of peripheral vascular disease without the need of contrast injection, offering advantages of serial imaging not limited by tissue penetration.

Descriptors: mouse, blood flow, hindlimbs, quantitative measurements, time of flight, peripheral vascular disease, model.

Woo, D.D.L. and I. Kurtz (2003). **Mapping blood pressure loci in (A/J x B6)F2 mice**. *Physiological Genomics* 15(3): 236-242. ISSN: 1094-8341.

Abstract: Although the genetics of rare, monogenic, forms of human hypertension are fairly well defined, the genetics of the common polygenic form of human essential hypertension is only emerging. With the ability to control environmental variables, animal models have provided valuable tools with which to study blood pressure (BP) homeostasis. We have now studied BP genetics in a model consisting of 1,521 F2 mice from a series of (A/J x B6) intercrosses kept under standardized conditions. Using whole genome quantitative trait loci (QTL) mapping, we have identified four novel significant BP loci. These included Abbp1 on mouse chromosome MMU1 [maximum LOD score (MLS) at similar to 35 cM = 6.8], Abbp2 on MMU4 (MLS at similar to 25 cM = 9.8), Abbp3 on MMU7 (MLS at similar to 25 cM = 5.4), and Abbp4 on MMU11 (MLS at similar to 58 cM = 6.3). Compared with A/J homozygotes, homozygosity for the B6 alleles of Abbp1, Abbp2,

or Abbp4 is independently associated with a 7-12 mmHg increase in BP. In contrast Abbp3 interacts epistatically with a locus on MMU17 (near D17Mit180) to modulate BPs in female (A/J x B6) F2 mice. Interestingly, Abbp4 on MMU11 is homologous to a major confirmed BP locus, BP1, on rat chromosome 10 and to a major confirmed BP locus, HYT1, on human chromosome 17. Defining the molecular differences between the A/J and the B6 alleles at these novel loci with major influences on the BP phenotype will contribute to our understanding of the complex genetics of BP control.
Descriptors: mice, blood pressure loci, mapping, (A, JxB6)F2 mice, hypertension, genetics, animal model.

Yanagiya, Y., R. Yoshimura, M. Hori, M. Kuwahara, H. Tsubone, and S. Sugano (1999). **The influence of chronic sympathectomy on cutaneous blood flow in the rat tail**. *Journal of Veterinary Medical Science* 61(7): 795-801. ISSN: 0916-7250.
Descriptors: rats, tail, skin, blood circulation, autonomic nervous system, body parts, body regions, integument, mammals, nervous system, physiological functions, Rodentia.

Yeboah, S. and K.B. Dakwa (2002). **Aspects of the feeding habits and reproductive biology of the Ghana mole-rat *Cryptomys zechi* (Rodentia, Bathyergidae)**. *African Journal of Ecology* 40(2): 110-119. ISSN: 0141-6707.
Descriptors: Ghana mole-rat, feeding habits, reproductive biology, aspects, stomach content, plant food source, breeding, birth weights.

Yigit, N., E. Colak, M. Sozen, S. Ozkurt, and R. Verimli (2001). **Observations on the feeding biology and behaviour of the fat dormouse, *Glis glis orientalis* nehring, 1903 (Mammalia: Rodentia) in captivity**. *Zoology in the Middle East* 22: 17-24. ISSN: 0939-7140.
Descriptors: fat dormouse, feeding biology, behavior, observations, captivity, gnawing patterns, hibernation, Rodentia.

Zaki, W.M. (1995). ***Some biochemical studies on blood of rats***. Dissertation, Zagazig University: Egypt. 99 p.
Descriptors: rats, blood, studies, biochemical, thesis.
Notes: Thesis (M.V.Sc. in Biochemistry).

Zeller, W., H. Weber, B. Panoussis, T. Burge, and R. Bergmann (1998). **Refinement of blood sampling from the sublingual vein of rats.** *Laboratory Animals* 32(4): 369-376. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: A refined method of repeated blood sampling is described: the tongue of the anaesthetized rat is pulled forward with the fingers and the sublingual vein is punctured with a 23 gauge hypodermic needle. Based on the requirement of a pharmacokinetic study, 0.5 or 1 ml of blood was collected 7 times at 0, 0.5, 1, 2, 4, 8 and 24 h. The degree of suffering was judged by determining the body weight and food and water consumption. All animals showed an increase in body weight already after 24 h and, therefore, the method of collecting blood from the sublingual vein can be recommended for repeated blood sampling. The haematological evaluation of groups of animals with differing body weight showed that sample volumes of up to 15% of the total blood volume lead to haematocrit values of approximately 40%. A remarkable initial drop in white blood cell counts followed by a marked rise 2 h after first sampling to values partly above the pre-test could not be directly related to the extracted blood volume.
Descriptors: rats, blood sampling, veins, pain, animal welfare, body weight, blood volume, hematocrit, feed intake, water intake, erythrocyte count, sublingual vein, refinement.

Zhou, Y.Q., L. Davidson, R.M. Henkelman, B.J. Nieman, F.S. Foster, L.X. Yu, and X.J. Chen (2004). **Ultrasound-guided left-ventricular catheterization: a novel method of whole mouse perfusion for microimaging.** *Laboratory Investigation* 84(3): 385-389. ISSN: 0023-6837.
Descriptors: mouse, ultrasound, ventricular catheterization, microimaging, whole mouse perfusion.

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Feed/Nutrition/Guidelines

Akiyama, H., K. Hoshino, M. Tokuzumi, R. Teshima, H. Mori, T. Inakuma, Y. Ishiguro, Y. Goda, J.I. Sawada, and M. Toyoda (1999). **The effect of feeding carrots on immunoglobulin E production and anaphylactic response in mice**. *Biological and Pharmaceutical Bulletin* 22(6): 551-555.
Descriptors: mice, feeding, carrots, immunoglobulin production, anaphylactic response, effect.

Alderton, D. (2002). ***Family Pet Guides: Hamster***, 128 p.
Descriptors: hamster, behavior, breeding, feeding, housing, husbandry, parasites, guide.

Anderson, D.K. (1999). **Paramyid rodent taxonomy: an illustrated guide to taxonomically significant characters**. *Journal of Vertebrate Paleontology* 19(Supplement 3): 29A.
Descriptors: rodent, taxonomy, illustrated guide, characters.
Notes: Meeting Information: Fifty-Ninth Annual Meeting of the Society of Vertebrate Paleontology, October 20-23, 1999, Denver, Colorado, USA.

Aoyama, K. (1997). **Satiation effect on within-session changes in rat feeding behavior**. *Japanese Journal of Animal Psychology* 47(1): 37-45.
Descriptors: rat, feeding behavior, satiation, effect, within session changes.

Austad, S.N. and D.M. Kristan (2003). **Are mice calorically restricted in nature?** *Aging Cell* 2(4): 201-7. ISSN: 1474-9718.
Abstract: An important question about traditional caloric restriction (CR) experiments on laboratory mice is how food intake in the laboratory compares with that of wild mice in nature. Such knowledge would allow us to distinguish between two opposing views of the anti-aging effect of CR--whether CR represents, in laboratory animals, a return to a more normal level of food intake, compared with excess food consumption typical of laboratory conditions or whether CR represents restriction below that of animals living in nature, i.e. the conditions under which house mice evolved. To address this issue, we compared energy use of three mouse genotypes: (1) laboratory-selected mouse strains (= laboratory mice), (2) house mice that were four generations or fewer removed from the wild (= wild-derived mice) and (3) mice living in nature (= wild mice). We found, after correcting for body mass, that ad libitum fed laboratory mice eat no more than wild mice. In fact, under demanding natural conditions, wild mice eat even more than ad libitum fed laboratory mice. Laboratory mice do, however, eat more than wild-derived mice housed in similar captive conditions. Therefore, laboratory mice have been selected during the course of domestication for increased food intake compared with captive wild mice, but they are not particularly gluttonous compared with wild mice in nature. We conclude that CR experiments do in fact restrict energy consumption beyond that typically experienced by mice in nature. Therefore, the retarded aging observed with CR is not due to eliminating the detrimental effects of overeating.

Descriptors: aging metabolism, caloric restriction, cell aging physiology, eating genetics, food deprivation physiology, age factors, body weight physiology, energy metabolism genetics, environment, controlled, feeding behavior physiology, mice, inbred mice strains, species specificity.

Bachman, G.C. (2003). **Food supplements modulate changes in leucocyte numbers in breeding male ground squirrels.** *Journal of Experimental Biology* 206(Part 14): 2373-80. ISSN: 0022-0949.

Abstract: Immunosuppression may be an important cost of reproduction in breeding males. It can result from elevated levels of testosterone or stress hormones and may serve to lower the energetic cost of maintaining immune function at a time of high demand. This suggests that greater access to energy resources could reduce immunosuppression as a cost of reproduction, minimizing the trade-off between energetic investment in current reproductive effort and survival. I examined the impact of food availability on immune function by provisioning male Belding's ground squirrels in the field from the time they emerged from hibernation to the start of breeding. Temporal changes in immune status, measured by leucocyte counts, differed between provisioned males and un-provisioned controls. Provisioning advanced the increase in lymphocytes and neutrophils from after breeding to before. At the start of breeding, the leucocyte count was three times greater in provisioned males than in controls and was still nearly twice as great at the end of breeding. Control males increased all leucocyte numbers after breeding. This experiment demonstrates that variation in food intake can lead to individual variation in the extent of immunosuppression during breeding and therefore that reduced immune function may not be an obligatory cost of reproduction.

Descriptors: ground squirrels, male, breeding, leucocyte numbers, changes, food supplements, food intake, immunosuppression.

Bae, H.H., J.E. Larkin, and I. Zucker (2003). **Juvenile Siberian hamsters display torpor and modified locomotor activity and body temperature rhythms in response to reduced food availability**. *Physiological and Biochemical Zoology* 76(6): 858-867. ISSN: 1522-2152.

Abstract: Siberian hamsters as young as 16 and 28 d displayed torpor in response to treatment with 2,500 mg/kg 2-deoxy-D-glucose and reduced food availability, respectively. In addition, most food-restricted hamsters displayed increased locomotor activity and elevated body temperatures in the 3 h immediately preceding daily food delivery. This anticipatory activity disappeared within a few days of reimposition of ad lib. feeding. Torpor first appeared spontaneously at ~13 wk of age in hamsters fed ad lib. and maintained in short day lengths. The onset of this "spontaneous" torpor was unaffected by the hamsters' history of food restriction before age 2 mo. Siberian hamsters born late in the breeding season can conserve energy by undergoing torpor immediately after weaning when they contend with food shortages and concurrent energetic challenges imposed by growth requirements and low ambient temperatures.

Descriptors: body temperature, locomotion, plane of nutrition, restricted feeding, thermoregulation, torpor, hamsters.

Bao, Y.X., W.G. Du, Z. Lin, B.Y. Hu, B.R. Chi, and X.D. Chen (2001). **Effect of temperature on energy requirement and food assimilation in Chinese white-bellied rat (*Niviventer confucianus*)**. *Acta Zoologica Sinica* 47(5): 597-600. ISSN: 0001-7302.

Descriptors: Chinese white-bellied rat, energy requirements, food assimilation, temperature, effect, metabolism, nutrition, energy requirement, temperature effects.

Barker, J.M., J.M. Wojtowicz, and R. Boonstra (2005). **Where's my dinner? Adult neurogenesis in free-living food-storing rodents**. *Genes Brain and Behavior* 4(2): 89-98. ISSN: 1601-1848.

Abstract: Postnatal hippocampal neurogenesis in wild mammals may play an essential role in spatial memory. We compared two species that differ in their reliance on memory to locate stored food. Yellow-pine chipmunks use a single cache to store winter food; eastern gray squirrels use multiple storage sites. Gray squirrels had three times the density of proliferating cells in the dentate gyrus (determined by Ki-67 immunostaining) than that found in chipmunks, but similar density of young neurons (determined by doublecortin immunostaining). Three explanations may account for these results. First, the larger population of young cells in squirrels may increase the flexibility of the spatial memory system by providing a larger pool of cells from which new neurons can be recruited. Second, squirrels may have a more rapid cell turnover rate. Third, many young cells in the squirrels may mature into glia rather than neurons. The densities of young neurons were higher in juveniles than in adults

of both species. The relationship between adult age and cell density was more complex than that has been found in captive populations. In adult squirrels, the density of proliferating cells decreased exponentially with age, whereas in adult chipmunks the density of young neurons decreased exponentially with age.
Descriptors: behavior, nervous system, neural coordination, Ki 67 immunostaining, laboratory techniques, histology and cytology techniques, immunologic techniques, doublecortin immunostaining, neurogenesis, food storing, memory reliance.

Barrett, D., C. Keenan, J. Kimball, L. Smith, and W. Powers (1996). **The effect of ad libitum feeding, group housing, and moderate dietary restriction on longevity, body weight gain, and clinical pathology parameters of Sprague-Dawley (SD) rats**. *Toxicologic Pathology* 24(6): 788. ISSN: 0192-6233.
Descriptors: rats, feeding, group housing, adlibitum, dietary restriction, effect, weight gain, pathology.
Notes: Meeting Information: XV International Symposium of the Society of Toxicologic Pathologists, June 9-13, 1996, St. Louis, Missouri, USA.

Batista, M.R., M. Ferraz, and R.B. Bazotte (1997). **Are physiological changes in meal-fed rats determined by the amount of food ingested in the last meal or due to feeding schedule?** *Physiology and Behavior* 62(2): 249-253. ISSN: 0031-9384.
Descriptors: physiological changes, meal fed, rats, feeding schedule, food ingested.

Beard, J.L., D.E. Brigham, S.K. Kelley, and M.H. Green (1998). **Plasma thyroid hormone kinetics are altered in iron-deficient rats.** *Journal of Nutrition* 128(8): 1401-1408. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Abstract: Iron deficiency anemia is associated with lower plasma thyroid hormone concentrations in rodents and, in some studies, in humans. The objective of this project was to determine if plasma triiodothyronine (T3) and thyroxine (T4) kinetics were affected by iron deficiency. Studies were done at a near-thermoneutral temperature (30 degrees C), and a cool environmental temperature (15 degrees C), to determine plasma T3 and T4 kinetics as a function of dietary iron intake and environmental need for the hormones. Weanling male Sprague-Dawley rats were fed either a low Fe diet [iron-deficient group (ID), <5 microgram/g Fe] or a control diet [control group (CN), 35 microgram/g Fe] at each temperature for 7 wk before the tracer kinetic studies. An additional ID group receiving exogenous thyroid hormone replacement was also used at the cooler temperature. For T4, the disposal rate was >60% lower (89 +/- 6 vs. 256 +/- 53 pmol/h, P < 0.001) in ID rats than in controls at 30 degrees C, and approximately 40% lower (192 +/- 27 vs. 372 +/- 26 pmol/h, P < 0.01) in ID rats at 15 degrees C. Exogenous T4 replacement in a cohort of ID rats at 15 degrees C normalized the T4 concentration and the disposal rate. For T3, the disposal rate was significantly lower in ID rats in a cool environment (92 +/- 11 vs. 129 +/- 11 pmol/h, P < 0.01); thyroxine replacement again normalized the T3 disposal rate (126 +/- 12 pmol/h). Neither liver nor brown fat thyroxine 5'-deiodinase activities were sufficiently different to explain the lower T3 disposal rates in iron deficiency. Thus, plasma thyroid hormone kinetics in iron deficiency anemia are corrected by simply providing more thyroxine. This suggests a central. regulatory defect as the primary lesion and not peripheral alterations.
Descriptors: rats, iron deficient, plasma, thyroid hormone, altered, anemia, rodents, weanling male, Sprague Dawley rats.

Belanger, M.P., W.J. Wallen, and C. Wittnich (1999). **Special feeding and care of senescent spontaneously hypertensive rats**. *Contemporary Topics in Laboratory Animal Science* 38(4): 7-11. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, hypertension, body weight, aging, female animals, cardiac insufficiency, feed formulation, pelleted feeds, blood pressure, heart rate, hematocrit, heart, weight, voluntary intake, powdered feed.

Bell, R.R., M.J. Spencer, and J.L. Sherriff (1997). **Voluntary exercise and monounsaturated canola oil reduce fat gain in mice fed diets high in fat.** *Journal of Nutrition* 127(10): 2006-2010. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Abstract: High fat diets increase body fat stores. The following experiment was undertaken to determine whether the type of dietary fat could influence fat storage and whether voluntary exercise could prevent diet-induced obesity in mice fed high fat diets. Sixty-nine 6-wk-old female mice were fed one of three diets: low fat

(11.5% of energy from fat), beef fat (40.8% of energy from fat) or canola oil (40.8% of energy from fat). In each diet group, 13 mice had free access to activity wheels in their cages (exercising), and the remaining 10 mice were housed in standard mouse cages (nonexercising). Body weight and body composition were measured before and after 8 wk of treatment. The nonexercising mice fed beef fat weighed more and had significantly more body fat (23.2 +/- 2.5 g/100 g body wt) than mice fed the low fat or canola oil diet (13.9 +/- 1.7 and 16.8 +/- 1.9 g/100 g body wt, respectively). Voluntary exercise did not affect lean body mass but did result in significantly lower body fat in all diet groups (beef, 12.6 +/- 0.9; low fat, 7.4 +/- 0.6; canola oil, 9.6 +/- 1.4 g/100 g body wt). The amount of body fat of mice fed the monounsaturated canola oil was significantly less than that of mice fed the beef fat diet, suggesting that the type of fat as well as the amount of fat influences body fat stores. Furthermore, voluntary exercise decreased body fat in all mice and prevented diet-induced obesity in mice fed diets high in fat.

Descriptors: rapeseed oil, tallow, monoenoic fatty acids, dietary fat, nutrient intake, animal models, experimental diets, physical activity.

Benito, P., W. House, and D. Miller (1997). **Changes in meal frequency alter iron absorption efficiency in rats**. *Nutrition Research* 17(9): 1469-1478. ISSN: 0271-5317.

Abstract: There is no standard procedure in regard to the type or feeding pattern of prestudy diet in studies on determinations of iron bioavailability. The objective of this study was to determine the influence of meal frequency on the absorptive capacity of mucosal cells. Male Wistar rats were assigned to three groups of ten rats each and fed 12 g of diet daily for three days. The food allotment was provided in either one meal (M1) daily (70 mg Fe/kg diet), four meals (M4) daily (70 mg Fe/kg diet), or a single meal for one day (210 mg Fe/kg diet) followed by single low-iron meals (9.4 mg Fe/kg diet) for two days (MX). The rats were then deprived of food for 18 hours, administered 59Fe by gavage, and killed ten hours later. Absorption was estimated as the 59Fe retained in carcass without the gastrointestinal tract. Mucosal cells from the duodenum were isolated by mechanical vibration and mucosal ferritin determined by an immunoassay method. The effect of meal frequency on absorption efficiency of 59Fe was significant and independent of liver iron stores. Absorption of 59Fe dose was higher in rats fed four meals daily (42.2 +/- 5.2%) than those fed one meal daily (27.1 +/- 2.7%), but rats fed a single meal for one day then iron-deficient meals for two days absorbed significantly more 59Fe (64.8 +/- 4.8%) than did rats in the other groups. These data indicate that the frequency of iron consumed in a short-term period alter the efficiency of iron absorption in rats. Iron status of mucosal cells alone, as determined by mucosal ferritin, cannot explain the variations in iron absorption.

Descriptors: feeding frequency, iron, absorption, digestive absorption, efficiency, intestines, mucous membrane, metalloproteins, nutrients, hemoglobin, body weight, liver, mineral content, rats, animal models, animal tissues, blood, blood composition, blood proteins, body parts, digestion, digestive system, elements, epithelium, feeding, heavy metals, mammals, metallic elements, metalloproteins, physical phenomena, physiological functions, proteins, proximate composition, Rodentia, transition elements, intestinal absorption, duodenum, jejunum, ileum, ferritin, nutrient reserves.

Blanton, C.A., B.A. Horwitz, C. Murtach Mark, D.W. Gietzen, S.M. Griffey, and R.B. McDonald (1998). **Meal patterns associated with the age-related decline in food intake in the Fischer 344 rat**. *American Journal of Physiology* 275(5, Part 2): R1494-R1502. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3

Descriptors: aging, feeding habits, behavior, biological development, anorexia of aging.

Boza, J.J., D. Moennoz, J. Vuichoud, A.R. Jarret, D. De Weck Gaudard, R. Fritsche, A. Donnet, E.J. Schiffrin, G. Perruisseau, and O. Ballevre (1999). **Food deprivation and refeeding influence growth, nutrient retention and functional recovery of rats**. *Journal of Nutrition* 129(7): 1340-1346. ISSN: 0022-3166.

NAL Call Number: 389.8 J82

Descriptors: food deprivation, refeeding, growth, nutrient retention, functional recovery, rats.

Bozinovic, F. (1997). **Diet selection in rodents: an experimental test of the effect of dietary fiber and tannins on feeding behavior**. *Revista Chilena De Historia Natural* 70(1): 67-71.

Descriptors: diet, rodents, selection, dietary fiber, effect, feeding behavior.

Buison, A., H. Lu, F. Guo, and K.L.C. Jen (1997). **High-fat feeding of different fats during pregnancy and lactation in rats: effects on maternal metabolism, pregnancy outcome, milk and tissue fatty acid profiles**. *Nutrition Research* 17(10): 1541-1554. ISSN: 0271-5317.
Descriptors: high fat, feeding, pregnancy, lactation, metabolism, milk, fatty acid, effect.

Buwalda, B., W.A.M. Blom, J.M. Koolhaas, and G. Van Dijk (2001). **Behavioral and physiological responses to stress are affected by high-fat feeding in male rats**. *Physiology and Behavior* 73(3): 371-377. ISSN: 0031-9384.
Descriptors: rats, males, high fat feeding, stress, behavior, physiology, response, affected, body temperature.

Byerly, M.S. and E.A. Fox (2003). **Age- and diet-dependent perturbations in feeding patterns of BDNF-deficient mice.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 928.13.
Online: http://sfn.scholarone.com
Descriptors: mice, BDNF deficient, age, diet, feeding patterns, purturbations, obesity, automated feeders, weight gain, hyperphagia.
Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Cahill Morasco, R., R.S. Hoffman, and L.R. Goldfrank (1998). **The effects of nutrition on plasma cholinesterase activity and cocaine toxicity in mice**. *Journal of Toxicology Clinical Toxicology* 36(7): 667-672.
Descriptors: nutrition, plasma, cholinesterase, cocaine, mice, effects.

Cant, J.P., B.W. McBride, and W.J. Croom Jr. (1996). **The regulation of intestinal metabolism and its impact on whole animal energetics**. *Journal of Animal Science* 74(10): 2541-2553. ISSN: 0021-8812.
NAL Call Number: 49 J82
Abstract: In digesting and absorbing dietary nutrients, the gastrointestinal tract consumes approximately 20% of all incoming energy. A substantial proportion of this consumption is due to the rapid turnover of cellular protein, which permits abrupt changes in gut size to occur, matching capacity with delivery. If it is size of the alimentary tract that constrains nutrient uptake, greater than 20% allocation of ME intake above maintenance to the gut would improve the growth rate of a young animal but the efficiency of ME utilization for growth would deteriorate. Less than 15% allocation in birds seems injurious to both growth rate and efficiency of growth. Nutrient transport capacity of the intestine may be modulated independent of size; in the case of glucose, an up- or down-regulation of the number of brush -border glucose transporter matches absorptive capacity with delivery. The maximum uptake capacity of a small intestine for glucose at any moment in time is a function of its length, the flow rate of digesta, and the distributed-in-space kinetic parameters of transport (e.g., Vmax and Km). An example maximum uptake capacity for glucose in sheep is calculated at 2,112 g/d, assuming continuous digesta flow. Intermittency of flow reduces the uptake capacity to a functional level of 295 g/d, demonstrating a constraining influence of the periodicity of the migrating myoelectric complex. Growth regulation by stimulatory and inhibitory mitotic signals is presented as a candidate for an energy-independent determinant of the upper limit to functional maximum uptake capacity of the small intestine. Both size and functional capacity of the intestine must be considered in assessing the impact this tissue may have on the rest of the animal.
Descriptors: chickens, sheep, cattle, rats, digestive absorption, intestines, rumen, protein synthesis, energy balance, energy metabolism, oxygen consumption, ions, glucose, nutrient transport, aldoses, birds, body parts, Bovidae, Bovinae, Caprinae, carbohydrates, digestion, digestive system, domestic animals, domesticated birds, energy exchange, Galliformes, gas exchange, livestock, mammals, metabolism, monosaccharides, physiological functions, plant physiology, poultry, reducing sugars, Rodentia, ruminants, stomach, sugars, useful animals, ion transport, literature reviews.

Carney, E.W., C.L. Zablotny, M.S. Marty, J.W. Crissman, P. Anderson, M. Woolhiser, and M. Holsapple (2004). **The effects of feed restriction during in utero and postnatal development in rats**. *Toxicological Sciences* 82(1): 237-249. ISSN: 1096-6080.
Descriptors: rats, in utero, postnatal development, feed restriction, effects, body weight, organ weight, estrus cycle, puberty.

Castro Chaves, C., A.F. Soares, and R.C. Santiago (1989). **Dietary deprivation of essential fatty acids impairs rat renal function**. *Journal of the American Society of Nephrology* 9: 32A.

Descriptors: rat, renal function, impaired, diet, deprivation, fatty acids.

Notes: Meeting Information: 31st Annual Meeting of the American Society of Nephrology, October 25-28, 1998, Philadelphia, Pennsylvania, USA. Program and Abstract Issue.

Chacon, F., P. Cano, S. Lopez Varela, V. Jimenez, A. Marcos, and A.I. Esquifino (2002). **Chronobiological features of the immune system. Effect of calorie restriction.** *European Journal of Clinical Nutrition* 56(Supplement 3): S69-S72. ISSN: 0954-3007.

NAL Call Number: QP141.A1J68

Abstract: The circadian organization of living organisms is fully established being a key component the activity of the neuro-endocrin-immune system that maintains the homeostasis. Secondary lymph organs, such as submaxillary lymph nodes and spleen, have been shown to exhibit a 24 h variation in blastogenic proliferative capacity and distribution of B and T subsets, with specific achrophases depending on the parameter studied or the lymphoid organ considered. However, less is known about the thymus. The immune system has been shown to change by calorie restriction, although no information is available about possible effects in 24 h variations. Similar questions can be posed for the neuro-endocrine system. As an example, some data are shown in this article about the effects of calorie restriction on the neuro-endocrin-immune system in growing male Wistar rats. Calorie restriction blunted the circadian secretory pattern of TSH observed in the control group that was characterized by the existence of two peaks at 17:00 or 01:00 h and that explained the low basal metabolic rate of these animals under this experimental condition. Concerning the immune system, the thymus gland exhibited 24 h variations in T, B and immature cells in both control and calorie-restricted male rats, thus confirming the circadian organization of the immune system. Moreover this circadian organization was changed by calorie restriction.

Descriptors: Wistar rats, male, calorie restriction, effect, immune system, thymus gland, basal metabolic rate.

Chalkley, S.M., M. Hettiarachchi, D.J. Chisholm, and E.W. Kraegen (2002). **Long-term high-fat feeding leads to severe insulin resistance but not diabetes in Wistar rats**. *American Journal of Physiology* 282(6, Part 1): E1231-E1238. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3

Descriptors: Wistar rats, high fat feeding, long term, insulin resistance, glucose tolerance, lipid excess, beta cell function.

Chambon Savanovitch, C., C. Felgines, S. Walrand, F. Raul, S. Zarrabian, M.T. Meunier, M.C. Farges, L. Cynober, and M.P. Vasson (2001). **A pancreatic extract-enriched diet improves the nutritional status of aged rats.** *Journal of Nutrition* 131(3): 813-819. ISSN: 0022-3166.

NAL Call Number: 389.8 J82

Abstract: Correction of the malnourished state, particularly common and severe in elderly people, is often unsuccessful. To improve the efficiency of realimentation, we evaluated the nutritional effect of a pancreatic extract (PE)-enriched diet in malnourished aged rats. Sprague-Dawley male rats were randomly assigned to 6 groups as follows: 1 group of control rats had free access to the diet for 12 wk (C group) and 5 groups were 50% food restricted for the same period. One food-restricted group was then killed (R group) and the 4 remaining groups were refed for 1 wk using a standard diet enriched either with two different doses of a pancreatic extract (2.4 or 4.8 g/d in PE1 and PE2 groups, respectively) or with an isonitrogenous casein hydrolysate (CH1 and CH2 groups, respectively). Profound alterations induced by food restriction (FR) were moderately corrected by refeeding, except nitrogen balance, which was reestablished in rats refed all diets ($P < 0.01$ vs. R). Supplementation of the food ration with a pancreatic extract clearly improved recovery. Indeed, body weight gain, both jejunal and ileal trophicity [jejunum: total height, PE2: 849 +/- 45 micrometer vs. CH2: 768 +/- 17 micrometer ($P < 0.05$); protein content, PE2: 69.9 +/- 5.7 mg vs. CH2: 56.4 +/- 4.8 mg ($P < 0.01$)] and nonspecific immune response in terms of H_2O_2 production by polymorphonuclear neutrophils and tumor necrosis factor alpha (TNF-alpha) by macrophages (PE2, 20.7 +/- 4.7 vs. CH2, 8.7 +/- 2.3, $P < 0.05$) were improved in rats fed PE2. A pancreatic extract could improve the efficiency of realimentation in malnourished aged rats.

Descriptors: diet, pancreas, extracts, nutritional state, supplements, elderly, food restriction, restricted feeding,

refeeding, intestinal mucosa, weight, skeletal muscle, protein content, nitrogen balance, enzyme activity, immune response, sucrose alpha glucosidase, glucan 1,4 alpha glucosidase, aminopeptidase, trypsin, chymotrypsin, elastase, rats, animal models.

Chang, Y.L., H.S. Sohn, K.C. Chan, C.D. Berdanier, and J.L. Hargrove (1997). **Low dietary protein impairs blood coagulation in BHE/cdb rats**. *Journal of Nutrition* 127(7): 1279-1283. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Abstract: The influence of dietary protein on blood coagulation tests was evaluated in BHE/cdb rats. Three experiments were conducted in order to compare effects of diets with low (8 g/100 g diet) or high (38 g/100 g diet) protein, to establish values for coagulation tests at intermediate (12-30 g/100 g diet) concentrations of dietary protein, and to compare feeding identical quantities of diets with 8 g protein/100 g diet vs. 18 g protein/100 g diet. After 4 wk of feeding the semipurified diets, bleeding time exceeded 15 min in the groups fed low protein diets, compared to a range of 3-6 min for the groups fed high protein diets. Several in vitro tests of coagulation were abnormal in the rats fed low protein diets. For example, prothrombin time averaged 27 +/- 8 s in rats fed 8 g protein/100 g diet plus beef tallow, but 17 +/- 1 s in rats fed 38 g protein/100 g diet plus tallow. The coagulation deficit in rats fed low protein was not affected by fat source (tallow vs. menhaden oil), but fibrinogen was elevated in rats fed diets with menhaden oil. Conversely, no differences in coagulation tests were observed among rats fed 12-30 g protein/100 g diet. Bleeding times ranged from 7 to 9 min, and prothrombin time was 17-18 s. Significant differences in plasma fibrinogen concentration and prothrombin time were observed in rats fed 8 vs. 18 g protein/100 g diet at a fixed rate of 6 g/100 g body weight. Platelet and blood cell numbers were unaffected by dietary protein. The evidence for multiple deficits in the coagulation system suggests that hepatic function in BHE/cdb rats may become impaired when the rats are fed low protein diets of the composition used here.
Descriptors: rats, low dietary protein, impairs, blood coagulation, prothrombin time, bleeding.

Chen, D., J. Yang, J. Zhu, Q. Zhang, M. Mi, and Y. Fan (1997). **The effect of nutrition intervention on energy metabolism in acute anoxic rats**. *Acta Nutrimenta Sinica* 19(4): 423-426.
Descriptors: rats, anorexic, metabolism, energy, nutrition, intervention, effect, acute.

Chibalin, A.V., D.V. Chibalina, J. Ryder, D. Galuska, A. Krook, and J.R. Zierath (2000). **High fat feeding-induced changes in expression of proteins involved in energy metabolism in rat skeletal muscle: effect of exercise**. *Acta Physiologica Scandinavica* 170(4): A60-A61. ISSN: 0001-6772.
Descriptors: rat, skeletal muscle, metabolism, high fat feeding, energy metabolism, exercise, effect, proteins.
Notes: Meeting Information: Joint Meeting of the Scandinavian and American Physiological Societies, August 16-19, 2000, Stockholm, Sweden.

Chignola, R., C. Rizzi, S. Vincenzi, T. Cestari, N. Brutti, A.P. Riviera, S. Sartoris, A.D.B. Peruffo, and G. Andrighetto (2002). **Effects of dietary wheat germ deprivation on the immune system in Wistarrats: a pilot study**. *International Immunopharmacology* 2(10): 1495-1501. ISSN: 1567-5769.
Descriptors: Wistar rats, pilot study, diet, wheat germ deprivation, effects, immune system, bioactive molecules, gastrointestinal tract.

Chovan, J.P., E. Yu, and S.C. Ring (2004). **Comparison of metabolism between nude (athymic) and CD1 mice**. *Drug Metabolism Reviews* 36(Supplement 1): 240. ISSN: 0360-2532.
Descriptors: biochemistry and molecular biophysics, pharmacology, drug metabolism, mouse strain comparison, nude, CD1.
Notes: Meeting Information: 7th International Meeting of the International Society for the Study of Xenobiotics, August 29-September 02, 2004, Vancouver, BC, Canada.

Chung, C.K., K.S. Ha, H.S. Kim, I.W. Kang, and B.S. Bae (1996). **[Effect of dietary Ca level and hormones on bone density of mouse]**. *Korean Journal of Nutrition* 29(9): 943-949. ISSN: 0367-6463.
Descriptors: calcium, rats, bones, vitamin D, hormones, alkaline earth metals, body parts, elements, mammals, metallic elements, musculoskeletal system, Rodentia, vitamins.
Language of Text: Korean with English and Korean summaries.

Cleary, M.P., N.J. Maihle, and J.P. Grande (2001). **Feeding AIN-93M diet markedly decreases the latency for development of mammary tumors in MMTV-TGF-(alpha) mice compared to feeding commercial rodent food**. *FASEB Journal* 15(4): A617. ISSN: 0892-6638.
Descriptors: mice, diet, mammary tumors, development, latency, fat deposition, body weights, pathology.
Notes: Meeting Information: Annual Meeting of the Federation of American Societies for Experimental Biology on Experimental Biology 2001, March 31-April 04, 2001, Orlando, Florida, USA.

Cover, C.E. and M.J. Barron (1998). **A new feeder for diet optimization in rats**. *Contemporary Topics in Laboratory Animal Science* 37(6): 84-86. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, restricted feeding, body weight, automatic feed dispensers, survival.

Dahl, P.E. and J.C. Kjaeve (2003). **Pulmonary function in rats dying from long-term parenteral nutrition.** *Scandinavian Journal of Clinical and Laboratory Investigation* 63(7-8): 473-480. ISSN: 0036-5513.
Descriptors: pulmonary function, parenteral nutrition, rats, dying, vascular injury, thrombus formation, vitamin, intralipid, infusion.

Darlis, N. Abdullah, J.B. Liang, S. Jalaludin, and Y.W. Ho (1999). **Preference test on feed and nutrient intakes in male and female lesser mouse deer (*Tragulus javanicus*) in captivity**. *Asian Australasian Journal of Animal Sciences* 12(8): 1292-1297. ISSN: 1011-2367.
NAL Call Number: SF55.A78A7
Descriptors: deer mouse, captivity, feed intake, nutrient intake, preference, diets, roughage, protein, energy content.

Davisson, M.T. (1997). **Rules and guidelines for genetic nomenclature in mice: excerpted version**. *Transgenic Research* 6(5): 309-319.
Descriptors: rules, guidelines, genetic nomenclature, mice.

Day, D.E., E.M. Mintz, and T.J. Bartness (1999). **Diet self-selection and food hoarding after food deprivation by Siberian hamsters**. *Physiology and Behavior* 68(1-2): 187-194. ISSN: 0031-9384.
Descriptors: diet, self selection, food hoarding, food deprivation, hamsters.

De Wilde, M.C., E. Hogyes, A.J. Kiliaan, T. Farkas, P.G. Luiten, and E. Farkas (2003). **Dietary fatty acids alter blood pressure, behavior and brain membrane composition of hypertensive rats**. *Brain Research* 988(1-2): 9-19. ISSN: 0006-8993.
Abstract: The beneficial effect of dietary n-3 polyunsaturated fatty acids (PUFAs) on developing hypertension has been repeatedly demonstrated. However, related changes in brain membrane composition and its cognitive correlates have remained unclear. Our study aimed at a comprehensive analysis of behavior and cerebral fatty acid concentration in hypertension after long-term PUFA-rich dietary treatment. Hypertensive and normotensive rats were provided a placebo, or one of two PUFA-enriched diets with a reduced (n-6) /(n-3) ratio for 75 weeks. Exploratory behavior and spatial learning capacity were tested. Systolic blood pressure (BP) was repeatedly measured. Finally, brain fatty acid composition was analyzed by gas chromatography. Hypertensive rats exhibited more active exploration but impaired spatial learning compared to normotensives. Both diets reduced BP, increased PUFA and monounsaturated fatty acid (MUFA) concentration, and reduced saturated fatty acid content in brain. The level of cerebral PUFAs and MUFAs was lower in hypertensive than in normotensive rats. Furthermore, BP positively, while spatial learning negatively correlated with cerebral (n-6)/(n-3) PUFA ratio. We concluded that regular n-3 PUFA consumption could prevent the development of hypertension, but reached only a very delicate improvement in spatial learning. Furthermore, we consider a potential role of metabolically generated MUFAs in the beneficial effects of PUFA supplementation.
Descriptors: rats, hypertensive, dietary fatty acids, blood pressure, behavior, brain membrane composition.

Demetriades, H., D. Botsios, D. Kazantzidou, L. Sakkas, K. Tsalis, K. Manos, and I. Dadoukis (1999). **Effect of early postoperative enteral feeding on the healing of colonic anastomoses in rats: comparison of three different enteral diets**. *European Surgical Research* 31(1): 57-63.

Descriptors: rats, diets, enteral feeding, healing, colonic anastomoses, comparison, postoperative.

DiBattista, D. (1999). **Operant responding for dietary protein in the golden hamster (*Mesocricetus auratus)*.** *Physiology and Behavior* 67(1): 95-8. ISSN: 0031-9384.

Abstract: Golden hamsters housed in operant chambers over a period of weeks had ad lib access to a maintenance diet that was either nutritionally complete (NCMD) or protein-free (PFMD), and they were required to press a lever on a fixed-ratio (FR) schedule to obtain 20-mg high-protein pellets. As the FR requirement increased, hamsters maintained on the NCMD made fewer lever presses and ate fewer pellets, and at the highest FR levels, they earned very few pellets. In contrast, hamsters maintained on PFMD increased the number of lever presses as the FR requirement increased, and they only slightly reduced the number of pellets eaten. Even at the highest FR requirement levels, PFMD hamsters still derived an average of 11-12% of total calories from protein, a level of intake that is either adequate for adult hamsters, or very nearly so. Previous research has shown that hamsters make adaptive behavioural adjustments in response to time-restricted access to dietary protein, and the present findings demonstrate that protein-restricted hamsters that must press a lever to obtain protein-rich pellets also make adaptive behavioural adjustments when challenged with increases in the FR requirement.

Descriptors: conditioning, operant, dietary proteins administration and dosage, food preferences psychology, *Mesocricetus* psychology, energy intake, hamsters, motivation, nutritional requirements.

Dobson, M., R.L. Goldingay, and D.J. Sharpe (2005). **Feeding behaviour of the squirrel glider in remnant habitat in Brisbane**. *Australian Mammalogy* 27(1): 27-35. ISSN: 0310-0049.

Abstract: The diet of the squirrel glider (*Petaurus norfolcensis*) was studied in a 45 ha forest remnant within an urban area close to Brisbane in south-east Queensland. Qualitative observations of feeding behaviour were conducted during each of 10 months between May 2002 and April 2003, on over 27 P. norfolcensis from at least 10 social groups. Four different feeding behaviours were recorded from 750 observations. Feeding from flowers accounted for 48% of the diet. Nectar and pollen were derived from 10 overstorey tree species, though forest red gum (*Eucalyptus tereticornis*) dominated because of its high abundance and protracted flowering period. Honeydew and lerp feeding accounted for 15% and 2% of all observations, respectively. Searching for arthropods accounted for 35% overall and occurred in 20 different tree species, where a range of substrates was used. Brushbox (*Lophostemon confertus*) was the most important; it was used in all seasons and accounted for 49% of these observations. These results contrast with assessment of the diet of *P. norfolcensis* at other sites where a greater range of broad food types was used. This may reflect the disturbed quality of the habitat at our site. However, these observations confirm the importance of eucalypt nectar in the diet of this species.

Descriptors: behavior, foods, ecology, environmental sciences, diet, habitat, feeding behavior.

Doerflinger, A. and S.E. Swithers (2004). **Effects of diet and handling on initiation of independent ingestion in rats.** *Developmental Psychobiology* 45(2): 72-82. ISSN: 0012-1630.

Abstract: The present study examined the effects of dietary manipulation on the age of onset of weaning in rat pups. In Experiment 1, female rats were placed on a standard chow (SC) or high-fat (HF) diet 1 week following mating. Pups were weighed daily from birth to Day 12, then animals were placed into specialized cages for separate recording of food intake of pups and dams. Pups were offered the same diet as their dam, and food intake and body weight were determined twice daily until Day 25. The results demonstrated that pups reared by dams fed the HF diet initiated independent ingestion on Day 16, approximately 24 hr before pups reared by dams fed the SC diet. There were no differences in body weight in pups across the two diets. While few differences were noted across diets in pups' or dams' behavior, HF pups appeared to demonstrate a delay in the establishment of circadian patterns of food intake. In Experiment 2, all dams were maintained on an SC diet until the day after parturition. At that time, dams and litters were placed into specialized cages and divided into four groups: HF/HF, HF/SC, SC/SC, and SC/HF (dam's diet/pup's diet, respectively). The results demonstrated that dams given the HF diet had pups that initiated food intake approximately 2 days before the pups of dams given the SC diet. In addition, pups offered the HF diet, independent of the dam's diet, initiated food intake approximately 0.8 days prior to pups offered the SC diet. Further, by Day 12, HF dams had pups that were heavier than SC dams. The results suggest that the onset of weaning in rats is affected by maternal diet and the weaning diet available to the pup.

Descriptors: diet, feeding behavior, sucking behavior, animals, newborn, behavior, animal, body weight, rats,

weaning.

Doring, H., K. Schwarzer, B. Nuesslein Hildesheim, and I. Schmidt (1998). **Leptin selectively increases energy expenditure of food-restricted lean mice.** *International Journal of Obesity and Related Metabolic Disorders* 22(2): 83-88.
NAL Call Number: RC628.A1O2
Abstract: OBJECTIVE: To find out whether leptin can attenuate hypometabolic torpor-like states of metabolic rate (MR) in adult lean animals, as it attenuates the morning suppression of thermoregulatory thermogenesis in suckling-age rat pups. DESIGN: Leptin effects on MR and food intake were studied in mice aged 4-7 months, in which a high incidence of exaggerated circadian reductions of MR had been induced by chronic food-restriction and, for comparison, in freefeeding mice. PROTOCOL: Continuous recordings of MR, for a group of seven mice maintained at an ambient temperature of 24 degrees C, while they were repeatedly--with pauses of at least six days--treated for three consecutive days with either recombinant murine leptin (20, 200 or 600 pmol.g-1.d-1) or saline. RESULTS: Leptin treatment caused dose-dependent 5-15% increases in energy expenditure by moderating the decreases in MR during the circadian minima, without affecting either the MR during the circadian maxima or food intake. Similar treatment of free-feeding mice caused dose-dependent decreases of food intake without changing MR. CONCLUSION: Leptin controls thermoregulatory energy expenditure when food supplies are scarce and changes food intake, rather than energy expenditure, when food is abundant.
Descriptors: mice, animal proteins, energy expenditure, food restriction, basal metabolism, food intake, circadian rhythm, dosage effects, thermoregulation, diurnal variation, body weight, energy balance, heat production.

Dou, Y., S. Gregersen, J. Zhao, F. Zhuang, and H. Gregersen (2001). **Effect of re-feeding after starvation on biomechanical properties in rat small intestine**. *Medical Engineering and Physics* 23(8): 557-566. ISSN: 1350-4533.
Descriptors: rat, small intestine, starvation, refeeding, effect, biomechanical properties, luminal nutrients, remodeling.

Dumas, J.F., D. Roussel, G. Simard, O. Douay, F. Foussard, Y. Malthiery, and P. Ritz (2004). **Food restriction affects energy metabolism in rat liver mitochondria.** *Biochimica Et Biophysica Acta* 1670(2): 126-131. ISSN: 0304-4165.
NAL Call Number: 381 B522[G]
Abstract: To examine the effect of 50% food restriction over a period of 3 days on mitochondrial energy metabolism, liver mitochondria were isolated from ad libitum and food-restricted rats. Mitochondrial enzyme activities and oxygen consumption were assessed spectrophotometrically and polarographically. With regard to body weight loss (-5%), food restriction decreased the liver to body mass ratio by 7%. Moreover, in food-restricted rats, liver mitochondria displayed diminished state 3 (-30%), state 4-oligomycin (-26%) and uncoupled state (-24%) respiration rates in the presence of succinate. Furthermore, "top-down" elasticity showed that these decreases were due to an inactivation of reactions involved in substrate oxidation. Therefore, it appears that rats not only adapt to food restriction through simple passive mechanisms, such as liver mass loss, but also through decreased mitochondrial energetic metabolism.
Descriptors: energy metabolism, oxidative phosphorylation, electron transport chain, dietary restriction, restricted feeding, calorie restrictions, energy restrictions.

Dwyer, D.M. and R.A. Boakes (1997). **Activity-based anorexia in rats as failure to adapt to a feeding schedule**. *Behavioral Neuroscience* 111(1): 195-205. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Descriptors: anorexia, activity, rats, feeding schedule, failure, adapt.

Even, P.C., V. Rolland, S. Roseau, J.C. Bouthegourd, and D. Tome (2001). **Prediction of basal metabolism from organ size in the rat: relationship to strain, feeding, age, and obesity**. *American Journal of Physiology* 280(6, Part 2): R1887-R1896. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: rat, strain, basal metabolism, organ size, feeding, age, obesity, prediction, Wistar rat.

Federation of European Laboratory Animal Science Associations (1996). **FELASA recommendations for the health monitoring of mouse, rat, hamster, gerbil, guineapig and rabbit experimental units. Report of the Federation of European Laboratory Animal Science Associations (FELASA) Working Group on Animal Health accepted by the FELASA board of management, November 1995**. *Laboratornye Zhivotnye* 6(3): 168-176.
Descriptors: mouse, rat, gerbil, hamster, rabbit, guinea pig, health monitoring, recommendations, FELSA, Federation of European Laboratory Animal Science Associations.

Feliu, M.S. and N.H. Slobodianik (1996). **Protein deprivation effects on the thymus of growing rats**. *Comunicaciones Biologicas* 14(2): 135-149.
Descriptors: protein, deprivation, thymus, rats, effect.

Fodor, K., V. Molnar, A. Beregi, F. Felkai, and S. Fekete (2003). **A kedvtelesbol tartott kisemlosok takarmanyozasa. [Nutrition of pet rodents and small mammals].** *Kisallat Praxis* 4(2): 68-76. ISSN: 1585-9142.
Descriptors: nutrition, rodents, nutrient requirements, pets, chinchillas, gerbils, guinea pigs, hamsters, mice, rabbits, rats, squirrels, small mammals, feeding management.
Language of Text: Hungarian with an English summary.

Francolin Silva, A.L. and S.S. Almeida (2004). **The interaction of housing condition and acute immobilization stress on the elevated plus-maze behaviors of protein-malnourished rats**. *Brazilian Journal of Medical and Biological Research* 37(7): 1035-1042. ISSN: 0100-879X.
Abstract: Protein malnutrition induces structural, neurochemical and functional alterations in the central nervous system, leading to behavioral alterations. In the present study, we used the elevated plus-maze (EPM) as a measure of anxiety to evaluate the interaction between acute immobilization and housing conditions on the behavior of malnourished rats. Pups (6 males and 2 females) were fed by Wistar lactating dams receiving a 6% (undernourished) or 16% (well-nourished) protein diet. After weaning, the animals continued to receive the same diets ad libitum until 49 days of age when they started to receive a regular lab chow diet. From weaning to the end of the tests on day 70, the animals were housed under two different conditions, i.e., individual or in groups of three. On the 69th day, half of the animals were submitted to immobilization for 2 h, while the other half were undisturbed, and both groups were tested 24 h later for 5 min in the EPM. Independent of other factors, protein malnutrition increased, while immobilization and social isolation per se decreased, EPM exploration. Analysis of the interaction of diet vs immobilization vs housing conditions showed that the increased EPM exploration presented by the malnourished group was reversed by acute immobilization in animals reared in groups but not in animals reared individually. The interaction between immobilization and housing conditions suggests that living for a long time in social isolation is sufficiently stressful to reduce the responses to another anxiogenic procedure (immobilization), while living in groups prompts the animals to react to acute stress. Thus, it is suggested that housing condition can modulate the effects of an anxiogenic procedure on behavioral responses of malnourished rats in the EPM.
Descriptors: rats, protein malnourished, housing condition, interaction, stress, behavior, diet, immobilization.

Frank, M.E., B.K. Formaker, and T.P. Hettinger (2003). **Taste responses to mixtures: analytic processing of quality.** *Behavioral Neuroscience* 117(2): 228-235. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Descriptors: tastes, mixtures, food preferences, feeding behavior, golden hamsters, conditioned taste aversions.

Gerold, S., E. Huisinga, F. Iglauer, A. Kurzawa, A. Morankic, and S. Reimers (1997). **Influence of feeding hay on the alopecia of breeding guinea pigs**. *Journal of Veterinary Medicine Series A* 44(6): 341-348.
Descriptors: guenia pigs, feeding, hay, alopecia, breeding.

Giacomelli, F.R.B. and M.R.M. Natali (1999). **A utilizacao de ratos em modelos experimentais de carencias nutricionais. [The use of rats in experimental models of deprivation nutrition].** *Arquivos De Ciencias Da Saude Da UNIPAR* 3(3): 239-249. ISSN: 1415-076x.
Descriptors: rats, model, food deprivation, nutrition, diet, protein level, organs, effects, cellular turnover.

Language of Text: Portuguese with an English summary.

Gupta, R.P. and P.C. Verma (1992). **Effect of experimental zinc deficiency on protein and feed efficiency ratios in guinea-pigs**. *Indian Journal of Nutrition and Dietetics* 29(11): 342-344. ISSN: 0022-3174.
Descriptors: guinea pigs, zinc deficiency, protein, feed, efficiency ratios, effect, body weight gain.

Gutierrez, A.C. and E.A. Keller (1997). **Analgesic response to stress is reduced in perinatally undernourished rats**. *Journal of Nutrition* 127(5): 765-769. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Abstract: Stress-induced analgesia was evaluated in adult rats submitted early in life to a protein deprivation schedule. Rats were undernourished with a hypoproteic diet containing 80 g casein/kg diet from d 14 of gestation until 50 days of age. Rats were thereafter fed a balanced nonpurified diet until 140 days of age, when they were exposed to two stressors: forced swimming and acute restraint, after which the analgesic response was evaluated. In addition, the analgesic response induced by different morphine doses was determined in another group of rats. Basal latency was not different in deprived and control rats. Undernourished rats presented a significantly lower analgesic response in both stress situations. However, when the analgesic response induced by different morphine doses (1, 2, 4 and 8 mg/kg, s.c.) was assessed, a significantly higher response occurred in undernourished rats compared to control rats. This lower stress-induced analgesia in undernourished rats may account for the behavioral alterations attributed to early undernutrition.
Descriptors: malnutrition, puerperium, stress, pain, protein deficiencies, dosage effects, morphine, rats, animal models, young animals, alkaloids, animal developmental stages, developmental stages, mammals, nutrient deficiencies, Rodentia, undernutrition, swimming, restraint.

Harris, R.B., T.D. Mitchell, J. Zhou, S. Herbert, and D.H. Ryan (2001). **Stress-induced weight loss in rats is influenced by the feeding regimen**. *Society for Neuroscience Abstracts* 27(2): 1956. ISSN: 0190-5295.
Descriptors: rats, weight loss, stress induced, feeding regimen, repeated restraint, time of day, food access.
Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Haseman, J.K., E. Ney, A. Nyska, and G.N. Rao (2003). **Effect of diet and animal care/housing protocols on body weight, survival, tumor incidences, and nephropathy severity of F344 rats in chronic studies.** *Toxicologic Pathology* 31(6): 674-81. ISSN: 0192-6233.
Abstract: Diet is an important environmental factor affecting body weight, survival, and age-related diseases of rodents. The NIH-07 open formula diet was the diet used in the National Toxicology Program's (NTPs) rodent carcinogenicity studies from 1980 to 1994. In 1994 the NTP began using a new diet designated the NTP-2000 diet. This paper compares body weight, survival, tumor incidence, and nephropathy severity in untreated control groups of Fischer 344 (F344) rats fed the NTP-2000 or NIH-07 diets, using data from 22 separate 2-year feed and inhalation studies. The feed studies were conducted in 3 different facilities, and all the inhalation studies were conducted in a single facility. During feed studies, rats were group housed in polycarbonate cages and fed diets in powder (mash) form, while in inhalation studies, rats were housed individually in wire mesh cages, and fed diets in pelleted form. Survival was significantly ($p<0.05$) higher in groups fed NTP-2000 diet compared to the corresponding groups fed NIH-07 diet, irrespective of sex or housing conditions. Use of the NTP-2000 diet was also associated with a decreased incidence of pituitary gland tumors in both sexes and decreased incidences of adrenal pheochromocytoma and preputial gland tumors in males. The incidence and severity of nephropathy was also decreased in animals receiving the NTP-2000 diet, especially males. The decreased nephropathy severity and the decreased incidence of pituitary gland tumors are likely the major factors contributing to the improved survival of rats receiving the NTP-2000 diet relative to those given the NIH-07 diet. These data also support earlier findings that decreased incidences of adrenal pheochromocytoma are associated with reduced nephropathy severity in male F344 rats. Throughout the two-year study female rats receiving the NTP-2000 diet were significantly ($p<0.05$) lighter than those receiving the NIH-07 diet. However, it is uncertain if this difference can be attributed to the NTP-2000 diet, since implementation of this diet by the NTP approximately coincided with changes in the F344 rat production colony that resulted in somewhat lighter animals being provided to the NTP. Controls from inhalation studies and feed studies differed significantly ($p<0.01$) in the incidence of a variety of tumors, irrespective of diet. This suggests that differences in animal care and housing

protocols may impact tumor incidence in F344 rats, most notably pituitary gland and testis tumors.
Descriptors: animal feed analysis, animal husbandry methods, body weight physiology, kidney diseases pathology, longevity physiology, neoplasms epidemiology, toxicity tests, chronic methods, food, formulated analysis, housing, animal, neoplasms pathology, rats, inbred F344 rats.

Hayakawa, T., Y. Morimoto, S. Doke, and H. Tsuge (1999). **Vitamin B6 nutrition and immune responses in rats**. *FASEB Journal* 13(4, Part 1): A237. ISSN: 0892-6638.
Descriptors: nutrition, immune response, vitamin B6, rats.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists for Experimental Biology 99, April 17-21, 1999, Washington, D.C., USA.

Hayase, K. (2000). **[The effect of dietary protein on changes in brain protein synthesis in aged rats]**. *Journal of Japanese Society of Nutrition and Food Science* 53(1): 19-22. ISSN: 0287-3516.
Descriptors: proteins, brain, protein synthesis, diet, rats, body parts, central nervous system, mammals, nervous system, Rodentia.
Language of Text: Japanese with an English summary.

Heinrichs, S.C. (2001). **Mouse feeding behavior: ethology, regulatory mechanisms and utility for mutant phenotyping**. *Behavioural Brain Research* 125(1-2): 81-88. ISSN: 0166-4328.
Descriptors: mouse, feeding behavior, regulatory mechanisms, mutant phenotyping, ingestive behavior, genetically obese.

Hendriks, W.H., C.A. Butts, D.V. Thomas, K.A.C. James, P.C.A. Morel, and M.W.A. Verstegen (2002). **Nutritional quality and variation of meat and bone meal.** *Asian Australasian Journal of Animal Sciences* 15(10): 1507-1516. ISSN: 1011-2367.
NAL Call Number: SF55.A78A7
Descriptors: meat and bone meal, amino acids, in vitro digestibility, nutritive value, protein composition, variation, rats, bioassays, crude protein, protein digestibility, New Zealand, amino acid composition.

Hirao, M., M. Tanaka, H. Emoto, H. Ishii, H. Yokoo, M. Yoshida, and A. Tsuda (1997). **Recovery from activity-stress ulcer by ad lib feeding in rats**. *Physiology and Behavior* 63(1): 85-89. ISSN: 0031-9384.
Descriptors: stress, ulcer, activity, recovery, feeding, ad lib, rats.

Hirashima, N., A. Yamanaka, T. Sakurai, M. Yanagisawa, and K. Goto (2003). **Analysis of feeding behavior in prepro-orexin knockout mice.** *Journal of Pharmacological Sciences* 91(Supplement 1): 203. ISSN: 1347-8613.
Descriptors: knockout mice, feeding behavior, analysis, prepro-orexin.
Notes: Meeting Information: 76th Annual Meeting of the Japanese Pharmacological Society, March 24-26, 2003, Fukuoka, Japan.

Holley, D.C., B. Said, A. Howard, and D.P. Ward (2003). **Monitoring lab animal feeding by using subcutaneous microchip transponders: validation of use with group-housed rats.** *Contemporary Topics in Laboratory Animal Science* 42(3): 26-28. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, group housed, monitoring feeding, microchip transponders, subcutaneous, pellet feeder, feeding behaviors.

Hopkins, I., S. Greenwald, C.L. Berry, and D.M. Berney (1998). **Quantitative changes in adult rat kidneys subjected to maternal protein deprivation**. *Journal of Pathology* 186(Supplement): 34A.
Descriptors: rat, kidneys, changes, protein, deprivation, maternal.
Notes: Meeting Information: 7th Meeting of the Pathological Society of Great Britain and Ireland, July 1-3, 1998, Leicester, England, UK.

Hoshiba, J. (2004). **Method for hand-feeding mouse pups with nursing bottles.** *Contemporary Topics in Laboratory Animal Science* 43(3): 50-53. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23
Descriptors: mice, neonates, laboratory animals, animal feeding equipment, bottle feeding, animal feeding, milk replacer, digestibility, ad libitum feeding, animal growth, liveweight gain, bloat.

Howell, L.A., R.B.S. Harris, C. Clarke, B.D. Youngblood, D.H. Ryan, and T.A. Gilbertson (1999). **The effects of restraint stress on intake of preferred and nonpreferred solutions in rodents.** *Physiology and Behavior* 65(4-5): 697-704. ISSN: 0031-9384.
Descriptors: rodents, restraint stress, solutions, intake, preferred, nonpreferred, effects, rat, hamsters.

Iossa, S., L. Lionetti, M.P. Mollica, R. Crescenzo, A. Barletta, and G. Liverini (2001). **Effect of cold exposure on energy balance and liver respiratory capacity in post-weaning rats fed a high-fat diet.** *British Journal of Nutrition* 85(1): 89-96. ISSN: 0007-1145.
NAL Call Number: 389.8 B773
Abstract: Variations in energy balance, body composition, and nutrient partitioning induced by high-fat feeding, cold exposure or by concomitant high-fat feeding and cold exposure were studied in young Wistar rats. Changes in hepatic metabolism as well as in serum free triiodothyronine and leptin levels were also evaluated. Rats were exposed to either 24 or 4 degrees C and fed either a low- or high-fat diet (10% or 50% energy respectively) for 2 weeks. Relative to low-fat feeding at 24 degrees C, both energy intake and expenditure were increased by high-fat feeding or by cold exposure, and these changes were accompanied by increased serum triiodothyronine levels. In response to concomitant high-fat feeding and cold exposure, serum triiodothyronine tended to be further elevated, but no further increases in energy intake or energy expenditure were observed. Independently of diet, the increased energy expenditure in cold-exposed rats was not completely balanced by adaptive hyperphagia, with consequential reductions in protein and fat gain, accompanied by marked decreases in serum leptin. Furthermore, unlike high-fat feeding at 24 degrees C, cold exposure enhanced hepatic mitochondrial oxidative capacity both in the low-fat- and high-fat-fed groups. It is concluded that in this strain of young Wistar rats, despite similarly marked stimulation of energy expenditure by high-fat feeding at 24 degrees C, by cold exposure and by concomitant high-fat feeding and cold exposure, an increased hepatic oxidative capacity occurred only in the presence of the cold stimulus.
Descriptors: cold stress, dietary fat, energy balance, liver, oxygen, oxygen consumption, respiration, peroxisomes, body composition, nutrition physiology, diet, experimental diets, animal proteins, temperature, metabolizable energy, energy intake, energy expenditure, hyperphagia, body weight, rats, animal models, nutrient intake, blood serum, triiodothyronine, hormones, nutrient partitioning, leptin.

Ishiwaka, R. and T. Mori (1998). **Regurgitation feeding of young in harvest mice, *Micromys minutus* (Rodentia: Muridae)**. *Journal of Mammalogy* 79(4): 1191-1197. ISSN: 0022-2372.
Descriptors: mice, young, feeding, regurgitation.

Itou, T., A. Maruyama, M. Ohta, Y. Shimizu, and M. Nishimura (1998). **Feeding profile and its pharmacological modification in mice**. *Japanese Journal of Pharmacology* 79(Supplement 1): 191. ISSN: 0021-5198.
Descriptors: feeding. profile, mice, modification, pharmacological.
Notes: Meeting Information: 71st Annual Meeting of the Japanese Pharmacological Society, March 23-26, 1998, Kyoto, Japan.

Iwakiri, R., Y. Gotoh, T. Noda, H. Sugihara, K. Fujimoto, J. Fuseler, and T.Y. Aw (2001). **Programmed cell death in rat intestine: effect of feeding and fasting**. *Scandinavian Journal of Gastroenterology* 36: 139-47. ISSN: 0036-5521.
Descriptors: rat intestine, programmed cell death, feeding, fasting, effect, apoptosis, luminal factors, DNA fragmentation.

Jacobson, C. and M. Maslov (2001). **Effects of extruded or pelleted diet on blood glucose, body weight, feed and water consumption in rats**. *Scandinavian Journal of Laboratory Animal Science* 28(3): 129-139. ISSN: 0901-3393.
Descriptors: laboratory animals, diet, blood sugar, body weight, feed consumption, water uptake, pellets, blood, blood composition, consumption, formulations, nutrient uptake, nutrition physiology, physiological functions,

useful animals.
Language of Text: Swedish summary.

Jen, K.L.C., J. Ilagan, and P.K.H. Lin (1997). **Metabolic consequences of weight cycling induced by high fat and protein feedings in female Sprague-Dawley rats**. *Nutrition Research* 17(8): 1321-1330. ISSN: 0271-5317.
Descriptors: Sprague Dawley rats, female, weight cycling, fat, protein, metabolic, consequences.

Kauffman, A.S., A. Cabrera, and I. Zucker (2001). **Torpor characteristics and energy requirements of furless Siberian hamsters.** *Physiological and Biochemical Zoology* 74(6): 876-84. ISSN: 1522-2152.
Abstract: After approximately 10 wk of exposure to decreasing day lengths, Siberian hamsters (*Phodopus sungorus*) begin to display spontaneous torpor bouts several times each week. Torpor is associated with reduced daily energy expenditure and lower food consumption and ameliorates the thermoregulatory challenges of winter. We tested the extent to which the energy savings conferred by daily torpor depend on the presence of an insulative pelage. Female hamsters were housed in a winter day length (8L:16D) at 5 degrees C; daily food intake and torpor characteristics were recorded for 5 wk in shaved (furless) or normal hamsters. Torpor-bout incidence decreased by 62% in furless hamsters, but the duration of individual bouts and the minimum body temperature attained during torpor were unaffected by loss of pelage. Body temperature declined more rapidly during entry into torpor and increased more slowly during arousal from torpor in furless than in control hamsters. Energy savings per torpor bout, assessed by the amount of food consumed on days that included a torpor bout, was substantially greater in normal than in furless hamsters (16.0% vs. 3.3%); this difference likely reflects the increased cost of thermoregulation during torpor, as well as the increased caloric expenditure incurred by furless hamsters during arousal from torpor. An insulative pelage may be a prerequisite for the energetic benefits derived from heterothermy in this species.
Descriptors: body temperature regulation physiology, eating, energy metabolism, movement, *Phodopus* physiology, hamsters, photoperiod, seasons.

Kim, H.H. and C.S. Park (2004). **A compensatory nutrition regimen during gestation stimulates mammary development and lactation potential in rats**. *Journal of Nutrition* 134(4): 756-761. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Descriptors: rats, nutrition regimen, gestation, lactation, mammary development, stimulates, growth phase, compensatory.

Kimball, J.P., N.J. Raritan, J. Sansone, C.M. Keenan, D.S. Barrett, E.V. Knight, L.A. Smith, and W.J. Powers (1998). **The effects of ad libitum and controlled feeding, and group housing on body weight gain, survival and clinical pathology parameters for Sprague-Dawley rats**. *Clinical Chemistry* 44(6, Part 2): A109.
Descriptors: rats, housing, feeding, weight gain, survival, pathology, ad libitum, controlled, Sprague Dawley rats.
Notes: Meeting Information: 50th Annual Meeting of the American Association of Clinical Chemistry, August 2-6, 1998, Chicago, Illinois, USA.

Kimura, N., T. Fukuwatari, R. Sasaki, and K. Shibata (2005). **The necessity of niacin in rats fed on a high protein diet**. *BioScience, Biotechnology and Biochemistry* 69(2): 273-279. ISSN: 0916-8451.
Abstract: It is known that niacin itself is not necessary in rats when tryptophan is given in adequate amounts, because rats can biosynthesize niacin from tryptophan. In our experiment, young rats were fed on a 20%, 40%, 60%, or 70% casein diet with or without niacin. The rats fed on the 20%, 40%, and 60% casein diets did not require niacin for growth, but the rats fed on the 70% casein diet needed it. This phenomenon was attributed to the supposition that liver aminocarboxymuconate-semialdehyde decarboxylase activities increased according with the dietary casein levels. The conversion ratio of tryptophan-niacin in rats fed on the 70% casein diet became extremely low, and then the rats needed niacin.
Descriptors: rats, high protein diet, niacin, tryptophan, casein, liver, biosynthesize, nutrition.

Kind, K.L., C.T. Roberts, A.I. Sohlstrom, A. Katsman, P.M. Clifton, J.S. Robinson, and J.A. Owens (2005). **Chronic maternal feed restriction impairs growth but increases adiposity of the fetal guinea pig**. *American Journal of Physiology, Regulatory Integrative and Comparative Physiology* 288(1): R119-R126. ISSN: 0363-6119.

Descriptors: fetal guinea pig, maternal feed restriction, chronic, impaired growth, adiposity, obesity, metabolic, cardiovascular, dysfunction.

Kind, K.L., G. Simonetta, P.M. Clifton, J.S. Robinson, and J.A. Owens (2002). **Effect of maternal feed restriction on blood pressure in the adult guinea pig**. *Experimental Physiology* 87(4): 469-477. ISSN: 0958-0670.
Descriptors: guinea pig, adult, maternal feed restriction, blood pressure, effect, undernutrition, protein restriction, fetal growth.

Kittel, B., F.C. Ruehl, G. Morawietz, J. Klapwijk, M.R. Elwell, B. Lenz, M.G. O'Sullivan, D.R. Roth, and P.F. Wadsworth (2004). **Revised guides for organ sampling and trimming in rats and mice. Part 2. A joint publication of the RITA and NACAD groups**. *Experimental and Toxicologic Pathology* 55(6): 413-431. ISSN: 0940-2993.
Descriptors: rats, mice, organ sampling, trimming, tissues, toxicity studies, regulatory, RITA, NACAD, revised guidelines.

Knight, E.V., D.S. Barrett, C.M. Keenan, J.P. Kimball, B.H. Eitzen, S. Bryant, L.N. Smith, R.J. Szot, and W.J. Powers (1998). **Influence of origin or controlled feeding on longevity of Sprague-Dawley rats**. *International Journal of Toxicology* 17(Supplement 2): 57-78.
Descriptors: Sprague Dawley rats, feeding, controlled, longevity, influence.

Kojima, T., M. Nishimura, T. Yajima, T. Kuwata, Y.I. Suzuki, T. Goda, S. Takase, and E. Harada (1998). **Effect of intermittent feeding on the development of disaccharidase activities in artificially reared rat pups**. *Comparative Biochemistry and Physiology, Part A, Molecular and Integrative Physiology* 121(3): 289-297. ISSN: 1095-6433.
NAL Call Number: QP1.C6
Descriptors: intermittent feeding, rat pups, development, disaccharidase, artificially reared, effect.

Kristan, D.M. and K.A. Hammond (1999). **Body composition, nutrient transport, and resting metabolic rate of energy restricted, parasitized mice**. *American Zoologist* 39(5): 94A. ISSN: 0003-1569.
Descriptors: mice, parasitized, body composition, metabolic rate, energy restricted, nutrient transport, resting.
Notes: Meeting Information: Annual Meeting of the Society for Integrative and Comparative Biology, January 04-08, 2000, Atlanta, Georgia, USA.

Krizova, E. and V. Simek (1996). **Effect of intermittent feeding with high-fat diet on changes of glycogen, protein and fat content in liver and skeletal muscle in the laboratory mouse**. *Physiological Research* 45(5): 379-383.
Descriptors: mouse, liver, muscle, protein, fat, effect, intermittent feeding, high fat, diet, glycogen.

Kurokawa, M., K. Akino, and K. Kanda (2000). **A new apparatus for studying feeding and drinking in the mouse.** *Physiology and Behavior* 70(1-2): 105-12. ISSN: 0031-9384.
Abstract: The quantity of powder food consumed by individual mice was gauged with a newly developed apparatus that includes a specialized feeding station, an electric scale, and an interface to a computer that records the weight of the powder food jar. Using the measurements that exceeded the cutoff value, that is, the threshold between a mouse feeding or drinking event and scale noise, the reconstructed data were presented as the daily pattern of feeding and drinking in time resolution of 9 to 30 min. In this system, the ratio of noise to total consumption value was less than 4%. The fractal structure and fitting curve of this time series data were also analyzed by the nonlinear least-squares method, combined with the maximum entropy method. These analyses demonstrated that the mouse feeding event has circadian and ultradian periodicity. This apparatus and system are useful tools in studying the daily feeding pattern of mice.
Descriptors: drinking behavior, feeding behavior, experimental instrumentation, feeding, new apparatus, housing, food consumed, analysis, inbred C57BL mice.

Laroque, P.A., K.P. Keenan, K. Soper, C. Dorian, M.F. Hubert, and P. Duprat (1996). **Effect of initial body weight and moderate dietary restriction (measured-feeding) on survival in Sprague-Dawley rats**. *Toxicologic Pathology* 24(6): 787. ISSN: 0192-6233.

Descriptors: dietary restriction, body weight, effect, measured feeding, survival, Sprague Dawley rats.
Notes: Meeting Information: XV International Symposium of the Society of Toxicologic Pathologists, June 9-13, 1996, St. Louis, Missouri, USA.

Lattanzio, S.B. and R. Eikelboom (2003). **Wheel access duration in rats. I. Effects on feeding and running.** *Behavioral Neuroscience* 117(3): 496-504. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Descriptors: feeding, suppression, body weight, rats, animal models, wheel running, feeding suppression.

Le Magnen, J. (1999). **Efficacy of olfactory, tactile and other food stimuli in the acquisition and manifestation of appetite in rats.** *Appetite* 33(1): 43-51. ISSN: 0195-6663.
NAL Call Number: QP141.A1A64
Abstract: A differential appetite for two forms of the same food is learned when they differ in smell, texture, position in the cage or visual appearance and eating of one version is followed by injection of amphetamine. Of these, the discrimination of smells affords the best basis for learning of appetites. For appetites learnt for combinations of olfactory and tactile stimuli, when the smells alone or the differences of texture alone are maintained during the test, the smells play the main role in the differentiation of intake of the two forms of food. On the other hand, when odours and textures remained combined but mixed in reverse, the rats followed the textures and not the smells in amphetamine-conditioned differential consumption. These findings confirm the role of learnt oral stimuli in the short-term control of food intake.
Descriptors: appetite, food intake, diet, experimental diets, stimuli, aroma, odors, texture, amphetamines, position, conditioning, organoleptic traits, rats, animal models, appearance.

Le Magnen, J. (1999). **Effect of a multiplicity of food stimuli on the amount eaten by the rat.** *Appetite* 33(1): 36-39. ISSN: 0195-6663.
NAL Call Number: QP141.A1A64
Abstract: The same diet was presented for brief periods in three sensorily discriminable forms either separately or simultaneously. A sudden shift from separate to simultaneous presentation produced the same increase in the consumption during the same time period. In some rats this hyperphagia was substantial and persistent but in other it was slight and rapidly disappeared. After some habituation to separate presentations, preferences for the differently flavoured version of the diet and among various placements in the cages were slight or undetectable in separate presentations but were stronger in multiple-choice tests. These results have implications regarding mechanisms of acquisition and expression of appetites and for the methodology of different designs of intake tests on sensorily different diets.
Descriptors: diet, experimental diets, diets, food intake, flavor, stimuli, appetite, rats, animal models.

Lesage, J., L. Dufourny, C. Laborie, F. Bernet, B. Blondeau, I. Avril, B. Breant, and J.P. Dupouy (2002). **Perinatal malnutrition programs sympathoadrenal and hypothalamic-pituitary-adrenal axis responsiveness to restraint stress in adult male rats.** *Journal of Neuroendocrinology* 14(2): 135-143. ISSN: 0953-8194.
Descriptors: rats, adult, male, restraint stress, response, perinatal malnutrition, hypothalamic, pituitary, adrenal, responsiveness.

Lett, B.T., V.L. Grant, and L.L. Gaborko (1998). **Wheel running simultaneously induces CTA and facilitates feeding in non-deprived rats.** *Appetite* 31(3): 351-360. ISSN: 0195-6663.
NAL Call Number: QP141.A1A64
Abstract: Previous findings indicate that wheel running can have either an aversive or an appetitive effect. That is, wheel running for 30 min induces conditioned taste aversion (CTA) in rats trained while hungry and thirsty but facilitates feeding in non-deprived rats. In Experiment 1, wheel running was also found to be effective in producing CTA in non-deprived rats. Therefore, Experiment 2 tested whether wheel running produces the aversive and appetitive effects simultaneously. During each of four training trials, two groups of non-deprived rats were given a flavored solution to drink for 10 min. Then those in the wheel group were put in running wheels for 30 min whereas those in the cage group spent 30 min in small cages. Finally, all rats were given a 60-min feeding test. After the first trial, the wheel group drank less flavored solution than the cage group during each of the remaining trials. The wheel group also ate more than the cage group on each feeding test. These

results indicate that wheel running produces CTA and facilitates eating at the same time. A role for the mesolimbic dopamine reward system in these effects was considered.

Descriptors: rats, physical activity, exercise, feeding, conditioned reflexes, feeding preferences, hunger, thirst, food deprivation, food preferences, food restriction, conditioned taste aversion.

Levine, S. and A. Saltzman (1999). **Effects of coprophagy on serum urea and the weight of the gastrointestinal tract of fed or fasted rats.** *Laboratory Animals* 33(3): 265-268. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Coprophagy can be minimized by fitting rat cages with metal grids which allow faecal pellets to pass through to the floor of the cage. When bedding was omitted overnight, the extent of coprophagy could be estimated from the weight of the droppings on the cage floor or the weight of the gastrointestinal (GI) tract removed from rats housed with or without grids. The effect of coprophagy was also demonstrated by the elevation of serum urea nitrogen in rats that consumed faeces. Therefore, precautions against coprophagy, or their absence, should be specified in all experimental protocols and reports.

Descriptors: rats, coprophagy, cages, floor type, starvation, body weight, urea, blood composition, digestive tract, weight, feces, collection.

Lewis, R.M., A.J. Forhead, C.J. Petry, S.E. Ozanne, and C.N. Hales (2002). **Long-term programming of blood pressure by maternal dietary iron restriction in the rat.** *British Journal of Nutrition* 88(3): 283-290. ISSN: 0007-1145.

NAL Call Number: 389.8 B773

Abstract: We have reported that blood pressure was elevated in 3-month-old rats whose mothers were Fe-restricted during pregnancy. These animals also had improved glucose tolerance and decreased serum triacylglycerol. The aim of the present study was to determine whether these effects of maternal nutritional restriction, present in these animals at 3 months of age, can be observed in the same animals in later life. Pulmonary and serum angiotensin converting enzyme (ACE) concentrations were also measured to investigate whether the renin-angiotensin system was involved in the elevation of blood pressure observed in the offspring of Fe-restricted dams. Systolic blood pressure was higher in the offspring of Fe-restricted dams at 16 months of age. Heart and kidney weight were increased as a proportion of body weight in the offspring of Fe-restricted dams. The pulmonary ACE concentration was not significantly different between the groups. The serum ACE concentration was significantly elevated in the offspring of Fe-restricted dams at 3 but not 14 months of age. There was a strong correlation between serum ACE levels at 3 and 14 months of age. Glucose tolerance and serum insulin were not different between the maternal diet groups. Serum triacylglycerol tended to be lower in the offspring of Fe-restricted dams. There were no differences in serum non-esterified fatty acids or serum cholesterol between the maternal diet groups. This study provides further evidence that maternal nutrition has effects on the offspring that persist throughout life. At 16 months of age, the elevation of blood pressure in Fe-restricted offspring does not appear to be mediated via changes in ACE levels. Both. cardiac hypertrophy and decreased serum triacylglycerol have also been observed in Fe-restricted fetuses, suggesting that these changes may be initiated in utero.

Descriptors: iron, maternal nutrition, pregnancy, longitudinal studies, blood pressure, progeny, heart, kidneys, liver, lungs, weight, body weight, diet, experimental diets, rats, animal models, hemodynamics, hydrolases, blood serum, insulin, blood lipids, gender differences, blood glucose, long term effects, renin angiotensin system, angiotensin converting enzyme, animal organs.

Lo, H., C. Chang, H. Wang, and C. Cheng (1998). **[Changes of body composition and liver function in rats with continuous and cyclic parenteral nutrition]**. *Nutritional Sciences Journal* 23(4): 323-334.

Descriptors: rats, liver function, body composition, changes, parenteral nutrition, cyclic infusion, hepatobiliary complications.

Language of Text: Chinese with an English summary.

Lorenz, J.N. (2002). **A practical guide to evaluating cardiovascular, renal, and pulmonary function in mice**. *American Journal of Physiology* 282(6, Part 2): R1565-R1582. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3

Descriptors: mice, guide, evaluating, cardiovascular, renal, pulmonary, function, genetically altered mice,

techniques.

Lucas, A., B.A. Baker, M. Desai, and C.N. Hales (1996). **Nutrition in pregnant or lactating rats programs lipid metabolism in the offspring**. *British Journal of Nutrition* 76(4): 605-612. ISSN: 0007-1145.
NAL Call Number: 389.8 B773
Descriptors: rats, pregnant, lactating, nutrition, lipid metabolism, offspring.

Makarios Lahham, L., S.M. Roseau, G. Fromentin, D. Tome, and P.C. Even (2004). **Rats free to select between pure protein and a fat-carbohydrate mix ingest high-protein mixed meals during the dark period and protein meals during the light period.** *Journal of Nutrition* 134(3): 618-624. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Descriptors: rats, protein, fat, carbohydrate, mixed meals, light, dark.

Maltais, L.J., J.A. Blake, J.T. Eppig, and M.T. Davisson (1997). **Rules and guidelines for mouse gene nomenclature: a condensed version**. *Genomics* 45(2): 471-476. ISSN: 0888-7543.
Descriptors: mouse, genes, nomenclature, DNA, loci, transgenics, chromosome aberrations, biotechnology, mice, guidelines.

Maltais, L.J., J.A. Blake, T. Chu, C.M. Lutz, J.T. Eppig, and I. Jackson (2002). **Rules and guidelines for mouse gene, allele, and mutation nomenclature: a condensed version**. *Genomics* 79(4): 471-474. ISSN: 0888-7543.
Descriptors: mouse, gene, allele, mutation nomenclature, rules, guidelines, condensed version.

McAdam, A.G. and S. Boutin (2003). **Effects of food abundance on genetic and maternal variation in the growth rate of juvenile red squirrels.** *Journal of Evolutionary Biology* 16(6): 1249-56. ISSN: 1010-061X.
Abstract: Sources of variation in growth in body mass were assessed in natural and experimental conditions of high and low food abundance using reciprocal cross-fostering techniques and long-term data (1987-2002) for a population of North American red squirrels (*Tamiasciurus hudsonicus*). Growth rates were significantly higher in naturally good and food supplemented conditions, than in poor conditions. Mother-offspring resemblance was higher in poor conditions as a result of large increases in both the direct genetic variance and direct-maternal genetic covariance and a smaller increase in the coefficient of maternal variation. Furthermore, the genetic correlation across environments was significantly less than one indicating that sources of heritable variation differed between the two environments. These results are consistent with the hypothesis that selection has eroded heritable variation for growth more in good conditions and indicate the potential for independent adaptation of growth rates in good and poor conditions.
Descriptors: red squirrels, juveniles, food abundance, effects, growth rate, genetic variation.

Mccutcheon, K.L., A.R. Francis, R.J. Martin, M.J. Keenan, C.E. O'Neil, M.S. Gillespie, R.A. Mekary, and M. Hegsted (2003). **Ad libitum versus meal feeding rats in obesity research.** *FASEB Journal* 17: 4-5 (Abstract No. 453.9). ISSN: 0892-6638.
Online: http://www.fasebj.org/
Descriptors: rats, obesity research, meal feeding, ad libitum, effects, weight gain, body fat, blood parameters, Wistar rats, cholesterol.
Notes: Meeting Information: FASEB Meeting on Experimental Biology: Translating the Genome, April 11-15, 2003, San Diego, CA, USA.

Meireles, C.L., S.R. Price, A.M.L. Pereira, J.T.A. Carvalhaes, and W.E. Mitch (1999). **Nutrition and chronic renal failure in rats: what is an optimal dietary protein?** *Journal of the American Society of Nephrology* 10(11): 2367-2373.
Descriptors: rats, nutrition, renal failure, chronic, dietary protein, optimal.

Moody, D.E., D. Pomp, and M.K. Nielsen (1997). **Variability in metabolic rate, feed intake and fatness among selection and inbred lines of mice**. *Genetical Research* 70(3): 225-235.
Descriptors: overweight, feed intake, inbred lines, selection, mice, metabolism, food consumption, carcass composition, fats, adipose tissues, food intake, animal tissues, behavior, body condition, body parts, breeding methods, carcasses, connective tissues, consumption, feeding habits, mammals, progeny, Rodentia, lean, body

fat.

Morawietz, G., F.C. Ruehl, B. Kittel, A. Bube, K. Keane, S. Halm, A. Heuser, and J. Hellmann (2004). **Revised guides for organ sampling and trimming in rats and mice. Part 3. A joint publication of the RITA and NACAD groups**. *Experimental and Toxicologic Pathology* 55(6): 433-449. ISSN: 0940-2993.
Descriptors: rats, mice, organ sampling, tissue preparation, trimming, methods, techniques, toxicology, RITA, NACAD, sample size, urinary, nervous, musculoskeletal, cardiovascular, lymphoreticular, guidelines.

Naderali, E.K. and G. Williams (2002). **Acute feeding with fat-enriched food causes prolonged vascular dysfunction in the rat**. *International Journal of Obesity* 26(Supplement 1): S93. ISSN: 0307-0565.
Descriptors: rat, acute feeding, fat enriched food, vascular dysfunction, prolonged.
Notes: Meeting Information: Ninth International Congress on Obesity, August 24-29, 2002, Sao Paulo, Brazil.

Nakanishi, Y., T. Futawatari, S. Haruyama, C. Shimizu, M. Yamamoto, R. Hayashi, Y. Shimomura, M. Shinoda, M. Takahashi, T. Tutiya, H. Shimizu, N. Sato, and M. Mori (1998). **Effects of high fat diet and schedule feeding on leptin level in the rat**. *International Journal of Obesity* 22(Supplement 3): S171. ISSN: 0307-0565.
Descriptors: high fat, diet, rat, feeding, schedule, effects, leptin level.
Notes: Meeting Information: Eighth International Congress on Obesity, August 29-September 3, 1998, Paris, France.

Narasimhamurthy, K., P.L. Raina, and K. Hariharan (1997). **Effect of long term feeding of high fat diets on growth, plasma and tissue lipids in rats**. *Journal of Food Science and Technology* 34(4): 303-310.
Descriptors: high fat, diets, long term feeding, effect, growth, plasma, tissue, lipids, rats.

Naumova, E.I., N.A. Ushakova, I.G. Meshcherskii, N.V. Kostina, and M.M. Umarov (2000). **[Nitrogen fixation: a new phenomenon in rodent nutrition]**. *Izvestiya Akademii Nauk Seriya Biologicheskaya* (3): 329-331. ISSN: 0002-3329.
Descriptors: voles, rodent nutrition, nitrogen fixation, rations, protein content, GI tract, bacteria, digestive tract.
Language of Text: Russian with an English summary.

Obatolu, V.A., A. Ketiku, and E.A. Adebowale (2003). **Effect of feeding maize/legume mixtures on biochemical indices in rats.** *Annals of Nutrition and Metabolism* 47(3-4): 170-175. ISSN: 0250-6807.
Descriptors: rats, feeding, maize and legume mixtures, biochemical indices, effect, diet, growth, protein content.

Obin, M., M. Halbleib, R. Lipman, K. Carroll, A. Taylor, and R. Bronson (2000). **Calorie restriction increases light-dependent photoreceptor cell loss in the neural retina of Fischer 344 rats**. *Neurobiology of Aging* 21(5): 639-645. ISSN: 0197-4580.
Descriptors: Fischer rats, photoreceptor cell loss, neural retina, calorie restriction, increases, cell density, aging, albino rats.

Overton, J.M., J.M. Van Ness, and R.M. Casto (1997). **Food restriction reduces sympathetic support of blood pressure in spontaneously hypertensive rats**. *Journal of Nutrition* 127(4): 655-660. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Abstract: We tested the hypothesis that food restriction would attenuate the development of hypertension in spontaneously hypertensive rats (SHR). Furthermore, we hypothesized that food restriction would reduce the tonic sympathetic nervous system support of blood pressure in the SHR. Male SHR (Charles River, age 5 wk) were randomly assigned to ad libitum (ADLIB, n=8) or food-restricted (FR, n = 9) groups. ADLIB rats were given free access to nonpurified diet and demineralized water. Food-restricted rats ate 60% of the amount of nonpurified diet consumed by rats in the ADLIB group. After 8 wk of treatment, ADLIB rats were heavier than FR rats (ADLIB = 318 +/- 4 g; FR = 193+/- 5 g, P < 0.05). Blood pressure and heart rate (HR) were measured after chronic implantation of iliac arterial and jugular venous catheters. Food-restricted rats had lower mean arterial blood pressure (MAP) than ADLIB rats, measured in conscious, unrestrained state 4-6 h after catheterization (ADLIB = 162 +/- 3 mmHg; FR = 142 +/- 3 mmHg, P < 0.05) and measured on the day after

surgery (ADLIB = 150 +/- 6 mmHg; FR = 130 +/- 3 mmHg, P < 0.05). There were no significant differences in resting HR on either day. Food-restricted rats exhibited augmented cardiac baroreflex-mediated bradycardia (bolus phenylephrine, 0.5-4.0 microgram/kg intravenously) as assessed by linear slope of the deltaHR/deltaMAP relationship (ADLIB = -0.73 beats/(min.mm Hg); FR = -1.62 beats/(min.mmHg), P < 0.05). Sympathetic support of blood pressure quantified by the depressor response to ganglionic blockade (hexamethonium 30 mg/kg; atropine 0.1 mg/kg intravenously), was greater in the ADLIB group (ADLIB: -59 +/- 8 mmHg; FR: -36 +/- 2 mmHg, P < 0.05). The results support the hypotheses that chronic food restriction reduces the development of hypertension and sympathetic support of MAP in spontaneously hypertensive rats.
Descriptors: starvation, blood pressure, hypertension, heart rate, restricted feeding, body weight, neurotropic drugs, rats, animal models, blood circulation, cardiovascular diseases, drugs, feeding, feeding systems, mammals, organic diseases, physiological functions, Rodentia, vascular diseases, arrhythmia, parasympatholytics.

Parks, E.J., T.L. Schneider, R.H. Baar, and M.R. Margosian (2004). **Metabolic studies in mice: effects of different diets and feeding regimens**. *FASEB Journal* 18: 4-5 (Abst. No. 579.2). ISSN: 0892-6638.
Online: http://www.fasebj.org/
Descriptors: mice, metabolic studies, feeding regimens, diets, effects, fasting, lipid metabolism.
Notes: Meeting Information: FASEB Meeting on Experimental Biology: Translating the Genome, April 17-21, 2004, Washington, D.C., USA.

Paul, M.J., A.S. Kauffman, and I. Zucker (2004). **Feeding schedule controls circadian timing of daily torpor in SCN-ablated Siberian hamsters**. *Journal of Biological Rhythms* 19(3): 226-237. ISSN: 0748-7304.
Descriptors: Siberian hamsters, feeding schedule, circadian timing, daily torpor, control, restricted food.

Pedrazzini, T., J. Seydoux, P. Kuenstner, J.F. Aubert, V. Pasdrun, E. Grouzmann, F. Beermann, and H.R. Brunner (1998). **Cardiovascular response, feeding behaviour, and locomotor activity in NPY Y1 receptor-deficient mice**. *Society for Neuroscience Abstracts* 24(1-2): 2046. ISSN: 0190-5295.
Descriptors: feeding behavior, locomotor activity, cardiovascular response, deficient mice, NPY Y1 receptor.
Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 2, November 7-12, 1998, Los Angeles, California, USA.

Perin, N., E. Jarocka Cyrta, M. Keelan, T. Clandinin, and A. Thomson (1999). **Dietary lipid composition modifies intestinal morphology and nutrient transport in young rats**. *Journal of Pediatric Gastroenterology and Nutrition* 28(1): 46-53.
Descriptors: young rats, nutrient transport, lipid composition, intestinal morphology, nursing, diet, fatty acid, dietary lipid.

Perrin, M.R. and E.J. Richardson (2004). **Factors affecting the induction of torpor and body mass in the fat mouse *Steatomys pratensis*.** *Journal of Thermal Biology* 29(3): 133-139. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Descriptors: *Steatomys pratensis*, Muridae, weight, torpor, inducing and influencing factors, starvation, food availability, drinking.

Pick, R.R., M.M. Perry, N.R. Carlson, and G.N. Wade (2001). **Metabolic fuel availability affects litter reduction but not maternal care in syrian hamsters**. *Society for Neuroscience Abstracts* 27(2): 2275. ISSN: 0190-5295.
Descriptors: Syrian hamsters, metabolic fuel, maternal care, litter reduction, availability, affects, estrus behavior, pup.
Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Pickard, C.L. and H.D. Mccarthy (1997). **The response of blood pressure to feeding composite diets of differing macronutrient composition in rats with hypertension of fetal origin**. *Proceedings of the Nutrition Society* 56(1A): 11A. ISSN: 0029-6651.
Descriptors: blood pressure, feeding, composite diets, macronutrients, rats, hypertension, response.

Notes: Meeting Information: Meeting of the Nutrition Society, June 24-28, 1996, Ulster, Coleraine.

Price, I.V. and B.B. Gorzalka (2002). **Effect of restraint stress duration on macronutrient intake in the female rat.** *Nutrition Research* 22(8): 931-943. ISSN: 0271-5317.
Descriptors: rat, female, restraint stress, macronutrient intake, effect, duration, food intake, duration, deprivation.

Proll, J. (1997). **Small environmental temperature differences change energy utilization of growing rats**. *Zeitschrift Fuer Ernaehrungswissenschaft* 36(4): 325. ISSN: 0044-264X.
Descriptors: growing rats, energy utilization, environmental temperature differences, change.
Notes: Meeting Information: 1st International Rostock Workshop on Energy and Substrate Utilization: Methodological Aspects of in Vivo Assessment in Animals and Man, September 5-7, 1996, Rostock, Germany.

Pulawa, L.K. and G.L. Florant (2000). **The effects of caloric restriction on the body composition and hibernation of the golden-mantled ground squirrel (*Spermophilus lateralis*).** *Physiological and Biochemical Zoology* 73(5): 538-46. ISSN: 1522-2152.
Abstract: In preparation for hibernation, golden-mantled ground squirrels (*Spermophilus lateralis*) must deposit sufficient amounts of lipid during the summer to survive winter hibernation. We conducted an experiment from May 1998 to February 1999 to examine the effects of caloric restriction on the body composition (lipid and fat-free mass) and hibernation of golden-mantled ground squirrels. Ground squirrels were either provided with food ad lib. (controls) or with only enough food to maintain a constant body mass throughout the experiment (calorically restricted). Changes in body composition were followed using total body electrical conductivity (TOBEC). Implanted data loggers that recorded body temperature were used to determine when ground squirrels entered their first torpor bout and the lengths of torpor bouts. Body composition did not change in the calorically restricted ground squirrels between May and September, while both lipid and fat-free mass increased in the controls. However, from September to February, calorically restricted ground squirrels lost only fat-free mass, not lipid mass, but controls lost both lipid and fat-free mass. Calorically restricted ground squirrels entered their first torpor bout about 4 wk after controls, but the torpor bout duration (or length) during hibernation did not differ between the two groups. These results show that ground squirrels maintain body composition during caloric restriction, and the limited quantities of stored lipid have an effect on when hibernation begins but not on torpor bout length.
Descriptors: body composition, physiology, eating, hibernation physiology, Sciuridae, diet, dietary fats, lipids blood, seasons.

Rabehl, N., P. Wolf, and J. Kamphues (1998). **Basic data for feeding hamsters**. *Journal of Animal Physiology and Animal Nutrition* 80(2-5): 220-225. ISSN: 0931-2439.
Descriptors: hamsters, feeding, nutrition, physiology, digestive system, feed intake, water uptake, behavior, excreta, physiological functions, Rodentia.

Raina, N., J. Lamarre, C.C. Liew, A.H. Lofti, and K.N. Jeejeebhoy (1999). **Effect of nutrition on tumor necrosis factor receptors in weight-gaining and -losing rats**. *American Journal of Physiology* 277(3, Part 1): E464-E473. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: rats, nutrition, tumor necrosis, factor receptors, weight gaining, weight losing, effect.

Ramirez, J.L., M.M. Zirkle Yoshida, S. Piert, J. Barrett, D. Yu, B. Dalton, and B. Girten (2001). **The effects of long-term feeding of rodent food bars on lipid peroxidation and antioxidant enzyme levels in Fischer rats**. *FASEB Journal* 1(4): A84. ISSN: 0892-6638.
Descriptors: Fischer rats, long term feeding, food bars, lipid, peroxidation, effect, diet, space station, livers, stress status.
Notes: Meeting Information: Annual Meeting of the Federation of American Societies for Experimental Biology on Experimental Biology 2001, March 31-April 04, 2001, Orlando, Florida, USA.

Rao, B.S. (1997). **Effect of schedule feeding on water intake and urine output in rats**. *Indian Journal of Physiology*

and Pharmacology 41(1): 35-41. ISSN: 0019-5499.
Descriptors: feeding. schedule, water intake, urine output, effect, rats.

Rao, G.N. and P.W. Crockett (2003). **Effect of diet and housing on growth, body weight, survival and tumor incidences of B6C3F1 mice in chronic studies.** *Toxicologic Pathology* 31(2): 243-50. ISSN: 0192-6233.
Abstract: Diet is one of the most important environmental factors influencing growth, body weight, survival, and age-related diseases of rodents in chronic studies. NIH-07 open formula diet was the selected diet for the NTP studies from 1980 to 1994. A new diet designated as NTP-2000 diet is the current diet for mice in the NTP studies beginning in 1994. This report is a summary of results of untreated control groups of B6C3F1 mice fed NTP-2000 or NIH-07 diet from several retrospective 2-year dosed-feed and inhalation studies for differences in growth, body weight, survival, and tumor incidences. The dosed-feed studies were conducted in 3 different facilities located in the United States, and all the inhalation studies were conducted in 1 facility. During dosed-feed studies, male and female mice housed in polycarbonate cages and fed the NTP-2000 diet had lower maximum body weights than those fed NIH-07 diet. However, during inhalation studies, mice housed in wire mesh cages and fed the NTP-2000 diet had higher maximum body weights than the mice fed NIH-07 diet. Survival was higher in groups fed NTP-2000 diet irrespective of sex, housing conditions, or body weight compared to the corresponding groups fed NIH-07 diet. Survival was higher in mice housed in polycarbonate cages irrespective of diet and sex compared to the respective sex and diet groups housed in wire mesh cages. During inhalation studies, survival of male and female mice fed NTP-2000 diet was higher than that of the groups fed NIH-07 diet, although the body weights of NTP-2000 diet groups were higher than those of the groups fed NIH-07 diet. When the NTP-2000 diet was used, male and female mice in dosed-feed studies and male mice in inhalation studies had markedly lower incidences of liver tumors than the corresponding groups fed NIH-07 diet. Significant decreases in the incidences of lung tumors were observed only in the male groups fed NTP-2000 diet during dosed-feed studies. These results suggest that body weight may not be the major contributing factor for mortality and liver tumors and that an interaction between diet and housing conditions appears to affect the growth, survival and tumor incidences of B6C3F1 mice.
Descriptors: animal feed, body weight physiology, diet, animal housing, neoplasms mortality, toxicity tests, chronic methods, carcinogenicity tests, food, formulated, mice, inbred mice strains, specific pathogen free organisms, survival rate.

Rasmussen, K.M. (1998). **Effects of under- and overnutrition on lactation in laboratory rats**. *Journal of Nutrition* 128(2s): 390s-393s. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Abstract: To study the effects of maternal nutritional status on lactational performance, the diets of laboratory rats were manipulated with food restriction or increases in fat concentration. Compared with rats fed control diets ad libitum, conception rate, milk production and litter growth decreased and milk fat concentration increased in both chronically food restricted and obese animals. Chronically food restricted rats mobilized body fat and reduced their energy expenditure for maintenance and activity. Differences in suckling pattern between control and food-restricted rats affected hormone concentrations important for successful lactation. Obese rats experienced greater difficulty than controls in delivering their pups and more of their pups died in the first days of life. Milk production among obese rats may be constrained by poor appetite and the high heat production that characterizes lactation in litter-bearing species. There are many parallels as well as important differences between results obtained from these models and findings in nursing women. Nevertheless, these models provide useful information about the possible mechanisms by which maternal nutritional status affects lactational performance.
Descriptors: diet, mothers, human nutrition, lactation, starvation, restricted feeding, experimentation, reproductive performance, malnutrition, overfeeding, fats, nutrient intake, overweight, digestion, nutrition physiology, litter size, growth, young animals, nutritional status, rats, animal models, food restriction, conception rate, undernutrition, fat mobilization, litter performance, pups, lactating females.

Ravishankar, H.N., S.S. Boddupalli, A.S. Gaikwad, and T. Ramasarma (1999). **Survival of rats under cold stress depends on dietary fat.** *Environmental and Nutritional Interactions* 3(4): 257-265.
NAL Call Number: RB152.5.E68
Descriptors: dietary fat, polyenoic fatty acids, cold stress, lipid peroxidation, environmental temperature,

relationships, survival, rats.

Reeves, P.G. (2003). **Patterns of food intake and self-selection of macronutrients in rats during short-term deprivation of dietary zinc.** *Journal of Nutritional Biochemistry* 14(4): 232-243. ISSN: 0955-2863.
NAL Call Number: QP141.A1J54
Abstract: Although it has been known for more than 50 years that zinc (Zn) deficiency regularly and consistently causes anorexia in many animal species, the basic mechanism(s) that cause this phenomenon still remain(s) an enigma. The following studies describe feeding behavior in the early stages of zinc deficiency in the rat model. In one experiment, we used computerized feeding monitors that measured the intake of individual rats at 10-min intervals over 24-hr periods. Male rats were acclimated to the cages and fed a Zn-adequate egg-white-based diet, or a similar diet with <1.0 mg Zn/kg. Food intake was monitored for seven, consecutive 24-hr periods. The 24-hr food intake pattern of the Zn-deprived rats did not differ from the controls; they simply ate less food, mainly during the night hours, with no differences between groups during the day. Although Zn-deprived rats ate less food than controls, the percentage of total diet consumed during night and day did not differ between groups. In another experiment, we simultaneously offered male rats three isocaloric diets with different macronutrient compositions and with or without adequate Zn, and measured the amount of each diet selected during seven, 24-hr periods. The three diets contained either 57% protein from egg white, 30% fat from soybean oil, or 80% carbohydrate from a combination of starch, hydrolyzed starch, and sucrose. For the first four days on experiment, rats selected similar amounts of each diet. Then the Zn-deprived rats began to select only 50% as much of the protein diet as the controls. Similar results were obtained when the data were expressed on the basis of each macronutrient as a percentage of the total diet selected. Zn-deprived rats selected a diet that contained 8% protein, 73% carbohydrate, and 6% fat while the Zn-adequate rats selected 12% protein. 69% carbohydrate, and 6% fat. Fat intake was not affected by Zn-deprivation. The results confirm our previous findings, and are discussed in terms of Zn-deprivation blunting the pathways of signal transduction that involve the peptide hormones known to affect food intake regulation.
Descriptors: rats, animal models, zinc, dietary minerals, nutrient deficiencies, anorexia, experimental diets, high protein diet, carbohydrates, high fat diet, feeding behavior, food intake, protein intake, fat intake, carbohydrate intake, cholecystokinin, neuropeptide Y, leptin, proteins, weight gain.

Reidelberger, R., D. Heimann, and K. Nelson (1999). **Comparative effects of duodenal infusions of maltose, oleic acid, and casein on sham feeding and gastric emptying in rats**. *Gastroenterology* 116(4, Part 2): A638. ISSN: 0016-5085.
Descriptors: rats, gastric emptying, sham feeding, oleic acid, casein, maltose, duodenal infusions, comparative effects.
Notes: Meeting Information: Digestive Disease Week and the 100th Annual Meeting of the American Gastroenterological Association, May 16-19, 1999, Orlando, Florida, USA.

Rodrigues, U.P., L. Chaguri, G. Medeiros, A. Sogorb, and F.S. Sogorb (1998). **Productivity of mice (*Mus musculus*) colonies under different pairing and feeding systems**. *Baltic Journal of Laboratory Animal Science* 8(1): 20-22. ISSN: 1407-0944.
Descriptors: mice, colonies, productivity, feeding systems, pairing.

Rollo, C.D., L.J. Kajiura, B. Wylie, and S. D'Souza (1999). **The growth hormone axis, feeding, and central allocative regulation: lessons from giant transgenic growth hormone mice**. *Canadian Journal of Zoology* 77(12): 1861-1873. ISSN: 0008-4301.
Descriptors: mice, giant transgenic growth hormone axis, feeding, alocative regulation.

Rowan, K.J., A. Srikandakumar, R.K. Englebright, and M.J. Josey (1996). **Compensatory growth in rats feed intake and growth patterns**. *Animal Production in Australia. Proceedings of the Australian Society of Animal Production* 21: 215-218. ISSN: 0728-5965.
Descriptors: rats, feed intake, growth patterns, compensatory growth.

Saucy, F., J. Studer, V. Aerni, and B. Schneiter (1999). **Preference for acyanognic white clover (*Trifolium repens*) in the vole *Arvicola terrestris*. I. Experiments with two varieties.** *Journal of Chemical Ecology* 25(6): 1441-

1454. ISSN: 0098-0331.
NAL Call Number: QD415.A1J6
Abstract: We report experimental results showing that, under both laboratory conditions as well as in outdoor enclosures, the fossorial vole *Arvicola terrestris* preferentially feeds on acyanogenic white clover (*Trifolium repens*) when offered the choice between two varieties (Ladino and Aran) differing highly in their content in cyanogenic glycosides. We also observed that the voles adapted their diet and reduced their relative consumption of the cyanogenic variety during experiments conducted for two to three weeks in outdoor enclosures as compared to shorter tests conducted for 48 hr in laboratory cages. In addition, we report a similar preference for the acyanogenic Ladino variety for the slugs *Arion ater* and *A. subfuscus.*
Descriptors: *Trifolium repens*, cyanogenesis, voles, diet, feeding preferences.

Schmidt Kittler, N. (2002). **Feeding specializations in rodents.** *Senckenbergiana Lethaea* 82(1): 141-152. ISSN: 0037-2110.
Descriptors: rodents, feeding, dentition, molar plan, evolution, specializations, occlusal surface, dental structures, hypsodont.

Sefcikova, Z. and S. Mozes (2002). **Effect of early nutritional experience on the feeding behaviour of adult female rats**. *Veterinarni Medicina Uzpi* 47(10-11): 315-322. ISSN: 0375-8427.
Abstract: Female Wistar rats were subjected to food restriction (free access to food for 2 hours daily) as follows: a) during the suckling period, i. e. up to day 15 (SR), b) during the weaning period from day 15 to 30 (WR), c) throughout 30 days post partum (SWR) and d) during adulthood, i.e. from day 60-75 of life (AR). This restriction was then changed to an ad libitum regime. The significantly decreased body weight found in females coming from litters of restrictedly fed mothers showed that these animals were considerably undernourished. Appetitive motivation increased in females that had been exposed to a restricted feeding regime during their infant period but remained unaffected in females restrictedly fed during their adult age. In comparison with the ad libitum fed controls and AR groups, significantly increased mean food intake was observed in all postnatally underfed groups (P<0.001). The greatest inclination to hyperphagia and qualitative changes in feeding behaviour were observed in SWR females whose feeding regime was restricted for the longest time. These animals showed hyperphagia even in the new environment regardless whether the whole group or only one female was tested. Our results reveal a) a determinant influence of the feeding regime of the animals at early age (41 %) while environmental and social factors represent only about 17 and 4 %, respectively and that b) changes in feeding habits in adult female rats may significantly depend on the length of postnatal undernutrition.
Descriptors: rats, females, mothers, progeny, animal feeding, unrestricted feeding, restricted feeding, underfeeding, feed intake, body weight, suckling, weaning, social behavior, perinatal period, age, environmental factors, ancestry, behavior, developmental stages, feeding, feeding habits, feeding systems, mammals, parents, Rodentia, sex.

Seki, M., K. Yamaguchi, H. Marumo, and K. Imai (1997). **Effects of food restriction on reproductive and toxicological parameters in rats. In search of suitable feeding regimen in long-term tests**. *Journal of Toxicological Sciences* 22(5): 427-437.
Descriptors: food restriction reproductive, toxicological, rats, effects, feeding regimen, long term tests.

Selmaoui, B., T.M. Bah, P.V. Brazzini, and R. Godbout (2003). **Daily changes of plasma corticosterone by an 8-h daytime feeding occur without body weight loss or severe food restriction in the rat**. *Biological Rhythm Research* 34(5): 423-433. ISSN: 0929-1016.
Descriptors: rat, food restriction, severe, body weight, plasma corticosterone, daily changes, daytime feeding, circadium rhythm.

Selvais, P.L., C. Labuche, N.X. Ninh, J.M. Keterlslegers, J.F. Denef, and D.M. Maiter (1997). **Cyclic feeding behaviour and changes in hypothalamic galanin and neuropeptide Y gene expression induced by zinc deficiency in the rat**. *Journal of Neuroendocrinology* 9(1): 55-62. ISSN: 0953-8194.
Descriptors: cyclic feeding behavior, rat, zinc deficiency, neuropeptide Y gene, hypothalamic galanin.

Shaft, A. and R.D.E. Rumsey (1998). **Gastrointestinal transit adaptation to force-feeding high-fat meals in adult**

rats. *Proceedings of the Nutrition Society* 57(1): 38A. ISSN: 0029-6651.
Descriptors: gastrointestinal, transit, force feeding, high fat meals, adult rats, adaptation.
Notes: Meeting Information: Symposium on Early Environmental, Genetic and Nutritional Influences on Adult Disease, July 9-11, 1997, Newcastle Upon Tyne, England, UK.

Shahneh, A.Z., H.J. Barforoosh, S.R. Miraei Ashtiani, and A. Nik Khah (2001). **Effect of dexamethasone on growth rate, feed conversion ratio and body composition in guinea pigs.** *Iranian Journal of Agricultural Sciences* 32(3): 487-494. ISSN: 1017-5652.
Descriptors: guinea pigs, growth rate, body composition, dexamethasone, effect, feed conversion ratio.

Shiraishi, T., K. Sasaki, A. Niijima, and Y. Oomura (1998). **Effects of leptin and orexins on the feeding behavior in rats**. *NeuroScience Research Supplement* 22: S262.
Descriptors: rats, feeding behavior, leptin, orexins, effects.
Notes: Meeting Information: 21st Annual Meeting of the Japan Neuroscience Society and the First Joint Meeting of the Japan Neuroscience Society and the Japanese Society for Neurochemistry, September 21-23, 1998, Tokyo, Japan.

Siemelink, M., A. Verhoef, and A.H. Piersma (2002). **Maternal nutrition and postnatal development of the offspring in the rat**. *Teratology* 65(6): 332. ISSN: 0040-3709.
Descriptors: rat, maternal nutrition, development, postnatal, coconut oil, flaxseed, fish oil, soybean.
Notes: Meeting Information: 42nd Annual Meeting of the Teratology Society, June 22-27, 2002, Scottsdale, Arizona, USA.

Silveira, P.P., M.H. Xavier, F.H. Souza, L.P. Manoli, R.M. Rosat, M.B.C. Ferreira, and C. Dalmaz (2000). **Interaction between repeated restraint stress and concomitant midazolam administration on sweet food ingestion in rats.** *Brazilian Journal of Medical and Biological Research* 33(11): 1343-1350. ISSN: 0100-879X.
Descriptors: rats, food ingestion, feeding behavior, restraint stress, midazolam administration, interaction, pellets, effect.

Simon, E., M. Del Puy Portillo, A. Fernandez Quintela, M.A. Zulet, J.A. Martinez, and A.S. Del Barrio (2002). **Responses to dietary macronutrient distribution of overweight rats under restricted feeding**. *Annals of Nutrition and Metabolism* 46(1): 24-31. ISSN: 0250-6807.
Descriptors: rats, overweight, restricted feeding, dietary macronutrient, distribution, responses, protein, amino acid, balance.

Sitren, H.S., L. Fish, G.M. Sumainah, J.J. Bagnall, and R.P. Bates (2002). **Effects of sesame feeding in rats on plasma and liver lipids**. *FASEB Journal* 16(5): A988. ISSN: 0892-6638.
Descriptors: rats, sesame feeding, plasma, lipids, effects, dietary protein, Sprauge Dawley rats, nutrition.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology, April 20-24, 2002, New Orleans, Louisiana, USA.

Sohlstrom, A., P. Fernberg, J.A. Owens, and P.C. Owens (2001). **Maternal nutrition affects the ability of treatment with IGF-I and IGF-II to increase growth of the placenta and fetus, in guinea pigs**. *Growth Hormone and IGF Research* 11(6): 392-398. ISSN: 1096-6374.
Descriptors: guinea pigs, maternal nutrition, placenta, fetus, growth, effects, IGF-I, IGF-II, food restriction, ad libitum.

Soriano, O., C. Torrero, M. Regalado, O. Casta Cervantes, and M. Salas (2002). **Effects of handling and undernourishing on the development of huddling in rats.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 878.4.
Online: http://sfn.scholarone.com
Descriptors: rats, handling, undernourishing, effects, huddling, development, thermoregulation, diet, nutrition.
Notes: Meeting Information: 32nd Annual Meeting of the Society of Neuroscience, November 02-07, 2002, Orlando, Florida, USA.

Strickland, J.L., J.L. Miner, and M.K. Nielsen (1998). **Feed intake, thyroid hormones, and adrenergic stimulation in high and low heat loss mice**. *Journal of Animal Science* 76(Supplement 2): 41. ISSN: 0021-8812.
NAL Call Number: 49 J82
Descriptors: feed intake, thyroid hormones, heat loss, high, low, stimulation.
Notes: Meeting Information: American Society of Animal Science, March 16-18, 1998, Midwest Section, USA.

Tabuchi, R. and I. Ohara (1997). **Optimal protein level is required for normalization of taste sensitivity in rats**. *Nutrition Research* 17(11-12): 1749-1790. ISSN: 0271-5317.
Abstract: The influence of levels of dietary protein on taste sensitivity for sodium chloride and zinc status was studied in rats. Animals were given free access to one of seven graded levels of purified egg protein (PEP) diets for 28 days. Preference tests for the solution of sodium chloride (0.86 and 8.56 mmol/L) versus deionized water were conducted on days 19 and 21. Feces, urine and blood were collected for assay of zinc concentrations. Only the rats fed the 8% PEP diet discriminated low concentration of 0.86 mmol/L sodium chloride solution. The rats fed another diets discriminated only high concentration of 8.56 mmol/L sodium chloride solution. Twenty percent PEP diet-fed group did not discriminate both concentrations of sodium chloride. Zinc in serum concentration ($r=0.89$, $p < 0.001$) and balance ($r=0.78$, $p < 0.001$) was correlated with dietary protein intake. Serum zinc concentrations of the rats fed the 8 and 10% PEP diets were within the normal range. Retained zinc levels remained constant within the range of 4-8% PEP diets. The present study indicates that 8% PEP is optimal dietary protein level to normalize taste sensitivity for sodium chloride.
Descriptors: diet, proteins, food intake, flavor, sodium chloride, zinc, nutritional status, dosage effects, feces, urine, blood serum, experimentation, feeding preferences, fluids, nutrition physiology, body weight, protein quality, feed conversion efficiency, rats, animal models, behavior, blood, body fluids, body parts, chlorides, digestibility, elements, excreta, feeding habits, heavy metals, inorganic acid salts, mammals, metallic elements, nutritive value, organoleptic properties, physical states, physiological functions, quality, Rodentia, salts, fluid intake, nutrient balance.

Torres Contreras, H. and F. Bozinovic (1997). **Food selection in an herbivorous rodent: balancing nutrition with thermoregulation**. *Ecology (Washington, DC)* 78(7): 2230-2237.
Descriptors: food selection, herbivorous, rodent, thermoregulation, nutrition, balancing.

Torres, I.L.S., G.D. Gamaro, A.P. Vasconcellos, R. Silveira, and C. Dalmaz (2002). **Effects of chronic restraint stress on feeding behavior and on monoamine levels in different brain structures in rats.** *Neurochemical Research* 27(6): 519-526. ISSN: 0364-3190.
Descriptors: rats, stress, chronic restraint, feeding behavior, brain, monoamine levels, eating behavior.

Turley, E., N.C. Armstrong, J.M.W. Wallace, W.S. Gilmore, M.V.J. Mckelvey, J.M. Allen, and J.J. Strain (1999). **Effect of cholesterol feeding on DNA damage in male and female Syrian hamsters**. *Annals of Nutrition and Metabolism* 43(1): 47-51. ISSN: 0250-6807.
Descriptors: Syrian hamsters, cholesterol feeding, DNA damage, male, female, effect.

Umezawa, M., K. Kogishi, H. Tojo, S. Yoshimura, N. Seriu, A. Ohta, T. Takeda, and M. Hosokawa (1999). **High-linoleate and high-alpha-linolenate diets affect learning ability and natural behavior in SAMR1 mice.** *Journal of Nutrition* 129(2): 431-437. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Abstract: Semipurified diets incorporating either perilla oil [high in alpha-linolenate, 18:3(n-3)] or safflower oil [high in linoleate, 18:2(n-6)] were fed to senescence-resistant SAMR1 mouse dams and their pups. Male offspring at 15 mo were examined using behavioral tests. In the open field test, locomotor activity during a 5-min period was significantly higher in the safflower oil group than in the perilla oil group. Observations of the circadian rhythm (48 h) of spontaneous motor activity indicated that the safflower oil group was more active than the perilla oil group during the first and second dark periods. The total number of responses to positive and negative stimuli was higher in the safflower oil group than in the perilla oil group in the light and dark discrimination learning test, but the correct response ratio was lower in the safflower oil group. The difference in the (n-6)/(n-3) ratios of the diets reflected the proportions of (n-6) polyunsaturated fatly acids, rather than those of (n-3) polyunsaturated fatty acids in the brain total fatty acids, and in the proportions of (n-6) and (n-3)

polyunsaturated fatty acids in the total polyunsaturated fatty acids of the brain phospholipids. These results suggest that in SAMR1 mice, the dietary alpha-linolenate/linoleate balance affects the (n-6)/(n-3) ratio of brain phospholipids, and this may modify emotional reactivity and learning ability.
Descriptors: linoleic acid, linolenic acid diet, nutrient intake, mental ability, behavior, experimental diets, dams mothers, pups, safflower oil, perilla, plant oils, mice, circadian rhythm, polyenoic fatty acids, ratios, brain, phosphatidylethanolamines, phosphatidylcholines, animal models, field activity, motor activity, light and dark discrimination, omega 3 fatty acids, omega 6 fatty acids.

Van der Velde, P. and H.S. Koopmans (1998). **Regulation of gastric emptying in free-feeding Lewis rats**. *FASEB Journal* 12(5): A735. ISSN: 0892-6638.
Descriptors: gastric emptying, regulation, free feeding, Lewis rats.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 98, Part II, April 18-22, 1998, San Francisco, California, USA.

Van der Velde, P., I. Koslowsky, and H.S. Koopmans (1999). **Measurement of gastric emptying during and between meal intake in free-feeding Lewis rats**. *American Journal of Physiology* 276(2, Part 1): R597-R605. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: gastric emptying, meal intake, free feeding, Lewis rats, measurement.

Van Ruiven, R., G.W. Meijer, A. Wiersma, V. Baumans, L.F.M. Van Zutphen, and J. Ritskes Hoitinga (1998). **The influence of transportation stress on selected nutritional parameters to establish the necessary minimum period for adaptation in rat feeding studies.** *Laboratory Animals* 32(4): 446-456. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The optimal length of the adaptation period after transportation of rats, to be used in nutritional studies, was investigated in this study. After intracontinental transportation of rats by car and by air to and from the laboratory for a total period of 15 h, measurements were carried out for a period of 3 weeks after transport. Control and transported animals were housed in the same laboratory before and after transportation. During transport the animals had access to food and water. As blood collection could also cause stress, a factorial design was carried out with transport and blood collection as main factors. Transport or blood collection did not cause significant effects on the following parameters: body weight, growth, clinical observation, and blood enzyme activities of LDH and ASAT. Water intake was significantly increased after transport. Food intake did not show consistent effects after transport or blood collection. Unexpectedly, blood corticosterone levels were significantly lower in the transported animals at day 1 after transport. After 3 days these levels were back to normal. Blood glucose, blood free fatty acids and blood urea nitrogen concentrations were incidentally decreased, whereas total cholesterol levels showed an incidental rise in the transported rats. The open-field behaviour test revealed no clear-cut results concerning the effects of transport or blood collection on faeces production, rearing and ambulation. Our results indicate that after intracontinental transport, an adaptation period of 3 days appears to be sufficient for rats to be used in nutritional studies.
Descriptors: rats, nutritional state, transport of animals, stress, body weight, feed intake, blood sampling, blood sugar, fatty acids, corticosterone, animal behavior, fearfulness, water intake, aspartate aminotransferase, lactate dehydrogenase, enzyme activity, cholesterol, urea, blood chemistry, transportation stress, nutritional parameters, minimum period, feeding studies, influence.

Varma, M., J.K. Chai, M.M. Meguid, A. Laviano, J.R. Gleason, Z.J. Yang, and V. Blaha (1999). **Effect of estradiol and progesterone on daily rhythm in food intake and feeding patterns in Fischer rats**. *Physiology and Behavior* 68(1-2): 99-107. ISSN: 0031-9384.
Descriptors: Fischer rats, food intake, daily rhythm, estradiol, progesterone, effect, feeding patterns.

Vidal Puig, A.J., D. Grujic, C.Y. Zhang, T. Hagen, O. Boss, Y. Ido, A. Szczepanik, J. Wade, and V. Mootha (2000). **Energy metabolism in uncoupling protein 3 gene knockout mice.** *Journal of Biological Chemistry* 275(21): 16258-16266. ISSN: 0021-9258.
Online: http://www.jbc.org/
NAL Call Number: 381 J824

Descriptors: mice, mitochondria, animal proteins, cell membranes, mutants, energy metabolism, skeletal muscle, ATP, ADP, phosphocreatine, food intake, triacylglycerols, body weight, oxygen consumption, oxygen, free radicals, aconitate hydratase, heat production, cold, body temperature regulation, blood chemistry, blood lipids, oxidation, fatty acids, glucose.

Vila, R., C. Adan, M.M. Grasa, R. Massanes, M. Esteve, C. Cabot, J. Estruch, J.A. Fernandez Lopez, X. Remesar, and M. Alemany (1998). **Food deprivation does not affect the levels of fatty-acyl-estrone in rat plasma**. *International Journal of Obesity* 22(Supplement 3): S186. ISSN: 0307-0565.
Descriptors: food deprivation, fatty-acyl-estrone, levels, rat, plasma, affect.
Notes: Meeting Information: Eighth International Congress on Obesity, August 29-September 3, 1998, Paris, France.

Voltura, M.B. and B.A. Wunder (1998). **Effects of ambient temperature, diet quality, and food restriction on body composition dynamics of the prairie vole, *Microtus ochrogaster.*** *Physiological Zoology* 71(3): 321-328. ISSN: 0031-935X.
Descriptors: environmental temperature, diets, starvation, body composition, restricted feeding, body fat, fiber, intake, *Pitymys ochrogaster*.

Walrand, S., C. Chambon Savanovitch, C. Felgines, J. Chassagne, F. Raul, B. Normand, M.C. Farges, B. Beaufrere, M.P. Vasson, and L. Cynober (2000). **Aging: a barrier to renutrition? Nutritional and immunologic evidence in rats.** *American Journal of Clinical Nutrition* 72(3): 816-824. ISSN: 0002-9165.
NAL Call Number: 389.8 J824
Descriptors: age, renutrition, barrier, immunologic, rats, nutritional, aging.

Wan, R., S. Camandola, and M.P. Mattson (2003). **Intermittent food deprivation improves cardiovascular and neuroendocrine responses to stress in rats.** *Journal of Nutrition* 133(6): 1921-1929. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Descriptors: rate, stress, responses, food deprivation, intermittent, cardiovascular, neuroendocrine, metabolism, disease.

Wilson, M.R. and S.J. Hughes (1997). **The effect of poor foetal and neonatal nutrition on islet function in neonatal rats**. 40(Supplement 1): A134.
Descriptors: poor nutrition, fetal, neonatal, effect, rats, islet function.
Notes: Meeting Information: 16th International Diabetes Federation Congress, July 20-25, 1997, Helsinki, Finland.

Wolgin, D.L. (2002). **Effects of chronic amphetamine on the appetitive and consummatory phases of feeding.** *Appetite* 38(3): 221-223. ISSN: 0195-6663.
NAL Call Number: QP141.A1A64
Descriptors: rats, animal models, appetite, feeding behavior, food intake, antifeedants, receptors, nutrient drug interactions.
Notes: Meeting Information: Columbia University Seminar on Appetitive Behavior, February 7, 2002, New York, New York.

Yabe, T. (2004). **Feeding behavior and harming mechanism in commensal rodents**. *Medical Entomology and Zoology* 55(4): 259-268. ISSN: 0424-7086.
Abstract: I discussed the relationships between harming mechanisms and feeding behavior such as commensalism, food habits, water requirements and responses to starvation in *Rattus rattus, R. norvegicus, R. exulans* and *Mus musculus*. Because of their commensalism they seasonally migrate between houses and the outdoors, and accidentally bring pathogens into houses. *R. norvegicus* is omnivorous and the others are basically herbivorous. However, they show unusual food habits and, for example, *R. rattus* eats bark and an excessive amount of insects when starving. Renal functions and food habits prove that *R. norvegicus* is the most prone to thirst, whereas *M. musculus* thrives in dry habitats. Feeding behavior is peculiar to rodent species and has characteristic relationship with harming mechanisms. Therefore, feeding behavior of involved species is a key

factor to solve harming mechanisms.
Descriptors: behavior, pest assessment control and management, population studies, commensalism, feeding behavior, food habits, harming mechanism, renal function, starvation response, water requirements.

Yang, H., R. Finaly, and D.H. Teitelbaum (2003). **Alteration in epithelial permeability and ion transport in a mouse model of total parenteral nutrition.** *Critical Care Medicine* 31(4): 1118-1125. ISSN: 0090-3493.
Descriptors: mouse, animal models, parenteral nutrition, epithelial permeability, intestinal, interferon-gamma, knockout mice.

Yang, H., F. Robert, Y. Fan, and D.H. Teitelbaum (2001). **Total parenteral nutrition changes intestinal ion transport and increases epithelial permeability in a mouse model**. *Gastroenterology* 120(5, Supplement 1): A675. ISSN: 0016-5085.
Descriptors: mouse, model, epithelial permeability, parenteral nutrition, intestinal ion transport, changes.
Notes: Meeting Information: 102nd Annual Meeting of the American Gastroenterological Association and Digestive Disease Week, May 20-23, 2001, Atlanta, Georgia, USA.

Yi, I. and F.K. Stephan (1998). **The effects of food deprivation, nutritive and non-nutritive feeding and wheel running on gastric stress ulcers in rats.** *Physiology and Behavior* 63(2): 219-25. ISSN: 0031-9384.
Abstract: Feeding and housing conditions that induce gastric lesions were investigated. Rats were housed in activity wheels or in hanging cages and exposed to food deprivation, ad lib cellulose or 6 g of cellulose per day for 5 days. Food-deprived rats in both housing conditions had ulcers in the rumen but many rats also had mucosal ulcers. Cellulose prevented rumenal ulcers but produced a tendency toward more severe mucosal ulcers. Ulcers in wheel-housed rats were somewhat larger but the difference was not significant. In a second experiment, rats were fed 6 g/day laboratory chow or 6 g/day chow + ad lib cellulose until b.wt. reached a preset criterion. On the average, about 10 days on the feeding regimen were required to induce ulcers in these groups. None of the rats had rumenal ulcers. Mucosal ulcers were reliably larger in rats that received cellulose in addition to 6 g of chow. There was no difference in ulcer area between wheel-housed and cage-housed rats. The results indicate that solid bulk, regardless of its caloric value or amount, protects the nonglandular stomach whereas noncaloric bulk tends to aggravate ulcers in the glandular stomach. A small amount of chow delays the rate of b.wt. loss and consequently ulcer formation. Furthermore, wheel running is not necessary to produce mucosal ulcers when food intake is insufficient to maintain b.wt. and b.wt. at sacrifice seems to be a good predictor of ulcer formation.
Descriptors: cellulose administration and dosage, food deprivation physiology, motor activity physiology, stomach ulcer physiopathology, stress physiopathology, body weight physiology, diet, energy intake, rats, Sprague Dawley rats.

York, J.J. and E.T. Clemens (1998). **Casein, red meat and soyprotein effects on nutrient digestibility and the colonic microstructure of the laboratory rat**. *Nutrition Research* 18(6): 1057-1066. ISSN: 0271-5317.
Abstract: Fifty white male rats were used to study the effects of varied protein source (i.e. casein, red meat or soyprotein) on the development and morphology of the rat's gastrointestinal tract. Laboratory rats appeared to take well to the meat base diet, consuming more of that diet during the early days of the study. There were, however, apparent diet adaptation periods for all experimental diets. After 15 days on the diets, rats fed the soyprotein had heavier stomach weights, and less colonic weight than the casein or meat-fed rats. Colonic morphology studies indicated the meat-fed rats had greater width of colonic crypts, and a lower surface area to mucosal volume ratio than casein or soyprotein-fed rats.
Descriptors: casein, meat, soybeans, plant protein, digestibility, intestines, stomach, weight, mucous membrane, ultrastructure, measurement, proteins, diet, experimentation, weight gain, body weight, dry matter content, rats, animal models, animal products, animal tissues, body parts, digestive system, epithelium, mammals, phosphoproteins, plant products, processed plant products, processed products, protein products, proteins, proximate composition, Rodentia, vegetables, small intestine, cecum, protein sources.

Zanutto, B.S. and J.E.R. Staddon (2001). **Feeding dynamics: how rats regulate eating when food is unavailable for unpredictable amounts of time**. *Society for NeuroScience Abstracts* 27(2): 2515. ISSN: 0190-5295.
Descriptors: rats, feeding dynamics, eating, food unavailable, free feeding, unpredictable amounts, effects.

Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Zanutto, B.S. and J.E.R. Staddon (1998). **Feeding dynamics: how rats regulate eating within and between meals**. *Society for Neuroscience Abstracts* 24(1-2): 194. ISSN: 0190-5295.
Descriptors: rats, eating, meals, feeding, dynamics, regulate.
Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 1, November 7-12, 1998, Los Angeles, California, USA.

Zeni, S., S. Di Gregorio, A. Weisstaub, M. Portela, and C. Mautalen (1999). **Comparative bone changes during pregnancy and lactation in rats feeding different calcium content diets**. *Journal of Bone and Mineral Research* 14(Supplement 1): S393.
Descriptors: rat, bone changes, pregnancy, diets, calcium content, lactation, comparison.
Notes: Meeting Information: Twenty First Annual Meeting of the American Society for Bone and Mineral Research, September 30-October 4, 1999, St. Louis, Missouri, USA.

Zwicker, G.M., J.D. Fikes, J.D. Thurman, B.A. Rogers, T.J. Bucci, A. Turturro, and R. Hart (1998). **Survival, body weight, and neoplastic lesions in brown Norway and F1BNF rats. A lifetime study of the effects of ad libitum and dietary restriction feeding**. *Toxicologic Pathology* 26(1): 169-170. ISSN: 0192-6233.
Descriptors: Norway rat, F1BNF rat, feeding, restriction, ad libitum, study, body weight, survival, neoplastic lesions, dietary.
Notes: Meeting Information: XVI International Symposium of the Society of Toxicologic Pathologists.

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Gavage

Alban, L., P.J. Dahl, A.K. Hansen, K.C. Hejgarrd, A.L. Jensen, M. Kragh, P. Thomsen, and P. Steensgaard (2001). **The welfare impact of increased gavaging doses in rats.** *Animal Welfare* 10(3): 303-314. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Abstract: Textbook recommendations for gavaging rats vary between 1-5 ml for an adult rat. This study indicates that high doses (i.e. doses up to 10 ml for a 250 g rat) might be safe to use; however, if an adverse impact on the rat is to be avoided, use of much lower doses should be considered - for example, doses that do not enforce opening of the pyloric sphincter in any rat. This would be less than 4 ml kg-1 in a 250 g rat.
Descriptors: rats, laboratory mammals, body weight, dosage effects, volume, stomach, stomach emptying, barium sulfate, radiography, body temperature, restraint of animals, animal behavior, animal welfare.

Bondy, G.S., C.A.M. Suzuki, S.M. Fernie, C.L. Armstrong, S.L. Hierlihy, M.E. Savard, and M.G. Barker (1997). **Toxicity of fumonisin B1 to B6C3F1 mice: a 14-day gavage study**. *Food and Chemical Toxicology* 35(10-11): 981-989. ISSN: 0278-6915.
NAL Call Number: 391.8 F73
Descriptors: toxicity, mice, fumonisins, mycotoxins, poisoning, pathology, mammals, mycotoxins, Rodentia, toxic substances, toxins.

Bondy, G.S., C.A.M. Suzuki, R.W. Mueller, S.M. Fernie, C.L. Armstrong, S.L. Hierlihy, M.E. Savard, and M.G. Barker (1998). **Gavage administration of the fungal toxin fumonisin B1 to female Sprague-Dawley rats**. *Journal of Toxicology and Environmental Health* 53(2): 135-151.
Descriptors: rats, fumonisins, mycotoxins, poisoning, females, toxicity, kidneys, bone marrow, liver, pathology, histopathology, cholesterol, sex, biological differences, body parts, cardiovascular system, digestive system, isoprenoids, mammals, mycotoxins, pathology, Rodentia, sex, steroids, sterols, toxic substances, toxins, urinary tract, urogenital system.

Brown, A.P., N. Dinger, and B.S. Levine (2000). **Stress produced by gavage administration in the rat.** *Contemporary Topics in Laboratory Animal Science* 39(1): 17-21. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: stress, rat, gavage, administration.

Cooke, G.M., H. Tryphonas, O. Puliod, D. Caldwell, G.S. Bondy, and D. Forsyth (2004). **Oral (gavage), in utero and postnatal exposure of Sprague Dawley rats to low doses of tributyltin chloride. 1. Toxicology, histopathology and clinical chemistry.** *Food and Chemical Toxicology* 42(2): 221-235. ISSN: 0278-6915.
NAL Call Number: 391.8 F73
Descriptors: oral gavage, in utero, rats, low doses, Sprague Dawley, toxicology.

Craig, M.A. and J.F. Elliott (1999). **Mice fed radiolabeled protein by gavage show sporadic passage of large quantities of intact material into the blood, an artifact not associated with voluntary feeding**. *Contemporary Topics in Laboratory Animal Science* 38(5): 18-23. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, radiolabeled protein, gavage, blood, feeding, passage, voluntary feeding.

Kim, J.C., B.H. Kang, C.C. Shin, Y.B. Kim, H.S. Lee, C.Y. Kim, J. Han, K.S. Kim, D.W. Chung, and M.K. Chung (2002). **Subchronic toxicity of plant sterol esters administered by gavage to Sprague-Dawley rats.** *Food and Chemical Toxicology* 40(11): 1569-1580. ISSN: 0278-6915.
NAL Call Number: 391.8 F73
Descriptors: Sprague Dawley rats, subchronic toxicity, plant sterol esters, gavage, daily, male, female, target organ.

Liao, J.W., S.J. Tsai, S.C. Wang, and J.S. Hwang (2003). **Safety evaluation of turmeric (*Curcuma longa L.*) powder via oral gavage for 28 days in rats.** *Plant Protection Bulletin (Taipei)* 45(3): 237-255. ISSN: 0577-750X.
Descriptors: rats, oral gavage, safety evaluation, tumeric, antioxident effect, hepatic disorders, cancer, toxicity.

Liao, J.W., S.C. Wang, S.Y. Liu, and J.S. Hwang (2002). **Safety evaluation of feeding yam tuber powder to rats by gavage for 28 days.** *Plant Protection Bulletin (Taipei)* 44(2): 75-88. ISSN: 0577-750X.
Descriptors: Sprague Dawley rats, yam tuber powder, feeding toxicity, gavage, safety evaluation.

Masanes, R.M., I. Rafecas, and X. Remesar (2001). **Absorption of a protein gavage in Zucker lean rats. Influence of protein content in the diet.** *Archives of Physiology and Biochemistry* 109(2): 168-174. ISSN: 1381-3455.
Descriptors: Zucker lean rats, protein gavage, diet, protein content, absorption, blood, labelled proteins, tissue proteins.

Tryphonas, H., G. Cooke, D. Caldwell, G. Bondy, M. Parenteau, S. Haywood, and O. Pulido (2004). **Oral (gavage), in utero and post-natal exposure of Sprague Dawley rats to low doses of tributyltin chloride. II. Effects on the immune system.** *Food and Chemical Toxicology* 42(2): 221-235. ISSN: 0278-6915.
NAL Call Number: 391.8 F73
Descriptors: oral gavage, rats, in utero, Sprague Dawley, effects, immune system.

Wheatley, J.L. (2002). **A gavage dosing apparatus with flexible catheter provides a less stressful gavage technique in the rat.** *Lab Animal* 31(7): 53-56. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: rats, laboratory animals, animal use refinement, distress, catheters, aggression, animal stress, dosage, restraint of animals, training people, animal technicians, laboratory equipment, measuring devices, mice, scruffing.

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Husbandry/Care/Handling/Enrichment

Adu, E.K., W.S. Alhassan, and F.S. Nelson (1999). **Smallholder farming of the greater cane rat, *Thryonomys swinderianus*, Temminck, in southern Ghana: a baseline survey of management practices.** *Tropical Animal Health and Production* 31(4): 223-32. ISSN: 0049-4747.

Abstract: Baseline management practices and productivity of captive greater cane rats were studied between February and July 1992 using questionnaires with 33 practising and former farmers in 16 villages in three regions in southern Ghana. The colony sizes were relatively small, ranging between 1 and 96, with nearly a 100% farmer drop-out rate. The mean litter size of the greater cane rats in this study was 4.8+/-0.13, with the young being weaned at 8.8 weeks old. Although nearly all the farmers interviewed (90.9%) had long-term commercial intentions, a number of problems militating against their objectives were encountered. These included lack of technical support on proper management practices for efficient production, housing design, dry season feeding, sex determination and the acquisition of foundation stock. In conclusion, these studies have shown the generally poor state of the greater cane rat industry in Ghana, which requires research into almost all aspects of the productivity of this animal under captive breeding.

Descriptors: animal husbandry methods, Rodentia physiology, agriculture, animal feed, animal husbandry standards, Ghana, housing, animal, litter size, questionnaires, reproduction, sex characteristics.

Ahn, D.C. and M.S. Kwon **[A simple restraint technique with a fenestrated drapes for repeated subcutaneous injection in rats]**. *Korean Journal of Laboratory Animal Science* 17(2): 125-128. ISSN: 1225-813X.

Abstract: A quiet restraint technique should be applied to rats in case of repeated subcutaneous injection with irritable drug in order to maintain the convenience to handling. The holding method with hands or the restraint technique with a commercial restrainer for rat brought difficulty about injection. As a rodents have a behavior to like the darkness, we devised a simple restraint technique with fenestrated drapes, in which a restrainer covered a rat with the cloth to feel relief, firstly, and pressed the cloth with 'C'-shape hands except for central hole exposing the rat skin for subcutaneous injection.

Descriptors: rats, injection, application methods, mammals, Rodentia, restraint, subcutaneous.

Language of Text: Korean with Korean and English summaries.

Alderton, D. (2002). ***Family Pet Guides: Hamster***, 128 p.

Descriptors: hamster, behavior, breeding, feeding, housing, husbandry, parasites, guide.

Ambrose, N. and D.B. Morton (2000). **The use of cage enrichment to reduce male mouse aggression.** *Journal of Applied Animal Welfare Science* 3(2): 117-125. ISSN: 1088-8705.

NAL Call Number: HV4701.J68

Descriptors: mice, male animals, aggressive behavior, enrichment, stimuli, olfactory stimulation, urine, cage cleaning, environmental enrichment.

Applebee, K. (2002). **Rodent environmental enrichment - animal welfare or human feel-good factor**. *Animal Technology and Welfare* 1(2): 65-69, 76, 78, 80. ISSN: 0264-4754.
NAL Call Number: SF757.A62
Descriptors: rodent, environmental enrichment, animal welfare, rats, caging, behavior, litter, furniture.
Language of Text: German, Spanish, and French summaries.

Arnold, C. and R.D. Westbrook (1997-1998). **Enrichment in group-housed laboratory golden hamsters.** *Animal Welfare Information Center Newsletter* 8(3-4): 22-24. ISSN: 1050-561X.
Online: http://www.nal.usda.gov/awic/newsletters/v8n3/8n3arnol.htm
NAL Call Number: aHV4701.A952
Descriptors: golden hamsters, group size, aggressive behavior, sex differences, age differences.

Arnold, J.L. and S.M. Siviy (2002). **Effects of neonatal handling and maternal separation on rough-and-tumble play in the rat.** *Developmental Psychobiology* 41(3): 205-15. ISSN: 0012-1630.
Descriptors: maternal behavior, animals, newborn, behavior, animal, play and playthings, Sprague Dawley rats, sex factors, stress, psychological psychology, weaning.

Artwohl, J., T. Hill, C. Comer, and T. Park (2002). **Naked mole-rats: unique opportunities and husbandry challenges**. *Laboratory Animals* 31(5): 32-36. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: naked mole rats, husbandry, challenges, housing, handling, enrichment.

Augustsson, H., L. Lindberg, and K. Dahlborn (2000). **Free-range laboratory rats: effects on activity, welfare and human-animal interaction**. *Acta Physiologica Scandinavica* 170(4): A108-A109. ISSN: 0001-6772.
Descriptors: laboratory rats, activity, animal care, behavior, animal welfare, free range, environmental enrichment, food intake, group housing, handling effects, human animal interactions.
Notes: Meeting Information: Joint Meeting of the Scandinavian and American Physiological Societies, August 16-19, 2000, Stockholm, Sweden.

Augustsson, H., L. Lindberg, A.U. Hoglund, and K. Dahlborn (2002). **Human-animal interactions and animal welfare in conventionally and pen-housed rats.** *Laboratory Animals* 36(3): 271-281. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The main aim of the present study was to explore the significance of large group/greater pen housing (PH) versus standard Makrolon caging (ST) in three behaviour tests related to human-animal interactions in the adult male laboratory rat. The rats' perception of human interaction was tested in three behavioural tests, of which two reflected common practical procedures, capture and restraint, whereas the third was a human approach test in a Y-maze. The rats' anticipatory reactions to handling and the reactions to restraint did not differ between groups, but the ST rats approached a human hand more quickly than did the PH rats ($P < 0.01$). Although food intake did not differ, ST rats gained more weight ($P < 0.01$) and had higher total cholesterol values ($P < 0.01$) than PH rats. In conclusion, this study shows that housing rats in large groups in an enriched environment did not influence their anticipatory reaction to handling in normal handling situations. However, as the PH rats tended to have a longer approach latency than ST rats in the Y-maze there might be underlying differences in appraisal that are not detected in practical situations. In addition, the PH rats weighed less and had lower total cholesterol values than ST rats and their urine corticosterone values were higher. These effects are suggested to be due to higher physical activity in the PH rats, and the implications of this on the animal as a model is discussed.
Descriptors: rats, laboratory mammals, animal behavior, animal welfare, pens, cages, group size, male animals, capture of animals, restraint of animals, fearfulness, feed intake, liveweight gain, blood lipids, cholesterol, urine analysis, corticosterone, physical activity.

Auvergne, R., C. Lere, B. El Bahh, S. Arthaud, V. Lespinet, A. Rougier, and G. Le Gal La Salle (2002). **Delayed kindling epileptogenesis and increased neurogenesis in adult rats housed in an enriched environment**. *Brain Research* 954(2): 277-285. ISSN: 0006-8993.
Abstract: Environmental risk factors such as stressful experiences have long been recognized to affect seizure

susceptibility, but little attention has been paid to the potential effects of improving housing conditions. In this study, we investigated the influence of an enriched environment on epileptogenesis. Epileptic susceptibility was assessed in animals housed in an enriched environment either before and during (group I) or only during (group II) a kindling procedure and in animals placed in isolated conditions (group III). The kindling paradigm provides a reliable assessment of the capacity to develop seizures following repeated daily low-frequency electrical stimulations. As both enriched environment and seizures are known to interfere with hippocampal neurogenesis, the number of newly generated dentate cells was assessed before and after the kindling procedure to investigate in more detail the relationship between epileptogenesis and neurogenesis. We found that susceptibility to developing epilepsy differed in animals housed in complex enriched environments and in those housed in isolated conditions. Kindling epileptogenesis occurred significantly later in animals housed in enriched conditions throughout the procedure (group I) than in animals from groups II and III. We also demonstrated that cells generated during kindling survived for at least 42 days and that these cells were more numerous on both sides of the brain following environmental enrichment than in rats housed in isolated conditions. As similar values were obtained regardless of the duration of the period of enrichment, these cellular changes may not play a major role in delaying kindling development. We suggest that the increase response in neurogenesis following seizures may be an adaptative rather an epileptogenic response.

Descriptors: kindling, neurogenesis, seizures, environmental factors, social environment, isolation, rats.

Awasthi, P.R., C.F. French, J. Sztein, R. Bedigian, J.J. Sharp, and K.C. Lloyd (2003). **Frozen sperm as an alternative to shipping live mice.** *Contemporary Topics in Laboratory Animal Science* 42(5): 8-11. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Abstract: Dissemination of live mice by air and/or ground shipping is costly and can result in spread of disease between senders' and recipients' colonies. Transporting cryopreserved sperm that can be recovered and used for deriving live mice by using assisted reproductive techniques may be a more economical, efficient, and safer alternative to shipping live animals. In this study, we tested the hypothesis that sperm cryopreserved at one location and then transported transcontinentally via a common package delivery service using both air and ground transport to a second location could be recovered for in vitro fertilization (IVF) to successfully derive liveborn offspring at the second location. Split aliquots of sperm from individual mice were tested at both senders' and recipients' locations by using similar cryopreservation and IVF procedures, in order to control for differences in handling procedures. At both senders' locations, fertilization rates using cryopreserved sperm were lower than those using fresh sperm. However, fertilization rates using sperm recovered after cryopreservation at the senders' locations were not significantly different than those obtained when the same cryopreserved sperm was recovered and used at the recipients' locations. At the one location where tested, the numbers of pups born and subsequently weaned after IVF using either shipped or nonshipped cryopreserved sperm were similar. We conclude that cryopreserved sperm can be transported between different facilities and used for IVF to successfully derive liveborn mice.

Descriptors: animal use alternatives methods, cryopreservation, semen preservation, spermatozoa, tissue and organ harvesting methods, transportation, fertilization in vitro, mice, inbred mice strains, pregnancy outcome, reproducibility of results.

Baamonde, C., M.A. Lumbreras, C. Martinez Cue, I.F. Vallina, J. Florez, and M. Dierssen (2002). **Postnatal handling induces long-term modifications in central beta-noradrenergic signalling in rats.** *Stress (Amsterdam)* 5(2): 137-47. ISSN: 1025-3890.

Abstract: Neonatal handling has been shown to induce a short-term reduction in the binding properties of beta-adrenoceptors and in their primary biochemical responses in the young rat brain, which may account for the reduced responsiveness to stress observed in the handled rats. We have studied the persistence and duration of these changes in cerebral cortex, cerebellum and hippocampus at successive stages of life in neonatally handled rats. Binding properties of the beta-adrenoceptors in handled animals were essentially similar to those of the control rats from 3 to 24 months of age. However, handling disturbed the efficacy of the beta-adrenoceptor intracellular signalling since the isoprenaline-induced accumulation of cyclic AMP was reduced in cerebral cortex at 1, 12 and 24 months; in cerebellum at 12 and 18 months; and in hippocampus at 3 and 12 months. This effect might be partially dependent on a regulatory action of handling on the adenylyl cyclase enzyme itself since both basal and forskolin-induced accumulation of cyclic AMP were persistently reduced. Therefore, postnatal handling can be considered as an effective intervention that modifies sensitivity to various hormonal

and neurochemical signals; these changes may be involved over a long period of time in protection against an excessive response to stress. These results suggest that the long-lasting adaptation of the adenylyl cyclase transduction system, which affects the primary biochemical response of the beta-adrenoceptor, may participate in the effects of this manipulation.

Descriptors: newborn animals physiology, handling psychology, norepinephrine physiology, receptors, adrenergic, beta physiology, signal transduction physiology, 1 methyl 3 isobutylxanthine pharmacology, adrenergic beta agonists pharmacology, aging physiology, cerebellum enzymology, cerebellum metabolism, cerebral cortex enzymology, cerebral cortex metabolism, cyclic amp biosynthesis, forskolin pharmacology, hippocampus enzymology, hippocampus metabolism, isoproterenol pharmacology, phosphodiesterase inhibitors pharmacology, radioligand assay, Wistar rats.

Bagnall, M., D. Leven, M.A. Hofer, and J.A. Gingrich (2001). **Effects of post-natal handling in mice lacking the 5-HT2A receptor**. *Society for Neuroscience Abstracts* 27(1): 1235. ISSN: 0190-5295.

Descriptors: mice, lacking 5HT2A receptor, postnatal handling, effects, anxiety, pups.

Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Banjanin, S. and N. Mrosovsky (2000). **Preferences of mice, *Mus musculus*, for different types of running wheel.** *Laboratory Animals* 34(3): 313-318. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Descriptors: mice, physical activity, exercise, materials, plastics, wheels, animal welfare, exercise wheels, plastic mesh, metal rods.

Barajas, M., J.R. Eguibar, and A. Moyaho (2002). **Maternal care affects novelty-induced grooming in HY and LY adult rats.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 571.16.

Online: http://sfn.scholarone.com

Descriptors: rats, maternal care, selfgrooming, duration, Sprague Dawley rats, yawning, stress.

Notes: Meeting Information: 32nd Annual Meeting of the Society of Neuroscience, November 02-07, 2002, Orlando, Florida, USA.

Barley, J.B., K.A. Cherry, J.P. Garner, C.M. Sherwin, P. Van Loo, M. Walsh, and V. Reinhardt (2004). **Water leakage in rodent cages: a discussion by the laboratory animal refinement and enrichment forum (LAREF)**. *Animal Technology and Welfare* 3(2): 111-113. ISSN: 0264-4754.

NAL Call Number: SF757.A62

Descriptors: rodent, animal welfare, bottles, leakage, cages, cleaning, flooding, laboratory animals, enrichment, nipple drinkers, pups, water, mice, rats.

Battles, A.H. (1997). **The biology, care, and diseases of the Syrian hamster**. In: K.L. Rosenthal (Editor), *Practical Exotic Animal Medicine*, Veterinary Learning Systems: Trenton, N.J. (USA), p. 145-154. ISBN: 18-842-54330.

Descriptors: hamsters, pet care, animal husbandry, animal diseases, mammals, Rodentia, biology.

Beane, M.L., M.A. Cole, R.L. Spencer, and J.W. Rudy (2002). **Neonatal handling enhances contextual fear conditioning and alters corticosterone stress responses in young rats.** *Hormones and Behavior* 41(1): 33-40. ISSN: 0018-506X.

Abstract: Previous studies have indicated that neonatal handling influences development of hypothalamic-pituitary-adrenal (HPA) control of corticosterone. In addition, corticosterone influences memory consolidation processes in contextual fear conditioning. Therefore, neonatal handling may affect hippocampal-dependent memory processes present in contextual fear conditioning by influencing the development of HPA control of corticosterone. To investigate the effects of neonatal handling on early learning, rat pups were either handled (15-min removal from home cage) on the first 15 days after birth or left undisturbed in their home cage. Handled rats and nonhandled rats were fear conditioned at 18, 21, or 30 days of age and then tested at two time points--24 h following conditioning and at postnatal day 45. Subsequently, at approximately postnatal day 60, rats were exposed to restraint stress and corticosterone levels were assessed during restraint and recovery. Handled and nonhandled rats did not differ significantly in their freezing response immediately following

footshock on the conditioning day. However, when tested for contextual fear conditioning at 24 h following conditioning and at postnatal day 45, handled rats showed more freezing behavior than nonhandled rats. When exposed to restraint stress, handled rats had a more rapid return of corticosterone to basal levels than nonhandled rats. These results indicate that neonatal handling enhances developmentally early memory processes involved in contextual fear conditioning and confirms previously reported effects of neonatal handling on HPA control of corticosterone.

Descriptors: corticosterone blood, fear physiology, stress physiopathology, animals, newborn, conditioning psychology physiology, electroshock, handling psychology, hippocampus physiology, hypothalamo hypophyseal system physiology, memory, short term physiology, pituitary adrenal system physiology, Long Evans rats, startle reaction physiology.

Belanger, M.P., W.J. Wallen, and C. Wittnich (1999). **Special feeding and care of senescent spontaneously hypertensive rats**. *Contemporary Topics in Laboratory Animal Science* 38(4): 7-11. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, hypertension, body weight, aging, female animals, cardiac insufficiency, feed formulation, pelleted feeds, blood pressure, heart rate, hematocrit, heart, weight, voluntary intake, powdered feed.

Belke, T.W. and J.P. Wagner (2005). **The reinforcing property and the rewarding aftereffect of wheel running in rats: a combination of two paradigms.** *Behavioural Processes* 68(2): 165-172. ISSN: 0376-6357.

Abstract: Wheel running reinforces the behavior that generates it and produces a preference for the context that follows it. The goal of the present study was to demonstrate both of these effects in the same animals. Twelve male Wistar rats were first exposed to a fixed-interval 30s schedule of wheel-running reinforcement. The operant was lever-pressing and the reinforcer was the opportunity to run for 45s. Following this phase, the method of place conditioning was used to test for a rewarding aftereffect following operant sessions. On alternating days, half the rats responded for wheel-running reinforcement while the other half remained in their home cage. Upon completion of the wheel-running reinforcement sessions, rats that ran and rats that remained in their home cages were placed into a chamber of a conditioned place preference (CPP) apparatus for 30min. Each animal received six pairings of a distinctive context with wheel running and six pairings of a different context with their home cage. On the test day, animals were free to move between the chambers for 10min. Results showed a conditioned place preference for the context associated with wheel running; however, time spent in the context associated with running was not related to wheel-running rate, lever-pressing rate, or post-reinforcement pause duration.

Descriptors: wheel running, effect, rewarding, rats, reinforcing, behavior.

Belz, E.E., J.S. Kennell, R.K. Czambel, R.T. Rubin, and M.E. Rhodes (2003). **Environmental enrichment lowers stress-responsive hormones in singly housed male and female rats.** *Pharmacology, Biochemistry and Behavior* 76(3-4): 481-6. ISSN: 0091-3057.

Abstract: Structural and social aspects of an environmental system can influence the physiology and behavior of animals occupying that system. This study examined the physiological effects of environmental enrichment (EE) with Kong Toys and Nestlets on stress-responsive hormones of the hypothalamic-pituitary-adrenal (HPA) axis under basal and mild stress conditions in singly housed, jugular vein-cannulated, male and female rats. Animals of both sexes housed with EE had significantly lower baseline adrenocorticotropic hormone (ACTH) and corticosterone (CORT) concentrations compared to those housed without EE. ACTH responses to the mild stress of saline injection were significantly lower in female rats housed with EE. Interaction with the Kong Toys and Nestlets appears to have provided the rats with a diversion from monotonous cage life, resulting in lower HPA axis activity before and after mild stress. These results are important because low, stable baselines are essential for accurately discerning pharmacological and other influences on the HPA axis.

Descriptors: environment, hormones metabolism, stress, psychological metabolism, corticotropin blood, dose response relationship, drug, hydrocortisone blood, hypothalamo hypophyseal system physiology, play and playthings, rats, Sprague Dawley rats, sex characteristics, social isolation.

Benaroya Milshtein, N., N. Hollander, A. Apter, T. Kukulansky, N. Raz, A. Wilf, I. Yaniv, and C.G. Pick (2004). **Environmental enrichment in mice decreases anxiety, attenuates stress responses and enhances natural killer cell activity.** *European Journal of Neuroscience* 20(5): 1341-7. ISSN: 0953-816X.

Abstract: The importance of environment in the regulation of brain, behaviour and physiology has long been recognized in biological, social and medical sciences. Animals maintained under enriched conditions have clearly been shown to have better learning abilities than those maintained under standard conditions. However, the effects of environmental enrichment (EE) on immunity and emotionality have been less documented and remain questionable. Therefore, we investigated the effect of EE on natural killer (NK) cell activity, psychological stress responses and behavioural parameters. Male C3H mice were housed either in enriched or standard conditions for 6 weeks. Behaviour was then examined by the grip-strength test, staircase and elevated plus maze, and corticosterone levels and NK cell activity were measured. Furthermore, animals exposed to the stress paradigm, achieved by electric shock with reminders, were tested for freezing time in each reminder. Corticosterone levels were also measured. The EE mice showed decreased anxiety-like behaviour and higher activity compared to standard mice, as revealed by a greater percentage of time spent in the open arms of the elevated plus maze, and a higher rate of climbing the staircase. A shorter freezing time in the stress paradigm and no corticosterone level reactivity were measured in EE mice. In addition, NK cell activity in spleens of EE mice was higher than that demonstrated in those of standard mice. Thus, EE has a beneficial effect on anxiety-like behaviour, stress response and NK cell activity. The effect on NK cell activity is promising, due to the role of NK cells in host resistance.

Descriptors: anxiety immunology, behavior, animal, cytotoxicity, immunologic physiology, environment, killer cells, natural immunology, stress, psychological immunology, corticosterone blood, mice, inbred C3H mice.

Bernard, R.S., M.E. Richardson, J.R. Diehl, and W.C. Bridges (2000). **The influence of husbandry schedules on the number of embryos collected from superovulated mice.** *Contemporary Topics in Laboratory Animal Science* 39(4): 13-5. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Abstract: We undertook this study to assess the effect of urine and fecal contamination in the cages of male mice on embryo production in females placed in these cages for breeding. Each superovulated female was placed with a stud male in a cage that was cleaned at 1, 24, or 168 h prior to breeding. Approximately 41 h after mating, embryos were flushed from the oviducts, and we determined the number of embryos and their developmental stages for each treatment group. The number of two-cell embryos collected did not differ significantly when cages were cleaned 1 or 24 h prior to mating the mice. However, significantly ($p < 0.05$) fewer embryos were recovered when cages were changed 168 h before the animals were mated.

Descriptors: animal husbandry, animal housing, ovulation induction methods, feces, hygiene, infection control, mice, urine.

Biesiadecki, B.J., P.H. Brand, L.G. Koch, and S.L. Britton (1999). **A gravimetric method for the measurement of total spontaneous activity in rats.** *Proceedings of the Society for Experimental Biology and Medicine* 222(1): 65-9. ISSN: 0037-9727.

Abstract: Currently available methods for the measurement of spontaneous activity of laboratory animals require expensive, specialized equipment and may not be suitable for use in low light conditions with nocturnal species. We developed a gravimetric method that uses common laboratory equipment to quantify the total spontaneous activity of rats and is suitable for use in the dark. The rat in its home cage is placed on a top-loading electronic balance interfaced to a computer. Movements are recorded by the balance as changes in weight and transmitted to the computer at 10 Hz. Data are analyzed on-line to derive the absolute value of the difference in weight between consecutive samples, and the one-second average of the absolute values is calculated. The averages are written to file for off-line analysis and summed over the desired observation period to provide a measure of total spontaneous activity. The results of in vitro experiments demonstrated that: 1) recorded weight changes were not influenced by position of the weight on the bottom of the cage, 2) values recorded from a series of weight changes were not significantly different from the calculated values, 3) the constantly decreasing force exerted by a swinging pendulum placed on the balance was accurately recorded, 4) the measurement of activity was not influenced by the evaporation of a fluid such as urine, and 5) the method can detect differences in the activity of sleeping and waking rats over a 10-min period, as well as during 4-hr intervals recorded during active (night-time) and inactive (daytime) periods. These results demonstrate that this method provides an inexpensive, accurate, and noninvasive method to quantitate the spontaneous activity of small animals.

Descriptors: behavior, animal, body weight, methods, rats.

Binder, R.L. (1996). **Nonstressful restraint device for longitudinal evaluation and photography of mouse skin lesions during tumorigenesis studies**. *Laboratory Animal Science* 46(3): 350-351. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Descriptors: mice, skin, lesions, carcinogenesis, animal welfare, restraint of animals, papilloma, animal husbandry methods, body parts, integument, mammals, neoplasms, organic diseases, Rodentia.

Bodnar, M.R., S. Sharma, P. Plotsky, and M.J. Meaney (1997). **The effects of postnatal handling and maternal separation on the serotonergic system in the adult rat**. *Society for Neuroscience Abstracts* 23(1-2): 801. ISSN: 0190-5295.
Descriptors: rat, postnatal handling, maternal separation, behavior, nervous system, adult, behavior, pup, serotonergic system.
Notes: Meeting Information: 27th Annual Meeting of the Society for Neuroscience, Part 1, October 25-30, 1997, New Orleans, Louisiana, USA.

Bohannon, J. (2002). **Animal models. To build a better mouse cage.** *Science* 298(5602): 2321. ISSN: 1095-9203.
Descriptors: laboratory animals, animal behavior, animal housing, mice, animal experimentation, environment, social behavior.

Brand, P.H., N. Qi, P.J. Metting, and S.L. Britton (2000). **A self-powered constant infusion device for use in unrestrained rats.** *American Journal of Physiology, Heart and Circulatory Physiology* 278(6): H2157-62. ISSN: 0363-6135.
Abstract: We developed a device that delivers fluid through a catheter at a constant rate and can be used in conscious animals to solve a variety of problems. For example, this device can be used for delivering drugs and maintaining intravascular catheter patency. The device provides infusions at low flows (1.0-1.5 ml/day), so that experimental agents may be administered with minimal volume loading of the rat. Arterial and venous catheter patency is maintained by infusion of heparinized saline through indwelling catheters attached to the device. The catheters exit from the rat in the intrascapular area and are routed through a protective spring to the device, which is suspended above the cage. The catheters may be attached to pressure transducers, blood may be sampled, and injections or infusions may be made without disturbing the rat. Because the device is self-contained, it can be suspended by a fluid-free swivel that rotates through 360 degrees, providing minimal restraint. The device has been used successfully to measure arterial and central venous blood pressures in two studies using rats.
Descriptors: rats, unrestrained, infusion pumps, catheterization, equipment design, pressure, drug delivery, catheter patency.

Bredy, T.W., A. Lee, R.E. Brown, and M.J. Meaney (2003). **Effect of neonatal handling and paternal care on hippocampal NMDA subunit expression in the monogamous California mouse (*Peromyscus californicus*).** *Hormones and Behavior* 44(1): 39-40. ISSN: 0018-506X.
Descriptors: mouse, neonatal handling, paternal care, effect, hippocampal NMDA, subunit expression.
Notes: Meeting Information: Society for Behavioral Neuroendocrinology Annual Meeting, June 25-28, 2003, Cincinnati, OH, USA.

Bredy, T.W., A.W. Lee, M.J. Meaney, and R.E. Brown (2004). **Effect of neonatal handling and paternal care on offspring cognitive development in the monogamous California mouse (*Peromyscus californicus*).** *Hormones and Behavior* 46(1): 30-38. ISSN: 0018-506X.
Abstract: In the laboratory rat and mouse, neonatal handling enhances hippocampal-dependent learning in adulthood, an effect mediated by changes in maternal behavior toward the handled young. In the present study, we examined the interaction between neonatal handling and biparental care during the early postnatal period and its effect on cognitive function in adult California mice (*Peromyscus californicus*). We characterized the parental behavior of handled and nonhandled father-present and father-absent families over the first 15 days of life. We then assessed cognitive performance of male and female offspring in the Barnes maze and object recognition test after they were 60 days of age. We found that the amount of licking and grooming received by pups was decreased in father-absent families. By postnatal days 12-15, licking and grooming in handled, father-absent families were equivalent to that of nonhandled, father-present families. Handling enhanced novel object

recognition in father-present male mice with no effect in females. In the nonhandled group, the presence of the father had no effect on object recognition learning in male or female mice. Handling also enhanced spatial learning in the Barnes maze. In nonhandled families, the presence of the father appeared to have no effect on spatial learning in the male offspring. Interestingly, spatial learning in nonhandled, father-absent, female offspring was similar to that of handled animals. The average amount of licking and grooming received by pups was negatively correlated with the average number of errors made on the first day of reversal training in the Barnes maze. These data support previous findings that neonatal handling facilitates learning and memory in adulthood, suggest that under certain environmental conditions, there is a sex difference in the response of pups to paternal care, and further demonstrate the importance of active parental investment for offspring cognitive development.

Descriptors: fathers, handling psychology, maze learning, *Peromyscus* psychology, recognition psychology, social environment, newborn animals, cognition, grooming, maternal behavior psychology, paternal behavior, sex factors.

Bredy, T.W., R.J. Grant, D.L. Champagne, and M.J. Meaney (2003). **Maternal care influences neuronal survival in the hippocampus of the rat.** *European Journal of Neuroscience* 18(10): 2903-2909. ISSN: 0953-816X.

Descriptors: rat, maternal care, behavior, neuronal survival, coordination, hippocampus, grooming, spatial learning, memory.

Breitweiser, B.A. (1997). **Husbandry and medical management of rodents and hedgehogs**. In: K.L. Rosenthal (Editor), *Practical Exotic Animal Medicine*, Veterinary Learning Systems: Trenton, N.J. (USA), p. 138-144. ISBN: 18-842-54330.

Descriptors: hamsters, pet animals, pet care, animal husbandry, veterinary medicine, mammals, Rodentia, useful animals, golden hamsters.

Brooks, W.W., C.H. Conrad, A.P. Nedder, O.H.L. Bing, and M.T. Slawsky (2003). **Thoracic massage permits use of echocardiography in unanesthetized rats.** *Comparative Medicine* 53(3): 288-292. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Purpose: The objective of the study reported here was to investigate whether massage-like stroking of the thorax and cranial portion of the abdomen might relax unanesthetized rats sufficiently to permit in vivo echocardiography. Methods: Nine-month-old spontaneously hypertensive rats (SHR) were first conditioned to being held by hand for 10 to 15 min twice a day for seven to 10 days. During each session, the animal was placed in supine position, and the thorax and cranial abdominal area were gently stroked (approx. 5 cm/s, 12 to 14 times/min). After the conditioning period, echocardiography was initiated. We obtained serial transthoracic two-dimensional (2-D) and M-mode echocardiograms from nine-month-old SHR that were treated with isoproterenol (60 mg/kg of body weight, s.c., x 1, followed by 30 mg/kg/d x3), and from old (20 to 24 months old) SHR, studied when labored breathing, suggestive of heart failure, was evident (SHR-F). Measurements included end-diastolic volume (EDV) and end-systolic volume (ESV). Results: In the isoproterenol-treated SHR, mean ½ SD echocardiographically derived EDV (2-D, 0.29 ½ 0.05; M-mode, 0.28 ½ 0.01 ml) was not significantly different from volume at necropsy (0.33 ½ 0.04 ml). Measurements of EDV and ESV by use of M-mode and 2-D echocardiography were significantly correlated (EDV R2 = 0.48, P = 0.05; ESV R2 = 0.39, P = 0.02). Echocardiography revealed pleuropericardial effusions (4/6), atrial thrombi (5/6), and left and right ventricular enlargement (6/6). The EDV and ESV were increased fivefold (P < 0.01) and threefold (P < 0.05), respectively, versus values for SHR not in heart failure (SHR-NF). Left ventricular ejection fraction of hearts from SHR-F was markedly decreased, compared with that in SHR-NF (44 ½ 7 versus 74 ½ 2%, respectively; P < 0.05). The presence or absence of left atrial thrombi and fluid in the thoracic cavity was confirmed at necropsy in SHR-F and SHR-NF. Conclusion: Thoracic massage permits use of echocardiography in unanesthetized rats, thereby providing a simple, non-invasive technique for assessment of cardiac structure and function in rats without the potentially adverse effects of anesthesia.

Descriptors: rats, laboratory animals, echocardiography, accuracy, training animals, animal handling, restraint of animals, massage, animal welfare.

Brown, C.J. and T.M. Donnelly (2004). **Rodent husbandry and care.** *Veterinary Clinics of North America Exotic Animal Practice* 7(2): 201-25. ISSN: 1094-9194.

Abstract: This article reviews the husbandry, care and normal behavioral preferences of pet rats and mice. It covers recognition of signs of pain, illness and abnormal responses, and describes necessary skills such as handling, blood collection and drug administration. Animal-human responses in owning and caring for rats and mice are considered. Included is advice on suitability of pet rats with children, neutering and dental examinations. The conclusion lists recommended textbooks, pet owner manuals, instructional CDs, and websites.
Descriptors: rats, mice, animal husbandry, animal nutrition, Rodentia, veterinary medicine, care, pain, blood collection, illness, handling.

Burman, O.H.P. and M. Mendl (2004). **Disruptive effects of standard husbandry practice on laboratory rat social discrimination**. *Animal Welfare* 13(2): 125-133. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, husbandry practice, disruptive effects, social discrimination, handling, behavior.

Burman, O.H.P. and M. Mendl (2000). **Short-term social memory in the laboratory rat: its susceptibility to disturbance.** *Applied Animal Behaviour Science* 67(3): 241-254. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: rats, memory, duration, animal welfare, aggressive behavior, experimental design.

Caldji, C., D. Francis, S. Sharma, P.M. Plotsky, and M.J. Meaney (1997). **Postnatal handling/maternal separation alters responses to startle and central benzodiazepine receptor level subtypes in adult rats**. *Society for Neuroscience Abstracts* 23(1-2): 1083. ISSN: 0190-5295.
Descriptors: rats, adult, postnatal handling, responses, startle, central benzodiazine receptor, maternal separation.
Notes: Meeting Information: 27th Annual Meeting of the Society for Neuroscience, October 25-30, 1997, New Orleans, Louisiana, USA.

Caldji, C., B. Tannenbaum, S. Sharma, D. Francis, P.M. Plotsky, and M.J. Meaney (1998). **Maternal care during infancy regulates the development of neural systems mediating the expression of fearfulness in the rat**. *Proceedings of the National Academy of Sciences of the United States of America* 95(9): 5335-5340. ISSN: 0027-8424.
Descriptors: rat, maternal care, infancy, neural systems, development, fearfulness, behavior, stress, response, grooming.

Callard, M.D., S.N. Bursten, and E.O. Price (2000). **Repetitive backflipping behaviour in captive roof rats (*Rattus rattus*) and the effects of cage enrichment.** *Animal Welfare* 9(2): 139-152. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, abnormal behavior, weaning, age differences, cage size, cages, sex differences, individual characteristics, circadian rhythm, fearfulness, stereotyped behavior, nest boxes.

Campbell, J. and L.P. Spear (1999). **Effects of early handling on amphetamine-induced locomotor activation and conditioned place preference in the adult rat.** *Psychopharmacology* 143(2): 183-9. ISSN: 0033-3158.
Abstract: RATIONALE: Altered hormonal stress responsiveness has been implicated in psychostimulant responsivity, and early handling represents a mild environmental manipulation which alters the hormonal profile following stress exposure. OBJECTIVE: The present experiments examined whether early handling in rats would alter locomotor effects of amphetamine, as well as cross-sensitization of locomotor responsiveness after chronic stress. Conditioned place preference (CPP) for amphetamine was also measured. METHODS: Handling consisted of daily 15-min isolation periods from days 1-12 postnatally. Novelty- and amphetamine (0, 1.5 mg/kg)-induced locomotion were examined using circular corridors in adult rats that were either restrained repeatedly over 8 days or not disturbed prior to testing. The effects of handling on amphetamine (0, 1, 2, 5 mg/kg) conditioned place preference (CPP) were also examined following 3 days of drug-compartment pairings. RESULTS: Early handling produced a more rapid post-stress recovery in corticosterone levels. Handled animals also exhibited a significant attenuation in amphetamine-induced CPP compared to non-handled controls. Locomotor responsiveness to novelty and amphetamine was not altered by early handling. Although no cross-

sensitization was observed, evidence for stress sensitization was seen, but was unaffected by early handling. CONCLUSIONS: Handled animals showed an attenuated CPP for amphetamine, data suggesting that sensitivity to the reward value of drugs of abuse in adulthood may be susceptible to relatively minor environmental manipulations early in life. This effect of handling on CPP does not seem to reflect differences in locomotor sensitivity to amphetamine.

Descriptors: amphetamine pharmacology, central nervous system stimulants pharmacology, conditioning, operant drug effects, handling psychology, motor activity drug effects, stress, psychological psychology, corticosterone blood, Sprague Dawley rats, sex characteristics, social environment.

Cannizzaro, C., M. Martire, L. Steardo, E. Cannizzaro, M. Gagliano, A. Mineo, and G. Provenzano (2002). **Prenatal exposure to diazepam and alprazolam, but not to zolpidem, affects behavioural stress reactivity in handling-naive and handling-habituated adult male rat progeny.** *Brain Research* 953(1-2): 170-80. ISSN: 0006-8993.

Abstract: A gentle long-lasting handling produces persistent neurochemical and behavioural changes and attenuates the impairment in the behavioural reactivity to novelty induced by the prenatal exposure to diazepam (DZ) in adult male rat progeny. This study investigated the consequences of a late prenatal treatment with three GABA/BDZ R agonists (DZ) alprazolam (ALP) and zolpidem (ZOLP)), on different stress-related behavioural patterns, in non-handled (NH), short-lasting handled (SLH) and long-lasting handled (LLH) adult male rats exposed to forced swim test (FST), acoustic startle reflex (ASR) and Vogel test (VT). The effects on motor activity were evaluated in the open field and in the Skinner box. The seizure sensitivity to picrotoxin (PTX) was investigated as an index of the functional state of GABA/BDZ Rs. A single daily s.c. injection of DZ (1.25-2.50 mg/kg) and ALP (0.125-0.250 mg/kg) over gestational days 14-20 induced a decrease in immobility time in the FST in NH rats, no change in SLH rats and an increase in LLH rats; DZ induced an increase in the peak amplitude of the ASR in NH rats, no change in SLH rats and a reduction in LLH rats; ALP was ineffective in all groups. DZ and ALP reduced the number of punished licks in the VT in NH, SLH and LLH rats while the unpunished licks were not modified. DZ decreased locomotion and the lever pressing responses while ALP increased them. DZ and ALP increased the seizure sensitivity to PTX (2.5-4.0 mg/kg i.p.). These findings indicate a convergence on anxiety-related behaviours in the effects of prenatal exposure to DZ and ALP and a differentiation on motor activity. Long-lasting handling was able to overcompensate the increased behavioural stress reactivity induced by the prenatal exposure to DZ and ALP.

Descriptors: alprazolam pharmacology, anti anxiety agents pharmacology, diazepam pharmacology, GABA agonists pharmacology, pyridines pharmacology, stress drug therapy, age factors, behavior, animal drug effects, convulsants pharmacology, exploratory behavior drug effects, habituation psychophysiology drug effects, handling psychology, picrotoxin pharmacology, prenatal exposure delayed effects, Wistar rats, reflex drug effects, startle reaction drug effects, swimming.

Caston, J., B. Devulder, F. Jouen, R. Lalonde, N. Delhaye Bouchaud, and J. Mariani (1999). **Role of an enriched environment on the restoration of behavioral deficits in Lurcher mutant mice.** *Developmental Psychobiology* 35(4): 291-303. ISSN: 0012-1630.

Descriptors: behavior, animal physiology, cerebellar diseases pathology, environment, mice, mutant strains physiology, nerve degeneration pathology, maze learning, mice, nerve fibers physiology, synapses physiology.

Champy, M.F., M. Selloum, L. Piard, V. Zeitler, C. Caradec, P. Chambon, and J. Auwerx (2004). **Mouse functional genomics requires standardization of mouse handling and housing conditions.** *Mammalian Genome* 15(10): 768-783. ISSN: 0938-8990.

Abstract: The study of mouse models is crucial for the functional annotation of the human genome. The recent improvements in mouse genetics now moved the bottleneck in mouse functional genomics from the generation of mutant mice lines to the phenotypic analysis of these mice lines. Simple, validated, and reproducible phenotyping tests are a prerequisite to improving this phenotyping bottleneck. We analyzed here the impact of simple variations in animal handling and housing procedures, such as cage density, diet, gender, length of fasting, as well as site (retro-orbital vs. tail), timing, and anesthesia used during venipuncture, on biochemical, hematological, and metabolic/endocrine parameters in adult C57BL/6J mice. Our results, which show that minor changes in procedures can profoundly affect biological variables, underscore the importance of establishing uniform and validated animal procedures to improve reproducibility of mouse phenotypic data.

Descriptors: mouse, handling, housing, standardization, genomics, genetics, changes, model.

Chang, F.T. and L.A. Hart (2002). **Human-animal bonds in the laboratory: how animal behavior affects the perspective of caregivers.** *ILAR Journal* 43(1): 10-18. ISSN: 1084-2020.
NAL Call Number: QL55.A1I43
Descriptors: laboratory animals, dogs, mice, laboratory workers, anthropology, animal welfare, animal husbandry, training of animals, stress, enrichment, safety at work, work satisfaction, human animal relations, animal technicians, environmental enrichment.

Chapillon, P., R. Lalonde, N. Jones, and J. Caston (1998). **Early development of synchronized walking on the rotorod in rats. Effects of training and handling.** *Behavioural Brain Research* 93(1-2): 77-81. ISSN: 0166-4328.
Abstract: There is considerable improvement of motor coordination on the rotorod during the first 3 weeks of development in rats. The purpose of the present study was to determine some factors implicated in this improvement. From days 15-22 of age, rats were: (1) extensively trained on the rotorod; (2) minimally trained on the rotorod; (3) handled daily but not trained on the rotorod; and (4) neither handled nor trained. All animals were tested on the rotorod on day 23, with separate groups of the naive rats also being tested on days, 19, 20, 21 or 22. Latencies before falling and the percentage of time spent walking in time to the movement of the rotating rod were recorded. There was a close correspondence between these two scores during ontogeny. The percentage of time spent walking was similar among extensively trained, minimally trained, and handled rats and significantly higher than that measured in rats tested only on 1 day. These results indicate that the emergence of this postural sensorimotor skill is more dependent on the maturation of sensorimotor brain region than on previous training on the apparatus.
Descriptors: handling psychology, musculoskeletal equilibrium physiology, psychomotor performance physiology, walking physiology, aging psychology, rats, inbred strains.

Chapillon, P., C. Manneche, C. Belzung, and J. Caston (1999). **Rearing environmental enrichment in two inbred strains of mice. 1. Effects on emotional reactivity.** *Behavior Genetics* 29(1): 41-6. ISSN: 0001-8244.
Abstract: The effects of an enriched rearing environment on two types of anxiety-like behavior (designated "trait" and "state" anxiety) and on spontaneous activity were investigated in two inbred strains of mice, BALB/c (C) and C57BL/6(B6). Subjects were socially reared from birth to 56 days of age under enriched or standard rearing conditions. The enriched environment consisted of an assembly of plastic boxes in which a various number of objects (running wheels, pieces of plastic, etc.) offered the possibility of multiple activities. The subjects were subsequently tested in three situations: a spontaneous activity recorder, an elevated plus-maze test (a model of state anxiety), and a free exploration test (a model of trait anxiety). No group differences could be found in spontaneous activity. Environmental enrichment, however, decreased the level of both types of anxiety-like behavior in the C strain. In contrast, the level of trait anxiety of the B6 mice was not modified. The results were discussed in relation to possible CNS modifications, especially in the limbic system.
Descriptors: newborn animals genetics, newborn animals growth and development, newborn animals psychology, anxiety genetics, environment, exploratory behavior physiology, temperament physiology, analysis of variance, animal housing, mice, inbred BALB c mice, inbred C57BL mice, play and playthings.

Clark Jr., J.A., P.H. Myers, M.F. Goelz, J.E. Thigpen, and D.B. Forsythe (1997). **Pica behavior associated with buprenorphine administration in the rat.** *Laboratory Animal Science* 47(3): 300-303. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Abstract: Marked gastric distention was observed in rats 20 h after they underwent partial hepatectomy under isoflurane anesthesia and received buprenorphine (0-3 mg/kg of body weight) after surgery. Hardwood bedding comprised the bulk of the gastric contents. A study was undertaken to determine the cause of the pica behavior (consumption of non-nutritive substances) and resultant gastric distention. Ten-week-old male Sprague Dawley rats were randomly assigned to one of six groups. Group-1 rats (n = 11) underwent laparotomy under isoflurane anesthesia, with buprenorphine (0.03 mg/kg) administered after surgery. Group-2 rats (n = 12) underwent laparotomy under isoflurane anesthesia, with buprenorphine (0.05 mg/kg) administered after surgery. Group-3 rats (n = 24) underwent laparotomy under isoflurane anesthesia, with saline administered after surgery. Isoflurane was administered at the same rate, concentration, and duration for all groups that underwent

laparotomy (groups 1 to 3). Buprenorphine or saline was administered subcutaneously as a single injection when anesthesia was discontinued (groups 1 to 3). Group-4 rats (n = 6) received buprenorphine (0.3 mg/kg) only. Group-5 rats (n = 6) received buprenorphine (0.05 mg/kg) only. Group-6 rats (n = 12) received saline only. Rats not undergoing laparotomy (groups 4 to 6) received buprenorphine or saline 18 to 20 h before euthanasia. Rats were housed individually in filter-topped polycarbonate cages containing hardwood bedding. A purified, pelleted diet and water were offered ad libitum. Food and water consumption were measured over the posttreatment period. Eighteen to 20 h after treatment, rats were euthanized, each stomach and its contents were weighed, contents. were examined grossly, and wet and dry gastric content weights were recorded. All weights were significantly (P <0.05) increased in rats receiving buprenorphine administered after surgery (groups 1 and 2), compared with rats of the control group (group 3). Weights of the stomach and contents, wet gastric contents, and dry gastric contents were significantly (P <0.05) increased in rats receiving 0.3 mg of buprenorphine/kg only (group 4), compared with values for their controls (group 6). Hardwood bedding comprised the bulk of the gastric contents in all groups receiving buprenorphine. Stomachs of rats not receiving buprenorphine contained the purified diet with little or no hardwood bedding. These results indicate that a single injection of buprenorphine at a dosage of 0.05 or 0.3 mg/kg resulted in rats ingesting hardwood bedding, leading to gastric distention. It was concluded that pica behavior associated with administration of buprenorphine should be considered when evaluating experimental data from rats housed on contact bedding.

Descriptors: analgesics, opioids, pica, litter, stomach, digesta, rats, hepatectomy, laparotomy, anesthetics, postoperative complications, opioid analgesics, gastric distention, isoflurane.

Coatney, R.W. (2001). **Ultrasound imaging: principles and applications in rodent research.** *ILAR Journal* 42(3): 233-247. ISSN: 1084-2020.

NAL Call Number: QL55.A1I43

Descriptors: ultrasonography, mice, rats, animal experiments, impedance, tissues, transducers, imagery, heart, animal welfare, literature reviews, ultrasound biomicroscopy, animal use refinement.

Cohen, S.M., M. Cano, T. Anderson, and E.M. Garland (1996). **Extensive handling of rats leads to mild urinary bladder hyperplasia.** *Toxicologic Pathology* 24(2): 251-7. ISSN: 0192-6233.

Abstract: The urinary and urothelial effects of the frequent handling necessary for obtaining fresh-voided urine specimens were evaluated in 5-wk-old male F-344 rats fed control diet or diet containing 7.5% sodium saccharin. Frequent handling consisted of holding rats by the back of the neck in a position to obtain fresh-voided urine directly into centrifuge tubes 3 times per week for 10 weeks, whereas seldomly handled control rats received this treatment only twice during the entire 10 weeks. The urothelium of frequently handled rats fed control diet showed superficial necrosis and regenerative hyperplasia as observed by light and scanning electron microscopy. These changes were not observed in rats fed control diet that were seldomly handled. The necrosis and hyperplasia were not as pronounced in frequently handled rats fed control diet as in seldomly handled, sodium-saccharin-treated rats, but handling also potentiated the severity of the changes produced by sodium saccharin feeding. The urothelial exfoliation and consequent regenerative hyperplasia are likely secondary effects of stress.

Descriptors: bladder pathology, handling psychology, body weight drug effects, carcinogens toxicity, drinking drug effects, epithelium pathology, hyperplasia etiology, hyperplasia pathology, microscopy, electron, scanning, necrosis pathology, inbred F344 rats, saccharin toxicity.

Colomina, M.T., D.J. Sanchez, J.L. Esparza, and J.L. Domingo (1999). **Prenatal effects of caffeine and restraint stress in mice**. *Proceedings of the Society for Experimental Biology and Medicine* 220(2): 106-111. ISSN: 0037-9727.

Descriptors: pregnancy, toxicity, genetic disorders, caffeine, stress, mice, alkaloids, disorders, heterocyclic compounds, mammals, physiological functions, purines, reproduction, Rodentia, sexual reproduction, xanthine alkaloids, xanthines, embryotoxicity, maternal toxicity, teratogenesis.

Cruz, J.I., J.M. Loste, and O.H. Burzaco (1998). **Observations on the use of medetomidine/ketamine and its reversal with atipamezole for chemical restraint in the mouse**. *Lab Animal* 32(1): 18-22. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Descriptors: ketamine, analgesics, anesthesia, mice, laboratory animals, detoxicants, drugs, mammals,

neurotropic drugs, Rodentia, useful animals, medetomidine, atipamezole.

Cruz, J.I., J.M. Loste, and O.H. Burzaco (1996). **Observations on the use of medetomidine-ketamine and its reversal with atipamezole for chemical restraint in the mouse**. *Journal of Veterinary Anaesthesia* 23(2): 78.
Descriptors: mice, laboratory animals, restraint of animals, anesthesia, analgesics, ketamine, animal husbandry methods, drugs, mammals, neurotropic drugs, Rodentia, useful animals, medetomidine.

Dahlborn, K., E. Hydbring, and A. Madej (1996). **Effects of environmental enrichment on urinary corticosterone excretion in female and male rats**. *Laboratory Animals in Modern Biology. Symposium Program, Scand-LAS, Goeteborg (Sweden),* 123 p.
Descriptors: rats, laboratory animals, males, females, glucocorticoids, environmental factors, adrenal cortex hormones, corticoids, hormones, mammals, Rodentia, sex, enrichment.

Dahlborn, K., B.A.A. Van Gils, H.A. Van de Weerd, J.E. Van Dijk, and V. Baumans (1996). **ICLAS proceedings: Evaluation of long-term environmental enrichment in the mouse**. *Scandinavian Journal of Laboratory Animal Science Supplement* 23(Supplement 1): 97-106. ISSN: 0901-3393.
Descriptors: mice, laboratory animals, animal housing, environmental factors, cages, feeding habits, drinking habits, glucocorticoids, urine, adrenal cortex hormones, behavior, body fluids, body parts, corticoids, excreta, hormones, enrichment, Rodentia.
Notes: Meeting Information: ICLAS, Scand LAS, FinLAS, Helsinki (Finland). Frontiers in Laboratory Animal Science, Helsinki (Finland), June 1995.

Dahlqvist, P., A. Ronnback, S.A. Bergstrom, I. Soderstrom, and T. Olsson (2004). **Environmental enrichment reverses learning impairment in the Morris water maze after focal cerebral ischemia in rats.** *European Journal of Neuroscience* 19(8): 2288-98. ISSN: 0953-816X.
Abstract: Cognitive impairment is common after ischemic stroke. In rodent stroke models using occlusion of the middle cerebral artery (MCA) this is reflected by impaired spatial memory associated with the size of the ischemic lesion. Housing in an enriched environment enhances brain plasticity and improves recovery of sensorimotor functions after experimental stroke in rats. In this study we report that postischemic housing in an enriched environment also attenuates the long-term spatial memory impairment after MCA occlusion and extinguishes the association between spatial memory and infarct volume. An enriched environment did not significantly alter the expression of selected neuronal plasticity-associated genes 1 month after MCA occlusion, indicating that most of the adaptive changes induced by an enriched environment have already occurred at this time point. We conclude that the attenuated memory impairment induced by environmental enrichment after MCA occlusion provides a useful model for further studies on the neurobiological mechanisms of recovery of cognitive functions after ischemic stroke.
Descriptors: brain ischemia psychology, environment, maze learning physiology, memory disorders psychology, brain ischemia metabolism, cognition physiology, memory disorders metabolism, memory disorders prevention and control, rats, Sprague Dawley rats, synapsins biosynthesis.

De Luca, A.M. (1997). **Environmental enrichment: does it reduce barbering in mice.** *Animal Welfare Information Center Newsletter* 8(2): 7-8. ISSN: 1050-561X.
Online: http://www.nal.usda.gov/awic/newsletters/v8n2/8n2deluc.htm
NAL Call Number: aHV4701.A952
Descriptors: mice, cages, vices, toys, animal welfare, boxes.

Dean, S.W. (1999). **Environmental enrichment of laboratory animals used in regulatory toxicology studies.** *Laboratory Animals* 33(4): 309-327. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: There is a wealth of information in the published literature which describes a multitude of approaches to enriching the environment of laboratory animals. This paper attempts to review the various methods of enrichment through social contact, enhancement of the environment and diet, and improvements in husbandry. It attempts to place the various enrichment initiatives within the context of a laboratory which conducts regulatory toxicology, describes some of the experiences in the author's own laboratory and attempts to

highlight those ideas which might prove practical to implement in the future. The aim is to demonstrate that a creative approach to environmental enrichment is indeed compatible with regulatory toxicology. It is hoped that this will encourage those responsible for the care and welfare of animals in such a laboratory to challenge historical practices and include environmental enrichment as a fundamental necessity of study design.

Descriptors: laboratory animals, laboratory mammals, *Macaca mulatta*, cages, monkeys, foraging, enrichment, environment, dogs, group size, toys, rabbits, floor pens, rats, mice, social dominance, floor type, pelleted feeds, guinea pigs, toxicology, animal welfare, literature reviews, United Kingdom.

Deng, J., M. St. Clair, C. Everett, M. Reitman, and R.A. Star (2000). **Buprenorphine given after surgery does not alter renal ischemia/reperfusion injury.** *Comparative Medicine* 50(6): 628-632. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Background and Purpose: Potential drugs for human acute renal failure are often tested in an animal model of renal ischemia/reperfusion injury. Analgesics are often not given after surgery because of concerns that they would alter renal function. Therefore, we tested whether postoperative analgesia would alter animal health or affect the degree of renal injury. Methods: Mice were subjected to either 32 or 37 minutes of renal ischemia, given two or six doses of buprenorphine or vehicle at 12-hour intervals, and followed for 72 hours. In some animals, we measured body temperature and physical activity by use of telemetry. Results: Animals treated with buprenorphine recovered more rapidly from surgery based on postoperative activity, and had a small but not significant tendency for faster restoration of normal body temperature. Animals treated with buprenorphine had less weight loss after 37 minutes of ischemia. Buprenorphine given after surgery did not influence the degree of renal injury after ischemia/reperfusion. Conclusions: Buprenorphine should be given after renal ischemia-reperfusion surgery because administration of the proper analgesic improved animal health without interfering with the renal ischemia/reperfusion model. Analgesic treatment at the time of the operation and 12 hours after was sufficient. Buprenorphine may reduce the post-surgical stress response, and thus potentially improve the specificity of testing for drugs that reduce or treat renal injury.

Descriptors: mice, laboratory mammals, animal models, analgesics, postoperative care, kidneys, ischemia, renal function, body temperature, physical activity, body weight, pain, histopathology, animal welfare.

Diven, K. (2003). **Inhalation anesthetics in rodents.** *Lab Animal* 32(3): 44-47. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Descriptors: rats, mice, guinea pigs, hamsters, gerbils, laboratory animals, general anesthetics, intranasal administration, depth of anesthesia, veterinary equipment, animal welfare, researchers.

Doerflinger, A. and S.E. Swithers (2004). **Effects of diet and handling on initiation of independent ingestion in rats.** *Developmental Psychobiology* 45(2): 72-82. ISSN: 0012-1630.

Abstract: The present study examined the effects of dietary manipulation on the age of onset of weaning in rat pups. In Experiment 1, female rats were placed on a standard chow (SC) or high-fat (HF) diet 1 week following mating. Pups were weighed daily from birth to Day 12, then animals were placed into specialized cages for separate recording of food intake of pups and dams. Pups were offered the same diet as their dam, and food intake and body weight were determined twice daily until Day 25. The results demonstrated that pups reared by dams fed the HF diet initiated independent ingestion on Day 16, approximately 24 hr before pups reared by dams fed the SC diet. There were no differences in body weight in pups across the two diets. While few differences were noted across diets in pups' or dams' behavior, HF pups appeared to demonstrate a delay in the establishment of circadian patterns of food intake. In Experiment 2, all dams were maintained on an SC diet until the day after parturition. At that time, dams and litters were placed into specialized cages and divided into four groups: HF/HF, HF/SC, SC/SC, and SC/HF (dam's diet/pup's diet, respectively). The results demonstrated that dams given the HF diet had pups that initiated food intake approximately 2 days before the pups of dams given the SC diet. In addition, pups offered the HF diet, independent of the dam's diet, initiated food intake approximately 0.8 days prior to pups offered the SC diet. Further, by Day 12, HF dams had pups that were heavier than SC dams. The results suggest that the onset of weaning in rats is affected by maternal diet and the weaning diet available to the pup.

Descriptors: diet, feeding behavior, sucking behavior, animals, newborn, behavior, animal, body weight, rats, weaning.

Dollinger, P., R. Baumgartner, E. Isenbugel, N. Pagan, H. Tenhu, and F. Weber (1999). **Husbandry and pathology of rodents and lagomorphs in Swiss zoos.** *Erkrankungen Der Zootiere* 39: 241-254. ISSN: 0138-5003.
Descriptors: Lagomorpha, Rodentia, zoos, wildlife parks, husbandry, pathology, care in captivity, parasites, diseases.

Donnelly, T.M. and C.J. Brown (2004). **Guinea pig and chinchilla care and husbandry.** *Veterinary Clinics of North America Exotic Animal Practice* 7(2): 351-73. ISSN: 1094-9194.
Abstract: This article reviews breeds and coat colors of guinea pigs and chinchillas, their husbandry, care and anatomy. The unusual reproductive physiology and reproductive diseases of these animals are described. We cover nutrition, the potential for disease on poor diets, and the vocalization of hystricomorph rodents. Skills such as handling, sexing, blood collection and drug administration, including antibiotic toxicity are described. The conclusion lists recommended textbooks, pet owner manuals, and websites.
Descriptors: care, animal husbandry, chinchilla, guinea pigs, veterinary medicine, anatomy, nutrition, reproduction, diets, disease, handling.

Duke, J.L., T.G. Zammit, and D.M. Lawson (2001). **The effects of routine cage-changing on cardiovascular and behavioral parameters in male Sprague-Dawley rats.** *Contemporary Topics in Laboratory Animal Science* 40(1): 17-20. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory mammals, animal husbandry, cleaning, blood pressure, heart rate, telemetry, data collection, physical activity, animal behavior, duration, frequency, fearfulness, stress, arousal behavior.

Ely, D.R., V. Dapper, J. Marasca, J.B. Correa, G.D. Gamaro, M.H. Xavier, M.B. Michalowski, D. Catelli, R. Rosat, M.B.C. Ferreira, and C. Dalmaz (1997). **Effect of restraint stress on feeding behavior of rats**. *Physiology and Behavior* 61(3): 395-398. ISSN: 0031-9384.
Descriptors: rats, feeding behavior, restraint stress, effect.

Escorihuela, R.M., J. Salles, A. Tobena, P. Driscoll, and A. Fernandez Teruel (1997). **Anxiety, novelty seeking, spatial working and reference memory and cholinergic transduction mechanisms in the Roman/Verh rat lines: effects of neonatal handling (NH)**. *Society for Neuroscience Abstracts* 23(1-2): 1849. ISSN: 0190-5295.
Descriptors: Roman Verh rat lines, anxiety, neonatal handling, reference memory, effects, transduction mechanisms.
Notes: Meeting Information: 27th Annual Meeting of the Society for Neuroscience, October 25-30, 1997, New Orleans, Louisiana, USA.

Eskola, S., M. Lauhikari, H.M. Voipio, M. Laitinen, and T. Nevalainen (1999). **Environmental enrichment may alter the number of rats needed to achieve statistical significance**. *Scandinavian Journal of Laboratory Animal Science* 26(3): 134-144. ISSN: 0901-3393.
Descriptors: rats, laboratory animals, experimental design, animal welfare, enrichment, statistical significance, number needed.

Fernandez Teruel, A., R.M. Escorihuela, B. Castellano, B. Gonzalez, and A. Tobena (1997). **Neonatal handling and environmental enrichment effects on emotionality, novelty/reward seeking, and age-related cognitive and hippocampal impairments: focus on the Roman rat lines.** *Behavior Genetics* 27(6): 513-26. ISSN: 0001-8244.
Abstract: Roman high- and low-avoidance (RHA/Verh and RLA/Verh) rats are selected and bred for extreme divergence in two-way active avoidance acquisition. In addition, compared to RLA/Verh rats, RHA/Verh rats are (behaviorally and physiologically) less anxious or reactive to stressors, show increased novelty (sensation)-seeking behavior as well as a higher preference for rewarding substances, and are usually less efficient in learning tasks not involving shock administration. The present article reviews evidence showing that neonatal handling and/or environmental enrichment leads to enduring effects (their magnitude frequently depending upon the rat line) on those behaviors. For example, it has been found that neonatal handling reduces most of the (behavioral and physiological) signs of emotionality/anxiety in RLA/Verh rats, while environmental enrichment increases their novelty seeking (also the case with RHA/Verh rats), saccharin and ethanol intake, and sensitivity

to amphetamine. Finally, initial results (currently being further elaborated upon) support a preventive action of both environmental treatments on age-related impairments in learning a spatial, water maze task as well as on hippocampal neuronal atrophy.

Descriptors: environment, exploratory behavior, handling psychology, inbred rats strains psychology, stress, psychological etiology, avoidance learning, emotions, hippocampus pathology, inbred rat strains genetics.

Fitzgerald, A.L., P. Juneau, C. Cain, and K. Southwick (2003). **Development of a quantitative method for evaluation of the electroencephalogram of rats by using radiotelemetry.** *Contemporary Topics in Laboratory Animal Science* 42(1): 40-45. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory animals, telemetry, electroencephalography, radio waves, electrodes, atropine, caffeine, ketamine, pentobarbital, image analysis, animal use refinement, animal welfare, laboratory equipment, laboratory techniques, drug effects.

Flecknell, P. (1998). **Developments in the veterinary care of rabbits and rodents**. *In Practice* 29(6): 286-295. ISSN: 0263-841X.

Descriptors: treatment, pets, anesthesia, antibiotics, drug therapy, rabbits, rodents.

Forsyth, A. and C. Watt (2004). **Post-operative care of cannulated rodents**. *Animal Technology and Welfare* 3(4): 133-134. ISSN: 0264-4754.

NAL Call Number: SF757.A62

Descriptors: rodents, post operative care, analgesics, animal behavior, body weight, cannulation, fluid therapy, food supplements, hypothermia, postoperative care, recovery, respiration rate, stress, surgery, temperature.

Frick, K.M. and S.M. Fernandez (2003). **Enrichment enhances spatial memory and increases synaptophysin levels in aged female mice.** *Neurobiology of Aging* 24(4): 615-26. ISSN: 0197-4580.

Abstract: The present study tested whether environmental enrichment can reduce age-related spatial reference memory deficits and alter synaptic protein levels in aged female mice. Female C57BL/6 mice, (4 or 27-28 months), were tested in spatial and cued Morris water maze tasks. Prior to (14 days) and during testing, a subset of aged females was exposed to rodent toys and running wheels for 3h per day. The remaining aged females were group housed but were not exposed to enriching objects. At the conclusion of testing, levels of the presynaptic protein synaptophysin were measured in hippocampus and frontoparietal cortex. Enrichment improved spatial memory acquisition; relative to young controls, aged enriched females performed similarly, whereas aged control females were impaired. Enrichment also accelerated the development of a spatial bias in spatial probe trials. In contrast, the cued task was not significantly affected by enrichment. Hippocampal and cortical synaptophysin levels were increased in aged enriched females relative to young and aged controls. These data suggest that environmental enrichment can be a potent cognitive enhancer for aged females and suggests a potential neurobiological mechanism of this effect.

Descriptors: aging metabolism, environment, memory physiology, synaptophysin biosynthesis, aging psychology, brain metabolism, maze learning physiology, inbred C57BL mice.

Frick, K.M., N.A. Stearns, J.Y. Pan, and J. Berger Sweeney (2003). **Effects of environmental enrichment on spatial memory and neurochemistry in middle-aged mice.** *Learning and Memory* 10(3): 187-98. ISSN: 1072-0502.

Abstract: The present study compared the effects of environmental enrichment on spatial memory, glutamic acid decarboxylase (GAD) activity, and synaptophysin levels in middle-aged male and female mice. Prior to testing, a subset of 18-month-old male and female C57BL/6 mice was housed with two to three toys and a running wheel in the home cage for up to 29 d. Adult mice (7 mo) of both sexes and the remaining middle-aged mice were group (social) housed, but not exposed to enriching objects. After the enrichment period, all mice were tested in a 1-day version of the Morris water maze, in which both spatial and nonspatial memory were assessed. Immediately after testing, the hippocampus and frontoparietal cortex were dissected, and GAD activity and synaptophysin levels were measured. Environmental enrichment reduced the age-related impairment in spatial acquisition and retention; relative to adult social controls, middle-aged enriched mice were unimpaired, whereas middle-aged social controls were impaired. This reduction was similar in middle-aged males and females. Enrichment did not affect cued memory in either sex. Although hippocampal GAD

activity was increased by enrichment in males, all other neurochemical measurements were unaffected by enrichment or aging in either sex. These data suggest that environmental enrichment initiated at middle age can reduce age-related impairments in spatial memory in males and females, although the underlying neurobiological mechanisms of this effect remain unknown.

Descriptors: aging physiology, environment, maze learning physiology, spatial behavior physiology, discrimination learning physiology, frontal lobe metabolism, glutamate decarboxylase metabolism, hippocampus metabolism, animal housing, memory disorders prevention and control, mice, inbred C57BL mice, parietal lobe metabolism, sex distribution, synaptophysin metabolism.

Gaertner, D.J. (2002). **Value for money in mouse housing systems versus following the trend.** *Contemporary Topics in Laboratory Animal Science* 41(6): 7-8. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: animal husbandry economics, equipment and supplies veterinary, animal husbandry methods, animal husbandry trends, budgets trends, cost allocation economics, cost allocation trends, equipment and supplies economics, equipment and supplies standards, mice.

Galef Jr., B.G. (1999). **Environmental enrichment for laboratory rodents: animal welfare and the methods of science.** *Journal of Applied Animal Welfare Science* 2(4): 267-280. ISSN: 1088-8705.

NAL Call Number: HV4701.J68

Descriptors: laboratory mammals, gerbils, rats, fearfulness, tameness, genotype environment interaction, enrichment, environment, cages, cage size, immune response, voles, corticosterone, blood plasma, animal housing, animal welfare, pair housing.

Galef Jr., B.G. and R.E. Sorge (2000). **Use of PVC conduits by rats of various strains and ages housed singly and in pairs.** *Journal of Applied Animal Welfare Science* 3(4): 279-292. ISSN: 1088-8705.

NAL Call Number: HV4701.J68

Descriptors: rats, laboratory animals, cages, group size, animal behavior, strain differences, age differences, sex differences, social dominance, polyvinyl chloride, plastic pipes, animal welfare, environmental enrichment.

Gariepy, J.L., D. Nehrenberg, and K.R. Mills (2001). **Maternal care and separation stress in high- and low-aggressive mice**. *Developmental Psychobiology* 38(3): 203. ISSN: 0012-1630.

Descriptors: mice, maternal care, separation stress, high aggressive, low aggressive.

Notes: Meeting Information: 33rd Annual Meeting of the International Society for Developmental Psychobiology, November 01-04, 2000, New Orleans, Louisiana, USA.

Gariepy, J.L., R.M. Rodriguiz, and B.C. Jones (2002). **Handling, genetic and housing effects on the mouse stress system, dopamine function, and behavior.** *Pharmacology, Biochemistry and Behavior* 73(1): 7-17. ISSN: 0091-3057.

Abstract: This research was designed to examine how early stimulation (i.e., handling), subsequent housing conditions and genetic factors interact to produce adult differences in stress regulation. High-aggressive (NC900) and low-aggressive (NC100) mice were handled for 3 weeks potspartum and were subsequently isolated or grouped until observed as adults in an open field or a dyadic test. In NC100, handling abolished the temporal variations seen in open-field activity among the nonhandled subjects and reduced corticosterone (CORT) activation. In NC900, these two measures were unaffected by handling. Only among handled NC100 did subsequent group rearing further reduce CORT activation. By contrast, handling caused an up-regulation of D1 dopamine receptors in both lines, and, in NC100, this effect was increased by group rearing. In a dyadic encounter with another male mouse, subjects of both lines showed handling effects. NC100 froze less rapidly and NC900 attacked more rapidly. This multifactorial design showed that the systemic effects of handling are modulated by genetic background, and that measures of these effects are affected by experience beyond infancy. Our findings also showed that the effects of handling vary when assessed across different physiological systems and across social and nonsocial testing conditions.

Descriptors: behavior, animal physiology, handling psychology, animal housing, interpersonal relations, receptors, dopamine D1 metabolism, stress blood, brain metabolism, corticosterone blood, corticosterone genetics, mice, receptors, dopamine D1 genetics, species specificity, stress genetics, mouse, stress system,

handling, genetic, effects, dopamine function, early stimulation.

Garner, J.P., B. Dufour, L.E. Gregg, S.M. Weisker, and J.A. Mench (2004). **Social and husbandry factors affecting the prevalence and severity of barbering ('whisker trimming') by laboratory mice**. *Applied Animal Behaviour Science* 89(3-4): 263-282. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: mice, social factors, husbandry factors, animal behavior, barbering, severity, prevalence, animal welfare.

Gazit, I., A. Terkel, and J. Terkel (1998). **Breeding and husbandry of the blind mole rat *Nannospalax ehrenbergi* at the Zoology department, Tel Aviv University**. *International Zoo Yearbook* 36(0): 246-255. ISSN: 0074-9664.
Descriptors: blind mole rat, breeding, husbandry, behavior, management conditions, artificial environment, tunnel system.

Gillingham, M.B., M.D. Clark, E.M. Dahly, L.A. Krugner Higby, and D.M. Ney (2001). **A comparison of two opioid analgesics for relief of visceral pain induced by intestinal resection in rats.** *Contemporary Topics in Laboratory Animal Science* 40(1): 21-26. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory mammals, opioids, analgesics, pain, morphine, thebaine, pharmacology, intestine resection, postoperative care, animal behavior, posture, grooming, intravenous injection, infusion, urination, adverse effects, animal welfare, oxymorphone, buprenorphine, bolus injection, continuous infusion, animal use refinement.

Goecke, J., H. Awad, J.C. Lawson, and G. Boivin (2005). **Evaluating postoperative analgesics in mice using telemetry.** *Comparative Medicine* 55(1): 37-44. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: The study examined the efficacy of preemptive or postoperative analgesia on surgical pain in the mouse. Radiotelemetry transmitters were surgically implanted in 28 female ICR mice. A mock ova implantation surgery was then performed. Mice were treated with a single dose of buprenorphine or flunixin meglumine prior to or after surgery, three doses of buprenorphine, or were untreated. Heart rate, blood pressure, home cage activity, food and water consumption, and body weight were measured. The no-analgesia group showed no significant differences between any parameters collected prior to surgery and those collected at similar times during the day of surgery. Significant increases in mouse activity on the day of surgery occurred with all analgesic treatments, compared with pre-surgical activity. There were no consistent significant changes in any other telemetry parameter after treatment with analgesics compared with no analgesia. Food consumption and body weight the day after surgery were reduced significantly in the animals treated with three doses of buprenorphine compared with untreated mice and mice given a single dose of buprenorphine. We conclude that the mock ova implant procedure does not induce sufficient pain to cause alterations in heart rate and blood pressure in the mouse. Activity was significantly reduced in the first 6 h after surgery in mice without analgesia, compared with activity prior to surgery. There were no significant differences between pre-emptive and postoperative analgesia. Body weight and food and water consumption were poor measures of pain because analgesia alone affected these parameters.
Descriptors: postoperative analgesics, evaluating, mice, telemetry, radiotelemetry, heart rate, blood pressure, pain.

Gomes, C.M., P.J. Frantz, G.L. Sanvitto, J.A. Anselmo Franci, and A.B. Lucion (1999). **Neonatal handling induces anovulatory estrous cycles in rats.** *Brazilian Journal of Medical and Biological Research* 32(10): 1239-42. ISSN: 0100-879X.
Abstract: Since previous work has shown that stimulation early in life decreases sexual receptiveness as measured by the female lordosis quotient, we suggested that neonatal handling could affect the function of the hypothalamus-pituitary-gonadal axis. The effects of neonatal handling on the estrous cycle and ovulation were analyzed in adult rats. Two groups of animals were studied: intact (no manipulation, N = 10) and handled (N = 11). Pups were either handled daily for 1 min during the first 10 days of life or left undisturbed. At the age of 90 days, a vaginal smear was collected daily at 9:00 a.m. and analyzed for 29 days; at 9:00 a.m. on the day of

estrus, animals were anesthetized with thiopental (40 mg/kg, ip), the ovaries were removed and the oviduct was dissected and squashed between 2 glass slides. The number of oocytes of both oviductal ampullae was counted under the microscope. The average numbers for each phase of the cycle (diestrus I, diestrus II, proestrus and estrus) during the period analyzed were compared between the two groups. There were no significant differences between intact and handled females during any of the phases. However, the number of handled females that showed anovulatory cycles (8 out of 11) was significantly higher than in the intact group (none out of 10). Neonatal stimulation may affect not only the hypothalamus-pituitary-adrenal axis, as previously demonstrated, but also the hypothalamus-pituitary-gonadal axis in female rats.

Descriptors: anovulation etiology, estrus physiology, handling psychology, animals, newborn, hypothalamo hypophyseal system physiology, pituitary adrenal system physiology, Wistar rats, reproduction.

Gomes, C.M., C. Raineki, P. Ramos de Paula, G.S. Severino, C.V. Helena, J.A. Anselmo Franci, C.R. Franci, G.L. Sanvitto, and A.B. Lucion (2005). **Neonatal handling and reproductive function in female rats.** *Journal of Endocrinology* 184(2): 435-45. ISSN: 0022-0795.

Abstract: Neonatal handling induces anovulatory estrous cycles and decreases sexual receptivity in female rats. The synchronous secretion of hormones from the gonads (estradiol (E2) and progesterone (P)), pituitary (luteinizing (LH) and follicle-stimulating (FSH) hormones) and hypothalamus (LH-releasing hormone (LHRH)) are essential for the reproductive functions in female rats. The present study aimed to describe the plasma levels of E2 and P throughout the estrous cycle and LH, FSH and prolactin (PRL) in the afternoon of the proestrus, and the LHRH content in the medial preoptic area (MPOA), median eminence (ME) and medial septal area (MSA) in the proestrus, in the neonatal handled rats. Wistar pup rats were handled for 1 min during the first 10 days after delivery (neonatal handled group) or left undisturbed (nonhandled group). When they reached adulthood, blood samples were collected through a jugular cannula and the MPOA, ME and MSA were microdissected. Plasma levels of the hormones and the content of LHRH were determined by RIA. The number of oocytes counted in the morning of the estrus day in the handled rats was significantly lower than in the nonhandled ones. Neonatal handling reduces E2 levels only on the proestrus day while P levels decreased in metestrus and estrus. Handled females also showed reduced plasma levels of LH, FSH and PRL in the afternoon of the proestrus. The LHRH content in the MPOA was significantly higher than in the nonhandled group. The reduced secretion of E2, LH, FSH and LHRH on the proestrus day may explain the anovulatory estrous cycle in neonatal handled rats. The reduced secretion of PRL in the proestrus may be related to the decreased sexual receptiveness in handled females. In conclusion, early-life environmental stimulation can induce long-lasting effects on the hypothalamus-pituitary-gonad axis.

Descriptors: newborn animals physiology, handling psychology, reproduction physiology, estradiol blood, follicle stimulating hormone blood, gonadorelin analysis, luteinizing hormone blood, median eminence chemistry, preoptic area chemistry, proestrus blood, progesterone blood, prolactin blood, radioimmunoassay methods, Wistar rats, septum of brain chemistry.

Gordon, C.J., E.T. Puckett, and B.K. Padnos (2001). **Noninvasive, continuous measurement of rat tail skin temperature by radiotelemetry**. *FASEB Journal* 15(4): A418. ISSN: 0892-6638.

Descriptors: rat, tail skin, temperature, noninvasive, monitoring, radiotelemetry, thermoregulatory status, stress, unrestrained.

Notes: Meeting Information: Annual Meeting of the Federation of American Societies for Experimental Biology on Experimental Biology 2001, March 31-April 04, 2001, Orlando, Florida, USA.

Gos, T., R. Hauser, and M. Krzyzanowski (2002). **Regional distribution of glutamate in the central nervous system of rat terminated by carbon dioxide euthanasia.** *Laboratory Animals* 36(2): 127-133. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Carbon dioxide euthanasia is an established method for the termination of small laboratory animals. It has also been employed by the authors in neurobiological research on the postmortem glutamate concentration in the structures of rat brains. The following investigations were aimed at optimizing the termination procedure based on the CO2 saturation rate of the inhaled air. Two rates of CO2 flow were applied, and the higher one significantly augmented the glutamate level in the hippocampus and cerebellum. The relationship between this finding and signs of central fear reaction is discussed. The authors conclude that lower rather than higher CO2 flow in euthanasia procedures is gentler and is therefore preferable for use with laboratory animals.

Descriptors: rats, euthanasia, carbon dioxide, dosage, fearfulness, animal welfare, amygdala, hippocampus, cerebellum, glutamic acid, animal use refinement.

Gutt, C.N., V. Riemer, C. Brier, R. Berguer, and V. Paolucci (1998). **Standardized technique of laparoscopic surgery in the rat.** *Digestive Surgery* 15(2): 135-9. ISSN: 0253-4886.

Abstract: The evolution of advanced laparoscopic techniques requires animal models for instrument development, evaluation of the physiopathological correlation and physician training. Selection of surgical models is primarily based on cost, availability, anatomic and physiologic considerations, and housing and anesthetic methods. The use of large animals is becoming increasingly difficult due to restrictive legislation, public concern, and economic factors. A standardized technique of laparoscopic surgery in the rat has been developed to perform procedures in all abdominal regions including fundoplication, splenectomy, nephrectomy, liver resection, herniorraphy, colotomy, colectomy, and retroperitoneal exploration. The equipment consists of a specially designed small animal operating table, a standard arthroscope and micro-instruments. The rat model gives the opportunity to investigate the physiopathological relations and immune functions of laparoscopic procedures, to develop micro-instruments under realistic conditions of a live organism, and it is an excellent training model especially for pediatric and microsurgery. Besides low costs and easy availability, the rat model requires less logistic and financial efforts.

Descriptors: disease models, animal, laparoscopy methods, colectomy methods, fundoplication methods, hepatectomy methods, hernia, inguinal surgery, pneumoperitoneum, artificial, rats, Sprague Dawley rats, splenectomy methods.

Hackbarth, H., N. Kuppers, and W. Bohnet (2000). **Euthanasia of rats with carbon dioxide--animal welfare aspects.** *Laboratory Animals* 34(1): 91-96. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Descriptors: rats, euthanasia, carbon dioxide, animal welfare, respiration rate, blood sugar, blood serum, corticosterone, corticotropin, death, distress.

Hale, K.D., D.A. Weigent, D.K. Gauthier, R.N. Hiramoto, and V.K. Ghanta (2003). **Cytokine and hormone profiles in mice subjected to handling combined with rectal temperature measurement stress and handling only stress**. *Life Sciences* 72(13): 1495-1508. ISSN: 0024-3205.

Abstract: Stress is known to either up- or down-regulate immunity. In this study, mice were subjected to handling combined with rectal temperature measurement (RTM) stress or handling only stress. We investigated whether there were any significant differences in the effect of handling combined with RTM and handling only on NK cell activity, serum cytokine (IL-1 beta , IL-6, and TNF- alpha) and ACTH and beta -endorphin levels, and splenic cytokine (IL-1 beta , IL-6, TNF- alpha , IFN- alpha , and IFN- beta) levels. Circulating cytokines and hormones and splenic cytokine mRNA levels were measured in individual mice. NK cell activity was significantly increased in both stress groups when compared to the control group. Handling combined with RTM produced significantly increased serum levels of IL-1 beta , IL-6, and beta -endorphin. Serum IL-1 beta , ACTH, and beta -endorphin were elevated significantly in the handling only group. Splenic TNF alpha mRNA in both of the stress groups and IL-6 mRNA in handling only group decreased significantly. Our observations are supported by existing literature demonstrating that various stressors have differential effects on immune functions and the neuroendocrine hormones and cytokines, which regulate them.

Descriptors: body temperature, corticotropin, cytokines, endorphins, hormone secretion, hormones, immune system, immunological factors, interleukin 1, interleukin 6, natural killer cells, stress, tumour necrosis factor, mice.

Han, S.S., K.H. Cho, H.S. Han, Y.B. Kim, J.W. Seo, and C.W. Song (1994). **[Reproductive performance of the SPF Sprague-Dawley rats under single paired rotational mating]**. *Korean Journal of Laboratory Animal Science* 10(2): 211-218. ISSN: 1225-813X.

Descriptors: rats, mating systems, reproductive performance, litter size, parturition, animal husbandry methods, animal performance, mammals, physiological functions, reproduction, Rodentia, sexual reproduction.

Language of Text: Korean with Korean and English summaries.

Hanberg, A. and C. Trossvik (1995). **In situ collection of intestinal lymph in the non-restrained rat**. *Scandinavian*

Journal of Laboratory Animal Science 22(4): 329-334. ISSN: 0901-3393.
Descriptors: rats, laboratory animals, lymph, sampling methods, body fluids, body parts, mammals, methods, Rodentia, useful animals.
Language of Text: Swedish and English summaries.

Harkin, A., T.J. Connor, J.M. O'Donnell, and J.P. Kelly (2002). **Physiological and behavioral responses to stress: What does a rat find stressful.** *Lab Animal* 31(4): 42-50. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: rats, laboratory animals, stress, animal behavior, stress factors, telemetry, transponders, responses, duration, heart rate, body temperature, locomotion, physical activity, cage density, litter, feces, subcutaneous injection, escape responses, lighting, odors, cage size, animal testing alternatives, animal handling, pair housing, confinement, stroboscopic lighting, animal use refinement.

Harris, R.B., T.D. Mitchell, J. Zhou, S. Herbert, and D.H. Ryan (2001). **Stress-induced weight loss in rats is influenced by the feeding regimen**. *Society for Neuroscience Abstracts* 27(2): 1956. ISSN: 0190-5295.
Descriptors: rats, weight loss, stress induced, feeding regimen, repeated restraint, time of day, food access.
Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Harris, R.B.S., T.D. Mitchell, J. Simpson, S.M. Redmann Jr., B.D. Youngblood, and D.H. Ryan (2002). **Weight loss in rats exposed to repeated acute restraint stress is independent of energy or leptin status.** *American Journal of Physiology* 1(2): R77-R88. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: rats, weight loss, repeated restraint, stress, energy, leptin status, husbandry, handling, hypophagia, hyperthermic.

Harris, R.B.S., J. Zhou, T. Mitchell, S. Hebert, and D.H. Ryan (2002). **Rats fed only during the light period are resistant to stress-induced weight loss**. *Physiology and Behavior* 76(4-5): 543-550. ISSN: 0031-9384.
Abstract: Repeated restraint stress (3 h/day for 3 days) causes a chronic down-regulation of body weight in rats. This study determined whether weight loss was influenced by the time of day that rats had access to food or that stress was applied. Groups of male Sprague-Dawley rats were fed a 40% kcal fat diet with food given ad libitum, only during the light phase or only during the dark phase. After 2 weeks of adaptation, rats within each feeding treatment were divided into four groups. One was exposed to repeated restraint at the start of the light phase, another was restrained at the start of the dark phase and the remaining groups were nonstressed controls for restrained rats. Body weight was significantly reduced in ad libitum- and dark-fed restrained rats, compared with nonstressed controls, from Day 2 of restraint, regardless of the time of day that they were stressed. There was no significant effect of restraint on weight change of light-fed rats. Food intake was inhibited by stress in ad libitum- and dark-fed rats, but it was not changed in light-fed rats. Serum corticosterone was increased by restraint in all rats irrespective of feeding schedule. This study demonstrates that stress-induced weight loss only occurs when rats have food available during their normal feeding period (dark phase) and is not determined by increased corticosterone release.
Descriptors: animal models, body weight, dark, feeding behavior, light, stress, weight reduction, rats.

Hawkins, P., D.B. Morton, R. Bevan, K. Heath, J. Kirkwood, P. Pearce, L. Scott, G. Whelan, A. Webb, and Joint Working Group on Refinement (2004). **Husbandry refinements for rats, mice, dogs and non-human primates used in telemetry procedures. Seventh report of the BVAAWF/FRAME/RSPCA/UFAW Joint Working Group on Refinement, Part B.** *Laboratory Animals* 38(1): 1-10. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: animal husbandry methods, dogs, mice, nonhuman primates, rats, veterinary telemetry, animal husbandry standards, animal welfare, laboratory animals, veterinary surgery, animal care, BVAAW, FRAME, RSPCA, UFAW, group housing, long term housing, post surgery, reviews.

Hayes, K.E., J.A. Raucci Jr., N.M. Gades, and L.A. Toth (2000). **An evaluation of analgesic regimens for abdominal surgery in mice.** *Contemporary Topics in Laboratory Animal Science* 39(6): 18-23. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory animals, postoperative care, analgesics, dosage, acetaminophen, feed intake, water intake, animal experiments, animal welfare, ibuprofen, buprenorphine, animal use refinement.

Hayssen, V. (1998). **Effect of transatlantic transport on reproduction of agouti and nonagouti deer mice, *Peromyscus maniculatus***. *Laboratory Animals* 32(1): 55-64. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: transport of animals, reproduction, infertility, Rodentia, rodents, laboratory animals, mammals, noxious animals, noxious mammals, pests, physiological functions, transport, useful animals, *Peromyscus maniculatus*, Muridae.

Hayton, S.M., A. Kriss, and D.P.R. Muller (1999). **Comparison of the effects of four anaesthetic agents on somatosensory evoked potentials in the rat.** *Laboratory Animals* 33(3): 243-251. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Electrophysiological techniques provide an objective and non-invasive measure of neurological function. In order to undertake detailed evoked potential studies in rats on repeated occasions, it is necessary to find an appropriate anaesthetic agent which has minimal and reproducible effects on the parameters to be studied and also has a minimal effect on the general welfare of the animals. In this study we compared the effects of four common anaesthetic agents (ketamine-xylazine, medetomidine, isoflurane and fentanyl/fluanisone-midazolam) on somatosensory evoked potentials (SEPs) in rats following electrical stimulation of the fore- and hind-paw. Fentanyl/fluanisone-midazolam was found to be well tolerated by the animals and to have, in general, the least deleterious effect on SEPs. For example, the response recorded at the level of the somatosensory cortex (P1), following forelimb stimulation, appeared on average 1.80 ms earlier with fentanyl/fluanisone-midazolam than with the other agents and the peak-to-peak amplitude (CI to CII) of the response recorded at the cervical (C3) level was on average 5.86 microvolt greater with fentanyl/fluanisone-midazolam. Fentanyl/fluanisone-midazolam is, therefore, recommended as the anaesthetic of choice for longitudinal studies of SEPs in the rat.
Descriptors: rats, anesthesia, ketamine, xylazine, medetomidine, isoflurane, fentanyl, electrical stimulation, responses, injectable anesthetics, cerebral cortex, fluanisone, midazolam.

Heikkilae, M., R. Sarkanen, H.M. Voipio, and T. Nevalainen (2001). **Cage position preferences of rats**. *Scandinavian Journal of Laboratory Animal Science* 28(2): 65-74. ISSN: 0901-3393.
Descriptors: rats, laboratory animals, animal husbandry, cages, behavior, animal housing, preferences, position.

Hennessy, M.B. and A. Morris (2005). **Passive responses of young guinea pigs during exposure to a novel environment: Influences of social partners and age.** *Developmental Psychobiology* 46(2): 86-96. ISSN: 0012-1630.
Descriptors: guinea pigs, responses, novel environment, social partners, age, exposure, isolation, study.

Hobbs, A., W. Kozubal, and F.F. Nebiar (1997). **Evaluation of objects for environmental enrichment of mice**. *Contemporary Topics in Laboratory Animal Science* 36(3): 69-71. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, animal welfare, behavior, litter for animals, pipes, plastics, animal housing, equipment, enrichment, Rodentia, activity, behavior patterns, toys.

Holden, H.E., R.E. Stoll, J.W. Spalding, and R.W. Tennant (1998). **Hemizygous Tg.AC Ttansgenic mouse as a potential alternative to the two-year mouse carcinogenicity bioassay: evaluation of husbandry and housing factors**. *Journal of Applied Toxicology* 18(1): 19-24. ISSN: 0260-437X.
Descriptors: transgenic mouse, two year mouse, alternative, husbandry, housing, bioassay, carcinogenicity.

Holley, D.C., B. Said, A. Howard, and D.P. Ward (2003). **Monitoring lab animal feeding by using subcutaneous microchip transponders: validation of use with group-housed rats.** *Contemporary Topics in Laboratory Animal Science* 42(3): 26-28. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23

Descriptors: rats, group housed, monitoring feeding, microchip transponders, subcutaneous, pellet feeder, feeding behaviors.

Horvath, K.M., T. Harkany, J. Mulder, J.M. Koolhaas, P.G. Luiten, and P. Meerlo (2004). **Neonatal handling increases sensitivity to acute neurodegeneration in adult rats.** *Journal of Neurobiology* 60(4): 463-72. ISSN: 0022-3034.

Abstract: Environmental stimuli during the perinatal period can result in persistent individual differences in neural viability and cognitive functions. Earlier studies have shown that brief daily maternal separation and/or handling of rat pups during the first weeks of life reduces stress reactivity during adulthood and attenuates neuronal loss and cognitive decline during aging. In the present study we examined whether neonatal handling also affects the sensitivity of the adult brain to an acute neurotoxic insult. Postnatally handled and nonhandled control rats were left undisturbed from weaning onwards until the age of 11 months. At this age, the animals were subjected to a neurotoxic challenge by unilateral infusion of 60 mM of the glutamate analogue N-methyl-D-aspartate (NMDA) into the nucleus basalis magnocellularis (NBM). The brains were collected to measure cholinergic cell and fiber loss. In the nonlesioned side of the brain, cholinergic cell number in the NBM and fiber density in the cortex were not different between postnatally handled and control rats. However, in the lesioned hemisphere handled animals exhibited a significantly higher loss of choline-acetyltransferase-immunoreactive and acetylcholinesterase-positive fibers in the somatosensory cortex. The present results provide evidence for an enhanced vulnerability of postnatally handled rats to acute neurodegeneration in contrast to the previously reported attenuation of spontaneous aging-related neurodegenerative processes.

Descriptors: handling psychology, immunity, natural physiology, maternal deprivation, nerve degeneration physiopathology, stress, psychological physiopathology, acetylcholine metabolism, acetylcholinesterase metabolism, animals, newborn, basal nucleus of meynert drug effects, basal nucleus of meynert pathology, basal nucleus of meynert physiopathology, cell death physiology, choline o acetyltransferase metabolism, cholinergic fibers pathology, corticosterone blood, immunohistochemistry, laterality physiology, n methylaspartate, nerve degeneration chemically induced, nerve degeneration pathology, neurotoxins, Wistar rats, stress, psychological blood, stress, psychological pathology.

Howell, L.A., R.B.S. Harris, C. Clarke, B.D. Youngblood, D.H. Ryan, and T.A. Gilbertson (1999). **The effects of restraint stress on intake of preferred and nonpreferred solutions in rodents.** *Physiology and Behavior* 65(4-5): 697-704. ISSN: 0031-9384.

Descriptors: rodents, restraint stress, solutions, intake, preferred, nonpreferred, effects, rat, hamsters.

Huang Brown, K.M. and F.A. Guhad (2002). **Chocolate, an effective means of oral drug delivery in rats.** *Lab Animal* 31(10): 34-36. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Descriptors: rats, laboratory animals, oral administration, indometacin, non steroidal antiinflammatory agents, dosage, training of animals, drug formulations, stress, animal welfare, animal testing alternatives, celecoxib, animal use refinement.

Hubrecht, R. (2000). **Advancing rabbit and rodent housing and husbandry research**. *Progress in the Reduction, Refinement and Replacement of Animal Experimentation: Proceedings of the 3rd World Congress on Alternatives and Animal Use in the Life Sciences, Bologna, Italy*, p. 1257-1267.

Descriptors: rabbit, rodent, housing, husbandry, animal welfare, enrichment, research.

Hurst, J.L., C.J. Barnard, U. Tolladay, C.M. Nevison, and C.D. West (1999). **Housing and welfare in laboratory rats: effects of cage stocking density and behavioural predictors of welfare.** *Animal Behaviour* 58(Part 3): 563-586. ISSN: 0003-3472.

NAL Call Number: 410 B77

Descriptors: rats, stocking density, stress response, sex differences, physiopathology, animal welfare, aggressive behavior, grooming, physical activity, escape responses, kidneys, adrenal glands, IGG, thymus gland, corticosterone, blood serum, testosterone, blood picture, blood chemistry.

Israeli, E., G. Zannineli, O. Weiss, M. Margalit, M. Chevion, E. Berenshtein, and E. Goldin (2003). **The effect of**

chronic restrain stress on the normal and inflammatory colon in rats. *Digestive Disease Week Abstracts and Itinerary Planner*: Abstract No. T1181.
Descriptors: rats, chronic restraint, stress, effect, colitis, colon, normal, inflammatory, digestive system.
Notes: Meeting Information: Digestive Disease, May 17-22, 2003, Orlando, Florida, USA.

Jablonski, P. and B.O. Howden (2002). **Oral buprenorphine and aspirin analgesia in rats undergoing liver transplantation.** *Laboratory Animals* 36(2): 134-143. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The objective of this study was to establish effective postoperative analgesia for Dark Agouti rats undergoing liver transplantation with minimal additional stress due to handling and no adverse effect on transplant outcome. Oral administration of buprenorphine (0.5 mg/kg/dose) or aspirin (100 mg/kg/dose) in raspberry-flavoured gelatine were compared to controls receiving no treatment or plain gelatine. The drugs were presented five times: immediately on recovery from anaesthesia and at 12 h intervals thereafter. All rats underwent right nephrectomy and replacement of their liver by an arterialized liver isograft preserved optimally for 24 h. All groups had reversible hepatic damage, lost weight and demonstrated severely reduced dark cycle activity after surgery. Neither treatment appeared to ameliorate the loss of body weight that probably reflected hepatic insufficiency during the first week as well as pain and surgical stress. In the second week, when liver function was 'normal', rats began to regain weight at the pre-transplant rate. Aspirin treatment significantly increased activity during the first and second dark cycles after surgery, whereas buprenorphine significantly increased activity during the second dark cycle only. Neither drug had any apparent adverse effects on the rats or on graft function. Postoperative oral administration of aspirin should be incorporated into future programmes of liver transplantation in rodents. More effective treatment in the immediate postoperative period may require oral administration of analgesia prior to surgery or a single subcutaneous injection of an analgesic agent on completion of surgery in addition to postoperative oral. administration of aspirin.
Descriptors: rats, postoperative care, aspirin, opium alkaloids, body weight, liver, weight, blood plasma, aspartate aminotransferase, alkaline phosphatase, enzyme activity, creatine, bilirubin, physical activity, animal welfare, animal use refinement.

Jackson, R.K. (1997). **Unusual laboratory rodent species: research uses, care, and associated biohazards**. *ILAR Journal* 38(1): 13-21. ISSN: 1084-2020.
NAL Call Number: QL55.A1I43
Descriptors: rodents, voles, Rodentia, squirrels, laboratory animals, animal models, experimentation, medical sciences, research, mammals, noxious animals, noxious mammals, pests, Rodentia, useful animals, *Octodon degus*, microtus, clethrionomys, peromyscus, *Sigmodon hispidus*, spermophilus, praomys, marmota.

Jennings, M., G.R. Batchelor, P.F. Brain, A. Dick, H. Elliott, R.J. Francis, R.C. Hubrecht, J.L. Hurst, D.B. Morton, and A.G. Peters (1998). **Refining rodent husbandry: the mouse.** *Laboratory Animals* 32(3): 233-259. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: mice, floor space, floor type, battery husbandry, cages, cage size, litter, social behavior, wastage, animal welfare, transport of animals, transgenic animals.

Kamerman, P.R., Z.L.C. Di, and A. Fuller (2001). **Miniature data loggers for remote measurement of body temperature in medium-sized rodents**. *Journal of Thermal Biology* 26(3): 159-163. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Descriptors: rodents, temperature, miniature data logger, body temperature, measurement, remote.

Key, D. (2004). **Environmental enrichment options for laboratory rats and mice.** *Lab Animal* 33(2): 39-44. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: animal husbandry methods, animals, laboratory physiology, behavior, animal physiology, environment design, animal welfare, aimal housing, mice, rats.

King Herbert, A.P., T.W. Hesterburg, P.P. Thevenaz, T.E. Hamm Jr., O.R. Moss, D.B. Janszen, and J.I. Everitt (1997).

Effect of immobilization restraint on Syrian golden hamsters. *Laboratory Animal Science* 47(4): 362-366. ISSN: 0023-6764.

NAL Call Number: 410.9 P94

Abstract: Rodent nose-only inhalation toxicology systems comprise whole-body immobilization in plastic restraint tubes. This method of restraint is known to have a variety of effects on animals. In the studies reported here, two independent toxicology laboratories examined the effects of inhalation tube restraint in Syrian golden hamsters, a species that has recently gained importance in inhalation studies of fibrous particulates. Body weight, food and water consumption, core body temperature, and plasma cortisol and corticosterone concentrations were assessed in animals immobilized in nose-only inhalation tubes, and the results were compared with those from unrestrained cage-control animals. Animals were immobilized for either 6 h/day, 5 days/week for 13 weeks (subchronic), or 4 h/day for 14 consecutive days (subacute), mimicking exposure conditions commonly used in nose-only inhalation studies. Tube restraint was found to induce a marked decrease in body weight, which increased in response to cessation of restraint. The body weight decrement was associated with significant differences in food and water consumption between the restrained and control groups in the subacute study and only food consumption in the subchronic study. During the restraint period, core body temperature in the immobilized animals increased slightly but not above the normal range for this species. Plasma cortisol and corticosterone concentrations were not significantly increased with use of restraint, compared with values in controls. Immobilization-associated body weight depression in Syrian golden hamsters is important for the evaluation of nose-only inhalation study results because many normal physiologic. parameters, as well as toxicant-induced effects, are associated with body weight status.

Descriptors: golden hamsters, restraint of animals, immobilization, inhalation, toxicology, body weight, feed intake, water intake, body temperature, corticosterone, hydrocortisone, blood plasma, inhalation tube restraint, nose only inhalation toxicology, subchronic studies, subacute studies.

Kort, W.J., J.M. Hekking Weijma, M.T. Ten Kate, V. Sorm, and R. Van Strik (1998). **A microchip implant system as a method to determine body temperature of terminally ill rats and mice**. *Laboratory Animals* 32(3): 260-269. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: *Klebsiella pneumoniae* was inoculated intratracheally into rats and mice, and the temperature of the animals was recorded twice daily using microchip transponders (ELAMS) implanted either s.c. or i.p. The microchip temperatures were compared with rectal temperatures taken at the same time. The results showed that ELAMS was easy to operate and there were no important drawbacks in the use of the system were observed. The temperatures measured by the transponders implanted s.c. and i.p. did not differ significantly from rectal temperatures. In 2 out of 3 experiments on rats, it was shown that when the temperatures reached values below 36 degrees C, the median survival time of the animals was 24 h. In an experiment on mice, the same median survival time was observed at 36 degrees C. In 1 experiment using rats, however, the disease was so acute that death occurred before any temperature drop. It is suggested that when a 36 degrees C cutoff point is used instead of the time of death in this particular animal model, the statistical analysis is not altered, and it may spare animals further suffering for approximately 24 h. It is concluded that the ELAMS system of monitoring body temperature is simple and relatively stress free for laboratory animals.

Descriptors: body temperature, monitoring, animal welfare, animal experiments, laboratory animals, experimental infections, transponders, rats, mice, *Klebsiella pneumoniae*.

Kramer, K., H. Van de Weerd, A. Mulder, C. Van Heijningen, V. Baumans, R. Remie, H.P. Voss, and B.F.M. Van Zutphen (2004). **Effect of conditioning on the increase of heart rate and body temperature provoked by handling in the mouse**. *ATLA, Alternatives to Laboratory Animals* 32(Supplement 1A): 177-181. ISSN: 0261-1929.

NAL Call Number: Z7994.L3A5

Abstract: To assess the effect of procedures on animal welfare, various physiological parameters, such as body weight, hormone levels in plasma and/or urine, heart rate (HR), blood pressure and body temperature (BT), can be used. When measuring physiological parameters with techniques involving restraint of the animals, the results must be interpreted with caution, since restraint itself may have an effect on those parameters. Radio-telemetry, using an implantable transmitter, provides a way to obtain more accurate and reliable physiological measurements from freely moving animals in their own environment. In this study, we have used radio-

telemetry to investigate the influence of conditioning on the increase of HR and BT as provoked by handling of mice. It was found that, after a conditioning period of 12 days, the increase of HR due to handling was significantly reduced.
Descriptors: animal testing alternatives, animal welfare, body temperature, conditioning, heart rate, stress, stress response, telemetry, mice.

Kramer, S. (1998). **Perioperatives Narkosemanagement bei Kleinsaugern. [Care of rabbits and rodents during and after anaesthesia].** *Tierarztliche Praxis Ausgabe K, Kleintiere/Heimtiere* 26(2): 129-135.
Descriptors: rabbits, rodents, care, anesthesia, post operative, surgery, husbandry.

Krebs Thomson, K., D. Giracello, A. Solis, and M.A. Geyer (2001). **Post-weaning handling attenuates isolation-rearing induced disruptions of prepulse inhibition in rats.** *Behavioural Brain Research* 120(2): 221-4. ISSN: 0166-4328.
Abstract: Isolation rearing is a developmentally specific non-pharmacological manipulation in rats that produces a deficit in sensorimotor gating, as measured by prepulse inhibition (PPI) of the startle reflex. Previous research has demonstrated that the isolation rearing effect on PPI is sensitive to several factors, including the time of testing with respect to length of isolation, prepulse intensities used, strain of rats, and type of housing environment. This study tested whether handling is another factor that interacts with the isolation-rearing paradigm in PPI. Rats were housed either in the social (three rats per cage) or isolate (one rat per cage) conditions and were handled either 1-2 times per week (minimal handling) or on a daily basis (daily handling). All rats were then tested at 8 and 10 weeks post-weaning. There was an interaction between housing and handling. In the minimal handling condition, isolation rearing produced a deficit in PPI. This effect was absent, however, in the daily handling condition. Thus, regular handling of rats may interfere with the observation of the isolation rearing effect on PPI and should be carefully controlled in studies using this animal model of PPI deficits.
Descriptors: handling psychology, social isolation psychology, startle reaction physiology, rats, Sprague Dawley rats.

Krohn, T.C., A.K. Hansen, and N. Dragsted (2003). **The impact of cage ventilation on rats housed in IVC systems.** *Laboratory Animals* 37(2): 85-93. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Today the use of individually ventilated cage systems (IVC systems) is common, especially for housing transgenic rodents. Typically, in each cage a ventilation rate of 40 to 50 air changes per hour is applied, but in some systems even up to 120 air changes per hour is applied. To reach this rate, the air is blown into the cage at a relatively high speed. However, at the animal's level most systems ventilate with an air speed of approximately 0.2 m/s. In the present paper, two studies were conducted, one analysing whether an air speed below 0.2 m/s or just above 0.5 m/s affects the rats, and another study analysing whether air changes of 50, 80 and 120 times per hour affect the rats. In both studies, monitoring of preferences as well as physiological parameters such as heart rate and blood pressure, was used to show the ability of the animals to register the different parameters and to avoid them if possible. Air speeds inside the cage of as high as 0.5 m/s could not be shown to affect the rats, while the number of air changes in each cage should be kept below 80 times per hour to avoid impacts on physiology (heart rate and systolic blood pressure). Also the rats prefer cages with air changes below 80 times per hour if they have the opportunity of choosing, as shown in the preference test.
Descriptors: rats, animal husbandry, ventilation, IVC systems, impact, housing, ventilation methods, air movements, animal welfare, behavior.

Krugner Higby, L., L. Smith, M. Clark, T.D. Heath, E. Dahly, B. Schiffman, S. Hubbard Van Stelle, D. Ney, and A. Wendland (2003). **Liposome-encapsulated oxymorphone hydrochloride provides prolonged relief of postsurgical visceral pain in rats.** *Comparative Medicine* 53(3): 270-279. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Adequate pain control is necessary for optimal postsurgical recovery and humane treatment of laboratory and companion animals. Opioid drugs are currently the most potent analgesic agents available in human and veterinary medicine. Long-acting formulations of opioid drugs confer several important advantages over standard pharmaceutical preparations, especially for use in animals. A long-acting formulation of

oxymorphone hydrochloride was produced by encapsulation into liposomes. Liposome-encapsulated (LE) oxymorphone was tested in a rat model of visceral postoperative pain. Rats were given one subcutaneous injection of LE oxymorphone (1.2 or 1.6 mg/kg of body weight) or standard oxymorphone (0.3 mg/kg) at the time of intestinal transection or resection. A single administration of LE oxymorphone hydrochloride was as effective for relief of postoperative pain in rats (P = 0.18), as were multiple (q4 h or q8 h) injections of 0.3 mg/kg of the standard pharmaceutical preparation. The rats given LE oxymorphone prior to intestinal resection also had significantly higher body weight at three and seven days after surgery than did rats that were given standard oxymorphone. In conclusion, LE oxymorphone was effective in treating visceral pain associated with intestinal surgery in rats. On the basis of body weight gain, rats treated with LE oxymorphone had improved recovery outcome, compared with rats treated with repeated injections of standard oxymorphone.

Descriptors: rats, laboratory animals, postoperative care, pain, analgesia, morphine, adverse effects, liposomes artificial, drug delivery systems, weight loss, voluntary intake, dose response, animal welfare.

Kudryashova, D.R., A.L. Markel, T.V. Sharova, and G.S. Yakobson (2004). **Effect of neonatal handling in rats with hereditary stress-induced arterial hypertension (NISAG rats).** *Bulletin of Experimental Biology and Medicine* 137(4): 345-7. ISSN: 0007-4888.

Abstract: NISAG rats were subjected to handling on days 1-21 after birth. Blood pressure and plasma corticosterone concentration were measured in 6-month-old handled and control NISAG rats at rest and under stress conditions. Animal behavior was studied in the open-field test. Handling had no effect on body weight and relative weights of the heart and adrenal glands. In rats subjected to handling, changes in blood pressure and adrenal cortex produced by acute emotional stress (30-min restriction) were less pronounced than in control animals. Handled rats demonstrated less fear in a new environment and exhibited high exploratory activity in the open-field test. Our findings suggest that neonatal handling reduces stress reactivity and decreases the severity of hypertension in adult NISAG rats.

Descriptors: handling psychology, hypertension physiopathology, psychological stress, newborn animals, behavior, animal physiology, blood pressure physiology, hypertension, genetics, rats, inbred rat strains.

Kuhnen, G. (1999). **The effect of cage size and enrichment on core temperature and febrile response of the golden hamster.** *Laboratory Animals* 33(3): 221-227. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: The aim of this study is to determine the effect of cage size and cage enrichment. Golden hamsters were individually housed in standard cages of four different sizes and in enriched cages of three different sizes since 3 weeks of age. Each of the seven housing groups consisted of 12 hamsters. After 14 weeks of housing in their respective environments the measurements started. The mean baseline rectal temperature was significantly higher in hamsters housed in small cages than in hamsters housed in large cages. After the injection of fever-inducing lipopolysaccharide rectal temperature increased by 1 to 2 degrees C. The increase of rectal temperature and the fever index were the highest in animals housed in large cages and the smallest in animals housed in small cages. Through cage enrichment and increasing cage size the mean febrile response increased while the mean baseline rectal temperature decreased. Cage size and cage enrichment had no effect on the dispersion of the measured values. The differences in microclimate between large and small cages were too small to have an effect on thermoregulation. The results indicate that housing in small cages induce chronic stress which obviously affects thermoregulation. The findings demonstrate that the results of some physiological experiments are significantly influenced by the preexperimental housing conditions.

Descriptors: golden hamsters, cages, cage density, enrichment, floor space, body temperature, fever, lipopolysaccharides, stress, standard deviation, animal experiments.

Kurien, B.T. and R.H. Scofield (1999). **Mouse urine collection using clear plastic wrap.** *Laboratory Animals* 33(1): 83-86. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Qualitative urinalysis using Multistix reagent strips for the detection of urinary pH, protein, glucose, bilirubin, blood, ketone, urobilinogen and creatinine can be carried out with a few drops of mouse urine. The use of metabolic cages is not practical for such qualitative studies particularly when several animals are involved. Here we describe two different methods for collecting pure mouse urine. The single animal method (SAM) involves allowing a single mouse to urinate on Glad cling wrap outside of the animal cage. The multiple

animal method (MAM) involves partitioning seven mice into seven different make-shift compartments laid out on top of the cling wrap and allowing them to urinate. The voided urine, in each case, is then aspirated into micro-centrifuge tubes using a Pipetman. Without coercion pure urine was obtained as early as 12 s. Volumes in the range of 10-25O microliter were obtained. Modifications of the SAM could prove useful for rat or mouse urine collection under conditions of microgravity.

Descriptors: mice, urine, sampling, urination, plastic film, laboratory methods.

Kuriyama, T., K. Oishi, H. Kakazu, and K. Machida (1998). **[Changes of physiological functions in rats induced by immobilization stress]**. *Nippon Eiseigaku Zasshi [Japanese Journal of Hygiene]* 52(4): 647-53. ISSN: 0021-5082.

Abstract: A study was conducted on the changes of physiological function in rats due to immobilization stress. Male Fischer rats (SPF) of 32 weeks of age were housed in individual cages for 4 weeks. Then all rats were immobilized by stainless wire mesh for 6 hours daily for 3 days. Blood was collected before the 1st stress, immediately after the 1st stress, immediately after the 3rd stress and the day after the 3rd stress. The results of this experiment were as follows: (1) The total leukocyte counts in the blood of the rats after the 1st trial was significantly higher than that before the 1st trial. (2) The percentage of lymphocytes in the blood after the 1st trial was significantly lower than that before the 1st trial, whereas that of neutrophils was significantly higher. (3) Correlations between phagocytic activity and superoxide production of neutrophils by histochemical NBT reduction assay showed significantly a positive correlation before the 1st trial. However, no significant correlations were observed in immediately after the 1st trial and the 3rd trial. The day after the 3rd trial, a positive correlation was observed again. These correlations showed that an unsuitable state of the neutrophil function was induced by the immobilization stress. (4) Serum biochemical profiles were affected by the immobilization stress. Also, GOT, GPT, LDH, CK and UA were increased after the 1st trial, whereas, TG, TP, ALB and ALP were decreased after the 1st trial. T-CHO was increased only immediately after the 3rd stress. These results suggest that immobilization stress affected blood cells and serum components, and then the host defense and physiological functions were damaged respectively.

Descriptors: immobilization adverse effects, stress physiopathology, leukocyte count, neutrophils physiology, phagocytosis, inbred F344 rats, superoxides metabolism.

Language of Text: Japanese.

Larsson, F., B. Winblad, and A.H. Mohammed (2002). **Psychological stress and environmental adaptation in enriched vs. impoverished housed rats.** *Pharmacology, Biochemistry and Behavior* 73(1): 193-207. ISSN: 0091-3057.

Abstract: In this study, we report differential behavioural and cognitive effects, as assessed in the open-field and the Morris water maze, following psychological stress in enriched vs. impoverished housed rats. Three stress conditions were evaluated: nonstress, mild stress and powerful stress. Mild stress consisted of exposure to an avoidance box but without shock, while in the powerful stress condition animals were exposed to an electric shock. The results revealed distinct effects in the differentially housed animals. Prior exposure to a mild stress enhanced escape performance in the water maze in enriched but not impoverished animals. However, preexposure to powerful stress negatively affected animals from both housing conditions in the water maze task, but with the enriched animals less affected than impoverished animals. In the open-field test, stress preexposure reduced locomotion counts in both the differentially housed animals. In addition, the results showed that the enrichment effect on emotional reactivity in the open-field is long-lasting and persists even after extensive training and housing in standard laboratory conditions. The results are discussed in relation to the nature of the behavioural and learning differences between the differentially housed animals.

Descriptors: environment, escape reaction, maze learning, motor activity, stress, psychological psychology, housing, animal statistics and numerical data, rats, Sprague Dawley rats.

Laviola, G., M. Rea, S. Morley Fletcher, S. Di Carlo, A. Bacosi, R. De Simone, M. Bertini, and R. Pacifici (2004). **Beneficial effects of enriched environment on adolescent rats from stressed pregnancies.** *European Journal of Neuroscience* 20(6): 1655-1664. ISSN: 0953-816X.

Abstract: The capacity of an early environmental intervention to normalize the behavioural and immunological dysfunctions produced by a stressed pregnancy was investigated. Pregnant Sprague-Dawley rats underwent three 45-min sessions per day of prenatal restraint stress (PS) on gestation days 11-21, and their offspring were

assigned to either an enriched-environment or standard living cages throughout adolescence [postnatal days (pnd) 22-43]. Juvenile rats from stressed pregnancies had a prominent depression of affiliative/playful behaviour and of basal circulating CD4 T lymphocytes, CD8 T lymphocytes and T4/T8 ratio. They also showed increased emotionality and spleen and brain frontal cortex levels of pro-inflammatory interleoukin-1beta (IL-1beta) cytokine. A more marked response to cyclophosphamide (CPA: two 2 mg/kg IP injections) induced immunosuppression was also found in prenatal stressed rats. Enriched housing increased the amount of time adolescent PS rats spent in positive species-typical behaviours (i.e. play behaviour), reduced emotionality and reverted most of immunological alterations. In addition to its effects in PS rats, enriched housing increased anti-inflammatory IL-2 and reduced pro-inflammatory IL-1beta production by activated splenocytes, also producing a marked alleviation of CPA-induced immune depression. In the brain, enriched housing increased IL-1beta values in hypothalamus, while slightly normalizing these values in the frontal cortex from PS rats. This is a first indication that an environmental intervention, such as enriched housing, during adolescence can beneficially affect basal immune parameters and rats response to both early stress and drug-induced immunosuppression.
Descriptors: rats, stressed, enriched environment, beneficial effects, pregnancies, behavioral, immunological.

Lawson, D.M., M. Churchill, and P.C. Churchill (2000). **The effects of housing enrichment on cardiovascular parameters in spontaneously hypertensive rats.** *Contemporary Topics in Laboratory Animal Science* 39(1): 9-13. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: housing, enrichment, cardiovascular, effects, rat, hypertensive.

Lazarov, O., J. Robinson, Y.P. Tang, I.S. Hairston, Z. Korade Mirnics, V.M. Lee, L.B. Hersh, R.M. Sapolsky, K. Mirnics, and S.S. Sisodia (2005). **Environmental enrichment reduces Abeta levels and amyloid deposition in transgenic mice.** *Cell* 120(5): 701-713. ISSN: 0092-8674.
Abstract: Cerebral deposition of beta-amyloid (Abeta) peptides is an invariant pathological hallmark in brains of patients with Alzheimer's disease (AD) and transgenic mice coexpressing familial AD-linked APP and PS1 variants. We now report that exposure of transgenic mice to an "enriched environment" results in pronounced reductions in cerebral Abeta levels and amyloid deposits, compared to animals raised under "standard housing" conditions. The enzymatic activity of an Abeta-degrading endopeptidase, neprilysin, is elevated in the brains of "enriched" mice and inversely correlated with amyloid burden. Moreover, DNA microarray analysis revealed selective upregulation in levels of transcripts encoded by genes associated with learning and memory, vasculogenesis, neurogenesis, cell survival pathways, Abeta sequestration, and prostaglandin synthesis. These studies provide evidence that environmental enrichment leads to reductions in steady-state levels of cerebral Abeta peptides and amyloid deposition and selective upregulation in levels of specific transcripts in brains of transgenic mice.
Descriptors: transgenic mice, enrichment, amyloid deposition, Abeta levels, Alzheimers disease, reduction.

Leach, M.C., N. Ambrose, V.J. Bosell, and D.B. Morton (2000). **The development of a novel form of mouse cage enrichment.** *Journal of Applied Animal Welfare Science* 3(2): 81-91. ISSN: 1088-8705.
NAL Call Number: HV4701.J68
Descriptors: mice, cages, enrichment, animal husbandry, animal behavior, animal welfare, cage design, environmental enrichment, cage insert, animal preferences, animal use refinement.

Lee, K.M., L.L. Reed, D.L. Bove, and J.A. Dill (1998). **Effects of water dilution, housing, and food on rat urine collected from the metabolism cage.** *Laboratory Animal Science* 48(5): 520-525. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Abstract: The objective of the study reported here was to investigate three factors that may affect the amounts of water consumed and urine excreted by a rat in the metabolism cage: water dilution, housing, and food. Young F344/N rats (eight per group) were used for all experiments. Food was withheld from rats before each 16-h urine collection, then rats were transferred into a metabolism cage. For trial A (water dilution), urine was collected from rats supplied with dyed water (0.05%,vol/vol). This was repeated three times over a 2-week period. Dye in water or urine was quantified, using a spectrophotometer. For trial B (housing), rats were individually housed in wire cages for 3 weeks before the first urine collection. Then they were group housed in the solid-bottom cage (four per cage). After 2 weeks of acclimation, urine collection was repeated. For trial C

(food), one group of rats was provided with food, the other was not, during urine collection. About 8% of urine samples of small volume (less than or equal to 3 ml) from trial A were contaminated with drinking water up to 13% of volume. The average urine volume associated with individual housing was approximately twice as large as that associated with group housing. When food was provided during urine collection, rats consumed similar amounts of water but excreted significantly smaller amounts of urine than did rats without food. It was concluded that water dilution of a urine sample from a sipper bottle is relatively small; rats individually housed in wire caging before urine collection can consumed and excrete a larger quantity of water, compared with rats group housed in solid-bottom cages: and highly variable urine volumes are, in part, associated with. lack of access to food during urine collection.

Descriptors: rats, metabolism, starvation, urine, volume, water intake, group size, cages, floor type, dilution, individual characteristics, renal function.

Lehmann, J., C.R. Pryce, A.L. Jongen Relo, T. Stohr, H.H.J. Pothuizen, and J. Feldon (2002). **Comparison of maternal separation and early handling in terms of their neurobehavioral effects in aged rats**. *Neurobiology of Aging* 23(3): 457-466. ISSN: 0197-4580.

Descriptors: rats, aging, early handling, husbandry, maternal separation, neurobehavioral effects, pup nonhandling, stress, comparison.

Lesage, J., L. Dufourny, C. Laborie, F. Bernet, B. Blondeau, I. Avril, B. Breant, and J.P. Dupouy (2002). **Perinatal malnutrition programs sympathoadrenal and hypothalamic-pituitary-adrenal axis responsiveness to restraint stress in adult male rats.** *Journal of Neuroendocrinology* 14(2): 135-143. ISSN: 0953-8194.

Descriptors: rats, adult, male, restraint stress, response, perinatal malnutrition, hypothalamic, pituitary, adrenal, responsiveness.

Lightfoot, T.L. (1999). **Molar trimming in rabbits, chinchillas, and guinea pigs.** *Proceedings of the North American Veterinary Conference, Orlando, Florida,* Eastern States Veterinary Association: Gainesville, FL, Vol. 13, p. 843-844.

NAL Call Number: SF605.N672

Descriptors: rabbits, chinchillas, guinea pigs, teeth, trimming, veterinary care.

Linder, C.C. (2003). **Mouse nomenclature and maintenance of genetically engineered mice.** *Comparative Medicine* 53(2): 119-125. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Modern genetic engineering technologies enable us to manipulate the mouse genome in increasingly complex ways to model human biology and disease. As a result, the number of mouse strains carrying transgenes or induced mutations has increased markedly. Thorough understanding of strain and gene nomenclature is essential to ensure that investigators know what kind of mouse they have, and what to expect in terms of phenotype. Genetically engineered mice alter gene function by over-expressing, eliminating, or modifying a gene product. The resulting phenotype is often unexpected and not completely understood, necessitating special care and potentially complex breeding and husbandry strategies. Animal care technicians responsible for routine maintenance of the colony facility managers, veterinarians, and research personnel working with mice should be well informed about the nature of the mutation, distinguishing characteristics, and necessary precautions in handling the mice. Personnel working with mice also must be aware of the multitude of factors intrinsic to the mouse and present in the environment that can influence reproductive performance. Finally, diligent adherence to the maintenance of genetic quality in conjunction with cryopreservation of germplasm is the best insurance against loss of a colony.

Descriptors: mice, laboratory animals, animal genetic resources, germplasm conservation, mutants, strain differences, strains, transgenic animals, phenotype, gene expression, inbred lines, animal models, animal husbandry, genotype, genetic background.

Liu, D., J. Diorio, J. Day, D. Francis, S. Sharma, and M.J. Meaney (1998). **Maternal care, cognition and hippocampal development in rats**. *Society for Neuroscience Abstracts* 24(1-2): 176. ISSN: 0190-5295.

Descriptors: rats, cognition, development, hippocampus, maternal care.

Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 1, November 7-12,

1998, Los Angeles, California, USA.

Liu, D., J. Diorio, D. Francis, F. Champagne, S. Sharma, and M.J. Meaney (1999). **Environmental effects on cognitive development in the rat: maternal care vs. environmental enrichment**. *Society for Neuroscience Abstracts* 25(1-2): 615. ISSN: 0190-5295.
Descriptors: rat, environmental effects, maternal care, cognitive development, environmental enrichment.
Notes: Meeting Information: 29th Annual Meeting of the Society for Neuroscience, October 23-28, 1999, Miami Beach, Florida, USA.

Lovic, V., A. Gonzalez, and A.S. Fleming (2001). **Maternally separated rats show deficits in maternal care in adulthood**. *Developmental Psychobiology* 39(1): 19-33. ISSN: 0012-1630.
Descriptors: rats, behavior, maternally separated, adulthood, maternal care, deficits, early experience, adult behavior.

Lucion, A.B., C.M. Gomes, C. Raineki, I. Franskoviaki, G.S. Severino, C.R. Franci, F.J.A. Anselmo, and G.L. Sanvitto (2003). **Neonatal handling and reproductive function in female rats.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 507.12.
Online: http://sfn.scholarone.com
Descriptors: rats, reproductive function, neonatal handling, female, behavior, stimulation, stress, hormones.
Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Lucion, A.B., F.M. Pereira, E.C. Winkelman, G.L. Sanvitto, and J.A. Anselmo Franci (2003). **Neonatal handling reduces the number of cells in the locus coeruleus of rats.** *Behavioral Neuroscience* 117(5): 894-903. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Descriptors: handling psychology, locus coeruleus cytology, newborn animals, cell count methods, locus coeruleus physiology, Wistar rats.

Luketich, J.D., K.E. Michel, P.G. Curcillo II, D.A. Rigberg, M.E. Weiss, I.D. Feurer, and J.L. Mullen (1998). **Automated, eight-cage indirect calorimetry in rats.** *Nutrition (Burbank)* 14(9): 672-7. ISSN: 0899-9007.
Abstract: We have constructed an automated, eight-cage indirect calorimeter (AIC) for the measurement of energy expenditure in rats. We compared the measurements of resting energy expenditure (REE) in rats during a 30-h fast obtained with the AIC with those obtained with a manual indirect calorimetry (MIC) system. There was both a high degree of correlation between the two techniques during the initial 18 h of the fast (r = 0.90, P < 0.05) and strong intertechnique agreement. REE (AIC) decreased during the final 12 h of the 30-h fast (79.6 +/- 2.7-72.0 +/- 4.4 kcal.kg-0.75.d-1 [mean +/- SD, P < 0.01]). REE (MIC) did not show a significant decrease during this part of the fast (79.7 +/- 2.6 - 75.2 +/- 4.7 kcal.kg-0.75.d-1 [P = NS]). During the final 12 h of the fast agreement between the two systems gradually dissipated and correlation was poor (r = 0.375, P < 0.05). The frequency of animal handling necessitated by MIC may have resulted in a stress-induced increase in metabolic work that would mask the animals' adaptive response to starvation. This investigation demonstrates the advantages of the AIC and calls into question the accuracy of manual methods under long-term starvation conditions.
Descriptors: rats, calorimetry, indirect, energy metabolism, eight cage, automated, exertion, fasting physiology.

Maclachlan, F. and M.R.E. Blackburn (1999). **Prior handling does not alter HPA responses to acute stress in adult rats**. *Journal of Endocrinology* 160(Supplement): P130. ISSN: 0022-0795.
Descriptors: rats, acute stress, prior handling, response, HPA, adults.
Notes: Meeting Information: 18th Joint Meeting of the British Endocrine Societies, April 12-15, 1999, Bournemouth, England, UK.

Macy Jr., J.D., G.A. Cameron, S.L. Ellis, E.A. Hill, and S.R. Compton (2002). **Assessment of static isolator cages with automatic watering when used with conventional husbandry techniques as a factor in the transmission of mouse hepatitis virus.** *Contemporary Topics in Laboratory Animal Science* 41(4): 30-35.

ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory mammals, cages, murine hepatitis virus, horizontal transmission, air filters, drinking water, water systems, valves, sentinel animals, disease surveys, sentinel surveillance, experimental infection, serological surveys, polymerase chain reaction, seroconversion, cage changing, open cages, filter top cages.

Maldonado, A.M. and C.L. Kirstein (2005). **Handling alters cocaine-induced activity in adolescent but not adult male rats**. *Physiology and Behavior* 84(2): 321-326. ISSN: 0031-9384.
Descriptors: behavior, development, pharmacology, locomotor activity.

Manser, C.E., D.M. Broom, P. Overend, and T.H. Morris (1998). **Investigations into the preferences of laboratory rats for nest-boxes and nesting materials.** *Laboratory Animals* 32(1): 23-35. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Nest-boxes and nesting materials were considered potentially useful items with which to enhance the environment of rats housed in standard laboratory cages. This study was carried out to determine whether such items are actually used by rats, and if so, what features are important in their design. Laboratory rats were allowed to choose between four commercially available nest-boxes. Nest-boxes were preferred to other parts of the cage but the nest-box most frequently selected was not suitable for routine laboratory use. Accordingly a new nestbox was designed, incorporating features apparently attractive to the animals. This was a simple structure of opaque perspex, consisting of a roof and three walls. Similarly, rats were exposed to six commercially available nesting materials and those consisting of long paper strips were most preferred.
Descriptors: rats, nests, environment, enrichment, cages, paper, wood shavings, cotton, animal welfare.

Mar, A., M. Wall, and J. Rochford (2003). **Behavioral effects of stress and antidepressant treatment in neonatally handled and maternally separated adult rats.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 217.20.
Online: http://sfn.scholarone.com
Descriptors: rats, adult, stress, behavioral effects, neonatally handled, antidepressant, life events.
Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Marashi, V., A. Barnekow, E. Ossendorf, and N. Sachser (2003). **Effects of different forms of environmental enrichment on behavioral, endocrinological, and immunological parameters in male mice.** *Hormones and Behavior* 43(2): 281-92. ISSN: 0018-506X.
Descriptors: aggression physiology, corticosterone blood, housing, animal, pituitary adrenal system physiology, social environment, antigens, surface analysis, cytokines analysis, immunoglobulin G blood, mice, inbred mice strains, stress, psychological blood, tyrosine 3 monooxygenase blood.

Marashi, V., A. Barnekow, and N. Sachser (2004). **Effects of environmental enrichment on males of a docile inbred strain of mice.** *Physiology and Behavior* 82(5): 765-776. ISSN: 0031-9384.
Abstract: Environmental enrichment is intended to improve the welfare of laboratory animals. However, regarding male mice, numerous studies indicate an increase in aggressive behavior due to cage structuring. On the one hand, this might be a problem concerning animal welfare. On the other hand, enrichment is though to hamper environmental standardization and to increase variability of data. Furthermore, increasing fights, arousal, and/or injury in enriched housed animals might superimpose other (positive) environmental effects on behavior and physiology. Therefore, the present study investigated effects of environmental enrichment on behavioral, endocrinological, and immunological parameters in male mice of the docile inbred strain ABG. From weaning until day 77+/-3 of life, animals were kept in stable sibling groups of four under three different housing conditions: (A) nonstructured Makrolon type III laboratory cages ("standard housing"=S); (B) equivalent laboratory cages that were enriched with a box and scaffolding ("enriched housing"=E); and (C) spacious terrariums that were structured richly ("super-enriched housing"=SE). No differences in agonistic behavior, levels of plasma corticosterone (CORT), and activities of adrenal tyrosine hydroxylase (TH) existed among S-, E-, and SE-housed ABG males. Play behavior and general activity increased significantly with

increasing enrichment. Concerning immunological parameters, males of both forms of enriched housing showed significantly lower percentages of CD4 and CD8 cells compared to S-housed mice. However, regarding the ratio of CD4/CD8 cells, IL-2, IL-4, IL-10, IFN-gamma, IgG1, and IgG2a, no significant housing-dependent differences were found. Enrichment did neither hamper standardization nor negatively influence the variability of physiological parameters. In summary, using a docile strain of mice revealed the positive effects of environmental enrichment also on male mice. The lack of adverse effects on behavior, physiology, standardization, and variability of data defuses these arguments against providing docile male mice with enrichment.

Descriptors: enrichment, effects, male mice, inbred strain, laboratory animals, behavior, aggressive, docile.

Marques de Araujo, S. and M.A. Cardoso (1999). **A laboratory cage for foster nursing newborn mice.** *Revista Brasileira De Pesquisas Medicas e Biologicas Sociedade Brasileira De Biofisica [Brazilian Journal of Medical and Biological Research]* 32(3): 319-21. ISSN: 0100-879X.

Abstract: We describe a cage to be used for foster nursing in order to guarantee that original mother's colostrum is not ingested by the newborn mice. A common (30.5 cm x 19.5 cm x 12.0 cm) mouse cage was fitted with a wire net tray with a mesh (1 cm x 1 cm), which divides the cage into an upper and a lower compartment. Mice born to females placed in the upper compartment pass through the mesh and fall into the lower compartment, where another lactating female with one or two of its own pups are. Of a total of 28 newborn mice of C3H/Hc and Swiss strains, 23 were successfully fostered. Important observations are presented to show that this is a valuable alternative for foster studies without great suffering on the part of the female.

Descriptors: laboratory animals, newborn animals, animal housing standards, equipment design, maternal fetal exchange, mice.

Masuda, J., D. Mitsushima, and F. Kimura (2004). **Female rats living in small cages respond to restraint stress with both adrenocortical corticosterone release and acetylcholine release in the hippocampus**. *NeuroScience Letters* 358(3): 169-172. ISSN: 0304-3940.

Descriptors: rats, female, stress, restraint, response, adrenocortical corticosterone, acetylcholine, hippocampus, small cages.

Matthews, D.A., N.A. Parkins, M. Underwood, and R.M. Santer (1997). **Establishing and maintaining a colony of aged male Wistar rats**. *Animal Technology* 48(2): 75-82. ISSN: 0264-4754.

NAL Call Number: QL55.I5

Descriptors: laboratory animals, rats, breeding methods, health, husbandry, maintaining, colony, aged, Wistar rats.

McCann, R.A., H.M. Wyatt, B.P. Smith, and S.M. Carlisle (2001). **A simple transport system for radiation treatment of specific pathogen-free mice in lifetime studies.** *Contemporary Topics in Laboratory Animal Science* 40(3): 39-42. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Abstract: To prevent the introduction of pathogens, specific pathogen-free (SPF) facilities generally have a "once out, never back" policy with respect to animals and materials. In a lifetime study of the long-term effects of ionizing radiation exposure in mice, large numbers of SPF mice needed to be transported from clean-animal barrier labs to a multiuser conventional building for radiation treatment and then back into the animal facility. The conventional building is known to harbor wild mice as well as insects, spiders, and mites, and this situation might potentiate the transfer of wild mouse pathogens to laboratory animals. Introduction of pathogens into the mouse population would jeopardize the entire study, but the radiation treatments were an essential component of the study. These considerations prompted development of a system for transporting individual animals out of and back into the facility without exposure to pathogens. The system consists of reusable transport/treatment vessels and transport protocols designed to minimize the potential for pathogen exposure.

Descriptors: animal housing standards, infection control methods, mice, specific pathogen free organisms, transportation methods, infection control standards, transportation standards, whole body irradiation veterinary.

McCoy, J., F. Jori, and C. Stem (1997). **Tranquillization of cane rats (*Thryonomys swinderianus*) with a depot neuroleptic (pipothiazine palmitate)**. *Journal of Veterinary Pharmacology and Therapeutics* 20(3): 233-239.

Descriptors: animal welfare, rats, animal husbandry, stress, Africa, neuroleptics, Rodentia, behavior, drugs, mammals, neurotropic drugs, Rodentia, pipothiazine palmitate, *Thryonomys swinderianus*.

Mcguire, B. (2003). **Paternal care and its effect on maternal behavior and pup survival and development in prairie voles (*Microtus ochrogaster*).** In: *Exploring Animal Behavior in Laboratory and Field: An Hypothesis Testing Approach to the Development, Causation, Function, and Evolution of Animal Behavior,* Academic Press Inc.: San Diego, CA, USA; London, UK, p. 167-176. ISBN: 0125583303.
Descriptors: prairie voles, pup survival, maternal behavior, paternal care, effect, development.

Mcintosh, J., H. Anisman, and Z. Merali (1999). **Short- and long-periods of neonatal maternal separation differentially affect anxiety and feeding in adult rats: gender-dependent effects**. *Developmental Brain Research* 113(1-2): 97-106.
Descriptors: rats, neonatal maternal separation, short periods, long periods, anxiety, feeding, affect, gender dependent effects, adult rats.

Meier, M., R. Reinermann, J. Warlich, and G. Manteuffel (1998). **An automated training device for pattern discrimination learning of group-housed gerbils.** *Physiology and Behavior* 63(4): 497-8. ISSN: 0031-9384.
Abstract: The setup, designed for the rodent *Meriones unguiculatus* (gerbil), allows flexible stimulus presentations and rewarding as well as on-line data registration. It consists of a spacious housing where the animals have free access to water. Food is supplied exclusively in the y-maze training compartment and serves as a reinforcer in an operant conditioning paradigm.
Descriptors: gerbils, discrimination learning, experimental instrumentation, group housed, Gerbillinae, microcomputers, reinforcement schedule.

Mende, G. (1999). ***Untersuchungen zur Beurteilung der Belastung von Laborratten durch einfache Manipulationen, and den Parametern Kortikosteron und Prolaktin. [Stress in rats following simple handling, measured by means of corticosterone and prolactin].*** Dissertation, Fachbereich Veterinmedizin, Freie Universitat: Berlin, Germany. 15 p.
Descriptors: rats, laboratory animals, stress, handling, measured, prolactin, corticosterone.
Language of Text: German with an English summary.

Mering, S., E. Kaliste Korhonen, and T. Nevalainen (2001). **Estimates of appropriate number of rats: interaction with housing environment.** *Laboratory Animals* 35(1): 80-90. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: An extensive list of physiological parameters from previous experiments was re-analysed in order to evaluate the effects of enrichment, cage type and group size on the within-group variation and hence on the number of animals needed in studies using Wistar rats. The independent factors studied in these experiments included the provision of aspen gnawing blocks for enrichment, solid bottom cages (SBCs) and grid floor cages (GFCs) and animal number per cage (varied from 1-4). SOLO power analysis was used to calculate the smallest number of animals (n) needed to detect an arbitrarily chosen 20% effect size, when significance was set at P = 0.05 and statistical power at 0.90. N ratios (n(larger)/n(smaller)) were calculated for the effect of enrichment, cage type and group size to compare the 'treatment group' with the 'control group'. The n values of adrenal gland, interscapular brown adipose tissue (BAT and epididymal adipose tissue (EAT) weights seemed to vary most, whereas final body weight (FBW) and growth seemed to be the least variable ones. According to one-sample t-test, the N ratios of most physiological parameters differed significantly from zero (except the ones of FBW) indicating the n values in 'treatment' and 'control' groups were unequal. The results indicate that some of the physiological parameters are susceptible to variability attributable to environmental modification in general whereas some are not. Furthermore, they suggest that variation different environments thus hindering the estimation of appropriate number of animals.
Descriptors: rats, group size, cage size, cages, enrichment, floor type, statistical analysis, experimental design, adrenal glands, adipose tissue, brown fat, thymus gland, spleen, body weight, growth, animal welfare.

Mering, S. (2000). ***Housing Environment and Enrichment for Laboratory Rats: Refinement and Reduction Outcomes***, Kuopio University Publications. C, Natural and Environmental Sciences, Vol. 114, Kuopion

Yliopisto: Kuopio, ISBN: 951781092X.
NAL Call Number: DISS F2000082
Descriptors: environment, housing, enrichment, rats, laboratory, refinement, outcomes.
Notes: Thesis (doctoral).

Michel, C. and M. Cabanac (1999). **Opposite effects of gentle handling on body temperature and body weight in rats.** *Physiology and Behavior* 67(4): 617-22. ISSN: 0031-9384.
Abstract: Opposite effects of gentle handling on body temperature and body weight in rats. PHhe aim of this study was to measure the body weight set point when rats are being handled gently and thus experience emotional rise in body temperature. Wistar male rats were used in this experiment, and each rat was its own control. Body weight set point was estimated from the rat's food hoarding behavior. The set point is the intersection of the regression line for hoarding with the X axis. During hoarding sessions the experimenter handled the rat and took its colonic temperature six to eight times, an action sufficient to arouse emotional fever. On alternate days the rats were not handled. Thus, body weight set point was obtained for each rat without handling and with handling. In sessions with handling, rats raised their body temperature, ate less, and defecated more than in control sessions. When handled, the body weight set point declined from 388 +/- 44 g to 366 +/- 47 g (p = 0.048, t = 2,39). The decline in the set point induced by gentle handling is believed to result from an elevation of the hypothalamic CRH.
Descriptors: body temperature physiology, body weight physiology, handling psychology, stress, psychological physiopathology, corticotropin releasing hormone blood, defecation physiology, emotions physiology, feeding behavior physiology, fever physiopathology, fever psychology, Wistar rats, stress, psychological blood, time factors.

Mitsushima, D., T. Funabashi, K. Shinohara, and F. Kimura (2003). **Rats living in small cages respond to restraint stress with adrenocortical corticosterone release but not with hippocampal acetylcholine release.** *Psychoneuroendocrinology* 28(4): 574-83. ISSN: 0306-4530.
Abstract: We previously reported that the restriction of environmental space attenuated the hippocampal acetylcholine release and impaired spatial learning function. To examine the effect of the restriction of environmental space on the stress response of the hippocampal acetylcholine release, an in vivo microdialysis study was performed in male rats after 4 days of housing in a large cylindrical cage (diameter=35 cm) or a small cylindrical cage (diameter=19 cm). Significant stress response of the hippocampal acetylcholine release was observed in rats in the large cages (N=5), but it was not observed in rats in the small cages (N=5). The corticosterone concentration in serum was significantly increased by the restraint stress in both groups of rats. Although cage size does not influence stress-induced secretion of corticosterone, rats housed in a small cage exhibit lower levels of stress-induced ACh release than rats living in a large cage.
Descriptors: acetylcholine metabolism, adrenal cortex metabolism, corticosterone secretion, hippocampus metabolism, restraint, physical psychology, stress, psychological metabolism, adaptation, psychological physiology, analysis of variance, corticosterone blood, environment, animal housing, hypothalamo hypophyseal system metabolism, microdialysis, pituitary adrenal system metabolism, rats, inbred rat strains, Wistar rats, stress metabolism.

Moncek, F., R. Duncko, B.B. Johansson, and D. Jezova (2004). **Effect of environmental enrichment on stress related systems in rats.** *Journal of Neuroendocrinology* 16(5): 423-31. ISSN: 0953-8194.
Abstract: The aim of this study was to test whether environmental enrichment alters the status and responsiveness of pituitary-adrenocortical and sympathetic-adrenomedullary hormones in rats. Previous studies have shown that rats kept in an enriched environment differ from those kept in standard cages in dendritic branching, synaptogenesis, memory function, emotionality and behaviour. In male Wistar rats kept in an enriched environment for 40 days, we studied basal concentrations of hormones, endocrine responses to 5-HT(1A) challenge and responsiveness and adaptation to repeated handling. Environmental enrichment consisted of large plexiglass cages with 10 rats per cage, which contained variety of objects exchanged three times a week. Rats kept in this enriched environment had higher resting plasma concentrations of corticosterone, larger adrenals and increased corticosterone release to buspirone challenge compared to controls. Lower adrenocorticotropic hormone, corticosterone and adrenaline responses to handling were noticed in rats kept in an enriched environment. Exposure to repeated handling led to a more rapid extinction of corticosterone

responses in rats kept in an enriched environment. Thus, environmental enrichment leads to pronounced changes in neuroendocrine regulation, including larger adrenals and increased adrenocortical function, which are so far considered to be indication of chronic stress.

Descriptors: corticosterone blood, habituation psychophysiology physiology, handling psychology, animal housing, neurosecretory systems physiology, stress, psychological physiopathology, adaptation, physiological, adrenal glands anatomy and histology, adrenal glands drug effects, adrenal glands secretion, anti anxiety agents pharmacology, body weight, buspirone pharmacology, corticotropin blood, neurosecretory systems drug effects, organ size, play and playthings, Wistar rats, serotonin agonists pharmacology, social environment, psychological blood.

Moons, C.P., P. Van Wiele, and F.O. Odberg (2004). **To enrich or not to enrich: providing shelter does not complicate handling of laboratory mice.** *Contemporary Topics in Laboratory Animal Science* 43(4): 18-21. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: animal husbandry standards, animal welfare, laboratory animal psychology, animal behavior, animal handling psychology, animal housing standards, animal husbandry methods, laboratory animal physiology, outbred strains, body weight physiology, drinking behavior, eating, mice, inbred mice strains, species specificity.

Moran, M.M., R.R. Roy, C.E. Wade, B.J. Corbin, and R.E. Grindeland (1998). **Size constraints of telemeters in rats.** *Journal of Applied Physiology* 85(4): 1564-71. ISSN: 8750-7587.

Abstract: This study was designed to determine the maximum-size subcutaneous telemeter that would enable long-term and multichannel data collection in a 170-g rat for 90 days. In phase 1, rats with implants weighing 5 (2.5 cm3), 15 (7.5 cm3), 25 (12.5 cm3), 35 (17.5 cm3), or 45 (22.5 cm3) g were compared with sham-operated (SOC) and nonoperated (NOC) control animals. Severe skin lesions, seromas, and lower growth rates were observed in rats having implants >/=35 g. Thus, in phase 2, rats implanted with 23.5 g (17.5 cm3; 11-g active telemeter and 12.5-g implant) were compared with rats implanted with 11 g (6 cm3; telemeter only) and with the SOC and NOC groups. No differences were found among implanted groups in mean arterial pressure (MAP), heart rate (HR), subcutaneous temperature, or spontaneous activity under standard housing conditions. All groups were more active and had a higher MAP during the dark than the light phase of the daily cycle. During 2 h of cold exposure (3 degreesC), both telemetered groups exhibited similar changes in HR, MAP, temperature, and activity levels. Adrenal glands were larger in the 23.5-g group (51 +/- 1.6 mg) than in the SOC (46 +/- 1.0 mg) and the NOC groups (41 +/- 2.0 mg). No other significant differences were found in organ, muscle, or bone weights. These data verify the feasibility of using 23.5-g (17.5 cm3) subcutaneous telemeters for chronic recordings in young adult rats.

Descriptors: telemetry instrumentation, telemetry methods, blood pressure, equipment design, growth, heart rate, implants, experimental, rats, reference values, skin pathology, telemetry adverse effects.

Morrison, S.D., A. Mcmechan, R. Berman, and J.H. Hannigan (2003). **Effect of prenatal alcohol exposure, stress and neonatal handling on hippocampal GFAP and NGF in rats: a time course evaluation.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 458.5.

Online: http://sfn.scholarone.com

Abstract: Glial fibrillary acidic protein (GFAP) is a marker for astrocyte growth in response to neuronal damage. Nerve growth factor (NGF) is involved in the mechanisms underlying neural plasticity. Our objective was to determine how prenatal alcohol exposure affects astrocyte reactivity as measured by GFAP and NGF protein levels. We hypothesized that prenatal alcohol exposure in rats would limit stress-induced increases in GFAP and NGF --presumably also from astrocytes --which would consequently compromise trophic support for neurons. We also hypothesized that neonatal handling would mitigate the effects of stress on GFAP and NGF. Pregnant dams were given either 0g/kg, 4g/kg, or 6g/kg alcohol via intragastric intubation from gestational days 8-20. The 0g/kg group and untreated dams served as controls. After birth, litters were handled daily from postnatal day 2 (PN2) to PN15, or left undisturbed. At PN24 rats were subjected to a forced-swim stress challenge. Half of the rats were not stressed. At 4 times post-stress (3, 24, and 72 hours and 7 days) rats were sacrificed and hippocampus was harvested and analyzed for GFAP and NGF by an ELISA. At 3 hours, all intubated groups had increased levels of GFAP relative to untreated controls. Also, rats exposed to neonatal

handling had decreased levels of GFAP and marginal decreases in NGF. The 6g/kg group was less responsive to the handling procedure, showing a smaller decrease in GFAP, although an increase in NGF not seen in controls relative to all other groups. There was a trend for neonatal handling to blunt the response to stress in both GFAP and NGF. These results support the hypothesis that mechanisms involved in neural plasticity in hippocampus may be activated by neonatal handling in alcohol-exposed rats but that handling in alcohol-exposed rats may exacerbate neural damage.

Descriptors: neural coordination, neuronal damage, nervous system disease, ELISA, immunologic techniques, laboratory techniques, forced swim stress challenge, neonatal handling, prenatal alcohol exposure.

Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Mortell, N. (2001). **Practical environmental enrichment for rats and mice: the results of a survey.** *Animal Technology* 52(1): 1-19. ISSN: 0264-4754.

NAL Call Number: QL55.I5

Abstract: A survey was undertaken to review the types of environmental enrichment for rats and mice that were currently being used or evaluated within the research industry. It was felt that, whilst much had been done to improve the welfare of many laboratory animal species over the last 10 years, the most commonly used animals - rats and mice - were somewhat neglected. Given that 85% of all animals used within UK laboratories are rats or mice, the author decided to try and find out what is actually being done. This review looks at current opportunities to enrich the lives of rats and mice within the industry and, more specifically, within the author's own laboratory. There is a great deal of scientific and observational data on types of environmental enrichment but little direction on what kinds of enrichment are the most appropriate for different sectors within the industry. A questionnaire was distributed in order to find out what different organisations are doing practically to provide environmental enrichment. The results of this questionnaire have been tabulated in formats which might help an organisation make a more informed decision on what type of enrichment is appropriate to their facilities. With the forthcoming European legislation it is likely that the provision of enrichment may become a legal requirement in the near future. It is hoped that, by discussing the options and highlighting those which are both popular and meet the basic needs of the animal, then organisations will have a reference point for their own current status in the provision of environmental enrichment. The overall aim of this report is not to be prescriptive but to share best practice and offer some suggestions as to what can. be done to improve the quality of life for the animals in our care.

Descriptors: rats, mice, laboratory mammals, enrichment, surveys, animal welfare, pelleted feeds, animal behavior, materials, animal husbandry.

Narciso, S.P., E. Nadziejko, L.C. Chen, T. Gordon, and C. Nadziejko (2003). **Adaptation to stress induced by restraining rats and mice in nose-only inhalation holders.** *Inhalation Toxicology* 15(11): 1133-43. ISSN: 0895-8378.

Abstract: There are limited data on the efficacy of procedures for adapting rodents to restraint in nose-only holders. We examined: (1) What effect does restraint in nose-only holders have on heart rate and body temperature? (2) Does a gradual increase in the duration of restraint facilitate adaptation? (3) How long does it take for rodents to become fully adapted to nose-only holders? (4) Do rats and mice respond and adapt similarly to restraint in nose only holders? Heart rate and body temperature were monitored as measures of stress using electrocardiograph (ECG) transmitters in male C57Bl/6J mice and Sprague-Dawley rats. In naive animals during the first hour of restraint, heart rate increased by 58 beats per minute (BPM) (18.6%) in rats and by 174 BPM (32.3%) in mice as compared to cage controls. Temperature increased by 2 degrees C in mice and was unchanged in rats compared to cage controls. Heart rate and temperature values remained within normal physiologic values during restraint. In rats, the response to restraint in nose-only holders was the same after 4 days regardless of whether the duration of restraint was increased gradually to 4 h/day or kept constant at 4 h/day. In mice, the group that was gradually adapted had a statistically significant higher heart rate and temperature after 4 days than the fixed-duration adapted group. Rats and mice restrained for 4 h/day every day showed a gradual decrease in heart rate and temperature over time. Full adaptation to restraint required 14 days of fixed-duration daily restraint.

Descriptors: adaptation, psychological, restraint, physical methods, stress, psychological psychology, administration, inhalation, animal experimentation, body temperature, electrocardiography, mice, inbred C57BL

mice, nose, rats, Sprague Dawley rats, restraint, physical instrumentation, time factors.

Need, A.C. and K.P. Giese (2003). **Handling and environmental enrichment do not rescue learning and memory impairments in alphaCamKII(T286A) mutant mice.** *Genes, Brain, and Behavior* 2(3): 132-9. ISSN: 1601-1848.

Abstract: Environmental enrichment and postnatal handling have been shown to improve learning and memory in the Morris water maze, and to rescue impairments caused by genetic modification, age or genetic background. Mice with a targeted point mutation that prevents autophosphorylation at threonine-286 of the alpha-isoform of the Ca2+/calmodulin-dependent kinase II have impaired hippocampus-dependent and -independent strategy learning and memory in the water maze. We have investigated whether these impairments can be rescued with a combination of postnatal handling and environmental enrichment in a hybrid genetic background. Severe impairments were seen in acquisition and probe trials in both enriched and nonenriched mutants, indicating that enrichment did not rescue the learning and memory impairments. However, enrichment did rescue a specific performance deficit; enhanced floating behaviour, in the mutants. In summary, we have shown the lack of autophosphorylation of the alpha-isoform of the Ca2+/calmodulin-dependent kinase II prevents enrichment-induced rescues of strategy learning and memory impairments. Furthermore, we have established that there are enrichment mechanisms that are independent of this autophosphorylation.

Descriptors: Ca2+ calmodulin dependent protein kinase metabolism, environment, handling psychology, maze learning physiology, Ca2+ calmodulin dependent protein kinase genetics, mice, mutant strains, phosphorylation, point mutation.

Nelson, K., E.G. Patterson Kane, and J. Love (2003). **Using animal preference to develop enriched caging for rats.** *Animal Technology and Welfare* 2(2): 85-88. ISSN: 0264-4754.

NAL Call Number: SF757.A62

Descriptors: rats, laboratory animals, cage design, animal preferences, testing, environmental enrichment, animal behavior, animal welfare, animal use refinement.

Nicklas, W., P. Baneux, R. Boot, T. Decelle, A.A. Deeny, M. Fumanelli, and W.B. Illgen (2003). **Recommendations for the health monitoring of rodent and rabbit colonies in breeding and experimental units: recommendations of the Federation of European Laboratory Animal Science Associations (FELASA) Working Group on Health Monitoring of Rodent and Rabbit Colonies accepted by the FELASA board of management, 9 June 2001.** *Baltic Journal of Laboratory Animal Science* 13(4): 226-251. ISSN: 1407-0944.

Descriptors: rodent, rabbit, colonies, animal care, health monitoring, methods, techniques, breeding units, experimental units, Federation of European Laboratory Animal Science Associations, FELASA.

Niewiesk, S., F. Voelp, and V. Meulen (1997). **A maintenance and handling device for cotton rats (*Sigmodon hispidus*)**. *Lab Animal* 26(7): 32-33. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Descriptors: Rodentia, laboratory animals, handling, laboratory equipment, methods, laboratory experimentation, equipment, experimentation, mammals, useful animals, animal handling, rats.

Nilsson, M., E. Perfilieva, U. Johansson, O. Orwar, and P.S. Eriksson (1999). **Enriched environment increases neurogenesis in the adult rat dentate gyrus and improves spatial memory.** *Journal of Neurobiology* 39(4): 569-78. ISSN: 0022-3034.

Abstract: The fetal and even the young brain possesses a considerable degree of plasticity. The plasticity and rate of neurogenesis in the adult brain is much less pronounced. The present study was conducted to investigate whether housing conditions affect neurogenesis, learning, and memory in adult rats. Three-month-old rats housed either in isolation or in an enriched environment were injected intraperitoneally with bromodeoxyuridine (BrdU) to detect proliferation among progenitor cells and to follow their fate in the dentate gyrus. The rats were sacrificed either 1 day or 4 weeks after BrdU injections. This experimental paradigm allows for discrimination between proliferative effects and survival effects on the newborn progenitors elicited by different housing conditions. The number of newborn cells in the dentate gyrus was not altered 1 day after BrdU injections. In contrast, the number of surviving progenitors 1 month after BrdU injections was markedly increased in animals housed in an enriched environment. The relative ratio of neurogenesis and gliogenesis was not affected by

environmental conditions, as estimated by double-labeling immunofluorescence staining with antibodies against BrdU and either the neuronal marker calbindin D28k or the glial marker GFAp, resulting in a net increase in neurogenesis in animals housed in an enriched environment. Furthermore, we show that adult rats housed in an enriched environment show improved performance in a spatial learning test. The results suggest that environmental cues can enhance neurogenesis in the adult hippocampal region, which is associated with improved spatial memory.

Descriptors: aging physiology, dentate gyrus cytology, environment, memory physiology, space perception physiology, antimetabolites, astrocytes chemistry, biological markers, bromodeoxyuridine, calcium binding protein, vitamin D dependent analysis, cell division physiology, dentate gyrus physiology, glial fibrillary acidic protein analysis, nerve tissue proteins analysis, neuronal plasticity physiology, neurons chemistry, neurons cytology, neurons physiology, rats, Sprague Dawley rats, stem cells cytology, stem cells physiology.

Olsson, I.A.S., C.M. Nevison, E.G. Patterson Kane, C.M. Sherwin, H.A. Van de Weerd, and H. Wurbel (2003). **Understanding behaviour: the relevance of ethological approaches in laboratory animal science.** *Applied Animal Behaviour Science* 81(3): 245-264. ISSN: 0168-1591.

NAL Call Number: QL750.A6

Descriptors: mice, rats, laboratory animals, animal behavior, strain differences, animal housing, cages, environmental enrichment, smell, vision, hearing, taste, touch, validity.

Olsson, I.A.S., S. Olsson, and K. Dahlborn (2002). **Improving housing conditions for laboratory mice: a review of 'environmental enrichment'.** *Laboratory Animals* 36(3): 243-270. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Laboratory animal facilities have been designed to provide a standard environment where animals can be kept in good physical health at the same time as economic and ergonomic considerations are met. Recognizing the potential welfare problem associated with behavioural restriction in such housing systems, a number of attempts have been made to improve this environment, generally described under the term 'environmental enrichment'. Modifications of cages for mice usually consist of providing material for nest building and structures which can serve as hiding places and/or for climbing. We have reviewed 40 studies carried out between 1987 and 2000, in which preferences as well as the effect of housing modifications have been studied. Mice will work for access to nesting material and make use of this material to make nests in which they rest. They prefer a more complex cage to the standard cage and will also work for access to cages with shelter and raised platforms. On the basis of present knowledge, it is recommended that mice should have access to nesting material. Strategies for future research are outlined in the article.

Descriptors: mice, laboratory mammals, enrichment, animal welfare, nesting, stress, cages, design, litter, animal behavior, male animals, aggressive behavior, territoriality, strain differences, literature reviews, animal stress, animal use refinement.

Ottensmeyer, K.L. (1997). ***Ein Beitrag Zur Tiergerechten Haltung Des Meerschweinschens Anhand Der Literatur. [Review of Appropriate Husbandry for Guinea-Pigs]***, Tierarztliche Hochschule: Hannover, Germany, 167 p.

Descriptors: guinea pigs, husbandry, laboratory animals, appropriate, review.

Language of Text: German with an English summary.

Otterness, I.G., J.D. Eskra, M.L. Bliven, A.K. Shay, J.P. Pelletier, and A.J. Milici (1998). **Exercise protects against articular cartilage degeneration in the hamster.** *Arthritis and Rheumatism* 41(11): 2068-76. ISSN: 0004-3591.

Abstract: OBJECTIVE: It has been reported that osteoarthritis can occur in hamsters. The present study was undertaken to determine the effects of exercise on the composition of articular cartilage and synovial fluid and on the development of cartilage degeneration in these animals. METHODS: Young (2.5-month-old) group-housed hamsters were compared with 5.5-month-old hamsters that had undergone 3 months of daily wheel running exercise (6-12 km/day) or 3 months of sedentary, individually housed living. The condition of the femoral condyles was determined by scanning electron microscopy in 12 exercising hamsters, 12 sedentary hamsters, and 6 of the young controls. The content of proteoglycan, hyaluronic acid, hydroxyproline, and proline in synovial fluid and patellar cartilage was measured. RESULTS: By scanning electron microscopy, the femoral articular cartilage was smooth and undulating in young controls and older exercising hamsters. In

contrast, the femoral condyles were fibrillated in all 12 of the sedentary hamsters. There was no difference in the patellar cartilage collagen content between the 3 groups, but proteoglycan content and synthesis were lower in the patellar cartilage of the sedentary group. Synovial fluid volume was also decreased in the sedentary group compared with the young controls or the older exercising hamsters. CONCLUSION: A sedentary lifestyle in the hamster leads to a lower proteoglycan content in the cartilage and a lower synovial fluid volume. These changes are associated with cartilage fibrillation, pitting, and fissuring. Daily exercise prevents early cartilage degeneration and maintains normal articular cartilage.

Descriptors: cartilage, articular metabolism, articular pathology, osteoarthritis prevention and control, physical conditioning, animal physiology, articular ultrastructure, hamsters, hyaluronic acid analysis, hydroxyproline analysis, microscopy, electron, scanning, osteoarthritis metabolism, osteoarthritis pathology, patella chemistry, patella metabolism, patella pathology, proteoglycans metabolism, *Mesocricetus*.

Papaioannou, A., U. Dafni, F. Alikaridis, S. Bolaris, and F. Stylianopoulou (2002). **Effects of neonatal handling on basal and stress-induced monoamine levels in the male and female rat brain.** *Neuroscience* 114(1): 195-206. ISSN: 0306-4522.

Descriptors: biogenic monoamines metabolism, brain metabolism, handling psychology, neural pathways metabolism, neurons metabolism, sex characteristics, stress metabolism, 3 4 dihydroxyphenylacetic acid metabolism, newborn animals, brain cytology, brain growth and development, dopamine metabolism, hydroxyindoleacetic acid metabolism, hypothalamo hypophyseal system metabolism, maternal behavior physiology, maternal deprivation, neural pathways cytology, neural pathways growth and development, neurons cytology, puberty metabolism, Wistar rats, serotonin metabolism, stress physiopathology, time factors.

Park, M.K., T.A. Hoang, J.D. Belluzzi, and F.M. Leslie (2003). **Gender specific effect of neonatal handling on stress reactivity of adolescent rats.** *Journal of Neuroendocrinology* 15(3): 289-95. ISSN: 0953-8194.

Abstract: Early neonatal handling of rat pups produces dampened hypothalamic-pituitary-adrenal axis reactivity to stress in adult male offspring. However, less is known about whether there is a similar effect for females. Although, most studies of neonatal handling have examined subsequent effects during adulthood, adolescence is an important developmental stage for stress responsivity. To address these issues, the effect of neonatal handling on the endocrine stress response and brain activity of male and female rats was determined in response to acute restraint stress during adolescence. Consistent with previous findings in adult males, neonatal handling reduced restraint stress-induced hormone levels in adolescent males. However, in contrast, we found elevated plasma hormone concentrations in handled females. A gender-specific handling effect on brain activity was also evident, with significantly increased stress-induced activation of the posterior cingulate cortex of handled females, as measured by c-fos mRNA expression. The striking gender difference in the effect of early neonatal handling provides evidence that this must be considered as an important variable in subsequent stress responsivity induced by early manipulations.

Descriptors: sex characteristics, sexual maturation physiology, stress physiopathology, acute disease, age factors, animals, newborn, corticosterone blood, corticotropin blood, gyrus cinguli growth and development, gyrus cinguli physiology, proto oncogene proteins c-Fos genetics, RNA, messenger analysis, rats, restraint, physical.

Park, M.K., T.A. Hoang, and F.M. Leslie (2001). **Gender-specific effect of early postnatal handling on stress responsivity in rats**. *Society for Neuroscience Abstracts* 27(2): 1959. ISSN: 0190-5295.

Descriptors: rats, stress responsivity, postnatal handling, gender specific effect, behavior.

Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Parker, K.J. and T.M. Lee (2002). **Interaction of photoperiod and testes development is associated with paternal care in *Microtus pennsylvanicus* (meadow voles)**. *Physiology and Behavior* 75(1-2): 91-95. ISSN: 0031-9384.

Descriptors: meadow voles, parternal care, reproductive system, photoperiod, testes development, interaction.

Patterson Kane, E.G. (2003). **Shelter enrichment for rats.** *Contemporary Topics in Laboratory Animal Science* 42(2): 46-48. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory animals, animal housing, cages, cage design, environmental enrichment, nest boxes, animal preferences, materials, cardboard, tin, plastics.

Patterson, K.E.G. (2004). **Enrichment of laboratory caging for rats: a review.** *Animal Welfare* 13, Supplement: S209-S214. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: animal welfare, behavior, rats, cageing, housing, field techniques, cage size, environmental enrichment, foraging, nesting material, social contact.
Notes: Meeting Information: Universities Federation for Animal Welfare (UFAW) Symposium on Science in the Service of Animal Welfare, Animal Welfare, Edinburgh, UK, April 02-04, 2003.

Patterson Kane, E.G., D.N. Harper, and M. Hunt (2001). **The cage preferences of laboratory rats.** *Laboratory Animals* 35(1): 74-79. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Preference tests were used to assess a range of enrichment options for rats kept under standard New Zealand (and similar) caging conditions. The rats did not show significant preferences for most of the options, over an empty cage. The exceptions were shredded paper, a nesting box and a semi-enriched condition incorporating a range of modifications. These cage modifications are recommended for the enrichment of laboratory rats.
Descriptors: rats, laboratory mammals, cages, litter, cage size, group size, enrichment, animal welfare, nest boxes, cage design, environmental enrichment, animal preferences.

Patterson Kane, E.G., M. Hunt, and D. Harper (2002). **Rats demand social contact.** *Animal Welfare* 11(3): 327-332. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, laboratory animals, cages, cage size, animal housing, motivation, animal welfare, environmental enrichment, group housing, animal preferences.

Patterson Kane, E.G., M. Hunt, and D.N. Harper (1999). **Behavioral indexes of poor welfare in laboratory rats.** *Journal of Applied Animal Welfare Science* 2(2): 97-110. ISSN: 1088-8705.
NAL Call Number: HV4701.J68
Descriptors: rats, cages, enrichment, group size, fearfulness, floor space, exploration, stress response, animal welfare.

Peters, A.G., P.M. Bywater, and M.F.W. Festing (2002). **The effect of daily disturbance on the breeding performance of mice.** *Laboratory Animals* 36(2): 188-192. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The United Kingdom Home Office Code of Practice for the housing and care of breeding animals requires that, 'the general well-being of all animals must be checked at least once daily'. However, excessive daily disturbance of rodent breeding colonies could be counter-productive to animal welfare if it increases pre-weaning mortality. An experiment involving 100 breeding cages of BALB/c mice compared daily inspection of the mouse cages, but without disturbing the mice within the nest, with daily inspection in which every individual was studied even if this involved removing the cage lid and disturbing the nest. No statistically significant differences were found between the two groups in breeding performance or pre-weaning mortality, though the disturbed group produced marginally fewer offspring and had slightly higher mortality. Average weaning weight did not differ between the groups, but sexual dimorphism at weaning was significantly increased in the disturbed group. It is concluded that there are unlikely to be any welfare benefits in an inspection regimen that involves disturbance of breeding mice, provided the cage is inspected daily.
Descriptors: mice, monitoring, nests, animal welfare, litter size, animal production, mortality, weaning, sexual dimorphism, environmental enrichment.

Pham, T.M., S. Soderstrom, B. Winblad, and A.H. Mohammed (1999). **Effects of environmental enrichment on cognitive function and hippocampal NGF in the non-handled rats.** *Behavioural Brain Research* 103(1): 63-70. ISSN: 0166-4328.

Abstract: In this study we examine whether exposure to differential housing after weaning would counteract the effects of postnatal handling (H) or nonhandling (NH) treatment by affecting learning and memory processes in young rats. In addition, we seek to determine if experience in enriched environment would alter hippocampal nerve growth factor (NGF) levels which is one of the factors known to be involved in the regulation of the survival and differentiation of developing basal forebrain neurones. Rats were either exposed to handling treatment, or left undisturbed starting day 1 after birth through day 21. After weaning on day 22, we exposed half of the H rats and half of the NH rats to environmental enrichment for 60 days. The other respective half of the rats was housed in isolated environmental condition (IC). Behavioural measures were taken in open field test, and spatial water maze test. Exposure to enriched environment following postnatal handling and nonhandling increased hippocampal NGF levels, and improved cognitive function in the both groups, with NH rats being more responsive to the effects of enrichment. Our results suggest that environmental enrichment has the potential to prevent or reduce the cognitive and neurochemical deficits in the adult animals associated with nonhandling.
Descriptors: cognition physiology, environment, hippocampus metabolism, nerve growth factors biosynthesis, handling psychology, hippocampus physiology, hypothalamus physiology, maze learning physiology, motor activity physiology, rats, Sprague Dawley rats, rats, non handled effects, environmental enrichment, cognitive function, postnatal handling.

Piersma, F.E., M.A.R.C. Daemen, A.E.J.M. Bogaard, and W.A. Buurman (1999). **Interference of pain control employing opioids in in vivo immunological experiments.** *Laboratory Animals* 33(4): 328-333. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Pain control (PC) in laboratory animals is supported by ethical as well as methodological considerations, aimed at preventing an interfering reduction in food and water intake and normalizing stress hormone levels. However, little is known about the immunomodulatory attributes of analgesics, which putatively prevents the routine implementation of PC in immunological research. In an established murine model of endotoxemia we investigated the immunomodulatory properties of common clinical analgesics (the opioids fentanyl and buprenorphine). Additionally, a literature study was conducted to investigate the frequency of PC in laboratory animals used for immunological experimentation. In line with various reports, we observed interactions between the opioid analgesics and the immune system that altered the outcome of performed in vivo immunological experiments. Of 100 evaluated publications, none mentioned the use of PC, indicating its uncommon implementation. In conclusion, more studies on the interactions between the immune system and analgesics are needed to establish better criteria for adequate implementation. Finally, we propose that methodological sections in scientific journals should clearly document whether or not PC was employed. If PC is not used, the reason for not using it should be stated.
Descriptors: laboratory animals, pain, analgesics, animal welfare, mice, lipopolysaccharides, tumor necrosis factor, fentanyl, opioids, dosage effects, immunosuppressive agents, antiinflammatory agents, experimental design, buprenorphine.

Powell, S.B., H.A. Newman, T.A. McDonald, P. Bugenhagen, and M.H. Lewis (2000). **Development of spontaneous stereotyped behavior in deer mice: effects of early and late exposure to a more complex environment.** *Developmental Psychobiology* 37(2): 100-8. ISSN: 0012-1630.
Descriptors: behavior, animal physiology, environment, *Peromyscus* psychology, stereotyped behavior physiology, age factors, newborn animal psychology, mice.

Price, I.V. and B.B. Gorzalka (2002). **Effect of restraint stress duration on macronutrient intake in the female rat.** *Nutrition Research* 22(8): 931-943. ISSN: 0271-5317.
Descriptors: rat, female, restraint stress, macronutrient intake, effect, duration, food intake, duration, deprivation.

Priebe, K., K.A. Giannotti, and W.G. Brake (2002). **Neonatal handling increases synaptophysin in the rat hippocampus: a radioimmunocytochemical study.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 730.14.
Online: http://sfn.scholarone.com

Descriptors: rat, neonatal handling, increase, synaptophysin, hippocampus, maternal separation, stress.
Notes: Meeting Information: 32nd Annual Meeting of the Society of Neuroscience, November 02-07, 2002, Orlando, Florida, USA.

Pritchett, K.R. and N.A. Johnston (2002). **A review of treatments for the eradication of pinworm infections from laboratory rodent colonies.** *Contemporary Topics in Laboratory Animal Science* 41(2): 36-46. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, rats, *Meriones unguiculatus*, golden hamsters, laboratory mammals, animal parasitic nematodes, helminth ova, *Syphacia obvelata*, *Syphacia muris*, *Syphacia*, *Aspiculuris tetraptera*, nematode infections, strain differences, anthelmintics, medicated feeds, dosage, oral administration, topical application, thiabendazole, ivermectin, piperazine, fenbendazole, cages, drug resistance, literature reviews, *Syphacia mesocriceti*, *Dentostomella translucida*.

Pryce, C.R., D. Bettschen, and J. Feldon (2001). **Comparison of the effects of early handling and early deprivation on maternal care in the rat.** *Developmental Psychobiology* 38(4): 239-51. ISSN: 0012-1630.
Descriptors: behavior, animal, sex behavior, animal, social isolation, lactation, Wistar rats, social behavior, early handling, deprivation.

Pryce, C.R., D. Bettschen, N.I. Nanz Bahr, and J. Feldon (2003). **Comparison of the effects of early handling and early deprivation on conditioned stimulus, context, and spatial learning and memory in adult rats.** *Behavioral Neuroscience* 117(5): 883-93. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Descriptors: conditioning psychology physiology, handling psychology, maternal deprivation, maze learning physiology, spatial behavior physiology, animals, newborn, corticotropin blood, Wistar rats.

Raje, S.S. and K.L. Stewart (2000). **Group housing female guinea pigs.** *Lab Animal* 29(8): 31-32. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: guinea pigs, female animals, group size, group housing, cages, space requirements, enrichment, behavior, husbandry, animal welfare.

Reeb Whitaker, C.K., B. Paigen, W.G. Beamer, R.T. Bronson, G.A. Churchill, I.B. Schweitzer, and D.D. Myers (2001). **The impact of reduced frequency of cage changes on the health of mice housed in ventilated cages.** *Laboratory Animals* 35(1): 58-73. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Our purpose in this investigation was to determine if we could reduce cage changing frequency without adversely affecting the health of mice. We housed mice at three different cage changing frequencies: 7, 14, and 21 days, each at three different cage ventilation rates: 30, 60 and 100 air changes per hour (ACH), for a total of nine experimental conditions. For each condition, we evaluated the health of 12 breeding pairs and 12 breeding trios of C57BL/6J mice for 7 months. Health was assessed by breeding performance, weanling weight and growth, plasma corticosterone levels, immune function, and histological examination of selected organs. Over a period of 4 months, we monitored the cage microenvironment for ammonia and carbon dioxide concentrations, relative humidity, and temperature one day prior to changing the cage. The relative humidity, carbon dioxide concentrations, and temperature of the cages at all conditions were within acceptable levels. Ammonia concentrations remained below 25 ppm (parts per million) in most cages, but, even at higher concentrations, did not adversely affect the health of mice. Frequency of cage changing had only one significant effect; pup mortality with pair matings was greater at the cage changing frequency of 7 days compared with 14 or 21 days. In addition, pup mortality with pair matings was higher at 30 ACH compared with other ventilation rates. In conclusion, under the conditions of this study, cage changes once every 14 days and ventilation rates of 60 ACH provide optimum conditions for animal health and practical husbandry.
Descriptors: liveweight gain, bites, mice, laboratory mammals, cages, animal husbandry, air pollution, ammonia, carbon dioxide, animal health, artificial ventilation, reproductive performance, weaning weight, blood plasma, corticosterone, relative humidity, air temperature, litter size, mortality, nose, epithelium, histopathology, lesions, growth curve, leukocyte count.

Reebs, S.G. and D. Maillet (2003). **Effect of cage enrichment on the daily use of running wheels by Syrian hamsters.** *Chronobiology International* 20(1): 9-20. ISSN: 0742-0528.

Abstract: Institutional animal care committees may one day require for the welfare of captive hamsters more floor space and the introduction of tunnels and toys. As hamsters are popular animal subjects in chronobiological research, and as clock phase is usually measured through running wheel activity, it is important to determine what effect cage enrichment might have on daily wheel use. Here the daily number of wheel revolutions, the daily duration of the running activity phase, the phase relationship between lights-off and onset of running activity, and the free-running period of circadian activity rhythms were measured in Syrian hamsters, *Mesocricetus auratus*, housed in single cages or in multiple cages linked by tunnels and supplied with commercial wooden toys. Free-running periodicity was not affected by cage enrichment. In multiple-cage systems, there were fewer daily revolutions, shorter wheel-running activity phases, and delayed running activity onsets. These effects, however, were small as compared to interindividual and week-to-week variation. They were statistically significant only under a light:dark cycle, not in constant darkness, and only when interindividual variation was eliminated through a paired design or when the number of cages was increased to five (the maximum tested). Daily wheel use is thus affected by cage enrichment, but only slightly.

Descriptors: activity cycles, behavior, animal physiology, housing, animal, motor activity, running, animal welfare, animals, laboratory, environment, hamsters, *Mesocricetus*, photoperiod.

Rehg, J.E., M.A. Blackman, and L.A. Toth (2001). **Persistent transmission of mouse hepatitis virus by transgenic mice.** *Comparative Medicine* 51(4): 369-374. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Variation in susceptibility to viral infection is well documented across mouse strains. Specific combinations of viral strains and murine hosts may favor viral infection and disease, and could potentially allow the unexpected development of chronic, persistent, or latent infections. In some genetically modified strains of mice, immune function and perhaps other physiologic or metabolic systems may be substantially or marginally impaired. In the case study reported here, we document the apparent persistent transmission of mouse hepatitis virus (MHV) over a two-year period by MHV-seropositive transgenic mice. Transmission occurred via direct contact with seropositive mice and exposure to contaminated bedding. However, MHV was not detected at diagnostic laboratories by use of viral isolation or reverse transcriptase-polymerase chain reaction (RT-PCR) analysis of tissues from MHV-seropositive animals. Our observation, together with the constantly expanding varieties of immune-impaired or poorly characterized murine hosts and the burgeoning dissemination of these animals throughout the biomedical research community, indicate that unexpected pathophysiologic presentations of common murine viral diseases may present new challenges to the biomedical research community in the future.

Descriptors: mice, transgenic animals, laboratory mammals, strain differences, immunological deficiency, murine hepatitis virus, asymptomatic infections, seroconversion, immunodiagnosis, disease transmission, sentinel animals, case reports.

Reljic, D., F.A. Guhad, G. Stodulski, and J. Hau (1996). **Influence of husbandry procedures on mouse locomotor activity**. *Scandinavian Journal of Laboratory Animal Science* 23(3): 121-128. ISSN: 0901-3393.

Descriptors: mice, laboratory animals, handling, physical activity, locomotion, mammals, movement, physiological functions, Rodentia, useful animals.

Ritskes Hoitinga, J. and R. Van Ruiven (1996). **Length of adaptation period after transporting rats**. *Laboratory Animals in Modern Biology. Symposium Program, Goeteborg (Sweden)*, p. 121.

Descriptors: rats, laboratory animals, transport of animals, adaptation, mammals, Rodentia, transport, useful animals.

Rock, F.M., M.S. Landi, H.C. Hughes, and R.C. Gagnon (1997). **Effects of caging type and group size on selected physiologic variables in rats**. *Contemporary Topics in Laboratory Animal Science* 36(2): 69-72. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, cages, group size, effects, housing, behavior, physiological variables, motor activity.

Rodrigues, U.P., L. Chaguri, G. Medeiros, A. Sogorb, and F.S. Sogorb (1998). **Productivity of mice (*Mus musculus*) colonies under different pairing and feeding systems**. *Baltic Journal of Laboratory Animal Science* 8(1): 20-22. ISSN: 1407-0944.
Descriptors: mice, colonies, productivity, feeding systems, pairing.

Rogers, T.D., N.M. Gades, J.D. Kearby, C.K. Virgous, and J.T. Dalton (2002). **Chronic restraint via tail immobilization of mice: effects on corticosterone levels and other physiologic indices of stress.** *Contemporary Topics in Laboratory Animal Science* 41(1): 46-50. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory mammals, animal welfare, stress, blood sampling, immobilization, tail, blood serum, corticosterone, body weight, thymus gland, weight, spleen, adrenal glands, experimental design, animal use refinement.

Rosa, M.L.N.M., R.C.B. Silva, F.T. Moura de Carvalho, M.L. Brandao, F.S. Guimaraes, and E.A. Del Bel (2003). **Non-handling is critical for isolation rearing-induced changes in prepulse inhibition in rats.** *Journal of Psychopharmacology* 17(Supplement 3): A44. ISSN: 0269-8811.
Descriptors: rats, non handling, isolation rearing, changes, behavior, behavioral and mental disorders, prepulse inhibition.
Notes: Meeting Information: Summer Meeting of the British Association for Psychopharmacology, July 20-23, 2003, Cambridge, England, UK.

Roughan, J.V. and P.A. Flecknell (2000). **Effects of surgery and analgesic administration on spontaneous behaviour in singly housed rats.** *Research in Veterinary Science* 69(3): 283-288. ISSN: 0034-5288.
NAL Call Number: 41.8 R312
Descriptors: pain, surgery, analgesics, ketoprofen, rats, laparotomy, behavior change, anesthesia, animal behavior, drug effects, buprenorphine.

Roughan, J.V. and P.A. Flecknell (2002). **Buprenorphine: a reappraisal of its antinociceptive effects and therapeutic use in alleviating post-operative pain in animals.** *Laboratory Animals* 36(3): 322-343. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Buprenorphine has been widely used for post-operative analgesia in laboratory animals. Clinical efficacy has been demonstrated in both subjective and objective pain assessment schemes, however doubts have been expressed as to its value as an analgesic. Initial dosage recommendations were based on analgesiometric studies. It is unlikely, however, that the pain elicited in analgesiometric tests is comparable to post-operative pain. This has resulted in recommendations of excessive dose rates and inappropriate clinical indications. Studies involving tests of the efficacy of buprenorphine for alleviating behavioural or other signs of tonic (post-surgical) pain provide a more appropriate estimation of the analgesic capabilities of the drug. However, buprenorphine also has major effects upon the behaviour of normal (unoperated) animals, and this makes assessments of efficacy difficult with some of the systems used for scoring clinical pain. Nevertheless, our most recent studies of the effects of buprenorphine upon pain-related behaviours in rats support the view that it is an effective post-operative analgesic. This short review critically reappraises the role of buprenorphine in this capacity and discusses a rational approach to the relief of pain in laboratory animals. We conclude that buprenorphine remains a valuable agent for pain relief in a wide range of animal species when used in an appropriate manner.
Descriptors: laboratory animals, rats, mice, postoperative care, analgesics, opium alkaloids, dosage, pain, animal behavior, drug effects, pica, animal welfare, literature reviews, animal use refinement.

Rozmiarek, H. (1999). **Convulsions in rodents related to frequent handling**. *Laboratory Animal Science* 49(5): 468-469. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Descriptors: rodents, mice, frequent handling, convulsions, stress, husbandry.

Ryabinin, A.E., Y.M. Wang, and D.A. Finn (1999). **Different levels of Fos immunoreactivity after repeated**

handling and injection stress in two inbred strains of mice. *Pharmacology, Biochemistry and Behavior* 63(1): 143-51. ISSN: 0091-3057.

Abstract: Expression of Fos and Fos-related antigens was immunohistochemically analyzed in DBA/2J and C57BL/6J inbred mice in response to acute or repeated handling and injection stress. Both strains showed a strong induction of Fos and Fos-related antigens in discrete areas of hypothalamus, amygdala, neocortex, septum, and thalamus 2 h after an acute intraperitoneal injection of normal saline. To habituate animals to this procedure, mice were subjected to repeated handling and injections during 2 weeks preceding the experiment. This procedure led to complete habituation of the immediate early gene response to injection stress in stress-responsive brain areas of C57BL/6J mice, such that no significant difference was found between expression of these proteins in brains of saline-injected animals after repeated stress vs. control animals. In contrast, many brain areas of saline-injected DBA/2J mice still showed elevated Fos and Fos-related antigen expression after repeated injections. These results indicate that identical habituation procedures do not necessarily lead to identical levels of gene expression in brains of inbred strains of mice. In turn, they suggest that genetic components for some behavioral and pharmacological traits identified using inbred strains could be related to different rates of habituation to experimental procedures.

Descriptors: handling psychology, nerve tissue proteins analysis, proto oncogene proteins c Fos analysis, stress metabolism, western blotting, corticosterone blood, immunohistochemistry, injections, intraperitoneal, inbred C57BL mice, inbred DBA mice, species specificity.

Saibaba, P., G.D. Sales, G. Stodulski, and J. Hau (1996). **Behaviour of rats in their home cages: daytime variations and effects of routine husbandry procedures analysed by time sampling techniques.** *Laboratory Animals* 30(1): 13-21. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: The behaviour of laboratory rats in their home cages was observed on both the mornings and the afternoons of days when cages were cleaned and compared to days when cages were not cleaned. Two different time sampling methods, 'instantaneous sampling' and 'one/zero sampling', were used and compared. In general the rats were more active in the mornings than in the afternoons. Activity, particularly locomotion and that associated with manipulation of the bedding was increased during both the mornings and the afternoons of cleaning days. Defaecation also increased on cleaning days whereas sitting decreased. The cleaning regime appeared to have a greater effect on behaviour than did time of day and the effect of cleaning lasted for several hours after the procedure had been completed. The implications for experimental design are discussed.

Descriptors: animal husbandry methods, behavior, animal, housing, animal, activity cycles, circadian rhythm, Sprague Dawley rats, time factors.

Schmitteckert, E.M., C.M. Prokop, and H.J. Hedrich (1999). **DNA detection in hair of transgenic mice-a simple technique minimizing the distress on the animals.** *Laboratory Animals* 33(4): 385-389. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: The breeding of transgenic animals requires that each individual offspring be analysed for integration of transgenic deoxyribonucleic acid (DNA), unless exclusively homozygous animals are mated. The standard protocol for identification of transgenic animals (Hogan et al. 1994) is based on tissue samples and preparation of chromosomal DNA including proteinase K digestion and phenol/chloroform extraction. The procedure described here represents a much simpler and faster method to screen offspring for the transgene DNA. It is based on the use of hair bulbs as sample material, which can be directly used for polymerase chain reaction (PCR) after alkaline lysis. This protocol allows large numbers of animals to be easily screened in a minimum amount of time. A unique advantage though, is the reduction of the distress caused to the animals. With respect to the 3Rs (Replacement, Reduction, Refinement), and because of technical advantages this method may replace ear or tail clipping.

Descriptors: mice, transgenic animals, hair analysis, polymerase chain reaction, hair, rapid methods, animal welfare, hair bulb.

Severino, G.S., I.A. Fossati, M.J. Padoin, C.M. Gomes, L. Trevizan, G.L. Sanvitto, C.R. Franci, J.A. Anselmo Franci, and A.B. Lucion (2004). **Effects of neonatal handling on the behavior and prolactin stress response in male and female rats at various ages and estrous cycle phases of females.** *Physiology and Behavior* 81(3): 489-98. ISSN: 0031-9384.

Abstract: Neonatal handling induces behavioral and hormonal changes, characterized by reduced fear in novel environments, and lesser elevation and faster return to basal levels of plasma corticosterone, prolactin and adrenaline, in response to stressors in adulthood. The present study aimed to analyze the effects of neonatal handling from Days 1 to 10 postnatal on prolactin response to ether stress in male and female rats at three life periods: neonatal, peripubertal and adulthood. Moreover, adult females were tested in two different phases of the estrous cycle, i.e., diestrus and estrus. In another set of experiments, the behavior of peripubertal and adult males and females in estrus and diestrus was analyzed in the elevated plus maze test. Pups were either handled for 1 min (handled group) or left undisturbed (nonhandled group) during the first 10 days after delivery. In adults, in the handled females in diestrus, stress induced a lesser increase in plasma prolactin compared with nonhandled ones, as in males. However, in estrus, handled females showed no difference in the prolactin response to stress. In the elevated plus maze, handled females in diestrus, but not in estrus, showed higher locomotor activity compared with nonhandled ones. Peripubertal male and female rats handled during the neonatal period showed no difference in behavior in the elevated plus maze compared with nonhandled animals. Early-life stimulation can induce long-lasting behavioral and stress-related hormonal changes, but they are not stable throughout life and phases of the estrous cycle.
Descriptors: aging physiology, behavior, animal physiology, estrus cycle physiology, handling psychology, prolactin blood, stress, psychological blood, newborn animals, anxiety psychology, environment, estradiol blood, Wistar rats, sex characteristics, sexual maturation, testosterone blood.

Sharp, J., T. Azar, and D. Lawson (2005). **Effects of a cage enrichment program on heart rate, blood pressure, and activity of male Sprague-Dawley and spontaneously hypertensive rats monitored by radiotelemetry.** *Contemporary Topics in Laboratory Animal Science* 44(2): 32-40. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Abstract: To determine whether a nonsocial enrichment program affects cardiovascular responses of individually housed male Sprague-Dawley (SD) and spontaneously hypertensive (SH) rats under basal conditions and after potentially stressful procedures, we used radiotelemetry to record heart rate (HR), systolic blood pressure (SBP), and activity in the cage. Enrichment comprised a simulated burrow (Rodent Retreat), then a food foraging item ("rat cannoli") 2 days later, and a paper bag of bedding for shredding (Nestpak) after another 2 days. Data were collected under undisturbed conditions and before and after several acute and chronic manipulations mimicking common husbandry, experimental, and stressful procedures. Enrichment often, but not always, reduced HR and SBP in male rats, suggesting decreased arousal and stress, and the effects depended on the parameter measured, strain of rat, and nature of the procedure to which animals were exposed. In general, HR varied more than SBP; enrichment affected SH rats more than SD rats; effects of enrichment were more consistently observed under undisturbed conditions than after manipulations of the rats; moderate responses to acute husbandry and experimental procedures were affected more than the larger changes produced by very stressful procedures; and responses to social interactions were unaffected by the enrichment program. What accounts for these variable effects of enrichment is unclear, and more studies are required to resolve the mechanisms. Whether this enrichment program should be used in an animal facility depends on several factors, particularly the professional judgment of the research, veterinary, and animal care staffs involved.
Descriptors: enrichment, rats, effects, heart rate, blood pressure, Sprague Dawley rats, radiotelemetry, activity, hypertensive.

Sharp, J., T. Zammit, T. Azar, and D. Lawson (2003). **Are "by-stander" female Sprague-Dawley rats affected by experimental procedures.** *Contemporary Topics in Laboratory Animal Science* 42(1): 19-27. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, female animals, laboratory animals, animal stress, animal welfare, gender differences, group housing, animal behavior, euthanasia, animal use refinement, heart rate, animal handling, animal physiology, individual housing.

Sharp, J., T. Zammit, T. Azar, and D. Lawson (2003). **Stress-like responses to common procedures in individually and group-housed female rats.** *Contemporary Topics in Laboratory Animal Science* 42(1): 9-18. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory animals, animal stress, animal welfare, animal handling, group housing, gender differences, cages, heart rate, blood pressure, female animals, circadian rhythm, animal use refinement, restraint of animals, subcutaneous injection, odors, intravenous injection, animal behavior, animal physiology, individual housing.

Sharp, J., T. Zammit, T. Azar, and D. Lawson (2002). **Does witnessing experimental procedures produce stress in male rats?** *Contemporary Topics in Laboratory Animal Science* 41(5): 8-12. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Abstract: The objective of this study was to test the hypotheses that male rats are stressed by being in the same room as animals subjected to common husbandry and experimental procedures and that the level of stress is affected by housing density. Two commonly used indices of stress, heart rate (HR) and mean arterial blood pressure (MAP), were determined by using radiotelemetry for 2 h before and 3 h after rats witnessed the following procedures: decapitation, decapitation and necropsy, cage change, restraint and subcutaneous injection, and restraint and tail-vein injection. In addition, home cage behaviors (sleeping, awake, moving, rearing, and grooming) were scored once each minute for 15 min before and 45 min after the procedures. Witnessing decapitation or decapitation and necropsy of 6 other rats induced small, but significant, increases in HR and MAP in animals housed alone, whereas responses in animals housed with one or three cagemates were more transient or not significant. Witnessing a routine cage change also induced small increases in HR and MAP in rats housed alone or with one cagemate, but HR and MAP decreased in rats housed four per cage. HR and MAP did not change in rats witnessing restraint and a subcutaneous injection of other rats, but these indices were transiently increased when rats witnessed animals being restrained in a rodent restrainer and given a tail-vein injection. Home cage behaviors were significantly altered only in rats witnessing decapitation and necropsy and then only in rats housed alone. We conclude that male Sprague-Dawley rats are not significantly stressed when present in the same room in which decapitation or other common experimental procedures are being performed, especially when the animals are housed with cagemates.
Descriptors: animal husbandry methods, blood pressure physiology, heart rate physiology, stress physiopathology, vision, autopsy, euthanasia, animal housing, injections, photic stimulation, rats, Sprague Dawley rats, physical restraint, specific pathogen free organisms, time factors.

Sharp, J.J., C.C. Linder, and L.E. Mobraaten (2001). **Genetically engineered mice. Husbandry and resources.** *Methods in Molecular Biology* 158: 381-96. ISSN: 1064-3745.
Descriptors: mice, mutant strains, animal husbandry, genetic engineering, mice, resources.

Sharp, J.L., T.G. Zammit, T.A. Azar, and D.M. Lawson (2002). **Stress-like responses to common procedures in male rats housed alone or with other rats.** *Contemporary Topics in Laboratory Animal Science* 41(4): 8-14. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory mammals, male animals, stress, stress factors, heart rate, blood pressure, group size, stocking density, cages, physical activity, restraint of animals, injection, odors, animal welfare, animal husbandry, telemetry, data collection, group housing, cage changing.

Sherwin, C.M. (1998). **The use and perceived importance of three resources which provide caged laboratory mice the opportunity for extended locomotion.** *Applied Animal Behaviour Science* 55(3-4): 353-367. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: mice, laboratory animals, cages, movement, microenvironments, enrichment, animal welfare, toys, usage, environmental enrichment, cost of access, running wheels, tunnel system, locomotion loops.

Sherwin, C.M. (1997). **Observations on the prevalence of nest-building in non-breeding TO strain mice and their use of two nesting materials.** *Laboratory Animals* 31(2): 125-132. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The spontaneous performance of nest-building behaviour by non-breeding laboratory mice suggests that routinely providing nesting material might be a suitable environmental enrichment. If nesting material is to be provided routinely, this should have characteristics which are preferred, or at least accepted by a considerable

proportion of the animal population; it should also be inexpensive. The present study therefore examined the prevalence of nest-building behaviour in 39 individually-housed, non-breeding, female mice, and their preferences for a commercial nesting product and a less expensive source of material (paper towels). Within minutes of the materials being placed in the cages, the mice began manipulating the paper towels. Thirty-six of the mice subsequently constructed nests during the first dark phase after the materials had been placed in the cage-the remaining three mice constructed nests during the following 48 h. The nests were usually constructed from a mixture of the two materials, though observations indicated the mice might have preferred characteristics of the inexpensive paper towels. There was a strong tendency to build nests in the same location used for sleeping prior to the nesting material being provided, and similarly, the mice were conservative in the site chosen to build a second nest after the first was removed. The most frequently chosen site for nest-building was under the feeder. Other studies have reported a high motivation for nest-building behaviour, widespread performance amongst many strains, and nest-building as a thermoregulatory behaviour by animals housed in standard laboratory air temperature. In conjunction with these. findings, the present results suggest that routinely providing paper towels is an inexpensive and practical means of environmental enrichment for non-breeding, laboratory mice.

Descriptors: mice, animal housing, nesting, enrichment, behavior patterns, animal welfare, environmental enrichment, nesting materials.

Sherwin, C.M. (2004). **Mirrors as potential environmental enrichment for individually housed laboratory mice**. *Applied Animal Behaviour Science* 87(1-2): 95-103. ISSN: 0168-1591.

NAL Call Number: QL750.A6

Descriptors: mice, animal welfare, behavior, mirrors, individually housed, environmental enrichment, feeding, nest position.

Sida, P., M. Koupilova, S. Hynie, and V. Klenerova (2003). **Effects of two types of restraint stress on the learned behaviour in rats.** *Acta Medica Hradec Kralove Universitas Carolina, Facultas Medica Hradec Kralove* 46(4): 153-6. ISSN: 1211-4286.

Abstract: To study the effects of stress on cognitive functions, Wistar and Lewis rats were exposed to restraint (immobilization stressor) (IMO) or restraint combined with partial immersion into water (IMO+C). Learned discriminatory avoidance response in Y-maze, with foot-shock as an unconditioned stimulus, was used as a memory test. The latency to enter the correct arm and number of wrong entries were daily recorded during the training period (20 days) until the criterion was reached, which was set at 90% avoidances (choosing the correct arm). After exposure of rats to one of the stressors for 60 min, the rats were returned to the home cage; the latency to enter the safe arm was recorded in 6 daily trials that started 1 h after application of stressor. Both stressors significantly prolonged the avoidance latencies for 2 or 3 days in Wistar and Lewis rats, respectively; then the latencies returned to the values obtained before the stress exposure. In Lewis rats, the latencies more increased after IMO+C than after IMO stressor, and the maximal increase in latencies was higher in Lewis rats than in Wistar rats. The latency did not reach the time limit for foot-shock delivery, and the number of correct choices remained unchanged in both strains. The results indicate that the used restraint stressors did not affect the long-term memory; rather a transient impairment of retrieval can be considered. Further, differences in response of Lewis and Wistar rats may be interpreted by different activity of hypothalamic-pituitary-adrenal axis activity in used strains.

Descriptors: avoidance learning, immobilization, stress, maze learning, rats, inbred Lewis rats, Wistar rats.

Silveira, P.P., A.K. Portella, Z. Clemente, E. Bassani, A.S. Tabajara, G.D. Gamaro, G. Dantas, I.L. Torres, A.B. Lucion, and C. Dalmaz (2004). **Neonatal handling alters feeding behavior of adult rats.** *Physiology and Behavior* 80(5): 739-45. ISSN: 0031-9384.

Abstract: Stress during the neonatal period leads to a large number of behavioral and biochemical alterations in adult life. The aim of this study is to verify the effects of handling and tactile stimulation during the first 10 days of life on feeding behavior in adult rats. Litters were divided into (1). intact; (2). handled (10 min/day); and (3). handled and tactile stimulated (10 min/day). Procedures were performed on Days 1-10 after birth. When adults, rats were tested for ingestion of sweet and savory snacks. We also measured body weight, ingestion of standard lab chow, and consumption of water and 1% glucose and 1.5% NaCl solutions. Stressed rats (handling and handling+tactile stimulation groups) consumed more sweet (two-way ANOVA, P=.008) or savory snacks

(P=.001) than intact ones. This effect was observed in males and females. There were no differences in body weight, ingestion of standard lab chow, water, or in the ingestion of sweetened or salty solutions between groups. The same animals were tested later in life (15 months of age), and the effect was still evident. We suggest that handling during the neonatal period leads to alterations in the CNS of rats, causing an increased ingestion of palatable food in adult life, and this alteration probably persists throughout the whole life.
Descriptors: newborn animals psychology, appetite physiology, feeding behavior physiology, handling psychology, stress, psychological physiopathology, age factors, analysis of variance, animals, newborn physiology, feeding behavior psychology, Wistar rats, taste physiology, touch physiology.

Silveira, P.P., M.H. Xavier, F.H. Souza, L.P. Manoli, R.M. Rosat, M.B.C. Ferreira, and C. Dalmaz (2000). **Interaction between repeated restraint stress and concomitant midazolam administration on sweet food ingestion in rats.** *Brazilian Journal of Medical and Biological Research* 33(11): 1343-1350. ISSN: 0100-879X.
Descriptors: rats, food ingestion, feeding behavior, restraint stress, midazolam administration, interaction, pellets, effect.

Smith, D.E., J.B. Blumberg, and R.D. Lipman (1999). **Improved survival rates in mice that received prophylactic fluids after carcinogen treatment.** *Contemporary Topics in Laboratory Animal Science* 38(1): 84-86. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, animal models, mortality, dehydration physiological, fluid therapy, prophylaxis, subcutaneous injection, carcinogens, animal welfare.

Smith, G.D., W.P. Hoffman, E.M. Lee, and J.K. Young (2000). **Improving the environment of mice by using synthetic gause pads.** *Contemporary Topics in Laboratory Animal Science* 39(6): 51-53. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, laboratory animals, cages, floor type, wire netting, dermatitis, ears, feed intake, body weight, incidence, animal welfare, environmental enrichment, progressive necrotizing dermatitis, animal preferences.

Smith, K.R. and R.A. Markle (1998). **Capsaicin use in neonatal rats: husbandry and welfare concerns.** *Lab Animal* 27(10): 38-40. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: rats, capsaicin, newborn animals, urination, dyspnea, animal welfare, skin lesions, complications.

Smith, M.M. and M. Hargaden (2001). **Developing a rodent enrichment program.** *Lab Animal* 30(8): 36-41. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: mice, rats, hamsters, laboratory mammals, enrichment, animal welfare, nests, animal behavior, abnormal behavior, record keeping, communication, barbering.

Soffie, M., K. Hahn, E. Terao, and F. Eclancher (1999). **Behavioural and glial changes in old rats following environmental enrichment.** *Behavioural Brain Research* 101(1): 37-49. ISSN: 0166-4328.
Abstract: The effects of enriched environment on short-term memory for event durations and on astrocytes (cell density, cell area and % of GFAP immunoreactivity) in hippocampus (Hi), frontal cortex (FC) and corpus callosum (CC) were analysed in old rats housed from weaning to the end of behavioural testing (23 months) either in standard (SC) or in enriched (EC) conditions and in young adults (5 months) all housed in SC. Old SC and EC and young SC rats trained (for 2 months) or not, in a Symbolic Delayed Matching to Sample Task, had to discriminate and remember two (2- and 10-s) signals after short retention intervals. Results confirm the aging-related acquisition and memory deficit. EC reduced the slowness of acquisition, reversed the short-term memory deficit and promoted the retention of the short signal (choose short effect). Old SC naive rats had many hypertrophied astrocytes with long processes in Hi and CC while old EC rats had decreased astrocytes number and size. The behavioural testing resulted in young adult SC rats in Hi and CC, in increased astrocytes number, size and GFAP% and in their decrease in old SC rats. EC and testing have additive effects (very low astrocytes number, size and GFAP%) to compensate for the aging-induced gliosis, mostly in Hi.
Descriptors: aging psychology, behavior, animal physiology, brain physiology, environment, neuroglia

physiology, astrocytes physiology, brain cytology, cell count, conditioning, operant physiology, corpus callosum cytology, corpus callosum physiology, discrimination psychology physiology, frontal lobe cytology, frontal lobe physiology, glial fibrillary acidic protein immunology, glial fibrillary acidic protein metabolism, hippocampus cytology, hippocampus physiology, immunohistochemistry, memory, short term physiology, neuronal plasticity physiology, Wistar rats.

Song, C.W., S.J. Lee, J.R. Kim, and S.S. Han (1992). **Reproductive performance of SPF ICR mice under single paired mating**. *Korean Journal of Animal Reproduction* 16(3): 261-267.
Descriptors: mice, laboratory animals, reproductive performance, mating systems, statistical methods, animal husbandry methods, animal performance, mammals, methods, Rodentia, useful animals.

Soriano, O., C. Torrero, M. Regalado, O. Casta Cervantes, and M. Salas (2002). **Effects of handling and undernourishing on the development of huddling in rats.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 878.4.
Online: http://sfn.scholarone.com
Descriptors: rats, handling, undernourishing, effects, huddling, development, thermoregulation, diet, nutrition.
Notes: Meeting Information: 32nd Annual Meeting of the Society of Neuroscience, November 02-07, 2002, Orlando, Florida, USA.

Sternberg, W.F. and C.G. Ridgway (2003). **Effects of gestational stress and neonatal handling on pain, analgesia, and stress behavior of adult mice.** *Physiology and Behavior* 78(3): 375-83. ISSN: 0031-9384.
Abstract: Stressors presented during the late prenatal and early postnatal periods can have long-term effects on offspring behavior, due to the sensitive periods in the formation of brain circuitry associated with early development. This study investigated the long-term effects of prenatal (restraint during the last week of gestation) and postnatal (daily handling for 14 days postnatal) stress, alone and in combination, on adulthood pain behavior, analgesic responses to stress and morphine, and on behavioral indices of stress reactivity. We found that all of the adult responses measured were altered by perinatal manipulations. Nociceptive thresholds were increased by prenatal or by postnatal stress in males and females; application of both stressors in combination negated these effects. Elevations in morphine analgesia were also observed in animals undergoing either perinatal stressor, but not in those who received both stressors. Behavioral and analgesic responses to stress were consistent with previous observations of reduced stress responsiveness following neonatal handling, with some sex-specific findings. Male and female handled subjects exhibited decreases in stress behavior, and both groups of female handled subjects (regardless of prenatal stress [PS] condition) exhibited decreases in stress-induced analgesia (SIA). Males, on the other hand, exhibited decreases in SIA only if they were prenatally stressed (regardless of handling condition). Thus, prenatal and postnatal stressors have differing effects on the neural circuitry underlying pain, pain inhibition, and stress behavior.
Descriptors: handling psychology, pain threshold physiology, prenatal exposure delayed effects, stress physiopathology, adaptation, physiological physiology, analgesia, analgesics, opioid pharmacology, analysis of variance, newborn animals, mice, morphine pharmacology, pain drug therapy, pain threshold drug effects, pain threshold psychology, reaction time physiology, sex factors, stress, psychological.

Stewart, L.S.A. and W.J. Martin (2003). **Evaluation of postoperative analgesia in a rat model of incisional pain.** *Contemporary Topics in Laboratory Animal Science* 42(1): 28-34. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory animals, postoperative care, pain, analgesia, flunixin, acetaminophen, fentanyl, opioid peptides, dosage, dose response, liveweight gain, distress, animal use refinement, animal welfare, buprenorphine.

Tabata, H., T. Kitamura, and N. Nagamatsu (1998). **Comparison of effects of restraint, cage transportation, anaesthesia and repeated bleeding on plasma glucose levels between mice and rats.** *Laboratory Animals* 32(2): 143-148. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: We examined the effects of handling, cage transportation, anaesthesia and repeated bleeding on plasma glucose levels in mice and rats. Plasma glucose was determined using a compact glucose analyser

Antsense, which provides a quick and accurate method without the necessity for special specimen preparation. In mice, plasma glucose was significantly elevated after primary handling or cage transportation. Anaesthesia increased plasma glucose levels two-fold, whilst repeated bleeding induced a rapid but transient increase. However, it was found to be possible to sample plasma glucose levels at one-hour intervals without any apparent effect on plasma glucose level as a result of stress from the sampling procedure. In contrast, the same set of procedures i.e. handling, cage transportation and anaesthesia, when performed on rats, seemed to have small or no observable effect on levels of plasma glucose. These results show the importance of the sampling procedure when determining plasma glucose in mice. It is recommended that the procedure which causes the least influence on endogenous glucose levels should be the method of choice and that animals should be acclimatized to the procedure, by appropriate handling, prior to sampling.

Descriptors: mice, rats, blood sugar, blood plasma, restraint of animals, transport of animals, cages, anesthesia, blood, sampling.

Tamada, A., S. Emura, D. Hayakawa, H. Chen, M. Jamali, T. Yamahira, K. Yoshida Terasawa, H. Isono, and S. Shoumura (1998). **Effect of immobilization on the ultrastructure of the golden hamster parathyroid gland.** *Okajimas Folia Anatomica Japonica* 74(6): 259-69. ISSN: 0030-154X.

Abstract: To investigate the morphological changes of the parathyroid gland of the immobilized hamsters, we studied the ultrastructure of the parathyroid gland of golden hamsters kept in special small cage (Ballman cage II). All hamsters of the control group were kept in one ordinary cage. Each hamster of the isolated group was kept in ordinary cage individually. Each hamster of the immobilized group was kept in Ballman cage II individually. All hamsters were kept for 5 days. On the first and fifth day of the experiment, bone mineral content (BMC) and bone mineral density (BMD) of whole body were measured by dual energy X-ray absorptiometry (DXA). In the control and isolated groups, BMD of the fifth day was significantly increased as compared to that of the first day. In the immobilized group BMC and body weight were significantly decreased. There was no significant difference among 3 groups concerning the mean serum calcium level. Volume density of the cell organelles and inclusions was estimated and compared among 3 groups. Volume density of the lysosomes and large vacuolar bodies of the isolated and immobilized groups was significantly higher than that of the control group. Much more lipid droplets were observed in the immobilized group than the control and isolated groups. No particular differences were observed as to the Golgi complex in the isolated and the immobilized groups compared to the control group. These findings suggest that the cellular activity of the parathyroid gland is suppressed with immobilization.

Descriptors: immobilization physiology, parathyroid glands physiology, parathyroid glands ultrastructure, body weight physiology, bone density, calcium blood, densitometry, x ray, hamsters, *Mesocricetus*, microscopy, electron.

Tasker, R.A.R., B.J. Connell, S.J. Ross, and C.M. Elson (1998). **Development of an injectable sustained-release formulation of morphine: antinociceptive properties in rats.** *Laboratory Animals* 32(3): 270-275. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Descriptors: rats, drug formulations, controlled release, morphine, chitosan, gels, adverse effects, analgesics, pain, animal welfare.

Tiba, P.A., B.D. Palma, S. Tufik, and D. Suchecki (2003). **Effects of early handling on basal and stress-induced sleep parameters in rats.** *Brain Research* 975(1-2): 158-66. ISSN: 0006-8993.

Abstract: Exposure of humans and animals to stressful events early in life leads to significant and often permanent behavioural, neuroendocrine and central alterations. Early handling consists of removing the litter from the nest for 15 min/day, from post-natal days 2 to 14 and results in lowered ACTH and corticosterone stress response and reduced anxiety-like and fear behaviours. Stress-induced sleep alterations usually consists of increased sleep time, known as sleep rebound. In the present study, basal and stress-induced sleep pattern of control non-manipulated (CTL) and early handled (EH) adult male rats was investigated. Sleep was evaluated by 21-h polysomnographic recordings (from 10:00 to 07:00 h of the next day) before and after a 1-h session of restraint stress. The results showed that in the first 3 h following stress, both CTL and EH animals exhibited an impairment of sleep, with a reduction of sleep efficiency, duration of slow wave sleep and of paradoxical sleep. On the contrary, time awake and awakening bouts were augmented in this period. Sleep rebound was observed

mainly in the dark period of the light-dark cycle. Stress-induced sleep changes were similar between CTL and EH animals for most sleep parameters. However, EH animals exhibited more bouts of paradoxical sleep on the night following stress exposure and longer bouts of paradoxical sleep in the light period that followed restraint stress. These data indicate that stress-induced alterations of sleep in early handled animals are similar to that observed in control animals, except for some parameters related to paradoxical sleep.

Descriptors: handling psychology, sleep physiology, stress, psychological physiopathology, newborn animals, electrodes, implanted, polysomnography, Wistar rats, physical restraint, sleep, REM physiology.

Torbati, D., J. Ramirez, E. Hon, M.T. Camacho, J.B. Sussmane, A. Raszynski, and J. Wolfsdorf (1999). **Experimental critical care in rats: gender differences in anesthesia, ventilation, and gas exchange.** *Critical Care Medicine* 27(9): 1878-84. ISSN: 0090-3493.

Abstract: OBJECTIVE: To compare normative ventilatory and gas-exchange data and anesthetic requirements in male and female rats subjected to critical care conditions. DESIGN: Prospective study. SETTING: Critical care research laboratory in a hospital. SUBJECTS: Twenty-two age-matched young male and female rats (Sprague-Dawley, Long Evans strain). INTERVENTIONS: Anesthesia was induced with 65 and 45 mg/kg pentobarbital in male and female rats, respectively. The rats were then tracheostomized and cannulated in one femoral vein and artery. Anesthesia was maintained using 8-15 mg/kg/hr pentobarbital (iv) and controlled by continuous hemodynamic monitoring. MEASUREMENTS AND MAIN RESULTS: Normoxic baselines for breathing frequency, tidal volume, minute volume, inspiratory-to-expiratory ratio, inspiratory drive (tidal volume/inspiratory time), respiratory system compliance, peak airway pressure, and gas-exchange profiles were established. Ventilatory and gas-exchange responses to oxygen and CO2 were then determined by exposure to 10 mins of hyperoxia (100% oxygen), two levels of mild and severe hypercapnic hyperoxia (inspired Pco2 of 30 and 60 torr; 4 and 8 kPa), and two levels of mild and severe normocapnic hypoxia (inspired PO2 of 81 and 48 torr; 10.7 and 6.3 kPa). The average anesthetic requirement (during a 5- to 6-hr experiment) was 30% less in the female rats than in the male rats ($p < .05$). Female rats showed significantly lower breathing frequency, minute volume (mL/min/kg), and inspiratory drive (mL/kg/sec) during hyperoxia, mild and severe hypercapnia, and mild hypoxia. Pulmonary peak airway pressure was significantly lower in the female rats, consistent with a significantly higher weight-indexed compliance during all exposures. The female rats also had significantly higher inspiratory-to-expiratory ratio and higher PaCO2 with lower pH during normoxia, hyperoxia, and mild hypercapnia. These gender differences had no effect on PaO2, which was similar in all exposures. CONCLUSIONS: There are significant gender differences in ventilation, gas exchange, and anesthetic requirements in rats subjected to critical care conditions. The gas-exchange values observed in these spontaneously breathing rats may represent the optimal levels attainable during pentobarbital anesthesia with normal lungs. They may serve as standards for ventilator settings in the rat models used for critical care studies.

Descriptors: anesthesia, critical care, respiration, artificial, respiratory mechanics drug effects, sex characteristics, anesthetics pharmacology, anoxia physiopathology, animal disease models, drug dose response relationship, hypercapnia physiopathology, hyperoxia physiopathology, pentobarbital pharmacology, prospective studies, pulmonary gas exchange drug effects, pulmonary ventilation drug effects, Long Evans rats, Sprague Dawley rats, sex factors.

Torbati, D., B.R. Totapally, M.T. Camacho, and J. Wolfsdorf (1999). **Experimental critical care in ventilated rats: effect of hypercapnia on arterial oxygen-carrying capacity.** *Journal of Critical Care* 14(4): 191-7. ISSN: 0883-9441.

Abstract: PURPOSE: We have previously demonstrated an increased arterial O2-carrying capacity in normal ventilated dogs subjected to both acute and prolonged exogenous hypercapnia. In the present study, we tested if arterial hypercapnia, during controlled ventilation, can increase O2-carrying capacity also in rats. MATERIALS AND METHODS: Twenty young male Sprague Dawley rats were anesthetized (60 mg/kg pentobarbital), tracheostomized, intubated, and one femoral vein and artery were cannulated. Anesthesia and paralysis were maintained using 15 mg/kg/h pentobarbital intravenously, and 2 mg/kg/h vecuronium bromide. The fluid balance (5 mL/kg/h saline), normothermia, and minute volume were maintained. The mean arterial blood pressure and heart rate were continuously monitored. Experiments included the following: (1) a control group, ventilated with normoxic air for 150 minutes ($n = 5$); (2) mild hypercapnia, a group of eight rats ventilated with normoxic air for 30 minutes and then ventilated with a mixture of normoxic air at 60 mm Hg CO2 (8 kPa) for 1 hour; and (3) severe hypercapnia, a group of seven rats were treated exactly as in group II, except a 90 mm Hg

(12 kPa) CO2 during hypercapnia. Gas-exchange profile, arterial hemoglobin (Hb) concentration, arterial Hb-oxygen saturation (Hb-O2), and arterial O2 content were periodically determined during normocapnia and 1 hour of hypercapnia. RESULTS: Exposures to mild and severe hypercapnia, in rats with maintained ventilation, significantly reduced the arterial O2 content by 20% and 33%, respectively, without significant changes in the arterial Hb concentration (-2%). Severe hypercapnia generated a significant reduction of -14% in the PaO2, but not in PaO2/ FiO2 ratio. CONCLUSION: Rats subjected to controlled ventilation and permissive hypercapnia, unlike dogs and perhaps humans, show no augmentation of Hb concentration. Hypercapnia in rats also provokes much stronger Bohr effect than in dogs. Hypercapnia-induced Bohr effect in rats is accompanied with extreme desaturations of Hb-O2, and substantial reduction in the O2-carrying capacity. We speculate that the strong hypercapnia-induced Bohr effect in rats may prevent hypoxia at the tissue level. However, to maintain a stable oxygen-carrying capacity in rats used for pulmonary critical care studies with hypercapnia, we suggest to use hyperoxia, with or without a mild hypothermia.

Descriptors: hypercapnia blood, oxygen blood, respiration, artificial, analysis of variance, pulmonary gas exchange, Sprague Dawley rats.

Tsai, P.P., U. Pachowsky, H.D. Stelzer, and H. Hackbarth (2002). **Impact of environmental enrichment in mice. 1. Effect of housing conditions on body weight, organ weights and haematology in different strains.** *Laboratory Animals* 36(4): 411-9. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Currently, environmental enrichment is a very common means of improving animal well-being, especially for laboratory animals. Although environmental enrichment seems to be a possible way for improving the well-being of animals, the consideration of housing laboratory animals should not only focus solely on animal well-being, manpower and economics but also on the precision and accuracy of the experimental results. The purpose of the present study was to evaluate the effects of enriched cages (nest box, nesting material, climbing bar) on body weight, haematological data and final organ weights. BALB/c, C57BL/6 and A/J mice, originated from Harlan Winkelmann, were used for the experiments - 16 animals of each strain. Animals at 3 weeks of age were marked and separated randomly to enriched or non-enriched cages, in groups of four, half for each housing condition. Both cages were type III Makrolon cages, only the enriched cages contained a nest box, a wood bar for climbing and nesting material. Animals were kept in a clean animal room under specific pathogen free (SPF) conditions. Body weights were recorded every week. Blood samples were collected at 14 weeks of age (white blood cells (WBC), red blood cells (RBC), haemoglobin (HGB), and haematocrit (HCT) were analysed). At 15 weeks of age, the animals were euthanized by CO(2) in their home cages, and final body weight and organ weights (heart, liver, kidney, adrenal, spleen and uterus) were recorded immediately. Although nearly all the test variables were not affected by environmental enrichment in their mean values, the enriched group showed higher coefficients of variation in many variables, and strain differences of both housing conditions were not consistent. The influences of enrichment were shown to be strain- and test-dependent. Such effects may lead to an increase in the number of animals which is necessary or may change the experimental results, especially when a study, using enriched housing conditions, focuses on strain differences. Since the same enrichment design can result in different influences, a positive or a negative or no adverse effect, due to the strain and the variables studied, researchers need to collect more information before enrichment designs are introduced into experimental plans.

Descriptors: animal husbandry methods, body weight physiology, organ size physiology, social environment, age factors, hematologic tests, mice, inbred mice strains, reproducibility of results, variation genetics.

Van de Weerd, H.A. (1996). ***Environmental Enrichment for Laboratory Mice: Preferences and Consequences***, Utrecht University: Utrecht, Netherlands, 138 p. ISBN: 90-393-1487-X.

Descriptors: battery husbandry, laboratory animals, mice, Muridae, rats, animal housing, enrichment, nesting, animal husbandry methods, behavior, farming systems, intensive farming, intensive husbandry, mammals, Rodentia, useful animals.

Van de Weerd, H.A., E.L. Aarsen, A. Mulder, C.L. Kruitwagen, C.F. Hendriksen, and V. Baumans (2002). **Effects of environmental enrichment for mice: variation in experimental results.** *Journal of Applied Animal Welfare Science* 5(2): 87-109. ISSN: 1088-8705.

NAL Call Number: HV4701.J68

Abstract: This study focused on the effects of different enriched environments for mice in a number of behavioral and physiological parameters in 2 routine laboratory testing procedures: potency testing for tetanus vaccine and stress-induced hyperthermia. The variability in the results was studied by calculating and analyzing mean absolute devi-ations. Mice from enriched conditions weighed more and consumed more food than mice from standard housing conditions. However, mice from enriched conditions lost more body weight after being housed individually. Other physiological parameters showed no differences. Mice from standard conditions were more active in an open field, suggesting a tendency to overrespond to various stimuli in a testing environment. Mice from enriched environments were more tranquil and easier to handle. The enrichment did not influence the variability in any of the parameters measured, al-though earlier results and results of other studies suggest that the effects on the vari-ability in results are parameter dependent. When enrichment does not influence vari-ability, there is no reason for not introducing cage enrichment and by doing so contributing to the animals' welfare.
Descriptors: animal husbandry standards, animal welfare, laboratory animals physiology, animal housing standards, mice physiology, analysis of variance, animal husbandry methods, laboratory animals psychology, animal eating behavior, handling psychology, mice psychology, inbred BALB c mice, motor activity, multivariate analysis, social environment, tetanus toxoid standards, vaccines, inactivated standards, weight gain.

Van de Weerd, H.A. and V. Baumans (1999). **Evaluation of environmental enrichment for laboratory mice.** *Animal Welfare Information Center Bulletin* 9(3-4): 1-2, 18-19. ISSN: 1522-7553.
Online: http://www.nal.usda.gov/awic/newsletters/v9n3/9n3weerd.htm
NAL Call Number: aHV4701.A952
Descriptors: mice, cages, nesting, enrichment, evaluation, body weight, literature reviews.

Van de Weerd, H.A., V. Baumans, J.M. Koolhaas, and L.F.M. Zutphen (1996). **ICLAS proceedings: Nesting material as enrichment in two mouse strains**. *Scandinavian Journal of Laboratory Animal Science* 23(Supplement 1): 119-123. ISSN: 0901-3393.
Descriptors: mice, laboratory animals, nesting, litter for animals, animal housing, behavior, enrichment, Rodentia.
Notes: Meeting Information: Frontiers in Laboratory Animal Science. Helsinki (Finland), June 1995.

Van de Weerd, H.A., P.L.P. Van Loo, L.F.M. Van Zutphen, J.M. Koolhaas, and V. Baumans (1998). **Strength of preference for nesting material as environmental enrichment for laboratory mice.** *Applied Animal Behaviour Science* 55(3-4): 369-382. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: mice, laboratory animals, litter, materials, cages, microenvironments, enrichment, animal welfare, animal behavior.

Van de Weerd, H.A., P.L.P. Van Loo, L.F.M. Van Zutphen, J.M. Koolhaas, and V. Baumans (1998). **Preferences for nest boxes as environmental enrichment for laboratory mice.** *Animal Welfare* 7(1): 11-25. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: mice, strains, enrichment, animal housing, behavior patterns, animal welfare.

Van de Weerd, H.A., P.L.P. Van Loo, L.F.M. Van Zutphen, J.M. Koolhaas, and V. Baumans (1997). **Preferences for nesting material as environmental enrichment for laboratory mice.** *Laboratory Animals* 31(2): 133-143. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Behavioural and psychological needs of laboratory animals generally cannot adequately be met in standard laboratory cages. Environmental enrichment, which provides a more structured environment can enhance the well-being of laboratory animals. They may perform more of their species-specific behaviour and may control their environment in a better way. An easily applicable form of enrichment for laboratory mice is nesting material. Six different types of nesting materials were evaluated in a preference test with male and female animals of two strains (C57BL/6J or BALB/c, n=48). No significant differences in preference were found between the strains or between the sexes. All mice showed a clear preference for cages with tissues or towels as compared to paper strips or no nesting material, and for cages with cotton string or wood-wool as

compared to wood shavings or no nesting material. Paper-derived materials were preferred over wood-derived materials, although the results also suggest that the nature (paper or wood) of the nesting material is less important than its structure, which determines the nestability of the material. Nesting material may be a relatively simple method to contribute to the well-being of laboratory mice.

Descriptors: mice, animal housing, nesting, materials, enrichment, animal welfare, environmental enrichment.

Van der Harst, J.E., A.M. Baars, and B.M. Spruijt (2003). **Standard housed rats are more sensitive to rewards than enriched housed rats as reflected by their anticipatory behaviour.** *Behavioural Brain Research* 142(1-2): 151-6. ISSN: 0166-4328.

Abstract: The present study was designed to investigate the effects of potentially stressful standard housing conditions for laboratory rats on the sensitivity to rewards as reflected by their anticipatory behaviour for sucrose. This anticipatory response is evoked in a conditioning paradigm in which a sucrose reward is repeatedly announced by a stimulus. The underlying neurocircuitry of this anticipatory response in expectation of a reward involves mesolimbic dopaminergic systems of which it is known that they can be sensitised by stressors. The results show that the anticipatory response for the sucrose reward is stronger in the standard housed animals which indicates that these animals are more sensitive to the reward than the enriched animals. From this, it is concluded that standard housed rats are stressed which is likely to be caused by deprivation of the ability to satisfy behavioural needs in these impoverished housing conditions.

Descriptors: appetitive behavior, reinforcement psychology, social environment, stress, psychological psychology, analysis of variance, conditioning psychology, housing, animal, Wistar rats, reward, sensory thresholds.

Van der Harst, J.E., P.C.J. Fermont, A.E. Bilstra, and B.M. Spruijt (2003). **Access to enriched housing is rewarding to rats as reflected by their anticipatory behaviour**. *Animal Behaviour* 66(3): 493-504. ISSN: 0003-3472.

NAL Call Number: 410 B77

Descriptors: enrichment, housing, environmental effects, reinforcement, classical conditioning, appetitive behavior, arousal, anticipation, rats.

Van der Meer, E., P.L. Van Loo, and V. Baumans (2004). **Short-term effects of a disturbed light-dark cycle and environmental enrichment on aggression and stress-related parameters in male mice.** *Laboratory Animals* 38(4): 376-83. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: In the laboratory setting, environmental factors have a major influence on the well-being of laboratory animals. The present study shows the importance of a semi-natural light-dark cycle. In this experiment one cohort of mice was kept with a continuous lighting for one week. After the first week the artificial light-dark cycle was 12:12 with lights on at 07:00 h. The second cohort of mice was kept with this 12:12 h light-dark cycle from the start. Half of each cohort received environmental enrichment. In order to analyse corticosterone levels, urine samples were collected. To measure agonistic behaviour, the behaviour of the mice was recorded on videotape immediately after cage cleaning. A significant difference in corticosterone levels between cohorts was found during disturbed lighting, but not after lighting conditions were reset to 12:12 h. In the first test week, mice subjected to disturbed lighting also showed a significantly shorter agonistic latency than control mice. This difference had disappeared when in the second test week all mice experienced 12:12 h lighting. No effects of enriched housing were found. This experiment has shown that disturbed lighting for socially-housed male mice caused physiological and behavioural changes indicative of stress, not only leading to much higher levels of corticosterone but also to shorter agonistic latency within the groups.

Descriptors: agonistic behavior physiology, behavior, animal physiology, inbred BALB c mice physiology, inbred BALB c mice psychology, photoperiod, body weight physiology, cohort studies, corticosterone urine, creatinine urine, drinking physiology, eating physiology, eating psychology, mice, random allocation, statistics, nonparametric, videotape recording.

Van Loo, P.L. and V. Baumans (2004). **The importance of learning young: the use of nesting material in laboratory rats.** *Laboratory Animals* 38(1): 17-24. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Unlike mice, adult laboratory rats do not spontaneously build nests when nesting material is offered.

As a result, nesting material is often regarded as unsuitable environmental enrichment for laboratory rats. Wild rats and pet rats, however, have been observed to build complex nests from nesting material at hand. It was hypothesized that nest building in rats is an acquired behaviour, rather than genetically predisposed. To test this hypothesis, the progeny of three Wistar rats provided with nesting material (Kleenex tissues) during pregnancy and three standard-housed rats were divided in 34 same-sex couples with access to nesting material: (1) from the age of 8 weeks (n=7); (2) from weaning (n=8); (3) from birth (n=17). The latter were subdivided into two groups after weaning, one provided with Kleenex tissues (n=9), the other with Enviro-dri (n=8). At the age of 12 weeks, all couples were provided with both types of nesting material for one week. Amount, shape, and soiling of the nesting material were scored on weekdays, and behaviour of the rats was scored twice weekly. Results indicated that the older the rats were when first provided with nesting material, the greater the amount of nesting material eaten and soiled, and the nests built were less elaborate. Overall, Enviro-dri was eaten less than Kleenex tissues. It is concluded that rats need to learn the proper use of nesting material. When provided from birth, nesting material is a suitable type of environmental enrichment for laboratory rats.

Descriptors: aging, laboratory animal physiology, learning physiology, nesting behavior, rats physiology, newborn animals, behavior, weaning.

Van Loo, P.L., H.J. Blom, M.K. Meijer, and V. Baumans (2005). **Assessment of the use of two commercially available environmental enrichments by laboratory mice by preference testing.** *Laboratory Animals* 39(1): 58-67. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: In the field of biomedical research, the demand for standardization of environmental enrichment for laboratory animals is growing. For laboratory mice, a wide variety of environmental enrichment items are commercially available. Most of these comply with the demands for standardization, hygiene and ergonomics. Whether these items also comply with their actual purpose, to enhance the well-being of the mice, is often not assessed scientifically. In this study, we tested the preference of mice for two commercially available nest boxes differing in shape and material: the Shepherd Shack/DesRes (SS/DR) and the Tecniplast Mouse House (TMH), in a simple preference test. To indicate strength of preference, both nest boxes were also tested against a highly preferred nesting material. Preference for the most preferred nest box was investigated further. Our results indicated a strong preference by mice for the SS/DR, but not for the TMH. Furthermore, nesting material was almost always combined with the SS/DR, but not with the TMH. More elaborate testing of the SS/DR in an automated preference test system confirmed that mice spent significantly more time in a cage in which an SS/DR is provided. Differences between both nest boxes are discussed with regard to their attractiveness to mice. It is also argued that enrichment should primarily be developed in concordance with the animals' needs prior to the marketing of enrichment tools.

Descriptors: environmental enrichment, assessment, commercially available, mice, testing, standardization, needs.

Van Loo, P.L., H.A. Van de Weerd, L.F. Van Zutphen, and V. Baumans (2004). **Preference for social contact versus environmental enrichment in male laboratory mice.** *Laboratory Animals* 38(2): 178-88. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Due to their aggressive nature, male mice are less frequently used than female mice in biomedical research. When aggressive males are being used, individual housing is common practice. The question arises whether this is an acceptable housing for a social species. The present study was designed to gain more insight into the nature of inter-male social contact and into the potential of a form of environmental enrichment (nesting material) to compensate for the lack of social contact. In a series of tests, we analysed whether male mice of different ages preferred to spend time (1) near a familiar cage mate versus an empty cage, or (2) near to a familiar cage mate versus direct contact with nesting material (tissues). Dwelling time in each of the test cages and sleeping sites was recorded, as was the behaviour of the test mice. Results indicated that when other conditions were similar, male mice preferred to sleep in close proximity to their familiar cage mate. Furthermore, the need to engage in active social behaviour increased with age. Tissues were used to a large extent for sleeping and sleep-related behaviour. It is concluded that single housing in order to avoid aggression between male mice is a solution with evident negative consequences for the animals. When individual housing is inevitable due to excessive aggressive behaviour, the presence of nesting material could partly compensate for the deprivation of social contact.

Descriptors: agonistic behavior, animal welfare, animal behavior, inbred BALB c mice psychology, social dominance, animal housing, mice, inbred BALB c mice physiology, random allocation.

Van Loo, P.L., E. Van der Meer, C.L. Kruitwagen, J.M. Koolhaas, L.F. Van Zutphen, and V. Baumans (2004). **Long-term effects of husbandry procedures on stress-related parameters in male mice of two strains.** *Laboratory Animals* 38(2): 169-77. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: In socially unstable groups of male laboratory mice, individuals may experience a chronic stress situation. Previous experiments have shown that the transfer of specific olfactory cues during cage cleaning, and the provision of nesting material decrease aggression and stress in group-housed male mice. In this study, the combined effect of these husbandry procedures were tested for their long-term effect on stress in groups of moderately aggressive (BALB/c) and severely aggressive (CD-1) male mice. The physiological and behavioural stress-related parameters used were body weight, food and water intake, spleen and thymus weight, adrenal tyrosine hydroxylase activity, urine corticosterone levels and behaviour in a cage emergence test. Long-term provision of nesting material and its transfer during cage cleaning was found to influence several stress-related physiological parameters. Mice housed in cages enriched with nesting material had lower urine corticosterone levels and heavier thymuses, and they consumed less food and water than standard-housed mice. Furthermore, marked differences were found between strains. CD-1 mice were less anxious in the cage emergence test, weighed more, ate and drank more, and had heavier thymuses but lighter spleens and lower corticosterone levels than BALB/c mice. We conclude that the long-term provision of nesting material, including the transfer of nesting material during cage cleaning, reduces stress and thereby enhances the welfare of laboratory mice.

Descriptors: agonistic behavior physiology, animal husbandry methods, behavior, animal physiology, inbred BALB c mice psychology, inbred ICR mice psychology, social dominance, stress, psychological psychology, body weight physiology, corticosterone urine, creatinine urine, drinking physiology, eating physiology, eating psychology, inbred BALB c mice physiology, inbred ICR mice physiology, organ size, random allocation, spleen physiology, stress, psychological etiology, thymus gland physiology, tyrosine 3 monooxygenase metabolism, husbandry procedures, stress, male, long term effects, nesting material, animal welfare, enrichment.

Van Loo, P.L., L.F. Van Zutphen, and V. Baumans (2003). **Male management: Coping with aggression problems in male laboratory mice.** *Laboratory Animals* 37(4): 300-13. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: In a laboratory environment, aggressive interactions between male mice may exceed normal levels leading to negative effects both on the well-being of the animals and on the validity of experimental results. In this paper we review results from the literature and our own research with regard to coping with excessive aggressive behaviour in male laboratory mice. Based on this review practical recommendations concerning the housing and care of male laboratory mice are formulated. In short, it is recommended to avoid individual housing, to transfer odour cues from the nesting area during cage cleaning and to apply nesting material as environmental enrichment. Furthermore, group size should be optimized to three animals per cage. Further research, in particular into the effects of frequency, duration, type and severity of disturbances during an experiment on the degree of aggression, is recommended.

Descriptors: aggression, laboratory animals, sex characteristics, animal husbandry, animal behavior, environment, animal housing, mice, species specificity, male mice, aggression problems, coping, management, negative effects, review, recommendations, care, cage cleaning.

Van Loo, P.L.P., A.C. De Groot, B.F.M. Van Zutphen, and V. Baumans (2001). **Do male mice prefer or avoid each other's company? influence of hierarchy, kinship, and familiarity.** *Journal of Applied Animal Welfare Science* 4(2): 91-103. ISSN: 1088-8705.

NAL Call Number: HV4701.J68

Descriptors: mice, male animals, laboratory mammals, social dominance, animal welfare, cages, group size, aggressive behavior, feed intake, water intake, nests, animal preferences.

Van Loo, P.L.P., C.L.J.J. Kruitwagen, J.M. Koolhaas, H.A. Van de Weerd, L.F.M. Van Zutphen, and V. Baumans (2002). **Influence of cage enrichment on aggressive behaviour and physiological parameters in male mice.** *Applied Animal Behaviour Science* 76(1): 65-81. ISSN: 0168-1591.

NAL Call Number: QL750.A6
Descriptors: mice, laboratory mammals, male animals, aggressive behavior, enrichment, litter, nesting, shelter, group size, agonistic behavior, social dominance, age differences, fighting, liveweight gain, feed intake, water intake, urine, corticosterone, creatinine, thymus gland, spleen, testes, vesicular gland, weight, tyrosine 3 monooxygenase, enzyme activity, testosterone, bites, environmental enrichment.

Van Loo, P.L.P., C.L.J.J. Kruitwagen, L.F.M. Van Zutphen, J.M. Koolhaas, and V. Baumans (2000). **Modulation of aggression in male mice: influence of cage cleaning regime and scent marks.** *Animal Welfare* 9(3): 281-295. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: mice, male animals, laboratory animals, age differences, fighting, odors, litter, sawdust, nests, social dominance, body weight, testes, testosterone, adrenal cortex, territoriality, cages, cleaning, animal welfare, urine, group housing, nesting material.

Van Loo, P.L.P., H.A. Van de Weerd, and V. Baumans (1996). **ICLAS proceedings: Short and long-term influence of an easy applicable enrichment device on the behaviour of the laboratory mouse**. *Scandinavian Journal of Laboratory Animal Science Supplement* 23(Supplement 1): 113-118. ISSN: 0901-3393.
Descriptors: mice, laboratory animals, environmental factors, behavior, cages, nest boxes, animal welfare, animal housing, enrichment, Rodentia.
Notes: Meeting Information: ICLAS, Scand LAS, FinLAS, Helsinki (Finland). Frontiers in Laboratory Animal Science. Helsinki (Finland), June 1995.

Van Loo, P.L.P., E. Van der Meer, C.L.J.J. Kruitwagen, J.M. Koolhaas, L.F.M. Van Zutphen, and V. Baumans (2003). **Strain-specific aggressive behavior of male mice submitted to different husbandry procedures.** *Aggressive Behavior* 29(1): 69-80. ISSN: 0096-140X.
Descriptors: mice, male, behavior, aggression, husbandry procedure, strain specific, animal welfare, nesting material.

Van Ruiven, R., G.W. Meijer, L.F.M. Van Zutphen, and J. Ritskes Hoitinga (1996). **Adaptation period of laboratory animals after transport: a review**. *Scandinavian Journal of Laboratory Animal Science* 23(4): 185-190. ISSN: 0901-3393.
Descriptors: mice, rats, rabbits, laboratory animals, transport, adaptation, physiological functions, lagomorphs, mammals, Rodentia, useful animals.

Varty, G.B., M.P. Paulus, D.L. Braff, and M.A. Geyer (2000). **Environmental enrichment and isolation rearing in the rat: effects on locomotor behavior and startle response plasticity.** *Biological Psychiatry* 47(10): 864-73. ISSN: 0006-3223.
Abstract: BACKGROUND: Laboratory rats exhibit behavioral changes that reflect a continuum of early life experience, from isolation-reared to socially reared to enrichment-reared conditions. In this study, we further characterize the behavioral effects of isolation, social, and enriched rearing on locomotor activity, patterns of movement and exploration, startle reactivity, prepulse inhibition (PPI), and habituation in adult rats. METHODS: Male Sprague-Dawley rat pups (21 days old) were housed under enrichment (three per cage with toys and exposure to enriched environments), normal social (three per cage), or isolation (one per cage) conditions. Eight weeks later, locomotor and exploratory behaviors, acoustic startle reactivity, PPI, and habituation were measured in the three groups. RESULTS: Enrichment-reared rats exhibited reduced exploration and rapid habituation of locomotor activity, increased startle reactivity, and normal PPI and startle habituation compared with socially reared controls. Isolation-reared rats exhibited increased exploration and normal habituation of locomotor activity, increased startle reactivity, reduced PPI, and normal startle habituation. CONCLUSIONS: Isolation- and enrichment-reared rats exhibited opposite changes in some behaviors and similar changes in other behaviors. Specifically, rats raised in enriched conditions appear more efficient at assimilating stimuli from their environment than do rats reared in isolation. Nevertheless, both enrichment- and isolation-rearing conditions increased startle reactivity, whereas only isolation rearing led to disruptions of PPI in adulthood. These results suggest that isolation- and enrichment-rearing conditions produce some common and some differential effects on how rats process environmental stimuli. For studies of isolation-

rearing effects on PPI, however, the complex and resource-intensive enrichment condition seems to offer few advantages over the normal social condition.
Descriptors: locomotion physiology, social environment, social isolation, startle reaction physiology, auditory perception physiology, behavior, animal physiology, exploratory behavior physiology, habituation psychophysiology physiology, rats, Sprague Dawley rats psychology, social behavior, spatial behavior physiology.

Von Frijtag, J.C., M. Schot, R. Van den Bos, and B.M. Spruijt (2002). **Individual housing during the play period results in changed responses to and consequences of a psychosocial stress situation in rats.** *Developmental Psychobiology* 41(1): 58-69. ISSN: 0012-1630.
Descriptors: aggression psychology, animal behavior physiology, animal housing, animal, play and playthings psychology, social behavior, social isolation psychology, stress psychology, analysis of variance, body weight physiology, rats, Wistar rats.

Wahlsten, D., P. Metten, and J.C. Crabbe (2003). **A rating scale for wildness and ease of handling laboratory mice: results for 21 inbred strains tested in two laboratories.** *Genes, Brain, and Behavior* 2(2): 71-9. ISSN: 1601-1848.
Abstract: Rating scales for difficulty in capturing and holding mice were devised that proved to be easy to use and highly sensitive to differences among mouse strains on the A and B priority lists of the Mouse Phenome Project. The simplicity of the scales makes it feasible to rate wildness during behavioral test sessions without adding much to testing time or distracting the technician from the principal task at hand. Overall wildness and placidity ratings obtained by combining capture and hold ratings provide a good impression of the difficulties encountered while working with lab mice in the course of complex experiments. Ratings of 21 inbred strains during the course of 15 behavioral tests in two laboratories demonstrated that the SPRET/Ei, PERA/Ei, CAST/Ei and SWR/J strains were particularly difficult to handle. The NOD/LtJ strain posed no special challenge in the Edmonton laboratory but was very difficult to handle in the Portland lab. The rating scales should be useful for judging the difficulties in working with novel targeted or induced mutations in mice as well as effects of a variety of environmental treatments or drugs.
Descriptors: wild animals psychology, behavior, animal, handling psychology, mice, inbred mice strains psychology, species specificity.

Waiblinger, E. and B. Konig (2004). **Refinement of gerbil housing and husbandry in the laboratory**. *ATLA, Alternatives to Laboratory Animals* 32(Supplement 1A): 163-169. ISSN: 0261-1929.
NAL Call Number: Z7994.L3A5
Descriptors: gerbil, housing, husbandry, behavior, stereotypic, digging, chewing, refinement, welfare.

Ward, L.E. (2001). **Handling the cotton rat for research.** *Lab Animal* 30(5): 45-50. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Abstract: First used as an animal model of poliomyelitis in the late 1940s, the cotton rat is currently used in biomedical research for studies of human respiratory syncytial virus and filariasis. The author provides useful information relevant to the care of these research animals, including husbandry considerations, proper handling, and common laboratory procedures.
Descriptors: animal husbandry methods, laboratory animals, Hesperomyinae physiology, animal husbandry standards, animal nutrition, animal disease models, health status, animal housing standards, rats, reproduction, research.

Weaver, S.A., J. Diorio, J. Rochford, and M.J. Meaney (1999). **Maternal separation and neonatal handling have differential effects on pain thresholds and morphine-induced analgesia in female diestrous rats**. *Society for Neuroscience Abstracts* 25(1-2): 507. ISSN: 0190-5295.
Descriptors: rats, maternal separation, neonatal handling, effects, pain thresholds, morphine, analgesia, female.
Notes: Meeting Information: 29th Annual Meeting of the Society for Neuroscience, Part 1, October 23-28, 1999, Miami Beach, Florida, USA.

Weisbroth, S.H., R. Peters, L.K. Riley, and W. Shek (1998). **Microbiological assessment of laboratory rats and**

mice. *ILAR Journal* 39(4): 272-290. ISSN: 1084-2020.
NAL Call Number: QL55.A1I43
Descriptors: rats, mice, surveillance, disease transmission, diagnostic techniques, serological surveys, immunological techniques, sampling, cages, animal husbandry, accuracy, Parvoviridae, *Helicobacter*, zoonoses, literature reviews.

Wenny, D.G. (2002). **Effects of human handling of seeds on seed removal by rodents**. *American Midland Naturalist* 147(2): 404-408. ISSN: 0003-0031.
Descriptors: rodents, seeds, human handling, seed removal, olfactory cues, human skin.

Whary, M.T., J.H. Cline, A.E. King, C.A. Corcoran, S. Xu, and J.G. Fox (2000). **Containment of *Helicobacter hepaticus* by use of husbandry practices [laboratory mice]**. *Comparative Medicine* 50(1): 78-81. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Descriptors: mice, *Helicobacter*, containment, husbandry practices, disease control.

Wolfer, D.P., O. Litvin, S. Morf, R.M. Nitsch, H.P. Lipp, and H. Wurbel (2004). **Laboratory animal welfare: cage enrichment and mouse behaviour.** *Nature* 432(7019): 821-2. ISSN: 1476-4687.
Abstract: Mice housed in standard cages show impaired brain development, abnormal repetitive behaviours (stereotypies) and an anxious behavioural profile, all of which can be lessened by making the cage environment more stimulating. But concerns have been raised that enriched housing might disrupt standardization and so affect the precision and reproducibility of behavioural-test results (for example, see ref. 4). Here we show that environmental enrichment increases neither individual variability in behavioural tests nor the risk of obtaining conflicting data in replicate studies. Our findings indicate that the housing conditions of laboratory mice can be markedly improved without affecting the standardization of results.
Descriptors: animal welfare standards, laboratory animal physiology, laboratory animal psychology, animal behavior, animal physiology, animal housing, analysis of variance, laboratory animal genetics, brain physiology, brain physiopathology, hybridization, genetic, maze learning, mice, inbred C57BL mice, inbred DBA mice, phenotype, reproducibility of results.

Wurbel, H., R. Chapman, and C. Rutland (1998). **Effect of feed and environmental enrichment on development of stereotypic wire-gnawing in laboratory mice.** *Applied Animal Behaviour Science* 60(1): 69-81. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: mice, cages, enrichment, abnormal behavior, animal welfare, behavior patterns, physical activity, grooming, tubes, pelleted feeds, hardness, stereotypies, cardboard tubes.

Xi, X., D. Mcginty, and R. Szymusiak (2001). **Acute handling stress induces respiratory depression in rats**. *Sleep (Rochester)* 24(Abstract Supplement): A296. ISSN: 0161-8105.
Descriptors: rats, acute handling stress, induces, respiratory depression, husbandry procedures.
Notes: Meeting Information: 15th Annual Meeting of the Associated Professional Sleep Societies, June 05-10, 2001, Chicago, Illinois, USA.

Yerroum, M., F. Braconnier, and P. Chariot (1999). **Influence of handling procedures on rat plasma creatine kinase activity.** *Muscle and Nerve* 22(8): 1119-21. ISSN: 0148-639X.
Descriptors: alanine transaminase blood, creatine kinase blood, specimen handling adverse effects, anesthetics administration and dosage, injections, intraperitoneal, Sprague Dawley rats.

Zhang, D. and Y. Wang (2000). **Yingxiang xiaoshu peitai xianwei zhushe chenggonglu de ruogan yinsu. [Some factors affecting microinjection success rate in the production of transgenic mice].** *Shanghai Nongye Xuebao (China) [Acta Agriculturae Shanghai (China)]* 16(4): 57-59. ISSN: 1000-3924.
Descriptors: mice, laboratory animals, genetic transformation, mammals, Rodentia, useful animals, microinjection, fertilized egg, pronuclei.
Language of Text: Chinese with an English summary.

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Noise/Lighting/Temperature/Humidity

Aggelopoulos, N.C. and H. Meissl (1999). **The sensitivity of retinal ganglion cells of the rat to ultraviolet light**. *Journal of Physiology (Cambridge)* 518(1): 106-107. ISSN: 0022-3751.
Descriptors: rat, ultraviolet light, sensitivity, retinal ganglia cells.
Notes: Meeting Information: Scientific Meeting of the Physiological Society, April 19-21, 1999, London, England, UK.

Aguas, A.P., N. Esaguy, N. Grande, A.P. Castro, and N.A.A. Castelo Branco (1999). **Effect low frequency noise exposure on BALB/c mice splenic lymphocytes**. *Aviation Space and Environmental Medicine* 70(3, Section 2): A128-A131.
Descriptors: noise, low frequency, BALB c mice, effect, splenic lymphocytes.

Ajarem, J. and M. Ahmad (2003). **Effect of temperature on the behavioural activities of male mice**. *Dirasat Pure Sciences* 30(1): 59-65. ISSN: 1560-456x.
Abstract: The effect of external thermal stress on the behavioural activities and on the tube restraint test was studied on male albino mice. The mice were subjected to 5, 15, 25, 35, and 45 degrees C, for 24 h considering 22 degrees C as the control temperature. Thereafter, the various observations were made inside a chamber at the specifically mentioned temperature. The locomotory activities including the numbers of squares crossed, rears, wall rears, and washes had direct correlations with thermal stresses. These activities decreased at lower and increased at higher temperatures. Moreover, these activities had a correlation with the observations on the locomotory and immobility durations. Locomotory and immobility durations were directly and inversely related to temperature, respectively. The animals in the tube restraint test also showed a direct correlation between the number of bites and temperature. These observations were discussed in light of the fact that behaviour was remarkably a sensitive mechanism in the regulation of body temperature. The possible role of such behavioural activities in a quest to maintain normothermia by the animal was discussed.
Descriptors: animal behavior, body temperature, heat stress, locomotion, temperature, mice, normothermia.
Language of Text: Arabic summary.

Akita, M., M. Kuwahara, R. Nishibata, H. Mikami, and H. Tsubone (2004). **The daily pattern of heart rate, body temperature, locomotor activity, and autonomic nervous activity in congenitally bronchial-hypersensitive (BHS) and bronchial-hyposensitive (BHR) guinea pigs**. *Experimental Animals (Tokyo)* 53(2): 121-127. ISSN: 1341-1357.
Descriptors: guinea pigs, bronchial hypersensitive, daily pattern, heart rate, body temperature, locomotor activity, autonomic nervous activity.

Akoev, G.N., I.L. Potekhina, V.N. Zinkin, M.S. Nikolaevich, S.N. Sergeev, and D.I. Yanik (2000). **Effects of a pulsing**

noise on the mechanoreceptors of rat. *Sensornye Sistemy* 14(3): 180-184. ISSN: 0235-0092.
Descriptors: white rats, pulsing noise, effects, mechanoreceptors, sciatic nerve, afferent impulse activity, ischiadic nerve, changes, impulse activity.

Alemayehu, A., L. Breen, and M. Printz (2003). **Genetic determinants of circadian variation in body temperature, heart rate, and locomotor activity in recombinant inbred rat strains.** *FASEB Journal* 17: 4-5 (Abstract No. 336.10). ISSN: 0892-6638.
Online: http://www.fasebj.org/
Descriptors: inbred rat strains, circadian variation, heart rate, body temperature, locomotor activity, genetic determinants.
Notes: Meeting Information: FASEB Meeting on Experimental Biology: Translating the Genome, San Diego, CA, USA, 2003.

Alexandridou, A., J. Sall, E. Hernandez, K.G. Csaky, and S.W. Cousins (2000). **Susceptibility of mice to basal laminar deposit (BLD) formation: role of aging and blue light exposure**. *IOVS* 41(4): S160.
Descriptors: mice, aging, blue light exposure, basal laminar deposit formation, susceptibility.
Notes: Meeting Information: Annual Meeting of the Association in Vision and Opthalmology, April 30-May 05, 2000, Fort Lauderdale, Florida, USA.

Alfaro, A., M. Martinez, V. Medran, M. Aviles, and E. Fernandez (1998). **Light-evoked changes of protein kinase c immunoreactivity in the rat retina**. *IOVS* 39(4): S564.
Descriptors: rat, retina, light evoked changes, protein kinase c, immunoreactivity.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 10-15, 1998, Fort Lauderdale, Florida, USA.

Anderson, L.E., J.E. Morris, L.B. Sasser, and R.G. Stevens (1999). **Effect of constant light on DMBA mammary tumorigenesis in rats**. *Cancer Letters* 148(2): 121-126.
Descriptors: constant light, effect, DMBA, mammary tumorigenesis, rats.

Andrews, J.F. and S.M. Mcbennett (1999). **Thermoneutral temperature of Aston strain ob/ob mice acclimated to warm (30 degree) v. cold (20 degree) environments**. *Symposium on Functionality of Nutrients and Behaviour, Proceedings of the Nutrition Society, Amiens, France,* Vol. 58(3), p. 76A.
Descriptors: ob-ob mice, acclimated warm, Aston strain, thermoneutral temperature vs. cold environment.

Arai, J., T. Kikuchi, N. Katai, H. Shibuki, and N. Yoshimura (1999). **Apoptosis of retinal photoreceptor cells in the mice after excessive light exposure**. *IOVS* 40(4): 4.
Descriptors: mice, light exposure, excessive, cells, retinal, apoptosis, photoreceptor.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 9-14, 1999, Fort Lauderdale, Florida, USA.

Arai, S., T. Hanaya, T. Sakurai, M. Ikeda, and M. Kurimoto (2005). **A novel phenomenon predicting the entry into a state of hibernation in Syrian hamsters (*Mesocricetus auratus*)**. *Journal of Veterinary Medical Science* 67(2): 215-217. ISSN: 0916-7250.
Abstract: When Syrian hamsters (*Mesocricetus auratus*) are bred in a cold and short-day environment, most animals go into hibernation after a certain period of time. However, to date it has not been possible to predict which hamster will enter hibernation. In this study, we subcutaneously implanted thermo-loggers in hamsters bred in the cold environment, and recorded the subcutaneous temperature at short intervals until they went into hibernation. A time series analysis of temperature disclosed that a fall of 0.4 to 0.8degreeC in subcutaneous temperature was seen 5 to 16 days before entering hibernation, and this phenomenon continued for three days or more. No hamster went into the hibernation without displaying this signal. Although the mechanism by which this phenomenon takes place is not clear, it is a sign from the body, which is useful for indicating if a hamster will enter hibernation shortly.
Descriptors: neural coordination, reproduction, telemetry, applied and field techniques, thermal recording implant, prosthetic, time series analysis, mathematical and computer techniques, breeding season,

environmental temperature, hibernation, subcutaneous temperature, thermoregulation.

Archana, R. and A. Namasivayam (2000). **Acute noise-induced alterations in the immune status of albino rats**. *Indian Journal of Physiology and Pharmacology* 44(1): 105-108. ISSN: 0019-5499.
Descriptors: rats, albino, immune status, noise, acute, induced alterations.

Arvanitogiannis, A. and S. Amir (1999). **Resetting the rat circadian clock by ultra-short light flashes**. *NeuroScience Letters* 261(3): 159-162. ISSN: 0304-3940.
Descriptors: rat, circadian clock, resetting, light flashes.

Attias, J., I. Bresloff, H. Haupt, F. Scheibe, and H. Ising (2003). **Preventing noise induced otoacoustic emission loss by increasing magnesium (Mg2+) intake in guinea-pigs.** *Journal of Basic and Clinical Physiology and Pharmacology* 14(2): 119-136. ISSN: 0792-6855.
Descriptors: guinea pigs, otoacoustic emission loss, induced, preventing, magnesium increase, intake, outer hair cells.

Augusteyn, R.C. (1998). **The effect of light deprivation on the mouse lens**. *Experimental Eye Research* 66(5): 669-674. ISSN: 0014-4835.
Descriptors: light, deprivation, effect, mouse, lens.

Bae, K. and D.R. Weaver (2003). **Light-induced phase shifts in mice lacking mPER1 or mPER2**. *Journal of Biological Rhythms* 18(2): 123-133. ISSN: 0748-7304.
Abstract: Three homologues of the *Drosophila* Period gene have been identified in mammals. In mice, these three genes (mPer1, mPer2, and mPer3) have distinct roles in the circadian clockwork. While products of mPer1 and mPer2 play important roles in the maintenance of circadian rhythmicity, mPer3 gene products are dispensable for rhythmicity. Several studies also implicate mPER1 and mPER2 in transduction of photic information to the core circadian clockwork. The phase-shifting effects of light were examined in mPER1-deficient and mPER2-deficient mice using T cycle paradigms, in which mice received 1 h of light per day at an interval of T hours. To assess phase delays, repeated exposure to 1 h of light per day at T=24 was used. To assess phase advances, exposure to 1-h light pulses at T=22-h intervals was used. The degeneration of rhythmicity in the mutant mice prevented assessment of a response in most cases. Nevertheless, clear examples of phase delays and phase advances were observed in both mPer1 and mPer2 mutant mice. These results are not consistent with the hypothesis that mPER1 and mPER2 play necessary and nonoverlapping roles in mediating the effects of light on the circadian clock.
Descriptors: circadian rhythm, genes, light, mutants, mice.

Baldwin, A.L. and L.M. Wilson (1999). **Effects of noise on mesenteric permeability in the rat**. *FASEB Journal* 13(4, Part 1): A1. ISSN: 0892-6638.
Descriptors: noise, effects, rat, permeability, mesenteric.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists for Experimental Biology 99, Washington, D.C., USA.

Bao, G., N. Metreveli, and E.C. Fletcher (1999). **Acute and chronic blood pressure response to recurrent acoustic arousal in rats.** *American Journal of Hypertension* 12(5): 504-10. ISSN: 0895-7061.
Abstract: Repetitive episodic hypoxia every 30 sec administered chronically to Sprague-Dawley (SD) rats has been shown by previous studies to cause a sustained increase in daytime blood pressure (BP). Acoustic arousal in humans during wake or sleep produces an acute BP rise. The question then arises as to whether chronic episodic acoustic arousal applied with the same frequency and duration as episodic hypoxia induces elevated BP. We exposed 14-week-old (N = 10) SD rats in individual cages to recurrent buzzer noise (500 Hz, 100 dB) 6 out of every 30 sec, 7 h/day for 35 days. Ten other rats were placed in similar cages daily but not exposed to noise, to provide a sham condition. An infrared beam with a detector was positioned at the end of each cage. This allowed us to quantify motion by registering the number of times the rat broke the beam per 7 h period. Mean intraarterial BP was measured in unrestrained conscious animals at baseline and at the end of 35 days of their respective conditions. Acute episodic acoustic stimulation caused an immediate response in BP and heart

rate. Habituation occurred in that the movement response to 120 noises per hour was 75% in hour one and 20% in hours two through seven on day one. The movement response was further reduced by day 35 but remained significantly higher than in animals not stimulated by noise. The cardiovascular response to noise also showed signs of habituation. Chronic noise stimulation produced no sustained increases in BP after 35 days of exposure.
Descriptors: arousal physiology, blood pressure physiology, circadian rhythm physiology, acoustic stimulation, anoxia physiopathology, heart rate physiology, movement physiology, noise, Sprague Dawley rats.

Bao, Y.X., W.G. Du, Z. Lin, B.Y. Hu, B.R. Chi, and X.D. Chen (2001). **Effect of temperature on energy requirement and food assimilation in Chinese white-bellied rat (*Niviventer confucianus*)**. *Acta Zoologica Sinica* 47(5): 597-600. ISSN: 0001-7302.
Descriptors: Chinese white-bellied rat, energy requirements, food assimilation, temperature, effect, metabolism, nutrition, energy requirement, temperature effects.

Baturin, D.A., I.N. Alimova, I.G. Popovich, M.A. Zabezhinsky, A.V. Semenchenko, A.L. Yashin, and V.N. Anisimov (2004). **Effect of light deprivation on homeostasis, life span and development of spontaneous tumors in HER-2/neu transgenic mice**. *Voprosy Onkologii (St. Petersburg)* 50(3): 332-338. ISSN: 0507-3758.
Descriptors: transgenic mice, light deprivation, effect, life span, development, spontaneous tumors, feed intake, decreased body mass.

Bauer, C.A., L.A. Herr, and T.J. Brozoski (1998). **Behavioral evidence of chronic tinnitus in rats with unilateral noise trauma**. *Society for Neuroscience Abstracts* 24(1-2): 1634. ISSN: 0190-5295.
Descriptors: noise, trauma, tinnitus, rats, behavioral, evidence.
Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 2, November 7-12, 1998, Los Angeles, California, USA.

Beck, B., S. Richy, and A. Stricker Krongrad (2003). **Ghrelin and body weight regulation in the obese Zucker rat in relation to feeding state and dark/light cycle**. *Experimental Biology and Medicine* 228(10): 1124-1131. ISSN: 1535-3702.
Abstract: Ghrelin is a new orexigenic peptide primarily produced by the stomach but also present in the hypothalamus. It has adipogenic effects when it is chronically injected in rodents but in obese humans, its plasma concentration is decreased. It can reverse the anorectic effects of leptin when it is co-injected with this peptide in the brain ventricles. The Zucker fa/fa rat is a genetic model of obesity related to a default in the leptin receptor. It is characterized by a large dysregulation of numerous hypothalamic peptides but the ghrelin status of this rat has not yet been determined. Through several experiments, we determine in lean and obese Zucker rats its circulating form in the plasma, its tissue levels and/or expression, and studied the influence of different feeding conditions and its light/dark variations. Ghrelin expression was higher in the obese stomach and hypothalamus ($P<0.05$ and $P<0.02$, respectively). The ratio of [Octanoyl-Ser3]-ghrelin (active form) to [Des-Octanoyl-Ser3]-ghrelin (inactive form) was approximately 1:1 in the stomach and 2:1 in the plasma in lean and obese rats (no differences). After fasting, plasma ghrelin concentrations increased significantly in lean (+64%; $P<0.001$) and obese (+60%; $P<0.02$) rats. After 24 hours of refeeding, they returned to their initial ad lib levels. Ghrelin concentrations were higher in obese rats by 69% ($P<0.005$), 65% ($P<0.02$), and 73% ($P<0.005$) in the ad libitum, fast, and refed states respectively. These results indicate that the obese Zucker rat is characterized by increases in the stomach mRNA expression and in peptide release in the circulation. They clearly support a role for ghrelin in the development of obesity in the absence of leptin signaling.
Descriptors: animal models, body weight, laboratory animals, leptin, obesity, peptides, stomach, rats.

Belke, D.D., L.C. Wang, and G.D. Lopaschuk (1997). **Effects of hypothermia on energy metabolism in rat and Richardson's ground squirrel hearts.** *Journal of Applied Physiology* 82(4): 1210-8. ISSN: 8750-7587.
Abstract: Glycolysis, glucose oxidation, palmitate oxidation, and cardiac function were measured in isolated working hearts from ground squirrels and rats subjected to a hypothermia-rewarming protocol. Hearts were perfused initially for 30 min at 37 degrees C, followed by 2 h of hypothermic perfusion at 15 degrees C, after which hearts were rewarmed to 37 degrees C and further perfused for 30 min. Functional recovery in ground squirrel hearts was greater than in rat hearts after rewarming. Hypothermia-rewarming had a similar general effect on the various metabolic pathways in both species. Despite these similarities, total energy substrate

metabolic rates were greater in rat than ground squirrel hearts during hypothermia despite a lower level of work being performed by the rat hearts, indicating that rat hearts are less efficient than ground squirrel hearts during hypothermia. After rewarming, energy substrate metabolism recovered completely in both species, although cardiac work remained depressed in rat hearts. The difference in functional recovery between rat and ground squirrel hearts after rewarming cannot be explained by general differences in energy substrate metabolism during hypothermia or after rewarming.
Descriptors: energy metabolism physiology, heart physiology, hypothermia metabolism, myocardium metabolism, Sciuridae metabolism, body temperature physiology, fatty acids metabolism, glucose metabolism, glycolysis physiology, myocardial contraction physiology, oxidation reduction, rats, Sprague Dawley rats, rewarming, species specificity, triglycerides metabolism.

Benca, R.M., M.A. Gilliland, and W.H. Obermeyer (1998). **Effects of lighting conditions on sleep and wakefulness in albino Lewis and pigmented brown Norway rats**. *Sleep (Rochester)* 21(5): 451-460. ISSN: 0161-8105.
Descriptors: rats, brown Norway, albino Lewis, sleep, wakefulness, lighting conditions, effects, light-dark, sleep patterns, pigmented.

Benstaali, C., A. Bogdan, and Y. Touitou (2002). **Effect of a short photoperiod on circadian rhythms of body temperature and motor activity in old rats**. *Pfluegers Archiv European Journal of Physiology* 444(1-2): 73-79. ISSN: 0031-6768.
Descriptors: old rats, short photoperiod, effect, circadian rhythms, body temperature, motor activity, young, light-dark cycle.

Benstaali, C., A. Mailloux, A. Bogdan, A. Auzeby, and Y. Touitou (2001). **Circadian rhythms of body temperature and motor activity in rodents: their relationships with the light-dark cycle**. *Life Sciences* 68(24): 2645-2656. ISSN: 0024-3205.
Abstract: A review which summarizes the results of the influence, shifts and modifications of the light-dark cycle on the circadian rhythms of body temperature and locomotor activity in rodents throughout the daily cycle is presented. A very close temporal and metabolic relation was found between these 2 functions.
Descriptors: adaptation, body temperature, circadian rhythm, locomotion, reviews, rodents.

Bertin, R., F. De Marco, and R. Portet (1997). **Effects of fasting and refeeding on energetic metabolism of cold acclimated rats.** *Archives of Physiology and Biochemistry* 105(5): 511-515. ISSN: 1381-3455.
Descriptors: cold acclimated rats, fasting, refeeding, energetic metabolism, effects, adipose tissue, weights, thermogenesis.

Bhatkal, S., G. Sundaresan, R. Mathur, B. Bhattacharya, and U. Sachdeva (2001). **Short term REM sleep deprivation effect on temperature rhythm of rats**. *Indian Journal of Physiology and Pharmacology* 45(2): 208-214. ISSN: 0019-5499.
Descriptors: rats, REM sleep deprivation, short term, temperature rhythm, effect, body temperature, circadian rhythm, sleep pattern.

Bijlsma, P.B., M.T.M. Van Raaij, C.J.G. Dobbe, A. Timmerman, A.J. Kiliaan, J.A.J.M. Taminiau, and J.A. Groot (2001). **Subchronic mild noise stress increases HRP permeability in rat small intestine in vitro**. *Physiology and Behavior* 73(1-2): 43-49. ISSN: 0031-9384.
Descriptors: rat, subchronic mild noise, stress, small intestine, permeability, HRP, intestinal barrier function, decreased.

Binda, M.M., C.R. Molinas, K. Mailova, and P.R. Koninckx (2004). **Effect of temperature upon adhesion formation in a laparoscopic mouse model**. *Human Reproduction (Oxford)* 19(11): 2626-2632. ISSN: 0268-1161.
Descriptors: mouse model, laparoscopic surgery, temperature, adhesion formation, prevention, hypoxia, pneumoperitoneum.

Bishop, B., G. Silva, J. Krasney, H. Nakano, A. Roberts, G. Farkas, D. Rifkin, and D. Shucard (2001). **Ambient temperature modulates hypoxic-induced changes in rat body temperature and activity differentially**. *American Journal of Physiology* 280(4, Part 2): R1190-R1196. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3
Descriptors: rat, ambient temperature, activity level, body temperature, circadian rhythm, hyperthermia, hypothermia, hypoxia, brain.

Bishop, B.P., A. Roberts, J. Augustin, A. Ray, D.I. Rifkin, and J.A. Krasney (2002). **Hypoxic-induced thermal response in Sprague-Dawley rats exposed to constant light**. *FASEB Journal* 16(4): A450. ISSN: 0892-6638.
Descriptors: Sprauge Dawley rats, constant light, thermal response, hypoxia, body temperature, circadian rhythm, induced thermal stress.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology, April 20-24, 2002, New Orleans, Louisiana, USA.

Blanchong, J.A., T.L. McElhinny, M.M. Mahoney, and L. Smale (1999). **Nocturnal and diurnal rhythms in the unstriped Nile rat, *Arvicanthis niloticus*.** *Journal of Biological Rhythms* 14(5): 364-77. ISSN: 0748-7304.
Abstract: In a laboratory population of unstriped Nile grass rats, *Arvicanthis niloticus*, individuals with two distinctly different patterns of wheel-running exist. One is diurnal and the other is relatively nocturnal. In the first experiment, the authors found that these patterns are strongly influenced by parentage and by sex. Specifically, offspring of two nocturnal parents were significantly more likely to express a nocturnal pattern of wheel-running than were offspring of diurnal parents, and more females than males were nocturnal. In the second experiment, the authors found that diurnal and nocturnal wheel-runners were indistinguishable with respect to the timing of postpartum mating, which always occurred in the hours before lights-on. Here they also found that both juvenile and adult *A. niloticus* exhibited diurnal patterns of general activity when housed without a wheel, even if they exhibited nocturnal activity when housed with a wheel. In the third experiment, the authors discovered that adult female *A. niloticus* with nocturnal patterns of wheel-running were also nocturnal with respect to general activity and core body temperature when a running wheel was available, but they were diurnal when the running wheel was removed. Finally, a field study revealed that all *A. niloticus* were almost exclusively diurnal in their natural habitat. Together these results suggest that individuals of this species are fundamentally diurnal but that access to a running wheel shifts some individuals to a nocturnal pattern.
Descriptors: circadian rhythm genetics, circadian rhythm physiology, Muridae physiology, body temperature physiology, copulation physiology, environment, motor activity physiology, Muridae genetics, sex characteristics, time factors.

Bogdanenko, E.V., Y.V. Sviridov, V.V. Galat, and R.I. Zhdanov (1999). **[Day ovulations in NMRI mice at natural light-dark cycle]**. *Baltic Journal of Laboratory Animal Science* 9(1): 5-9. ISSN: 1407-0944.
Abstract: In the 1st of 2 experiments, female mice were mated during the day (from 10.50 to 16.50 h) or at night. The females were slaughtered on day 19 of pregnancy. In the 2nd experiment, females were mated from 09.30 to 18.45 h, and were subsequently slaughtered. In the 1st experiment, the number of live fetuses per female averaged 11.4+or-1.4 and 10.9+or-2.5 in the day- and night-mated groups respectively, the preimplantation mortality in the 2 groups being 10.5+or-2.8 and 17.8+or-2.9%. For the 2nd experiment, data are tabulated on the numbers of follicles and corpora lutea in the right and left ovaries of females mated at different times during the day, and autopsied at different intervals thereafter.
Descriptors: mating, time, ovulation, pregnancy rate, embryo mortality, mice.
Language of Text: Russian with an English summary.

Bonaventura, L.R. and M.T. Romero (2000). **Effects of light pulses on ultrasonic vocalization in the neonatal rat**. *Society for Neuroscience Abstracts* 26(1-2): Abstract No. 76.31. ISSN: 0190-5295.
Descriptors: neonatal rats, ultrasonic vocalization, light pulses, effect, stressful stimuli, environmental light, behavioral response.
Notes: Meeting Information: 30th Annual Meeting of the Society for Neuroscience, November 4-9, 2000, New Orleans, LA, USA.

Boulant, J.A. and A.R. Chow (1998). **Mechanisms of temperature sensitivity in rat hypothalamic neurons**. *FASEB Journal* 12(4): A120. ISSN: 0892-6638.
Descriptors: rat, hypothalamic neurons, temperature sensitivity, nervous system, mechanisms.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology

98, Part 1, April 18-22, 1998, San Francisco, California, USA.

Bowers, F., K. Valter, and J. Stone (1998). **Dual rescue effect of oxygen on light induced photoreceptor death in the rat**. *IOVS* 39(4): S127.
Descriptors: rat, photoreceptor death, light induced, oxygen effect, rescue, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 10-15, 1998, Fort Lauderdale, Florida, USA.

Briaud, S.A., B.L. Zhang, and F. Sannajust (2004). **Continuous light exposure and sympathectomy suppress circadian rhythm of blood pressure in rats**. *Journal of Cardiovascular Pharmacology and Therapeutics* 9(2): 97-105. ISSN: 1074-2484.
Descriptors: rats, blood pressure, circadian rhythm, continuous light exposure, heart rate, locmotor activity, suppression.

Briese, E. (1998). **Normal body temperature of rats: the setpoint controversy**. *NeuroScience and Biobehavioral Reviews* 22(3): 427-436. ISSN: 0149-7634.
Descriptors: rats, normal body temperature, set point, controversy, thermoregulation, circadian rhythm.

Brown, D.R., A.R. Patwardhan, L.V. Brown, R.O. Speakman, and D.C. Randall (2002). **Effects of an 8:8 hour light:dark cycle on the blood pressure and heart rate power spectra in rat**. *FASEB Journal* 16(4): A110. ISSN: 0892-6638.
Descriptors: rat, blood pressure, heart rate, 8:8 hour light-dark cycle, effects, circadian rhythm.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology, April 20-24, 2002, New Orleans, Louisiana, USA.

Busch, E.M., T.G. Gorgels, and D. Van Norren (1999). **Temporal sequence of changes in rat retina after UV-A and blue light exposure**. *Vision Research* 39(7): 1233-1247. ISSN: 0042-6989.
Descriptors: rat, retina, UV-A, blue light, exposure, changes, temporal, sequence.

Bustamante, D.M., R.F. Nespolo, E.L. Rezende, and F. Bozinovic (2002). **Dynamic thermal balance in the leaf-eared mouse: the interplay among ambient temperature, body size, and behavior**. *Physiological and Biochemical Zoology* 75(4): 396-404. ISSN: 1522-2152.
Descriptors: leaf-eared mouse, thermal balance, ambient temperature, body size, behavior, thermoregulation, huddling, thermoneutrality.

Buzadzic, B., D. Blagojevic, B. Korac, Z.S. Saicic, M.B. Spasic, and V.M. Petrovic (1997). **Seasonal variation in the antioxidant defense system of the brain of the ground squirrel (*Citellus citellus*) and response to low temperature compared with rat.** *Comparative Biochemistry and Physiology, Part C, Pharmacology, Toxicology and Endocrinology* 117(2): 141-9. ISSN: 1367-8280.
Abstract: Seasonal variation in the activity of antioxidant enzymes (superoxide dismutase (EC 1.15.1.1.; SOD), catalase (EC 1.11.1.6; CAT), glutathione peroxidase (EC 1.11.1.9; GSH-Px), glutathione reductase (EC 1.6.4.2; GR), glutathione-S-transferase (EC 2.5.1.18; GST) and low-molecular-weight antioxidants: ascorbic acid (AsA), vitamin E (VIT E) and glutathione (CSH+GSSG) were examined in the brain of the ground squirrels (*Citellus citellus*) maintained at 30 degrees C during the whole year. The highest activity (per mg protein) of antioxidant defense (AD) enzymes was found in the spring and was much lower in the summer. A further decrease in activity of CAT, GSH-Px and GST was observed in the winter. The highest levels of AsA and glutathione were recorded in winter in comparison with spring and summer. AD system in the brain of the ground squirrel and rates (maintained at thermoneutrality) exposed to low temperature (4 degrees C) for 3, 6 or 24 hr during the summer was studied as well. Summer was chosen as a period of stable euthermia for ground squirrels and in thermoregulation similar to rats. Consumption of free fatty acid and glucose during the acute exposure to low temperature was found to be species specific. In the ground squirrel, an increase in the specific activities of SOD, after 3, 6 and 24 hr, CAT after 3 and 6 hr and GR after 6 hr of exposure to low temperature was detected. When activities were expressed in U/g wet mass, an increase of SOD after 3, 6 and 24 hr ($P < 0.02$, $P < 0.02$, $P < 0.005$) and CAT and GSH-Px 3 hr ($P < 0.01$) upon exposure to low temperature was

observed. In the rats, no changes in the specific activities of these enzymes after exposure to low temperature were recorded and only an increase in GST activity (U/g wet mass) after 6 hr exposure was registered. Low-molecular-weight AD components in both animal species were unchanged upon short-term exposure to low temperature. The species-specific differences in brain AD between the rats and the ground squirrels after short exposure to low temperature may be ascribed to seasonal changes of the brain activity in the latter.
Descriptors: rat, ground squirrel, seasonal variation, antioxident defense system, brain, temperature.

Caldwell, H.K. and H.E. Albers (2004). **Effect of photoperiod on vasopressin-induced aggression in Syrian hamsters.** *Hormones and Behavior* 46(4): 444-9. ISSN: 0018-506X.
Abstract: Syrian hamsters are photoperiodic and become sexually quiescent when exposed to short "winter-like" photoperiods. In short photoperiods, male hamsters display significantly higher levels of aggression than males housed in long photoperiods. Arginine-vasopressin (AVP) within the anterior hypothalamus (AH) has been reported to modulate aggression in hamsters housed in long photoperiods. Previous studies have shown that AVP can facilitate aggression and its effects appear to be mediated by AVP V(1a) receptors (V(1a)R). In the present study, we investigated whether the increased levels of aggression observed after exposure to short photoperiod were the result of an increased responsiveness to AVP within the AH. Injections of AVP into the AH significantly increased aggression in hamsters housed in a long photoperiod, but had no effect in hamsters housed in a short photoperiod. In addition, injection of a V(1a)R antagonist into the AH significantly inhibited aggression in hamsters housed in long photoperiod, but had no effect in hamsters housed in a short photoperiod. These findings indicate that AVP within the AH increases aggression in hamsters housed in long photoperiods, but not in hamsters housed in short photoperiods.
Descriptors: Syrian hamsters, aggression physiology, argipressin analogs, derivatives, physiology, hypothalamus physiology, photoperiod, argipressin administration and dosage, hamsters, hormone antagonists pharmacology, hypothalamus drug effects, mesocricetus, microinjections, receptors, vasopressin antagonists and inhibitors.

Callahan, M.F., M. Sosa, B. Mckee, and T.L. Smith (2004). **Regional blood flow in mice: effects of core body temperature**. *FASEB Journal* 18: 4-5 (Abst. 855.16). ISSN: 0892-6638.
Online: http://www.fasebj.org/
Descriptors: mice, regional blood flow, core body temperature, effects, lowered core temperature, rewarming, heart rate, cardiac output.
Notes: Meeting Information: FASEB Meeting on Experimental Biology: Translating the Genome, April 17-21, 2004, Washington, D.C., USA.

Cambras, T., J. Vilaplana, A. Torres, M.M. Canal, N. Casmitjana, A. Campuzano, and A. Diez-Noguera (1998). **Constant bright light (LL) during lactation in rats prevents arhythmicity due to LL**. *Physiology and Behavior* 63(5): 875-882. ISSN: 0031-9384.
Descriptors: rats, constant bright light, lactation, prevents, arhythmicity, circadian system, light-dark cycles, motor activity, female, male.

Campuzano, A., T. Cambras, J. Vilaplana, M.M. Canal, M. Carulla, and A. Diez Noguera (1999). **Period length of the light-dark cycle influences the growth rate and food intake in mice**. *Physiology and Behavior* 67(5): 791-797. ISSN: 0031-9384.
Abstract: The growth rate and the food intake of mice (7 groups of 20 animals each) kept under symmetric light dark (LD) cycles with different periods (T) of 21, 22, 23, 24, 25, 26, and 27 h, respectively, for 80 days were studied. The mice were then kept in constant darkness for a further 80 days. Throughout the experiment, motor activity was recorded every 15 min for each mouse by means of an acti meter that used crossed infrared beams. Several variables related to the circadian motor activity rhythm were calculated, and correlated with body weight, food intake, and the efficiency of food for growth (food efficiency) calculated as: 100x body weight increase/amount of food intake. Results show that these three variables seem to be influenced by the number of circadian cycles that the animal has experienced, but also, and more significantly, by the degree to which the alpha phase of the individual rhythm and the dark phase of the external cycle coincide. Therefore, circadian rhythms would seem to affect the physiological processes that regulate growth and energy expenditure.
Descriptors: food intake, body weight, circadian rhythm, energy consumption, intake, energy metabolism,

energy exchange, growth, mice.

Canal Corretger, M.M., T. Cambras, and A. Diez Noguera (2003). **Effect of light during lactation on the phasic and tonic responses of the rat pacemaker**. *Chronobiology International* 20(1): 21-36. ISSN: 0742-0528.

Abstract: The circadian system in mammals generates endogenous circadian rhythms and entrains them to external cycles. Here, we examine whether the lighting conditions under which rats are reared affect the properties of the circadian pacemaker. We maintained three groups of rats under constant darkness (DD-rats), constant bright light (LL-rats) or light-dark cycles of 24 hours (LD-rats) during lactation. We then studied motor activity rhythm under constant light of four intensities, and under seven light-dark cycles with periods ranging between 22 and 27 hours. Results show that neither the tau nor the phase angle to the external cycle differed between groups. Differences were found in the amplitude of the circadian rhythm and in the number of rats that became arrhythmic under LL. We conclude that the light received during lactation affects the strength of the circadian pacemaker and its sensitivity to light.

Descriptors: rats, circadian rhythm, lactation, light, photoperiod, photosensitivity, constant bright light, constant darkness, light-dark cycles.

Canal Corretger, M.M., T. Cambras, J. Vilaplana, and A. Diez Noguera (2003). **The manifestation of the motor activity circadian rhythm of blinded rats depends on the lighting conditions during lactation**. *Chronobiology International* 20(3): 441-450. ISSN: 0742-0528.

Abstract: The purpose of this experiment was to examine the effect of different lighting conditions during lactation on the functioning of the circadian pacemaker in the adult rat in absence of the retinal input. We reared one group of rats under constant light (LL-rats) and the other under constant darkness (DD-rats). After weaning they were placed under light-dark cycles of 24 h period for 29 days to eliminate the aftereffects of the previous lighting. All the animals were then binocularly enucleated and motor activity was recorded. Results reveal that, before and after the enucleation, the expression of the circadian rhythm was stronger in DD- than in the LL-rats. Our results indicate that lighting conditions during lactation modify the functioning of the circadian pacemaker.

Descriptors: blindness, circadian rhythm, lactation, light relations, locomotion, rats.

Canal Corretger, M.M., T. Cambras, J. Vilaplana, and A. Diez Noguera (2000). **Bright light during lactation alters the functioning of the circadian system of adult rats**. *American Journal of Physiology* 278(1, Part 2): R201-R208. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3

Abstract: To examine the role of light in the maturation of the circadian pacemaker, 12 groups of rats were raised in different conditions of exposure to constant bright light (LL) during lactation: duration and timing of LL were varied. the motor activity rhythm of the rats was studied after weaning, first under LL and then under constant darkness (DD). In DD, 2 light pulses (at circadian time 15 (CT15) and CT22) were applied to test the response of the pacemaker. Greater exposure to LL days during lactation increased the number of rhythmic rats and the amplitude of their motor activity rhythm in the LL stage and decreased the phase delay due to the light pulse at CT15. The timing of LL during lactation affected these variables too. Because the response of the adult to light depended on the number and timing of LL days during lactation, the exposure to light during the early stages may influence the development of the circadian system by modifying it structurally or functionally.

Descriptors: lactation, maturation, circadian rhythm, light, dark, lactation stage, adults, rats.

Canal, C.M.M., J. Vilaplana, T. Cambras, and N.A. Diez (2001). **Effect of light on the development of the circadian rhythm of motor activity in the mouse**. *Chronobiology International* 18(4): 683-696. ISSN: 0742-0528.

Descriptors: mouse, development, circadian rhythm, motor activity, light, effect, constant light, constant darkness, phase shifts.

Canal, C.M.M., J. Vilaplana, T. Cambras, and A. Diez-Noguera (2001). **Functioning of the rat circadian system is modified by light applied in critical postnatal days**. *American Journal of Physiology* 280(4, Part 2): R1023-R1030. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3

Descriptors: rat, circadian system, biological clock, circadian rhythm, light, critical postnatal days, light pulse, light sensitivity, exposure, motor activity.

Caputa, M., K. Dokladny, and B. Kurowicka (1998). **Behavioral approach to the study of the upper limit of temperature tolerance in rats**. *Physiology and Behavior* 65(1): 183-189. ISSN: 0031-9384.
Descriptors: rats, temperature tolerance, upper limit, behavior, critical thermal maximum, heat escape, motor activity.

Carper, D.A., V.R. Leverenz, and F.J. Giblin (1999). **Differential display analysis of guinea pig lenses exposed to UVA light in vivo**. *IOVS* 40(4): S381.
Descriptors: UVA light, guinea pig, lenses, in vivo, exposed, analysis, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 30-May 05, 2000, Fort Lauderdale, Florida, USA.

Challet, E., S. Losee Olson, and F.W. Turek (1999). **Reduced glucose availability attenuates circadian responses to light in mice.** *American Journal of Physiology* 276(4, Part 2): R1063-R1070. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: We tested whether circadian responses to light are modulated by decreased glucose availability, by photic phase resetting of the circadian rhythm of locomotor activity in mice exposed to 4 metabolic challenges. In mice housed in constant darkness, light pulses applied during early subjective night induced phase delays of the rhythm of locomotor activity, whereas light pulses applied during late subjective night caused phase advances. We concluded that circadian responses to light are reduced when brain glucose availability is decreased, suggesting a metabolic modulation of light-induced phase shifts.
Descriptors: hyperglycemia, hypoglycemia, insulin, circadian rhythm.

Challet, E., V.J. Poirel, A. Malan, and P. Pevet (2003). **Light exposure during daytime modulates expression of Per1 and Per2 clock genes in the suprachiasmatic nuclei of mice**. *Journal of NeuroScience Research* 72(5): 629-637. ISSN: 0360-4012.
Abstract: The suprachiasmatic nuclei (SCN) of the hypothalamus contain the master circadian clock in mammals. Nocturnal light pulses that reset the circadian clock also lead to rapid increases in levels of Per1 and Per2 mRNA in the SCN, suggesting that these genes are involved in the synchronization to light. During the day, when light has no phase-shifting effects in nocturnal rodents, the consequences of light exposure for Per expression have been less thoroughly studied. Therefore, the effects of light exposure during the day were assessed on Per1 and Per2 mRNA in the SCN of mice. Expression of Per1 and Per2 was generally increased by 30-min light pulses during the subjective day, with more pronounced effects in the morning. One exception was noted for a transient decrease in Per2 expression after a short light pulse applied at midday. Prolonged light exposure (up to 3 hr) starting at midday markedly increased Per2 expression but not that of Per1. Moreover, the amplitude of the daily variations of both Per and the duration of Per1 peak was increased in mice exposed to a light-dark cycle compared with those transferred to constant darkness. Finally, the amplitude of the daily variations of both Per and the basal level of Per1 were increased in mice under a light-dark cycle compared with animals synchronized to a skeleton photoperiod (i.e., with daily dawn and dusk 1-hr exposures to light). Taken together, the results indicate that prolonged light exposure during daytime positively modulates daily levels of Per1 and Per2 mRNA in the SCN of mice.
Descriptors: animal behavior, brain, circadian rhythm, daylight, gene expression, genes, genetics, messenger RNA, nocturnal activity, photoperiodism, mice.

Challet, E., A. Malan, F.W. Turek, and O. Van Reeth (2004). **Daily variations of blood glucose, acid-base state and pCO2 in rats: effect of light exposure.** *NeuroScience Letters* 355(1-2): 131-135. ISSN: 0304-3940.
Descriptors: rats, blood glucose, acid-base state, daily variations, light exposure, effects, circadian clock, pCO2, constant darkness, light exposure, retinal inputs.

Challet, E., B. Pitrosky, B. Sicard, A. Malan, and P. Pevet (2002). **Circadian organization in a diurnal rodent, *Arvicanthis ansorgei* Thomas 1910: chronotypes, responses to constant lighting conditions, and photoperiodic changes**. *Journal of Biological Rhythms* 17(1): 52-64. ISSN: 0748-7304.
Descriptors: rodent, diurnal, circadian organization, daily patterns, constant lighting, photoperiodic changes, *Arvicanthis ansorgei*, wheel running.

Challet, E., O. Van Reeth, and F.W. Turek (1999). **Altered circadian responses to light in streptozotocin-induced diabetic mice**. *American Journal of Physiology* 277(2, Part 1): E232-E237. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: circadian response, altered, light, streptozotocin, diabetic mice.

Chambers, J.B., T.D. Williams, R.P. Henderson, J.M. Overton, and M.E. Rashotte (2000). **Changes in cardiovascular and metabolic status induced by thermoneutrality and cold ambient temperature in normotensive rats**. *FASEB Journal* 14(4): A321. ISSN: 0892-6638.
Descriptors: rats, normotensive, cardiovascular changes, metabolic status, induced, thermoneutrality, cold, ambient temperature.
Notes: Meeting Information: Annual Meeting of Professional Research Scientists: Experimental Biology, April 15-18, 2000, San Diego, California, USA.

Chambers, M.L., D. Organisciak, R. Darrow, K. Woltjen, A. Aggarwal, J. Stepczynski, and P. Wong (1998). **Defining the degeneration phenotype of light-induced, oxidative stress-mediated, retinal damage in rats**. *IOVS* 39(4): S128.
Descriptors: rats, retinal damage, oxidative stress mediated, light induced, degeneration phenotype, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 10-15, 1998, Fort Lauderdale, Florida, USA.

Chan, M.L., H.J. Vreman, R.J. Wong, B.W.Y. Yong, and D.K. Stevenson (1999). **In vivo efficacy of light-emitting diodes (LEDs) as a light source for phototherapy in neonatal jaundiced rats**. *Journal of Investigative Medicine* 47(2): 56A.
Descriptors: rats, jaundiced, phototherapy, light emitting diodes, efficacy, neonatal, light source.
Notes: Meeting Information: Western Regional Meeting of the American Federation for Medical Research, January 27-30, 1999, Carmel, California, USA.

Chappell, M.A., T. Garland Jr., E.L. Rezende, and F.R. Gomes (2004). **Voluntary running in deer mice: speed, distance, energy costs and temperature effects**. *Journal of Experimental Biology* 207(22): 3839-3854. ISSN: 0022-0949.
Descriptors: deer mice, voluntary running, speed, distance, energy costs, temperature effects, metabolism, energetics, locomotion.

Chen, G.D. and L.D. Fechter (2003). **The relationship between noise-induced hearing loss and hair cell loss in rats.** *Hearing Research* 177(1-2): 81-90. ISSN: 0378-5955.
Descriptors: rats, noise induced hearing loss, hair cell loss, relationship, high frequency, dead hair cells, impaired hair cells.

Chen, J., M.I. Simon, M.T. Matthes, D. Yasumura, and M.M. Lavail (1999). **Increased susceptibility to light damage in an arrestin knockout mouse model of Oguchi disease (stationary night blindness)**. *IOVS* 40(12): 2978-2982.
Descriptors: light damage, susceptibility, knockout mouse, Oguchi disease, arrestin, night blindness.

Chen, L., W. Wu, T. Dentchev, Y. Zeng, J. Wang, I. Tsui, J.W. Tobias, J. Bennett, D. Baldwin, and J.L. Dunaief (2004). **Light damage induced changes in mouse retinal gene expression**. *Experimental Eye Research* 79(2): 239-247. ISSN: 0014-4835.
Descriptors: mouse, retina, gene expression, light damage, retinal degeneration, oxidative stress, photo-oxidative stress.

Cho, Y., T.W.L. Gong, A. Kanicki, R.A. Altschuler, and M.I. Lomax (2004). **Noise overstimulation induces immediate early genes in the rat cochlea**. *Molecular Brain Research* 130(1-2): 134-148. ISSN: 0169-328X.
Descriptors: rat, noise, overstimulation, cochlea, genes, permanent hearing loss, threshold shift, high intensity.

Christians, E.S. and I.J. Benjamin (2005). **The stress or heat shock (HS) response: insights from transgenic mouse**

models. *Methods (San Diego)* 35(2): 170-5. ISSN: 1046-2023.
Abstract: Since its discovery, stress or heat shock (HS) response has been widely studied as a paradigm for gene regulation. From control of gene expression to function and involvement in pathological processes, different aspects of the stress response have received extended attention and investigation by various approaches, using small analyzing molecules, cells and organisms. This chapter is focused on animal models, such as transgenic mice that allow integrated analysis of intact organisms in physiological and pathological conditions. Genetically modified mice, developed to generate gain- and loss-of-function, are described. The challenges of using the transgenic mouse model are also discussed.
Descriptors: gene expression regulation, heat shock proteins physiology, transgenic mice, DNA metabolism, animal disease models, reporter genes, heat, heat shock proteins 70 metabolism, mice, knockout mice, protein conformation, protein folding, temperature, transgenes.

Chung, Y., A. Kanicki, and R.A. Altschuler (2002). **Noise overstimulation induces changes in growth hormone levels in the rat cochlea.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 58.13.
Online: http://sfn.scholarone.com
Descriptors: rat, noise overstimulation, stress, chochlea, hair cells, growth hormone levels, change, auditory nerve.
Notes: Meeting Information: 32nd Annual Meeting of the Society of Neuroscience, November 02-07, 2002, Orlando, Florida, USA.

Cooper, R.M. (2002). **Diffuse light increases metabolic activity in the lateral geniculate nucleus, visual cortex, and superior colliculus of the cone-dominated ground squirrel visual system.** *Vision Research* 42(27): 2899-2907. ISSN: 0042-6989.
Descriptors: ground squirrel, metabolic activity, diffuse light, increases, visual cortex, superior colliculus, visual system.

Craik, S.A., N.N. Neumann, D.W. Smith and M. Belosevic (2002). **Effect of ultraviolet light on *Giardia muris* cysts in drinking water determined by loss of infectivity in mice**. In: B.E. Olson, M.E. Olson and P.M. Wallis (Editors), *Giardia: the Cosmopolitan Parasite*, CABI Publishing: New York, NY, p. 249-259.
Descriptors: cysts developmental stages, disease models, drinking water, experimental infection, infectivity, mathematical models, ultraviolet radiation, *Cryptosporidium*, *Giardia*, *Giardia muris*, mice.

Croson, W.B., W.S. Hunter, R. Sivanesan, and A. Bartke (1998). **Reduced core temperature in Ames dwarf mice**. *FASEB Journal* 12(4): A120. ISSN: 0892-6638.
Descriptors: Ames dwarf mice, core temperature, reduced, physiology, aging, thermoregulation.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 98, Part 1, April 18-22, 1998, San Francisco, California, USA.

Cutrera, R., M. Pedemonte, G. Vanini, D.P. Cardinali, and R.A. Velluti (1998). **Auditory deprivation modifies biological rhythms in the Syrian hamster**. *Journal of Sleep Research* 7(Supplement 2): 55. ISSN: 0962-1105.
Descriptors: Syrian hamster, auditory deprivation, biological rhythms, modifies.
Notes: Meeting Information: 14th Congress of the European Sleep Research Society, September 9-12, 1998, Madrid, Spain.

Cvijic, G., V. Janic Sibalic, M. Demajo, A. Karakasevic, V.M. Petrovic, and O.K. Ivanisevic Milovanovic (1997). **The effects of continuous light and darkness on the activity of monoamine oxidase A and B in the hypothalamus, ovaries and uterus of rats**. *Acta Physiologica Hungarica* 85(3): 269-276.
Descriptors: light, darkness, continuous, effects, uterus, ovaries, rats, monamine oxidase, hypothalamus.

Daly, G.H., J.M. Dileonardo, N.R. Balkema, and G.W. Balkema (2004). **The relationship between ambient lighting conditions, absolute dark-adapted thresholds, and rhodopsin in black and hypopigmented mice**. *Visual Neuroscience* 21(6): 925-934. ISSN: 0952-5238.
Abstract: Significant variation in absolute dark-adapted thresholds is observed both within and between strains of mice with differing ocular pigmentation levels. Differences in threshold within a single strain are related to

the Williams' photostasis effect, that is. photoreceptor rhodopsin levels are dependent upon ambient lighting conditions. To examine threshold differences among, strains, we equalized rhodopsin levels by maintaining albino mice (C2J/C2J) at 2 X 10-4 cd/m2 (dim light) and black mice at 2 X 102 cd/m2 (bright light). This resulted ill ocular rhodopsin levels for albino mice (albino-dim) of 494 +/- 11 pmoles/eye and rhodopsin levels for black mice (black-bright) of 506 +/- 25 pmoles/eye. For comparison, rhodopsin levels in black mice maintained in dim light are 586 +/- 46 pmoles/eye and 2 17 +/- 46 pinoles/eye in albino mice maintained in bright light. We found similar dark-adapted thresholds (6.-18 log cd/m2 vs. 6.47 log cd/m2) in albino and black mice with equivalent rhodopsin determined with a water maze test. This suggests that dark-adapted thresholds are directly related to rhodopsin levels regardless of the level of ocular melanin. The number of photoreceptors, photoreceptor layer thickness, and outer segment length did not differ significantly between albino (dark) and black mice (bright). These results demonstrate that the visual sensitivity defect found in hypopigmented animals is secondary to abnormal rhodopsin regulation and that hypopigmented animals have either, in improper input to the photostasis mechanism or that the photostasis mechanism is defective.

Descriptors: sensory reception, water maze test, laboratory techniques, absolute dark adapted thresholds, ambient lighting conditions, visual thresholds.

Danciger, M., J.E. Lyon, D.M. Worrill, J. Lem, C. Grimm, A. Wenzel, and C.E. Reme (2003). **Chromosomal loci of alleles that protect the mouse retina from light-induced damage.** *American Journal of Human Genetics* 73(5): 530. ISSN: 0002-9297.

Descriptors: mouse, retina, light induced damage, chromosomal loci, alleles, protect.

Notes: Meeting Information: 53rd Annual Meeting of the American Society of Human Genetics, November 04-08, 2003, Los Angeles, CA, USA.

Danciger, M., T. Rickabaugh, M.T. Matthes, D. Yasumura, M.M. Lavail, and D.B. Farber (1999). **Quantitative trait loci in the mouse influence the severity of light damage**. *IOVS* 40(4): S595.

Descriptors: light damage, mouse, trait loci, quantitative, influence, severity, meeting abstract.

Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 9-14, 1999, Fort Lauderdale, Florida, USA.

Dark, J. and D.R. Miller (1997). **Metabolic fuel privation in hibernating and awake ground squirrels.** *Physiology and Behavior* 63(1): 59-65. ISSN: 0031-9384.

Abstract: The nature of metabolic fuel utilization during hibernation and periodic arousal is not completely understood. 2-Deoxy-D-glucose (2DG) and mercaptoacetate (MA) were administered to hibernating ground squirrels. These drugs disrupt glucose and fatty acid oxidation, respectively. Telemetrically recorded body temperature (Tb) was analyzed to determine rate of rewarming from hibernation, duration of euthermia during periodic arousal, and proportion of animals arousing after treatments. 2DG given during hibernation significantly increased latency to regain euthermia, especially during the initial phase of rewarming (from first Tb > 10 degrees C to first Tb > 15 degrees C), without affecting the duration or other features of the ensuing euthermic period; MA did not affect rate of rewarming. MA treatment during hibernation affected thermoregulation after the animals aroused, including an increased duration of euthermia and maintenance of erratic patterns of Tb. The percentage of animals that aroused from hibernation was increased in a dose-dependent fashion by each drug. 2DG and MA treatments had little or no impact on nonhibernating ground squirrels in the cold. We suggest that glucose oxidation is important for rewarming from deep torpor; limited glucose availability cannot, however, support normal levels of euthermia when fatty acid oxidation is compromised. On the other hand, fatty acid oxidation may be less necessary for normal arousal from torpor, but critical for the maintenance of euthermia during the arousal phase.

Descriptors: ground squirrels, metabolic fuel, hibernating, awake, privation, arousal, drugs, thermoregulation.

Dauchy, R.T., L.A. Sauer, D.E. Blask, and G.M. Vaughan (1997). **Light contamination during the dark phase in "photoperiodically controlled" animal rooms: effect on tumor growth and metabolism in rats**. *Laboratory Animal Science* 47(5): 511-518. ISSN: 0023-6764.

NAL Call Number: 410.9 P94

Abstract: Enhanced neoplastic growth and metabolism have been reported in animals maintained in constant light (24L:0D) environment. Results from this laboratory indicate that tumor growth is directly dependent upon

increased ambient blood concentrations of arachidonic and linoleic acids, particularly linoleic acid. Tumor linoleic acid utilization and production if its putative mitogenic metabolite, 13-hydroxyoctadecadienoic acid (13-HODE), are suppressed by the circadian neurohormone melatonin, the production of which is itself regulated by light in all mammals. This study was performed to determine whether minimal light contamination (0.2 lux) in an animal room during an otherwise normal dark phase may disrupt normal circadian production of melatonin and affect tumor growth and metabolism. Animals of groups I (12L:12D), II (12L:12-h light-contaminated dark phase), and III (24L:0D) had plasma total fatty acid (TFA), linoleic acid (LA), and melatonin concentrations measured prior to tumor implantation; groups I and II had daily cycles in plasma TFA and LA values, whereas group III had constant values throughout the day. The integrated mean TFA and LA values for the entire day were similar in all groups. Although group-I animals had a normal nocturnal surge of melatonin (127.0 pg/ml) at 2400 h, the nocturnal amplitude was suppressed in group-II animals (16.0 pg/ml); circadian variation in melatonin concentration was not seen in group-III animals (7.4 pg/ml). At 12 weeks of age, rats had the Morris hepatoma 7288CTC implanted as "tissue-isolated" tumors grown subcutaneously. Latency to onset of palpable tumor mass for groups I, II, and III was 11, 9, and 5 days respectively. Tumor growth rates were 0.72 +/- 0.09, 1.30 +/- 0.15, and 1.48 +/- 0.17 g/d (mean +/- SD, n = 6/group) in groups I, II, and III respectively. Arteriovenous difference measurements for TFA and LA across the tumors were 4.22 +/- 0.89 and 0.83 +/- 0.18 (group I), 8.26 +/- 0.66 and 1.64 +/- 0.13 (group II).

Descriptors: rats, neoplasms, biological rhythms, melatonin, light regimes, blood plasma, blood lipids, linoleic acid, metabolites, darkness, acids, blood, blood composition, environmental control, environmental factors, fatty acids, heterocyclic compounds, hormones, indoles, lighting, mammals, organic acids, organic diseases, Rodentia, unsaturated fatty acids, scotoperiod, circadian rhythm.

Davis, R.R., M.L. Cheever, E.F. Krieg, and L.C. Erway (1999). **Quantitative measure of genetic differences in susceptibility to noise-induced hearing loss in two strains of mice**. *Hearing Research* 134(1-4): 9-15. ISSN: 0378-5955.

Descriptors: noise induced, hearing loss, mice, genetic differences, susceptibility, quantitative measure.

Davis, R.R., J.K. Newlander, X.B. Ling, G.A. Cortopassi, E.F. Krieg, and L.C. Erway (2001). **Genetic basis for susceptibility to noise-induced hearing loss in mice**. *Hearing Research* 155(1-2): 82-90. ISSN: 0378-5955.

Descriptors: mice, hearing loss, noise induced, genetic susceptibility, inbred strains, age related hearing loss, permanent threshold shift.

Daymude, J.A. and R. Refinetti (1999). **Phase-shifting effects of single and multiple light pulses in the golden hamster**. *Biological Rhythm Research* 30(2): 202-215. ISSN: 0929-1016.

Descriptors: hamster, light pulses, single, multiple, phase shifting, effects.

De Jesus, R. and Z. Quintero (2001). **Influencia de diferentes niveles de intensidad de la luz sobre algunos parametros reproductivos en ratones NMRI. [Influence of different levels of light intensity on some reproductive parameters in NMRI mice].** *Revista Cientifica, Facultad De Ciencias Veterinarias, Universidad Del Zulia* 11(5): 403-407. ISSN: 0798-2259.

Abstract: In the Animal House at Los Andes University, Merida, Venezuela, an experiment was run to determine if differences in light intensity levels found along shelves where reproductive mice are kept has any influence on reproductive parameters such as: birthing intervals, litter size at birth, number of young weaned, and fertility levels (percentages). The study was carried out utilizing the NMRI mice that had been in reproduction in this biological facility since 1995. Forty mating pairs that mated monogamously from this genetic block were used. The animals were maintained at an environmental temperature of 22+or-3 degrees C and a relative humidity of 75+or-5% with a lighting cycle of 10:14 h (light:dark). They were fed a commercial food concentrate (Super S brand) and water ad libitum. The artificial light used was fluorescent (40Wx8 tubes/room in sets of two tubes). The rack of study shelves was situated under one of the sets of tubes. The light intensity was measured by placing light-meters in each shelf box with no animals present but with litter boxes, food grates and water sources, in the same positions as when animals are present. ANOVA showed a significant difference (P<0,05) in the intensities of light measured. With regard to reproductive parameters studied, significant differences were observed (P<0,05) at different light levels. The results indicated that reproductive parameters are significantly affected by variation in light intensity.

Descriptors: environmental factors, fluorescent light, light intensity, reproduction, reproductive performance, mice.
Language of Text: Spanish with an English summary.

De Sousa Pereira, A., A.P. Aguas, N.R. Grande, J. Mirones, E. Monteiro, and N.A.A. Castelo Branco (1999). **The effect of chronic exposure to low frequency noise on rat tracheal epithelia**. *Aviation Space and Environmental Medicine* 70(3, Section 2): A86-A90.
Descriptors: rat, exposure, low frequency noise, chronic, effect, tracheal epithelia.

De Sousa Pereira, A., N.R. Grande, E. Monteiro, M.S.N. Castelo Branco, and N.A.A. Castelo Branco (1999). **Morphofunctional study of rat pleural mesothelial cells exposed to low frequency noise**. *Aviation Space and Environmental Medicine* 70(3, Section 2): A78-A85.
Descriptors: low frequency noise, exposed, pleural mesothelial cells, morphfunctional study.

Debow, S. and F. Colbourne (2003). **Brain temperature measurement and regulation in awake and freely moving rodents.** *Methods (Orlando)* 30(2): 167-171. ISSN: 1046-2023.
Descriptors: rodents, free moving, brain temperature, regulation, measurement, awake, ischemic brain injury, hyperthermia, models.

Decoursey, P.J., S. Pius, C. Sandlin, D. Wethey, and J. Schull (1998). **Relationship of circadian temperature and activity rhythms in two rodent species**. *Physiology and Behavior* 65(3): 457-463. ISSN: 0031-9384.
Descriptors: rodent species, activity rhythms, circadian temperatures, relationship.

Demas, G.E. and R.J. Nelson (1998). **Photoperiod, ambient temperature, and food availability interact to affect reproductive and immune function in adult male deer mice (*Peromyscus maniculatus)***. *Journal of Biological Rhythms* 13(3): 253-262. ISSN: 0748-7304.
Descriptors: deer mice, adult, male, ambient temperature, photoperiod, food availability, reproductive, immune, function, affect, energy availability.

Devarajan, K. and B. Rusak (2004). **Oxytocin levels in the plasma and cerebrospinal fluid of male rats: effects of circadian phase, light and stress**. *NeuroScience Letters* 367(2): 144-147. ISSN: 0304-3940.
Descriptors: rats, male, oxytocin levels, plasma, cerebral spinal fluid, light, stress, circadian phase, effects, social behavior, reproduction.

Deveci, D. and S. Egginton (2002). **The effects of reduced temperature and photoperiod on body composition in hibernator and non-hibernator rodents**. *Journal of Thermal Biology* 27(6): 467-478. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Abstract: We examined the differential change in body composition in response to a gradual reduction in both environmental temperature and photoperiod to mimic seasonal fluctuations in the wild (summer-winter transition), from ambient to 5 degrees C and 1:23 light:dark for 8 weeks. In contrast to acute cold exposure used in previous studies, cold-acclimated rats showed an initial increase in growth rate relative to normothermic controls, possibly due to cold-stimulated hyperphagia. In hamsters, maintenance of growth rate during initial cold exposure reflects the intrinsic high oxidative capacity, while subsequent cessation of growth is consistent with the preparation for hibernation. Cold-induced atrophy of skeletal muscles coincided with increased capacity for non-shivering thermogenesis (NST) associated with a greater mass of brown adipose tissue (BAT). Cardiac hypertrophy may compensate for an increase in total peripheral resistance and/or work load of the heart in both species (40 and 20%, respectively), while hypertrophy of the lungs (20 and 40%) and diaphragm muscle (7 and 40%) was consistent with increased ventilation associated with a cold-induced increase in basal metabolic rate. Gonadal atrophy in hamsters (160%) may be an energy saving strategy during the nonreproductive season, while maintenance of other endocrine gland masses (thyroid, adrenal, pineal) reflects the continued importance of hormonal regulation of homeostasis. The interspecific differences appear to accommodate the increased demands of shivering thermogenesis (skeletal muscle hypertrophy) or NST (BAT, diaphragm) in rats and hamsters, respectively. Those systems representing cardiovascular and metabolic control completed their adaptation quickly (within 4-week cold acclimation), while the respiratory and reproductive

systems continued to respond to a further 4-week exposure. This differential time course may reflect the relative strength of selection pressure on these systems for the process of cold acclimation.
Descriptors: acclimatization, atrophy, body composition, environmental temperature, growth rate, hibernation, hyperphagia, hypertrophy, photoperiod, seasonal variation, selection pressure, stress, stress response, hamsters, rats, rodents.

Drazen, D.L., L.J. Kriegsfeld, and R.J. Nelson (1999). **Effects of photoperiod, temperature, and torpor on immune function in Siberian hamsters**. *Society for Neuroscience Abstracts* 25(1-2): 1189. ISSN: 0190-5295.
Descriptors: photoperiod, temperature, torpor, hamsters, immune function, effects.
Notes: Meeting Information: 29th Annual Meeting of the Society for Neuroscience, October 23-28, 1999, Miami Beach, Florida, USA.

Drela, N., E. Kozlowska, P. Szczypiorski, K. Izdebska Szymona, and A. Eberhardt (1999). **Laser light irradiation effect on mouse thymocytes and spleen lymphocytes**. *Central European Journal of Immunology* 24(1): 36-43.
Descriptors: laser light, irradiation, mouse, thymocytes, spleen lymphocytes, effect.

Ducommun, P., P.A. Rueux, A. Kadouri, U. Von Stockar, and I.W. Marison (2002). **Monitoring of temperature effects on animal cell metabolism in a packed bed process.** *Biotechnology and Bioengineering* 77(7): 838-842. ISSN: 0006-3592.
NAL Call Number: 381 J8224
Abstract: Animal cell (Chinese Hamster Ovary) concentration was determined on-line in a packed bed process using dielectric spectroscopy. This enabled the evaluation of the effect of temperature on specific metabolic rates during 3 months of continuous culture. The effect of low cultivation temperature on cell growth and metabolism was monitored, and the data were used for process development. At 37 degrees C cells grew exponentially with a specific growth rate of 0.038 d-1 and specific glucose uptake and lactate production rates increased continually. Reduction of the temperature to 33.5 degrees C resulted in a lowering of these metabolic rates while having no effect on cell proliferation. Subsequent reduction of the temperature to 32 degrees C resulted in stabilization of the cell concentration at a high density (3.6 x 10(7) cell per mL of packed bed). In addition, the specific production rate of the protein of interest increased by a factor of 6 compared to the value at 37 degrees C. During the stationary phase at 32 degrees C, all other specific metabolic rates could be controlled to low and constant levels.
Descriptors: animal cell, hamster, ovary, temperature, effect, concentration, metabolic rates.

Dudley, V.J., N. Vidula, M. Kuzmanovic, and V. Sarthy (2003). **Changes in glutamate transporter expression following light damage to mouse retina**. *ARVO Annual Meeting Abstract Search and Program Planner*: Abstract No. 2269.
Descriptors: mouse, retina, light damage, glutamate transporter, changes, photoreceptor degeneration, constant light exposure.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 04-08, 2003, Fort Lauderdale, FL, USA.

Eifler, M.A. and N.A. Slade (1998). **Activity patterns in relation to body mass and ambient temperature among overwintering cotton rats (*Sigmodon hispidus*)**. *Canadian Journal of Zoology* 76(4): 668-672. ISSN: 0008-4301.
Abstract:
Descriptors: cotton rats, ambient temperature, body mass, activity patterns, over wintering, Kansas.

Emmerich, E., F. Richter, U. Reinhold, V. Linss, and W. Linss (2000). **Effects of industrial noise exposure on distortion product otoacoustic emissions (DPOAEs) and hair cell loss of the cochlea: long term experiments in awake guinea pigs**. *Hearing Research* 148(1-2): 9-17. ISSN: 0378-5955.
Descriptors: guinea pigs, industrial noise exposure, otoacoustic emissions, hair cell loss, cochlea, continuous industrial noise, impulse noise.

Emmerich, E., F. Richter, W. Meissner, and H.G. Dieroff (2000). **The effect of impulse noise exposure on distortion**

product otoacoustic emissions in the awake guinea pig. *European Archives of Oto Rhino Laryngology* 257(3): 128-132. ISSN: 0937-4477.
Descriptors: impulse noise exposure, effect, otoacoustic emissions distortion, awake guinea pigs.

Feoktistova, N.Y. and I.G. Meschersky (2005). **Seasonal changes in desert hamster *Phodopus roborovskii* breeding activity**. *Acta Zoologica Sinica* 51(1): 1-6. ISSN: 0001-7302.
Abstract: Data on desert hamster *Phodopus roborovskii* winter activity and seasonal patterns of reproduction are scarce. During 9 years we maintain a colony of desert hamsters under natural temperature and light regimes. These natural conditions suggest that the data on breeding activity may be in a good accordance with that in the wild. None of observed animals showed signs of torpor or hibernation in winter - even at about 40 degrees C below zero. The first peak of breeding (2.4 litters born per 10 pairs and 3.5 pups per litter in average) occurs in April and the second one (2.9 - 2.6 litters per 10 pairs and 3.9 - 3.6 pups per litter in average) in June - July. In autumn and early winter, the intensity of breeding declines to 0.1 - 0.4 litters per 10 pairs but does not cease completely. All adult males have visible testes and all adult females have opened vaginas entries through the year. The averaged males' plasma level of testosterone, being maximal in summer, declines in autumn and early winter, but single hamsters keep their testosterone high even under shortest photoperiod and during cold months. In spring, average testosterone level significantly increases but does not reach summer values.
Descriptors: behavior, endocrine system, chemical coordination and homeostasis, reproductive system, reproduction, seasonal change, winter activity, breeding activity.

Field, R.B., R.S. Redman, A.M. Calloway, and W.J. Goldberg (1999). **Effect of 24 hours light on circadian rhythms of secretory enzymes and morphology of rat Von Ebner's glands**. *Archives of Oral Biology* 44(11): 953-960.
Descriptors: light, 24 hours, circadian rhythms, secretory enzymes, morphology, Von Ebner's glands, rat.

Florez Duquet, M., E.D. Peloso, and E. Satinoff (1999). **Circadian rhythms of selected and body temperature in young and old rats in a thermal gradient**. *FASEB Journal* 13(5, Part 2): A744. ISSN: 0892-6638.
Descriptors: temperature, circadian rhythms, rats, young, old, thermal gradient.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 99, April 17-21, 1999, Washington, D.C., USA.

Florez Duquet, M., E.D. Peloso, and E. Satinoff (1998). **Ambient temperature and fever in young and old rats**. *Society for Neuroscience Abstracts* 24(1-2): 367. ISSN: 0190-5295.
Descriptors: ambient temperature, rats, young, old, fever.
Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 1, November 7-12, 1998, Los Angeles, California, USA.

Foden, N.D., G. Lees, and R.M. Jones (1998). **Effects of temperature and isoflurane GABAA receptor function in cultured rat neurones: contribution to reduced anaesthetic requirement**. *British Journal of Anaesthesia* 80(4): 547. ISSN: 0007-0912.
Descriptors: rat neruones, temperature, isoflurane, effects, GABAA receptor function, anesthetic.
Notes: Meeting Information: Proceedings of the Anaesthetic Research Society, November 20-22, 1997, London, England, UK.

Foster, R.G. and C. Helfrich Forster (2001). **The regulation of circadian clocks by light in fruitflies and mice**. *Philosophical Transactions of the Royal Society of London Series B, Biological Sciences* 356(1415): 1779-1789. ISSN: 0962-8436.
Abstract: A circadian clock has no survival value unless biological time is adjusted (entrained) to local time and, for most organisms, the profound changes in the light environment provide the local time signal (zeitgeber). Over 24 h, the amount of light, its spectral composition and its direction change in a systematic way. In theory, all of these features could be used for entrainment, but each would be subject to considerable variation or 'noise'. Despite this high degree of environmental noise, entrained organisms show remarkable precision in their daily activities. Thus, the photosensory task of entrainment is likely to be very complex, but fundamentally similar for all organisms. To test this hypothesis, we compare the photoreceptors that mediate entrainment in both flies and mice, and assess their degree of convergence. Although superficially different,

both organisms use specialized (employing novel photopigments) and complex (using multiple photopigments) photoreceptor mechanisms. We conclude that this multiplicity of photic inputs, in highly divergent organisms, must relate to the complex sensory task of using light as a zeitgeber.
Descriptors: circadian rhythm, light, photoreceptors, pigments, reviews, *Diptera*, mice.

Freire Santos, F., A.M. Oteiza Lopez, C.A. Vergara Castiblanco, and M.E. Ares Mazas (1999). **Effect of salinity, temperature and storage time on mouse experimental infection by *Cryptosporidium parvum*.** *Veterinary Parasitology* 87(1): 1-7. ISSN: 0304-4017.
NAL Call Number: SF810.V4
Descriptors: *Cryptosporidium parvum*, mice, cryptosporidiosis, experimental infections, oocysts, infectivity, pathogenicity, environmental factors, salinity, temperature, storage, duration, factorial analysis.

Frenzilli, G., P. Lenzi, V. Scarcelli, F. Fornai, A. Pellegrini, P. Soldani, A. Paparelli, and M. Nigro (2004). **Effects of loud noise exposure on DNA integrity in rat adrenal gland**. *Environmental Health Perspectives* 112(17): 1671-1672. ISSN: 0091-6765.
Descriptors: rat, adrenal gland, loud noise exposure, effects, DNA integrity, cellular damage, environmental stressor, acoustic effects.

Funk, D. and S. Amir (1999). **Conditioned fear attenuates light-induced suppression of melatonin release in rats**. *Physiology and Behavior* 67(4): 623-626. ISSN: 0031-9384.
Descriptors: rats, conditioned fear, attenuates, light induced suppression, melatonin release.

Gantebein, M., L. Attolini, and B. Bruguerolle (1998). **Nicorandil affects diurnal rhythms of body temperature, heart rate and locomotor activity in rats**. *European Journal of Pharmacology* 346(2-3): 125-130. ISSN: 0014-2999.
Descriptors: rats, body temperature, heart rate, locomotor activity, diurnal rhythms, nicorandil, affects, surgery.

Garcia Allegue, R., P. Lax, A.M. Madariaga, and J.A. Madrid (1999). **Locomotor and feeding activity rhythms in a light-entrained diurnal rodent, *Octodon degus***. *American Journal of Physiology* 277(2): R523-R531. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: The wheel running (WR) and feeding activity (FA) of *Octodon degus*, a new laboratory rodent characterized by its diurnal habits, were recorded under different lighting conditions. Under 12:12-h light-dark (LD 12:12) cycles, WR activity exhibited a crepuscular pattern with 2 peaks, M and E, associated with "dawn" and "dusk", respectively. In both cases, an anticipatory activity was patent, suggesting that, beside the masking effect of LD transitions, both peaks have an endogenous origin. This pattern, which was also observed under a skeleton photoperiod (LD 0.5:11.5), became unimodal after LD 0.5:23.5 and constant darkness (DD) exposure. Simultaneously, FA showed an arrhythmic pattern in most animals, especially under DD, when none of the animals exhibited a significant circadian rhythm. The existence of 2 groups of oscillators, or 2 oscillators, would explain most properties of the WR rhythms noted in this species. It is concluded that the degu's temporal feeding strategy seems mainly arrhythmic, whereas its WR pattern is driven by a strongly circadian bimodal rhythm.
Descriptors: feeding, circadian rhythm, photoperiod, feeding behavior, laboratory animals.

Gautier, H. (2000). **Body temperature regulation in the rat**. *Journal of Thermal Biology* 25(4): 273-279. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Descriptors: rat, body temperature regulation, respiratory heat dissipation, breathing pattern, cold, heat, heat loss index, metabolic rate, ventilation.

Gebczynski, A.K. and J.R.E. Taylor (2004). **Daily variation of body temperature, locomotor activity and maximum nonshivering thermogenesis in two species of small rodents**. *Journal of Thermal Biology* 29(2): 123-131. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6

Descriptors: small rodents, daily variation, body temperature, locomotor activity, nonshivering, thermogenesis, circadian rhythms.

Genin, F. and M. Perret (2003). **Daily hypothermia in captive grey mouse lemurs (*Microcebus murinus*): effects of photoperiod and food restriction.** *Comparative Biochemistry and Physiology, Part B, Biochemistry and Molecular Biology* 136B(1): 71-81. ISSN: 1096-4959.
NAL Call Number: QP501.C6
Abstract: The grey mouse lemur (*Microcebus murinus*) is a small nocturnal primate exhibiting daily torpor. In constant ambient temperature (22-24 (degree)C), body temperature (Tb) and locomotor activity were monitored by telemetry in animals exposed to short (SP: 10 h light/day) or long (LP: 14 light/day) photoperiods. They were first fed ad libitum for 8 days and then subjected to 80% restricted feeding for 8 more days. During ad libitum feeding, locomotor activity was significantly lower in SP-exposed animals than in LP-exposed animals. Whatever the photoperiod, animals entered daily hypothermia within the first hours following the light onset. Depth of daily hypothermia increased irregularly under SP exposure, whereas minimal daily Tb was constantly above 35 (degree)C under LP exposure. After the transfer from long photoperiod to short photoperiod corresponding to the induction of seasonal fattening, locomotor activity and depth of controlled daily hypothermia did not change significantly. In contrast, food restriction led to a significant increase in locomotor activity and in frequency of daily torpor (Tb<33 (degree)C) and body temperature reached minimum values averaging 25 (degree)C. However, SP-exposed animals exhibited lower minimal daily Tb and higher torpor duration than LP exposed animals. Therefore, daily torpor appears as a rapid response to food restriction occurring whatever the photoperiod, although enhanced by short photoperiod.
Descriptors: seasonal variation, locomotion, body temperature.

Gesi, M., F. Fornai, P. Lenzi, G. Natale, P. Soldani, and A. Paparelli (2001). **Time-dependent changes in adrenal cortex ultrastructure and corticosterone levels after noise exposure in male rats**. *European Journal of Morphology* 39(3): 129-135. ISSN: 0924-3860.
Descriptors: male rats, noise exposure, adrenal cortex, corticosterone levels, time dependent changes, stressful stimulus, endocrine dysfunctions.

Gesi, M., F. Fornai, P. Lenzi, P. Soldani, M. Ferrucci, and A. Paparelli (2000). **Ultrastructural localization of calcium deposits in rat myocardium after loud noise exposure**. *Journal of Submicroscopic Cytology and Pathology* 32(4): 585-590. ISSN: 1122-9497.
Descriptors: rat, calcium deposits, myocardium, loud noise exposure, ultrastructural alterations, noise induced, morphological alterations.

Ghosh, D., S. Ghosh, S. Chattopadhyay, and J. Debnath (2000). **Effect of noise exposure (85 DB) on testicular adrenocortical steroidogenic key enzymes, acid and alkaline phosphatase activities of sex organs in mature albino rats**. *Journal of Environmental Sciences (China)* 12(3): 286-289. ISSN: 1001-0742.
Descriptors: albino rats, noise exposure, effects, sex organs, reproductive system, reproduction, biochemical effects, reproductive effects, testicular, adrenocortical, activities.

Giblin, F.J., V.R. Leverenz, V.A. Padgaonkar, N.J. Unakar, L. Dang, L.R. Lin, M.F. Lou, V.N. Reddy, D. Borchman, and J.P. Dillon (2002). **UVA light in vivo reaches the nucleus of the guinea pig lens and produces deleterious, oxidative effects.** *Experimental Eye Research* 75(4): 445-458. ISSN: 0014-4835.
Descriptors: guinea pig, UVA light, lens, nucleous, effects, oxidative, ultraviolet light, harmful nature, cataract formation.

Godsil, B.P. and M.S. Fanselow (2001). **Learned and unlearned fear reactions to bright light in the rat**. *Society for Neuroscience Abstracts* 27(1): 1400. ISSN: 0190-5295.
Descriptors: rat, bright light, fear reactions, learned, unlearned, defensive, freezing, dark, sensory damage, reactions.
Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Godsil, B.R. and M.S. Fanselow (2004). **Light stimulus change evokes an activity response in the rat**. *Learning and Behavior* 32(3): 299-310. ISSN: 1543-4494.
Descriptors: rat, light changes, stimulus, activity response, bright light, fear, evoked defensive responses.

Goksoy, C. and R. Utkucal (2000). **Binaural interaction component and white-noise enhancement in middle latency responses: differential effects of anaesthesia in guinea pigs**. *Experimental Brain Research* 130(3): 410-414. ISSN: 0014-4819.
Descriptors: white noise, guinea pigs, latency, responses, anesthesia, effects.

Gordon, C.J. (2004). **Effect of cage bedding on temperature regulation and metabolism of group-housed female mice.** *Comparative Medicine* 54(1): 63-68. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Mice are generally housed in groups in cages lined with an absorbent bedding material at ambient temperature (Ta) of 20 to 24+C, which is comfortable for humans, but cool for mice. Little is known about the effects of bedding on thermoregulation of group-housed mice. To determine whether bedding material affects thermoregulatory stability, core temperature (Tc) and motor activity (MA) were monitored by use of radiotelemetry in female CD-1 mice housed in groups of four in a standard plastic cage at Ta of 23.5+C. Ten groups were tested using three types of bedding material: a deep layer of heat-treated wood shavings (DWS) that allowed mice to burrow, a thin layer of wood shavings (TWS) just covering the bottom of the cage floor, or a layer of beta chips (BC). Mice could not burrow in the TWS or BC. The Tc and MA were affected by bedding type and time of day. Mice housed with DWS maintained a significantly higher Tc (deltaTc = 1.0+C) during the day, compared with that in mice housed with TWS and BC. During the night, Tc and MA were high in all groups and there was no effect of bedding type on Tc or MA. Effect of bedding on metabolic rate (MR) was estimated by measuring oxygen consumption for six hours in groups of four mice at Ta of 23.5+C. The Tc was significantly reduced in mice housed on the TWS and BC, but MR was unaffected by bedding type. There was a trend for higher MR in mice on BC. Compared with use of other bedding materials, housing mice on DWS and comparable materials provides an environment to burrow, thus reducing heat loss. The effects of bedding material on temperature regulation may affect rodent health and well being. Moreover, bedding will affect variability in toxicologic and pharmacologic studies whenever an endpoint is dependent on body temperature.
Descriptors: laboratory animals, group housing, thermoregulation, litter bedding, ambient temperature, body temperature, mice, temperature regulation, housing, effect, female.

Gordon, C.J., P. Becker, and J.S. Ali (1998). **Behavioral thermoregulatory responses of single- and group-housed mice.** *Physiology and Behavior* 65(2): 255-62. ISSN: 0031-9384.
Abstract: The ambient temperature (Ta) to house and study laboratory rodents is critical for nearly all biomedical studies. The ideal Ta for housing rodents and other animals should be based on their thermoregulatory requirements. However, fundamental information on the behavioral thermoregulatory responses of single- and group-housed rodents is meager. To address this issue, thermoregulatory behavior was assessed in individual and groups of CD-1 mice housed in a temperature gradient. Mice were housed in groups of five or individually while selected Ta and motor activity were monitored. Single- and group-housed mice displayed a circadian oscillation of selected Ta and motor activity with relatively warm T(a)s of approximately 29 degrees C selected during the light phase; during the dark phase selected Ta was reduced by 4 degrees C, whereas motor activity increased. Selected Ta of aged (11 months old) mice housed individually was approximately 1.0 degrees C warmer than the group-housed mice. Thermal preference of younger mice (2 months old) was similar for single- and group-housed animals. The operative Ta of mice housed in standard facilities was estimated by measuring the cooling rate of "phantom" mice modeled from aluminum cylinders. The results show that the typical housing conditions for single- and group-housed mice are cooler than their Ta for ideal thermal comfort.
Descriptors: behavior, animal physiology, body temperature regulation physiology, social isolation, aging physiology, circadian rhythm physiology, housing, animal, mice, motor activity physiology, temperature, time factors.

Gordon, C.J., Y. Yang, and S. Ramsdell (1998). **Behavioral thermoregulatory response to maitotoxin in mice.** *Toxicon* 36(10): 1341-1347. ISSN: 0041-0101.

NAL Call Number: 391.8 T66
Descriptors: mice, dinophyta, toxins, intraperitoneal injection, body temperature regulation, body temperature, animal behavior, air temperature, hypothermia, environmental temperature, thermoregulatory behavior, motor activity, core temperature.

Gordon, C.J., P. Becker, P. Killough, and B. Padnos (2000). **Behavioral determination of the preferred foot pad temperature of the mouse**. *Journal of Thermal Biology* 25(3): 211-219. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Descriptors: mouse, foot pad, preferred temperature, behavioral determination.

Gordon, C.J., E.T. Puckett, and B.K. Padnos (2001). **Noninvasive, continuous measurement of rat tail skin temperature by radiotelemetry**. *FASEB Journal* 15(4): A418. ISSN: 0892-6638.
Descriptors: rat, tail skin, temperature, noninvasive, monitoring, radiotelemetry, thermoregulatory status, stress, unrestrained.
Notes: Meeting Information: Annual Meeting of the Federation of American Societies for Experimental Biology on Experimental Biology 2001, March 31-April 04, 2001, Orlando, Florida, USA.

Gorman, M.R., J.A. Elliott, and J.A. Evans (2003). **Plasticity of hamster circadian entrainment patterns depends on light intensity.** *Chronobiology International* 20(2): 233-48. ISSN: 0742-0528.
Abstract: The multiple oscillatory basis of the mammalian circadian pacemaker is adduced by, among other phenomena, the occurrence of split locomotor activity rhythms in rodents after prolonged exposure to constant light. More recently, split rhythms entrained to a 24h light:dark:light:dark cycle have been documented following scheduled access of hamsters to a novel running wheel or by photoperiod manipulations alone. Because the incidence of constant light-induced splitting depends on light intensity, the role of this variable was assessed in this new splitting paradigm. Male Syrian hamsters, entrained to a 14h light:10h dark cycle, were transferred to individual running wheel cages 7h after light onset. Transfer coincided with the beginning of the scotophase of a new photocycle alternating between 5h of relative dark and 7h of light. For four weeks bright photophases (approximately 350 lux) were alternated with either dim (< 0.1 lux) or completely dark (0 lux) scotophases. An additional group received moderate intensity photophases (approximately 45 lux) paired with dim scotophase illumination. For an additional four weeks, all hamsters were exposed to the same bright:dim light:dark cycle. Dim light in the scotophase significantly increased the incidence of split activity rhythms relative to that observed with completely dark scotophases. Overall wheel-running rates and activity induced by a cage change were also increased in dim light-exposed animals. Group differences largely disappeared four weeks later when hamsters previously maintained in completely dark scotophases were exposed to dim scotophases. Photophase light intensity did not affect the overall incidence of splitting, but influenced the timing of activity in the afternoon scotophase. The effects of dim illumination may be mediated in part via enhanced locomotor responses to transfer to a new cage or by changes in coupling interactions between component oscillators.
Descriptors: circadian rhythm physiology, circadian rhythm radiation effects, *Mesocricetus* physiology, hamsters, light, motor activity physiology, motor activity radiation effects, photoperiod.

Gorrand, J.M., J. Cluzel, S. Lelong, and M. Doly (2001). **Retinal sensitivity and backscattering from rods in Long Evans rats subjected to damaging light**. *IOVS* 42(4): S64.
Descriptors: Long Evans rats, retinal sensitivity, backscattering, rods, light damage, lighting, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 29-May 04, 2001, Fort Lauderdale, Florida, USA.

Grande, N.R., A.P. Aguas, A. De Sousa Pereira, E. Monteiro, and N.A.A. Castelo Branco (1999). **Morphological changes in rat lung parenchyma exposed to low frequency noise**. *Aviation Space and Environmental Medicine* 70(3, Section 2): A70-A77.
Descriptors: low frequence noise, rat, lung parenchyma, morphological changes.

Grimm, C., A. Wenzel, F. Hafezi, and C.E. Reme (2000). **Gene expression in the mouse retina: the effect of damaging light**. *Molecular Vision* 6(34): 252-260. ISSN: 1090-0535.

Online: http://www.molvis.org/molvis/
Descriptors: mouse, retina, damaging light levels, effect, gene expression, photoreceptors, apoptotic cell death, retinal degeneration, light exposure.
Notes: Cited April 23, 2001.

Guenther, K., S. Hauptfleisch, and B. Lemmer (2003). **Influence of a light pulse on peripheral clock gene expression in rats.** *Naunyn Schmiedeberg's Archives of Pharmacology* 367(Supplement 1): R90. ISSN: 0028-1298.
Descriptors: rats, peripheral clock gene expression, light pulse, influence.
Notes: Meeting Information: 44th Spring Meeting of the Deutsche Gesellschaft fuer Experimentelle und Klinische Pharmakologie und Toxikologie and the 20th Meeting of the Gesellschaft fuer Umwelt Mutationsforschung, March 17-20, 2003, Mainz, Germany.

Gunduz, B. (2002). **Effects of photoperiod and temperature on growth and reproductive organ mass in adult male Mongolian gerbils, *Meriones unguiculatus.*** *Turkish Journal of Biology* 26(2): 77-82. ISSN: 1300-0152.
Abstract: Rates of growth and sexual maturation of Mongolian gerbils vary in response to photoperiod. Previous work has shown that the responses of the testes and body weight of juvenile and adult gerbils are influenced not only by the photoperiods but also by other factors. The present work sought to determine if Mongolian gerbils alter body mass, body composition and/or reproductive organ mass in response to different photoperiods and temperatures. Male Mongolian gerbils were raised under long (14 h Light) or short (10 h Light) photoperiods from 26 days of age. Photoperiods did not affect body mass and body length. Temperature affected body mass only under 10 h L with animals housed at 10 degrees C being significantly lighter than gerbils housed at 20 degrees C. Temperature did not affect the length of the body. Changes in body mass in response to photoperiod and/or temperature exposure were primarily due to the deposition or loss of fat-free dry mass and water. The mass of the reproductive organs (testes and seminal vesicles) was significantly decreased in gerbils housed under 10 h L. The mass of reproductive organs at 86 or 160 days of age was not affected by the temperature. Taken together, these results suggest that male Mongolian gerbils use photoperiodic information and temperature to change their body and reproductive organ mass.
Descriptors: body length, body mass index, growth rate, photoperiod, sexual maturity, temperature, testes, vesicular gland, water, gerbils, *Meriones unguiculatus*.
Language of Text: Turkish summary.

Gunduz, B. (2002). **Daily rhythm in serum melatonin and leptin levels in the Syrian hamster (*Mesocricetus auratus*).** *Comparative Biochemistry and Physiology, Part A, Molecular & Integrative Physiology* 132A(2): 393-401. ISSN: 1095-6433.
NAL Call Number: QP1.C6
Abstract: Melatonin is produced and secreted by the pineal gland in a rhythmic manner; circulating levels are high at night and low in the day. Leptin is a hormone secreted by adipocytes as a product of the obese gene and plays an important role in regulating body energy homeostasis and reproductive function in rodents and humans. The present study was conducted to examine daily fluctuations in serum levels of melatonin and leptin in Syrian hamster. We measured serum leptin and melatonin levels by ELISA in (a) intact and pinealectomized (pinx) male hamsters kept under long daylight conditions [14 h of light (14L)]; (b) intact and pinx hamsters under short daylight (10L); and (c) intact hamsters in constant light (24L). Blood samples were obtained every 2 h throughout a 24-h period. Statistically significant circadian variations were found in both melatonin and leptin profiles. Their relationship was inverse, i.e. when melatonin was high in the serum, leptin was comparably low. These results suggest that there is a rhythm in leptin levels in the adult male Syrian hamster and this rhythm is pineal gland (melatonin) and/or photoperiod dependent.
Descriptors: photoperiod, hamster, melatonin, leptin, body temperature, circadian variations.

Guo, H., J. Mccormick, D. Wilkinson, Y. Wu, and J.P. Steiner (2003). **Cyclophilin ligands protect against light-induced retinal degeneration in mice.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 816.8.
Online: http://sfn.scholarone.com
Descriptors: mice, light induced retinal degeneration, cyclophilins ligands, protect, retinal photoreceptors, apoptosis.

Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Haim, A. (2001). **Comparative body temperature daily rhythms in rodents: do they have an ecological significance?** *Chronobiology International* 18(6): 1110-1111. ISSN: 0742-0528.
Descriptors: rodents, body temperature, daily rhythms, comparative, ecological significance.
Notes: Meeting Information: 25th Meeting of the International Society of Chronobiology, Kemer, Turkey.

Haim, A., R.J. Van Aarde, and N. Zisapel (1998). **Body temperature daily rhythms in the striped mouse *Rhabdomys pumilio*: the effects of alpha and beta blockade**. *Physiology and Behavior* 63(5): 889-893. ISSN: 0031-9384.
Descriptors: striped mouse, body temperature, daily rhythms, blockade, alpha, beta, light, dark, photoperiod, ambient temperature.

Hale, K.D., D.A. Weigent, D.K. Gauthier, R.N. Hiramoto, and V.K. Ghanta (2003). **Cytokine and hormone profiles in mice subjected to handling combined with rectal temperature measurement stress and handling only stress**. *Life Sciences* 72(13): 1495-1508. ISSN: 0024-3205.
Abstract: Stress is known to either up- or down-regulate immunity. In this study, mice were subjected to handling combined with rectal temperature measurement (RTM) stress or handling only stress. We investigated whether there were any significant differences in the effect of handling combined with RTM and handling only on NK cell activity, serum cytokine (IL-1 beta , IL-6, and TNF- alpha) and ACTH and beta -endorphin levels, and splenic cytokine (IL-1 beta , IL-6, TNF- alpha , IFN- alpha , and IFN- beta) levels. Circulating cytokines and hormones and splenic cytokine mRNA levels were measured in individual mice. NK cell activity was significantly increased in both stress groups when compared to the control group. Handling combined with RTM produced significantly increased serum levels of IL-1 beta , IL-6, and beta -endorphin. Serum IL-1 beta , ACTH, and beta -endorphin were elevated significantly in the handling only group. Splenic TNF alpha mRNA in both of the stress groups and IL-6 mRNA in handling only group decreased significantly. Our observations are supported by existing literature demonstrating that various stressors have differential effects on immune functions and the neuroendocrine hormones and cytokines, which regulate them.
Descriptors: body temperature, corticotropin, cytokines, endorphins, hormone secretion, hormones, immune system, immunological factors, interleukin 1, interleukin 6, natural killer cells, stress, tumour necrosis factor, mice.

Harris, R.B.S., J. Zhou, T. Mitchell, S. Hebert, and D.H. Ryan (2002). **Rats fed only during the light period are resistant to stress-induced weight loss**. *Physiology and Behavior* 76(4-5): 543-550. ISSN: 0031-9384.
Abstract: Repeated restraint stress (3 h/day for 3 days) causes a chronic down-regulation of body weight in rats. This study determined whether weight loss was influenced by the time of day that rats had access to food or that stress was applied. Groups of male Sprague-Dawley rats were fed a 40% kcal fat diet with food given ad libitum, only during the light phase or only during the dark phase. After 2 weeks of adaptation, rats within each feeding treatment were divided into four groups. One was exposed to repeated restraint at the start of the light phase, another was restrained at the start of the dark phase and the remaining groups were nonstressed controls for restrained rats. Body weight was significantly reduced in ad libitum- and dark-fed restrained rats, compared with nonstressed controls, from Day 2 of restraint, regardless of the time of day that they were stressed. There was no significant effect of restraint on weight change of light-fed rats. Food intake was inhibited by stress in ad libitum- and dark-fed rats, but it was not changed in light-fed rats. Serum corticosterone was increased by restraint in all rats irrespective of feeding schedule. This study demonstrates that stress-induced weight loss only occurs when rats have food available during their normal feeding period (dark phase) and is not determined by increased corticosterone release.
Descriptors: animal models, body weight, dark, feeding behavior, light, stress, weight reduction, rats.

Hascoet, M. and M. Bourin (1998). **A new approach to the light/dark test procedure in mice**. *Pharmacology Biochemistry and Behavior* 60(3): 645-653. ISSN: 0091-3057.
Descriptors: mice, light-dark test, anxiolytic agents, diazepam, computer integrated, strain differences, locomotor activity.

Hascoet, M., M. Bourin, and B.A. Dhonnchadha (2001). **The mouse light-dark paradigm: a review**. *Progress in Neuro Psychopharmacology and Biological Psychiatry* 25(1): 141-166. ISSN: 0278-5846.
Descriptors: mouse, light, dark, behavior, nervous system, neural coordination, stressors, rodents, anxiolytic, black and white test.

Hasegawa, H., T. Yazawa, H. Tanaka, M. Yasumatsu, M. Otokawa, and Y. Aihara (2000). **Effects of ambient light on body temperature regulation in resting and exercising rats**. *NeuroScience Letters* 288(1): 17-20. ISSN: 0304-3940.
Descriptors: rats, exercising, body temperature, ambient light, effects, temperature regulation, resting, light, darkness, thermoregulation.

Hernandez, E., P. Morales, P. Sierra, P. Rubsamen, K.G. Csaky, and S.W. Cousins (1998). **A mouse model for RPE injury based on blue light exposure**. *IOVS* 39(4): S392.
Descriptors: mouse, model, blue light exposure, RPE injury, sensory system, eye, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 10-15, 1998, Fort Lauderdale, Florida, USA.

Hiebert, S.M., E.K. Fulkerson, K.T. Lindermayer, and S.D. McClure (2000). **Effect of temperature on preference for dietary unsaturated fatty acids in the Djungarian hamster (*Phodopus sungorus*)**. *Canadian Journal of Zoology* 78(8): 1361-1368. ISSN: 0008-4301.
Abstract: Previous studies have shown that hibernators preparing for winter prefer a diet rich in unsaturated fat. This study was designed to determine if a daily heterotherm, the Djungarian hamster (*Phodopus sungorus*), shows a similar preference when given simultaneous access to two diets, one rich in saturated fat and the other rich in unsaturated fat. In two experiments, hamsters that had been exposed to short days for 8-10 weeks were exposed to 8 degrees C for 10 days. When half of these animals were moved to a warm environment (26-29 degrees C), they developed a significantly lower preference for the unsaturated diet than controls that remained at 8 degrees C (P<0.01). This difference in preference disappeared when the experimental group was returned to 8 degrees C (P=0.4). Although mean body temperature (Tb) was significantly lower (mean difference=0.35 degrees) in experimental animals in the cold environment, most animals did not enter daily torpor at any time during the experiment. Together, these results suggest that the large decreases in core Tb accompanying torpor, originally assumed to necessitate the incorporation of unsaturated fatty acids into cell membranes of hibernators and daily heterotherms, are not necessary to stimulate changes in food choice.
Descriptors: environmental temperature, feeding preferences, saturated fatty acids, unsaturated fatty acids, hibernation, wild animals, *Phodopus sungorus*, hamsters.
Language of Text: French summary.

Hiebert, S.M., K. Hauser, and A.J. Ebrahim (2003). **Djungarian hamsters exhibit temperature-dependent dietary fat choice in long days**. *Physiological and Biochemical Zoology* 76(6): 850-857. ISSN: 1522-2152.
Abstract: Previous studies have shown that whole-animal thermal responses of ectotherms and heterotherms (e.g., hibernators), both of which experience a wide range of body temperatures, are related to the saturation level of somatic lipids, which in turn can be influenced by the ratio of saturated and unsaturated fatty acids in the diet. This study demonstrates that Djungarian hamsters held in long days display ambient temperature-dependent choice of dietary fats, increasing their preference for saturated fats when ambient temperature increases (to 27 degrees C) and later reversing this preference when ambient temperature is returned to its original value (8 degrees C). Changes in percent contribution of the unsaturated and saturated diets in response to temperature were accomplished almost solely by changes in the amount of unsaturated diet consumed. Temperature-dependent fatty acid choice occurs at a stage in the annual cycle when Djungarian hamsters do not enter spontaneous daily torpor and therefore experience only small changes in core body temperature. These results suggest that temperature-dependent fatty acid choice may occur in a wide range of animals, including nonheterothermic endotherms.
Descriptors: body temperature, dietary fat, food preferences, saturated fatty acids, unsaturated fatty acids, hamsters.

Hildebrandt Eriksen, E.S., T. Christensen, and N.H. Diemer (2002). **Mild focal cerebral ischemia in the rat. The**

effect of local temperature on infarct size. *Neurological Research* 24(8): 781-788. ISSN: 0161-6412.
Descriptors: rat, cerebral ischemia, local temperature, effect, infarct size, infarct development.

Honma, S. and K.I. Honma (1999). **Light-induced uncoupling of multioscillatory circadian system in a diurnal rodent, Asian chipmunk**. *American Journal of Physiology* 276(5, Part 2): R1390-1396. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: light induced, uncoupling, circadian system, rodent, chipmunk, diurnal.

Hori, S., K. Hori, T. Ishigaki, K. Koyama, M. Kaya, H. Takeda, and J. Tsujita (2001). **Zucker obese rats are sensitive to weight-reducing effect and insensitive to orexigenic effect cold exposure.** *Journal of Thermal Biology* 26(4-5): 479-483. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Abstract: Male Wistar and Zucker (lean and obese) rats at 7 weeks of age were divided into three groups: warm-acclimated (25 degrees C for 11 weeks), cold-acclimated (10 degrees C for 11 weeks), and deacclimated (10 degrees C for 9 weeks and 25 degrees C for 2 weeks) groups. The rate of increase in body mass (BM) was lower in obese rats as compared to lean rats. Cold-acclimated Wistar and Zucker lean rats exhibited greater food intake, compared to warm-acclimated rats. Food intake did not increase in obese rats exposed to cold. Obese rats are sensitive to weight-reducing effect and insensitive to the orexigenic effect by cold exposure.
Descriptors: obesity, weight reduction, acclimatization, environmental temperature, food intake, heat production.

Hou, F., S. Wang, S. Zhai, Y. Hu, W. Yang, and L. He (2003). **Effects of alpha -tocopherol on noise-induced hearing loss in guinea pigs**. *Hearing Research* 179(1-2): 1-8. ISSN: 0378-5955.
Abstract: Preventing noise-induced hearing loss (NIHL) by antioxidants is based on the hypothesis that generation of reactive oxygen species is one of the causes of NIHL. alpha -Tocopherol is a naturally occurring antioxidant with no noticeable side effects. In this study, we attempted to protect guinea pigs from developing NIHL by administering alpha -tocopherol. Pigmented male guinea pigs were exposed to a noise (4 kHz octave band, 100 dB SPL), 8 h/day for 3 days consecutively. alpha -Tocopherol (10 mg/kg or 50 mg/kg daily) was given by intraperitoneal injection from 3 days before through 3 days after the noise exposure. Auditory evoked brainstem response (ABR) thresholds at 2, 4 and 8 kHz were recorded prior to the experiment, immediately post-noise, 2 and 8 days post-noise. On day 8 post-noise, after the ABR recording, guinea pigs were decapitated and the cochleae were removed for cochlear surface preparations and scanning electron microscope (SEM) study. ABR threshold shifts of groups receiving alpha -tocopherol were significantly smaller than those of groups not receiving alpha -tocopherol at all frequencies and all time points tested except that of group 3 at 8 kHz 8 days post-noise. No hair cell loss was seen on the surface preparations, but stereocilia loss was found by SEM study. The noise-induced stereocilia loss was significantly decreased by alpha -tocopherol. These results indicate that alpha -tocopherol can attenuate the noise-induced cochlear damage. Further investigations on the preventive effect of alpha -tocopherol on NIHL in noise-exposed workers are necessary.
Descriptors: alpha tocopherol, antioxidants, cilia, deafness, disease models, ear diseases, ears, hearing impairment, laboratory animals, noise, guinea pigs.

Hummer, D., S. Bhatnagar, and T. Lee (2003). **A phase shift of the light cycle but not chronic restraint disrupts estrous cycles of rats.** *Hormones and Behavior* 44(1): 55-56. ISSN: 0018-506X.
Descriptors: rats, light cycle, phase shift, chronic restraint, reproductive system, estrus cycle, locomotor activity.
Notes: Meeting Information: Society for Behavioral Neuroendocrinology Annual Meeting, June 25-28, 2003, Cincinnati, OH, USA.

Hunter, W.S., W.B. Croson, A. Bartke, M.V. Gentry, and C.J. Meliska (1999). **Low body temperature in long-lived Ames dwarf mice at rest and during stress.** *Physiology and Behavior* 67(3): 433-7. ISSN: 0031-9384.
Abstract: Among homeothermic animals, larger species generally have lower metabolic rates and live longer than do smaller species. Because Ames dwarf mice (dwarfs) live approximately 1 year longer than their larger normal sex- and age-matched siblings (normals), we hypothesized that they would have lower body core temperature (Tco). We, therefore, measured Tco of six dwarfs and six normals during 24-h periods of ad lib

feeding, 24-h food deprivation, and emotional stress induced by cage switching. With ad lib feeding, Tco of dwarfs averaged 1.6 degrees C lower than normals; during food deprivation, Tco of both dwarfs and controls was significantly lower than when food was available ad lib; and following cage switch, Tco was elevated in both groups. However, during all three experiments, Tco was significantly lower in dwarfs than in normals. These data support the hypothesis that Ames dwarf mice, which live longer than normal size controls, maintain lower Tco than normals. Because dwarfs are deficient in thyroid stimulating hormone (TSH) and growth hormone (GH), their low Tco may be a result of reduced thermogenesis due to lack of those hormones. However, whether low Tco per se is related to the increased longevity of the dwarf mice remains an interesting possibility to be investigated.

Descriptors: body constitution physiology, body temperature physiology, dwarfism, pituitary physiopathology, longevity physiology, metabolism physiology, analysis of variance, food deprivation physiology, genotype, mice, mutant strains, rest physiology, species specificity, stress, psychological physiopathology.

Hut, R.A., B.M. Barnes, and S. Daan (2002). **Body temperature patterns before, during, and after semi-natural hibernation in the European ground squirrel.** *Journal of Comparative Physiology, Part B, Biochemical, Systemic, and Environmental Physiology* 172(1): 47-58. ISSN: 0174-1578.

Abstract: Ground squirrels undergo extreme body temperature fluctuations during hibernation. The effect of low body temperatures on the mammalian circadian system is still under debate. Using implanted temperature loggers, we recorded body temperature patterns in European ground squirrels kept in an enclosure under natural conditions. Although hibernation onset was delayed, hibernation end corresponded closely to that measured in a field population. Circadian body temperature fluctuations were not detected during deep torpor, but indications of circadian timing of arousal episodes at higher temperatures were found at the beginning and end of hibernation. One male exhibited synchronised arousals to a relatively constant phase of the day throughout hibernation. All animals first entered torpor in the afternoon. Daily body temperature fluctuations were decreased or distorted during the first days after hibernation. We hypothesise that hibernation may affect the circadian system by either decreasing the expression of the circadian oscillator, or by decreasing the amplitude of the circadian oscillator itself. possibly due to gradual, temperature dependent, internal desynchronisation. The latter mechanism may be beneficial because it might facilitate post-hibernation re-entrainment rates.

Descriptors: circadian rhythm physiology, hibernation physiology, Sciuridae physiology, arousal physiology, body temperature physiology, thermometers.

Ignat'ev, D.A., R.Y. Gordon, V.V. Vorob'ev, and V.V. Rogachevsky (2005). **A comparative analysis of restoration of electroencephalographic and protein-synthesizing activities in neocortex and hippocampus in hibernating (ground squirrels) and nonhibernating (rats) animals during exit from hypothermia**. *Biofizika* 50(1): 140-151. ISSN: 0006-3029.

Abstract: A similarity in the sequence of restoration of the EEG spectrum between ground squirrels arousing from torpor and rats passing out of artificial hypothermia (17-18degreeC) was shown. First of all, the low-frequency part of the EEG spectrum was restored. As animals warmed up, their breathing became hurried, cold shivering appeared, and the theta- and alpha-rhythms increased. During the exit from hypothermia, the activity of the protein-synthesizing system in both rats and ground squirrels was almost entirely restored when the animal body temperature achieved 21-22degreeC. In ground squirrel, the rate of protein synthesis in the neocortex was lower than in hippocampus CA1 and CA3 areas, whereas in rats, on the contrary, it was higher in the neocortex in comparison with the CA3 area.

Descriptors: rats, ground squirrels, biochemistry and molecular biophysics, metabolism, nervous system, neural coordination, electroencephalography, EEG, clinical techniques, diagnostic techniques, hibernation, hypothermia.

Ignat'ev, D.A., G.S. Sukhova, and V.P. Sukhov (2001). **The analysis of changes in heart rate and temperature of ground squirrel *Citellus undulatus* in various physiological states**. *Zhurnal Obshchei Biologii* 62(1): 66-77. ISSN: 0044-4596.

Descriptors: ground squirrel, heart rate, temperature, changes, hibernation, arousal, physiological state.

Ikeda, M., M. Sagara, and S. Inoue (2000). **Continuous exposure to dim illumination uncouples temporal patterns of sleep, body temperature, locomotion and drinking behavior in the rat**. *NeuroScience Letters* 279(3): 185-

189. ISSN: 0304-3940.
Descriptors: rat, dim illumination, continuous exposure, patterns, sleep, body temperature, locomotion, drinking, behavior.

Imig, T.J., A. Hall, and D. Durham (2003). **Unilateral noise damage alters spontaneous metabolic activity in the rat's auditory system: a neural correlate of tinnitus?** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 182.10.
Online: http://sfn.scholarone.com
Descriptors: rat, auditory system, tinnitus, noise damage, metabolic activity, unilateral, high frequency, brain.
Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Inan, S.Y. and F. Aksu (2002). **Amnesic effects of relative humidity and temperature in mice**. *Lab Animal* 31(2): 40-48. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: age, animal models, cold stress, heat stress, hyperthermia, hypothermia, memory, relative humidity, temperature, man, mice.

Iossa, S., L. Lionetti, M.P. Mollica, R. Crescenzo, A. Barletta, and G. Liverini (2001). **Effect of cold exposure on energy balance and liver respiratory capacity in post-weaning rats fed a high-fat diet.** *British Journal of Nutrition* 85(1): 89-96. ISSN: 0007-1145.
NAL Call Number: 389.8 B773
Abstract: Variations in energy balance, body composition, and nutrient partitioning induced by high-fat feeding, cold exposure or by concomitant high-fat feeding and cold exposure were studied in young Wistar rats. Changes in hepatic metabolism as well as in serum free triiodothyronine and leptin levels were also evaluated. Rats were exposed to either 24 or 4 degrees C and fed either a low- or high-fat diet (10% or 50% energy respectively) for 2 weeks. Relative to low-fat feeding at 24 degrees C, both energy intake and expenditure were increased by high-fat feeding or by cold exposure, and these changes were accompanied by increased serum triiodothyronine levels. In response to concomitant high-fat feeding and cold exposure, serum triiodothyronine tended to be further elevated, but no further increases in energy intake or energy expenditure were observed. Independently of diet, the increased energy expenditure in cold-exposed rats was not completely balanced by adaptive hyperphagia, with consequential reductions in protein and fat gain, accompanied by marked decreases in serum leptin. Furthermore, unlike high-fat feeding at 24 degrees C, cold exposure enhanced hepatic mitochondrial oxidative capacity both in the low-fat- and high-fat-fed groups. It is concluded that in this strain of young Wistar rats, despite similarly marked stimulation of energy expenditure by high-fat feeding at 24 degrees C, by cold exposure and by concomitant high-fat feeding and cold exposure, an increased hepatic oxidative capacity occurred only in the presence of the cold stimulus.
Descriptors: cold stress, dietary fat, energy balance, liver, oxygen, oxygen consumption, respiration, peroxisomes, body composition, nutrition physiology, diet, experimental diets, animal proteins, temperature, metabolizable energy, energy intake, energy expenditure, hyperphagia, body weight, rats, animal models, nutrient intake, blood serum, triiodothyronine, hormones, nutrient partitioning, leptin.

Ito, R., T. Hisada, M. Horimoto, and M. Tachibana (2000). **Effects of noise on pre- and postnatal development in rats**. *Teratology* 62(3): 30A. ISSN: 0040-3709.
Descriptors: rats, pre and postnatal development, noise, effects, environmental effects, food consumption, lactation, body weight, stress.
Notes: Meeting Information: Thirty Ninth Annual Meeting of the Japanese Teratology Society, July 14-16, 1999, Kagoshima, Japan.

Jacobs, G.H., J.A. Fenwick, and G.A. Williams (2001). **Cone-based vision of rats for ultraviolet and visible lights**. *Journal of Experimental Biology* 204(14): 2439-2446. ISSN: 0022-0949.
Descriptors: rats, sensory reception, cone based, ultraviolet, visible light, UV sensitivity, UV vision, color vision, photosensitivity, vision, wavelength discrimination.

Jia, L., W.O. Cepurna, J.C. Morrison, and E.C. Johnson (1998). **Variation in light and dark phase intraocular pressure following aqueous humor outflow obstruction in the rat**. *IOVS* 39(4): S938.
Descriptors: rat, light-dark phase, variation, intraocular pressure, aqueous humor outflow, obstruction, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 10-15, 1998, Fort Lauderdale, Florida, USA.

Johns, E.J. and G.D. Bristow (1998). **Cardiovascular responses to light and darkness in normotensive and hypertensive rats**. *Fundamental and Clinical Pharmacology* 12(Supplement 1): 77S.
Descriptors: rats, hypertensive, light, darkness, cardiovascular response, normotensive.
Notes: Meeting Information: Satellite Symposium to the 17th Scientific Meeting of the International Society of Hypertension on Blood Pressure Variability in Health and Disease, June 5, 1998, Nancy, Paris.

Johnson, E.C., M.M. Lavail, W.O. Cepurna, L. Jia, K. Ackhavong, and J.C. Morrison (1999). **Housing in low level, constant light stabilizes circadian intraocular pressure (IOP) oscillations in brown norway rats, simplifying a glaucomatous neuropathy model**. *IOVS* 40(4): S672.
Descriptors: Norway rats, housing, low level constant light, intraocular pressure, glaucomatous, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 9-14, 1999, Fort Lauderdale, Florida, USA.

Kask, A., H.P. Nguyen, R. Pabst, and S. Von Horsten (2001). **Factors influencing behavior of group-housed male rats in the social interaction test: focus on cohort removal.** *Physiology and Behavior* 74(3): 277-82. ISSN: 0031-9384.
Abstract: The rat social interaction (SI) test is used widely to measure anxiety-like behavior, yet the influence of various factors such as testing time, pre-experimental manipulations (transport stress), and testing of animals from the same cage (cohort removal, CR) on SI has not been systematically studied. We measured SI behavior of male triad-housed Wistar rats in a novel dimly lit arena (low light unfamiliar, LU) and found that SI time is higher in the beginning of the activity (dark) phase when compared with SI time in first half of the light phase. Furthermore, SI time is significantly increased by habituation of animals to the testing room during light phase, but this intervention has no effect in early dark phase when SI behavior is already maximal. Sequential removal of rats from the home cage led to the stress-like behavioral and physiological consequences. Rats removed in the last position had shorter SI time and higher body temperature. These data demonstrate that SI is higher during early dark vs. early light phase and confirm that CR has anxiogenic-like effects in rats. We conclude that the usage of sequentially removed group-housed rats in behavioral tests can be a source for considerable variation due to anxiety that develops in animals remaining in the cage. On the other hand, CR may be a useful method to study behavioral/neurochemical mechanisms of psychogenic stress in rats.
Descriptors: arousal, social behavior, social environment, circadian rhythm, habituation psychophysiology, rats, Wistar rats.

Kauffman, A.S., A. Cabrera, and I. Zucker (2001). **Torpor characteristics and energy requirements of furless Siberian hamsters.** *Physiological and Biochemical Zoology* 74(6): 876-84. ISSN: 1522-2152.
Abstract: After approximately 10 wk of exposure to decreasing day lengths, Siberian hamsters (*Phodopus sungorus*) begin to display spontaneous torpor bouts several times each week. Torpor is associated with reduced daily energy expenditure and lower food consumption and ameliorates the thermoregulatory challenges of winter. We tested the extent to which the energy savings conferred by daily torpor depend on the presence of an insulative pelage. Female hamsters were housed in a winter day length (8L:16D) at 5 degrees C; daily food intake and torpor characteristics were recorded for 5 wk in shaved (furless) or normal hamsters. Torpor-bout incidence decreased by 62% in furless hamsters, but the duration of individual bouts and the minimum body temperature attained during torpor were unaffected by loss of pelage. Body temperature declined more rapidly during entry into torpor and increased more slowly during arousal from torpor in furless than in control hamsters. Energy savings per torpor bout, assessed by the amount of food consumed on days that included a torpor bout, was substantially greater in normal than in furless hamsters (16.0% vs. 3.3%); this difference likely reflects the increased cost of thermoregulation during torpor, as well as the increased caloric expenditure

incurred by furless hamsters during arousal from torpor. An insulative pelage may be a prerequisite for the energetic benefits derived from heterothermy in this species.

Descriptors: body temperature regulation physiology, eating, energy metabolism, movement, *Phodopus* physiology, hamsters, photoperiod, seasons.

Kauffman, A.S., M.J. Paul, M.P. Butler, and I. Zucker (2003). **Huddling, locomotor, and nest-building behaviors of furred and furless Siberian hamsters.** *Physiology and Behavior* 79(2): 247-56. ISSN: 0031-9384.

Abstract: Rodents living in the cold employ both behavioral and physiological mechanisms to achieve thermoregulation. We examined the impact of fur loss on behavioral thermoregulation in cold-challenged Siberian hamsters (*Phodopus sungorus*). Intact female hamsters exposed to an ambient temperature (T(a)) of 5 degrees C increased their general locomotor activity by 50% relative to animals maintained at 23 degrees C. At both T(a)'s, fur removal resulted in substantial increases in daily food intake (37% and 22% at 5 and 23 degrees C, respectively) but did not affect the amount of locomotor activity; increased food intake after fur loss evidently is not caused by increases in locomotor activity. Furred hamsters housed in groups of three at 5 degrees C consumed 16% less food per day than did singly housed individuals. Fur removal resulted in identical 39% increases in food intake in group- or singly housed animals. Energy savings that accrued from huddling were identical in furred and furless animals; this behavior conserves energy even in the absence of an insulative pelage. The availability of nesting material resulted in an 18% reduction in food consumption in intact animals kept at 5 degrees C. The increase in food intake produced by fur removal was attenuated by approximately 80% when furless animals had access to nesting material. Huddling and nest-building behaviors each ameliorate energetic challenges posed by absence of fur; animals that concurrently employ several modes of thermoregulation realize substantial energy savings in the cold.

Descriptors: body temperature regulation physiology, hair physiology, motor activity physiology, nesting behavior physiology, *Phodopus* physiology, *Phodopus* psychology, body weight, cold, eating physiology, energy metabolism, hamsters, housing, animal, *Phodopus* anatomy and histology, social isolation.

Kauffman, A.S., M.J. Paul, and I. Zucker (2004). **Increased heat loss affects hibernation in golden-mantled ground squirrels.** *American Journal of Physiology Regulatory, Integrative and Comparative Physiology* 287(1): R167-73. ISSN: 0363-6119.

Abstract: During hibernation at ambient temperatures (T(a)) above 0 degrees C, rodents typically maintain body temperature (T(b)) approximately 1 degrees C above T(a), reduce metabolic rate, and suspend or substantially reduce many physiological functions. We tested the extent to which the presence of an insulative pelage affects hibernation. T(b) was recorded telemetrically in golden-mantled ground squirrels (*Spermophilus lateralis*) housed at a T(a) of 5 degrees C; food intake and body mass were measured at regular intervals throughout the hibernation season and after the terminal arousal. Animals were subjected to complete removal of the dorsal fur or a control procedure after they had been in hibernation for 3-4 wk. Shaved squirrels continued to hibernate with little or no change in minimum T(b), bout duration, duration of periodic normothermic bouts, and food intake during normothermia. Rates of rewarming from torpor were, however, significantly slower in shaved squirrels, and rates of body mass loss were significantly higher, indicating increased depletion of white adipose energy stores. An insulative pelage evidently conserves energy over the course of the hibernation season by decreasing body heat loss and reducing energy expenditure during periodic arousals from torpor and subsequent intervals of normothermia. This prolongs the hibernation season by several weeks, thereby eliminating the debilitating consequences associated with premature emergence from hibernation.

Descriptors: body temperature regulation physiology, hibernation physiology, arousal physiology, body temperature physiology, body weight physiology, eating physiology, energy metabolism physiology, hair growth and development, hair physiology, Sciuridae, telemetry, temperature.

Kawakami, K., T. Takeuchi, S. Yamaguchi, A. Ago, M. Nomura, T. Gonda, and S. Komemushi (2003). **Preference of guinea pigs for bedding materials: wood shavings versus paper cutting sheet.** *Experimental Animals (Tokyo)* 52(1): 11-5. ISSN: 1341-1357.

Abstract: The preference of guinea pigs for bedding materials, wood shavings (WS) or paper cutting sheets (PS), was studied. Animals aged 8 weeks and 20 weeks showed a similar behaviour pattern during 30 min in the light, preferring WS to PS regardless of ages. Over both light and dark periods for 24 h, guinea pigs apparently preferred WS in the light, spending much more time resting in them than in PS. In the dark, the border-crossing

was significantly more frequent than in the light, and the staying time was rather longer in PS than WS. The results suggest that guinea pigs prefer different bedding materials under light and dark conditions.
Descriptors: guinea pigs, housing, bedding materials, paper, wood, preference darkness, light.

Kawamoto, K., S. Tanaka, M. Kawano, T. Hayashi, and K. Tsuchiya (2000). **Effects of photoperiod and ambient temperature on the gonadotropin-releasing hormone neuronal system in the gray hamster, *Tscherskia triton.*** *Neuroendocrinology* 72(5): 284-292. ISSN: 0028-3835.
Abstract: Male gray hamsters (*Tscherskia triton* [*Cricetulus triton*]) were kept from birth under a long-day (LD: 16 h light and 8 h dark) photoperiod and at 23 degrees C until the experiment began. The animals were then kept for 30 days under different light regimes and ambient temperatures. After autopsy, immunocytochemical and semiquantitative reverse transcription-PCR analyses were performed on forebrain tissue. Exposure to a short-day (SD: 8 h light and 16 h dark) photoperiod at 23 degrees C induced a functional decline in the GnRH neuronal system (increased neuron number and immunoreactivity, and reduced cell size). LD with low ambient temperature (7 degrees C) did not influence the GnRH neuronal system. SD with low ambient temperature increased the SD-induced functional decline in GnRH neurons. Changes in immunoreactivity of GnRH fibres in the median eminence, their release site, were also similar to those in neuronal perikarya. Significant differences in GnRH gene expression were detected in the SD only group and the SD with low ambient temperature group. No differences were detected between the 2 groups. These findings suggest that low ambient temperature increased the SD-induced decline in GnRH release from nerve terminals but was not a crucial factor in the synthesis of this decapeptide.
Descriptors: light regime, GnRH, neurons, brain, environmental temperature, temperature, *Cricetulus*.

Kennaway, D.J., A. Voultsios, T.J. Varcoe, and R.W. Moyer (2002). **Melatonin in mice: rhythms, response to light, adrenergic stimulation, and metabolism.** *American Journal of Physiology* 282(2, Part 2): R358-R365. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: mice, light, melatonin, rhythms, metabolism, stimulation.

Khammanivong, A. and D. Nelson (1998). **The mouse circadian system becomes unresponsive to light after "saturating" light-induced phase delays**. *Society for Neuroscience Abstracts* 24(1-2): 1916. ISSN: 0190-5295.
Descriptors: mouse, cirdacian system, light, saturating light, phase delays, unresponsive.
Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 2, November 7-12, 1998, Los Angeles, California, USA.

Kinsey, S.G., B.J. Prendergast, and R.J. Nelson (2003). **Photoperiod and stress affect wound healing in Siberian hamsters.** *Physiology and Behavior* 78(2): 205-11. ISSN: 0031-9384.
Abstract: Changes in day length alter several indices of immune function in Siberian hamsters. These experiments tested the hypothesis that photoperiodic changes in immune function are integrated at an organismal level as reflected by the ability to heal a cutaneous wound. Given the well-documented effects of psychological stressors on immune function, we also tested the hypothesis that photoperiod modulates the effects of acute stress on wound healing. Male hamsters were housed in long (16L:8D; LD) or short (8L:16D; SD) day lengths for 8+/-2 weeks. SD-treatment was sufficient to induce winter reproductive status. Hamsters then received a dermal punch wound. Hamsters were subjected to either 2 h of daily restraint stress or a control treatment for 3 days prior to and 5 days after wounding. Wounds were digitally photographed daily, and wound size was measured to quantify healing. Wounds of LD hamsters healed significantly faster than did those of SD hamsters. Restraint stress significantly accelerated healing in SD hamsters. The results suggest that the enhancing effects of short-term psychological stressors on immune function are apparent only when reproductive function is suppressed. In nature, enhanced wound healing coincident with the breeding season and territorial defense may be adaptive.
Descriptors: *Phodopus* physiology, photoperiod, stress physiopathology, wound healing radiation effects, body weight radiation effects, hamsters, reproduction radiation effects, restraint, physical, skin injuries, time factors, wounds, penetrating physiopathology.

Kiyatkin, E.A. and P.L. Brown (2004). **Modulation of physiological brain hyperthermia by environmental temperature and impaired blood outflow in rats**. *Physiology and Behavior* 83(3): 467-474. ISSN: 0031-9384.
Descriptors: brain, hyperthermia, temperature, blood, outflow, rats, modulation, environmental.

Klaus, S., H. Munzberg, C. Truloff, and G. Heldmaier (1998). **Physiology of transgenic mice with brown fat ablation: obesity is due to lowered body temperature**. *American Journal of Physiology* 274(2): R387-R293. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: The physiological basis for the development of obesity was examined in uncoupling protein-diphtheria toxin A chain (UCP-DTA) transgenic mice. In these mice the promoter of the brown adipose tissue (BAT)-specific UCP was used to drive expression of DTA, resulting in decreased BAT function and development of obesity and insulin resistance. In adult UCP-DTA mice, food intake and food assimilation, locomotor activity, metabolic rate and body temperature were measured in comparison to control mice. No differences were observed in food intake or assimilation and locomotor activity. Weight-specific metabolic rates at temperatures between 20 and 37 degrees C, however, were consistently lower in transgenic mice. Continuous telemetric recording of core body temperature showed that transgenic mice displayed a downshift in body temperature levels of ~0.9 degrees C. In summary, evidence was provided that suggests that attenuated body temperature levels alone can be responsible for development of obesity and that BAT thermogenesis is a major determinant of body temperature levels in rodents.
Descriptors: energy balance, brown fat, body temperature, obesity, transgenic animals, energy metabolism, food intake, body weight, heat production, mice.

Klaus, U., R. Weinandy, and R. Gattermann (2000). **Circadian activity rhythms and sensitivity to noise in the Mongolian gerbil (*Meriones unguiculatus*)**. *Chronobiology International* 17(2): 137-145. ISSN: 0742-0528.
Descriptors: Mongolian gerbil, circadian activity rhythms, sensitivity to noise.

Kobayashi, A., T. Osaka, Y. Namba, S. Inoue, T.H. Lee, and S. Kimura (1998). **Capsaicin activates heat loss and heat production simultaneously and independently in rats.** *American Journal of Physiology* 275(1, Part 2): R92-R98. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: brown fat, body temperature regulation, subcutaneous injection.

Kojima, M., T. Okuno, I. Hata, and K. Sasaki (2000). **The relevancy of different light wavelengths, pupil size, and iris pigmention in the etiology of cataracts induced by ultraviolet radiation in rats**. *IOVS* 41(4): S205.
Descriptors: rats, induced cataracts, ultraviolet radiation, pupil size, iris pigmentation, different light wavelengths, relevancy, etiology, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 30-May 05, 2000, Fort Lauderdale, Florida, USA.

Kojima, M., T. Okuno, M. Miyakoshi, K. Sasaki and N. Takahashi (2002). **Environmental temperature and cataract progression in experimental rat cataract models.** In: *Progress in Lens and Cataract Research: In Honour of Professor Kazuyuki Sasaki.*, Vol. 35, S. Karger AG: Basel, Switzerland, p. 125-134. ISBN: 3805573677.
Descriptors: rat, cataract models, environmental temperature, cataract progression, research.

Kolker, D.E., H. Fukuyama, D.S. Huang, J.S. Takahashi, T.H. Horton, and F.W. Turek (2003). **Aging alters circadian and light-induced expression of clock genes in golden hamsters.** *Journal of Biological Rhythms* 18(2): 159-69. ISSN: 0748-7304.
Abstract: Aging alters numerous aspects of circadian biology, including the amplitude of rhythms generated by the suprachiasmatic nuclei (SCN) of the hypothalamus, the site of the central circadian pacemaker in mammals, and the response of the pacemaker to environmental stimuli such as light. Although previous studies have described molecular correlates of these behavioral changes, to date only 1 study in rats has attempted to determine if there are age-related changes in the expression of genes that comprise the circadian clock itself. We used in situ hybridization to examine the effects of age on the circadian pattern of expression of a subset of the

genes that comprise the molecular machinery of the circadian clock in golden hamsters. Here we report that age alters the 24-h expression profile of Clock and its binding partner Bmal1 in the hamster SCN. There is no effect of age on the 24-h profile of either Per1 or Per2 when hamsters are housed in constant darkness. We also found that light pulses, which induce smaller phase shifts in old animals than in young, lead to decreased induction of Per1, but not of Per2, in the SCN of old hamsters.

Descriptors: aging genetics, aging physiology, circadian rhythm genetics, circadian rhythm physiology, gene expression genetics, gene expression physiology, cloning, molecular, DNA primers, DNA, complementary biosynthesis, complementary genetics, hamsters, in situ hybridization, light, mesocricetus, motor activity drug effects, motor activity physiology, nuclear proteins biosynthesis, nuclear proteins genetics, reverse transcriptase polymerase chain reaction, trans activators biosynthesis, trans activators genetics, transcription factors biosynthesis, transcription factors genetics.

Koontz, T.L., U.L. Shepherd, and D. Marshall (2001). **The effects of climate change on Merriam's kangaroo rat, *Dipodomys merriami.*** *Journal of Arid Environments* 49(3): 581-591. ISSN: 0140-1963.

NAL Call Number: QH541.5.D4J6

Descriptors: *Dipodomys*, animal ecology, arid lands, climate change, temperature, precipitation, global warming, summer, winter, population density, body measurements, New Mexico, mean body mass.

Kort, W.J., J.M. Hekking Weijma, M.T. Ten Kate, V. Sorm, and R. Van Strik (1998). **A microchip implant system as a method to determine body temperature of terminally ill rats and mice**. *Laboratory Animals* 32(3): 260-269. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: *Klebsiella pneumoniae* was inoculated intratracheally into rats and mice, and the temperature of the animals was recorded twice daily using microchip transponders (ELAMS) implanted either s.c. or i.p. The microchip temperatures were compared with rectal temperatures taken at the same time. The results showed that ELAMS was easy to operate and there were no important drawbacks in the use of the system were observed. The temperatures measured by the transponders implanted s.c. and i.p. did not differ significantly from rectal temperatures. In 2 out of 3 experiments on rats, it was shown that when the temperatures reached values below 36 degrees C, the median survival time of the animals was 24 h. In an experiment on mice, the same median survival time was observed at 36 degrees C. In 1 experiment using rats, however, the disease was so acute that death occurred before any temperature drop. It is suggested that when a 36 degrees C cutoff point is used instead of the time of death in this particular animal model, the statistical analysis is not altered, and it may spare animals further suffering for approximately 24 h. It is concluded that the ELAMS system of monitoring body temperature is simple and relatively stress free for laboratory animals.

Descriptors: body temperature, monitoring, animal welfare, animal experiments, laboratory animals, experimental infections, transponders, rats, mice, *Klebsiella pneumoniae*.

Korytko, A.I., S.H. Vessey, and J.L. Blank (1998). **Phenotypic differences in the GnRH neuronal system of deer mice *Peromyscus maniculatus* under a natural short photoperiod.** *Journal of Reproduction and Fertility* 114(2): 231-5. ISSN: 0022-4251.

Abstract: The neural mechanisms by which short photoperiod induces gonadal regression among seasonally breeding mammals are not well understood. One hypothesis suggests that the proximate cause of seasonal gonadal regression is a photoperiod-induced modification in GnRH secretion. This hypothesis is indirectly supported by our recent findings using immunocytochemistry which identified specific photoperiod-induced adjustments in the number and morphology of GnRH containing neurones between reproductively competent and reproductively regressed laboratory housed male deer mice. Herein, we report that the GnRH neuronal system is similarly affected in reproductively responsive and nonresponsive wild male deer mice *Peromyscus maniculatus* exposed to a natural short photoperiod. The distribution of immunoreactive (IR)-GnRH neurones was nearly identical in field caught animals and those housed under artificial photoperiod in the laboratory. Compared with reproductively nonresponsive males, reproductively responsive mice from the field population possessed a greater total number of IR-GnRH neurones, a greater number of IR-GnRH neurones within the lateral hypothalamus, and a greater proportion of bipolar IR-GnRH neurones. Each of these distributional and morphological characters was consistent with our findings in laboratory housed male deer mice exposed to an artificial short photoperiod. Taken together, these data underscore the validity of using an artificial photoperiod

to evaluate seasonal adjustments in reproductive function in the laboratory.
Descriptors: brain chemistry, gonadorelin analysis, neurons chemistry, *Peromyscus* physiology, photoperiod, seasons, cell count, immunohistochemistry, neurons cytology, reproduction.

Koutoku, T., T. Nakanishi, T. Takagi, I. Yamasaki, R. Zhang, K. Sashihara, E.S. Saito, S. Saito, and M. Furuse (2003). **Effect of environmental lighting on aggressive and anxious behavior in male mice**. *Journal of Applied Animal Research* 23(1): 65-74. ISSN: 0971-2119.
Abstract: To study the influence of the different conditions of environmental lighting on aggressive behaviour and open field activity, male mice were kept under different conditions of environmental lighting, i.e., (A) 12-hour each light and dark (LD), (B) continuous light (LL) and (C) continuous dark (DD) for 27 days. Although no significant differences were observed among three groups, LL and DD conditions tended to show the inhibitory effect on aggression. In the open field test, the crossing, the time and the path significantly increased with the length of lighting period, but rearing and defaecation were not affected. The amounts of monoamines and their metabolites in the cerebellum, cerebrum and brainstem were hardly affected by lighting conditions. Taken together, DD condition was most preferable for mice to keep calm rather LL condition.
Descriptors: aggression, aggressive behavior, animal behavior, brain, light relations, lighting, monoamines, physical activity, mice.
Language of Text: Hindi summary.

Kramer, K., H. Van de Weerd, A. Mulder, C. Van Heijningen, V. Baumans, R. Remie, H.P. Voss, and B.F.M. Van Zutphen (2004). **Effect of conditioning on the increase of heart rate and body temperature provoked by handling in the mouse**. *ATLA, Alternatives to Laboratory Animals* 32(Supplement 1A): 177-181. ISSN: 0261-1929.
NAL Call Number: Z7994.L3A5
Abstract: To assess the effect of procedures on animal welfare, various physiological parameters, such as body weight, hormone levels in plasma and/or urine, heart rate (HR), blood pressure and body temperature (BT), can be used. When measuring physiological parameters with techniques involving restraint of the animals, the results must be interpreted with caution, since restraint itself may have an effect on those parameters. Radio-telemetry, using an implantable transmitter, provides a way to obtain more accurate and reliable physiological measurements from freely moving animals in their own environment. In this study, we have used radio-telemetry to investigate the influence of conditioning on the increase of HR and BT as provoked by handling of mice. It was found that, after a conditioning period of 12 days, the increase of HR due to handling was significantly reduced.
Descriptors: animal testing alternatives, animal welfare, body temperature, conditioning, heart rate, stress, stress response, telemetry, mice.

Kramer, K., H.P. Voss, J. Grimbergen, and A. Bast (1999). **Circadian rhythms of heart rate, body temperature, and locomotor activity in freely moving mice measured with radio telemetry.** *Lab Animal* 27(8): 23-26. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: mice, telemetry, circadian rhythm, heart rate, body temperature, locomotor activity.

Krebs, H., M. Macht, P. Weyers, H.G. Weijers, and W. Janke (1996). **Effects of stressful noise on eating and non-eating behavior in rats**. *Appetite* 26(2): 193-202. ISSN: 0195-6663.
NAL Call Number: QP141.A1A64
Descriptors: noise, feeding, behavior, rats, food intake, feeding habits, stress, behavior, feeding habits, mammals, pollutants, Rodentia.

Kriegsfeld, L.J., N.J. Ranalli, M.A. Bober, and R.J. Nelson (2000). **Photoperiod and temperature interact to affect the GnRH neuronal system of male prairie voles (*Microtus ochrogaster*).** *Journal of Biological Rhythms* 15(4): 306-16. ISSN: 0748-7304.
Abstract: Individuals of numerous species limit energy expenditure during winter by inhibiting reproduction and other nonessential functions. To time these adaptations appropriately with the annual cycle, animals rely on environmental cues that predict, well in advance, the onset of winter. The most commonly studied

environmental factor that animals use to time reproduction is photoperiod. Rodents housed in short photoperiods in the laboratory or in naturally declining day lengths exhibit pronounced alterations in reproductive function concomitant with alterations in the hypothalamic gonadotropin-releasing hormone neuronal system. Because animals in their natural environment use factors in addition to photoperiod to time reproduction, the present study sought to determine the independent effects of photoperiod and temperature, as well as the interaction between these factors, on reproductive parameters and the GnRH neuronal system. Male prairie voles were housed in either long (LD 16:8) or short (LD 8:16) day lengths for 10 weeks. Animals in each photoperiod were further subdivided into groups housed in either mild (i.e., 20 degrees C) or low (i.e., 8 degrees C) temperatures. As shown with immunohistochemistry, voles that underwent gonadal regression in response to short photoperiods and long-day voles housed in low temperatures (and maintained large gonads) exhibit higher GnRH-immunoreactive (GnRH-ir) neuron numbers in the preoptic area/anterior hypothalamus (POA/AH) relative to all other groups. In addition, voles that underwent gonadal regression in response to both short days and low temperatures did not exhibit an increase in GnRH-ir neuron numbers compared to long-day, mild-temperature controls. These data suggest that photoperiod and temperature interact to influence reproductive function potentially by alterations of the GnRH neuronal system.

Descriptors: acclimatization physiology, gonadorelin physiology, hypothalamus, anterior physiology, neurons physiology, photoperiod, preoptic area physiology, body weight, epididymis anatomy and histology, epididymis physiology, hypothalamus, anterior cytology, immunohistochemistry, median eminence cytology, median eminence physiology, Microtinae, neurons cytology, organ size, preoptic area cytology, seminal vesicles anatomy and histology, seminal vesicles physiology, temperature, testis anatomy and histology, testis physiology.

Kriegsfeld, L.J., A.G. Trasy, and R.J. Nelson (2000). **Temperature and photoperiod interact to affect reproduction and GnRH synthesis in male prairie voles**. *Journal of Neuroendocrinology* 12(6): 553-558. ISSN: 0953-8194.

Descriptors: male prairie voles, reproduction, temperature, photoperiod, affect, day lengths, GnRH, seasonally breeding.

Krol, E., P. Redman, P.J. Thomson, R. Williams, C. Mayer, J.G. Mercer, and J.R. Speakman (2005). **Effect of photoperiod on body mass, food intake and body composition in the field vole, *Microtus agrestis***. *Journal of Experimental Biology* 208(3): 571-584. ISSN: 0022-0949.

Abstract: Many small mammals respond to seasonal changes in photoperiod by altering body mass and adiposity. These animals may provide valuable models for understanding the regulation of energy balance. Here, we present data on the field vole (*Microtus agrestis*) - a previously uncharacterised example of photoperiod-induced changes in body mass. We examined the effect of increased day length on body mass, food intake, apparent digestive efficiency, body composition, de novo lipogenesis and fatty acid composition of adipose tissue in cold-acclimated (8degreeC) male field voles by transferring them from a short (SD, 8 hours:16 hours L:D) to long day photoperiod (LD, 16 hours:8 hours L:D). During the first 4 weeks of exposure to LD, voles underwent a substantial increase in body mass, after which the average difference between body masses of LD and SD voles stabilized at 7.5 g. This 24.8% increase in body mass reflected significant increases in absolute amounts of all body components, including dry fat mass, dry lean mass and body water mass. After correcting body composition and organ morphology data for the differences in body mass, only gonads (testes and seminal vesicles) were enlarged due to photoperiod treatment. To meet energetic demands of deposition and maintenance of extra tissue, voles adjusted their food intake to an increasing body mass and improved their apparent digestive efficiency. Consequently, although mass-corrected food intake did not differ between the photoperiod groups, the LD voles undergoing body mass increase assimilated on average 8.4 kJ day-1 more than animals maintained in SD. The majority (73-77%) of the fat accumulated as adipose tissue had dietary origin. The rate of de novo lipogenesis and fatty acid composition of adipose tissue were not affected by photoperiod. The most important characteristics of the photoperiodic regulation of energy balance in the field vole are the clear delineation between phases where animals regulate body mass at two different levels and the rate at which animals are able to switch between different levels of energy homeostasis. Our data indicate that the field vole may provide an attractive novel animal model for investigation of the regulation of body mass and energy homeostasis at both organism and molecular levels.

Descriptors: field vole, biosynchronization, digestive system, ingestion, assimilation, nutrition, reproduction, body mass, daylight exposure, digestive efficiency, fat deposition, food intake, photoperiod, seasonal variation.

Kueng, N., A. Wenzel, C. Grimm, C.E. Reme, and G. Niemeyer (1999). **Electroretinographic effects of light-exposure in c-Fos-/- mice and wildtype littermates**. *IOVS* 40(4): S24.
Descriptors: light exposure, c-Fos mice, wildtype, electroretinographic, littermates, effects, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 9-14, 1999, Fort Lauderdale, Florida, USA.

Kumar, N.A., D.C. Mathangi, and A. Namasivayam (1998). **Noise-induced changes in free radical scavenging enzymes in the blood and brain of albino rats**. *Medical Science Research* 26(12): 811-812.
Descriptors: noise, changes, free radical, scavenging enzymes, blood, brain, albino rats.

Kurisu, K., O. Sawamoto, H. Watanabe, and A. Ito (1996). **Sequential changes in the Harderian gland of rats exposed to high intensity light. [Erratum: Apr 1996, v. 46 (2), p. 251.]**. *Laboratory Animal Science* 46(1): 71-76. ISSN: 0023-6764.
NAL Call Number: 410.9 P94
Abstract: We examined sequential changes in histology, fluorescent microscopy, and porphyrin content in the Harderian glands of 55 male Wistar rats exposed to fluorescent light of 2,500 or 1,600 lux for 12 h a day up to 8 days and of 10 control rats. After exposure for 1 day there was severe necrosis of the glandular cells, with edema and cellular infiltration of the Harderian gland adjacent to the retina. After exposure for 4 and 8 days these changes regressed and glandular cells regenerated. Red fluorescence in frozen sections of glands from control rats was interpreted to be due to porphyrins. The red fluorescence was faint in glandular acini injured by exposure to light for 4 and 8 days, and porphyrin content of the gland decreased after 4 and 8 days. Homogenates of the Harderian glands from five control rats caused marked hemolysis after exposure to sunlight. Thus exposure to high-intensity light induced necrosis of the glandular cells in the Harderian glands. The injury appeared to be a direct effect of light on the glandular cells, probably as a result of photodynamic action on the porphyrins in the gland. Injury to the Harderian glands could occur in other albino rodents with glandular porphyrins.
Descriptors: animal glands, injurious factors, light, porphyrins, necrosis, histopathology, rats, body parts, heterocyclic compounds, mammals, pathology, radiation, Rodentia, fluorescent light, light intensity.

Labyak, S.E., F.W. Turek, E.P. Wallen, and P.C. Zee (1998). **Effects of bright light on age-related changes in the locomotor activity of Syrian hamsters**. *American Journal of Physiology* 274(3, Part 2): R830-R839. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: Syrian hamsters, bright light, effects, age related changes, locomotor activity, circadian rhythms, stimuli, light-dark cycles, daily activity.

Lambadjieva, N.D. (1999). **Influence of testosterone on some behavioral reactions of male immature rats exposed to continual light**. *Methods and Findings in Experimental and Clinical Pharmacology* 21(1): 17-20.
Descriptors: testosterone, behavioral reactions, continual light, immature rats, influence.

Langseth, A.J., L.N. Tracy, and D.E. Nelson (2003). **Changes in photic responsiveness of the mouse circadian pacemaker following light-dark entrainment.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 511.11.
Online: http://sfn.scholarone.com
Descriptors: mouse, circadian pacemaker, light-dark entrainment, photic responsiveness, changes.
Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Larkin, J.E. and H.C. Heller (1996). **Temperature sensitivity of sleep homeostasis during hibernation in the golden-mantled ground squirrel.** *American Journal of Physiology* 270(4, Part 2): R777-84. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: Brain temperature (Tbr), vigilance state, and electroencephalograph slow-wave activity (EEG SWA, 1.0-4.0 Hz) were measured during hibernation and spontaneous arousals to euthermia in seven golden-mantled ground squirrels (*Spermophilus lateralis*). Animals were held at air temperatures (Ta) ranging from 6 to 21

degrees C. SWA was used as a measure of the intensity of non-rapid eye movement (NREM) sleep. Squirrels that had hibernated at high Ta had lower SWA in NREM sleep in the hours following arousal than when they hibernated at low Ta. SWA in NREM sleep during euthermia immediately following arousal was significantly correlated to minimum Tbr and SWA during hibernation. The duration of the preceding hibernation bout had no significant effect on SWA during euthermia. We hypothesize that the restorative process of sleep, reflected by SWA, is temperature sensitive and is compromised by the low temperatures in hibernation. The accumulation of a SWA debt during hibernation may be related to the temperature-dependent depression of SWA during hibernation.

Descriptors: hibernation physiology, homeostasis, sleep physiology, temperature sense, arousal, body temperature, brain physiology, electroencephalography, Sciuridae, temperature, time factors.

Larkin, J.E., J. Jones, and I. Zucker (2002). **Temperature dependence of gonadal regression in Syrian hamsters exposed to short day lengths**. *American Journal of Physiology* 282(3, Part 2): R744-R752. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3

Abstract: We sought to determine whether ambient temperature (Ta) affects gonadal function by altering the rate at which circadian rhythms entrain to short day lengths. Syrian hamsters were housed in cages where they received 14 h of light per day (long days, 14 L) at 22 degrees C. Hamsters were then transferred to cages to receive 10 h of light per day (short days, 10 L) and kept at 5, 22, or 28 degrees C or were maintained in 14 L at 22 degrees C. Body mass and estimated testis volume as well as duration of nocturnal locomotor activity (alpha), previously established as a reliable indicator of the duration of nocturnal melatonin secretion, were determined over the course of 24 weeks. Testicular regression in short days was accelerated by 4 weeks at 5 degrees C and delayed by 3 weeks at 28 degrees C relative to 22 degrees C. The interval between alpha - expansion and initiation of testicular regression was markedly affected by Ta with delays of 0, 3, and 6 weeks at 5, 22, and 28 degrees C, respectively. All hamsters held at 5 and 22 degrees C underwent testicular regression, but 25% of those maintained at 28 degrees C failed to do so. We suggest that Ta modulates testicular regression primarily by affecting responsiveness of neuroendocrine target tissues to long melatonin signals.

Descriptors: body mass index, circadian rhythm, gonads, melatonin, photoperiod, regression, temperature, testes, hamsters.

Larkin, J.E. and I. Zucker (1999). **Low temperature accelerates entrainment to short day photoperiod and gonadal regression in the Siberian hamster**. *Society for Neuroscience Abstracts* 25(1-2): 868. ISSN: 0190-5295.

Descriptors: low temperature, entrainment, accelerates, short day, photoperiod, gonadal regression, hamster.

Notes: Meeting Information: 29th Annual Meeting of the Society for Neuroscience, October 23-28, 1999, Miami Beach, Florida, USA.

Lataye, R., P. Campo, and G. Loquet (2000). **Combined effects of noise and styrene exposure on hearing function in the rat**. *Hearing Research* 139(1-2): 86-96. ISSN: 0378-5955.

Descriptors: noise, styrene, exposure, rat, hearing, effects.

Lavail, M.M., G.M. Gorrin, D. Yasumura, and M.T. Matthes (1999). **Increased susceptibility to constant light in NR and PCD mice with inherited retinal degenerations**. *IOVS* 40(5): 1020-1024.

Descriptors: constant light, increased susceptibility, NR, PCD, mice, retinal degenerations, inherited.

Lax, P. and J.A. Madrid (2000). **Macronutrient self-selection pattern in rats under different lighting conditions**. *Biological Rhythm Research* 31(1): 71-87. ISSN: 0929-1016.

Abstract: The effect of constant darkness (DD) and constant light (LL) on the circadian pattern of macronutrient self-selection, daily food intake and body weight was analysed in rats using an automated computer system. No significant differences in energy intake were observed between groups as regards energy intake or macronutrient preferences. Fat and CHO intakes showed a negative correlation ($p<0.005$ in LL and $p<0.0005$ in DD and LD), while protein intake remained constant, which suggests the existence of separate regulation mechanisms governing the intake of protein and energy. Energetic requirements can be preponderantly covered by CHO or fat, depending on the preferences of the animal. Body weight measurements reflected no significant variations between groups at the end of the experiment. However, the circadian pattern of wheel-running activity and the intake of the three macronutrients measured in both constant lighting conditions varied with

respect to that observed in LD. This was particularly true in the case of LL, when constant illumination exerted a decoupling effect on the rhythms. The results indicate that lighting conditions modulate the circadian pattern of wheel-running activity and macronutrient intake. However, changes in temporal organisation of food intake did not affect macronutrient preferences, daily energy intake, number of meals, feeding duration or body weight, suggesting the existence of a double, circadian and homeostatic, control of such variables.
Descriptors: body weight, carbohydrates, circadian rhythm, energy intake, fat, feed intake, feeding behavior, food intake, light regime, nutrient requirements, nutrients, protein intake, rats.

Lax, P., S. Zamora, and J.A. Madrid (1999). **Food entrainment to 4-h T cycles in rats kept under constant lighting conditions**. *Physiology and Behavior* 67(2): 307-314. ISSN: 0031-9384.
Abstract: The effect of 4-h feeding cycles on feeding pattern was analysed in 18 rats kept under constant light (LL) and constant darkness (DD). The scheduled pattern of food-approach behaviour elicited dissociation of the feeding activity into several components associated to the feeding times (CAFT), which coexisted with the previous circadian free-running rhythms. In LL rats and those in the rest phase of DD, the CAFT was characterized by an increased number of food approaches confined exclusively to the period of food availability, with poor anticipatory activity. However, in the active phase of some DD rats, CAFT included an additional anticipatory activity. The interaction between the CAFT and the free-running rhythms involved modulation of the CAFT, depending on the free-running periodicity. After termination of the feeding-restriction schedule, some DD and LL rats retained the CAFT for at least 3 days. However, when access to food was denied 10 days after ending the restricted schedule, rats did not show any feeding activity associated to the previous feeding times. A spontaneous feeding pattern similar to that imposed by the previous feeding schedule emerged immediately after food deprivation in 2 of the DD rats. It is concluded that although these results are compatible with the existence of a food-trainable pacemaker, the existence of a multioscillatory light-trainable pacemaker with some oscillators trained by food pulses and others free-running may also provide an explanation.
Descriptors: feeding behavior, feeding habits, food deprivation, conditioning, conditioned reflexes, dark, light, rats.

Lax, P., S. Zamora, and J.A. Madrid (1999). **Food-entrained feeding and locomotor circadian rhythms in rats under different lighting conditions**. *Chronobiology International* 16(3): 281-291. ISSN: 0742-0528.
Descriptors: rats, lighting conditions, locomotor circadium rhythms, food entrained feeding.

Lenzi, P., G. Frenzilli, M. Gesi, M. Ferrucci, G. Lazzeri, F. Fornai, and M. Nigro (2003). **DNA damage associated with ultrastructural alterations in rat myocardium after loud noise exposure.** *Environmental Health Perspectives* 111(4): 467-471. ISSN: 0091-6765.
Descriptors: rat, DNA damage, ultrastructural alterations, myocardium, loud noise exposure, cardiovascular system.

Li, F., W. Cao, K. Alvarez, S. Chen, M. Dittmar, and R.E. Anderson (2001). **Protection of photoreceptors in rats by adaptation to bright cyclic light**. *IOVS* 42(4): S628.
Descriptors: rats, bright cyclic light, adaptation, sensory reception, photoreceptor cell loss, retinal degeneration, light induced, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 29-May 04, 2001, Fort Lauderdale, Florida, USA.

Li, F., W. Cao, H.M. Chen, and R.E. Anderson (2000). **Delay of photoreceptor degeneration in adult rats by adaptation to bright cyclic light**. *Society for Neuroscience Abstracts* 26(1-2): Abstract No. 735.9. ISSN: 0190-5295.
Descriptors: rats, bright cyclic light, adaptation, photoreceptor degeneration, delay, retinas, susceptibility to light damage, adaptation system.
Notes: Meeting Information: 30th Annual Meeting of the Society for Neuroscience, November 4-9, 2000, New Orleans, LA, USA.

Li, F., W. Cao, H.M. Chen, and R.E. Anderson (2000). **Adaptation of adult rats to chronic bright cyclic light delays photoreceptor degeneration induced by acute constant light challenge**. *IOVS* 41(4): S21.

Descriptors: adult rats, chronic bright cyclic light, adaptation, delays, photoreceptor degeneration, constant light challenge, acute, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 30-May 05, 2000, Fort Lauderdale, Florida, USA.

Li, G., A. Laabich, J. Xue, and N.G.F. Cooper (2003). **Gene expression profiling of rat retina during light deprivation.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 456.5.
Online: http://sfn.scholarone.com
Descriptors: rat, retina, light deprivation, gene expression profiling, changes, mRNA, protein.
Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Li, X.M., P. Delagrange, and F. Levi (2001). **Daily melatonin treatment sets the period of body temperature and locomotor activity rhythms at 24h in mice exposed to constant light**. *Chronobiology International* 18(6): 1152. ISSN: 0742-0528.
Descriptors: mice, body temperature, locomotor activity, rhythms, melatonin treatment, daily, constant light exposure.
Notes: Meeting Information: 25th Meeting of the International Society of Chronobiology, Kemer, Turkey.

Linthorst, A.C.E., C. Flachskamm, and J.M.H. Reul (2001). **Hippocampal serotonin responses to forced swim stress in rats: influence of water temperature**. *Society for Neuroscience Abstracts* 27(1): 1104. ISSN: 0190-5295.
Descriptors: rats, forced swim stress, water temperature, hippocampal serotonin responses, behavior, varied water temperatures.
Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Liou, G.I., Y. Fei, N. Peachey, and H. Ripps (1998). **Photoreceptor abnormalities in IRBP-/-mice reared in cyclic light or darkness**. *IOVS* 39(4): S41.
Descriptors: mice, reared in cyclic light-dark, photoreceptor abnormalities, IRBP mice, sensory system, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 10-15, 1998, Fort Lauderdale, Florida, USA.

Liu, C., M. Peng, A.M. Laties, and R. Wen (1998). **Preconditioning with bright light evokes a protective response against light damage in the rat retina**. *Journal of Neuroscience* 18(4): 1337-1344. ISSN: 0270-6474.
Descriptors: rat, retina, light damage, preconditioning, bright light, protective response, photoreceptor degeneration, resistant, constant exposure.

Lobo, L.L., L. Paut Pangano, G. Debilly, M. Jouvet, and J.L. Valatx (1998). **Sleep-wake stages and central temperature of hypoprolactinemic (IPL) rats under constant light**. *Journal of Sleep Research* 7(Supplement 2): 157. ISSN: 0962-1105.
Descriptors: rats, constant light, sleep-wake stages, central temperature, hypoprolactemic, IPL.
Notes: Meeting Information: 14th Congress of the European Sleep Research Society, September 9-12, 1998, Madrid, Spain.

Lopez Gonzalez, M.A., J.M. Guerrero, and F. Delgado (1997). **Presence of the pineal hormone melatonin in rat cochlea: its variations with lighting conditions**. *NeuroScience Letters* 238(1-2): 81-83. ISSN: 0304-3940.
Descriptors: rat, chochlea, pineal hormone, melatonin, variation, lighting conditions, immune system.

Loudon, A.S., N. Ihara, and M. Menaker (1998). **Effects of a circadian mutation on seasonality in Syrian hamsters (*Mesocricetus auratus*).** *Proceedings of the Royal Society of London Series B Biological Sciences* 265(1395): 517-21. ISSN: 0962-8452.
Abstract: In Syrian hamsters, exposure to short photoperiods or constant darkness induces a decrease in gonadotrophin secretion and gonadal regression. After 10-12 weeks, animals undergo spontaneous gonadal reactivation, gonadotrophin concentrations rise, and in males, testes size increases and spermatogenesis

resumes. The tau mutation shortens the period of circadian wheel-running activity by 4 h in the homozygote. Here, we examine the impact of this mutation on the reproductive response to photoperiod change. Seventeen adult tau mutant and nine adult wild-type males were housed in complete darkness for 25 weeks and testes size determined at weekly intervals. Gonadal regression and subsequent recrudescence occurred in both groups of animals. Regression occurred more rapidly in tau mutants, with a nadir significantly earlier than wild-types but after a similar number of circadian cycles. Rates of testicular recrudescence were similar in both groups. Our data suggest that an acceleration of the circadian period increases the rate of reproductive inhibition in animals exposed to inhibitory photoperiods. Once initiated, the rate of spontaneous reactivation may be independent of the circadian axis.
Descriptors: circadian rhythm genetics, *Mesocricetus* physiology, mutation, seasons, testis anatomy and histology, analysis of variance, darkness, hamsters, homozygote, *Mesocricetus* genetics, photoperiod, regression analysis, testis physiology.

Lucas, R.J., J.A. Stirland, Y.N. Mohammad, and A. Loudon (2000). **Postnatal growth rate and gonadal development in circadian tau mutant hamsters reared in constant dim red light**. *Journal of Reproduction and Fertility* 118(2): 327-330. ISSN: 0022-4251.
Descriptors: mutant hamsters, post natal growth rate, gonadal development, reared in constant dim red light, circadian tau.

Maes, J.H.R. and G. De Groot (2003). **Effects of noise on the performance of rats in an operant discrimination task.** *Behavioural Processes* 61(1-2): 57-68. ISSN: 0376-6357.
Descriptors: rats, noise, effects on performance, operant discrimination task, irregular, moderate intensity, noise, no noise.

Mailloux, A., C. Benstaali, A. Bogdan, A. Auzeby, and Y. Touitou (1999). **Body temperature and locomotor activity as marker rhythms of aging of the circadian system in rodents**. *Experimental Gerontology* 34(6): 733-740. ISSN: 0531-5565.
Descriptors: aging, circadian system, rodents, body temperature, locmotor activty, marker.

Makarios Lahham, L., S.M. Roseau, G. Fromentin, D. Tome, and P.C. Even (2004). **Rats free to select between pure protein and a fat-carbohydrate mix ingest high-protein mixed meals during the dark period and protein meals during the light period.** *Journal of Nutrition* 134(3): 618-624. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Descriptors: rats, protein, fat, carbohydrate, mixed meals, light, dark.

Malberg, J.E. and L.S. Seiden (1998). **Small changes in ambient temperature cause large changes in 3,4-methylenedioxymethamphetamine (MDMA)-induced serotonin neurotoxicity and core body temperature in the rat**. *Journal of Neuroscience* 18(13): 5086-5094. ISSN: 0270-6474.
Descriptors: rat, core body temperature, thermoregulation, changes, serotonin neurotoxicity, amphetamine derivative, MDMA, ambient temperature.

Maskrey, M., D. Megirian, and G.A. Farkas (1998). **Effect of changing body temperature on the ventilatory and metabolic responses of lean and obese Zucker rats.** *American Journal of Physiology* 275(2, Part 2): R531-R540. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: obesity, body temperature regulation, hypercapnia, hypoxia, metabolism.

Maskrey, M., P.R. Wiggins, and P.B. Frappell (2001). **Behavioral thermoregulation in obese and lean Zucker rats in a thermal gradient.** *American Journal of Physiology* 281(5, Part 2): R1675-R1680. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: obesity, body temperature regulation, rats, behavioral, thermoregulation.

Maskrey, M., D. Megirian, and G.A. Farkas (1998). **Effect of changing body temperature on the ventilator and metabolic responses of lean and obese Zucker rats**. *American Journal of Physiology* 275(2, Part 2): R531-

R540. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: Zucker rats, lean, obese, changing body temperature, effect, ventilator, metabolic, responses, breathing pattern, respiration.

Matasic Rossini, M. and I. Samarzija (1997). **Dynamics of body temperature changes in rats induced by chlorpromazine and clozapine**. *Acta Pharmaceutica (Zagreb)* 47(4): 237-243. ISSN: 1330-0075.
Descriptors: rats, body temperature, changes, induced, chlorpromazine, clozapine, drugs, hypothermic, temperature decreases.

Matthew, C.B., I.V. Sils, and R.P. Francesconi (1998). **The rat as a model of hormonal alterations in circadian periodicity of core temperature**. *FASEB Journal* 12(4): A121. ISSN: 0892-6638.
Descriptors: rat, model, hormonal alterations, circadian periodicity, core temperature.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 98, Part 1, April 18-22, 1998, San Francisco, California, USA.

McLennan, I.S. and J. Taylor Jeffs (2004). **The use of sodium lamps to brightly illuminate mouse houses during their dark phases.** *Laboratory Animals* 38(4): 384-92. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The human and murine diurnal rhythms are out of phase. Consequently in conventionally-lit mouse houses the mice's deep sleep is often disrupted, the daily welfare monitoring of the mice is limited by their inactivity, and scientific data obtained from the mice model the sleeping rather than awake human. Sodium light is bichromatic, with both wavelengths being in the human visual field but at the margin of murine vision. We report here that sodium lamps can be used to light mouse houses to a level that is comfortable for humans, but still sufficiently dull to permit nocturnal behaviour in mice. The response of mice to sodium light was initially monitored by recording the locomotory activity of BALB/c mice. The movement of mice in their cages greatly increased at the start of the nocturnal phase. Alterations in the white light cycle caused an acute change in the onset of nocturnal behaviour. In contrast, sodium light did not suppress the onset of nocturnal locomotory behaviour, even though the lighting was sufficiently bright for humans to read without light adaptation. The sodium lighting was then used to observe the nocturnal behaviour of over 150 mice of various strains, for over 1.5 years. Mice were invariably awake and alert during the nocturnal/sodium light phase. All exhibited high locomotory activity, except for nursing mothers. Some tasks, such as cage cleaning and minor surgery, were more easily done under white than sodium lighting. We therefore adjusted the timing of the light cycles to provide white light in the morning and sodium light (nocturnal phase) in the afternoon. This provided for easy operation of the mouse house, while yielding both animal welfare and scientific advantages.
Descriptors: circadian rhythm physiology, animal housing, lighting, mice physiology, photoperiod, behavior, animal physiology, inbred BALB c mice, inbred C57BL mice, knockout mice, transgenic mice, wakefulness physiology.

Mcmullen, C.A., F.H. Andrade, and J.S. Stahl (2004). **Functional and genomic changes in the mouse ocular motor system in response to light deprivation from birth.** *Journal of Neuroscience* 24(1): 161-169. ISSN: 0270-6474.
Descriptors: mouse, ocular motor system, light deprivation, birth, functional changes, genomic changes, response, development.

Meerlo, P., A. Sgoifo, S.F. De Boer, and J.M. Koolhaas (1999). **Long-lasting consequences of a social conflict in rats: behavior during the interaction predicts subsequent changes in daily rhythms of heart rate, temperature, and activity.** *Behavioral Neuroscience* 113(6): 1283-90. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Abstract: This study shows that the long-term consequences of a social conflict in rats do not depend on the physical intensity of the fight in terms of aggression received but, especially, on how the subjects deal with it. Experimental rats were introduced into the cage of an aggressive conspecific for 1 hr, and the effects on daily rhythms of heart rate, body temperature, and activity thereafter were measured by means of telemetry. In some rats, the confrontation caused a strong decrease in the daily rhythm amplitude that lasted up to 3 weeks, whereas

other subjects showed only minor changes. The changes in rhythm amplitude did not correlate with the number of attacks received from the territory owner. Contrary to this, the changes showed a clear negative correlation with the aggression of the experimental rats themselves. Subjects fighting back and counterattacking the cage owner subsequently had a smaller reduction in rhythm amplitude.

Descriptors: aggression physiology, behavior, animal physiology, body temperature physiology, conflict psychology, heart rate physiology, motor activity physiology, circadian rhythm physiology, rats, social behavior, time factors.

Meyer, C.W.E., M. Klingenspor, J. Rozman, and G. Heldmaier (2004). **Gene or size: metabolic rate and body temperature in obese growth hormone-deficient dwarf mice**. *Obesity Research* 12(9): 1509-1518. ISSN: 1071-7323.

NAL Call Number: RC628.O294

Abstract: Objective: SMA1 mice carry a missense mutation in the growth hormone gene that leads to semidominant dwarfism and obesity. In this study, the basic thermal and metabolic properties of SMA1 mice were examined to detect metabolic alterations that can support the accretion of excess fat. Research Methods and Procedures: Basal and resting metabolic rates (RMRs) in wild-type and SMA1 (sma1/+ and sma1/sma1) mice were determined by indirect calorimetry. Body temperature (Tb) was recorded using intraperitoneally implanted temperature-sensitive transmitters, and body composition was determined by DXA. Results: SMA1 mice have proportionally lower basal and resting metabolic rates, higher body mass (BM)-specific RMRs, and a higher lower critical temperature, and display a decrease in Tb by 0.4 degrees C in sma1/+ and 0.9 degrees C in sma1/sma1. Discussion: The analysis of gene effects on BM and energy expenditure in mouse mutants must consider the appropriate allometric relationship between BM and metabolic rate. With the exception of Tb, all metabolic alterations observed in SMA1 reflect reduced size.

Descriptors: animal models, body fat, body temperature, energy consumption, energy metabolism, genes, growth, human diseases, laboratory animals, obesity, mice.

Mikhail, N., S. Dawoud, H.A. Saif Helmy, and S. El Kholly (1997). **Effect of noise stress on rat brain histopathology, ultrastructure and neurotransmitter activity**. *Journal of the Medical Research Institute* 18(1): 64-73. ISSN: 1110-0133.

Descriptors: rat, brain, noise stress, effect, histopathology, ultrastructure, neurotransmitter activity, albino rats, neurobehavioral changes.

Miller, P.S., M.K. Nielsen, and H.Y. Chen (1998). **Growth curves, feed intake, water intake, organ weights, and heat production of mice selected for high or low heat loss**. *Journal of Dairy Science* 81(Supplement 1): 134.

Descriptors: mice, heat loss, growth curves, feed intake, organ weights, heat production, water intake.

Notes: Meeting Information: Joint Meeting of the American Dairy Science Association and the American Society of Animal Science, July 28-31, 1998, Denver, Colorado, USA.

Mio, M., M. Yabuta, and C. Kamei (1998). **Biphasic effects of ultraviolet light (UVB) on the histamine release from rat mast cells**. *Japanese Journal of Pharmacology* 79(Supplement 1): 99. ISSN: 0021-5198.

Descriptors: rat, mast cells, histamine release, ultraviolet light, UVB, biphasic effects.

Notes: Meeting Information: 71st Annual Meeting of the Japanese Pharmacological Society, March 23-26, 1998, Kyoto, Japan.

Mistlberger, R.E., H. Lukman, and B.G. Nadeau (1998). **Circadian rhythms in the Zucker obese rat: assessment and intervention.** *Appetite* 30(3): 255-267. ISSN: 0195-6663.

NAL Call Number: QP141.A1A64

Abstract: Body temperature (Tb) and activity were recorded by telemetry in obese and lean Zucker rats in light-dark (LD), constant dark (DD) and constant light (LL). In LD, obese rats, by comparison with lean rats, exhibited a 2-4-h phase advance and attenuated amplitude of Tb and activity rhythms. These differences persisted on the first day of DD, and thus were not due to differential sensitivity to masking effects of light. In LL, obese and lean rats exhibited similar free-running periods, thus the phase advance in LD was also not due to a short intrinsic period. In LD, obese rats exhibited more diurnal food intake and a reduced LD intake ratio. To assess the role of diurnal feeding in weight gain, one group of obese rats was fed ad libitum, and another fed

only at night. Food intake did not differ significantly between groups, but ad libitum fed rats gained 23% more weight (60 g) over 60 days, suggesting that excessive diurnal feeding may contribute adversely to body weight regulation in this animal model of obesity.
Descriptors: rats, obesity, circadian rhythm, body temperature, activity, light, dark, food intake, weight gain, eating patterns, timing, body weight, light regime.

Mittag, T.W., A.U. Bayer, and M.M. Lavail (1999). **Light-induced retinal damage in mice carrying a mutated SOD I gene**. *Experimental Eye Research* 69(6): 677-683. ISSN: 0014-4835.
Descriptors: retinal damage, light-induced, mice, SOD I gene.

Miyagi, M., K. West, R.M. Darrow, D.T. Organisciak, and J.W. Crabb (2001). **Protein nitration in rat retina as a result of light exposure**. *IOVS* 42(4): S628.
Descriptors: rat, sensory reception, retinal light damage, intense visible light, light exposure, protein nitration, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 29-May 04, 2001, Fort Lauderdale, Florida, USA.

Miyagi, M., H. Sakaguchi, R.M. Darrow, L. Yan, K.A. West, K.S. Aulak, D.J. Stuehr, J.G. Hollyfield, D.T. Organisciak, and J.W. Crabb (2002). **Evidence that light modulates protein nitration in rat retina**. *Molecular and Cellular Proteomics* 1(4): 293-303. ISSN: 1535-9476.
Descriptors: rat, retina, protein nitration, light modulation, damaging light, photoreceptor cell death, light induced, retinal physiology.

Mizota, A. and U.E. Adachi (2002). **Effect of body temperature on electroretinogram of mice.** *IOVS* 43(12): 3754-3757.
Descriptors: mice, body temperature, effect, electroretinogram, ERG, retina.

Monsefi, M., T. Talaei, and F. Dehghani (2004). **Effect of the noise stress on the cell surface and extracellular matrix glycoconjugates in developing mouse heart**. *Anatomical Science International* 79: 371. ISSN: 1447-6959.
Descriptors: mouse, noise stress, effect, cell surface, developing mouse heart, matrix coconjugates, pregnancy.
Notes: Meeting Information: 16th International Congress of the IFAA (International Federation of Associations of Anatomists) and the 109th Annual Meeting of the Japanese Association of Anatomists, August 22-27, 2004, Kyoto, Japan.

Mori, M., H. Kobayashi, M. Naganuma, C. Sugiyama, Y. Katsumura, and C. Furihata (2000). **Induction of unscheduled DNA synthesis in hairless mouse epidermis by ultraviolet light**. *Journal of Toxicological Sciences* 25(1): 17-24.
Descriptors: induction, DNA synthesis, hairless mouse epidermis, ultraviolet light.

Morimoto, Y., K. Nakai, T. Arai, F. Karasawa, A. Ohnuki, T. Sato, M. Katoh, and M. Kikuchi (2000). **Ultraviolet light prevents the development of vasospasm in rat femoral arteries: pharmacological analysis**. *Japanese Journal of Pharmacology* 82(Supplement 1): 91. ISSN: 0021-5198.
Descriptors: rat, ultraviolet light, femoral arteries, vasospasm development, prevents, pharmacological analysis.
Notes: Meeting Information: 73rd Annual Meeting of the Japanese Pharmacological Society, March 23-25, 2000, Yokohama, Japan.

Morimoto, Y., S. Kohyama, K. Nakai, H. Matsuo, F. Karasawa, and M. Kikuchi (2003). **Long-term effects of UV light on contractility of rat arteries in vivo.** *Photochemistry and Photobiology* 78(4): 372-376. ISSN: 0031-8655.
Descriptors: rat, arteries, contractility, UV light, long term, effects, smooth muscle cells, loss, contractile responses, reduced, endothelial function.

Morooka, H., Y. Terao, O. Shibata, and K. Sumikawa (1998). **Effect of body temperature on ischemia-induced activation of stress-activated protein kinases in rat kidneys**. *Anesthesiology (Hagerstown)* 89(3A): A200.

ISSN: 0003-3022.
Descriptors: rat, kidneys, stress activated, ischemia induced, protein kinases, body temperature, effect.
Notes: Meeting Information: Annual Meeting of the American Society of Anesthesiologists, October 17-21, 1998, Orlando, Florida, USA.

Morrison, J.C., W.O. Cepurna, E.C. Johnson, V. Ackhavong, and L. Jia (2000). **Loss of optic nerve axons in aged rats following chronic intraocular pressure (IOP) elevation due to constant light housing**. *IOVS* 41(4): S896.
Descriptors: rats, optic nerve axons, intraocular pressure, elevation, constant light, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 30-May 05, 2000, Fort Lauderdale, Florida, USA.

Morrissette, R.N. and H.C. Heller (1998). **Effects of temperature on sleep in the developing rat**. *American Journal of Physiology* 274(4, Part 2): R1087-R1093. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: rat, developing, sleep, temperature, effects, autonomic systems, postnatally, vulnerabilities, immature autonomic functions, ambient temperature, variations.

Morrow, N.S., M. Schall, C.V. Grijalva, P.J. Geiselman, T. Garrick, S. Nuccion, and D. Novin (1997). **Body temperature and wheel running predict survival times in rats exposed to activity-stress**. *Physiology and Behavior* 62(4): 815-825. ISSN: 0031-9384.
Abstract: The relationship between restricted feeding (feeding for 1 h each day), core body temperature (Tau b), wheel running, survival and gastric erosion formation was examined in female rats exposed to activity-stress. Core body temperature and gross motor activity were telemetrically monitored in 4 groups of Sprague-Dawley rats that had free access to running wheels and in one group that was not allowed to run on the wheels. 24 h prior to the onset of hypothermia and predicted mortality, different groups were left undisturbed, warmed with a heat lamp, denied access to running wheels, or euthanized. Length of survival in wheel-running rats varied from 2 to 12 days. During the first day of food deprivation, premorbid changes in the variability of Tau b during the diurnal period and the mean number of wheel revolutions during the nocturnal period were strongly predictive of length of survival. Warming rats with a heat lamp or preventing rats from ever running on the wheel increased the length of survival and attenuated gastric erosion formation. Only rats that were warmed had a greater likelihood of survival. Gastric pathology was also reduced in rats that were euthanized prior to becoming moribund. Rats that were left undisturbed or locked from the running wheel over the last 24 h of testing became moribund and had extensive gastric mucosal damage. These results indicate that thermoregulatory disturbances induced by restricted feeding and not wheel running alone are critical in determining survival and the degree of gastric mucosal injury in rats exposed to activity-stress. Results further suggest that predisposing factors may put some rats at risk for the development of activity-stress-induced mortality.
Descriptors: body temperature, anorexia nervosa, survival, food restriction, exercise, physical activity, stress, stomach ulcers, mortality, death, hypothermia, rats.

Mousel, M.R. and M.K. Nielsen (1997). **Daily activity and core body temperature of mice selected for high and low heat loss**. *Journal of Animal Science* 75(Supplement 1): 144. ISSN: 0021-8812.
NAL Call Number: 49 J82
Descriptors: mice, high heat loss, low heat loss, daily activity, core body temperature.
Notes: Meeting Information: 89th Annual Meeting of the American Society of Animal Science, July 29-August 1, 1997, Nashville, Tennessee, USA.

Mousel, M.R., W.W. Stroup, and M.K. Nielsen (2001). **Locomotor activity, core body temperature, and circadian rhythms in mice selected for high or low heat loss**. *Journal of Animal Science* 79(4): 861-868. ISSN: 0021-8812.
NAL Call Number: 49 J82
Abstract: Collection of locomotor activity and core temperature data spanned generations 20 and 21 for a total of 352 mice divided into 3 replicates high heat (MH) low heat (ML) losses and unselected controls (MC). Physical activity and core body temperature data were accumulated using implanted transmitters and continuous automated collection. Measurement for each animal was for 3 d. Activity was recorded for each half hour and

then averaged for the day; temperature was averaged daily; circadian rhythm was expressed in 12 h (light vs. dark) or 6 h periods as well as by fitting cyclic models. Activity means were transformed to log base 2 to lessen heterogeneity of variance within lines. Heat loss for a 15 h period beginning at 1630 and feed intake for 7 d were measured on 74 additional mice in order to estimate the relationship between locomotor activity and heat loss or feed intake. Selection lines were different (P<0.01) for both locomotor activity and core body temperature. Differences were due to selection (MH-ML, P<0.01), and there was no evidence of asymmetry of response (P>0.38). Retransformed from log base 2 to the scale of measurement, mean activity counts were 308, 210 and 150 for MH, MC and ML, respectively. Mean core temperatures were 37.2, 36.9 and 36.7 degrees C for MH, MC and ML (P<0.01), respectively. Females had greater physical activity (P<0.01) and body temperature (P<0.01) than males. There was no evidence of a sex x selection criterion interaction for either activity or temperature (P>0.20). Overall phenotypic correlation between body temperature and log base 2 activity was 0.43 (P<0.01). Periods during the day were different for both 12 and 6 h analyses (P<0.01), but there were no period x selection criterion interactions (P>0.1) for physical activity or body temperature. More sensitive cyclic models revealed significant (P<0.01) 24, 12, 8 and 6 h cycles that differed (P<0.01) among lines. Estimated differences between MH and ML mice in feed intake and heat loss due to locomotor activity were 36 and 11.5%, respectively. Variation in activity thus contributed to variation in feed intake.

Descriptors: body temperature, circadian rhythm, feed intake, heat loss, locomotion, physical activity, mice.

Mrosovsky, N. (1999). **Further experiments on the relationship between the period of circadian rhythms and locomotor activity levels in hamsters.** *Physiology and Behavior* 66(5): 797-801. ISSN: 0031-9384.

Abstract: A number of experiments in the past have demonstrated that rats and mice have shorter free-running circadian rhythms when they have access to a running wheel in their cage. Moreover, within groups of rats and hamsters, individuals making most use of their running wheels tend to have shorter circadian rhythms. However, these effects are not always evident. This article analyzes the results of four additional experiments on hamsters, some showing correlations between high activity and fast rhythms, and others not. It is suggested that failure to find this relationship occurs when there is an insufficient range of activity levels within a group. When present, correlations between locomotor activity and periodicity reflect causal links because shorter rhythms can be produced by providing a type of running wheel on which hamsters run more. The effects of possible changes in activity on circadian period should be considered when interpreting experiments on physiological manipulations of the circadian period.

Descriptors: circadian rhythm physiology, motor activity physiology, hamsters, linear models, photoperiod, time factors.

Mrosovsky, N., R.G. Foster, and P.A. Salmon (1999). **Thresholds for masking responses to light in three strains of retinally degenerate mice**. *Journal of Comparative Physiology, Part A, Sensory Neural and Behavioral Physiology* 184(4): 523-428.

Descriptors: light, masking, thresholds, mice, retinally degenerate, response.

Mrosovsky, N., R.J. Lucas, and R.G. Foster (2001). **Persistence of masking responses to light in mice lacking rods and cones**. *Journal of Biological Rhythms* 16(6): 585-588. ISSN: 0748-7304.

Descriptors: mice, retinal degeneration, light masking responses, rods, cones, lacking, light.

Muchlinski, A.E., B.C. Baldwin, D.A. Padick, B.Y. Lee, H.S. Salguero, and R. Gramajo (1998). **California ground squirrel body temperature regulation patterns measured in the laboratory and in the natural environment.** *Comparative Biochemistry and Physiology, Part A, Molecular and Integrative Physiology* 120(2): 365-72. ISSN: 1095-6433.

NAL Call Number: QP1.C6

Abstract: Body temperature (Tb) was measured by telemetry in both laboratory maintained and natural environment California ground squirrels, *Spermophilus beecheyi.* Laboratory animals had a mean diurnal Tb of 37.5 degrees C under conditions of LD 14:10, 20 degrees C and 36.5 degrees C under conditions of LD 10:14, 20 degrees C (P < 0.01). Nocturnal mean Tbs were 37.1 and 35.2 degrees C, respectively (P < 0.05). Mean diurnal Tbs for each animal in the natural environment ranged from 39.3 to 40.1 degrees C (mean = 39.6 degrees C) during both study seasons which included the hot season months of March through August and the cool season months of December through February. Natural environment hot season mean Tb was not

significantly different from cool season mean Tb but both mean Tbs were significantly different from the diurnal mean Tbs measured in the laboratory (P < 0.05). California ground squirrels exhibit an open-field stress induced hyperthermia in the laboratory which can be extended for periods up to 6 h. The hyperthermic response is blocked by L-propranolol at a dosage of 15 mg kg-1. Laboratory animals do not habituate to repeated open-field exposures over a five consecutive day period. It is suggested that stress hyperthermia might be a normal component of thermoregulation in some free-living ground squirrels because of the openness of the habitat in which they exist.

Descriptors: body temperature regulation, Sciuridae physiology, fever, stress.

Mucignat Caretta, C. and A. Caretta (1999). **Urinary chemical cues affect light avoidance behaviour in male laboratory mice, *Mus musculus*.** *Animal Behaviour* 57(Part 4): 765-769. ISSN: 0003-3472.

NAL Call Number: 410 B77

Abstract: Chemical signals from conspecifics can influence the behaviour and neuroendocrine axis of mice. Several different molecules are excreted with urine, depending on hormonal level, and can indicate the sex of the emitter. In male mice, these chemicals are the major urinary proteins (MUPs) and some small volatile odorant molecules that are found bound to them. We tested adult males for light avoidance behaviour in a two-chamber apparatus, with one light and one dark side, in the presence or absence of male urinary substances. The presence of chemical cues on either side of the cage was expected to modify light avoidance behaviour. The volatiles released from purified MUPs had the same effect as whole adult male urine, in that they induced a faster onset of exploration of the light compartment. The results show that mice can use the information carried by the odorant molecules released by MUPs to recognize the urine of male mice, and respond appropriately.

Descriptors: mice, male animals, urine, volatile compounds, pheromones, light, animal behavior.

Mustonen, A.M., P. Nieminen, and H. Hyvarinen (2002). **Effects of continuous light and melatonin treatment on energy metabolism of the rat**. *Journal of Endocrinological Investigation* 25(8): 716-723. ISSN: 0391-4097.

Descriptors: rat, continuous light, melatonin treatment, energy metabolism, effects, food intake, fat metabolism, body mass.

Mutti, D.O., K. Zadnik, and C.J. Murphy (1998). **The effect of continuous light on refractive error and the ocular components of the rat**. *Experimental Eye Research* 67(6): 631-636. ISSN: 0014-4835.

Descriptors: continuous light, refractive error, ocular, rat, effect, components.

Nagai, Y., T. Sakai, T. Yoshitoshi, and K. Kitahara (1999). **Expression of cytokine gene in the rat retina after injury and light damage**. *IOVS* 40(4): S934.

Descriptors: retina, injury, light damage, rat, cytokine gene, meeting abstract.

Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 9-14, 1999, Fort Lauderdale, Florida, USA.

Nagapetyan, K.O., R.A. Arutyunyan, L.A. Matinyan, K.A. Arutyunyan, and L.V. Nurbekyan (2001). **Body temperature changes in young and adult rats in response to emotionally significant sound and immobilization**. *Ontogenez* 32(2): 154-156. ISSN: 0475-1450.

Descriptors: rats, adult, young, body temperature, emotionally significant sound, immobilization, changes, thermoregulation, age, stressful factors.

Nevo, E. (1998). **Evolution of a visual system for life without light: optimization via tinkering in blind mole rats**. In: *Principles of Animal Design: The Optimization and Symmorphosis Debate*, p. 288-298.

Descriptors: blind mole rats, visual system, evolution, light, without light, life.

Newsom, D.M., G.L. Bolgos, L. Colby, and J.A. Nemzek (2004). **Comparison of body surface temperature measurement and conventional methods for measuring temperature in the mouse**. *Contemporary Topics in Laboratory Animal Science* 43(5): 13-18. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Abstract: Temperature is a valuable parameter used to judge wellness of animals in a research setting; therefore, reliable, noninvasive, and inexpensive methods for monitoring temperature are becoming a necessity in research

laboratories. A new method for obtaining temperature in mice, the measurement of body surface temperature via an external probe, was compared to two more common methods, the rectal probe and telemetry. The comparisons of the temperature measuring devices were performed in mice made hypothermic via prolonged anesthesia and in mice made hyperthermic by injection of endotoxin. The results demonstrated good correlation between the surface temperature measurements and the temperatures obtained by both telemetry and the rectal probe. The correlations were particularly significant when core body temperatures were below normal. In addition, the surface probe compared favorably with the other methods with regard to animal stress, observed complications, and initial cost. These results suggest that the surface probe could provide an efficient means for obtaining valuable physiological data and determining humane endpoints.
Descriptors: animal welfare, body temperature, laboratory animals, methodology, probes, stress, mice.

Nielsen, M.K., B.A. Freking, L.D. Jones, S.M. Nelson, T.L. Vorderstrasse, and B.A. Hussey (1997). **Divergent selection for heat loss in mice. II. Correlated responses in feed intake, body mass, body composition, and number born through fifteen generations**. *Journal of Animal Science* 75(6): 1469-1476. ISSN: 0021-8812.
NAL Call Number: 49 J82
Descriptors: heat loss, mice, feed intake, body mass, generations, number born, body composition, responses.

Nir, I. (1998). **Treatment with light enhances photoreceptor survival in dystrophic RCS rats**. *IOVS* 39(4): S571.
Descriptors: rats, dystrophic RCS, light, treatment, photoreceptor survival, enhances, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 10-15, 1998, Fort Lauderdale, Florida, USA.

Nymark, S., C. Haldin, H. Suominen, K. Donner, and A. Koskelainen (2002). **Light-adaptation in rat rods at different temperatures.** *ARVO Annual Meeting Abstract Search and Program Planner*: Abstract No. 1419.
Descriptors: rat, light adaptation, rods, different temperatures, mammalian rods, lower vertebrates, amphibians, differences.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 05-10, 2002, Fort Lauderdale, FL, USA.

Ohlemiller, K.K., J.S. Wright, and A.F. Heidbreder (2000). **Vulnerability to noise-induced hearing loss in 'middle-aged' and young adult mice: a dose-response approach in CBA, C57BL, and BALB inbred strains**. *Hearing Research* 149(1-2): 239-247. ISSN: 0378-5955.
Descriptors: young adult mice, middle aged mice, noise induced hearing loss, vulnerability, CBA, C57BL, BALB, inbred strains, dose response, cochlea, noise induced permanent threshold shift, genes.

Ohtsuka, H. (2004). **Circadian rhythm of the electroretinogram and the control system in rats**. *Medical Journal of Hiroshima University* 52(4-6): 47-56. ISSN: 0018-2087.
Abstract: Circadian rhythm in the electroretinogram (ERG) in continuous darkness (DD) over a long period were examined to find whether a free-running rhythm in retinal function exists in rats and if the rhythm is related to the circadian control system in the suprachiasmatic nucleus (SCN) in SCN lesioned rats. ERGs were recorded every 4 hours over 48 hours under a 12-hour light/dark cycle (LD) in SCN non-lesioned or lesioned rats, and on days 61, 85, 97 and 117 in DD in SCN non-lesioned rats. Locomotor activities were examined concurrently to compare the rhythms in the ERG. The amplitudes of the a- and b-waves changed in a circadian fashion in both LD and DD in the SCN nonlesioned rats. The acrophases shifted for every measurement in DD. The mean free-running period in the ERG and locomotor activity rhythms were 24.50 hours. However, no circadian rhythm was observed in the ERG or locomotor activity in the SCN lesioned rats. These results indicated that a circadian rhythm exists in the rat retinal function, in which the rhythm free-runs with the same periodicity as that for locomotor activity, and a circadian rhythm for retinal function was confirmed to be associated with the SCN.
Descriptors: nervous system, neural coordination, sense organs, sensory reception, electroretinography, clinical techniques, diagnostic techniques, locomotor activity examination, laboratory techniques, circadian rhythm, continuous darkness.

Okane, N., T. Osaka, A. Kobayashi, S. Inoue, and S. Kimura (2001). **Effects of the capsaicin analogue**

resiniferatoxin on thermoregulation in anesthetized rats. *Journal of Thermal Biology* 26(4-5): 345-349. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Abstract: (1) Administration of resiniferatoxin (RTX; 50 microgram/kg, s.c.) induced triphasic metabolic responses with immediate facilitation followed by transitory inhibition and subsequent long-lasting facilitation in urethan-anesthetized rats. The temperature of skin increased immediately after the RTX injection, suggesting cutaneous vasodilation and heat loss. The colonic temperature decreased initially and then increased above the baseline level. (2) Pretreatment with ruthenium red, a putative vanilloid receptor (VN2) antagonist, attenuated the RTX-induced heat loss and inhibition of heat production. (3) Adrenal demedullation selectively attenuated the RTX-induced immediate thermogenesis, and the beta-blocker propranolol prevented both phases of thermogenesis. Thus, the sympathetic nervous system and adrenaline contributed to the thermogenic responses.
Descriptors: analogs, euphorbia, heat production.

Oliveira, M.J.R., A.S. Pereira, P.G. Ferreira, N.R. Grande, A.P. Aguas, L. Guimaraes, D. Freitas, and A.P.O. Carvalho (2003). **Reduction of rat pleural microvilli caused by noise pollution.** *Experimental Lung Research* 29(7): 445-454. ISSN: 0190-2148.
Descriptors: rat, pleural microvilli, reduction, noise pollution, chronic exposure, cotton mill rooms, noise polluted environments.

Oliveira, M.J.R., A.S. Pereira, P.G. Ferreira, L. Guimaraes, D. Freitas, A.P.O. Carvalho, N.R. Grande, and A.P. Aguas (2005). **Arrest in ciliated cell expansion on the bronchial lining of adult rats caused by chronic exposure to industrial noise**. *Environmental Research* 97(3): 282-286. ISSN: 0013-9351.
Descriptors: rats, adult, industrial noise, chronic exposure, ciliated cell, expansion, arrest, bronchial lining, high intensity, low frequency.

Omoto, M., H. Manabe, C. Kuwabara, Y. Tamura, A. Nakamura, and H. Shiomi (1998). **Role of central adenosine on regulation of body temperature in hibernating golden hamster**. *Japanese Journal of Pharmacology* 79(Supplement 1): 196. ISSN: 0021-5198.
Descriptors: golden hamster, body temperature, hibernating, central adenosine, role, regulation.
Notes: Meeting Information: 71st Annual Meeting of the Japanese Pharmacological Society, March 23-26, 1998, Kyoto, Japan.

Organisciak, D.T., R.M. Darrow, L. Barsalou, and I.R. Bicknell (1999). **Rhodopsin and circadian dependent retinal light damage in transgenic rats**. *IOVS* 40(4): S226.
Descriptors: retinal light damage, rats, transgenic, circadian, rhodopsin, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 9-14, 1999, Fort Lauderdale, Florida, USA.

Organisciak, D.T., R.M. Darrow, L. Barsalou, R.K. Kutty, and B. Wiggert (2000). **Circadian-dependent retinal light damage in rats**. *IOVS* 41(12): 3694-3701.
Descriptors: rats, retinal light damage, circadian dependent, dark environment, dim cyclic light environment, susceptibility, photoreceptors.

Ortega, H.H., J.A. Lorente, G.A. Mira, C. Baravalle, and N.R. Salvetti (2004). **Constant light exposure causes dissociation in gonadotrophin secretion and inhibits partially neuroendocrine differentiation of leydig cells in adult rats**. *Reproduction in Domestic Animals* 39(6): 417-423. ISSN: 0936-6768.
Descriptors: rats, adult, leydig cells, constant light exposure, female, photoperiod effects, polycystic ovaries, pituitary.

Osiel, S., D.A. Golombek, and M.R. Ralph (1998). **Conservation of locomotor behavior in the golden hamster: effects of light cycle and a circadian period mutation**. *Physiology and Behavior* 65(1): 123-131. ISSN: 0031-9384.
Descriptors: golden hamster, locomotion behavior, conservation, light cycle, effects, circadian period, light-dark cycle, constant dark, activity.

Ou, H.C., B.A. Bohne, and G.W. Harding (2000). **Noise damage in the C57BL/CBA mouse cochlea**. *Hearing Research* 145(1-2): 111-122. ISSN: 0378-5955.
Descriptors: mouse, C57BL CBA, chochlea, noise damage, auditory system, response, genetic mutations, threshold shift, hair cell loss.

Overton, J.M., L.M. Roberts, S.P. Gagnon, and T.D. Williams (2003). **Ambient temperature and blood pressure regulation in B6 mice.** *FASEB Journal* 17: 4-5 (Abstract No. 826.4). ISSN: 0892-6638.
Online: http://www.fasebj.org/
Descriptors: mice, B6 mice, blood pressure, ambient temperature, regulation, dark phase, light phase.
Notes: Meeting Information: FASEB Meeting on Experimental Biology: Translating the Genome, April 11-15, 2003, San Diego, CA, USA.

Pagala, M.K., W. Poon, S. Chundru, and D. Grob (2002). **Effect of temperature on digitally monitored swimming endurance of mice**. *FASEB Journal* 16(4): A41. ISSN: 0892-6638.
Descriptors: mice, body temperature, low temperature, swimming endurance, effect, metabolic rate, water temperature, high temperature.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology, April 20-24, 2002, New Orleans, Louisiana, USA.

Pauluhn, J. and U. Mohr (1999). **Repeated 4-week inhalation exposure of rats: effect of low-, intermediate, and high-humidity chamber atmospheres**. *Experimental and Toxicologic Pathology* 51(2): 178-187. ISSN: 0940-2993.
Descriptors: rats, exposure, inhalation, low, intermediate, high humidity, chamber, atmospheres, effect, repeated.

Pelissier, A.L., M. Gantenbein, and B. Bruguerolle (1999). **Caffeine-induced modifications of heart rate, temperature, and motor activity circadian rhythms in rats**. *Physiology and Behavior* 67(1): 81-88. ISSN: 0031-9384.
Abstract: The effects of repeated caffeine administration on the circadian rhythms of heart rate (H), body temperature (T) and motor activity (A) were examined in 8 unrestrained adult male Wistar rats (10 weeks old, mean weight 275 g) maintained under controlled conditions (LD 12:12, light from 0600 to 1800 h) by using radiotelemetry transmitters. The study was divided into three 7-day observation spans; a 1-week control span (P1), a 1-week treatment span (P2) and a 1-week recovery span (P3). P1 was performed for assessing baseline measurements of H, T and A. During P2, four rats received caffeine (25 mg/kg) at 0900 h, while 4 rats received saline in the same conditions every day of the observation span. H, T and A were continuously monitored and plotted every 10 min. For P1, P2 and P3, a power spectrum analysis (Fourier transform) was applied to determine the dominant period of rhythmicity. If H, T and A circadian rhythms were detected, the characteristics of these rhythms (mesors, amplitudes and acrophases) were determined by cosinor analysis, expressed as means +or- SEM and compared by analysis of variance. Caffeine did not suppress the circadian rhythmicity of H, T and A, but significantly increased mesors and decreased amplitudes of the 3 rhythms and advanced acrophases of temperature and activity compared to the control group.
Descriptors: heart, heart rate, temperature, body temperature, caffeine, circadian rhythm, rats.

Pelissier, A.L., M. Gantenbein, F. Prudian, and B. Bruguerolle (1998). **Effets d'une anesthesie generale a l'ether ou a la ketamine sur les rythmes circadiens de la temperature corporelle, de la frequence cardiaque et de l'activite locomotrice chez le rat. [Influence of general anaesthetics on circadian rhythms of heart rate, body temperature and locomotor activity in rats].** *STAL, Sciences Et Techniques De L' Animal De Laboratoire* 23(2): 91-98. ISSN: 0339-722X.
Descriptors: rats, anesthetics, influence, heart rate, temperature, locomotor activity, ketamine, ether, daily rhythm.
Language of Text: French with an English summary.

Perrin, M.R. and E.J. Richardson (2005). **Factors affecting average daily metabolic rate of the fat mouse *Steatomys pratensis* (Dendromurinae)**. *Journal of Thermal Biology* 30(2): 103-109. ISSN: 0306-4565.

NAL Call Number: QP82.2.T4J6
Descriptors: metabolism, circadian rhythm, metabolic rate, torpor, ambient temperature.

Petervari, E., M. Balasko, Z. Szelenyi, Z. Hummel, and M. Szekely (2002). **Fasting hypometabolism and thermoregulation in cold-adapted rats.** *Journal of Thermal Biology* 27(5): 359-364. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Abstract: (1) Cold-adapted rats, upon acute cold-exposure, exhibit overshoot increase in metabolic rate (MR) and paradoxical rise in core temperature (Tc). (2) Fasting causes suppression of resting (daytime) but not nocturnal MR and Tc. (3) In fasting rats, acute cold-exposure evokes relatively greater overshoot MR- and Tc-rises than in control rats, while central prostaglandin E induces relatively greater elevations in MR and Tc. (4) Re-feeding quickly reverses fasting-induced MR- and Tc-suppression, earlier than body weight is normalized. (5) The metabolic suppression originating from gastrointestinal signals can be overruled by opposite abdominal information (feeding) or by thermoregulatory information (cold signals).
Descriptors: fasting, thermoregulation, cold adapted, rats, metabolic rate, core temperature, feeding, cold, gastrointesinal.

Phelps, M.J., J. Liu, J.D. Benson, C.E. Willoughby, J.A. Gilmore, and J.K. Critser (1999). **Effects of Percoll separation, cryoprotective agents, and temperature on plasma membrane permeability characteristics of murine spermatozoa and their relevance to cryopreservation.** *Biology of Reproduction* 61(4): 1031-1041. ISSN: 0006-3363.
NAL Call Number: QL876.B5
Descriptors: mice, spermatozoa, plasma membranes, membrane permeability, hydraulic conductivity, mathematical models, density gradient centrifugation, dimethyl sulfoxide, glycerol, ethylene glycol, propylene glycol, cryopreservation, simulation models, temperature, motility, strain differences, sperm motility.

Phillips, P.K. and J.E. Heath (2004). **Comparison of surface temperature in 13-lined ground squirrel (*Spermophilus tridecimlineatus*) and yellow-bellied marmot (*Marmota flaviventris*) during arousal from hibernation.** *Comparative Biochemistry and Physiology, Part A, Molecular & Integrative Physiology* 138(4): 451-457. ISSN: 1095-6433.
NAL Call Number: QP1.C6
Abstract: Surface temperatures (T(s)) of eight 13-lined ground squirrels and seven yellow-bellied marmots were measured during arousal from hibernation using infrared thermography (IRT) and recorded on videotape. Animals aroused normally in 5 degrees C cold rooms. Body temperatures were recorded during arousal using both cheek pouch and interscapular temperature probes. Warming rate in arousal was exponential. Mean mass specific warming rates show the squirrels warm faster (69.76 degrees C/h/kg) than the marmots (4.49 degrees C/h/kg). Surface temperatures (T(s)) for 11 regions were measured every few minutes during arousal. The smaller ground squirrel shows the ability to perfuse distal regions without compromising rise in deep body temperature (T(b)). All squirrel T(s)'s remained low as T(b) rose to 18 degrees C, at which point, eyes opened, squirrels became more active and all T(s)'s rose parallel to T(b). Marmot T(s) remained low as T(b) rose initially. Each marmot showed a plateau phase where T(b) remained constant (mean T(b) 20.3+/-1.0 degrees C, duration 9.4+/-4.1 min) during which time all T(s)'s rose, and then remained relatively constant as T(b) again began to rise. An anterior to posterior T(s) gradient was evident in the ground squirrel, both body and feet. This gradient was only evident in the feet of the marmots.
Descriptors: squirrel, temperature, hibernation, arousal, marmots, infrared thermography, IRT, body temperature.

Ponce, R.H., C.S. Carriazo, and N.T. Vermouth (2001). **Lactate dehydrogenase activity of rat epididymis and spermatozoa: effect of constant light**. *European Journal of Histochemistry* 45(2): 141-150. ISSN: 1121-760X.
Descriptors: rat, epididymis, spermatozoa, constant light, effect, chronic exposure, fertility, reduction, sperm transit, fertilizing ability.

Popelar, J., J.P. Erre, J. Syka, and J.M. Aran (2000). **Suppression of cochlear activity in guinea pigs elicited by contralateral noise**. *European Journal of Neuroscience* 12(Supplement 11): 494. ISSN: 0953-816X.
Descriptors: guinea pigs, cochlear activity, suppression, elicited by contralateral noise, conference proceedings.

Notes: Meeting Information: Meeting of the Federation of European Neuroscience Societies, June 24-28, 2000, Brighton, UK.

Pozdeyev, N.V. and E.V. Lavrikova (2000). **Diurnal changes of tyrosine, dopamine, and dopamine metabolites content in the retina of rats maintained at different lighting conditions**. *Journal of Molecular Neuroscience* 15(1): 1-9. ISSN: 0895-8696.
Descriptors: rats, retina, different lighting conditions, diurnal changes, tyrosine, dopamine, metabolites, daily rhythms, photoperiod, intensity.

Prendergast, B.J., S.D. Bilbo, and R.J. Nelson (2005). **Short day lengths enhance skin immune responses in gonadectomised Siberian hamsters**. *Journal of Neuroendocrinology* 17(1): 18-21. ISSN: 0953-8194.
Abstract: In Siberian hamsters and other photoperiodic rodents, exposure to short photoperiods simultaneously inhibits gonadal hormone secretion and enhances some measures of immune function. The present study tested whether gonadal hormones mediate the effects of short days on skin immune function (delayed-type hypersensitivity reactions) in male Siberian hamsters. The magnitude of delayed-type hypersensitivity reactions was greater in hamsters exposed to short days relative to those in long days. Comparable effects of photoperiod were obtained in castrated hamsters bearing empty or testosterone-filled implants. The data suggest that contemporary gonadal hormone secretion is neither necessary, nor sufficient to mediate the effects of short photoperiods on skin immune function.
Descriptors: Siberian hamsters, endocrine system, chemical coordination, homeostasis, immune system, integumentary system, gonadectomy, testosterone implant, delayed type hypersensitivity reaction, immune function, photoperiodic rodents, short days, skin immune function.

Pribenszky, C., M. Molnar, S. Cseh, and L. Solti (2004). **Survival of mouse blastocysts after low-temperature preservation under high pressure**. *Acta Veterinaria Hungarica* 52(4): 479-487. ISSN: 0236-6290.
Descriptors: mouse, blastocytes, survival, low temperature preservation, high pressure, cryoinjuries, embryos, hydrostatic pressure.

Printz, M. (2000). **Radiotelemetry-based blood pressure, heart rate, and temperature analysis of recombinant inbred rat strains**. *Journal of Hypertension* 18(Supplement 4): S186. ISSN: 0263-6352.
Descriptors: rat, inbred strains, heart rate, temperature, blood pressure, radiotelemetry, recombinant.
Notes: Meeting Information: 18th Scientific Meeting of the International Society of Hypertension, August 20-24, 2000, Chicago, Illinois, USA.

Proll, J. (1997). **Small environmental temperature differences change energy utilization of growing rats**. *Zeitschrift Fuer Ernaehrungswissenschaft* 36(4): 325. ISSN: 0044-264X.
Descriptors: growing rats, energy utilization, environmental temperature differences, change.
Notes: Meeting Information: 1st International Rostock Workshop on Energy and Substrate Utilization: Methodological Aspects of in Vivo Assessment in Animals and Man, September 5-7, 1996, Rostock, Germany.

Prostran, M., Z. Nesic, S. Vuckovic, Z. Todorovic, R. Stojanovic, and M. Ivanovic (2003). **Acute exposure to higher ambient temperature potentiates cataleptic and hyperthermic effects of fentanyl in female rats.** *European Neuropsychopharmacology* 13(Supplement 4): S442. ISSN: 0924-977X.
Descriptors: female rats, acute exposure, higher ambient temperature, potentiates, hyperthermic, cataleptic, effects, fentanyl.
Notes: Meeting Information: 16th Congress of the European College of Neuropsychopharmacology, September 20-24, 2003, Prague, Czech Republic.

Rabat, A., J.J. Bouyer, J.M. Aran, A. Courtiere, W. Mayo, and M. Le Moal (2004). **Deleterious effects of an environmental noise on sleep and contribution of its physical components in a rat model**. *Brain Research* 1009(1-2): 88-97. ISSN: 0006-8993.
Descriptors: environmental noise, deleterious effects, sleep, physical components, rat model, sleep disturbances.

Rado, R., I. Zuri, U. Shanas, and J. Terkel (1997). **Winter and summer daily activity in the blind mole rat: the role of light and temperature**. *Austrian Academy of Sciences Meeting, Vienna, Austria,* Blackwell Wissenschafts-

Verlag GmbH: Berlin, Germany, p. 75. ISBN: 3826331893.
Descriptors: blind mole rat, light, role, daily activity, summer, winter, temperature.
Notes: Poster.

Ranatunga, K.W. (1998). **Temperature dependence of mechanical power output in mammalian (rat) skeletal muscle**. *Experimental Physiology* 83(3): 371-376. ISSN: 0958-0670.
Descriptors: mammalian, rat, skeletal system, mechanical power, temperature, skeletal muscle, force velocity, fiber bundles, temperature range.

Ranchon, I. and R.E. Anderson (2000). **PBN protects albino rat retina from light-induced retinal degeneration**. *IOVS* 41(4): S21.
Descriptors: albino rat, retina, retinal degeneration, light induced, PBN protects, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 30-May 05, 2000, Fort Lauderdale, Florida, USA.

Rascher, K., G. Servos, G. Berthold, H.G. Hartwig, U. Warskulat, S.B. Heller, and D. Haeussinger (2004). **Light deprivation slows but does not prevent the loss of photoreceptors in taurine transporter knockout mice**. *Vision Research* 44(17): 2091-2100. ISSN: 0042-6989.
Descriptors: knockout mice, light deprivation, photoreceptors, loss, slows, taurine transporter, retinal degeneration, apoptosis, necrosis.

Rashotte, M.E., A.M. Ackert, and J.M. Overton (2002). **Ingestive behavior and body temperature during the ovarian cycle in normotensive and hypertensive rats**. *American Journal of Physiology* 282(1, Part 2): R216-R225. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: The relationship between ingestive behaviour (eating+drinking) and core body temperature (Tb) in naturally cycling female rats was compared in a normotensive strain (Sprague-Dawley; SD) and a hypertensive strain reputed to have chronically elevated Tb (spontaneously hypertensive rats; SHR). Tb (by telemetry) and ingestive behaviour (automated recording) were quantified every 30 seconds. Ingestive behaviour and Tb were related on all days of the ovarian cycle in both strains but the strength of that relationship was reduced on the day of oestrus (E) compared with non-oestrous days. Several strain differences in Tb were found as well. In SHR, dark-phase Tb was elevated on E, whereas SD remained at the lower non-oestrous values. Fluctuations in dark-phase Tb were correlated with ingestive behaviour in both strains but had greater amplitude in SHR except on E. Short-term fasting or sucrose availability did not eliminate elevated dark-phase Tb on E in SHR. We propose that oestrus-related changes unique to SHR may indicate heightened thermal reactivity to hormonal changes, ingestive behaviour and general locomotor activity.
Descriptors: body temperature, feed intake, feeding behavior, hypertension, ingestion, estrus cycle, estrus, strain differences, strains, water intake, rats.

Ravishankar, H.N., S.S. Boddupalli, A.S. Gaikwad, and T. Ramasarma (1999). **Survival of rats under cold stress depends on dietary fat.** *Environmental and Nutritional Interactions* 3(4): 257-265.
NAL Call Number: RB152.5.E68
Descriptors: dietary fat, polyenoic fatty acids, cold stress, lipid peroxidation, environmental temperature, relationships, survival, rats.

Refinetti, R. (2003). **Metabolic heat production, heat loss and the circadian rhythm of body temperature in the rat**. *Experimental Physiology* 88(3): 423-429. ISSN: 0958-0670.
Abstract: Metabolic heat production (calculated from oxygen consumption), dry heat loss (measured in a calorimeter) and body temperature (measured by telemetry) were recorded simultaneously at 6 min intervals over five consecutive days in rats maintained in constant darkness. Robust circadian rhythmicity (confirmed by chi square periodogram analysis) was observed in all three variables. The rhythm of heat production was phase-advanced by about half an hour in relation to the body temperature rhythm, whereas the rhythm of heat loss was phase-delayed by about half an hour. The balance of heat production and heat loss exhibited a daily oscillation 180 deg out of phase with the oscillation in body temperature. Computations indicated that the amount of heat

associated with the generation of the body temperature rhythm (1.6 kJ) corresponds to less than 1% of the total daily energy budget (172 kJ) in this species. Because of the small magnitude of the fraction of heat balance associated with the body temperature rhythm, it is likely that the daily oscillation in heat balance has a very slow effect on body temperature, thus accounting for the 180 deg phase difference between the rhythms of heat balance and body temperature.

Descriptors: animal models, body temperature, circadian rhythm, heat loss, heat production, laboratory animals, physiology, rats.

Refinetti, R. (1998). **Homeostatic and circadian control of body temperature in the fat-tailed gerbil**. *Comparative Biochemistry and Physiology, Part A, Molecular and Integrative Physiology* 119(1): 295-300. ISSN: 0300-9629.

NAL Call Number: QP1.C6

Descriptors: fat tailed gerbil, homeostatic, circadian, control, body temperature, light-dark cycle, light phase, ambient temperatures, cold exposure, thermoreulatory set point.

Refinetti, R. (1997). **The effects of ambient temperature on the body temperature rhythm of rats, hamsters, gerbils, and tree shrews**. *Journal of Thermal Biology* 22(4-5): 281-284. ISSN: 0306-4565.

NAL Call Number: QP82.2.T4J6

Descriptors: rats, hamsters, gerbils, tree shrews, ambient temperature, effect, body temperature rhythm, telemetry, rhythm amplitude.

Refinetti, R. and G. Piccione (2005). **Intra- and inter-individual variability in the circadian rhythm of body temperature of rats, squirrels, dogs, and horses**. *Journal of Thermal Biology* 30(2): 139-146. ISSN: 0306-4565.

NAL Call Number: QP82.2.T4J6

Descriptors: behavior, chemical coordination and homeostasis, circadian rhythm, body temperature, inter subject variability, intra subject variability.

Rezende, E.L., A. Cortes, L.D. Bacigalupe, R.F. Nespolo, and F. Bozinovic (2003). **Ambient temperature limits above-ground activity of the subterranean rodent *Spalacopus cyanus***. *Journal of Arid Environments* 55(1): 63-74. ISSN: 0140-1963.

NAL Call Number: QH541.5.D4J6

Abstract: We studied daily activity patterns of the subterranean rodent *Spalacopus cyanus*, in the field during summer and winter, and under laboratory conditions at two different temperatures, 15 degrees C and 30 degrees C. This rodent exhibited nocturnal activity in the laboratory, but diurnal above-ground activity in the field. We suggest that this discrepancy between field and laboratory results is a consequence of differential space-use inside burrows during the day, and that low external ambient temperatures appear to constrain activity of *S. cyanus* outside their burrows during the night in summer and winter. In contrast, we hypothesize that high summer temperatures constrain above-ground activity at midday.

Descriptors: nocturnal activity, temperature, rodents.

Riccio, A.P. and B.D. Goldman (2000). **Circadian rhythms of locomotor activity in naked mole-rats (*Heterocephalus glaber*).** *Physiology and Behavior* 71(1-2): 1-13. ISSN: 0031-9384.

Abstract: A wide variety of organisms exhibit various circadian rhythms in their behavior and physiology. Circadian rhythms are regulated by internal clocks that are generally entrained primarily by the environmental light:dark (L:D) cycle. There have been few studies of circadian rhythms in fossorial species that inhabit an environment where day-night variations are minimal and where exposure to light occurs infrequently. In this study, circadian patterns of wheel-running activity were examined in naked mole-rats (Heterocephalus glaber). Naked mole-rats are fossorial and eusocial, living in colonies of 60-70 animals with only one breeding female. Most individual mole-rats that ran on wheels (65%) exhibited robust circadian rhythms of locomotor activity, entrained to various L:D cycles, and free-ran in constant darkness (DD) with taus averaging 23.5 h. The remainder of the animals either free-ran or were arrhythmic under the various L:D cycles. Mole-rats generally failed to entrain to non-24-h T-cycles with period lengths ranging from T=23 h to T=25 h. There was considerable inter-individual variation in the circadian patterns of locomotor activity in naked mole-rats as is

observed in other subterranean mammals that have been studied. In contrast to the results obtained when mole-rats were individually housed with access to running wheels, circadian rhythms of general locomotor activity were typically not observed for animals monitored while they were housed in a colony setting. However, clear nocturnal rhythms of general locomotor activity were displayed by four males while residing in their home colonies. Two of these males exhibited the physical appearance of a disperser morph - subordinate individuals that are believed to leave their home colonies to achieve reproductive opportunities elsewhere. All four of these males were among the largest males in their respective colonies. These results demonstrate that although naked mole-rats are not frequently exposed to light, the species has retained the capacity to exhibit locomotor patterns of circadian rhythmicity and has the ability to entrain to 24-h L:D cycles. The possible adaptive function of this circadian capacity is discussed.

Descriptors: circadian rhythm physiology, mole rats physiology, motor activity physiology, housing, animal, social environment.

Riccio, A.P. and B.D. Goldman (2000). **Circadian rhythms of body temperature and metabolic rate in naked mole-rats**. *Physiology and Behavior* 71(1-2): 15-22. ISSN: 0031-9384.

Descriptors: naked mole rats, body temperature, circadian rhythms, metabolic rate, thermoregulation, running wheel activity, rodent.

Roca, A., X. Liu, and J. Chen (2001). **Rapid morphological changes to light damage in arrestin knockout mice**. *IOVS* 42(4): S116.

Descriptors: arrestin knockout mice, light damage, morphological changes, sensory reception, retinal light damage, apoptosis, light exposure, meeting abstract.

Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 29-May 04, 2001, Fort Lauderdale, Florida, USA.

Rocha, D.C.M., L. Debeljuk, and L.R. Franca (1999). **Exposure to constant light during testis development increases daily sperm production in adult Wistar rats**. *Tissue and Cell* 31(3): 372-379. ISSN: 0040-8166.

Abstract: Testis histology and daily sperm production were evaluated in adult (160-day-old) Wistar rats that had been exposed to constant light for the first 25 days after birth, and in control animals that had been exposed to a 12 h-light:12 h-dark light regime. Significantly greater ($P<0.05$) numbers of Sertoli cell nucleoli and round spermatids per cross-section of seminiferous tubule were found in animals exposed to constant light. Epididymis weight, daily sperm production per testis and per gram of testis and Leydig cell compartment volume, were increased significantly ($P<0.05$) in the constant-light group. Although there was a trend towards an increased Sertoli cell population per testis in animals exposed to constant light this difference was not significant. The number of round spermatids per Sertoli cell was the same in both groups. The diameter and volume of round spermatid nuclei at stages I and VII of the cycle of seminiferous epithelium were significantly lower ($P<0.05$) in treated animals.

Descriptors: spermatozoa, testes, light regime, epididymis, seminiferous epithelium, spermatids, Sertoli cells, Leydig cells, nuclei, semen production, spermatogenesis, rats.

Rogalska, J., M. Caputa, K. Wentowska, and A. Nowakowska (2004). **Stress-induced behaviour in juvenile rats: effects of neonatal asphyxia, body temperature and chelation of iron**. *Behavioural Brain Research* 154(2): 321-329. ISSN: 0166-4328.

Abstract: Newborn mammals, showing reduced normal body temperature, might be protected against iron-mediated, delayed neurotoxicity of perinatal asphyxia. Therefore, we investigated the effects of (1) neonatal body temperature and neonatal critical anoxia as well as (2) postanoxic chelation of iron with deferoxamine, on open-field stress-induced behaviour in juvenile rats. The third aim of this study was to compare (after the above-mentioned treatments) circadian changes in spontaneous motor activity and body temperature in juvenile rats permanently protected from any stress. Neonatal anoxia at body temperature adjusted (both during anoxia and 2 h reoxygenation) to a level typical of healthy (37 degrees C) or febrile (39 degrees C) adults led to the stress-induced hyperactivity in juvenile (5-45 days old) rats. Both normal neonatal body temperature of 33 degrees C and chelation of iron prevented the hyperactivity in rats. Neither neonatal body temperature nor neonatal anoxia affected spontaneous motor activity or body temperature of juvenile rats, recorded in their home-cages with implantable transmitters. Circadian rhythmicity was also undisturbed. Presented data support the hypothesis that

physiologically reduced neonatal body temperature can provide a protection against iron-mediated postanoxic disturbances of behavioural stress responses in juvenile rats.
Descriptors: animal models, anoxia, body temperature, circadian rhythm, iron, laboratory animals, newborn animals, respiration, stress, rats.

Romanovsky, A.A., A.I. Ivanov, and Y.P. Shimansky (2002). **Selected contribution: ambient temperature for experiments in rats: a new method for determining the zone of thermal neutrality**. *Journal of Applied Physiology* 92(6): 2667-2679. ISSN: 8750-7587.
Descriptors: rats, ambient temperature, thermal neutrality, environment, housing conditions, experiments, new method, thermoneutral zone.

Rubini, A. (2005). **Effect of perfusate temperature on pulmonary vascular resistance and compliance by arterial and venous occlusion in the rat**. *European Journal of Applied Physiology* 93(4): 435-439. ISSN: 1439-6319.
Descriptors: rat, arterial, venous, occlusion, pulmonary vascular resistance, temperature, effect, perfusing fluid, vessel walls, stiffness.

Ruby, N.F. and H.C. Heller (1996). **Temperature sensitivity of the suprachiasmatic nucleus of ground squirrels and rats in vitro.** *Journal of Biological Rhythms* 11(2): 126-36. ISSN: 0748-7304.
Abstract: Temperature compensation of circadian rhythms in neuronal firing rate was investigated in the suprachiasmatic nucleus (SCN) of ground squirrels and rats in vitro. A reduction in SCN temperature from 37 to 25 degrees C reduced peak firing rates by > 70% in rats but only by approximately 21% in squirrels; trough firing rates were marginally altered in both species. In the rat SCN at 25 degrees C, the peak in neuronal activity decreased progressively on successive days and circadian rhythms no longer were present by Day 3. There was a 37% reduction in the number of single units detected and an increase in the temporal variability of peak firing rates among individual rat SCN neurons at low temperature. By contrast, single units were readily detected and circadian rhythms were robust in squirrels at 37 and 25 degrees C; a Q10 of 0.927 was associated with a shortening of tau by 2 h and a 5-h phase change after only 48 h at low temperature. These results suggest that temperature can have a substantial impact on circadian organization in a mammalian pacemaker considered to be temperature compensated.
Descriptors: neurons physiology, Wistar rats physiology, Sciuridae physiology, suprachiasmatic nucleus physiology, action potentials, circadian rhythm, electrophysiology, microelectrodes, rats, species specificity, temperature, time factors.

Ruedi Bettschen, D., J. Feldon, and C.R. Pryce (2004). **Circadian- and temperature-specific effects of early deprivation on rat maternal care and pup development: short-term markers for long-term effects?** *Developmental Psychobiology* 45(2): 59-71. ISSN: 0012-1630.
Abstract: We compare the effects on pup body weight and on maternal care of 4-hr separation from dam and littermates on postnatal Days 1 to 14 (early deprivation, ED) under different thermal and circadian conditions. ED was performed at either 21 degrees C (Cold), or 32 degrees C (Warm), and either during the light or dark phase. The comparison group was nonhandling (NH), either under a nonreversed (Light) or reversed (Dark) cycle. At weaning, Cold ED pups were of lower body weight than Warm ED pups, and Warm ED pups were of lower body weight than NH pups. Light and Dark ED pups received high care at reunion relative to NH, and Cold ED pups received higher care at several hours postreunion relative to Warm ED and NH pups. We propose that reduced pup weight and increased maternal care are short-term markers for the severity of Cold ED, and that this manipulation could therefore impact negatively on emotionality and cognition in adulthood.
Descriptors: behavior, biosynchronization, development, circadian effects, cognition, emotions, maternal care, temperature effects.

Rybalko, N. and J. Syka (2001). **Susceptibility to noise exposure during postnatal development in rats**. *Hearing Research* 155(1-2): 32-40. ISSN: 0378-5955.
Descriptors: rats, noise exposure, post natal development, susceptibility, hearing loss, adult rats, young rats, broad band noise.

Saegusa, Y. and H. Tabata (2003). **Usefulness of infrared thermometry in determining body temperature in mice**.

Journal of Veterinary Medical Science 65(12): 1365-1367. ISSN: 0916-7250.
Abstract: The rectal temperature obtained using a standard electronic thermometer was compared with ear, back skin, tail skin and sole skin temperatures obtained using an infrared thermometer in B6C3F1 mice. Using both methods, we investigated baseline temperatures, diurnal and 2-week variations in temperatures, and ethanol-induced hypothermia in these body locations. Ear and back temperatures were shown to be close to and consistent with rectal temperatures in various situations, and measured temperatures at these sites were almost constant, with very similar diurnal variation. Conversely, tail and sole temperatures were lower and much more variable. These results indicate that ear and back skin temperatures obtained using a convenient and non-invasive infrared thermometer are as reliable, and should be safer and less stressful to animal subjects, compared to standard rectal temperature measurements.
Descriptors: body temperature, diagnosis, diagnostic techniques, infrared radiation, thermometers, mice.

Sakamoto, K., K. Kadota, and K. Oishi (2004). **Light-induced phase-shifting of the peripheral circadian oscillator in the hearts of food-deprived mice**. *Experimental Animals (Tokyo)* 53(5): 471-474. ISSN: 1341-1357.
Descriptors: mice, food deprived, light induced phase shifting, circadian oscillator, heart, mammalian, constant darkness, fasting.

Saljo, A., B. Feng, J. Shi, A. Hamberger, H.A. Hansson, and K.G. Haglid (2002). **Exposure to short-lasting impulse noise causes neuronal c-jun expression and induction of apoptosis in the adult rat brain**. *Journal of Neurotrauma* 19(8): 985-991. ISSN: 0897-7151.
Descriptors: rat, brain, impulse noise, exposure, short lasting, apoptosis, auditory function, CNS, harmful, noise, intensity.

Salloum, A.C., G. Silva, D. Rifkin, B. Bishop, G. Farkas, and J.A. Krasney (1999). **Hypoxia alters body temperature (tb) and activity circadian rhythms in rats**. *FASEB Journal* 13(5, Part 2): A787. ISSN: 0892-6638.
Descriptors: hypoxia, body temperature, activity, circadium rhythm, rats, alters.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 99, April 17-21, 1999, Washington, D.C., USA.

Salvetti, F., B. Chelli, M. Gesi, A. Pellegrini, G. Giannaccini, A. Lucacchini, and C. Martini (2000). **Effect of noise exposure on rat cardiac peripheral benzodiazepine receptors**. *Life Sciences* 66(13): 1165-1175. ISSN: 0024-3205.
Descriptors: noise exposure, rat, cardiac receptors, effect, benzodiazepine.

Sasaki, K., H. Ino, T. Chiba, and U.E. Adachi (1999). **Light-induced apoptosis in the neonatal mouse retina and superior colliculus**. *IOVS* 40(13): 3079-3083.
Descriptors: apoptosis, retina, superior colliculus, neonatal mouse, light induced.

Satinoff, E. (1998). **Patterns of circadian body temperature rhythms in aged rats**. *Clinical and Experimental Pharmacology and Physiology* 25(2): 135-140. ISSN: 0305-1870.
Descriptors: rats, aged, patterns, circadian body temperature rhythms, young rats, variation, differences, behavioral level.

Sato, J., H. Morimae, K. Takanari, Y. Seino, T. Okada, M. Suzuki, and K. Mizumura (2000). **Effects of lowering ambient temperature on pain-related behaviors in a rat model of neuropathic pain**. *Experimental Brain Research* 133(4): 442-449. ISSN: 0014-4819.
Descriptors: rat model, neuropathic pain, pain related behaviors, ambient temperature, lowering, effects, aggravated pain related behaviors.

Sato, M. and A. Ishikawa (2004). **Room temperature storage of mouse epididymal spermatozoa: exploration of factors affecting sperm survival**. *Theriogenology* 61(7-8): 1455-1469. ISSN: 0093-691X.
NAL Call Number: QP251.A1T5
Abstract: To explore optimal conditions for in vitro sperm survival, we examined the effects of several media used for murine egg culture and in vitro fertilization (IVF; including M16, M2, PB1, TYH, and CZB) on motility of murine spermatozoa stored at 22 degrees C under paraffin oil. Of media tested, M2 medium, that had

been adjusted to pH 7.2 by adding N-2-hydroxyethylpiperazine-N'-2-ethanesulfonic acid (HEPES), was found to be the best. Addition of various concentrations of HEPES to TYH did not improve sperm survival, suggesting that HEPES (and probably neutral pH) do not enhance survival of murine sperm. Since M16 has higher amounts of bicarbonate than M2 (25 mM versus 4.15 mM), four variations of M16 media containing 4.15, 8.30, 16.60, or 33.20 mM bicarbonate were prepared and tested. The modified M16 media with 4.15-16.60 mM bicarbonate yielded good sperm survival (comparable to M2 medium), while relatively high concentrations of bicarbonate (ranging from 16.60 to 33.20 mM) were deleterious to isolated sperm, suggesting the need for a minimum level of residual bicarbonate. However, the mechanism by which the lifespan of spermatozoa is extended remains unknown. The in vitro fertilizing abilities of spermatozoa left in M2 medium for 1, 3, and 5 days at 22 degrees C were 52.5, 21.8, and 7.0%, respectively, when the cleavage rate to the two-cell stage was examined. Transfer of two-cell embryos produced in vitro with spermatozoa stored for 1, 3, and 5 days at 22 degrees C resulted in production of fetuses with efficiencies of 42.5, 23.4, and 12.5%, respectively, which were lower than that of embryos derived from in vitro fertilization with fresh spermatozoa (68.1%). In conclusion, spermatozoa kept in M2 medium for up to 5 days at 22 degrees C can fertilize oocytes.
Descriptors: bicarbonates, cell culture, cleavage, epididymis, in vitro fertilization, spermatozoa, survival, temperature, mice.

Scheer, F.A.J.L., G.J. Ter Horst, C.G. Van Eden, and R.M. Buijs (1999). **Diurnal phase, light and suprachiasmatic nucleus affect heart rate in rat**. *Society for Neuroscience Abstracts* 25(1-2): 870. ISSN: 0190-5295.
Descriptors: diurnal phase, light, affect heart rate, rat, suprachiasmatic nucleus.
Notes: Meeting Information: 29th Annual Meeting of the Society for Neuroscience, October 23-28, 1999, Miami Beach, Florida, USA.

Seelke, A.M. and M.S. Blumberg (2005). **Thermal and nutritional modulation of sleep in infant rats.** *Behavioral Neuroscience* 119(2): 603-11. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Descriptors: body temperature regulation, sleep physiology, newborn animals, food deprivation, nutritional status, rats, research support, National Institutes of Health, N.I.H., extramural, temperature.

Seifert, E.L. and J.P. Mortola (2000). **Light-dark differences in the effects of ambient temperature on gaseous metabolism in newborn rats**. *Journal of Applied Physiology* 88(5): 1853-1858. ISSN: 8750-7587.
Descriptors: newborn rats, light-dark differences, ambient temperature, gaseous metabolism, effects, body temperature, thermoregulation.

Seiler, M.J., O.L. Liu, N.G.F. Cooper, T.L. Callahan, H.M. Petry, and R.B. Aramant (2000). **Selective photoreceptor damage in albino rats using continuous blue light: a protocol useful for retinal degeneration and transplantation research**. *Graefe's Archive for Clinical and Experimental Ophthalmology* 238(7): 599-607. ISSN: 0721-832X.
Descriptors: albino rats, selective photoreceptor damage, continuous blue light, retinal degeneration, transplantation, protocol, model.

Sembulingam, K., P. Sembulingam, and A. Namasivayam (1999). **Effect of acute noise stress on acetylcholine content in discrete areas of rat brain**. *Journal of Environmental Biology* 20(4): 289-292. ISSN: 0254-8704.
Descriptors: acute noise stress, effect, acetylcholine, rat, brain.

Sembulingam, K., P. Sembulingam, and A. Namasivayam (1998). **Effect of chronic noise stress on some selected stress indices in albino rats**. *Journal of Environmental Biology* 19(1): 63-66. ISSN: 0254-8704.
Descriptors: albino rats, chronic noise stress, effect, selected stress indicies, plasma corticosterone level, leucocyte count, organ weight.

Sendowski, I., C.A. Braillon, and C. Delaunay (2004). **CAP amplitude after impulse noise exposure in guinea pigs.** *European Archives of Oto Rhino Laryngology* 261(2): 77-81. ISSN: 0937-4477.
Descriptors: guinea pigs, noise exposure, gun shot, high energy impulse, auditory function, CAP amplitude, recovery.

Serdarevich, C. and J.E. Fewell (1998). **Influence of core temperature on the time to last gasp during acute hypoxia in newborn rats**. *FASEB Journal* 12(5): A780. ISSN: 0892-6638.
Descriptors: newborn rats, acute hypoxia, last gasp, core temperature, influence, time.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 98, Part II, April 18-22, 1998, San Francisco, California, USA.

Severinsen, T. and I.C. Munch (1999). **Body core temperature during food restriction in rats**. *Acta Physiologica Scandinavica* 165(3): 299-305. ISSN: 0001-6772.
Abstract: Deep body temperature and locomotor activity of rats fed a reduced food amount (n=9) and of starved rats (n=9), were measured by implanted transmitters. Both groups were then refed ad libitum. The reduction in body temperature was significant for both groups, but larger in the starved rats. There was a displacement of the circadian temperature rhythm in the starved rats. No significant differences in locomotor activity between groups was observed until the start of refeeding. Rats fed reduced food amounts rapidly increased their activity, while the starved group retained a low activity for several days. Thermal conductance was reduced by 30% in both groups. It is concluded that the reduction in thermal conductance may explain how starving and semi-starving rats are able to maintain core temperatures close to normal, even if resting metabolic rates are drastically reduced. The measured reduction in body core temperature signifies a change in the thermoregulatory 'set-point' during starvation.
Descriptors: body temperature, food restriction, starvation, heat production, resting energy exchange, energy metabolism, physical activity, metabolism, rats.

Sharma, V.K., M.K. Chandrashekaran, M. Singaravel, and R. Subbaraj (1998). **Ultraviolet-light-evoked phase shifts in the locomotor activity rhythm of the field mouse *Mus booduga.*** *Journal of Photochemistry and Photobiology, Part B, Biology* 45(2-3): 83-86.
Descriptors: field mouse, locomotor activity rhythm, phase shifts, evoked, ultraviolet, light.

Sharma, V.K. (2003). **Effect of light intensity on the phase and period response curves in the nocturnal field mouse *Mus booduga.*** *Chronobiology International* 20(2): 223-231. ISSN: 0742-0528.
Descriptors: field mouse, behavior, circadian clocks, light intensity, effect, response curves, light stimuli.

Sharma, V.K., M. Singaravel, and R. Subbaraj (1999). **Ultraviolet light-induced phase response curve for the locomotor activity rhythm of the field mouse *Mus booduga***. *Naturwissenschaften* 86(2): 96-97.
Descriptors: ultraviolet, light, response curve, locomotor activity, field mouse.

Shaw, P.J., B.M. Bergmann, and A. Rechtschaffen (1998). **Effects of paradoxical sleep deprivation on thermoregulation in the rat**. *Sleep (Rochester)* 21(1): 7-17. ISSN: 0161-8105.
Descriptors: sleep deprivation, effects, rat, thermoregulation.

Shimizu, Y. and K. Tonosaki (1999). **Low environmental temperature modulates gustatory nerve activity and behavioral responses to NaCl in rats**. *American Journal of Physiology* 277(2): R368-R373. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: The effects of cold ambient temperature on chorda tympani nerve responses to taste stimuli such as sucrose, NaCl, quinine HCl (QHCl) and HCl were studied in 76 male Wistar rats (6-7 weeks old, 180-230 g). The electrophysiological recordings of the whole chorda tympani nerves from control (22 degrees C) and cold-exposed (4 degrees C) rats revealed that the responses to sucrose, HCl and QHCl were unaffected by cold exposure. In contrast, the nerve responses to NaCl were enhanced time dependently, reaching a maximum 7-14 days after cold exposure. Responses to sodium acetate were likewise increased as they were to NaCl, whereas those to KCl were unchanged after cold exposure. In addition, the residual NaCl responses after lingual application of the sodium-channel blocker amiloride in cold-exposed rats were similar to those in control rats. It is thus most likely that cold exposure potentiates the chorda tympani nerve responses to Na+, but not to Cl-. Behavioural studies with the 2-bottle preference test showed that the cold-exposed rats refused to drink NaCl solutions at 0.05 and 0.1 M, the concentrations being preferred by control rats. It is concluded that the ambient temperature influences taste cell function, and that the enhanced NaCl response of the chorda tympani nerve is related to the avoidance of NaCl intake under cold environment.

Descriptors: environmental temperature, sucrose, taste, sodium chloride, cold stress, feeding behavior, rats.

Sigworth, L.A. and M.A. Rea (2003). **Adenosine A1 receptors regulate the response of the mouse circadian clock to light.** *Brain Research* 960(1-2): 246-251. ISSN: 0006-8993.
Descriptors: mouse, circadian clock, light, adenosine, A1 receptors, response, regulation, hamsters.

Silva, G.A., J.R. Hetling, and D.R. Pepperberg (2000). **Electroretinographic determination of the response of mouse rods in vivo to a step of light**. *IOVS* 41(4): S493.
Descriptors: mouse rods, in vivo step of light, response, electroretinographic determination, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 30-May 05, 2000, Fort Lauderdale, Florida, USA.

Silva, M.J., A. Dias, A. Barreta, P.J. Nogueira, N.A.A. Castelo Branco, and M.G. Boavida (2002). **Low frequency noise and whole-body vibration cause increased levels of sister chromatid exchange in splenocytes of exposed mice**. *Teratogenesis Carcinogenesis and Mutagenesis* 22(3): 195-203. ISSN: 0270-3211.
Descriptors: mice, low frequency noise, whole body vibration, chronic exposure, long term occupational exposure, splenocytes, murine model.

Sinhasane, S.V. and B.N. Joshi (1998). **Exposure to different spectra of light, continuous light and treatment with melatonin affect reproduction in the Indian desert gerbil *Meriones hurrianae* (Jerdon)**. *Biological Signals and Receptors* 7(3): 179-187. ISSN: 1422-4933.
Descriptors: Indian desert gerbil, continuous light, different spectra, melatonin, reproduction, gonadal response, white light, red light.

Sinhasane, S.V. and B.N. Joshi (1997). **Melatonin and exposure to constant light/darkness affects ovarian follicular kinetics and estrous cycle in Indian desert gerbil *Meriones hurrianae* (Jerdon)**. *General and Comparative Endocrinology* 108(3): 352-357. ISSN: 0016-6480.
Descriptors: Indian desert gerbil, melatonin, constant light-dark, exposure, estrus cycle, ovarian follicular kinetics, affect, photoperiodic influence, reproduction.

Smith, D., J. Pedro Botet, I. Cantuti Castelvetri, B. Shukitt Hale, E.J. Schaefer, J. Joseph, and J.M. Ordovas (2001). **Influence of photoperiod, laboratory caging and aging on plasma lipid response to an atherogenic diet among F1B hamsters.** *International Journal of Neuroscience* 106(3-4): 185-94. ISSN: 0020-7454.
Abstract: The effects and interactions of photoperiod, animal caging, aging and diet on plasma lipid levels in male F1B hamsters were examined in the current study. Sixteen young and sixteen old animals were housed one or four per cage. Eight young animals from each housing group were placed in an animal room with either 12/12 h (PT-12) or 10/14 h (PT-10) light/dark cycle while the sixteen old animals were maintained under a PT-12 light cycle. Plasma cholesterol and triglyceride concentrations were determined in all animals after a 2-week period of acclimation on chow diet and following 4-week intervention on atherogenic diet. Baseline total cholesterol (TC) levels were 131+/-25 mg/dl and 142+/-39 mg/dl for young and old animals, respectively, while baseline triglyceride (Tg) levels were 202+/-48 mg/dl and 160+/-37 mg/dl respectively for the same animals. Following 4-weeks on an atherogenic diet, single-caged PT 12 animals had elevated but significantly lower TC levels than group-caged animals (161+/-30 mg/dl and 240 +/-58 mg/dl, respectively) while single and group housed PT10 animals had TC levels of 296+/-75 mg/dl and 351+/-124 mg/dl, respectively. Similarly, plasma Tg levels rose to 330+/-100 mg/dl and 486+/-200 mg/dl in single and group housed PT12 animals (respectively) and to 668+/-270 mg/dl and 545+/-199 mg/dl in single and group housed PT10 animals (respectively). No significant changes related to atherogenic diet were observed in plasma TC or Tg levels in the older animals. Although caging conditions influence the cholesterol and triglyceride response to the atherogenic diet ($p<.05$), light cycle photoperiod seems to exert a greater effect ($p<.005$). In conclusion, photoperiod length dramatically affects diet-induced plasma lipid concentrations in young male F1B hamsters, and thus needs be considered in experimental designs of animal-housed lipid research.
Descriptors: aging physiology, cholesterol blood, diet, atherogenic, housing, animal, photoperiod, triglycerides blood, hamsters.

Sobrian, S.K., V.T. Vaughn, W.K. Ashe, B. Markovic, V. Djuric, and B.D. Jankovic (1997). **Gestational exposure to loud noise alters the development and postnatal responsiveness of humoral and cellular components of the immune system in offspring [rats]**. *Environmental Research* 73(1-2): 227-241. ISSN: 0013-9351.
Descriptors: progeny, noise, environment, immunity, blood, pregnancy, females, immune response, stress, responses, rats.

Soldani, P., M. Gesi, P. Lenzi, G. Natale, F. Fornai, A. Pellegrini, M.P. Ricciardi, and A. Paparelli (1999). **Long-term exposure to noise modifies rat adrenal cortex ultrastructure and corticosterone plasma levels**. *Journal of Submicroscopic Cytology and Pathology* 31(3): 441-448. ISSN: 1122-9497.
Descriptors: noise, exposure, long term, rat, adrenal cortex, ultrastructure, corticosterone, plasma, levels.

Soldani, P., A. Pellegrini, M. Gesi, G. Natale, P. Lenzi, F. Martini, and A. Paparelli (1997). **Gender difference in noise stress-induced ultrastructural changes in rat myocardium**. *Journal of Submicroscopic Cytology and Pathology* 29(4): 527-536. ISSN: 1122-9497.
Descriptors: rat, myocardium, noise stress, induced ultrastructural changes, gender differences, male, female, subcellular alterations, cardiomyocytes, atrial myocardium.

Sollars, P.J., M.D. Ogilvie, M.A. Rea, and G.E. Pickard (2002). **5-HT1B receptor knockout mice exhibit an enhanced response to constant light**. *Journal of Biological Rhythms* 17(5): 428-437. ISSN: 0748-7304.
Abstract: Serotonin (5-HT) can act presynaptically at 5-HT1B receptors on retinal terminals in the suprachiasmatic nucleus (SCN) to inhibit glutamate release, thereby modulating the effects of light on circadian behaviour. 5-HT1B receptor agonists (1) inhibit light-induced phase shifts of circadian activity rhythms, (2) attenuate light-induced Fos expression in the SCN, and (3) reduce the amplitude of optic nerve-evoked excitatory postsynaptic currents in SCN neurons in vitro. To determine whether functional disruption of the 5-HT1B presynaptic receptors would result in an amplified response of the SCN to light, the period (tau) of the circadian rhythm of wheel-running activity was estimated under several different conditions in 5-HT1B receptor knockout (KO) mice and genetically matched wild-type animals. Under constant light (LL) conditions, the tau of 5-HT1B receptor KO mice was significantly greater than the tau of wild-type mice. A quantitative analysis of the wheel-running activity revealed no differences between wild-type and KO mice in either total activity or the temporal distribution of activity under LL conditions, suggesting that the observed increase in tau was not a function of reduced activity. Under constant dark conditions, the period of the circadian rhythm of wheel-running activity of wild-type and 5-HT1B receptor KO mice was similar. In addition, no differences were noted between wild-type and 5-HT1B receptor KO mice in the rate of reentrainment to a 6 h phase advance in the 12:12 light:dark cycle or in phase shifts in response to a 10 min light pulse presented at circadian time 16. The enhanced response of the SCN circadian clock of the 5-HT1B receptor KO mice to LL conditions is consistent with the hypothesis that the endogenous activation of 5-HT1B presynaptic receptors modulates circadian behaviour by attenuating photic input to the SCN.
Descriptors: biochemical receptors, circadian rhythm, gene expression, genes, light relations, neurons, neurotransmitters, retina, serotonin, signal transduction, mice.

Song, X. and B. Rusak (2000). **Acute effects of light on body temperature and activity in Syrian hamsters: influence of circadian phase**. *American Journal of Physiology* 278(5, Part 2): R1369-R1380. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: Syrian hamsters, light, acute effects, body temperature, activity, circadian phase influence.

Song, Z.G. and D.H. Wang (2003). **Metabolism and thermoregulation in the striped hamster *Cricetulus barabensis.*** *Journal of Thermal Biology* 28(6-7): 509-514. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Abstract: (1) Basal metabolic rate (BMR), nonshivering thermogenesis (NST), and maximum metabolic rate (MMR) of *Cricetulus barabensis* were measured. (2) Thermal neutral zone (TNZ) was 27-30 degrees C and BMR was 2.20+/-0.09 ml O2 g(-1) h(-1). NST and MMR were 7.27+/-0.47 and 14.24+/-1.16 ml O2 g(-1) h(-1), respectively. (3) The ecophysiological properties of relatively high body temperature, narrow TNZ, high BMR and thermogenic capacity enable this species to adapt to its environment.

Descriptors: Chinese hamsters, vertebrate pests, metabolic rate, temperature, basal metabolic rate, BMR.

Soutto, M., P. Molinero, and J.M. Guerrero (1997). **Continuous light exposure modifies the nocturnal increase in rat thymus type II thyroxine 5'-deiodinase**. *CMLS Cellular and Molecular Life Sciences* 53(8): 697-699. ISSN: 1420-682X.
Descriptors: rat, thymus, continual light exposure, modifies, increase, thyroxine deiodinase activity, day, night, light exposure, basal values, high values.

Specht, S., M. Leffak, R.M. Darrow, and D.T. Organisciak (1999). **Damage of rat retinal DNA induced in vivo by visible light**. *Photochemistry and Photobiology* 69(1): 91-98. ISSN: 0031-8655.
Descriptors: rat, retinal, DNA, damage, visible light, in vivo, induced.

Specht, S., D.T. Organisciak, R.M. Darrow, and M. Leffak (2000). **Continuing damage to rat retinal DNA during darkness following light exposure**. *Photochemistry and Photobiology* 71(5): 559-566. ISSN: 0031-8655.
Descriptors: rat, continuing retinal damage, DNA, light exposure, darkness, photoreceptor cells, degenerative process after light exposure.

Stern, S. and V.G. Laties (1998). **60 hz electric fields and incandescent light as aversive stimuli controlling the behavior of rats responding under concurrent schedules of reinforcement**. *Bioelectromagnetics* 19(4): 210-221. ISSN: 0197-8462.
Descriptors: rats, electric fields, incandescent light, aversive stimuli, behavior, reinforcement, stimulus intensity, food.

Stokes, M.A., S. Kent, and S.M. Armstrong (1999). **The effect of multiple pulses of light on the circadian phase response of the rat**. *Journal of Biological Rhythms* 14(3): 172-184. ISSN: 0748-7304.
Descriptors: light pulses, multiple, rat, circadian phase, effect, response.

Storck, A.M., J.A. Libbin, J.M. Overton, and M.E. Rashotte (1999). **Daily body temperature rhythms during the estrous cycle in female SHR rats: feeding and fasting effects**. *Society for Neuroscience Abstracts* 25(1-2): 77. ISSN: 0190-5295.
Descriptors: rats, daily body temperature, rhythms, estrus cycle, feeding, fasting, effects.
Notes: Meeting Information: 29th Annual Meeting of the Society for Neuroscience, Part 1, October 23-28, 1999, Miami Beach, Florida, USA.

Strickland, J.L., J.L. Miner, and M.K. Nielsen (1998). **Feed intake, thyroid hormones, and adrenergic stimulation in high and low heat loss mice**. *Journal of Animal Science* 76(Supplement 2): 41. ISSN: 0021-8812.
NAL Call Number: 49 J82
Descriptors: feed intake, thyroid hormones, heat loss, high, low, stimulation.
Notes: Meeting Information: American Society of Animal Science, March 16-18, 1998, Midwest Section, USA.

Sudo, M., T. Moriya, M. Akiyama, and S. Shibata (2000). **Behavioral free-running and rhythmic expression of the clock genes under constant lighting conditions in mice**. *NeuroScience Research* 24(Supplement): S168. ISSN: 0921-8696.
Descriptors: mice, constant lighting conditions, clock genes, behavior, free running, rhythmic expression.
Notes: Meeting Information: 23rd Annual Meeting of the Japan Neuroscience Society and the 10th Annual Meeting of the Japanese Neural Network Society, 2000, Yokohama, Japan.

Sugawara, T., P.A. Sieving, P.M. Iuvone, and R.A. Bush (1998). **The melatonin antagonist luzindole protects retinal photoreceptors from light damage in the rat**. *IOVS* 39(12): 2458-2465.
Abstract:
Descriptors: rat, light damage, retinal photoreceptors, malatonin antagonist, luzindole, modulates light damage, eyes.

Sugi, H., S. Sugiura, and H. Yamashita (2003). **Role of light chains in the motor function of rat cardiac myosin.** *Zoological Science (Tokyo)* 20(12): 1540. ISSN: 0289-0003.

Descriptors: rat, cardiac myosin, motor function, light chains, role.
Notes: Meeting Information: Proceedings of the Seventy Fourth Annual Meeting of the Zoological Society of Japan, September 17-19, 2003, Hakodate, Japan.

Sugimoto, N., S. Sakurada, and O. Shido (2000). **Changes in ambient temperature at the onset of thermoregulatory responses in exercise-trained rats**. *International Journal of Biometeorology* 43(4): 169-171.
Descriptors: exercise trained rats, thermoregulatory responses, changes in ambient temperature.

Sugimoto, N., O. Shido, S. Sakurada, S. Ito, and T. Nagasaka (1998). **Changes in core temperature and thermoeffector thresholds in exercise-trained rats**. *Japanese Journal of Physiology* 48(2): 163-166. ISSN: 0021-521X.
Descriptors: rats, core temperature, changes, thermoeffector thresholds, exercise, running wheel, training, sedentary, core temperature level.

Sundgren Andersson, A.K., P. Ostlund, and T. Bartfai (1998). **Simultaneous measurement of brain and core temperature in the rat during fever, hyperthermia, hypothermia and sleep**. *Neuroimmunomodulation* 5(5): 241-247. ISSN: 1021-7401.
Descriptors: rat, brain temperature, core temperature, fever, sleep, hypothermia, hyperthermia, measurement, animal model.

Suzuki, M., T. Yamasoba, T. Ishibashi, J.M. Miller, and K. Kaga (2002). **Effect of noise exposure on blood-labyrinth barrier in guinea pigs**. *Hearing Research* 164(1-2): 12-18. ISSN: 0378-5955.
Descriptors: guinea pigs, noise exposure, blood-labyrinth barrier, effect, chochlea, endothelial cell, auditory canal.

Swoap, S.J., J.M. Overton, and G. Garber (2004). **Effect of ambient temperature on cardiovascular parameters in rats and mice: a comparative approach.** *American Journal of Physiology Regulatory, Integrative and Comparative Physiology* 287(2): R391-6. ISSN: 0363-6119.
Abstract: Ambient air temperatures (T(a)) of <6 degrees C or >29 degrees C have been shown to induce large changes in arterial blood pressure and heart rate in homeotherms. The present study was designed to investigate whether small incremental changes in T(a), such as those found in typical laboratory settings, would have an impact on blood pressure and other cardiovascular parameters in mice and rats. We predicted that small decreases in T(a) would impact the cardiovascular parameters of mice more than rats due to the increased thermogenic demands resulting from a greater surface area-to-volume ratio in mice relative to rats. Cardiovascular parameters were measured with radiotelemetry in mice and rats that were housed in temperature-controlled environments. The animals were exposed to different T(a) every 72 h, beginning at 30 degrees C and incrementally decreasing by 4 degrees C at each time interval to 18 degrees C and then incrementally increasing back up to 30 degrees C. As T(a) decreased, mean blood pressure, heart rate, and pulse pressure increased significantly for both mice (1.6 mmHg/ degrees C, 14.4 beats.min(-1). degrees C(-1), and 0.8 mmHg/ degrees C, respectively) and rats (1.2 mmHg/ degrees C, 8.1 beats.min(-1). degrees C(-1), and 0.8 mmHg/ degrees C, respectively). Thus small changes in T(a) significantly impact the cardiovascular parameters of both rats and mice, with mice demonstrating a greater sensitivity to these T(a) changes.
Descriptors: blood pressure physiology, heart rate physiology, temperature, consciousness, mice, motor activity, Sprague Dawley rats, species specificity, telemetry.

Syka, J. and N. Rybalko (2000). **Threshold shifts and enhancement of cortical evoked responses after noise exposure in rats**. *Hearing Research* 139(1-2): 59-68. ISSN: 0378-5955.
Descriptors: noise, exposure, rats, threshold shifts, enhancement, cortical, response.

Symes, P.A., S. Mcbennett, and J.F. Andrews (1997). **Feeding and behavioral thermoregulation in obese mice**. *Proceedings of the Nutrition Society* 56(1A): 76A. ISSN: 0029-6651.
Descriptors: mice, thermoregulation, feeding, behavioral, obese.
Notes: Meeting Information: Meeting of the Nutrition Society, June 24-28, 1996, Ulster, Coleraine.

Syrkin, N.J., G.D. Mele, C.M. Winget, and D.C. Holley (1998). **Light-emitting diodes (led) and cool white**

fluorescent (cwf) light have similar effects on the circadian system of the rat. *FASEB Journal* 12(5): A748. ISSN: 0892-6638.
Descriptors: rat, white fluorescent light, light emitting diodes, similar effects, circadian system, behavior.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 98, Part II, April 18-22, 1998, San Francisco, California, USA.

Szelenyi, Z., Z. Hummel, and M. Szekely (2000). **Circadian and ultradian body core temperature rhythms of rats as influenced by cold exposure and/or food restriction**. *Journal of Physiology (Cambridge)* 526P: 169. ISSN: 0022-3751.
Descriptors: rats, circadian, ultradian, body core temperature rhythms, cold exposure, food restriction, influence.
Notes: Meeting Information: Scientific Meeting of the Physiological Society, May 27-29, 2000, Budapest, Hungary.

Takanashi, T., S. Kaidzu, N. Tane, T. Kodama, and A. Ohira (2001). **Increase of endogenous peroxidase activity in the rat retina after excessive light exposure**. *IOVS* 42(4): S635.
Descriptors: rat, excessive light exposure, retina, endogenous peroxidase activity, increase, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 29-May 4, 2001, Fort Lauderdale, Florida, USA.

Tang, I.H. and C.A. Fuller (1999). **Circadian responses of Fischer 344 albino rats to green light-dark cycles**. *Society for Neuroscience Abstracts* 25(1-2): 870. ISSN: 0190-5295.
Descriptors: Fisher 344 albino rats, green light, light-dark cycles, response, circadian.
Notes: Meeting Information: 29th Annual Meeting of the Society for Neuroscience, October 23-28, 1999, Miami Beach, Florida, USA.

Tang, I.H. and C.A. Fuller (1998). **Entrainment of hamster circadian rhythms by square wave and simulated natural light-dark cycles**. *FASEB Journal* 12(5): A748. ISSN: 0892-6638.
Descriptors: hamster, entrainment, circadian rhythms, square wave, simulated natural light dark cycles, sensory system.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 98, Part II, April 18-22, 1998, San Francisco, California, USA.

Tang, I.H., D.M. Murakami, and C.A. Fuller (1999). **Effects of square-wave and simulated natural light-dark cycles on hamster circadian rhythms**. *American Journal of Physiology* 276(4, Part 2): R1195-R1202. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: square wave, effects, light-dark cycles, hamster, circadian rhythms, simulated.

Tang, J., J.H. Pi, D. Wang, F.J. Wu, and Q.C. Chen (2004). **Effect of weak noise on the frequency tuning of mouse inferior collicular neurons**. *Zoological Research* 25(3): 191-197. ISSN: 0254-5853.
Descriptors: mouse, inferior collicular neurons, frequency tuning, weak noise, effect, increased sensitivity, high frequency sound.

Tanito, M., H. Masutani, H. Nakamura, A. Ohira, and J. Yodoi (2002). **Cytoprotective effect of thioredoxin against retinal light damage in mice.** *ARVO Annual Meeting Abstract Search and Program Planner*: Abstract No. 3728.
Descriptors: mice, retinal light damage, injury, thioredoxin, cytoprotective effect, therapeutic, suppress photooxidative stress.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 05-10, 2002, Fort Lauderdale, FL, USA.

Tankersley, C.G., R. Irizarry, S. Flanders, and R. Frank (2000). **Variations in circadian regulation of body temperature and heart rate among inbred mouse strains**. *FASEB Journal* 14(4): A610. ISSN: 0892-6638.

Descriptors: mouse, inbred strains, heart rate, body temperature, circadian regulation, variations, thermoregulation.
Notes: Meeting Information: Annual Meeting of Professional Research Scientists: Experimental Biology, April 11-15, 2003, San Diego, CA, USA.

Tesseromatis, C., A. Kotsiou, C. Mourouzis, T.H. Saranteas, A. Potamianou, and E. Vairactaris (2004). **Light induced changes in quinolone levels in rat serum and tissues**. *European Journal of Drug Metabolism and Pharmacokinetics* 29(4): 231-233. ISSN: 0378-7966.
Abstract: Circadian rhythm may induce alterations of the pharmacokinetic properties of several drugs in clinical use. This study was to investigate whether lighting conditions alter the quinolone (pefloxacin) levels in serum and tissues and to determine any accumulation of the drug in the skin. Thirty male Wistar rats were divided into groups A, B, C, (n=10). The animals of group A were housed under 12hours light/12hours dark conditions, group B under 24hour UV and group C was kept in complete darkness. All animals received 5 doses of 11mg/Kg pefloxacin every 8hours for 48hours. Pefloxacin levels were determined in serum, skin and femur by the inhibition zone in *E.coli*. in vitro. Pefloxacin concentrations in serum were increased in 24hour darkness living status and decreased in 24hour UV conditions as compared to group A animals. Additionally, both skin and femur pefloxacin levels were decreased under dark and UV conditions. In conclusion total light as well as total dark exposure may lead to pefloxacin pharmacokinetic changes which may have implications in the effectiveness of the drug in tissues.
Descriptors: blood and lymphatics, transport and circulation, integumentary system, chemical coordination and homeostasis, pharmacology, skeletal system, movement and support, circadian rhythm, drug accumulation, light induced change.

Thannickal, T.C. and V.M. Kumar (2002). **Effect of ambient temperature on brain temperature and sleep-wakefulness in medial preoptic area lesioned rats.** *Indian Journal of Physiology and Pharmacology* 46(3): 287-297. ISSN: 0019-5499.
Descriptors: rats, ambient temperature, effect, brain temperature, sleep, wakefulness, medial preoptic, lesions, thermoregulation.

Thomas, B.B., M.M. Oommen, and Ashadevi (2001). **Constant light and blinding effects on reproduction of male South Indian gerbils**. *Journal of Experimental Zoology* 289(1): 59-65. ISSN: 0022-104X.
Abstract: The effects of exposure to constant light (CL) and blinding on male reproductive behavioural physiology of South Indian gerbils (*Tatera indica cuvieri*) were assessed. Exposure to CL diminished reproductive efficiency of males with a reduction in the proportion of ejaculating males. This is further evidenced by increase in the number and duration of intromissions and intromission latency. Concomitantly, reproductive organ weight and epididymal sperm count were also reduced. However, in weanlings CL did not induce changes either in their maturational process or their reproductive organs' weight. Blinding of adult reproductively inactive males resulted in a considerable proportion of them exhibiting sexual activity, which is reflected in the seminal vesicle weight and epididymal sperm count. Blinded weanlings showed earlier testicular descent and higher seminal vesicle weight. These studies reveal that blinding (constant darkness) has a stimulatory effect whereas CL is inhibitory in the reproduction of the tropical rodent *Tatera indica cuvieri.*
Descriptors: dark, intromission, light, photoperiodism, reproductive behavior, reproductive efficiency, spermatozoa, testes, vesicular gland.

Thumann, G., K.U. Bartz Schmidt, N. Kociok, P. Kayatz, K. Heimann, and U. Schraermeyer (1999). **Retinal damage by light in the golden hamster: an ultrastructural study in the retinal pigment epithelium and Bruch's membrane**. *Journal of Photochemistry and Photobiology, Part B, Biology* 49(2-3): 104-111.
Descriptors: retinal damage, light, hamster, pigment epithelium, Bruch's membrane, ultrastructural study.

Tian, N. (2003). **Light deprivation blocks the developmental changes of ganglion cell dendritic ramification in mouse retina**. *ARVO Annual Meeting Abstract Search and Program Planner*: Abstract No. 3237.
Descriptors: mouse, light deprivation, ganglion cell, changes, development, retina, structural refinement.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 04-08, 2003, Fort Lauderdale, FL, USA.

Tierno, A., P. Fiore, and R.L. Gannon (2002). **Delta opioid inhibition of light-induced phase advances in hamster circadian activity rhythms**. *Brain Research* 937(1-2): 66-73. ISSN: 0006-8993.

Abstract: A master neuronal pacemaker located within the suprachiasmatic nucleus in the ventral hypothalamus generates circadian activity rhythms in hamsters. The circadian pacemaker receives afferent input from many brain regions, one of which is the intergeniculate leaflet of the thalamus. This thalamic input to the suprachiasmatic nucleus in hamsters contains enkephalins, neuropeptide Y, neurotensin, and GABA. The role of enkephalins in modulating light-induced phase shifts of hamster activity rhythms has not been reported. Therefore, in this study, we examined the ability of enkephalin-mimetic and other opioid compounds to modulate light-induced phase advances in hamster circadian activity rhythms. The delta opioid agonists SNC 80 and BW373U86 both inhibited light-induced phase advances of hamster circadian activity rhythms. Neither the micro opioid agonist morphine, nor the kappa opioid agonist U50488H had any effect on light-induced phase shifts. The antagonists naltrindole, naltrexone, and nor-binaltorphimine, selective for delta , micro , and kappa opioids respectively, were also without effect on light-induced phase advances. Therefore, we found that only delta opioid agonists modulate light-induced phase advances in hamster circadian activity rhythms. These results imply that enkephalins released from the intergeniculate leaflet onto components of the suprachiasmatic pacemaker may be capable of inhibiting the responsiveness of the pacemaker to photic input arriving from the retina. The inability of antagonists to modulate light-induced phase advances suggests that endogenous opiate systems are not tonically active in generating circadian activity rhythms, but rather that enkephalins are probably used by the circadian system to modulate responses only under certain conditions or time of day.

Descriptors: circadian rhythm, enkephalins, gamma aminobutyric acid, hypothalamus, light relations, morphine, naltrexone, narcotic antagonists, neurotensin, hamsters.

Tobler, I., M. Herrmann, H.M. Cooper, J. Negroni, E. Nevo, and P. Achermann (1998). **Rest-activity rhythm of the blind mole rat *Spalax ehrenbergi* under different lighting conditions**. *Behavioural Brain Research* 96(1-2): 173-183. ISSN: 0166-4328.

Descriptors: blind mole rat, behavior, lighting conditions, rest-activity rhythm, circadian rhythm, light dark cycle, rodent.

Tong, T.Y.Y. and V.H.H. Goh (2000). **Effect of selected wavelengths of light on the fertility status of rats.** *Animal Technology* 51(1): 1-7. ISSN: 0264-4754.

NAL Call Number: QL55.I5

Abstract: This study was to evaluate the influence of different wavelengths of light on the fertility status of non-seasonally breeding laboratory rats. Starting at 18 days of age, albino Wistar rats were housed under blue, green, yellow or white light during the photophase of an alternating 12 h:12 h light:dark cycle. At 60 days of age, females at pro-oestrus were paired with males giving rise to various combinations of mating groups comprising animals raised under white light or coloured light and mated under white or coloured light respectively. The number of implantations and quality of embryos retrieved from females on day 14 of pregnancy showed that different coloured light affected the fertility status of coloured light-exposed albino Wistar rats. Blue light was most damaging to fertility, followed by green and then yellow light.

Descriptors: rats, blue light, white light, light, proestrus, female animals, natural mating, litter size, embryos, embryonic development, abnormalities, inbred strains, green light, yellow light, Wistar rats.

Torres Contreras, H. and F. Bozinovic (1997). **Food selection in an herbivorous rodent: balancing nutrition with thermoregulation**. *Ecology (Washington, DC)* 78(7): 2230-2237.

Descriptors: food selection, herbivorous, rodent, thermoregulation, nutrition, balancing.

Tosini, G., J.C. Dirden, and C. Fukuhara (2001). **Induction of photosensitivity in neonatal rat pineal: effect of age and light intensity**. *IOVS* 42(4): S361.

Descriptors: rat, neonatal, pineal, light intensity, age, induction of photosensitivity, vision, sensory system, meeting abstract.

Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 29-May 04, 2001, Fort Lauderdale, Florida, USA.

Trillmich, F. (2000). **Effects of low temperature and photoperiod on reproduction in the female wild guinea pig**

(***Cavia aperea***). *Journal of Mammalogy* 81(2): 586-594. ISSN: 0022-2372.
Descriptors: guinea pigs, low temperature, photoperiod, reproduction, effects, female, wild.

Ueda, T.N., C.J. Zhou, T. Ueda, Y. Yamamoto, S. Fukuda, S. Shioda, H. Yasuhara, and R. Koide (2001). **Retinal light damage in rats exposed to blue light emitter diode light**. *IOVS* 42(4): S629.
Descriptors: rats, blue light, diode light, retinal damage, exposure, sensory reception, injury, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, April 29-May 04, 2001, Fort Lauderdale, Florida, USA.

Ugarte, M. and N.N. Osborne (1999). **The localization of free zinc varies in rat photoreceptors during light and dark adaptation**. *Experimental Eye Research* 69(4): 459-461. ISSN: 0014-4835.
Descriptors: free zink, localization, varies, light, dark, adaptation, rat, photoreceptors.

Uno, T. and M. Shibata (2001). **Central efferent control of nonshivering thermogenesis in rats.** *Journal of Thermal Biology* 26(4-5): 485-489. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Abstract: Removal of the midbrain tonic inhibitory mechanism (MTIM) on nonshivering thermogenesis (NST) increases temperatures of the interscapular brown adipose tissue (T(IBAT)) and rectum (T(rec)) in urethane-anesthetized rats through disinhibition-induced activation of the central sympathetic nervous system. The magnitude of T(IBAT) and T(rec) increases by midbrain procaine microinjections during hypothalamic warming and cooling was smaller and larger, respectively, than that during thermoneutral hypothalamic temperature. In conscious animals, the midbrain procaine administration increased body temperature more in decerebrated than in control animals. It was concluded that the hypothalamus exerts its modulatory influences on the MTIM. However, its mode of action is not known.
Descriptors: heat production, body temperature, brain, hypothalamus, midbrain.

Usui, S., T. Okazaki, and Y. Honda (2003). **Interruption of the rat circadian clock by short light-dark cycles**. *American Journal of Physiology* 284(5, Part 2): R1255-R1259. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: Ninety male Sprague-Dawley rats were exposed to 1:1-h light-dark (LD1:1) cycles for 50-90 days, and then they were released into constant darkness (DD). During LD1:1 cycles, behavioural rhythms were gradually disintegrated, and circadian rhythms of locomotor activity, drinking, and urine 6-sulfatoxymelatonin excretion were eventually abolished. After release into DD, 44 (49%) rats showed arrhythmic behaviour for >10 days. Seven (8%) animals that remained arrhythmic for >50 days in DD were exposed to brief light pulses or 12:12-h light-dark cycles, and then their circadian rhythms were restored. These results indicate that the circadian clock was stopped, at least functionally, by LD1:1 cycles and was restarted by subsequent light stimulation.
Descriptors: animal behavior, circadian rhythm, light regime, light relations, photoperiodism, rats.

Usui, S., Y. Takahashi, and T. Okazaki (2000). **Range of entrainment of rat circadian rhythms to sinusoidal light-intensity cycles**. *American Journal of Physiology* 278(5, Part 2): R1148-R1156. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: rat, circadian rhythm, sinusoidal light intensity cycles, illuminance, maximum, minimum, light-dark, entrainment, sinusoidal fluctuations of light intensity.

Van Campen, L.E., W.J. Murphy, J.R. Franks, P.I. Mathias, and M.A. Toraason (2002). **Oxidative DNA damage is associated with intense noise exposure in the rat**. *Hearing Research* 164(1-2): 29-38. ISSN: 0378-5955.
Descriptors: rat, intense noise exposure, oxidative DNA damage, hearing loss, noise induced, antioxident therapy.

Van den Buuse, M. (1999). **Circadian rhythms of blood pressure and heart rate in conscious rats: effects of light cycle shift and timed feeding**. *Physiology and Behavior* 68(1-2): 9-15. ISSN: 0031-9384.
Abstract: Eight mature male rats were subjected to varying light cycles with ad lib. or restricted access to food and blood pressure, heart rate, and behavioural activity were measured using radiotelemetry. In rats that were

fed ad lib., a shift of the light cycle by 6 h (from lights on 07.00-19.00 h to lights on 13.00 to 01.00 h) induced an immediate, but from then on gradual, shift of the circadian rhythms of blood pressure, heart rate, and behavioural activity, which took 4-5 days to fully synchronize with the new light cycle. Rats on a normal light cycle receiving feeding for 1 h only during the light period rather than ad lib. feeding, showed a suppressed circadian rhythm, with the dark period values reduced to values not significantly different from those observed in the light period. During the 1 h timed feeding, blood pressure, heart rate, and behavioural activity peaked to levels that were normally seen during the dark period.

Descriptors: rats, blood pressure, heart rate, circadian rhythms, light cycle, timed feeding, ad lib, restricted.

Van der Meer, E., P.L. Van Loo, and V. Baumans (2004). **Short-term effects of a disturbed light-dark cycle and environmental enrichment on aggression and stress-related parameters in male mice.** *Laboratory Animals* 38(4): 376-83. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: In the laboratory setting, environmental factors have a major influence on the well-being of laboratory animals. The present study shows the importance of a semi-natural light-dark cycle. In this experiment one cohort of mice was kept with a continuous lighting for one week. After the first week the artificial light-dark cycle was 12:12 with lights on at 07:00 h. The second cohort of mice was kept with this 12:12 h light-dark cycle from the start. Half of each cohort received environmental enrichment. In order to analyse corticosterone levels, urine samples were collected. To measure agonistic behaviour, the behaviour of the mice was recorded on videotape immediately after cage cleaning. A significant difference in corticosterone levels between cohorts was found during disturbed lighting, but not after lighting conditions were reset to 12:12 h. In the first test week, mice subjected to disturbed lighting also showed a significantly shorter agonistic latency than control mice. This difference had disappeared when in the second test week all mice experienced 12:12 h lighting. No effects of enriched housing were found. This experiment has shown that disturbed lighting for socially-housed male mice caused physiological and behavioural changes indicative of stress, not only leading to much higher levels of corticosterone but also to shorter agonistic latency within the groups.

Descriptors: agonistic behavior physiology, behavior, animal physiology, inbred BALB c mice physiology, inbred BALB c mice psychology, photoperiod, body weight physiology, cohort studies, corticosterone urine, creatinine urine, drinking physiology, eating physiology, eating psychology, mice, random allocation, statistics, nonparametric, videotape recording.

Van Schanke, A., M.J. Jongsma, H.J. Van Kranen, L.H.F. Mullenders, and F.R. De Gruijl (2002). **Effect of fractionation of exposure to ultraviolet light on the induction of nevi and skin tumors in mice**. *Pigment Cell Research* 15(Supplement 9): 72. ISSN: 0893-5785.

Descriptors: mice, skin tumors, nevi, induction, ultraviolet light, exposure, effect.

Notes: Meeting Information: XVIII International Pigment Cell Conference (IPCC), September 09-13, 2002, Egmond aan Zee, Netherlands.

Vargas, M.L., F. Tejada, A. Penuela, R. Penafiel, and A. Cremades (2000). **Effect of potassium deficiency on body temperature in mice.** *Journal of Thermal Biology* 25(1-2): 125-129. ISSN: 0306-4565.

NAL Call Number: QP82.2.T4J6

Descriptors: potassium, mice, deficiency, body temperature.

Vaughan, D.K., S.F. Coulibaly, R.M. Darrow, and D.T. Organisciak (2003). **A morphometric study of light-induced damage in transgenic rat models of retinitis pigmentosa.** *IOVS* 44(2): 848-855.

Descriptors: transgenic rat models, retinitis pigmentosa, light induced damage, morphometric study, dim cycles, darkness, intense green light.

Vazquez, A.E., B.L. Lonsbury Martin, and A.E. Luebke (1998). **Noise-induced hearing loss in the CBA/CAJ mouse: temporary and permanent changes in distortion product otoacoustic emissions**. *Society for Neuroscience Abstracts* 24(1-2): 901. ISSN: 0190-5295.

Descriptors: hearing loss, noise induced, temporary, permanent, CBA CAJ mouse, distortion, otoacoustic emissions.

Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 1, November 7-12,

1998, Los Angeles, California, USA.

Vazquez, A.E., Q.Y. Zheng, B.L. Lonsbury Martin, and A.E. Luebke (1999). **Distortion-product otoacoustic emissions and effects of noise damage in a congenic strain of C57BL6J, B6.CAST-+Ahl mice**. *Society for Neuroscience Abstracts* 25: 1-2. ISSN: 0190-5295.
Descriptors: mice, noise damage, effects, otoacoustic emissions, strain, C57BL6J, B6.CAST-+Ahl mice.
Notes: Meeting Information: 29th Annual Meeting of the Society for Neuroscience, Part 1, October 23-28, 1999, Miami Beach, Florida, USA.

Veening, J.G., J.A. Bouwknecht, H.J.J. Joosten, P.J. Dederen, T.J.J. Zethof, L. Groenink, J. Van der Gugten, and B. Olivier (2004). **Stress-induced hyperthermia in the mouse: c-FOS expression, corticosterone and temperature changes**. *Progress in Neuro Psychopharmacology and Biological Psychiatry* 28(4): 699-707. ISSN: 0278-5846.
Descriptors: mouse, hyperthermia, stress induced, corticosterone changes, temperature changes, thermoregulatory response.

Vidal Puig, A.J., D. Grujic, C.Y. Zhang, T. Hagen, O. Boss, Y. Ido, A. Szczepanik, J. Wade, and V. Mootha (2000). **Energy metabolism in uncoupling protein 3 gene knockout mice.** *Journal of Biological Chemistry* 275(21): 16258-16266. ISSN: 0021-9258.
Online: http://www.jbc.org/
NAL Call Number: 381 J824
Descriptors: mice, mitochondria, animal proteins, cell membranes, mutants, energy metabolism, skeletal muscle, ATP, ADP, phosphocreatine, food intake, triacylglycerols, body weight, oxygen consumption, oxygen, free radicals, aconitate hydratase, heat production, cold, body temperature regulation, blood chemistry, blood lipids, oxidation, fatty acids, glucose.

Vistamehr, S. and N. Tian (2004). **Light deprivation suppresses the light response of inner retina in both young and adult mouse**. *Visual Neuroscience* 21(1): 23-37. ISSN: 0952-5238.
Descriptors: mouse, adult, young, light deprivation, light response, inner retina, visual stimulation.

Voipio, H.M. (1997). **How do rats react to sound?** *Scandinavian Journal of Laboratory Animal Science Supplement* 24(1): 1-70. ISSN: 0901-3393.
Descriptors: rats, laboratory animals, sound, behavior, adaptation, females, males, age groups, mammals, radiation, Rodentia, sex, useful animals.
Notes: Thesis (Dr. Med. Vet.).

Voltura, M.B. and B.A. Wunder (1998). **Effects of ambient temperature, diet quality, and food restriction on body composition dynamics of the prairie vole, *Microtus ochrogaster.*** *Physiological Zoology* 71(3): 321-328. ISSN: 0031-935X.
Descriptors: environmental temperature, diets, starvation, body composition, restricted feeding, body fat, fiber, intake, *Pitymys ochrogaster*.

Wang, D. and Z. Wang (2000). **Body temperature regulation and evaporative water loss in root vole (*Microtus oeconomus*)**. *Acta Theriologica Sinica* 20(1): 37-47. ISSN: 1000-1050.
Descriptors: root vole, body temperature regulation, evaporative water loss, energetics, metabolic rate, thermal conductance, thermal neutral zone, body mass.

Warn, P.A., M.W. Brampton, A. Sharp, G. Morrissey, N. Steel, D.W. Denning, and T. Priest (2003). **Infrared body temperature measurement of mice as an early predictor of death in experimental fungal infections**. *Laboratory Animals* 37(2): 126-131. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Temperatures of mice were measured using an infrared high performance non-contact thermometer, after the device had been calibrated using implantable microchips containing temperature transponders. Mice were infected with three species of *Candida* (isolates) and the resultant disseminated infections monitored. Mouse temperatures could be reliably measured using the infrared device and this measurement caused little

distress to the mice. We were further able to demonstrate that mice rarely recovered if their body temperature dropped below 33.3 degrees C (sensitivity 68%, specificity 97%). Adoption of a 33.3 degrees C endpoint in fungal sepsis experiments measured by infrared non-contact thermometer would significantly reduce the suffering in the terminal stages of this type of infection model.

Descriptors: body temperature, death, hypothermia, infrared imagery, measurement, mycoses, sepsis, thermometers, *Candida*.

Wasowicz, M., C. Morice, P. Ferrari, J. Callebert, and C. Versaux Botteri (2002). **Long-term effects of light damage on the retina of albino and pigmented rats**. *IOVS* 43(3): 813-820.

Descriptors: rats, albino, pigmented, light damage, retina, long term effects, phototoxicity, retinal alterations, retinal physiology.

Weinert, D. and J. Waterhouse (1998). **Diurnally changing effects of locomotor activity on body temperature in laboratory mice.** *Physiology and Behavior* 63(5): 837-43. ISSN: 0031-9384.

Abstract: In mice circadian body temperature curves are masked due to the effect of motor activity. However, body temperature will not immediately reflect activity, but rather the integrated activity over IT minutes (integration time) and after a certain delay (lag), and the sensitivity to such masking may change throughout the circadian cycle. The aims of the present investigation were to estimate IT and lag, to quantify the effect of motor activity on body temperature at different times of the day, and, using these results, to draw temperature curves that are closer to the endogenous one. Activity and body temperature of adult male laboratory mice were recorded telemetrically at 10-min intervals. Animals were housed in air-conditioned rooms (T = 22+/-2 degrees C; relative humidity: 55-65%) with a light-dark cycle of 12 h:12 h (light from 0700 to 1900 hours) and food and water available ad lib. The diurnal activity and body temperature rhythms were similar with a main maximum during the dark time and a secondary maximum immediately following lights-on. Nearly all changes of activity were reflected in body temperature. IT and lag were established on the basis of the best correlation between body temperature and activity (overlapping 4-h sections of 12 days) for all combinations of IT from 10 to 90 min and lag from 0 to 50 min (10-min steps each). The overall means of IT and lag were 40 and 0 min, respectively. During the dark time the values were somewhat larger, but not significantly so. The correlation between activity and body temperature was significantly better in the light time compared to the dark time. The sensitivity of the body temperature to changes in activity was investigated by linear regression analysis for every hour over 12 days (IT = 40 min, lag = 0 min). The gradients assessed by regression analysis showed a diurnal pattern with maximal values during the light time ($p < 0.01$). Thus, body temperature was raised by activity more during the light time (minimum of body temperature and activity) than during the dark time. The intercepts showed a nearly sinusoidal diurnal pattern with maximal values in the middle of the dark time. Accepting that the intercepts correspond to zero activity at a certain time of day, one might use them to get a curve that is closer to the endogenous body temperature rhythm. Mechanisms (circadian and thermoregulatory) that might cause the diurnally changing sensitivity of body temperature to activity are discussed.

Descriptors: body temperature regulation physiology, circadian rhythm physiology, motor activity physiology, mice, regression analysis, thermoregulatory, diurnally, changing effects, locomotor activity, temperature curves.

Weinert, D. and J. Waterhouse (1999). **Daily activity and body temperature rhythms do not change simultaneously with age in laboratory mice**. *Physiology and Behavior* 66(4): 605-612. ISSN: 0031-9384.

Descriptors: activity, body temperature, change, rhythms, mice, age, laboratory.

Weinert, D., J. Waterhouse, and H. Weinert (2002). **Body temperature in laboratory mice: circadian and homeostatic control**. *Zoology (Jena)* 105(Supplement 5): 90. ISSN: 0944-2006.

Descriptors: mice, circadian, homeostatic, control, body temperature.

Notes: Meeting Information: 95th Annual Meeting of the Deutsche Zoologische Gesellschaft (German Zoological Society), May 20-24, 2002, Halle/Saale, Germany.

Weinert, D. and H. Weinert (2003). **The relative Zeitgeber strength of lights-on and lights-off is changed in old mice**. *Chronobiology International* 20(3): 405-416. ISSN: 0742-0528.

Abstract: The daily activity pattern of old mice is characterized by a decreased amplitude, a phase advance, and less stable relationship between lights-off and the onset of the main activity maximum. When analyzing the

possible causes of these changes, it must be remembered that the activity rhythm of laboratory mice is bimodal, with a main peak in the first half of the dark time and a secondary one shortly after lights-on. Thus it seems to be controlled by at least two circadian oscillators - an "evening oscillator" coupled more strongly to lights-off and a "morning oscillator" coupled to lights-on - though both oscillators are also coupled to each other. The objective of the present paper was to investigate the putative changes in the strength of these couplings in HaZ:ICR mice of different ages (adult animals of 20 weeks, n=12; old mice of 72 and 91 weeks of age, n=6 each) and kept in a 24 h LD-cycle with a gradually reduced light:dark ratio. In adult mice, lengthening the dark time caused the onset of the main maximum of activity to be delayed in relation to the time of lights-off, while the morning maximum of activity was advanced in relation to lights-on. On average, the sizes of the advance and the delay were equal. As a consequence, the activity pattern did not shift in relation to the middle of the dark time. Lengthening the dark time resulted in a bigger (on average, 1.5 h) difference between the evening and morning activity onsets. Under short photoperiods (<less or =>2 h of light) the activity rhythm started to free run, and the difference between evening and morning activity onsets decreased again. The changes obtained in senile mice were similar. However, the limits of entrainment were reached with longer photoperiods compared to adult animals. Also, the phase delay of the activity onset in the evening was much less, nearly zero. As a consequence, the activity pattern as a whole phase-advanced in relation to the middle of the dark time. A model was proposed in which lights-off triggers advances of the "evening oscillator," lights-on delays the "morning oscillator," and the two oscillators are coupled with each other. Though it was probably the case, decreased coupling strengths could not be shown with the present experimental approach. However, it was clearly evident that, with increasing age, the advancing effect of lights-off exceeded the delaying effect of lights-on.

Descriptors: aging, animal models, circadian rhythm, light relations, man, mice.

Weinert, D. and V. Kompauerova (1998). **Light-induced phase and period responses of circadian activity rhythms in laboratory mice of different age**. *Zoology (Jena)* 101(1): 45-52. ISSN: 0944-2006.

Descriptors: mice, circadian activity rhythms, light induced phase, different age, period responses, light, dark, locomotor activity.

Weinert, H., D. Weinert, and J. Waterhouse (2002). **The circadian activity and body temperature rhythms of mice during their last days of life**. *Biological Rhythm Research* 33(2): 199-212. ISSN: 0929-1016.

Descriptors: mice, aging, death, body temperature, motor activity, circadian activity, old mice, younger mice, last days of life.

Williams, T.P., A. Squitieri, R.P. Henderson, and J.P.P. Webbers (1999). **Reciprocity between light intensity and rhodopsin concentration across the rat retina**. *Journal of Physiology (Cambridge)* 516(3): 869-874. ISSN: 0022-3751.

Descriptors: rat, retina, light intensity, rhodopsin concentration, reciprocity.

Wooden, K.M. and G.E. Walsberg (1999). **Effect of body-temperature perturbations on locomotory performance in a diurnal desert rodent, *Spermophilus tereticaudus***. *American Zoologist* 39(5): 76A. ISSN: 0003-1569.

Descriptors: body temperature, perturbations, locomotory performance, desert rodent, effect, dirunal, *Spermophilus tereticaudus*.

Notes: Meeting Information: Annual Meeting of the Society for Integrative and Comparative Biology, January 04-08, 2000, Atlanta, Georgia, USA.

Wooden, K.M. and G.E. Walsberg (2004). **Body temperature and locomotor capacity in a heterothermic rodent.** *Journal of Experimental Biology* 207(1): 41-46. ISSN: 0022-0949.

Descriptors: heterothermic rodent, locomotor capacity, body temperature, ground squirrel, energetic costs, sprint speed, thermoregulation.

Wooden, K.M. and G.E. Walsberg (2002). **Effect of environmental temperature on body temperature and metabolic heat production in a heterothermic rodent, *Spermophilus tereticaudus***. *Journal of Experimental Biology* 205(14): 2099-2105. ISSN: 0022-0949.

Descriptors: heterothermic rodent, ambient temperature, effect, body temperature, metabolic heat, energy

expenditure, thermoregulatory ability.

Woodley, R. and R. Buffenstein (2001). **Reproductive function of naked mole-rats is extremely sensitive to ambient temperature**. *American Zoologist* 41(6): 1629. ISSN: 0003-1569.
Descriptors: naked mole rats, reproductive function, sensitivity, ambient temperature, thermoconforming, poikilothermic.
Notes: Meeting Information: Annual Meeting of the Society for Integrative and Comparative Biology, January 02-06, 2002, Anaheim, California, USA.

Wu, J.M., E.P. Chen, and P.G. Soderberg (1998). **Ascorbic acid does not protect photic injury by blue light on rat retina**. *IOVS* 39(4): S827.
Descriptors: rat, retina, photic injury, blue light, ascorbic acid, protection, meeting abstract.
Notes: Meeting Information: Annual Meeting of the Association for Research in Vision and Ophthalmology, May 10-15, 1998, Fort Lauderdale, Florida, USA.

Wu, J., S. Seregard, B. Spangberg, M. Oskarsson, and E. Chen (1999). **Blue light induced apoptosis in rat retina**. *Eye (London)* 13(4): 577-583.
Descriptors: rat, retina, apoptosis, blue light.

Yarosh, D.B., J. Kibitel, S.E. Ullrich, T.H. Kim, H.N. Ananthaswamy, P. Krien, A. Fourtanier, and M.L. Kripke (1999). **Direct comparison of DNA damage, isomerization of urocanic acid and edema in the mouse produced by three commonly used artificial UV light sources**. *Photochemistry and Photobiology* 69(5): 571-574. ISSN: 0031-8655.
Descriptors: UV light, DNA damage, mouse, edema, uric acid, isomerization, comparison.

Yavin, S., A. Aroyo, and A. Arav (2003). **Affect of low intensity light on mice embryo development using the time laps "embryoguard" system.** *Fertility and Sterility* 80(Supplement 3): S121-S122. ISSN: 0015-0282.
Descriptors: mice embryo, development, low light intesity, affect, time laps embryoguard system, reproduction.
Notes: Meeting Information: 59th Annual Meeting of the American Society for Reproductive Medicine, October 11-15, 2003, San Antonio, Texas, USA.

Yoda, M., Y. Nakano, T. Tobe, S. Shioda, N.H. Choi Miura, and M. Tomita (2001). **Characterization of mouse GBP28 and its induction by exposure to cold.** *International Journal of Obesity and Related Metabolic Disorders* 25(1): 75-83.
NAL Call Number: RC628.A1O2
Abstract: OBJECTIVE: To investigate whether the expression of the novel adipose tissue-specific protein GBP28 in adipose tissue and serum are altered in mice under a variety of conditions. DESIGN: Mice were fed a high-fat diet for 4 weeks, fasted for 48 h or exposed at 4 degrees C. SUBJECTS: C57BL/6J mouse, male, 4-6 weeks old. MEASUREMENTS: GBP28 mRNA, GBP28 protein, blood glucose, insulin and fad pad weight of the mice. RESULTS: We first confirmed that the mouse has GBP28 and its characteristics are the same as human GBP28. Serum concentration and mRNA levels of GBP28 significantly increased in the mice exposed to cold. CONCLUSION: GBP28 may play a role in homeostasis, regulating body temperature and basal metabolic rate in response to changing environmental conditions.
Descriptors: mice, body fat, adipose tissue, cold, exposure, dietary fat, animal proteins, protein synthesis, messenger RNA, blood sugar, insulin, body composition, homeostasis.

Yoda, T., L.I. Crawshaw, K. Yoshida, L. Su, T. Hosono, O. Shido, S. Sakurada, Y. Fukuda, and K. Kanosue (2000). **Effects of food deprivation on daily changes in body temperature and behavioral thermoregulation in rats**. *American Journal of Physiology* 278(1, Part 2): R134-R139. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: Homeothermic animals regulate body temperature (Tb) by using both autonomic and behavioral mechanisms. In the latter process, animals seek out cooler or warmer places when they are exposed to excessively hot or cold environments. Thermoregulation is affected by the state of energy reserves in the body. In the present study, we examine the effects of 4-day food deprivation on circadian changes in Tb and on cold-

escape and heat-escape behaviors in rats. Continuous measurement of Tb during food deprivation indicated that the peak Tb amplitude was not different from baseline values, but the trough amplitude continuously decreased after the onset of food deprivation. Cold-escape behavior was facilitated by food deprivation, whereas heat-escape behavior was unchanged. After the termination of food deprivation, the lowered Tb returned to normal on the first day. However, cold-escape behavior was still facilitated on the third day after food reintroduction. Autonomic and behavioral thermoregulatory effectors are modulated in the face of food shortage so as to maintain optimal performance during the active period, whereas increasing energy conservation occurs during the quiescent phase.
Descriptors: body temperature, deprivation, food deprivation, thermoregulation, energy conservation, effects, animal models, rats.

Yoshida, N., S.J. Hequembourg, C.A. Atencio, J.J. Rosowski, and M.C. Liberman (2000). **Acoustic injury in mice: 129/SvEv is exceptionally resistant to noise-induced hearing loss**. *Hearing Research* 141(1-2): 97-106. ISSN: 0378-5955.
Descriptors: mice, acoustic injury, resistant, 129 SvEv, hearing loss.

Yoshida, N. and M.C. Liberman (2000). **Sound conditioning reduces noise-induced permanent threshold shift in mice**. *Hearing Research* 148(1-2): 213-219. ISSN: 0378-5955.
Descriptors: mice, noise induced permanent threshold shift, sound conditioning, reduces, changes, outer hair cell function.

Zawilska, J.B., J. Rosiak, and J.Z. Nowak (1998). **Effects of near-ultraviolet light on the nocturnal serotonin n-acetyltransferase activity of rat pineal gland**. *NeuroScience Letters* 243(1-3): 49-52. ISSN: 0304-3940.
Descriptors: rat, pineal gland, near ultraviolet light, effects, nocturnal serotonin n-acetyltransferase activity, UVA, signal, melatonin biosynthesis.

Zhao, C., W. Lu, H. Wang, and D. Che (2002). **[Effect of temperature on spermatogenic function of mouse]**. *Journal of Jilin Agricultural University* 24(6): 78-81. ISSN: 1000-5684.
Abstract: The effects of water bath temperature on the structure of testis tissue and spermatogenic function were investigated in mice. Degenerative changes in the seminiferous tubules were observed in mice bathed in 35 degrees C for 45 minutes (P<0.05). The regression of the testes was extremely significant in mice bathed in 40 degrees C for 45 minutes (P<0.01). It was found that seminiferous epithelium is sensitive to changes in temperature; sertoli and leydig cells showed weak sensitivities.
Descriptors: Leydig cells, seminiferous epithelium, seminiferous tubules, sertoli cells, temperature, testes, mice.
Language of Text: Chinese with an English summary.

Zhou, G., H. Gong, J. Wu, X. Zhou, and R.W. Williams (2004). **Myopia induced by lighting in advance in neonatal mice**. *Anatomical Science International* 79: 374. ISSN: 1447-6959.
Descriptors: neonatal mice, myopia, induced, lighting, conference.
Notes: Meeting Information: 16th International Congress of the IFAA (International Federation of Associations of Anatomists) and the 109th Annual Meeting of the Japanese Association of Anatomists, August 22-27, 2004, Kyoto, Japan.

Zhu, M., D. Nehra, J.J.H. Ackerman, and D.A. Yablonskiy (2004). **On the role of anesthesia on the body/brain temperature differential in rats**. *Journal of Thermal Biology* 29(7-8): 599-603. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Descriptors: rats, body, brain, temperature, anesthesia, role, blood flow, oxygen consumption, anesthetics, temperature gradients.

Zimmer, M.B. and W.K. Milsom (2002). **Ventilatory pattern and chemosensitivity in unanesthetized, hypothermic ground squirrels (*Spermophilus lateralis*).** *Respiratory Physiology and Neurobiology* 133(1-2): 49-63. ISSN: 1569-9048.
Abstract: The present study examined the effects of severe hypothermia in the absence of anesthesia on breathing pattern, ventilatory control and chemosensitivity in a cold tolerant species capable of seasonal

hibernation. Hypothermia was induced in ground squirrels and ventilation and heart rate were recorded in animals breathing air at a body temperature (Tb) of 5 and 10 degrees C. The animals were then exposed to hypercapnic (2, 4 and 6% CO(2)) and hypoxic (12, 10, 8 and 4% O(2)) gas mixtures. We found that severe hypothermia in ground squirrels caused the breathing pattern to change from a continuous pattern to patterns that are commonly observed during hibernation. This suggests that temperature and metabolism alone are important factors in producing these patterns. The relative ventilatory sensitivity to hypercapnia was retained in the ground squirrel during hypothermia while ventilatory sensitivity to hypoxia was totally abolished. This is in contrast to hibernation where a small but significant hypoxic ventilatory response is present along with an enhanced relative response to hypercapnia. This suggests that changes in Tb alone can not account for the changes seen in ventilatory sensitivity during hibernation.

Descriptors: chemoreceptors physiology, hypothermia physiopathology, pulmonary ventilation physiology, respiration, Sciuridae physiology, hibernation physiology, respiratory function tests methods, wakefulness physiology.

Zimmer, M.B. and W.K. Milsom (2001). **Effects of changing ambient temperature on metabolic, heart, and ventilation rates during steady state hibernation in golden-mantled ground squirrels (*Spermophilus lateralis*).** *Physiological and Biochemical Zoology* 74(5): 714-23. ISSN: 1522-2152.

Abstract: To determine whether metabolic rate is suppressed in a temperature-independent fashion in the golden-mantled ground squirrel during steady state hibernation, we measured body temperature and metabolic rate in ground squirrels during hibernation at different T(a)'s. In addition, we attempted to determine whether heart rate, ventilation rate, and breathing patterns changed as a function of body temperature or metabolic rate. We found that metabolic rate changed with T(a) as it was raised from 5 degrees to 14 degrees C, which supports the theory that different species sustain falls in metabolic rate during hibernation in different ways. Heart rate and breathing pattern also changed with changing T(a), while breathing frequency did not. That the total breathing frequency did not correlate closely with oxygen consumption or body temperature, while the breathing pattern did, raises important questions regarding the mechanisms controlling ventilation during hibernation.

Descriptors: heart rate physiology, hibernation physiology, respiration, Sciuridae physiology, adaptation, physiological, body temperature, oxygen consumption.

Zolotareva, N.N., T.M. Agapkina, and A.N. Severtsov (2002). **Biochemical and physiological status of Mongolian gerbils under low temperature conditions.** *Advances in Ethology* 37: 177. ISSN: 0931-4202.

Descriptors: Mongolian gerbils, biochemical status, physiological status, low temperature conditions.

Notes: Meeting Information: 4th International Symposium on Physiology and Behaviour of Wild and Zoo Animals, September 29-October 02, 2002, Berlin, Germany.

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Bochnowicz, S., R.R. Osborn, D.W.P. Hay, and D.C. Underwood (1997). **Hypoxia-induced pulmonary hypertension in an optimized environment for the guineapig.** *Laboratory Animals* 31(4): 347-356. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: Prolonged exposure to hypoxia elicits a variety of time-related morphologic and physiologic changes in the pulmonary vasculature of mammals, including humans. The study of hypoxia-induced changes in rodents generally requires a prolonged exposure to 9% oxygen for a minimum of 10 days in an airtight chamber, which has only been generally described in the literature as large (200-400 l), sealed acrylic chambers. To assist in the search for better therapies for diseases associated with chronic hypoxia using animal models, we have custom-built an airtight chamber for hypoxic exposure of rodents, and characterized the effect of chronic hypoxia on functional and morphologic changes in the pulmonary vasculature of the guineapig using this system. This chamber has been designed to alleviate any unnecessary stress related to food or water intake, cleanliness and excess illumination to the animals during the hypoxic-exposure period. Chronic exposure of the guineapig to hypoxia (0-21 days) produced time-related physiologic, morphologic, and haematologic changes. For example, after 10 days in hypoxia (9% oxygen), pulmonary artery pressure was significantly increased from 13 +/- 1 mmHg in normoxic controls (day 0, n=6) to 26 +/- 0 mmHg (day 10, n=4, P<0.01). Right ventricular hypertrophy in hypoxic animals, presented as a ratio of right ventricle free wall weight to body weight, showed a significant increase from 0.054 +/- 0.004 (day 0) to 0.069 + 0.004 on day 10 (P < 0.05), while age-matched normoxic animals showed no changes in right ventricular weight (day 0=0.059; day 10=0.058; P>0.05). Red blood cell count significantly increased over the same time period, from 5.9 +. 0.1 (day 0) to 6.4 +/- 0.1 (day 10, P < 0.05), as did haematocrit, 48 +/- 0.7 (day 0) to 61 +/- 0.9 (day 10, P < 0.05), and haemoglobin, 16 +/- 0.2 (day 0) to 20 +/- 0.1 (day 10, P<0.05). It is concluded that considerations for the well-being of the test animals (i.e. continuous water, ample food supplies, burrow-like hiding places, sanitation and protection from excess illumination) can easily be incorporated into a hypoxic chamber. The purpose of the present study was to explore modifications that may provide the animal with an optimized environment which will reduce anxiety and stress, as seen in their behaviour when inside the chambers, and to thoroughly characterize the morphologic and physiologic changes associated with chronic hypoxia which develop in a consistent time-related manner.
Descriptors: guinea pigs, hypoxia, hypertension, lungs, erythrocyte count, hematocrit, platelet count, animal housing, body weight, stress factors, animal welfare.

Colas, F., G. Hedelin, M.C. Kopferschmitt, N. Frossard, G. Pauli, and F. De Blay (1998). **Prevalence of asthma, rhinitis and conjunctivitis among workers handling rats in research settings**. *European Respiratory Journal* 12(Supplement 28): 31S-32S. ISSN: 0903-1936.
Descriptors: rats, handling, research, asthma, rhinitis, conjunctivitis, prevalence, occupational health, diseases, conditions, animals.
Notes: Meeting Information: European Respiratory Society Annual Congress, September 19-23, 1998, Geneva,

Switzerland.

Duff, J.P., R.J. Higgins, A.W. Sainsbury, and S.K. Macgregor (2001). **Zoonotic infections in red squirrels.** *Veterinary Record* 148(4): 123-4. ISSN: 0042-4900.
NAL Call Number: 41.8 V641
Descriptors: rodent diseases epidemiology, Sciuridae, zoonoses epidemiology, zoonoses microbiology, zoonoses parasitology, bacterial infections epidemiology, bacterial infections veterinary, Great Britain epidemiology, helminthiasis, animal epidemiology, parapoxvirus, poxviridae infections epidemiology, poxviridae infections veterinary, rodent diseases microbiology, rodent diseases parasitology, toxoplasmosis, animal epidemiology.

Hankenson, F.C., N.A. Johnston, B.J. Weigler, and R.F. Di Giacomo (2003). **Zoonoses of occupational health importance in contemporary laboratory animal research.** *Comparative Medicine* 53(6): 579-601. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: In contemporary laboratory animal facilities, workplace exposure to zoonotic pathogens, agents transmitted to humans from vertebrate animals or their tissues, is an occupational hazard. The primary (e.g., macaques, pigs, dogs, rabbits, mice, and rats) and secondary species (e.g., sheep, goats, cats, ferrets, and pigeons) of animals commonly used in biomedical research, as classified by the American College of Laboratory Animal Medicine, are established or potential hosts for a large number of zoonotic agents. Diseases included in this review are principally those wherein a risk to biomedical facility personnel has been documented by published reports of human cases in laboratory animal research settings, or under reasonably similar circumstances. Diseases are listed alphabetically, and each section includes information about clinical disease, transmission, occurrence, and prevention in animal reservoir species and humans. Our goal is to provide a resource for veterinarians, health-care professionals, technical staff, and administrators that will assist in the design and on-going evaluation of institutional occupational health and safety programs.
Descriptors: laboratory animals, zoonoses, animal technicians, disease reservoirs, disease transmission, symptoms, biomedical research, literature reviews.

Jackson, R.K. (1997). **Unusual laboratory rodent species: research uses, care, and associated biohazards**. *ILAR Journal* 38(1): 13-21. ISSN: 1084-2020.
NAL Call Number: QL55.A1I43
Descriptors: rodents, voles, Rodentia, squirrels, laboratory animals, animal models, experimentation, medical sciences, research, mammals, noxious animals, noxious mammals, pests, Rodentia, useful animals, *Octodon degus*, microtus, clethrionomys, peromyscus, *Sigmodon hispidus*, spermophilus, praomys, marmota.

Krohn, T.C. and A.K. Hansen (2004). **Reduction in the spread of rodent urinary allergens during cage changing by laminar air flow cabins. Reduction in rodent allergens by LAF cabins**. *Scandinavian Journal of Laboratory Animal Science* 31(3): 149-154. ISSN: 0901-3393.
Descriptors: rodent, urinary allergens, cage changes, laminar air flow, spread, reduction, staff protection.

Renstrom, A., G. Bjoring, and A.U. Hoglund (2001). **Evaluation of individually ventilated cage systems for laboratory rodents: occupational health aspects.** *Laboratory Animals* 35(1): 42-50. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: New ventilated caging systems for laboratory animals were compared with conventional caging regarding allergen distribution, ergonomic suitability, cage environment and animal welfare. This paper presents occupational health evaluations. Mice were placed in individually ventilated cage (IVC) systems, a ventilated cabinet, and in cages on open shelves (conventional husbandry). The IVC systems were studied at negative and positive airflow. Aeroallergens were sampled on filters (n=204, including controls) in undisturbed rooms and during cage changing. Concentrations of mouse urinary allergen (Mus m 1) in filter eluates were measured using sandwich ELISA. An ergonomic evaluation was performed with measurement of traction forces. Staff exposure during cage changing was high in all systems, range 116-4430 ng Mus m 1/m(3). In undisturbed animal rooms, allergen levels were orders of magnitude higher when using conventional caging compared with ventilated systems; $P < 0.001$. At positive pressure, both IVCs leaked allergen (median Mus m 1 concentration

was < 0.08 ng/m(3) at negative, but 6.5 ng/m(3) (IVC 1) and 0.8 ng/m(3) (IVC2S) at positive pressure). The IVC systems had ergonomic disadvantages compared with the conventional husbandry and the ventilated cabinet, for instance with cages in unsuitable working heights. Ventilated husbandry solutions reduce levels of airborne allergen substantially at negative pressure, but are ergonomically less suitable. To prevent allergen exposure during cage changing, we propose that this procedure should be performed under ventilated conditions. Producers and users must cooperate in optimizing animal caging systems for both animals and. staff.

Descriptors: mice, rodents, cages, design, artificial ventilation, husbandry, allergens, occupational hazards, ventilated cage system, welfare, safety at work, ergonomics.

Waggie, K.S. and P.L. Marion (1997). ***Demodex* sp. in California ground squirrels.** *Journal of Wildlife Diseases* 33(2): 368-70. ISSN: 0090-3558.

Abstract: An undescribed species of *Demodex* (Acari: Demodecidae) was observed in hair follicles and ducts of sebaceous glands in the ear canals of seven California ground squirrels (*Spermophilus beecheyi)* from Santa Clara County, California (USA). The animals had died of unrelated causes and were submitted for necropsy between September 1994 and February 1996. Similar mites were observed in the lumens of hair follicles and ducts of Meibomian glands in the eyelids of two of these squirrels. Microscopic changes in the epithelium and surrounding dermis, when present, were minimal. No associated clinical signs of disease or macroscopic lesions were observed. To our knowledge, this is the first report of *Demodex* sp. in a ground squirrel.

Descriptors: mite infestations veterinary, rodent diseases parasitology, Sciuridae parasitology, California epidemiology, ear canal parasitology, eyelids parasitology, hair parasitology, meibomian glands parasitology, mite infestations epidemiology, mite infestations parasitology, mites, rodent diseases epidemiology, sebaceous glands parasitology, skin parasitology.

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Welfare/Wellbeing/Fasting/Behavior

Abramsky, Z., M.L. Rosenweig, and A. Subach (1998). **Do gerbils care more about competition or predation?** *Oikos* 83(1): 75-84. ISSN: 0030-1299.
Descriptors: gerbils, owls, predator prey relations, habitats, experimentation, biological competition, Israel, Asia, birds, ecosystems, mammals, predation, Rodentia, Strigiformes, western Asia.

Aikey, J.L., J.G. Nyby, D.M. Anmuth, and P.J. James (2002). **Testosterone rapidly reduces anxiety in male house mice (*Mus musculus*)**. *Hormones and Behavior* 42(4): 448-460. ISSN: 0018-506X.
Descriptors: testosterone, anxiety, mating behavior, gamma aminobutyric acid receptors, *Mus musculus*.

Ajarem, J. and M. Ahmad (2003). **Effect of temperature on the behavioural activities of male mice**. *Dirasat Pure Sciences* 30(1): 59-65. ISSN: 1560-456x.
Abstract: The effect of external thermal stress on the behavioural activities and on the tube restraint test was studied on male albino mice. The mice were subjected to 5, 15, 25, 35, and 45 degrees C, for 24 h considering 22 degrees C as the control temperature. Thereafter, the various observations were made inside a chamber at the specifically mentioned temperature. The locomotory activities including the numbers of squares crossed, rears, wall rears, and washes had direct correlations with thermal stresses. These activities decreased at lower and increased at higher temperatures. Moreover, these activities had a correlation with the observations on the locomotory and immobility durations. Locomotory and immobility durations were directly and inversely related to temperature, respectively. The animals in the tube restraint test also showed a direct correlation between the number of bites and temperature. These observations were discussed in light of the fact that behaviour was remarkably a sensitive mechanism in the regulation of body temperature. The possible role of such behavioural activities in a quest to maintain normothermia by the animal was discussed.
Descriptors: animal behavior, body temperature, heat stress, locomotion, temperature, mice, normothermia.
Language of Text: Arabic summary.

Allen, D.L., B.C. Harrison, A. Maass, M.L. Bell, W.C. Byrnes, and L.A. Leinwand (2001). **Cardiac and skeletal muscle adaptations to voluntary wheel running in the mouse.** *Journal of Applied Physiology* 90(5): 1900-8. ISSN: 8750-7587.
Abstract: In this paper, we describe the effects of voluntary cage wheel exercise on mouse cardiac and skeletal muscle. Inbred male C57/Bl6 mice (age 6-8 wk; n = 12) [corrected] ran an average of 4.3 h/24 h, for an average distance of 6.8 km/24 h, and at an average speed of 26.4 m/min. A significant increase in the ratio of heart mass to body mass (mg/g) was evident after 2 wk of voluntary exercise, and cardiac atrial natriuretic factor and brain natriuretic peptide mRNA levels were significantly increased in the ventricles after 4 wk of voluntary exercise. A significant increase in the percentage of fibers expressing myosin heavy chain (MHC) IIa was observed in both the gastrocnemius and the tibialis anterior (TA) by 2 wk, and a significant decrease in the percentage of

fibers expressing IIb MHC was evident in both muscles after 4 wk of voluntary exercise. The TA muscle showed a greater increase in the percentage of IIa MHC-expressing fibers than did the gastrocnemius muscle (40 and 20%, respectively, compared with 10% for nonexercised). Finally, the number of oxidative fibers as revealed by NADH-tetrazolium reductase histochemical staining was increased in the TA but not the gastrocnemius after 4 wk of voluntary exercise. All results are relative to age-matched mice housed without access to running wheels. Together these data demonstrate that voluntary exercise in mice results in cardiac and skeletal muscle adaptations consistent with endurance exercise.

Descriptors: acclimatization, heart physiology, motor activity physiology, muscle, skeletal physiology, physical conditioning, animal physiology, body weight, heart anatomy and histology, mice, inbred C57Bl6 mice, muscle fibers, fast twitch cytology, fast twitch physiology, slow twitch cytology, slow twitch physiology, skeletal anatomy and histology, myosin heavy chains analysis, NADH-tetrazolium reductase analysis, organ size.

Aloisi, A.M., I. Ceccarelli, and C. Lupo (1998). **Behavioural and hormonal effects of restraint stress and formalin test in male and female rats.** *Brain Research Bulletin* 47(1): 57-62. ISSN: 0361-9230.

Abstract: The formalin test was used to measure the analgesia induced by restraint in male and female rats. Animals were restrained for 30 min or left undisturbed in their cage and then (1) killed immediately to collect blood for hormonal determinations; or (2) subcutaneously injected with formalin in the hind paw (or sham-injected), introduced to an open field for recording of behaviour, and killed at the end of this procedure. In both experiments, corticosterone was found to be higher in females. In Experiment 1, the ability of restraint to be stressful was confirmed by the increase in corticosterone in both sexes and by the decrease of testosterone in males. In Experiment 2, restraint-treatment induced a reduction in licking and flexing that was limited to the second phase. The reduction occurred in different periods and to a different degree in the two sexes; it was greater in females. Spontaneous behaviours showed sex differences in restraint-treated but not in formalin-treated animals. The results show that the hormonal effects observed after restraint are not present after the formalin test and that the marked analgesia observed with phasic painful stimuli does not occur with a longer-lasting one such as that induced by formalin, after which only partial and short-lasting effects were observed.

Descriptors: behavior, animal physiology, hormones physiology, stress, psychological physiopathology, analysis of variance, corticosterone physiology, estradiol physiology, pain physiopathology, pain measurement, Wistar rats, restraint, physical, testosterone physiology.

Amiri, L., T. Dark, K.M. Noce, and C.L. Kirstein (1998). **Odor preferences in neonatal and weanling rats.** *Developmental Psychobiology* 33(2): 157-62. ISSN: 0012-1630.

Abstract: In order to establish odors which can be used in appetitive and aversive conditioning paradigms, naive rat pups, postnatal day 7 (i.e., PND 7) and weanlings (PND 25), were placed in a rectangular open field with an odorant at one or both ends. Time spent over each odor was measured for 3 min. At both ages subjects avoided peppermint, orange, and lemon odors in favor of fresh home-cage bedding. Comparing any of these three odorants with each other resulted in no significant differences in preferences. In experiments using banana odorant, equal time was spent between banana and no odorant. However, in a two-odorant choice between banana and peppermint, weanlings preferred banana whereas pups showed no preference. The results of this study indicate that in an appetitive learning paradigm, peppermint, orange, or lemon odors may be used, while in aversive learning paradigms banana odor may be more appropriate for weanlings.

Descriptors: odors, orientation physiology, rats, Sprague Dawley rats growth and development, Sprague Dawley rats psychology, reinforcement psychology, smell physiology, age factors, analysis of variance, animals, newborn growth and development, animals, newborn psychology, citrus, *Mentha piperita*, plant extracts, sex factors, weaning, Zingiberales.

Andrade, C.S. and F.S. Guimaraes (2003). **Anxiolytic-like effect of group housing on stress-induced behavior in rats.** *Depression and Anxiety* 18(3): 149-52. ISSN: 1091-4269.

Descriptors: anti anxiety agents pharmacology, behavior, animal drug effects, diazepam pharmacology, social behavior, stress psychology, anti anxiety agents administration and dosage, diazepam administration and dosage, rats, Wistar rats.

Aoyama, K. (1997). **Satiation effect on within-session changes in rat feeding behavior**. *Japanese Journal of Animal Psychology* 47(1): 37-45.

Descriptors: rat, feeding behavior, satiation, effect, within session changes.

Arakawa, H. (2005). **Age dependent effects of space limitation and social tension on open-field behavior in male rats.** *Physiology and Behavior* 84(3): 429-436. ISSN: 0031-9384.

Abstract: Cage stocking density can be manipulated by changing in cage size and group size in the cage. The effects of these two factors were investigated in three developmental stages in male rats: juvenile, post-pubertal, and adult. An open-field test was conducted to measure exploratory behavior which was influenced by levels of activity, anxiety, and exploration. When the cage size was decreased, juvenile rats displayed decreased locomotion and lower propensity for exploration, whereas such changes were not evident in post-pubertal rats. When the group size was increased, adult rats exhibited higher locomotion. However, these factors did not affect risk assessment behavior of rats in these developmental stages. Thus, it appears that the effect of stocking density differs depending on the developmental stage of the animal: Juvenile rats increased anxiety following limiting space, whereas adult rats increased activity following increase in social tension.

Descriptors: male rats, space limitation, effects, age, social tension, density, behavior, group size.

Augustsson, H., K. Dahlborn, and B.J. Meyerson (2005). **Exploration and risk assessment in female wild house mice (*Mus musculus musculus*) and two laboratory strains**. *Physiology and Behavior* 84(2): 265-277. ISSN: 0031-9384.

Abstract: In an evolutionary prospective, it is possible that female mice have a differential perception of novel events than male mice and use a different behavioural strategy for risk assessment. However, female mice are less studied than male mice in behavioural tests of emotional reactivity. The aim of the present study was to investigate how wild-derived female house mice differ from domesticated female mice in their risk assessment strategy. A total of 46 adult female mice, 14 BALB/c, 16 C57BL/6 and 14 Wild mice were tested in the Concentric Square Field (CSF), Open Field (OF) and Elevated Plus Maze (EPM) at three consecutive days. Parameters from all three tests were categorized according to their relevance to activity, exploration, approach-avoidance and use of open areas-shelter. Principal Component Analysis (PCA-SIMCA) of the animals' behaviour in the CSF arena was performed both for females alone and in comparison with earlier findings in male mice under the same test conditions. The results clearly show that female wild mice had a higher avoidance of open areas than the laboratory strains. There was also a trend indicating differences in exploration and approach-avoidance between female Wild and the laboratory strains. The multivariate test, CSF, was able to detect differences between Wild and laboratory strains in three (exploration, approach-avoidance, open-shelter) of the four functional categories measured. Wild female mice also had a higher frequency of rearing and grooming and a lower duration in the corridors in the CSF. Clear strain differences were found between BALB and C57BL in all tests where BALB generally had higher risk assessment and lower risk taking than C57BL. No general sex differences were found, however the sex differences were greater in Wild mice compared to the laboratory strains.

Descriptors: exploratory behavior, risk assessment, domestication, sex differences, evolution, emotional behavior, avoidance behavior, open field behavior, *Mus musculus musculus*, mice, strains difference.

Augustsson, H. and B.J. Meyerson (2004). **Exploration and risk assessment: a comparative study of male house mice (*Mus musculus musculus*) and two laboratory strains**. *Physiology and Behavior* 81(4): 685-698. ISSN: 0031-9384.

Abstract: The ability to gather information and assess risks in novel environments is crucial for survival and fitness in the wild. Our aim was to characterise behavioural strategies of exploration and risk assessment in novel environments and to investigate in what respects wild house mice differ from domesticated mice. A total of 39 adult male mice from three genetic backgrounds (Wild, BALB/c, and C57BL/6) were tested in three behavioural tests, the concentric square field (CSF), a modified open field (OF), and a conventional elevated plus maze (EPM). In addition to spatial measures, behavioural measures of exploration and risk assessment were registered. The parameters were categorised according to their relevance to activity, exploration, approach-avoidance, and use of open areas/shelter. Wild mice had lower activity and a higher avoidance of open areas than the laboratory strains. No differences were found in exploratory motivation. The BALB/c mice avoided risk areas and showed high risk assessment (SAP), whereas C57BL/6 mice were more explorative and risk taking and showed little risk assessment. Wild mice seemed to have a different behavioural strategy of risk assessment in being more cautious before entering a potentially dangerous zone but explored all zones after

assessed as nonrisky. A principal component analysis (PCA) of the animals' behaviour in the CSF arena supported these findings by clearly separating the three strains on the basis of their behavioural performances. It is concluded that there are obvious differences in behavioural strategies related to risk assessment and risk taking among wild mice versus domesticated house mice and also among laboratory strains. The relationship between the animal's risk concern and adaptability is discussed and should be a matter of importance considering animal welfare as well as the experimental aim and protocol.

Descriptors: exploratory behavior, risk assessment, novelty, open field behavior, domestication, adaptiveness, *Mus musculus musculus*, principle component analysis, strain differences.

Bae, H.H., J.E. Larkin, and I. Zucker (2003). **Juvenile Siberian hamsters display torpor and modified locomotor activity and body temperature rhythms in response to reduced food availability**. *Physiological and Biochemical Zoology* 76(6): 858-867. ISSN: 1522-2152.

Abstract: Siberian hamsters as young as 16 and 28 d displayed torpor in response to treatment with 2,500 mg/kg 2-deoxy-D-glucose and reduced food availability, respectively. In addition, most food-restricted hamsters displayed increased locomotor activity and elevated body temperatures in the 3 h immediately preceding daily food delivery. This anticipatory activity disappeared within a few days of reimposition of ad lib. feeding. Torpor first appeared spontaneously at ~13 wk of age in hamsters fed ad lib. and maintained in short day lengths. The onset of this "spontaneous" torpor was unaffected by the hamsters' history of food restriction before age 2 mo. Siberian hamsters born late in the breeding season can conserve energy by undergoing torpor immediately after weaning when they contend with food shortages and concurrent energetic challenges imposed by growth requirements and low ambient temperatures.

Descriptors: body temperature, locomotion, plane of nutrition, restricted feeding, thermoregulation, torpor, hamsters.

Bales, K.L. and C.S. Carter (2002). **Oxytocin facilitates parental care in female prairie voles (but not in males).** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 89.3.

Online: http://sfn.scholarone.com

Descriptors: prairie voles, female, parental care, behavior, oxytocin, parturition, estrogen, huddling, grooming, oxytocin antagonist.

Notes: Meeting Information: 32nd Annual Meeting of the Society of Neuroscience, November 02-07, 2002, Orlando, Florida, USA.

Baracat, E.C.E. and E.F. Collares (1997). **Gastric emptying of liquids in rats dehydrated by water deprivation.** *Brazilian Journal of Medical and Biological Research* 30(11): 1363-1369. ISSN: 0100-879X.

Descriptors: rats, liquids, gastric emptying, dehydrated, water deprivation, hematocrit, plasma density, duodenal mucosa, receptors.

Barclay, R. (2001). **The effects of intrusion on the behaviour of caged laboratory rats (*Rattus norvegicus*): consequences for welfare.** *Animal Welfare* 10(4): 421-436. ISSN: 0962-7286.

NAL Call Number: HV4701.A557

Descriptors: rats, laboratory mammals, aggressive behavior, territoriality, cages, social dominance, social behavior, grooming, body weight, male animals, female animals, sex differences, investigatory behavior.

Bartness, T.J. (1997). **Food hoarding is increased by pregnancy, lactation, and food deprivation in Siberian hamsters**. *American Journal of Physiology* 272(1, Part 2): R118-R125. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3

Descriptors: food hoarding, increased, pregnancy, lactation, food deprivation, Siberian hamsters.

Bartolomucci, A., P. Palanza, P. Sacerdote, G. Ceresini, A. Chirieleison, A.E. Panerai, and S. Parmigiani (2003). **Individual housing induces altered immuno-endocrine responses to psychological stress in male mice.** *Psychoneuroendocrinology* 28(4): 540-58. ISSN: 0306-4530.

Abstract: Social isolation and lack of social support have deleterious effects on health, thus being regarded as one of the most relevant causes of diseases in human and other mammalian species. However, only few are the studies aimed at evaluating the psychoneuroimmunological functions of individually housed subjects. The

present study was designed to understand how the behavior and the physiology of male house mice might be affected by individual housing. We first analyzed whether individual housing of different duration (1-42 days) would result in immuno-endocrine dysfunction (experiment 1). Then we investigated whether housing conditions would affect the reaction to an acute mild psychological stress (experiments 2 and 3). There were three main findings: first, individually housing mice for increasing time periods did not induce any major immuno-endocrine effects compared to a stable sibling group housing. Therefore, prolonged isolation does not seem to dramatically impair mice immuno-endocrine functions. Second, when exposed to a mild acute stress, i.e. forced exposure to a novel environment, isolated mice showed higher basal corticosterone and lower type 1 (IL-2) and type 2 (IL-4) cytokines as well as splenocytes proliferation compared to group housed male mice. Finally, when faced with a free choice between a novel environment and their home cage, individually housed mice showed reduced neophobic responses resulting in increased exploration of the novel environment, thus suggesting a low anxiety profile. Altogether, our findings suggest that individual housing in itself does not change immunocompetence and corticosterone level, but does affect reactivity to a stressor. In fact, individually housed mice showed high behavioral arousal, as well as altered immuno-endocrine parameters, when challenged with mild psychological novelty-stress.

Descriptors: neuroimmunomodulation physiology, social isolation psychology, psychological immunology, stress, psychological psychology, adaptation, physiological physiology, body weight physiology, corticosterone blood, dominance subordination, endocrine system physiology, housing, animal, interferon type II blood, interleukin 10 blood, mice, social environment.

Bauer, D.J., T.J. Christenson, K.R. Clark, S.K. Powell, and R.A. Swain (2003). **Acetaminophen as a postsurgical analgesic in rats: a practical solution to neophobia.** *Contemporary Topics in Laboratory Animal Science* 42(2): 20-25. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory animals, postoperative care, acetaminophen, analgesia, oral administration, drinking water, drinking, palatability, preoperative care, preanesthetic medication, body weight, feed intake, animal use refinement, veterinary drugs, water intake.

Baumans, V. and E. Kaliste (2004). **The welfare of laboratory mice**. In: E. Kaliste (Editor), *The Welfare of Laboratory Animals*, Animal Welfare, Vol. XIII, No. 2, Kluwer Academic: Dordrecht, Netherlands, p. 119-152. ISBN: 1402022700.

Descriptors: laboratory animals, mice, *Mus musculus*, animal welfare, animal experiments, mammals, Rodentia, useful animals.

Bazhan, N.M., E.N. Makarova, and T.V. Yakovleva (1996). **Deprivation of food during pregnancy and reproduction in the water vole (*Arvicola terrestris*)**. *Journal of Mammalogy* 77(4): 1078-1084. ISSN: 0022-2372.

Descriptors: food deprivation, pregnancy, reproduction, water vole.

Beck, K.D. and V.N. Luine (1999). **Food deprivation modulates chronic stress effects on object recognition in male rats: role of monoamines and amino acids.** *Brain Research* 830(1): 56-71. ISSN: 0006-8993.

Descriptors: amino acids metabolism, biogenic monoamines metabolism, food deprivation, form perception physiology, memory physiology, stress physiopathology, amygdala metabolism, behavior, animal physiology, hippocampus metabolism, hydrocortisone blood, prefrontal cortex metabolism, rats, Sprague Dawley rats, weight gain.

Belke, T.W. and J.P. Wagner (2005). **The reinforcing property and the rewarding aftereffect of wheel running in rats: a combination of two paradigms.** *Behavioural Processes* 68(2): 165-172. ISSN: 0376-6357.

Abstract: Wheel running reinforces the behavior that generates it and produces a preference for the context that follows it. The goal of the present study was to demonstrate both of these effects in the same animals. Twelve male Wistar rats were first exposed to a fixed-interval 30s schedule of wheel-running reinforcement. The operant was lever-pressing and the reinforcer was the opportunity to run for 45s. Following this phase, the method of place conditioning was used to test for a rewarding aftereffect following operant sessions. On alternating days, half the rats responded for wheel-running reinforcement while the other half remained in their

home cage. Upon completion of the wheel-running reinforcement sessions, rats that ran and rats that remained in their home cages were placed into a chamber of a conditioned place preference (CPP) apparatus for 30min. Each animal received six pairings of a distinctive context with wheel running and six pairings of a different context with their home cage. On the test day, animals were free to move between the chambers for 10min. Results showed a conditioned place preference for the context associated with wheel running; however, time spent in the context associated with running was not related to wheel-running rate, lever-pressing rate, or post-reinforcement pause duration.
Descriptors: wheel running, effect, rewarding, rats, reinforcing, behavior.

Bell, S.M., T.E. Thiele, R.J. Seeley, I.L. Bernstein, and S.C. Woods (1998). **Effects of food deprivation on conditioned taste aversions in rats**. *Pharmacology Biochemistry and Behavior* 60(2): 459-466. ISSN: 0091-3057.
Descriptors: food, deprivation, taste aversion, rats, effects.

Belz, E.E., J.S. Kennell, R.K. Czambel, R.T. Rubin, and M.E. Rhodes (2003). **Environmental enrichment lowers stress-responsive hormones in singly housed male and female rats.** *Pharmacology, Biochemistry and Behavior* 76(3-4): 481-6. ISSN: 0091-3057.
Abstract: Structural and social aspects of an environmental system can influence the physiology and behavior of animals occupying that system. This study examined the physiological effects of environmental enrichment (EE) with Kong Toys and Nestlets on stress-responsive hormones of the hypothalamic-pituitary-adrenal (HPA) axis under basal and mild stress conditions in singly housed, jugular vein-cannulated, male and female rats. Animals of both sexes housed with EE had significantly lower baseline adrenocorticotropic hormone (ACTH) and corticosterone (CORT) concentrations compared to those housed without EE. ACTH responses to the mild stress of saline injection were significantly lower in female rats housed with EE. Interaction with the Kong Toys and Nestlets appears to have provided the rats with a diversion from monotonous cage life, resulting in lower HPA axis activity before and after mild stress. These results are important because low, stable baselines are essential for accurately discerning pharmacological and other influences on the HPA axis.
Descriptors: environment, hormones metabolism, stress, psychological metabolism, corticotropin blood, dose response relationship, drug, hydrocortisone blood, hypothalamo hypophyseal system physiology, play and playthings, rats, Sprague Dawley rats, sex characteristics, social isolation.

Benaroya Milshtein, N., N. Hollander, A. Apter, T. Kukulansky, N. Raz, A. Wilf, I. Yaniv, and C.G. Pick (2004). **Environmental enrichment in mice decreases anxiety, attenuates stress responses and enhances natural killer cell activity.** *European Journal of Neuroscience* 20(5): 1341-7. ISSN: 0953-816X.
Abstract: The importance of environment in the regulation of brain, behaviour and physiology has long been recognized in biological, social and medical sciences. Animals maintained under enriched conditions have clearly been shown to have better learning abilities than those maintained under standard conditions. However, the effects of environmental enrichment (EE) on immunity and emotionality have been less documented and remain questionable. Therefore, we investigated the effect of EE on natural killer (NK) cell activity, psychological stress responses and behavioural parameters. Male C3H mice were housed either in enriched or standard conditions for 6 weeks. Behaviour was then examined by the grip-strength test, staircase and elevated plus maze, and corticosterone levels and NK cell activity were measured. Furthermore, animals exposed to the stress paradigm, achieved by electric shock with reminders, were tested for freezing time in each reminder. Corticosterone levels were also measured. The EE mice showed decreased anxiety-like behaviour and higher activity compared to standard mice, as revealed by a greater percentage of time spent in the open arms of the elevated plus maze, and a higher rate of climbing the staircase. A shorter freezing time in the stress paradigm and no corticosterone level reactivity were measured in EE mice. In addition, NK cell activity in spleens of EE mice was higher than that demonstrated in those of standard mice. Thus, EE has a beneficial effect on anxiety-like behaviour, stress response and NK cell activity. The effect on NK cell activity is promising, due to the role of NK cells in host resistance.
Descriptors: anxiety immunology, behavior, animal, cytotoxicity, immunologic physiology, environment, killer cells, natural immunology, stress, psychological immunology, corticosterone blood, mice, inbred C3H mice.

Bertin, R., F. De Marco, and R. Portet (1997). **Effects of fasting and refeeding on energetic metabolism of cold**

acclimated rats. *Archives of Physiology and Biochemistry* 105(5): 511-515. ISSN: 1381-3455.
Descriptors: cold acclimated rats, fasting, refeeding, energetic metabolism, effects, adipose tissue, weights, thermogenesis.

Bohannon, J. (2002). **Animal models. To build a better mouse cage.** *Science* 298(5602): 2321. ISSN: 1095-9203.
Descriptors: laboratory animals, animal behavior, animal housing, mice, animal experimentation, environment, social behavior.

Bouwknecht, J.A. and R. Paylor (2002). **Behavioral and physiological mouse assays for anxiety: a survey in nine mouse strains.** *Behavioural Brain Research* 136(2): 489-501. ISSN: 0166-4328.
Descriptors: anxiety genetics, anxiety psychology, behavior, animal physiology, body temperature physiology, darkness, exploratory behavior physiology, fever genetics, fever physiopathology, light, mice, inbred mice strains, reproducibility of results, species specificity, stress, psychological genetics, psychological physiopathology, psychological psychology.

Boza, J.J., D. Moennoz, J. Vuichoud, A.R. Jarret, D. De Weck Gaudard, R. Fritsche, A. Donnet, E.J. Schiffrin, G. Perruisseau, and O. Ballevre (1999). **Food deprivation and refeeding influence growth, nutrient retention and functional recovery of rats**. *Journal of Nutrition* 129(7): 1340-1346. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Descriptors: food deprivation, refeeding, growth, nutrient retention, functional recovery, rats.

Bozinovic, F. (1997). **Diet selection in rodents: an experimental test of the effect of dietary fiber and tannins on feeding behavior**. *Revista Chilena De Historia Natural* 70(1): 67-71.
Descriptors: diet, rodents, selection, dietary fiber, effect, feeding behavior.

Buckley, C. and J.E. Schneider (2003). **Food hoarding is increased by food deprivation and decreased by leptin treatment in Syrian hamsters.** *American Journal of Physiology* 285(5, Part 2): R1021-R1029. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: Syrian hamsters, food hoarding, food deprivation, leptin treatment, food intake, increase, decrease.

Buison, A., M. Pellizzon, S. Fried, and K.L.C. Jen (1997). **Body weight gain after food deprivation depends on baseline plasma leptin levels in rats**. *FASEB Journal* 11(3): A230. ISSN: 0892-6638.
Descriptors: body weight, weight gain, food deprivation, baseline plasma leptin levels, rats.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 97, April 6-9, 1997, New Orleans, Louisiana, USA.

Burda, H., S. Begall, O. Gruetjen, A. Scharff, E. Nevo, A. Beiles, J. Cerveny, and K. Prucha (1999). **How to eat a carrot? Convergence in the feeding behavior of subterranean rodents**. *Naturwissenschaften* 86(7): 325-327.
Descriptors: carrot, eat, behavior, feeding, rodents, subterranean.

Burghardt, P.R., L.J. Fulk, G.A. Hand, and M.A. Wilson (2004). **The effects of chronic treadmill and wheel running on behavior in rats.** *Brain Research* 1019(1-2): 84-96. ISSN: 0006-8993.
Abstract: In order to better understand the behavioral adaptations induced by physical activity, this set of experiments assessed the effects of two modes of running exercise on a battery of behavioral tests. The effects of 8 weeks of forced treadmill running and voluntary wheel running on behavior measures in the elevated plus maze, open field, social interaction and conditioned freezing paradigms were investigated. Eight weeks of treadmill running did not alter behavior in any test paradigm. Rats given unrestricted access to running wheels (WR) had a lower percent open arm time (6.0+/-2.3%) compared to locked wheel controls (LC) (20.7+/-5.7%) in the elevated plus maze. WR also showed decreased entries into center (0.2+/-0.2) and crossed fewer lines (61.0+/-14.9) in the open field compared to control groups. Both WR and LC groups showed increased social interaction; however, these differences are attributed to housing conditions. The effects of 4 weeks of wheel running on elevated plus maze and open field behavior were also investigated to address the possibility of a temporal effect of exercise on behavior. Four weeks of wheel running produced behavioral changes in the open field similar to those found at 8 weeks, but not in the elevated plus maze suggesting a temporal effect of wheel

running on plus maze behavior. The behavioral adaptations found after 4 and 8 weeks of wheel running were not due solely to enriched environment and appear to be indicative of enhanced defensive behavior.
Descriptors: exercise test methods, exploratory behavior physiology, interpersonal relations, maze learning physiology, motor activity physiology, exercise test instrumentation, rats, Sprague Dawley rats, time factors.

Buwalda, B., W.A.M. Blom, J.M. Koolhaas, and G. Van Dijk (2001). **Behavioral and physiological responses to stress are affected by high-fat feeding in male rats**. *Physiology and Behavior* 73(3): 371-377. ISSN: 0031-9384.
Descriptors: rats, males, high fat feeding, stress, behavior, physiology, response, affected, body temperature.

Caldwell, H.K. and H.E. Albers (2004). **Effect of photoperiod on vasopressin-induced aggression in Syrian hamsters.** *Hormones and Behavior* 46(4): 444-9. ISSN: 0018-506X.
Abstract: Syrian hamsters are photoperiodic and become sexually quiescent when exposed to short "winter-like" photoperiods. In short photoperiods, male hamsters display significantly higher levels of aggression than males housed in long photoperiods. Arginine-vasopressin (AVP) within the anterior hypothalamus (AH) has been reported to modulate aggression in hamsters housed in long photoperiods. Previous studies have shown that AVP can facilitate aggression and its effects appear to be mediated by AVP V(1a) receptors (V(1a)R). In the present study, we investigated whether the increased levels of aggression observed after exposure to short photoperiod were the result of an increased responsiveness to AVP within the AH. Injections of AVP into the AH significantly increased aggression in hamsters housed in a long photoperiod, but had no effect in hamsters housed in a short photoperiod. In addition, injection of a V(1a)R antagonist into the AH significantly inhibited aggression in hamsters housed in long photoperiod, but had no effect in hamsters housed in a short photoperiod. These findings indicate that AVP within the AH increases aggression in hamsters housed in long photoperiods, but not in hamsters housed in short photoperiods.
Descriptors: Syrian hamsters, aggression physiology, argipressin analogs, derivatives, physiology, hypothalamus physiology, photoperiod, argipressin administration and dosage, hamsters, hormone antagonists pharmacology, hypothalamus drug effects, mesocricetus, microinjections, receptors, vasopressin antagonists and inhibitors.

Callard, M.D., S.N. Bursten, and E.O. Price (2000). **Repetitive backflipping behaviour in captive roof rats (*Rattus rattus*) and the effects of cage enrichment.** *Animal Welfare* 9(2): 139-152. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, abnormal behavior, weaning, age differences, cage size, cages, sex differences, individual characteristics, circadian rhythm, fearfulness, stereotyped behavior, nest boxes.

Cannizzaro, C., M. La Barbera, F. Plescia, R. Contino, G. Santodonato, M. Gagliano, and E. Cannizzaro (2003). **Effects of prenatal acute stress on the behavioural reactivity in handled and non-handled rat progeny.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 660.7.
Online: http://sfn.scholarone.com
Descriptors: rat progeny, acute stress, prenatal, handling, behavior, activity, psychological stimuli, stress exposure, adaptive responses.
Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Caston, J., B. Devulder, F. Jouen, R. Lalonde, N. Delhaye Bouchaud, and J. Mariani (1999). **Role of an enriched environment on the restoration of behavioral deficits in Lurcher mutant mice.** *Developmental Psychobiology* 35(4): 291-303. ISSN: 0012-1630.
Descriptors: behavior, animal physiology, cerebellar diseases pathology, environment, mice, mutant strains physiology, nerve degeneration pathology, maze learning, mice, nerve fibers physiology, synapses physiology.

Castro Chaves, C., A.F. Soares, and R.C. Santiago (1989). **Dietary deprivation of essential fatty acids impairs rat renal function**. *Journal of the American Society of Nephrology* 9: 32A.
Descriptors: rat, renal function, impaired, diet, deprivation, fatty acids.
Notes: Meeting Information: 31st Annual Meeting of the American Society of Nephrology, October 25-28,

1998, Philadelphia, Pennsylvania, USA. Program and Abstract Issue.

Champagne, F.A., D.D. Francis, A. Mar, and M.J. Meaney (2003). **Variations in maternal care in the rat as a mediating influence for the effects of environment on development.** *Physiology and Behavior* 79(3): 359-71. ISSN: 0031-9384.

Abstract: Variations in maternal care have been widely considered as a critical influence in development. In the rat, variations in maternal behavior, particularly in licking/grooming, regulate the development of endocrine, emotional and cognitive responses to stress. These studies form the basis of a potentially useful model for the study of maternal effects in mammals. In this paper we provide a detailed methodological investigation into this model of maternal behavior, providing an analysis of the frequency, temporal dynamics, and transmission of maternal licking/grooming in several large cohorts. Frequency data indicate that licking/grooming is normally distributed across dams. The peak in licking/grooming occurs in the first few days postpartum and gradually declines. Dams designated as High or Low LG mothers differ in this behavior only during the first week postpartum. Observations over Days 2 to 5 postpartum are essential for the reliable assessments of individual differences in maternal behavior. Individual differences in licking/grooming behavior are stable across multiple litters, and are not associated with differences in litter size, weaning weight of pups, or gender ratio of the litter. We also observed no significant differences in the amount of licking/grooming received by individual pups within a litter, though variation does exist. Finally, maternal licking/grooming is transmitted to female offspring, though there is considerable within-litter variation in the expression of this behavior. Overall, these findings indicate considerable, normal variations in licking/grooming in the rat that are a stable, individual characteristic of rat dams.

Descriptors: grooming, individuality, lactation psychology, maternal behavior psychology, phenotype, adaptation, physiological, imprinting psychology, litter size, models, animal, Long Evans rats, sex factors.

Chaouloff, F., O. Berton, S. Aquerre, M. Hay, and P. Mormede (1997). **Effects of food deprivation on midbrain 5-HT1A autoreceptors in Lewis and SHR rats**. *Neuropharmacology* 36(4-5): 483-488.

Descriptors: food deprivation, effects, Lewis rats, SHR rats, midbrain, autoreceptors.

Chignola, R., C. Rizzi, S. Vincenzi, T. Cestari, N. Brutti, A.P. Riviera, S. Sartoris, A.D.B. Peruffo, and G. Andrighetto (2002). **Effects of dietary wheat germ deprivation on the immune system in Wistarrats: a pilot study**. *International Immunopharmacology* 2(10): 1495-1501. ISSN: 1567-5769.

Descriptors: Wistar rats, pilot study, diet, wheat germ deprivation, effects, immune system, bioactive molecules, gastrointestinal tract.

Chwalibog, A., K. Jakobsen, A.H. Tauson, and G. Thorbek (1998). **Heat production and substrate oxidation in rats fed at maintenance level and during fasting**. *Comparative Biochemistry and Physiology, Part A, Molecular and Integrative Physiology* 121a(4): 423-429. ISSN: 1095-6433.

NAL Call Number: QP1.C6

Abstract: A total of 36 Wistar rats were fed a commercial diet to a stipulated live weight of 75 g (Group A), 100 g (Group B) and 225 g (Group C). All rats were measured in energy balance experiments, in which the animals were fed near maintenance level, followed by a period of fasting with measurements of the gas exchange. The rats in Group A, B and C were fasted for 2, 3 and 4 days, respectively. The minimum heat production on the last day of fasting for all groups was proportional to metabolic body weight (kg0.75) with a regression: heat production, kJ day(-1) = 321 x kg0.75 (R2 = 0.994). In rats fed near maintenance level, heat production was provided by oxidation of carbohydrates in 80-85%, oxidation of protein was 10-15%, while oxidation of fat contributed less than 10%. It is suggested that in the fasting period, the contribution to the total heat production from oxidized carbohydrate and fat depended on the size of the fat depots, a large fat depot giving rise to fat oxidation. On the last day of fasting, 24, 51 and 90% of the total heat originated from fat oxidation in Group A, B and C, respectively.

Descriptors: rats, heat, oxidation, underfeeding, diet, chemical reactions, feeding, temperature.

Clark Jr., J.A., P.H. Myers, M.F. Goelz, J.E. Thigpen, and D.B. Forsythe (1997). **Pica behavior associated with buprenorphine administration in the rat.** *Laboratory Animal Science* 47(3): 300-303. ISSN: 0023-6764.

NAL Call Number: 410.9 P94

Abstract: Marked gastric distention was observed in rats 20 h after they underwent partial hepatectomy under isoflurane anesthesia and received buprenorphine (0-3 mg/kg of body weight) after surgery. Hardwood bedding comprised the bulk of the gastric contents. A study was undertaken to determine the cause of the pica behavior (consumption of non-nutritive substances) and resultant gastric distention. Ten-week-old male Sprague Dawley rats were randomly assigned to one of six groups. Group-1 rats (n = 11) underwent laparotomy under isoflurane anesthesia, with buprenorphine (0.03 mg/kg) administered after surgery. Group-2 rats (n = 12) underwent laparotomy under isoflurane anesthesia, with buprenorphine (0.05 mg/kg) administered after surgery. Group-3 rats (n = 24) underwent laparotomy under isoflurane anesthesia, with saline administered after surgery. Isoflurane was administered at the same rate, concentration, and duration for all groups that underwent laparotomy (groups 1 to 3). Buprenorphine or saline was administered subcutaneously as a single injection when anesthesia was discontinued (groups 1 to 3). Group-4 rats (n = 6) received buprenorphine (0.3 mg/kg) only. Group-5 rats (n = 6) received buprenorphine (0.05 mg/kg) only. Group-6 rats (n = 12) received saline only. Rats not undergoing laparotomy (groups 4 to 6) received buprenorphine or saline 18 to 20 h before euthanasia. Rats were housed individually in filter-topped polycarbonate cages containing hardwood bedding. A purified, pelleted diet and water were offered ad libitum. Food and water consumption were measured over the posttreatment period. Eighteen to 20 h after treatment, rats were euthanized, each stomach and its contents were weighed, contents. were examined grossly, and wet and dry gastric content weights were recorded. All weights were significantly ($P < 0.05$) increased in rats receiving buprenorphine administered after surgery (groups 1 and 2), compared with rats of the control group (group 3). Weights of the stomach and contents, wet gastric contents, and dry gastric contents were significantly ($P < 0.05$) increased in rats receiving 0.3 mg of buprenorphine/kg only (group 4), compared with values for their controls (group 6). Hardwood bedding comprised the bulk of the gastric contents in all groups receiving buprenorphine. Stomachs of rats not receiving buprenorphine contained the purified diet with little or no hardwood bedding. These results indicate that a single injection of buprenorphine at a dosage of 0.05 or 0.3 mg/kg resulted in rats ingesting hardwood bedding, leading to gastric distention. It was concluded that pica behavior associated with administration of buprenorphine should be considered when evaluating experimental data from rats housed on contact bedding.
Descriptors: analgesics, opioids, pica, litter, stomach, digesta, rats, hepatectomy, laparotomy, anesthetics, postoperative complications, opioid analgesics, gastric distention, isoflurane.

Clark, M.M., J.M. Vonk, and B.G.J. Galef (1998). **Intrauterine position, parenting, and nest-site attachment in male Mongolian gerbils.** *Developmental Psychobiology* 32(3): 177-81. ISSN: 0012-1630.
Abstract: We housed male Mongolian gerbils, their mates, and foster litters of standardized size and sex ratio in enclosures that provided cover in two locations. Males had been gestated in known intrauterine positions: either between two females (2F males) or between two males (2M males). From Days 1 to 20 postpartum, we examined the frequency with which both males and females were in contact with the pups they were rearing. We found that 2F males spent more time with pups than did 2M males both during entire observation periods and when females were away from the nest. Further, when pups were moved from the nest site. 2M males spent more time than did 2F males in the vacated nest site. We concluded that 2F male gerbils spent more time with pups than 2M males not because of a greater attachment of 2F than 2M males to places of concealment, their male, or their nest site. Rather, 2F males were more attracted to pups than were 2M males.
Descriptors: Gerbillinae growth and development, nesting behavior physiology, object attachment, paternal behavior, prenatal exposure delayed effects, analysis of variance, Gerbillinae psychology, nuclear family, observation, sex factors.

Crawley, J.N. (2003). **Behavioral phenotyping of rodents.** *Comparative Medicine* 53(2): 140-146. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: Established methods for analyzing behavioral traits in mutant lines of mice allow researchers to understand the outcomes of genetic manipulations in the nervous system. A rigorous six-tiered behavioral phenotyping strategy is described. Recommendations are offered for the design of mouse behavioral testing suites in animal housing facilities.
Descriptors: mice, laboratory animals, animal behavior, phenotype, phenotypic variation, transgenic animals, knockout mutants, fearfulness, avoidance conditioning, conditioned behavior, neurophysiology, statistical analysis, experimental design, working conditions, research facilities.

Crawley, J.N. (1999). **Behavioral phenotyping of transgenic and knockout mice: experimental design and evaluation of general health, sensory functions, motor abilities, and specific behavioral tests.** *Brain Research* 835(1): 18-26. ISSN: 0006-8993.
Descriptors: behavior, animal physiology, knockout mice physiology, transgenic mice physiology, psychomotor performance physiology, sensation genetics, sensation physiology, health, knockout mice genetics, transgenic mice genetics, phenotype, research design.

Cunningham, J.T., M.L. Penny, T. Fleming, and L.L. Ji (2004). **The effects of water deprivation and rehydration on cFos and FosB in the rat forebrain**. *FASEB Journal* 18: 4-5 (Abst. 207.10). ISSN: 0892-6638.
Online: http://www.fasebj.org/
Descriptors: rat, forebrain, water deprivation, rehydration, effect, cFos, FosB, plasma osmoality, specific gravity.
Notes: Meeting Information: FASEB Meeting on Experimental Biology: Translating the Genome, April 17-21, 2004, Washington, D.C., USA.

D'Amato, F.R., R. Rizzi, and A. Moles (2001). **A model of social stress in dominant mice: effects on sociosexual behaviour.** *Physiology and Behavior* 73(3): 421-6. ISSN: 0031-9384.
Abstract: The possibility of socially stressing the dominant/aggressive member of a pair of male mice is tested. Male mice (NMRI outbreed strain) were housed in pairs to assess dominant and subordinate roles by agonistic interactions and urine-marking test. Social stress for dominant males consisted in 30 min/day of exposure to their subordinate partner interacting with a female in the adjacent compartment of the cage, for 9 days. Results showed that dominance status was maintained. Behavioural observations indicated that neither the subordinates nor the dominant males habituated to this experimental procedure. At the end of the chronic stress, dominant animals were given the opportunity to interact for 30 min with a female in their compartment. Results indicated that stressed dominants showed impairment in their sexual behaviour and were more oriented towards the physical environment in comparison with control dominants. The behavioural response to apomorphine (0.25 mg/kg) indicated an alteration of the dopaminergic functioning in socially stressed dominant mice. This study suggests that the characteristics of the stressor and the effects of the chronic social stress could be different, according to male social status.
Descriptors: sex behavior, animal physiology, social behavior, social environment, stress, psychological psychology, apomorphine pharmacology, dopamine agonists pharmacology, mice, models, psychological, social dominance.

D'Arbe, M., R. Einstein, and N.A. Lavidis (2002). **Stressful animal housing conditions and their potential effect on sympathetic neurotransmission in mice.** *American Journal of Physiology Regulatory, Integrative and Comparative Physiology* 282(5): R1422-8. ISSN: 0363-6119.
Abstract: Although the sympathetic nervous system (SNS) plays a major role in mediating the peripheral stress response, due consideration is not usually given to the effects of prolonged stress on the SNS. The present study examined changes in neurotransmission in the SNS after exposure of mice (BALB/c) to stressful housing conditions. Focal extracellular recording of excitatory junction currents (EJCs) was used as a relative measure of neurotransmitter release from different regions of large surface areas of the mouse vas deferens. Mice were either group housed (control), isolation housed (social deprivation), group housed in a room containing rats (rat odor stress), or isolation housed in a room containing rats (concurrent stress). Social deprivation and concurrent stressors induced an increase of 30 and 335% in EJC amplitude, respectively. The success rate of recording EJCs from sets of varicosities in the concurrent stressor group was greater compared with all other groups. The present study has shown that some common animal housing conditions act as stressors and induce significant changes in sympathetic neurotransmission.
Descriptors: mice, housing conditions, stress, potential effect, sympathetic nervous system, group housed, isolation housed.

Davis, J.A. (1999-2000). **The triple A approach to ensuring animal welfare.** *Animal Welfare Information Center Bulletin* 10(3-4): 1-2, 20-22. ISSN: 1522-7553.
Online: http://www.nal.usda.gov/awic/newsletters/v10n3/10n3davi.htm
NAL Call Number: aHV4701.A952

Descriptors: laboratory animals, mice, animal welfare, pain, mental stress, clinical aspects, disease course, weight losses, body weight, euthanasia, clinical examination, gait, body temperature, experimental design, animal handling, endpoints, animal use refinement.

Day, D.E., E.M. Mintz, and T.J. Bartness (1999). **Diet self-selection and food hoarding after food deprivation by Siberian hamsters**. *Physiology and Behavior* 68(1-2): 187-194. ISSN: 0031-9384.
Descriptors: diet, self selection, food hoarding, food deprivation, hamsters.

De Wilde, M.C., E. Hogyes, A.J. Kiliaan, T. Farkas, P.G. Luiten, and E. Farkas (2003). **Dietary fatty acids alter blood pressure, behavior and brain membrane composition of hypertensive rats**. *Brain Research* 988(1-2): 9-19. ISSN: 0006-8993.
Abstract: The beneficial effect of dietary n-3 polyunsaturated fatty acids (PUFAs) on developing hypertension has been repeatedly demonstrated. However, related changes in brain membrane composition and its cognitive correlates have remained unclear. Our study aimed at a comprehensive analysis of behavior and cerebral fatty acid concentration in hypertension after long-term PUFA-rich dietary treatment. Hypertensive and normotensive rats were provided a placebo, or one of two PUFA-enriched diets with a reduced (n-6) /(n-3) ratio for 75 weeks. Exploratory behavior and spatial learning capacity were tested. Systolic blood pressure (BP) was repeatedly measured. Finally, brain fatty acid composition was analyzed by gas chromatography. Hypertensive rats exhibited more active exploration but impaired spatial learning compared to normotensives. Both diets reduced BP, increased PUFA and monounsaturated fatty acid (MUFA) concentration, and reduced saturated fatty acid content in brain. The level of cerebral PUFAs and MUFAs was lower in hypertensive than in normotensive rats. Furthermore, BP positively, while spatial learning negatively correlated with cerebral (n-6)/(n-3) PUFA ratio. We concluded that regular n-3 PUFA consumption could prevent the development of hypertension, but reached only a very delicate improvement in spatial learning. Furthermore, we consider a potential role of metabolically generated MUFAs in the beneficial effects of PUFA supplementation.
Descriptors: rats, hypertensive, dietary fatty acids, blood pressure, behavior, brain membrane composition.

Della, Z.O., M. Boulanger, O. Broux, E. Douillet, B. Husson, and J. Duhault (1998). **NPY and NPY analogues on the feeding behavior and body weight in rodents**. *International Journal of Obesity* 22(Supplement 3): S125. ISSN: 0307-0565.
Descriptors: NPY, NPY analogues, feeding behavior, body weight, rodents.
Notes: Meeting Information: Eighth International Congress on Obesity, August 29-September 3, 1998, Paris, France.

Dennis Jr., M.B. (2002). **Welfare issues of genetically modified animals.** *ILAR Journal* 43(2): 100-109. ISSN: 1084-2020.
NAL Call Number: QL55.A1I43
Descriptors: mice, laboratory animals, transgenic animals, animal models, animal welfare, morbidity, mortality, genetic engineering, animal use alternatives, phenotype, animal use refinement, animal use reduction, Institutional Animal Care and Use Committee, committees.

Dobson, M., R.L. Goldingay, and D.J. Sharpe (2005). **Feeding behaviour of the squirrel glider in remnant habitat in Brisbane**. *Australian Mammalogy* 27(1): 27-35. ISSN: 0310-0049.
Abstract: The diet of the squirrel glider (*Petaurus norfolcensis*) was studied in a 45 ha forest remnant within an urban area close to Brisbane in south-east Queensland. Qualitative observations of feeding behaviour were conducted during each of 10 months between May 2002 and April 2003, on over 27 P. norfolcensis from at least 10 social groups. Four different feeding behaviours were recorded from 750 observations. Feeding from flowers accounted for 48% of the diet. Nectar and pollen were derived from 10 overstorey tree species, though forest red gum (*Eucalyptus tereticornis*) dominated because of its high abundance and protracted flowering period. Honeydew and lerp feeding accounted for 15% and 2% of all observations, respectively. Searching for arthropods accounted for 35% overall and occurred in 20 different tree species, where a range of substrates was used. Brushbox (*Lophostemon confertus*) was the most important; it was used in all seasons and accounted for 49% of these observations. These results contrast with assessment of the diet of *P. norfolcensis* at other sites where a greater range of broad food types was used. This may reflect the disturbed quality of the habitat at our

site. However, these observations confirm the importance of eucalypt nectar in the diet of this species.
Descriptors: behavior, foods, ecology, environmental sciences, diet, habitat, feeding behavior.

Dock, D.B., M.Q. Latorraca, J.E. Aguilar Nascimento, and M.H.G. Gomes da Silva (2004). **Probiotics enhance recovery from malnutrition and lessen colonic mucosal atrophy after short-term fasting in rats.** *Nutrition* 20(5): 473-476. ISSN: 0899-9007.
Descriptors: rats, short term fasting, mucosal atrophy, malnutrition, probiotics, recovery.

Donald, J.A., B. Davis, K.L. Minerds, and T. Toop (1999). **The effect of total water deprivation on the natriuretic peptide system of the hopping mouse, *Notomys alexis***. *Comparative Biochemistry and Physiology, Part A, Molecular and Integrative Physiology* 124(Supplement): S90. ISSN: 1095-6433.
NAL Call Number: QP1.C6
Descriptors: total water deprivation, hopping mouse, effect, natiuretic peptide system.
Notes: Meeting Information: Fifth International Congress of Comparative Physiology and Biochemistry, August 23-28, 1999, Calgary, Alberta, Canada.

Dou, Y., S. Gregersen, J. Zhao, F. Zhuang, and H. Gregersen (2002). **Morphometric and biomechanical intestinal remodeling induced by fasting in rats.** *Digestive Diseases and Sciences* 47(5): 1158-1168. ISSN: 0163-2116.
Descriptors: rats, fasting, intestinal remodeling, small intestine, nutrition, functional changes, smooth muscle, muscle layers.

Duelli, R., M.H. Maurer, S. Heiland, V. Elste, and W. Kuschinsky (1999). **Brain water content, glucose transporter densities and glucose utilization after 3 days of water deprivation in the rat**. *NeuroScience Letters* 271(1): 13-16. ISSN: 0304-3940.
Descriptors: brain, water deprivation, rat, water content, glucose transporter, utilization.

Duke, J.L., T.G. Zammit, and D.M. Lawson (2001). **The effects of routine cage-changing on cardiovascular and behavioral parameters in male Sprague-Dawley rats.** *Contemporary Topics in Laboratory Animal Science* 40(1): 17-20. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory mammals, animal husbandry, cleaning, blood pressure, heart rate, telemetry, data collection, physical activity, animal behavior, duration, frequency, fearfulness, stress, arousal behavior.

Dumas, J.F., D. Roussel, G. Simard, O. Douay, F. Foussard, Y. Malthiery, and P. Ritz (2004). **Food restriction affects energy metabolism in rat liver mitochondria.** *Biochimica Et Biophysica Acta* 1670(2): 126-131. ISSN: 0304-4165.
NAL Call Number: 381 B522[G]
Abstract: To examine the effect of 50% food restriction over a period of 3 days on mitochondrial energy metabolism, liver mitochondria were isolated from ad libitum and food-restricted rats. Mitochondrial enzyme activities and oxygen consumption were assessed spectrophotometrically and polarographically. With regard to body weight loss (-5%), food restriction decreased the liver to body mass ratio by 7%. Moreover, in food-restricted rats, liver mitochondria displayed diminished state 3 (-30%), state 4-oligomycin (-26%) and uncoupled state (-24%) respiration rates in the presence of succinate. Furthermore, "top-down" elasticity showed that these decreases were due to an inactivation of reactions involved in substrate oxidation. Therefore, it appears that rats not only adapt to food restriction through simple passive mechanisms, such as liver mass loss, but also through decreased mitochondrial energetic metabolism.
Descriptors: energy metabolism, oxidative phosphorylation, electron transport chain, dietary restriction, restricted feeding, calorie restrictions, energy restrictions.

Dunel Erb, S., C. Chevalier, P. Laurent, A. Bach, F. Decrock, and Y. Le Maho (2001). **Restoration of the jejunal mucosa in rats refed after prolonged fasting.** *Comparative Biochemistry and Physiology, Part A, Molecular & Integrative Physiology* 129A(4): 933-947. ISSN: 1095-6433.
NAL Call Number: QP1.C6
Abstract: To investigate the importance of body fuel depletion on gut rehabilitation after food deprivation, we

compared the kinetics of jejunal mucosa alteration and restoration in rats that were refed after reaching different stages in body fuel depletion. Rats (P2) were refed while still in the so-called phase II, where body protein utilization is minimized, whereas rats (P3) were refed when they had reached the stage of increasing protein utilization (phase III). There was a significant decrease in total mass of intestine (P2, -30%; P3, -40%) and jejunal mucosa (P2, -52%; P3, -60%), as well in the size of the crypts (P2, -15%; P3, -36%) and villi (P2, -37%; P3, -55%). Structural changes of the mucosa included disappearance of some villi and a reduction in the size and number of crypts. Despite the larger morphological alterations in P3, the restoration of mucosa was as fast and complete after only 3 days of refeeding for both P2 and P3 rats. The respective roles of the mitosis pressure and of the lamina propria dynamics were studied. The rapid reversibility of the gut mucosal alterations due to fasting might constitute an integrative process.

Descriptors: rats, refeeding, jejunum, intestinal mucosa, morphology, morphometrics, fasting.

El Fazaa, S., N. Gharbi, A. Kamoun, and L. Somody (1999). **Effet du jeune aigu et chronique sur l' activite de l' axe hypophyso-corticosurrenalien chez le rat. [Effects of acute and chronic starvation on pituitary-adrenal axis activity in rat].** *Medecine Et Nutrition* 35(6): 237-244. ISSN: 0398-7604.

Abstract: Le travail a consiste a comparer chez le rat male les effets d' une denutrition aigue (3 jours de jeune) et d' une denutrition chronique ou intermittente (3 jours de jeune sur 4, durant 4 cycles consecutifs) sur l' evolution de la glycemie et sur l' activite de l' axe hypophyso-corticosurrenalien. La denutrition aigue entraine une diminution notable du poids corporel qui devient plus importante au cours de la denutrition chronique. L' activation de l' axe hypophyso-corticosurrenalien, apres 3 jours de jeune, montre que celui-ci constitue un stress et serait l' image d' une agression classique. L' absence de reponse hypophysaire, malgre l' activation corticosurrenalienne, temoigne d' une dissociation entre ces deux systemes, qui s' installe lorsque la denutrition se prolonge. Les taux eleves de glucocorticoides visent egalement a ajuster la concentration sanguine de glucose aux besoins de l' organisme.

Descriptors: rats, laboratory animals, underfeeding, blood sugar, physiological regulation, pituitary gland, adrenal glands, glucocorticoids, adrenal cortex hormones, animal glands, blood, blood composition, body parts, corticoids, endocrine glands, feeding, hormones, mammals, physiological functions, Rodentia, useful animals.

Language of Text: French with an English summary.

El Fazaa, S., L. Somody, N. Gharbi, A. Kamoun, C. Gharib, and G. Gauquelin Koch (1999). **Effects of acute and chronic starvation on central and peripheral noradrenaline turnover, blood pressure and heart rate in the rat**. *Experimental Physiology* 84(2): 357-368. ISSN: 0958-0670.

Descriptors: rat, starvation, acute, chronic, effects, blood pressure, heart rate, noradrenaline turnover.

Ely, D.R., V. Dapper, J. Marasca, J.B. Correa, G.D. Gamaro, M.H. Xavier, M.B. Michalowski, D. Catelli, R. Rosat, M.B.C. Ferreira, and C. Dalmaz (1997). **Effect of restraint stress on feeding behavior of rats**. *Physiology and Behavior* 61(3): 395-398. ISSN: 0031-9384.

Descriptors: rats, feeding behavior, restraint stress, effect.

Emond, M., S. Faubert, and M. Perkins (2003). **Social conflict reduction program for male mice.** *Contemporary Topics in Laboratory Animal Science* 42(5): 24-6. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Abstract: Aggression within caged groups of unfamiliar male mice can be a serious welfare problem for maintaining mice in the laboratory. At our Center, two observation periods were set aside daily in order to identify, according to previously described behaviors, dominant mice and separate these when indicated. By reducing or eliminating the number of aggressive acts between group members in the same cage, our social conflict reduction program has led to a 57% reduction of mice being reported for clinical signs, death, and euthanasia. Welfare concerns seemed to be addressed. Therefore the program we implemented to reduce social conflict was effective in decreasing injuries and loss due to fighting. Minimizing aggression will have the additional benefit of reducing the confounding effect of stress on an animal's performance in experimental situations. This simple yet humane program can be applied easily to other animal facilities where male Crl:CD-1 mice (and possibly other stocks or strains) are used and fighting is a concern.

Descriptors: aggression psychology, conflict psychology, housing, animal, sex behavior, animal, animal welfare, hostility, mice, inbred mice strains, social dominance.

Escobar, C., M. Diaz Munoz, F. Encinas, and R. Aguilar Roblero (1998). **Persistence of metabolic rhythmicity during fasting and its entrainment by restricted feeding schedules in rats**. *American Journal of Physiology* 274(5, Part 2): R1309-R1316. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: biological rhythms, metabolism, rats, mammals, Rodentia, food entrainable oscillators, circadian rhythm.

Fano, E., J.R. Sanchez Martin, A. Arregi, B. Castro, A. Alonso, P. Brain, and A. Azpiroz (2001). **Social stress paradigms in male mice: Variations in behavior, stress and immunology.** *Physiology and Behavior* 73(1-2): 165-73. ISSN: 0031-9384.
Abstract: Male OF1 strain mice were allocated, after 2 weeks of individual housing, to cohabitating (6 or 16 days), fixed dyadic interaction pairs (6 or 16 daily encounters) or control groups (6 or 16 days). These different social stress situations were assessed for their effects on splenic contents of NE, IL-1 and IL-2 and serum levels of corticosterone. Spleen NE contents showed no significant variations, but serum corticosterone titers were generally higher in interacting pairs and subordinates. Splenic IL-2 did not respond in the same way to the treatments as IL-1. The differences in splenic interleukin contents could not be simply related to observed changes in serum corticosterone levels. Different mechanisms appear to regulate changes in glucocorticoids and the measured cytokines. These physiological phenomena do not simply reflect in the animal's social status (dominant or submissive). The intensity and duration of the agonistic behavior displayed as well as the interaction experience accumulated may account for the observed differences between the paradigms.
Descriptors: arousal physiology, corticosterone blood, dominance subordination, interleukin 1 blood, interleukin 2 blood, norepinephrine blood, social environment, agonistic behavior physiology, immune tolerance physiology, mice, inbred mice strains, spleen immunology.

Farnum, C.E., A.O. Lee, K. O'Hara, and N.J. Wilsman (2003). **Effect of short-term fasting on bone elongation rates: an analysis of catch-up growth in young male rats.** *Pediatric Research* 53(1): 33-41. ISSN: 0031-3998.
Descriptors: rats, young male, short term fasting, effect, bone elongation rate, growth, nutritional stunting, postnatal.

Fehr, M. (2002). **Nyulak, tengerimalacok, kisragcsalok es hullok allatvedelmi kovetelmenyeknek megfelelo eutanaziaja. [Euthanasia of rabbits, guineapigs, rodents and reptiles, respecting animal welfare requirements].** *Magyar Allatorvosok Lapja* 124(5): 307-311. ISSN: 0025-004X.
Descriptors: animal welfare, euthanasia, guinea pigs, mice, rabbits, rats, reptiles.
Language of Text: Hungarian.

Fitzgerald, S.M., J.E. Hall, and M.W. Brands (2001). **Rapid hypotensive response to fasting in spontaneously hypertensive rats.** *American Journal of Hypertension* 14(11, Part 1): 1123-1127. ISSN: 0895-7061.
Descriptors: rats, hypertensive, fasting, response, renal function, arterial pressure, sodium intake, changes.

Francis, D.D., L.J. Young, and T.R. Insel (2002). **Do variations in parental care alter social behavior in adult prairie vole offspring?** *Developmental Psychobiology* 41(1): 77. ISSN: 0012-1630.
Descriptors: prairie vole, offspring, social behavior, parental care, variations, adult.
Notes: Meeting Information: 33rd Annual Meeting of the International Society for Developmental Psychobiology, November 01-04, 2000, New Orleans, LA, USA.

Francis, R.J. (2002). **Assessing the welfare of genetically modified mice**. *Animal Technology and Welfare* 1(1): 19-21. ISSN: 0264-4754.
NAL Call Number: SF757.A62
Descriptors: modified mice, welfare, genetically modified, adverse effects, DNA, transgenic.
Language of Text: French, Spanish and Italian summaries.

Francolin Silva, A.L. and S.S. Almeida (2004). **The interaction of housing condition and acute immobilization stress on the elevated plus-maze behaviors of protein-malnourished rats**. *Brazilian Journal of Medical and Biological Research* 37(7): 1035-1042. ISSN: 0100-879X.

Abstract: Protein malnutrition induces structural, neurochemical and functional alterations in the central nervous system, leading to behavioral alterations. In the present study, we used the elevated plus-maze (EPM) as a measure of anxiety to evaluate the interaction between acute immobilization and housing conditions on the behavior of malnourished rats. Pups (6 males and 2 females) were fed by Wistar lactating dams receiving a 6% (undernourished) or 16% (well-nourished) protein diet. After weaning, the animals continued to receive the same diets ad libitum until 49 days of age when they started to receive a regular lab chow diet. From weaning to the end of the tests on day 70, the animals were housed under two different conditions, i.e., individual or in groups of three. On the 69th day, half of the animals were submitted to immobilization for 2 h, while the other half were undisturbed, and both groups were tested 24 h later for 5 min in the EPM. Independent of other factors, protein malnutrition increased, while immobilization and social isolation per se decreased, EPM exploration. Analysis of the interaction of diet vs immobilization vs housing conditions showed that the increased EPM exploration presented by the malnourished group was reversed by acute immobilization in animals reared in groups but not in animals reared individually. The interaction between immobilization and housing conditions suggests that living for a long time in social isolation is sufficiently stressful to reduce the responses to another anxiogenic procedure (immobilization), while living in groups prompts the animals to react to acute stress. Thus, it is suggested that housing condition can modulate the effects of an anxiogenic procedure on behavioral responses of malnourished rats in the EPM.
Descriptors: rats, protein malnourished, housing condition, interaction, stress, behavior, diet, immobilization.

Freed, D.E. and L. Green (1998). **A behavioral economic analysis of fat appetite in rats**. *Appetite* 31(3): 333-349. ISSN: 0195-6663.
NAL Call Number: QP141.A1A64
Descriptors: rats, appetite, fats, energy, nutrient intake, feeding preferences, feeding habits, behavior, mammals, nutrition physiology, physiological functions, Rodentia, energy intake.

Frynta, D. and J. Cihakova (1996). **Neutral cage interactions in *Mus macedonicus* (Rodentia: Muridae): an aggressive mouse?** *Acta Societatis Zoologicae Bohemicae* 60(2-3): 97-102. ISSN: 1211-376X.
Descriptors: *Mus macedonicus*, agonistic behavior, captive born and wild individuals, captive observations.

Frystyk, J., P.J.D. Delhanty, C. Skjaerbaek, and R.C. Baxter (1999). **Changes in the circulating IGF system during short-term fasting and refeeding in rats.** *American Journal of Physiology* 277(2): E245-E252. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: rats, short term fasting, refeeding, circulating IGF, changes, serum, RNA, insulin, hepatic synthesis.

Fukuroda, T., A. Ishihara, A. Kanatani, T. Tanaka, M. Hidaka, T. Fukami, A. Ogiwara, and M. Ihara (1998). **Effects of the neuropeptide y (NPY) y1 receptor antagonist 1229u91 on feeding behavior in rats**. *International Journal of Obesity* 22(Supplement 3): S125. ISSN: 0307-0565.
Descriptors: feeding, behavior, rats, neuropeptide, receptor antagonist, NPY, effects, 1229u91.
Notes: Meeting Information: Eighth International Congress on Obesity, August 29-September 3, 1998, Paris, France.

Funk, D. and S. Amir (1999). **Conditioned fear attenuates light-induced suppression of melatonin release in rats**. *Physiology and Behavior* 67(4): 623-626. ISSN: 0031-9384.
Descriptors: rats, conditioned fear, attenuates, light induced suppression, melatonin release.

Galef, B.G. (2002). **Social influences on food choices of Norway rats and mate choices of Japanese quail.** *Appetite* 39(2): 179-180. ISSN: 0195-6663.
NAL Call Number: QP141.A1A64
Descriptors: rats, Japanese quails, animal models, food choices, social environment, learning, nutrient intake, cost benefit analysis, feeding behavior.

Galef Jr., B.G. and E.E. Whiskin (1998). **Limits on social influence on food choices of Norway rats**. *Animal*

Behaviour 56(4): 1015-1020. ISSN: 0003-3472.
NAL Call Number: 410 B77
Descriptors: feeding preferences, rats, spices, palatability, diet, experimentation, sugar, cocoa beans, feeding habits, social behavior, behavior, flavorings, mammals, organoleptic properties, plant products, processed plant products, processed products, quality, Rodentia.

Galsworthy, M.J., I. Amrein, P.A. Kuptsov, I.I. Poletaeva, P. Zinn, A. Rau, A. Vyssotski, and H.P. Lipp (2005). **A comparison of wild-caught wood mice and bank voles in the Intellicage: assessing exploration, daily activity patterns and place learning paradigms.** *Behavioural Brain Research* 157(2): 211-217. ISSN: 0166-4328.
Abstract: Our previous work has revealed very high baseline neurogenesis in the dentate gyrus of wood mice as compared particularly to bank voles; a difference which may be related to learning capacity. This study explored whether the newly-developed Intellicage system could be used to compare these species in simple spatial learning paradigms. The Intellicage is essentially a group-housing cage that also allows continuous automatic recording of each individual's behaviour. Seven wild-caught bank voles (*Clethrionomys glareolus*) were compared with seven wild-caught long-tailed wood mice (*Apodemus sylvaticus*) in the Intellicage system over 9 days. During the first 90 min after entering the cage, the wood mice were substantially more exploratory than the bank voles (P = 0.003). Over subsequent days, both species showed nocturnal activity increases with voles being 3.7 times more active overall. In the spatial learning paradigms, there were significant species-by-time interactions with wood mice outperforming bank voles on both place learning (P = 0.027) and subsequent reversal (P = 0.006). Conclusions are firstly that the wood mice show superior learning abilities in this paradigm, and secondly that the Intellicage serves as a valuable cognitive testing arena for small wild rodents, or for circumstances where cognition must be compared independent of different responses to handling or novel environments.
Descriptors: wood mice, bank voles, exploration, wild caught, activity patterns, learning, Intellicage.

Garey, J., L. Kow, W. Huynh, S. Ogawa, and D.W. Pfaff (2002). **Temporal and spatial quantitation of nesting and mating behaviors among mice housed in a semi-natural environment**. *Hormones and Behavior* 42(3): 294-306. ISSN: 0018-506X.
Descriptors: mice, nesting, mating, behavior, environment, natural, social interactions.

Gariepy, J.L., D. Nehrenberg, and K.R. Mills (2001). **Maternal care and separation stress in high- and low-aggressive mice**. *Developmental Psychobiology* 38(3): 203. ISSN: 0012-1630.
Descriptors: mice, maternal care, separation stress, high aggressive, low aggressive.
Notes: Meeting Information: 33rd Annual Meeting of the International Society for Developmental Psychobiology, November 01-04, 2000, New Orleans, Louisiana, USA.

Gariepy, J.L., R.M. Rodriguiz, and B.C. Jones (2002). **Handling, genetic and housing effects on the mouse stress system, dopamine function, and behavior.** *Pharmacology, Biochemistry and Behavior* 73(1): 7-17. ISSN: 0091-3057.
Abstract: This research was designed to examine how early stimulation (i.e., handling), subsequent housing conditions and genetic factors interact to produce adult differences in stress regulation. High-aggressive (NC900) and low-aggressive (NC100) mice were handled for 3 weeks potspartum and were subsequently isolated or grouped until observed as adults in an open field or a dyadic test. In NC100, handling abolished the temporal variations seen in open-field activity among the nonhandled subjects and reduced corticosterone (CORT) activation. In NC900, these two measures were unaffected by handling. Only among handled NC100 did subsequent group rearing further reduce CORT activation. By contrast, handling caused an up-regulation of D1 dopamine receptors in both lines, and, in NC100, this effect was increased by group rearing. In a dyadic encounter with another male mouse, subjects of both lines showed handling effects. NC100 froze less rapidly and NC900 attacked more rapidly. This multifactorial design showed that the systemic effects of handling are modulated by genetic background, and that measures of these effects are affected by experience beyond infancy. Our findings also showed that the effects of handling vary when assessed across different physiological systems and across social and nonsocial testing conditions.
Descriptors: behavior, animal physiology, handling psychology, animal housing, interpersonal relations,

receptors, dopamine D1 metabolism, stress blood, brain metabolism, corticosterone blood, corticosterone genetics, mice, receptors, dopamine D1 genetics, species specificity, stress genetics, mouse, stress system, handling, genetic, effects, dopamine function, early stimulation.

Garner, J.P., B. Dufour, L.E. Gregg, S.M. Weisker, and J.A. Mench (2004). **Social and husbandry factors affecting the prevalence and severity of barbering ('whisker trimming') by laboratory mice**. *Applied Animal Behaviour Science* 89(3-4): 263-282. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: mice, social factors, husbandry factors, animal behavior, barbering, severity, prevalence, animal welfare.

Gattermann, R., R. Weinandy, and P. Fritzsche (2004). **Running-wheel activity and body composition in golden hamsters (*Mesocricetus auratus*).** *Physiology and Behavior* 82(2-3): 541-4. ISSN: 0031-9384.
Abstract: Running wheels are frequently used in behavioural and physiological experiments. The function of wheel-running activity in laboratory animals is controversial. In the present long-term study, the influence of this activity was evaluated in male golden hamsters over a period of 52 weeks. Four months after the start of the experiment, hamsters with access to running wheels were significantly heavier than those without these wheels. In addition, food consumption nearly doubled. The absolute values of fat-free mass (FFM), total body water (TBW) and crude fat mass (CFM) increased. However, in contrast to these absolute differences, the relative values were never different and general body composition was therefore unaffected by running-wheel activity. Different organ masses were established for absolute values of kidneys, testes and epididymis; possible effects on reproduction are discussed. The present data indicating improved physical condition leads to the assumption that a running wheel is a useful enrichment, enhancing animal welfare in the golden hamster.
Descriptors: body composition physiology, motor activity physiology, physical conditioning, animal physiology, animal welfare, body weights and measures, hamsters, housing, animal, *Mesocricetus*, random allocation.

Georgsson, L., J. Barrett, and D. Gietzen (2001). **The effects of group-housing and relative weight on feeding behaviour in rats**. *Scandinavian Journal of Laboratory Animal Science* 28(4): 201-209. ISSN: 0901-3393.
Descriptors: rats, group housing, weight, feeding behavior, effect.
Language of Text: Swedish summary.

Ghelardini, C., N. Galeotti, A.P. Vettori, S. Capaccioli, A. Quattrone, and A. Barolini (1997). **Effect of K+ channel modulation on mouse feeding behaviour**. *European Journal of Pharmacology* 329(1): 1-8. ISSN: 0014-2999.
Descriptors: feeding behavior, K+ channel modulation, effect, mouse.

Giacomelli, F.R.B. and M.R.M. Natali (1999). **A utilizacao de ratos em modelos experimentais de carencias nutricionais. [The use of rats in experimental models of deprivation nutrition].** *Arquivos De Ciencias Da Saude Da UNIPAR* 3(3): 239-249. ISSN: 1415-076x.
Descriptors: rats, model, food deprivation, nutrition, diet, protein level, organs, effects, cellular turnover.
Language of Text: Portuguese with an English summary.

Godsil, B.P. and M.S. Fanselow (2001). **Learned and unlearned fear reactions to bright light in the rat**. *Society for Neuroscience Abstracts* 27(1): 1400. ISSN: 0190-5295.
Descriptors: rat, bright light, fear reactions, learned, unlearned, defensive, freezing, dark, sensory damage, reactions.
Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Goecke, J., H. Awad, J.C. Lawson, and G. Boivin (2005). **Evaluating postoperative analgesics in mice using telemetry.** *Comparative Medicine* 55(1): 37-44. ISSN: 1532-0820.
NAL Call Number: SF77.C65
Abstract: The study examined the efficacy of preemptive or postoperative analgesia on surgical pain in the mouse. Radiotelemetry transmitters were surgically implanted in 28 female ICR mice. A mock ova implantation

surgery was then performed. Mice were treated with a single dose of buprenorphine or flunixin meglumine prior to or after surgery, three doses of buprenorphine, or were untreated. Heart rate, blood pressure, home cage activity, food and water consumption, and body weight were measured. The no-analgesia group showed no significant differences between any parameters collected prior to surgery and those collected at similar times during the day of surgery. Significant increases in mouse activity on the day of surgery occurred with all analgesic treatments, compared with pre-surgical activity. There were no consistent significant changes in any other telemetry parameter after treatment with analgesics compared with no analgesia. Food consumption and body weight the day after surgery were reduced significantly in the animals treated with three doses of buprenorphine compared with untreated mice and mice given a single dose of buprenorphine. We conclude that the mock ova implant procedure does not induce sufficient pain to cause alterations in heart rate and blood pressure in the mouse. Activity was significantly reduced in the first 6 h after surgery in mice without analgesia, compared with activity prior to surgery. There were no significant differences between pre-emptive and postoperative analgesia. Body weight and food and water consumption were poor measures of pain because analgesia alone affected these parameters.

Descriptors: postoperative analgesics, evaluating, mice, telemetry, radiotelemetry, heart rate, blood pressure, pain.

Gordon, C.J., P. Becker, P. Killough, and B. Padnos (2000). **Behavioral determination of the preferred foot pad temperature of the mouse**. *Journal of Thermal Biology* 25(3): 211-219. ISSN: 0306-4565.

NAL Call Number: QP82.2.T4J6

Descriptors: mouse, foot pad, preferred temperature, behavioral determination.

Gutierrez, A.C. and E.A. Keller (1997). **Analgesic response to stress is reduced in perinatally undernourished rats**. *Journal of Nutrition* 127(5): 765-769. ISSN: 0022-3166.

NAL Call Number: 389.8 J82

Abstract: Stress-induced analgesia was evaluated in adult rats submitted early in life to a protein deprivation schedule. Rats were undernourished with a hypoproteic diet containing 80 g casein/kg diet from d 14 of gestation until 50 days of age. Rats were thereafter fed a balanced nonpurified diet until 140 days of age, when they were exposed to two stressors: forced swimming and acute restraint, after which the analgesic response was evaluated. In addition, the analgesic response induced by different morphine doses was determined in another group of rats. Basal latency was not different in deprived and control rats. Undernourished rats presented a significantly lower analgesic response in both stress situations. However, when the analgesic response induced by different morphine doses (1, 2, 4 and 8 mg/kg, s.c.) was assessed, a significantly higher response occurred in undernourished rats compared to control rats. This lower stress-induced analgesia in undernourished rats may account for the behavioral alterations attributed to early undernutrition.

Descriptors: malnutrition, puerperium, stress, pain, protein deficiencies, dosage effects, morphine, rats, animal models, young animals, alkaloids, animal developmental stages, developmental stages, mammals, nutrient deficiencies, Rodentia, undernutrition, swimming, restraint.

Habold, C., C. Chevalier, S. Dunel Erb, C. Foltzer Jourdainne, Y.l. Maho, and J.H. Lignot (2004). **Effects of fasting and refeeding on jejunal morphology and cellular activity in rats in relation to depletion of body stores.** *Scandinavian Journal of Gastroenterology* 39(6): 531-539. ISSN: 0036-5521.

Descriptors: rats, fasting, refeeding, effects, jejunal morphology, cellular activity, body stores, intestinal mucosa, fat stores, starvation.

Han, E.S., T.R. Evans, S. Lee, and J.F. Nelson (2001). **Food restriction differentially affects pituitary hormone mRNAs throughout the adult life span of male F344 rats.** *Journal of Nutrition* 131(6): 1687-1693. ISSN: 0022-3166.

NAL Call Number: 389.8 J82

Abstract: Because neuroendocrine mechanisms may contribute to the antiaging effects of food restriction (FR), we measured the effect of FR on mRNAs encoding anterior pituitary (AP) tropic hormones. Slot blots or RNase protection assays were done on AP RNA from 3-, 6-, 12-, 18- and 24-mo-old male F344 rats consuming food ad libitum (AL) or food restricted (FR; to 60% of AL food intake) from 6 wk. Both AL and FR rats gained body weight during the study ($P < 0.05$), but FR rats weighed approximately 40% less ($P < 0.0001$). Messenger RNA

levels were expressed in two ways, i.e., per total AP and per microgram total AP RNA. Proopiomelanocortin (POMC) mRNA/microgram RNA was higher (P < 0.0005) in FR than in AL rats at all ages. Thyroid-stimulating hormone (TSH) beta mRNA declined with age (P < 0.05) in AL but not FR rats and was reduced by FR up to 12 mo (P < 0.01). Growth hormone (GH) mRNA/microgram RNA declined with age (P < 0.05) in AL but not FR rats, and total GH mRNA in the AP was reduced by FR at early ages (P < 0.05). FR reduced prolactin (PRL) mRNA and its age-related increase (P < 0.0005). Levels of luteinizing hormone (LH) beta and follicle-stimulating hormone (FSH) beta mRNAs did not differ between AL and FR rats until 12 mo, but thereafter rose in FR (LH beta mRNA; P < 0.01, FSH beta mRNA; P < 0.05). Many of these changes in gene expression corroborate previously reported hormonal changes in FR rodents and mutant mice with extended life spans, and thus provide further support for the hypothesis that an altered hormonal milieu contributes to the antiaging effects of food restriction.

Descriptors: diet, food restriction, messenger RNA, pituitary hormones, anterior pituitary, age differences, aging, body weight, food intake, pro opiomelanocortin, thyrotropin, somatotropin, prolactin, LH, FSH, restricted feeding, underfeeding, rats, animal models.

Harikai, N., T. Sugawara, K. Tomogane, K. Mizuno, and S. Tashiro (2004). **Acute heat stress induces jumping escape behavior in mice.** *Physiology and Behavior* 83(3): 373-376. ISSN: 0031-9384.

Abstract: A new heat escape behavior was revealed in mice (ddY mice) under acute heat stress conditions. Mice in a fully covered cage were exposed to 24, 34, 37 and 38.5 degrees C for 60 min. Rectal temperature increased in conditions above 34 degrees C. Furthermore, serum osmolality and body weight loss also increased in conditions above 37 degrees C. At above 37 degrees C, a large number of mice attempted to escape from the partially covered cage, and so exhibited jumping behavior during a period of 60 min. However, mice exposed to 24 and 34 degrees C did not exhibit such behavior. These results indicated that acute heat stress above 37 degrees C induced evaporative water loss and jumping escape behavior in mice.

Descriptors: heat, stress, escape, jumping, mice, behavior, ddY mice, temperature.

Harkin, A., T.J. Connor, J.M. O'Donnell, and J.P. Kelly (2002). **Physiological and behavioral responses to stress: What does a rat find stressful.** *Lab Animal* 31(4): 42-50. ISSN: 0093-7355.

NAL Call Number: QL55.A1L33

Descriptors: rats, laboratory animals, stress, animal behavior, stress factors, telemetry, transponders, responses, duration, heart rate, body temperature, locomotion, physical activity, cage density, litter, feces, subcutaneous injection, escape responses, lighting, odors, cage size, animal testing alternatives, animal handling, pair housing, confinement, stroboscopic lighting, animal use refinement.

Harri, M., J. Lindblom, H. Malinen, M. Hyttinen, T. Lapvetelainen, S. Eskola, and H.J. Helminen (1999). **Effect of access to a running wheel on behavior of C57BL/6J mice.** *Laboratory Animal Science* 49(4): 401-5. ISSN: 0023-6764.

NAL Call Number: 410.9 P94

Abstract: BACKGROUND AND PURPOSE: To evaluate how and when mice run on a running wheel and how ad libitum access to the wheel affect behavior, feed intake, and weight gain. METHODS: Seventeen 2-month-old C57BL/6J mice had access to the wheel, whereas 19 control mice did not. After 3 to 6.5 weeks, behavior was video-recorded over 24 h for each mouse. RESULTS: Experimental mice ran an average 2 km/24 h in 114 min. Highest running activity took place at the onset of darkness. Experimental mice spent 22 min more feeding on the cage floor than did control mice. These times were deducted from those for all other behaviors: 74 min from resting time, 39 min from climbing and feeding on the cage lid, 14 min from locomotion on the cage floor, and 10 min from grooming. In relative figures, deduction from sleeping time was only 9%, whereas climbing time was halved. CONCLUSIONS: Climbing on the cage lid has a similar circadian rhythm as does wheel running and high-energy expenditure. Because experimental mice climbed less, their weight gain and feed intake were similar to those of control mice. Thus, wheel running can substitute for other forms of energy-consuming behaviors and vice versa.

Descriptors: behavior, animal, exertion, inbred C57BL mice physiology, circadian rhythm, eating, energy metabolism, mice, motor activity, weight gain.

Harris, R.B.S., H.Y. Gu, T.D. Mitchell, L. Endale, M. Russo, and D.H. Ryan (2004). **Increased glucocorticoid**

response to a novel stress in rats that have been restrained. *Physiology and Behavior* 81(4): 557-568. ISSN: 0031-9384.
Descriptors: rats, stress, restraint, glucocorticoid response, weight loss, adrenal response, hypophagia.

Heijboer, A.C., E. Donga, P.J. Voshol, Z.C. Dang, L.M. Havekes, J.A. Romijn, and E.P.M. Corssmit (2005). **Sixteen hours of fasting differentially affects hepatic and muscle insulin sensitivity in mice**. *Journal of Lipid Research* 46(3): 582-588. ISSN: 0022-2275.
Descriptors: mice, fasting, hepatic, muscle, insulin sensitivity, affects, changes, liver steatosis.

Henderson, A.L., W. Cao, R. Wang, M. Lu, and C.E. Cerniglia (1998). **The effect of food restriction on the composition of intestinal microflora in rats**. *Experimental Gerontology* 33(3): 239-247. ISSN: 0531-5565.
Descriptors: rats, starvation, feces, microbial flora, intestines, body parts, digestive system, excreta, feeding, mammals, Rodentia, food restriction.

Hendrie, C.A. and N.J. Starkey (1998). **Pair-bond disruption in Mongolian gerbils: effects on subsequent social behaviour**. *Physiology and Behavior* 63(5): 895-901. ISSN: 0031-9384.
Abstract: Gerbils are social rodents which form stable male-female pairs. These pair bonds appear to be based on prolonged association rather than an exclusive mating relationship. However, both sexes contribute to territorial defense and pup rearing. Therefore, pair-bond disruption may be expected to have consequences for subsequent behaviour. This hypothesis was examined in a series of laboratory studies. Behavioural consequences of pair-bond disruption were seen in both sexes and the optimum housing parameters were found to be to pair males and females for 5 weeks and to examine their behaviour 1 week after pair-bond disruption. Two further studies using these parameters were conducted to examine the combined influence of pair-bond disruption and the sex of the animal being interacted with. Results across all studies revealed a consistent pattern. Females showed increased immobility in contact, that is, freezing upon another animal's approach, and altered cage-orientated behaviour, regardless of the sex of the animal they were interacting with. In contrast, males showed decreased social investigation and offense and initiated fewer social interactions. However, these effects were only seen in interactions with other males. No changes in social behaviour were evident in interactions between pair-bond-disrupted males and females. The behavioural strategies of pair-bond-disrupted males and females in a social situation therefore differ. From these studies, it may be concluded that pair-bond disruption has consistent and reproducible effects on subsequent social behaviour in gerbils and that there are important sex differences in the behavioural expression of this.
Descriptors: Gerbillinae psychology, pair bond, social behavior, agonistic behavior, sex behavior, animal, spatial behavior.

Hennessy, M.B. (1999). **Social influences on endocrine activity in guinea pigs, with comparisons to findings in nonhuman primates.** *NeuroScience and Biobehavioral Reviews* 23(5): 687-98. ISSN: 0149-7634.
Abstract: Guinea pigs exhibit a rich and varied social organization. Studies in recent years have demonstrated that social stimuli have widespread neuroendocrine effects in guinea pigs. Here, effects on the hypothalamic-pituitary-adrenal, adrenal medullary/sympathetic, and hypothalamic-pituitary-gonadal systems of both adult and developing guinea pigs are reviewed. These systems respond to various social variables, or factors that affect social variables, including: separation from attachment objects, housing conditions, changes in housing, the familiarity of the environment in which social interactions occur, foraging conditions, surrogate-rearing, agonistic interactions, and the establishment of dominance rank. Similarities and differences between these findings and those in nonhuman primates are discussed. It is argued that the guinea pig is well suited for the study of socioendocrine effects throughout the life span, and can provide a valuable complement to nonhuman primate research in this area.
Descriptors: endocrine glands physiology, guinea pigs psychology, primates psychology, social environment, hierarchy, social.

Hennessy, M.B. and A. Morris (2005). **Passive responses of young guinea pigs during exposure to a novel environment: Influences of social partners and age.** *Developmental Psychobiology* 46(2): 86-96. ISSN: 0012-1630.
Descriptors: guinea pigs, responses, novel environment, social partners, age, exposure, isolation, study.

Higashimoto, M., M. Sano, M. Kondoh, and M. Sato (2002). **Different responses of metallothionein and leptin induced in the mouse by fasting stress.** *Biological Trace Element Research* 89(1): 75-84. ISSN: 0163-4984.
Descriptors: mouse, fasting stress, leptin, metallothionein, responses, liver, zinc, oxidative damage, target organs.

Higuchi, H., A. Mitomi, T. Tsurumaki, T. Yamaguchi, and A. Hasegawa (2001). **Blood pressure, contraction of vascular smooth muscle and feeding behavior of npy-y1 receptor knock-out mice**. *Japanese Journal of Pharmacology* 85(Supplement 1): 161. ISSN: 0021-5198.
Descriptors: mice, blood pressure, feeding behavior, meeting abstract, smooth muscle, contraction.
Notes: Meeting Information: 74th Annual Meeting of the Japanese Pharmacological Society, March 21-23, 2001, Yokohama, Japan.

Hikiji, K., K. Inoue, S. Iwasaki, A. Nakada, K. Ichihara, and N. Kiriike (2001). **Serotonin receptors in rat frontal cortex and feeding behavior**. *Society for Neuroscience Abstracts* 27(1): 813. ISSN: 0190-5295.
Descriptors: rat, frontal cortex, feeding behavior, serotonin receptors, food intake.
Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Hirashima, N., A. Yamanaka, T. Sakurai, M. Yanagisawa, and K. Goto (2003). **Analysis of feeding behavior in prepro-orexin knockout mice.** *Journal of Pharmacological Sciences* 91(Supplement 1): 203. ISSN: 1347-8613.
Descriptors: knockout mice, feeding behavior, analysis, prepro-orexin.
Notes: Meeting Information: 76th Annual Meeting of the Japanese Pharmacological Society, March 24-26, 2003, Fukuoka, Japan.

Hurst, J.L., C.J. Barnard, C.M. Nevison, and C.D. West (1998). **Housing and welfare in laboratory rats: the welfare implications of social isolation and social contact among females.** *Animal Welfare* 7(2): 121-136. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, cages, group size, welfare, females, housing, behavior, social isoloation, blood serum, corticosterone, aggressive behavior.

Hurst, J.L., C.J. Barnard, U. Tolladay, C.M. Nevison, and C.D. West (1999). **Housing and welfare in laboratory rats: effects of cage stocking density and behavioural predictors of welfare.** *Animal Behaviour* 58(Part 3): 563-586. ISSN: 0003-3472.
NAL Call Number: 410 B77
Descriptors: rats, stocking density, stress response, sex differences, physiopathology, animal welfare, aggressive behavior, grooming, physical activity, escape responses, kidneys, adrenal glands, IGG, thymus gland, corticosterone, blood serum, testosterone, blood picture, blood chemistry.

Hyman, S. and N.E. Rawson (2001). **Preliminary results of olfactory testing in rats without deprivation.** *Lab Animal* 30(1): 38-39. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: rats, laboratory mammals, water deprivation, food deprivation, smell, circadian rhythm, light regime, hyperglycemia, animal experiments, animal behavior, animal testing alternatives, animal use refinement.

Ibuka, N. and K. Fukumura (1997). **Unpredictable deprivation of water increases the probability of torpor in the Syrian hamster**. *Physiology and Behavior* 62(3): 551-556. ISSN: 0031-9384.
Descriptors: water, hamster, deprivation, torpor, probability, unpredictable.

Ichikawa, T., K. Ishihara, K. Nozue, S. Miyazawa, N. Nemoto, and K. Hotta (1998). **Serum and antral gastrin levels in fed and fasted rats: relation to aging**. *Comparative Biochemistry and Physiology, Part A, Molecular and Integrative Physiology* 121(3): 223-228. ISSN: 1095-6433.

NAL Call Number: QP1.C6
Descriptors: rats, gastrin, starvation, aging, age, stomach, blood, gastrointestinal hormones, biological development, body parts, digestive system, feeding, gastrointestinal hormones, hormones, mammals, peptides, Rodentia.

Ikeda, M., M. Sagara, and S. Inoue (2000). **Continuous exposure to dim illumination uncouples temporal patterns of sleep, body temperature, locomotion and drinking behavior in the rat**. *NeuroScience Letters* 279(3): 185-189. ISSN: 0304-3940.
Descriptors: rat, dim illumination, continuous exposure, patterns, sleep, body temperature, locomotion, drinking, behavior.

Ikeda, S., S. Sukemori, Y. Kurihara, and S. Ito (1999). **Changes in the frequency of coprophagy according to the growth of rats**. *Japanese Journal of Livestock Management* 34(3): 71-75. ISSN: 1342-1131.
Descriptors: rats, coprophagia, age, body weight, feces, behavior, excreta, feeding habits, mammals, Rodentia.

Ikeda, S., S. Sukemori, Y. Kurihara, and S. Ito (2000). **Frequency of coprophagy in aged rats.** *Journal of Agricultural Science (Tokyo)* 45(2): 165-168. ISSN: 0375-9202.
Descriptors: rats, coprophagia, aging, behavior, behavior, biological development, feeding habits, mammals, Rodentia.
Language of Text: Japanese summary.

Iwakiri, R., Y. Gotoh, T. Noda, H. Sugihara, K. Fujimoto, J. Fuseler, and T.Y. Aw (2001). **Programmed cell death in rat intestine: effect of feeding and fasting**. *Scandinavian Journal of Gastroenterology* 36: 139-47. ISSN: 0036-5521.
Descriptors: rat intestine, programmed cell death, feeding, fasting, effect, apoptosis, luminal factors, DNA fragmentation.

Iwasaki, S., K. Inoue, N. Kiriike, and K. Hikiji (2000). **Effect of maternal separation on feeding behavior of rats in later life**. *Physiology and Behavior* 70(5): 551-556. ISSN: 0031-9384.
Descriptors: rats, maternal separation, effect, feeding behavior, hyperphagia, body weight, food consumption, postnatal, abnormal feeding behavior.

Jablonski, P., B.O. Howden, and K. Baxter (2001). **Influence of buprenorphine analgesia on post-operative recovery in two strains of rats.** *Laboratory Animals* 35(3): 213-222. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Abstract: The objective of this study was to establish an effective post-operative analgesic regimen for Sprague-Dawley (SD) and Dark Agouti (DA) rats. Buprenorphine (0.01 or 0.05 mg/kg), a partial mu opioid agonist, was administered subcutaneously immediately on completion of a standardized surgical procedure, involving anaesthesia, laparotomy and visceral manipulation. Two of the four treatment groups and the saline control group received a second injection 9 h later. Behavioural observations by three independent observers provided no information in assessing pain in this model. All rats lost weight, consumed less food and water after surgery. On the first day, both SD and DA rats receiving buprenorphine lost less weight than untreated control groups. Using weight loss as an efficacy criterion, low-dose buprenorphine, given once or twice, provided effective analgesia in SD rats. A higher single dose provided no additional benefit and a second dose was detrimental, reducing body weight and food intake. In DA rats, the high dose, given twice, appeared to be more effective than the lower dose. All DA cage cohorts consumed <10% pre-operative food despite buprenorphine treatment, suggesting a higher dosage may be necessary. However, all SD and 80% DA rats who received no buprenorphine gained body weight on the second day, whereas most of the buprenorphine-treated rats continued to lose weight for another 2 days, despite increased food consumption by both strains. Buprenorphine may adversely affect intestinal function over a number of days due to its enterohepatic circulation; this effect may be more severe in DA rats. Adverse metabolic effects of buprenorphine and other opioids may preclude their use. in the future if it can be shown that non-steroidal anti-inflammatory drugs (NSAIDs) provide equally effective analgesia.
Descriptors: rats, strain differences, laboratory mammals, postoperative care, analgesics, pain, weight losses,

feed intake, water intake, dosage, adverse effects, drug effects, pharmacokinetics, animal welfare, animal testing alternatives, animal use refinement.

Janczak, A.M., B.O. Braastad, and M. Bakken (2000). **Fear-related behaviour in two mouse strains differing in litter size.** *Animal Welfare* 9(1): 25-38. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: mice, selection criteria, litter size, strain differences, fearfulness, anxiety, fighting, escape responses, animal behavior, animal welfare.

Jasmin, L. and P.T. Ohara (2001). **Long-term intrathecal catheterization in the rat.** *Journal of NeuroScience Methods* 110(1-2): 81-9. ISSN: 0165-0270.
Abstract: We report an intrathecal (i.t.) catheter system that permits repeated administration of volumes of 10 microl or more in the awake rat over many months. A small skin incision is made and a 32 ga polyurethane catheter is inserted in the sacral subarachnoid space using a modified 22 ga needle. The other end of the catheter is tunneled subcutaneously to the flank and exteriorized through a titanium port. The device is well tolerated, does not cause sensory or motor deficits, and does not interfere with behavioral testing. Rats equipped with this device can be housed with other rats. Over the 9 month observation period the function of the catheter was verified by repeated injection of 15 microl of 2% lidocaine that caused temporary paraplegia. Out of 12 implanted rats, the number of fully functional catheters was 10 at 3 months, seven at 6 months, and six at 9 months. At 3 months, i.t. injection of anti-dopamine-beta-hydroxylase antibodies conjugated to saporin (DBH-SAP, 5 microg/10 microl) resulted in noradrenergic denervation of the spinal cord in all rats (n=10). We propose that intrathecal catheterization is well suited for long term behavioral and pharmacological studies.
Descriptors: antigens, CD antigens, neoplasm antigens, surface, avian proteins, spinal cord drug effects, subarachnoid space drug effects, catheters, indwelling adverse effects, animal disease models, dopamine-beta-hydroxylase antagonists and inhibitors, dopamine-beta-hydroxylase metabolism, glial fibrillary acidic protein, immunohistochemistry, injections, spinal adverse effects, spinal methods, membrane glycoproteins metabolism, neurotoxins pharmacology, paralysis chemically induced, paralysis physiopathology, rats, Sprague Dawley rats, spinal cord physiopathology, spinal cord surgery, spinal cord diseases chemically induced, spinal cord diseases physiopathology, subarachnoid space surgery, time factors.

Jenkins, E.S. and R.D. Combes (1999). **The welfare problems associated with using transgenic mice to bioassay for bovine spongiform encephalopathy**. *Animal Welfare* 8(4): 421-431. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: transgenic mice, bioassay, bovine spongiform encephalopathy, welfare problems, prion disease, Porter ethical score system, evaluation method, distress, pain.

Jensen, S.P., S.J. Gray, and J.L. Hurst (2003). **How does habitat structure affect activity and use of space among house mice?** *Animal Behaviour* 66(2): 239-250. ISSN: 0003-3472.
NAL Call Number: 410 B77
Descriptors: mice, activity, habitat structure, space use, open site, protected site, food.

Jones, J.S. and K.E. Wynne Edwards (2000). **Paternal hamsters mechanically assist the delivery, consume amniotic fluid and placenta, remove fetal membranes, and provide parental care during the birth process**. *Hormones and Behavior* 37(2): 116-125. ISSN: 0018-506X.
Descriptors: hamsters, paternal care, behavior, delivery, placenta, fetal membrane, birth process, mechanically assist, paternal behavior.

Jones, M.A., J.M. Vanness, and J.M. Overton (1997). **Short-term food deprivation reduces blood pressure in spontaneously hypertensive rats (shr)**. *FASEB Journal* 11(3): A467. ISSN: 0892-6638.
Descriptors: rats, hypertensive, blood pressure, food deprivation, short term, reduces.
Notes: Meeting Information: Annual Meeting of the Professional Research Scientists on Experimental Biology 97, April 6-9, 1997, New Orleans, Louisiana, USA.

Jones, M.A., J.M. Vanness, M. Casto, and J.M. Overton (1998). **Influence of food deprivation on sympathetic**

support of blood pressure in the spontaneously hypertensive rat. *Nutrition Research* 18(9): 1581-1594. ISSN: 0271-5317.
Descriptors: food deprivation, hypertensive, rat, blood pressure, influence, sympathetic support, hypertensive.

Kaiser, S., T. Nubold, I. Rohlmann, and N. Sachser (2003). **Pregnant female guinea pigs adapt easily to a new social environment irrespective of their rearing conditions.** *Physiology and Behavior* 80(1): 147-53. ISSN: 0031-9384.
Abstract: For male guinea pigs, the social rearing conditions are crucial for the course of social interactions and endocrine stress responses in later life. While colony-reared males adjust easily to new social situations, high levels of aggression and extreme endocrine responses are found in males that were raised in pairs [*Psychoneuroendocrinology* 23 (1998) 891]. This study investigated whether the same finding also applies to females. Therefore, 8 females reared in mixed-sexed colonies of 8-10 males and 12-13 females (designated as CF) and 8 females reared in mixed-sexed pairs (designated as PF) were transferred to an unknown colony for 3 days. Control females remained in their respective housing conditions. Serum cortisol concentrations (CORT) were determined before, during and after the transfer. The behavior of the CF and PF was recorded on the first, second and third day of transfer. All females adjusted easily to the new social situation, but frequencies of some behavioral patterns were significantly different between CF and PF. In the new social situation, PF displayed social orientation as well as defensive aggressive and avoidance behavior more frequently than CF. On the day of transfer, resident males displayed courtship behavior more frequently towards PF than CF. CORT did not differ between PF and CF either before, during or after the transfer. Furthermore, the transfer to the new social situation did not result in significantly increased CORT 4 h later either in CF or PF. We conclude that-in contrast to male guinea pigs-females are able to adapt to unfamiliar conspecifics independently of their social rearing conditions.
Descriptors: behavior, animal physiology, hydrocortisone blood, pregnancy psychology, social behavior, social environment, adaptation, psychological physiology, guinea pigs, housing, pregnancy, blood.

Kaliste Korhonen, E. and S. Eskola (2000). **Fighting in NIH/S male mice: consequences for behaviour in resident-intruder tests and physiological parameters.** *Laboratory Animals* 34(2): 189-198. ISSN: 0023-6772.
NAL Call Number: QL55.A1L3
Descriptors: mice, fighting, social dominance, individual characteristics, aggressive behavior, test procedure, wounds, body weight, testes, spleen, adrenal glands, epididymis, weight, adipose tissue, blood serum, corticosterone, animal experiments, animal welfare.

Karolewicz, B. and I.A. Paul (2001). **Group housing of mice increases immobility and antidepressant sensitivity in the forced swim and tail suspension tests.** *European Journal of Pharmacology* 415(2-3): 197-201. ISSN: 0014-2999.
Abstract: The forced swim test and tail suspension test are often used in laboratory practice to identify compounds that possess antidepressant-like activity. This experiment was conducted to determine whether housing conditions per se influence the response of mice in these antidepressant screening procedures. Male NIH Swiss mice were housed individually or in groups (five per cage) for 8 weeks prior to testing. After 8 weeks, the animals were exposed to the forced swim and tail-suspension tests. Group housed mice displayed high levels of immobility in the forced swim and tail suspension tests. Desipramine injection 60 min prior testing, in doses 7.5 and 15 mg/kg, produced significant reductions in the immobility time in forced swimming and tail suspension tests. Individually housed mice, when exposed to these tests, displayed lower levels of immobility with a magnitude comparable to the effect of desipramine in group housed mice. Desipramine given to individually housed mice did not reduce the duration of immobility either in the forced swim test or in the tail suspension test. These results indicate that both tests are sensitive to housing conditions. This observation suggests that long lasting group housing may be critical to the behavioral response in these preclinical screening procedures in mice.
Descriptors: antidepressive agents, tricyclic pharmacology, behavior, animal drug effects, desipramine pharmacology, housing, animal, immobilization, stress drug therapy, antidepressive agents, tricyclic therapeutic use, desipramine therapeutic use, mice.

Kask, A., H.P. Nguyen, R. Pabst, and S. Von Horsten (2001). **Factors influencing behavior of group-housed male**

rats in the social interaction test: focus on cohort removal. *Physiology and Behavior* 74(3): 277-82. ISSN: 0031-9384.

Abstract: The rat social interaction (SI) test is used widely to measure anxiety-like behavior, yet the influence of various factors such as testing time, pre-experimental manipulations (transport stress), and testing of animals from the same cage (cohort removal, CR) on SI has not been systematically studied. We measured SI behavior of male triad-housed Wistar rats in a novel dimly lit arena (low light unfamiliar, LU) and found that SI time is higher in the beginning of the activity (dark) phase when compared with SI time in first half of the light phase. Furthermore, SI time is significantly increased by habituation of animals to the testing room during light phase, but this intervention has no effect in early dark phase when SI behavior is already maximal. Sequential removal of rats from the home cage led to the stress-like behavioral and physiological consequences. Rats removed in the last position had shorter SI time and higher body temperature. These data demonstrate that SI is higher during early dark vs. early light phase and confirm that CR has anxiogenic-like effects in rats. We conclude that the usage of sequentially removed group-housed rats in behavioral tests can be a source for considerable variation due to anxiety that develops in animals remaining in the cage. On the other hand, CR may be a useful method to study behavioral/neurochemical mechanisms of psychogenic stress in rats.

Descriptors: arousal, social behavior, social environment, circadian rhythm, habituation psychophysiology, rats, Wistar rats.

Korystov, Y.N., A.V. Kulikov, L.V. Arkhipova, G.N. Smirnova, V.V. Shaposhnikova, M.K. Levitman, and L.M. Chailakhyan (2003). **Social stress in groups of mice: methods for recording conflicts and their consequences.** *Doklady Biological Sciences Proceedings of the Academy of Sciences of the USSR* 390: 271-3. ISSN: 0012-4966.

Descriptors: conflict psychology, mice, inbred strains physiology, social behavior, stress, psychological metabolism, age factors, body weight, cell count, animal housing, mice, inbred mice strains psychology, tape recording, thymus gland cytology, time factors.

Notes: Biological sciences sections translated from Russian.

Koutoku, T., T. Nakanishi, T. Takagi, I. Yamasaki, R. Zhang, K. Sashihara, E.S. Saito, S. Saito, and M. Furuse (2003). **Effect of environmental lighting on aggressive and anxious behavior in male mice**. *Journal of Applied Animal Research* 23(1): 65-74. ISSN: 0971-2119.

Abstract: To study the influence of the different conditions of environmental lighting on aggressive behaviour and open field activity, male mice were kept under different conditions of environmental lighting, i.e., (A) 12-hour each light and dark (LD), (B) continuous light (LL) and (C) continuous dark (DD) for 27 days. Although no significant differences were observed among three groups, LL and DD conditions tended to show the inhibitory effect on aggression. In the open field test, the crossing, the time and the path significantly increased with the length of lighting period, but rearing and defaecation were not affected. The amounts of monoamines and their metabolites in the cerebellum, cerebrum and brainstem were hardly affected by lighting conditions. Taken together, DD condition was most preferable for mice to keep calm rather LL condition.

Descriptors: aggression, aggressive behavior, animal behavior, brain, light relations, lighting, monoamines, physical activity, mice.

Language of Text: Hindi summary.

Kowalski, T.J., R.C. Young, and G.P. Smith (1998). **Deprivation of food and water, not maternal separation, increases neuropeptide Y expression in lean Zucker rat pups**. *Society for Neuroscience Abstracts* 24(1-2): 448. ISSN: 0190-5295.

Descriptors: food, water, deprivation, neuropeptide Y, expression, rat, pups.

Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 1, November 7-12, 1998, Los Angeles, California, USA.

Koyama, S. (2004). **Primer effects by conspecific odors in house mice: a new perspective in the study of primer effects on reproductive activities**. *Hormones and Behavior* 46(3): 303-310. ISSN: 0018-506X.

Abstract: Half a century has passed since the first report of the influence of odors on mice. Odors are known to influence behavior (signaling effect) and affect the physiology (primer effect) of mice. This review focuses on summarizing the primer effects found so far in female and male mice. Odors from conspecifics of the opposite

sex had the tendency to enhance reproductive activities, whereas odors from conspecifics of the same sex diminish them. Only 2,5-dimethylpyrazine, one of the odor components identified in group-housed females, has been reported to have a suppressive influence on both males and females by lowering reproductive activities. Studies showed progress from the discovery of phenomena to the identification of odor components that cause such changes in reproductive organs and related neuroendocrinological changes. Compared to studies on the mechanisms of primer effects in females, the mechanisms in males are not yet clarified, and detailed studies on effects on the reproductive organs are still in primitive stages especially for males. Hypotheses on the influence of changes in the concentration of testosterone, estrogen, and prolactin on spermatogenesis and sperm maturation after exposure to odors are discussed.

Descriptors: conspecific odors, reviews, sex differences, reproduction, pheromones, odor, suppression, neuroendocrine system, testosterone, estrogens, prolactin, spermatogenesis, mice, 2,5 dimethylpyrazine.

Krarup, A., P. Chattopadhyay, A.K. Bhattacharjee, J.R. Burge, and G.R. Ruble (1999). **Evaluation of surrogate markers of impending death in the galactosamine-sensitized murine model of bacterial endotoxemia.** *Laboratory Animal Science* 49(5): 545-550. ISSN: 0023-6764.

NAL Call Number: 410.9 P94

Descriptors: mice, death, lethal dose, endotoxins, body temperature regulation, coat, posture, consciousness, locomotion, euthanasia, humane endpoints, distress, animal use refinement.

Krebs, H., M. Macht, P. Weyers, H.G. Weijers, and W. Janke (1996). **Effects of stressful noise on eating and non-eating behavior in rats**. *Appetite* 26(2): 193-202. ISSN: 0195-6663.

NAL Call Number: QP141.A1A64

Descriptors: noise, feeding, behavior, rats, food intake, feeding habits, stress, behavior, feeding habits, mammals, pollutants, Rodentia.

Krohn, T.C., A.K. Hansen, and N. Dragsted (2003). **Telemetry as a method for measuring the impact of housing conditions on rats' welfare.** *Animal Welfare* 12(1): 53-62. ISSN: 0962-7286.

NAL Call Number: HV4701.A557

Descriptors: rats, laboratory mammals, cages, floor type, grid floors, litter, floors, plastic panels, stress factors, heart rate, blood pressure, body temperature, telemetry, animal welfare, animal preferences.

Krohn, T.C., K. Hejgaard, and A.K. Hansen (2001). **Methods for general assessment of the welfare of laboratory rats**. *Acta Agriculturae Scandinavica Section A, Animal Science* 51(Supplement 30): 118-123. ISSN: 0906-4702.

Descriptors: animal welfare, behavior assessment, laboratory animals, physiology, reviews, methods, rats.

Krohn, T.C. and A.K. Hansen (2002). **The application of traditional behavioural and physiological methods for monitoring of the welfare impact of different flooring conditions in rodents.** *Scandinavian Journal of Laboratory Animal Science* 29(2): 79-89. ISSN: 0901-3393.

Descriptors: rodents, flooring conditions, welfare, behavior, rats, mice, environmental impacts, grid housing.

Larsson, F., B. Winblad, and A.H. Mohammed (2002). **Psychological stress and environmental adaptation in enriched vs. impoverished housed rats.** *Pharmacology, Biochemistry and Behavior* 73(1): 193-207. ISSN: 0091-3057.

Abstract: In this study, we report differential behavioural and cognitive effects, as assessed in the open-field and the Morris water maze, following psychological stress in enriched vs. impoverished housed rats. Three stress conditions were evaluated: nonstress, mild stress and powerful stress. Mild stress consisted of exposure to an avoidance box but without shock, while in the powerful stress condition animals were exposed to an electric shock. The results revealed distinct effects in the differentially housed animals. Prior exposure to a mild stress enhanced escape performance in the water maze in enriched but not impoverished animals. However, preexposure to powerful stress negatively affected animals from both housing conditions in the water maze task, but with the enriched animals less affected than impoverished animals. In the open-field test, stress preexposure reduced locomotion counts in both the differentially housed animals. In addition, the results showed that the enrichment effect on emotional reactivity in the open-field is long-lasting and persists even after extensive

training and housing in standard laboratory conditions. The results are discussed in relation to the nature of the behavioural and learning differences between the differentially housed animals.

Descriptors: environment, escape reaction, maze learning, motor activity, stress, psychological psychology, housing, animal statistics and numerical data, rats, Sprague Dawley rats.

Latham, N. and G. Mason (2004). **From house mouse to mouse house: the behavioural biology of free-living *Mus musculus* and its implications in the laboratory**. *Applied Animal Behaviour Science* 86(3-4): 261-289. ISSN: 0168-1591.

NAL Call Number: QL750.A6

Abstract: Understanding a species' behaviour in natural conditions can give insights into its development, responses and welfare in captivity. Here, we review research and pest control literatures on the free-living house mouse (*Mus musculus*), analysing its sensory world, developmental processes and behaviour to suggest how laboratory environments might affect mouse welfare, normalcy, test design, and behaviour. Mouse development from foetus to weaning is influenced by prenatal stress and nutrient levels, and post-natal litter size and other factors affecting maternal care, all with lasting effects on adult bodyweight, aggression, activity levels, stress responsiveness and masculinisation. These influences may well be important in the laboratory, for example unwittingly differing between facilities leading to site-differences in phenotype. Murine senses are dominated by olfactory, auditory and tactile cues. Their hearing extends into the ultrasonic, and vision, from mid-range wavelengths to the ultraviolet. In mouse facilities, behaviour and welfare may therefore also be affected by sensory stimuli unnoticed by humans. The physical and social environment and behaviour of wild mice differ greatly from those of laboratory mice. Dispersal age varies with resource-levels and social cues, and mice often either live alone or in family groups. Mice occupy territories/ranges measuring a few square meters to several square kilometers, and which allow running, climbing, and burrowing. Mice are often active during dawn/dusk, and spend their time patrolling their territories, investigating neighbours' odour cues, foraging, finding mates and rearing litters. The potential impact of these many differences and restrictions on laboratory mouse development, normalcy and welfare has only begun to be explored.

Descriptors: mouse, behavior, natural conditions, welfare, free living, stress, biology, laboratory, captivity.

Laviola, G., M. Rea, S. Morley Fletcher, S. Di Carlo, A. Bacosi, R. De Simone, M. Bertini, and R. Pacifici (2004). **Beneficial effects of enriched environment on adolescent rats from stressed pregnancies.** *European Journal of Neuroscience* 20(6): 1655-1664. ISSN: 0953-816X.

Abstract: The capacity of an early environmental intervention to normalize the behavioural and immunological dysfunctions produced by a stressed pregnancy was investigated. Pregnant Sprague-Dawley rats underwent three 45-min sessions per day of prenatal restraint stress (PS) on gestation days 11-21, and their offspring were assigned to either an enriched-environment or standard living cages throughout adolescence [postnatal days (pnd) 22-43]. Juvenile rats from stressed pregnancies had a prominent depression of affiliative/playful behaviour and of basal circulating CD4 T lymphocytes, CD8 T lymphocytes and T4/T8 ratio. They also showed increased emotionality and spleen and brain frontal cortex levels of pro-inflammatory interleoukin-1beta (IL-1beta) cytokine. A more marked response to cyclophosphamide (CPA: two 2 mg/kg IP injections) induced immunosuppression was also found in prenatal stressed rats. Enriched housing increased the amount of time adolescent PS rats spent in positive species-typical behaviours (i.e. play behaviour), reduced emotionality and reverted most of immunological alterations. In addition to its effects in PS rats, enriched housing increased anti-inflammatory IL-2 and reduced pro-inflammatory IL-1beta production by activated splenocytes, also producing a marked alleviation of CPA-induced immune depression. In the brain, enriched housing increased IL-1beta values in hypothalamus, while slightly normalizing these values in the frontal cortex from PS rats. This is a first indication that an environmental intervention, such as enriched housing, during adolescence can beneficially affect basal immune parameters and rats response to both early stress and drug-induced immunosuppression.

Descriptors: rats, stressed, enriched environment, beneficial effects, pregnancies, behavioral, immunological.

Leach, M.C., V.A. Bowell, T.F. Allan, and D.B. Morton (2002). **Aversion to gaseous euthanasia agents in rats and mice.** *Comparative Medicine* 52(3): 249-257. ISSN: 1532-0820.

NAL Call Number: SF77.C65

Abstract: Despite euthanasia being the most common of all procedures carried out on laboratory animals, the potential distress associated with gaseous agents has received little interest until recently, with growing concern

over use of carbon dioxide as a humane method of euthanasia. The distress associated with exposure to carbon dioxide, argon, and carbon dioxide-argon mixtures was investigated in rats and mice by measuring the degree of aversion on exposure to low, medium, and high concentrations of these agents. Animals were exposed to the various concentrations in a test chamber containing air or gas mixtures that they were able to enter and leave at will. Aversion was assessed, using measurements of initial withdrawal time and total dwelling time in the test chamber, as they were the most sensitive measurements of aversion. Comparisons between euthanasia agent and control (air) treatments indicated that concentrations of agents recommended for rapid and efficient induction are associated with some degree of aversion. Carbon dioxide and the carbon dioxide-argon mixtures were more aversive than was argon for rats and mice. These findings suggest that induction with carbon dioxide either alone or in combination with argon is likely to cause considerable distress before the loss of consciousness in rodents, which is unacceptable considering that effective and more humane alternatives are available.

Descriptors: rats, mice, laboratory mammals, euthanasia, hypoxia, carbon dioxide, argon, mixtures, escape responses, animal welfare, distress, animal use refinement.

Leach, M.C., V.A. Bowell, T.F. Allan, and D.B. Morton (2002). **Degrees of aversion shown by rats and mice to different concentrations of inhalational anaesthetics.** *Veterinary Record* 150(26): 808-815. ISSN: 0042-4900.

NAL Call Number: 41.8 V641

Descriptors: inhaled anesthetics, halothane, isoflurane, carbon dioxide, concentration, rats, mice, animal behavior, animal welfare, enflurane.

Leach, M.C., D.C.J. Main, and P.D. Thornton (2004). **Development of a welfare benchmarking protocol for laboratory mice.** *Animal Welfare* 13, Supplement: S246-S247. ISSN: 0962-7286.

NAL Call Number: HV4701.A557

Descriptors: mice, welfare protocol, development, UFAW, Universities Federation for Animal Welfare, symposium, animal welfare, laboratory animals.

Notes: Meeting Information: Universities Federation for Animal Welfare (UFAW) Symposium on Science in the Service of Animal Welfare, Animal Welfare, Edinburgh, UK, April 02-04, 2003.

Leenaars, P.P.A.M., M.A. Koedam, P.W. Wester, V. Baumans, E. Claassen, and C.F.M. Hendriksen (1998). **Assessment of side effects induced by injection of different adjuvant/antigen combinations in rabbits and mice.** *Laboratory Animals* 32(4): 387-406. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: We evaluated the side effects induced by injection of Freund's adjuvant (FA) and alternative adjuvants combined with different antigens. Rabbits and mice were injected subcutaneously, intramuscularly (rabbits) and intraperitoneally (mice) with different adjuvants (FA, Specol, RIBI, TiterMax, Montanide ISA50) in combination with several types of antigens (synthetic peptides, autoantigen, glycolipid, protein, mycoplasma or viruses). The effects of treatment on the animals' well-being were assessed by clinical and behavioural changes (POT and LABORAS assays) and gross and histopathological changes. In rabbits, treatment did not appear to induce acute or prolonged pain and distress. Mice showed behavioural changes immediately after (predominantly secondary) immunization. Injection of several adjuvant/antigen mixtures resulted in severe pathological changes, depending on adjuvant, type of antigen, animal species used and route of injection. Both rabbits and mice showed pathological changes ranging from marked to severe after injection of FA, and ranging from minimal to marked after Specol and Montanide injections. Pathological changes after RIBI injections were severe in rabbits, though slight in mice. After TiterMax injections, pathological changes were moderate in rabbits, though severe in mice. In conclusion, injection of FA according to present guidelines resulted mostly in severe pathological changes, whereas only very few clinical and behavioural signs indicated prolonged severe pain. Our findings indicate that Montanide ISA50 and Specol induce acceptable antibody titres, and cause fewer pathological changes than FA. Thus they are effective alternatives to FA.

Descriptors: rabbits, mice, adverse effects, adjuvants, antigens, animal welfare, species differences, immune response, intramuscular injection, intraperitoneal injection, subcutaneous injection, pain, antibody formation, immunization, lesions, histopathology.

Lesage, J., F. Del Favero, M. Leonhardt, H. Louvart, S. Maccari, D. Vieau, and M. Darnaudery (2004). **Prenatal stress**

induces intrauterine growth restriction and programmes glucose intolerance and feeding behaviour disturbances in the aged rat. *Journal of Endocrinology* 181(2): 291-296. ISSN: 0022-0795.
Descriptors: rat, aged, prenatal stress, intrauterine, growth restriction, feeding behavior, glucose intolerance, hyperglycemia, programming.

Levine, S. and A. Saltzman (2002). **Acute uremia in rats: feeding sucrose overnight is preferable to starvation**. *Renal Failure* 24(2): 127-131. ISSN: 0886-022X.
Descriptors: rats, starvation, acute uremia, feeding sucrose, gastrointestinal tract, overnight fast, liver weight loss, alternative.

Levy, F., A.I. Melo, B.G.J. Galef, M. Madden, and A.S. Fleming (2003). **Complete maternal deprivation affects social, but not spatial, learning in adult rats.** *Developmental Psychobiology* 43(3): 177-191. ISSN: 0012-1630.
Descriptors: rats, adult, maternal deprivation, affects, social learning, spatial learning, tactile stimulation, performance, social interactions.

Lino De Oliveira, C., T.C.M. De Lima, and A. De Padua Carobrez (2005). **Structure of the rat behaviour in the forced swimming test**. *Behavioural Brain Research* 158(2): 243-250. ISSN: 0166-4328.
Descriptors: behavior, methods and techniques, forced swimming test, clinical techniques, diagnostic techniques, antidepressant drug screening.

Linthorst, A.C.E., C. Flachskamm, and J.M.H. Reul (2001). **Hippocampal serotonin responses to forced swim stress in rats: influence of water temperature**. *Society for Neuroscience Abstracts* 27(1): 1104. ISSN: 0190-5295.
Descriptors: rats, forced swim stress, water temperature, hippocampal serotonin responses, behavior, varied water temperatures.
Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Lovic, V., A. Gonzalez, and A.S. Fleming (2001). **Maternally separated rats show deficits in maternal care in adulthood**. *Developmental Psychobiology* 39(1): 19-33. ISSN: 0012-1630.
Descriptors: rats, behavior, maternally separated, adulthood, maternal care, deficits, early experience, adult behavior.

Luis, J., F.A. Cervantes, M. Martinez, R. Cardenas, J. Delgado, and A. Carmona (2004). **Male influence on maternal behavior and offspring of captive volcano mice (*Neotomodon alstoni*) from Mexico.** *Journal of Mammalogy* 85(2): 268-272. ISSN: 0022-2372.
Descriptors: *Neotomodon alstoni*, parental care, males, growth, survival, Mexico, male parental care, offspring survival and growth relations, volcano mice, behavior.

Madrid, J.A., F.J. Sanchez Vazquez, P. Lax, P. Matas, E.M. Cuenca, and S. Zamora (1998). **Feeding behavior and entrainment limits in the circadian system of the rat**. *American Journal of Physiology* 275(2, Part 2): R372-R383. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Descriptors: biological rhythms, meal patterns, rats, feeding habits, behavior, feeding, mammals, Rodentia, circadian rhythm, eating patterns.

Maldonado, A.M. and C.L. Kirstein (2005). **Handling alters cocaine-induced activity in adolescent but not adult male rats**. *Physiology and Behavior* 84(2): 321-326. ISSN: 0031-9384.
Descriptors: behavior, development, pharmacology, locomotor activity.

Mandillo, S. and F.R. D'Amato (1997). **Effect of strange male odour on parental care in lactating female mice**. *Animal Behaviour* 54(4): 901-910. ISSN: 0003-3472.
NAL Call Number: 410 B77
Descriptors: lactation, mice, behavior, young animals, age, reproductive performance, smell, males, side effects, maternal behavior, behavior, mammals, physiological functions, Rodentia, secretion, sex, lactation stage, odors,

adverse effects.

Mang'era, K., M. Krzyzelewski, S. Greaves, D. Greenberg, and M. Billinghurst (2005). **Molecular-size fractionation of pentastarch, radiolabelling with tc-99m, and evaluation of biological behaviour in mice**. *Nuclear Medicine Communications* 26(4): 375-381. ISSN: 0143-3636.
Descriptors: blood and lymphatics, transport and circulation, radiation biology, radiolabeling, laboratory techniques, behavior, stability, fractionation.

Manni, L., A. Antonelli, N. Costa, and L. Aloe (2005). **Stress alters vascular-endothelial growth factor expression in rat arteries: role of nerve growth factor**. *Basic Research in Cardiology* 100(2): 121-130. ISSN: 0300-8428.
Abstract: The aim of this study was to investigate the role of stress and nerve growth factor (NGF) on the expression of vascular-endothelial growth factor (VEGF) and NGF high-affinity receptor (tyrosine kinase A, TrKA) in the ascending and abdominal aorta. Adult male rats were exposed to immobilization stress for one hour or injected with purified murine NGF. Four hours after treatments, rats were sacrificed and VEGF, NGF and TrkA expression in ascending and abdominal aorta evaluated. The effects of anti-NGF treatment on arterial VEGF expression and on stress-induced arterial cell proliferation were also studied in control and stressed rats. The data indicated that both stress and NGF injection induced a rapid increase of arterial VEGF associated with an elevated level of NGF and TrkA in arterial tissues. Blocking NGF action by neutralizing NGF-antibodies, results in down-regulation of stress-induced VEGF expression by arteries and in the blockade of stress-induced proliferation of cells from the arterial wall. Overall our data demonstrated that NGF is involved in the regulation of VEGF and in cardiac vessels response after emotional stress.
Descriptors: rat, arteries, nerve, growth factor, stress, vascular, endothelial, expression.

Marashi, V., A. Barnekow, E. Ossendorf, and N. Sachser (2003). **Effects of different forms of environmental enrichment on behavioral, endocrinological, and immunological parameters in male mice.** *Hormones and Behavior* 43(2): 281-92. ISSN: 0018-506X.
Descriptors: aggression physiology, corticosterone blood, housing, animal, pituitary adrenal system physiology, social environment, antigens, surface analysis, cytokines analysis, immunoglobulin G blood, mice, inbred mice strains, stress, psychological blood, tyrosine 3 monooxygenase blood.

Marchlewska Koj, A., J. Kapusta, and M. Kruczek (2003). **Prenatal stress modifies behavior in offspring of bank voles (*Clethrionomys glareolus*).** *Physiology and Behavior* 79(4-5): 671-8. ISSN: 0031-9384.
Abstract: The aim of the present study was to investigate the effect of prenatal stress on behavior of adult bank vole males and females. Pregnant females were submitted to stress by short encounters of two females at the same stage of pregnancy, to crowded condition by transfer to a cage with four to five nonpregnant females, or stressed by immobilization. The stressors were applied on Days 13, 14, and 15 of pregnancy. The results indicate that prenatal stress influenced adult offspring behavior tested in the presence of the same sex, as compared to controls. Females and males differ in their reactions to stress. Prenatal stress decreased the nonaggressive behavior of females but males did not change their amicable approaches toward males. In bank vole males, prenatal social or immobilization stress increased aggression, but females made more attacks only after prenatal stressing by immobilization. This indicates that in bank vole females classical stressor involved different mediators from those associated with prenatal social stresses. Our results indicate that prenatal stress in bank voles decreases the social activity of female offspring and increases aggression in male offspring. Social stress applied to females in late pregnancy may increase the number of aggressive males in a population.
Descriptors: aggression physiology, microtinae physiology, prenatal exposure delayed effects, social environment, stress physiopathology, immobilization physiology, maternal exposure, sex factors, stress classification.

Margulis, S.W., M. Nabong, G. Alaks, A. Walsh, and R.C. Lacy (2005). **Effects of early experience on subsequent parental behaviour and reproductive success in oldfield mice, *Peromyscus polionotus***. *Animal Behaviour* 69: 627-634. ISSN: 0003-3472.
NAL Call Number: 410 B77
Descriptors: behavior, terrestrial ecology, ecology, environmental sciences, reproduction, reproductive success, parental behavior, experience.

Martins, M.J., C. Hipolito Reis, and I. Azevedo (2001). **Effect of fasting on rat duodenal and jejunal microvilli.** *Clinical Nutrition* 20(4): 325-331. ISSN: 0261-5614.
Descriptors: rat, fasting, effect, duodenal, jejunal, microvilli, morphology, apoptosis, desquamation, refeeding.

Masini, C.V., S. Sauer, and S. Campeau (2005). **Ferret odor as a processive stress model in rats: neurochemical, behavioral, and endocrine evidence**. *Behavioral Neuroscience* 119(1): 280-292. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Abstract: Predator odors have been shown to elicit stress responses in rats. The present studies assessed the use of domestic ferret odor as a processive stress model. Plasma corticosterone and adrenocorticotropin hormone levels were higher after 30 min of exposure to ferret odor (fur/skin) but not control odors, ferret feces, urine, or anal gland secretions. Behavioral differences were also found between ferret and the control odors as tested in a defensive withdrawal paradigm. In addition, c-fos messenger RNA expression in several brain areas previously associated with processive stress was significantly higher in ferret odor-exposed rat brains than in control odor-exposed brains. These results suggest that ferret odor produces a reliable unconditioned stress response and may be useful as a processive stress model.
Descriptors: behavior, biochemistry and molecular biophysics, endocrine system, chemical coordination and homeostasis, nervous system, neural coordination, behavioral difference, ferret odor, processive stress model, stress response.

McGlone, J.J., D.L. Anderson, and R.L. Norman (2001). **Floor space needs for laboratory mice: BALB/cJ males or females in solid-bottom cages with bedding.** *Contemporary Topics in Laboratory Animal Science* 40(3): 21-5. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Abstract: Studies were initiated to determine the effects of restricted (32.2 cm2 per mouse), normal (96.8 cm2), or excess floor space (129.0 cm2) allowances by using a model of three mice per cage. BALB/cJ mice were bred on-site and weaned at 3 weeks of age into specially designed polycarbonate shoebox cages modified to each space allowance. Cages contained aspen shavings for bedding, and mice were fed and watered ad libitum. Body weight gains, feed and water use, and immunologic measures largely were not effected by floor space allowances. Female BALB/cJ mice were heavier and had increased lymphocyte blastogenesis to phytohemagglutinin (20 microg/mL) when given 32.2 cm2/mouse than when given 129 cm2/mouse. Female mice showed an increase in grooming and sitting behaviors when given 32.2 cm2/mouse, but male mice with restricted floor space spent more time lying down but showed no change in grooming or sitting behaviors compared to mice given more space. Among male mice, limited floor space did not significantly influence growth rates, but male mice given 32.2 cm2/mouse had less mortality than did mice given more space. We conclude that floor spaces as limited as 32.2 cm2/mouse did not cause behavior, health, immune or performance problems for BALB/cJ mice.
Descriptors: mice, male, female, floor space, bedding, solid bottom cages, space, restricted, normal, excess, effects.

Mcguire, B. (2003). **Paternal care and its effect on maternal behavior and pup survival and development in prairie voles (*Microtus ochrogaster*).** In: *Exploring Animal Behavior in Laboratory and Field: An Hypothesis Testing Approach to the Development, Causation, Function, and Evolution of Animal Behavior*, Academic Press Inc.: San Diego, CA, USA; London, UK, p. 167-176. ISBN: 0125583303.
Descriptors: prairie voles, pup survival, maternal behavior, paternal care, effect, development.

Mcintosh, J., H. Anisman, and Z. Merali (1999). **Short- and long-periods of neonatal maternal separation differentially affect anxiety and feeding in adult rats: gender-dependent effects**. *Developmental Brain Research* 113(1-2): 97-106.
Descriptors: rats, neonatal maternal separation, short periods, long periods, anxiety, feeding, affect, gender dependent effects, adult rats.

Mcquade, R., P.J. Tyrrell, and S.C. Stanford (1998). **The effect of microdialysis probe implantation on behaviour of rats in the light/dark box**. *British Journal of Pharmacology* 123(Supplement): 244. ISSN: 0007-1188.
Descriptors: rats, behavior, adverse effects, microdialysis probe, implantation, light, dark box, meeting abstract.

Notes: Meeting Information: Meeting of the British Pharmacological Society held jointly with Dutch Pharmacological Society, The Belgian Society for Fundamental and Clinical Physiology and Pharmacology, December 10-12, 1997, Harrogate, England, UK.

Meerlo, P., A. Sgoifo, S.F. De Boer, and J.M. Koolhaas (1999). **Long-lasting consequences of a social conflict in rats: behavior during the interaction predicts subsequent changes in daily rhythms of heart rate, temperature, and activity.** *Behavioral Neuroscience* 113(6): 1283-90. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Abstract: This study shows that the long-term consequences of a social conflict in rats do not depend on the physical intensity of the fight in terms of aggression received but, especially, on how the subjects deal with it. Experimental rats were introduced into the cage of an aggressive conspecific for 1 hr, and the effects on daily rhythms of heart rate, body temperature, and activity thereafter were measured by means of telemetry. In some rats, the confrontation caused a strong decrease in the daily rhythm amplitude that lasted up to 3 weeks, whereas other subjects showed only minor changes. The changes in rhythm amplitude did not correlate with the number of attacks received from the territory owner. Contrary to this, the changes showed a clear negative correlation with the aggression of the experimental rats themselves. Subjects fighting back and counterattacking the cage owner subsequently had a smaller reduction in rhythm amplitude.
Descriptors: aggression physiology, behavior, animal physiology, body temperature physiology, conflict psychology, heart rate physiology, motor activity physiology, circadian rhythm physiology, rats, social behavior, time factors.

Mertens, C. (2000). **Phenotype characterization and welfare assessment of transgenic rodents (mice).** *Journal of Applied Animal Welfare Science* 3(2): 127-139. ISSN: 1088-8705.
NAL Call Number: HV4701.J68
Descriptors: mice, transgenic animals, progeny testing, screening, phenotypes, strain differences, animal welfare, congenital abnormalities, postnatal development, animal health, data collection.

Mill, J., M.J. Galsworthy, J.L. Paya Cano, F. Sluyter, L.C. Schalkwyk, R. Plomin, and P. Asherson (2002). **Home-cage activity in heterogeneous stock (HS) mice as a model of baseline activity.** *Genes, Brain, and Behavior* 1(3): 166-73. ISSN: 1601-1848.
Abstract: Behavioral genetic work in humans indicates that clinical hyperactivity is best viewed as the extreme end of activity levels in the population. However, current animal models of hyperactivity are not studied as quantitative traits as they are either knockout models or inbred strains. Furthermore, these animal models generally demonstrate elevated locomotion in novel environments, but not in their home-cages. This is the opposite of the symptoms seen in the human condition where childhood hyperactivity is generally more pronounced in constant, unstimulating situations. In this study we filmed an outbred population of 44 heterogeneous stock (HS) mice under red light during their active phase, to assess the reliability of individual differences in home-cage behavior and extract an index of home-cage activity (HCA) level. We then compared this measure to locomotor behavior in a novel environment--the open-field. Reliable individual differences in home-cage behaviors such as running, swinging on bars, and burrowing were found, and principal component factor analysis yielded a general activity factor, which accounted for 32% of the variance and correlated 0.90 with a subjective impression of activity level. The correlation between HCA and locomotor activity in the open-field was 0.23, which was non-significant. However, the association with HCA level appeared to increase over the five minutes of the open-field, presumably as the mice habituated. Furthermore, although mice displaying particularly high and low HCA were indistinguishable early in the open-field task, they became significantly differentiated over time. We conclude that home-cage behaviors and the open-field, after habituation, display good face and construct validity, and may provide a good model of baseline activity for quantitative trait loci (QTL) discovery and functional genomics in the HS mice.
Descriptors: arousal genetics, brain physiology, motor activity physiology, social environment, arousal physiology, crosses, genetic, exploratory behavior physiology, mice, models, genetic, quantitative trait loci, reference values.

Moragrega, I., M.C. Carrasco, P. Vicens, and R. Redolat (2003). **Spatial learning in male mice with different levels of aggressiveness: effects of housing conditions and nicotine administration**. *Behavioural Brain Research*

147(1-2): 1-8. ISSN: 0166-4328.
Abstract: The main aim of the present investigation was to evaluate the possible modulation of spatial learning ability by housing conditions and level of aggressiveness in mice, also testing whether differences in locomotion and anxiety could influence this relationship. Additionally, we have examined effects of nicotine in the acquisition and retention of a spatial learning task in groups of mice differing in these variables. NMRI male mice were either group-housed or individually housed for 30 days and then classified into mice with short (SAL) and long (LAL) attack latency after a pre-screening agonistic encounter. Locomotor activity and baseline levels of anxiety of these groups were evaluated in the actimeter and elevated plus-maze. Results indicated that SAL and LAL individually housed mice displayed higher locomotion activity than LAL group-housed mice. In the plus-maze test, SAL and LAL individually housed mice showed more total and open arm entries than group-housed LAL mice, confirming the hyperactivity of individually housed mice and suggesting that isolation had no clear anxiolytic or anxiogenic actions. In the water-maze, we compared the performance of individually housed SAL, individually housed LAL mice, and group-housed LAL mice treated with nicotine (0.35 and 0.175mg/kg) or vehicle. Nicotine did not improve acquisition in group-housed mice and even impaired it in individually housed mice. Retention of platform position was better in vehicle-treated individually housed mice in comparison with vehicle-treated group-housed mice. The present study demonstrates that housing conditions but not level of aggressiveness modify spontaneous locomotor activity and behaviors displayed on the elevated plus-maze test, and can also influence retention of a spatial learning task.
Descriptors: mice, spatial learning, housing conditions, aggressiveness, anxiety, nicotine, effect.

Morien, A., L. Garrard, and N.E. Rowland (1999). **Expression of Fos immunoreactivity in rat brain during dehydration: effect of duration and timing of water deprivation**. *Brain Research* 816(1): 1-7. ISSN: 0006-8993.
Descriptors: rat, brain, dehydration, water deprivation, Fos, immunoreactivity, duration, timing.

Moshkin, M.P., L.V. Akinchina, O.T. Kudaeva, I.E. Kolosova, and V.A. Kozlov (2004). **The influence of female mouse smell on the immunity, endocrine status and aggressive behavior of laboratory male mice**. *Immunologiya* 25(6): 350-354. ISSN: 0206-4952.
Abstract: The impact produced by the smell of ICR females (1-, 7- or 21-day expositions) on the immune functions of ICR males, which were kept in 4-species groups, was investigated. Chemosignals of females provoked a higher concentration of testosterone in blood plasma of males and activated temporarily the adrenocortical system - the concentration of corticosterone in blood plasma was increasing by day 7 of the smell exposition. The chemosignals suppressed the humoral response to sheep erythrocytes (SE) and reduced the proliferative response of B cells to LPS, but they did not affect the scope of the cell immune response (CIR) and even intensified the spontaneous synthesis of IgG by splenic cells. The immunosuppressive effect from the smell petered out in castration. The androgen-dependent suppression of the humoral-response mechanisms did not affect negatively the survival of males in group aggression. It was rather the other way: the immunophysiological changes caused by the reproductive chemosignals of females contributed to a better resistance of males to trauma, whose probability increases in competition for a potential sexual partner.
Descriptors: behavior, biochemistry and molecular biophysics, endocrine system, chemical coordination and homeostasis, immune system, castration, clinical techniques, aggressive behavior, cell immune response, sexual competition, smell.

Murakoshi, K. and T. Noguchi (2005). **Simulation of rat behavior by a reinforcement learning algorithm in consideration of appearance probabilities of reinforcement signals**. *Biosystems* 80(1): 83-90. ISSN: 0303-2647.
Descriptors: behavior, models and simulations, computational biology, reinforcement learning algorithm, mathematical and computer techniques, reinforcement learning, reinforcement signal.

Nagai, T., K. Yamada, and T. Nabeshima (2005). **Behavioral approaches for analyzing emotionality in mutant mice**. *Folia Pharmacologica Japonica* 125(2): 71-76. ISSN: 0015-5691.
Descriptors: behavior, biochemistry and molecular biophysics, nervous system, neural coordination, pharmacology, brain chemistry, emotionality, head dipping behavior, marble burying behavior, psychology, social interaction.

Nishioka, K., M. Okano, Y. Ichihara, N. Ichihara, and K. Nishizaki (2005). **Immunosuppressive effect of restraint stress on the initiation of allergic rhinitis in mice**. *International Archives of Allergy and Immunology* 136(2): 142-147. ISSN: 1018-2438.

Descriptors: mice, allergic rhinitis, initiation, restraint stress, immunosuppressive effect, acute stress, antibody production, inhibits.

Nunes, S., E.M. Muecke, J.A. Anthony, and A.S. Batterbee (1999). **Endocrine and energetic mediation of play behavior in free-living Belding's ground squirrels.** *Hormones and Behavior* 36(2): 153-65. ISSN: 0018-506X.

Abstract: Many juvenile mammals play, and rates and patterns of play behavior often differ between young males and females. The sexual dimorphisms typical of mammalian play suggest that it might be influenced by gonadal hormones. Moreover, because play competes with growth, physical development, and acquisition of fat reserves for available energy, play behavior should theoretically be influenced by energetic variables. We examined patterns of social play behavior and endocrine and energetic mediation of social play in free-living juvenile Belding's ground squirrels (*Spermophilus beldingi)*. Bouts of social play in young *S. beldingi* resembled adult copulation and fighting, and young males initiated sexual play but not play fighting at much higher rates than did young females. To elucidate the proximal causes of play, we altered early androgen exposure by treating females with testosterone (T) at birth and used females treated with oil vehicle as controls. We concurrently manipulated energy availability by provisioning with extra food and used unprovisioned squirrels as controls. Hourly rates of play behavior were highest near the time of weaning and declined thereafter among both experimental and control groups of juveniles. Thus, we observed no influence of either T treatment or food provisioning on the temporal patterning of play behavior. Perinatal T treatment had no effect on play fighting, but caused rates of sexual play behavior initiated by young females to increase to near those observed for young males, suggesting that T organizes a masculine tendency to initiate sexual play behavior but not play fighting. Food provisioning increased rates of play among males and females from both T-treated and control litters, suggesting that energy availability limits play behavior.

Descriptors: energy metabolism physiology, hormones physiology, play and playthings psychology, Sciuridae physiology, social behavior, aggression drug effects, aggression physiology, aging physiology, behavior, animal physiology, body weight physiology, hormones blood, sex behavior, animal drug effects, sex behavior, animal physiology, testosterone blood, testosterone pharmacology, testosterone physiology.

Oarada, M., T. Nikawa, and N. Kurita (2002). **Effect of timing of food deprivation on host resistance to fungal infection in mice.** *British Journal of Nutrition* 88(2): 151-158. ISSN: 0007-1145.

NAL Call Number: 389.8 B773

Abstract: Mice were deprived of food for a period of 72 h at varying times relative to the time of infection with *Paracoccidioides brasiliensis*. Host resistance was diminished profoundly when the period of food deprivation was from 48 h before to 24 h after infection (group B). When food deprivation was initiated immediately after infection (group C), host resistance was reduced less profoundly. When food deprivation was initiated at 24 and 48 h post-infection, reductions in host resistance were only moderate or not observed respectively. These results suggest that the earlier in the course of infection starvation occurs, the more profoundly host resistance is impaired. When food deprivation was initiated 72 h before infection, finishing at the time of infection (group A), the reduction in host resistance was considerably less profound compared with group B mice, suggesting that refeeding initiated immediately after infection is responsible for rapid restoration of the antifungal resistance in starved mice. Infection-induced responses of corticosterone and interferon-gamma were changed according to the timing of food deprivation. Group A mice, similar to non-fasted controls, showed an infection-induced increase in serum corticosterone concentration, while groups B and C did not. Group C mice showed a substantially greater infection-induced increase in serum interferon-gamma compared with the other fasted and non-fasted control groups.

Descriptors: food deprivation, starvation, timing, disease resistance, paracoccidioidomycosis, *Paracoccidioides brasiliensis*, mice, animal models, diet, interferon, blood serum, corticosterone, corticotropin, spleen, liver, refeeding.

Ohta, R., A. Matsumoto, T. Nagao, and M. Mizutani (1998). **Comparative study of behavioral development between high and low shuttlebox avoidance rats.** *Physiology and Behavior* 63(4): 545-51. ISSN: 0031-9384.

Abstract: Previously, we reported that high- and low-avoidance animals (HAA and LAA, respectively), selectively bred for different avoidance response rates in a shuttlebox avoidance test, showed additional behavioral differences in wheel cage activity and in water maze performance after weaning. In the present study, physical and behavioral development were examined in HAA and LAA during the preweaning period. As compared to HAA, LAA offspring showed lower body weight, delayed eye opening, poorer performance in pivoting and negative geotaxis, and increased open-field activity. A fostering study indicated that these differences observed in eye opening, pivoting, negative geotaxis, open-field activity, swimming speed, shuttlebox avoidance and wheel cage activity were independent of maternal care. Only the pup weight was strongly dependent on the maternal line. These results indicate that behavioral differences between HAA and LAA observed in the pre- and postweaning periods may be linked to the avoidance genotype, but the difference in pup weight may be caused by maternal care.
Descriptors: avoidance learning physiology, behavior, animal physiology, body weight drug effects, body weight physiology, growth physiology, locomotion physiology, maze learning physiology, motor activity physiology, musculoskeletal equilibrium physiology, rats.

Olsson, I.A.S., C.M. Nevison, E.G. Patterson Kane, C.M. Sherwin, H.A. Van de Weerd, and H. Wurbel (2003). **Understanding behaviour: the relevance of ethological approaches in laboratory animal science.** *Applied Animal Behaviour Science* 81(3): 245-264. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: mice, rats, laboratory animals, animal behavior, strain differences, animal housing, cages, environmental enrichment, smell, vision, hearing, taste, touch, validity.

Osiel, S., D.A. Golombek, and M.R. Ralph (1998). **Conservation of locomotor behavior in the golden hamster: effects of light cycle and a circadian period mutation**. *Physiology and Behavior* 65(1): 123-131. ISSN: 0031-9384.
Descriptors: golden hamster, locomotion behavior, conservation, light cycle, effects, circadian period, light-dark cycle, constant dark, activity.

Palanza, P., L. Gioiosa, and S. Parmigiani (2001). **Social stress in mice: gender differences and effects of estrous cycle and social dominance.** *Physiology and Behavior* 73(3): 411-20. ISSN: 0031-9384.
Abstract: A large discrepancy in the possibility of inducing social stress in the two genders exists. Since generalizations of findings from one sex to the other appear not to be valid, reliable models of social stress in females are needed. We examined the effects of social context in the housing environment, as a possible source of stress, on exploration and anxiety in male and female mice, taking into account the estrous phase for females and the social status for males as additional variables. Mice housed individually or with siblings were tested in a free-exploratory paradigm of anxiety (where test animals have a choice to stay in their home cage or to explore an open field, OF). Individually housed females did not leave their home cage for long periods, explored less the unfamiliar area and displayed higher risk assessment, a behavioral profile suggestive of lower propensity for exploration and higher level of anxiety compared with group-housed females. Individually housed males tended to show an opposite profile. Proestrus mice were less sensitive to the decrease of exploratory propensity induced by individually housing compared to estrus and diestrus mice. Social dominants and social subordinates in sibling groups did not differ in their exploratory responses to the OF. Different housing procedures, as means to provide different social environment, may differentially induce mild social stress in male and female mice.
Descriptors: estrus physiology, estrus psychology, social dominance, social environment, stress, psychological physiopathology, behavior, animal physiology, exploratory behavior physiology, mice, sex characteristics.

Patterson Kane, E.G., M. Hunt, and D. Harper (2002). **Rats demand social contact.** *Animal Welfare* 11(3): 327-332. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: rats, laboratory animals, cages, cage size, animal housing, motivation, animal welfare, environmental enrichment, group housing, animal preferences.

Patterson Kane, E.G., M. Hunt, and D.N. Harper (1999). **Behavioral indexes of poor welfare in laboratory rats.** *Journal of Applied Animal Welfare Science* 2(2): 97-110. ISSN: 1088-8705.

NAL Call Number: HV4701.J68
Descriptors: rats, cages, enrichment, group size, fearfulness, floor space, exploration, stress response, animal welfare.

Pedrazzini, T., J. Seydoux, P. Kuenstner, J.F. Aubert, V. Pasdrun, E. Grouzmann, F. Beermann, and H.R. Brunner (1998). **Cardiovascular response, feeding behaviour, and locomotor activity in NPY Y1 receptor-deficient mice**. *Society for Neuroscience Abstracts* 24(1-2): 2046. ISSN: 0190-5295.
Descriptors: feeding behavior, locomotor activity, cardiovascular response, deficient mice, NPY Y1 receptor.
Notes: Meeting Information: 28th Annual Meeting of the Society for Neuroscience, Part 2, November 7-12, 1998, Los Angeles, California, USA.

Peterson, N.C. and J.E. Peavey (1998). **Comparison of in vitro monoclonal antibody production methods with an in vivo ascites production technique.** *Contemporary Topics in Laboratory Animal Science* 37(5): 61-66. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: mice, monoclonal antibodies, ascites, tissue culture, animal welfare, production costs, labor requirements, antibody formation, laboratory equipment.

Petervari, E., M. Balasko, Z. Szelenyi, Z. Hummel, and M. Szekely (2002). **Fasting hypometabolism and thermoregulation in cold-adapted rats.** *Journal of Thermal Biology* 27(5): 359-364. ISSN: 0306-4565.
NAL Call Number: QP82.2.T4J6
Abstract: (1) Cold-adapted rats, upon acute cold-exposure, exhibit overshoot increase in metabolic rate (MR) and paradoxical rise in core temperature (Tc). (2) Fasting causes suppression of resting (daytime) but not nocturnal MR and Tc. (3) In fasting rats, acute cold-exposure evokes relatively greater overshoot MR- and Tc-rises than in control rats, while central prostaglandin E induces relatively greater elevations in MR and Tc. (4) Re-feeding quickly reverses fasting-induced MR- and Tc-suppression, earlier than body weight is normalized. (5) The metabolic suppression originating from gastrointestinal signals can be overruled by opposite abdominal information (feeding) or by thermoregulatory information (cold signals).
Descriptors: fasting, thermoregulation, cold adapted, rats, metabolic rate, core temperature, feeding, cold, gastrointesinal.

Pohorecky, L.A. (1999). **Testing the genetics of behavior in mice.** *Science* 285(5436): 2067-8; Author Reply 2069-70. ISSN: 0036-8075.
Descriptors: behavior, animal, genetics, behavioral methods, housing, animal, animals, laboratory, confounding factors epidemiology, handling psychology, mice, rats.
Notes: Comment On: *Science*. 1999 Jun 4;284(5420):1670-2.

Powell, F. and P.B. Banks (2004). **Do house mice modify their foraging behaviour in response to predator odours and habitat?** *Animal Behaviour* 67(4): 753-759. ISSN: 0003-3472.
NAL Call Number: 410 B77
Abstract: Predator odours and habitat structure are thought to influence the behaviour of small mammalian prey, which use them as cues to reduce risks of predation. We tested this general hypothesis for house mice, *Mus domesticus*, by manipulating fox odour density via addition of fox scats and habitat via patchy mowing of vegetation, for populations in 1515-m field enclosures. Using giving-up densities (GUDs), the density of food remaining when an animal quits harvesting a patch, we measured foraging behaviours in response to these treatments. Mice consistently avoided open areas, leaving GUDs two to four times greater in these areas than in densely vegetated patches. However, mouse GUDs did not change in response to the addition of fox scats, even immediately after fresh scats were added. There was no interaction between fox odour and habitat use. We then tested whether habituation to fox odours had occurred, by comparing the individual responses to scats of eight mice born into enclosures with fox scats to those of eight mice born into scat-free enclosures and five wild mice. In smaller enclosures, GUDs of trays with scats did not differ from GUDs of trays without scats for any treatment. We conclude that exposure to high levels of fox odours did not alter the foraging behaviour of mice, but that mice did reduce foraging in areas where habitat was removed, perceiving predation risk to be greater in these areas than controls. We suggest further that studies using the scat-at-trap' technique, which have shown

avoidance of predator odours by mice and other small mammals, may overestimate the general avoidance of predator odours by free-living prey, which must forage with a constant background of predator odours.
Descriptors: foraging behavior, odor, predator prey interactions, habitat selection, cover, risks, risk assessment, *Mus musculus*.

Powell, S.B., H.A. Newman, T.A. McDonald, P. Bugenhagen, and M.H. Lewis (2000). **Development of spontaneous stereotyped behavior in deer mice: effects of early and late exposure to a more complex environment.** *Developmental Psychobiology* 37(2): 100-8. ISSN: 0012-1630.
Descriptors: behavior, animal physiology, environment, *Peromyscus* psychology, stereotyped behavior physiology, age factors, newborn animal psychology, mice.

Price, H. (2002). **Veterinary role in laboratory mouse welfare**. *Veterinary Times* 32(33): 14. ISSN: 1352-9374.
Descriptors: mouse, welfare, laboratory animals, veterinary role.

Pullinger, V.J. and N. Dawson (2003). **Animal welfare dentistry: modernising dental care in rodents 'a cut in the right direction'**. *Animal Technology and Welfare* 2(3): 189-191. ISSN: 0264-4754.
NAL Call Number: SF757.A62
Descriptors: animal welfare, dental care, laboratory animals, techniques, teeth, rodents.

Rashotte, M.E., A.M. Ackert, and J.M. Overton (2002). **Ingestive behavior and body temperature during the ovarian cycle in normotensive and hypertensive rats**. *American Journal of Physiology* 282(1, Part 2): R216-R225. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: The relationship between ingestive behaviour (eating+drinking) and core body temperature (Tb) in naturally cycling female rats was compared in a normotensive strain (Sprague-Dawley; SD) and a hypertensive strain reputed to have chronically elevated Tb (spontaneously hypertensive rats; SHR). Tb (by telemetry) and ingestive behaviour (automated recording) were quantified every 30 seconds. Ingestive behaviour and Tb were related on all days of the ovarian cycle in both strains but the strength of that relationship was reduced on the day of oestrus (E) compared with non-oestrous days. Several strain differences in Tb were found as well. In SHR, dark-phase Tb was elevated on E, whereas SD remained at the lower non-oestrous values. Fluctuations in dark-phase Tb were correlated with ingestive behaviour in both strains but had greater amplitude in SHR except on E. Short-term fasting or sucrose availability did not eliminate elevated dark-phase Tb on E in SHR. We propose that oestrus-related changes unique to SHR may indicate heightened thermal reactivity to hormonal changes, ingestive behaviour and general locomotor activity.
Descriptors: body temperature, feed intake, feeding behavior, hypertension, ingestion, estrus cycle, estrus, strain differences, strains, water intake, rats.

Roche, J.P. and W. Timerlake (1998). **The influence of artificial paths and landmarks on the foraging behavior of Norway rats (*Rattus norvegicus*)**. *Animal Learning and Behavior* 26(1): 76-84. ISSN: 0090-4996.
NAL Call Number: QL785.A725
Abstract: In two experiments, we explored how the foraging behavior of Norway rats was influenced by different arrangements of artificial paths and vertical landmarks. The rats used the paths successively less for orienting to food in treatments in which paths led to food but were crooked, in which paths led only halfway to food, and in which paths were misaligned with respect to food. The arrangement of paths influenced the rats' rate of energy intake in the beginning of the experiment, whereas the arrangement of beacons did not. With experience, the rats employed different orientation strategies in the presence of different arrangements of paths or beacons, and, by the final 4 days, all groups achieved statistically indistinguishable net rates of return. The rates of energy intake were similar because the rats in different treatments traveled similar distances per session, despite differing arrangements of paths and landmarks.
Descriptors: rats, foraging, behavior, movement, orientation, nutrient intake, feeding habits, mammals, physiological functions, Rodentia, foraging efficiency, behavior patterns, energy intake.

Rogalska, J., M. Caputa, K. Wentowska, and A. Nowakowska (2004). **Stress-induced behaviour in juvenile rats: effects of neonatal asphyxia, body temperature and chelation of iron**. *Behavioural Brain Research* 154(2):

321-329. ISSN: 0166-4328.
Abstract: Newborn mammals, showing reduced normal body temperature, might be protected against iron-mediated, delayed neurotoxicity of perinatal asphyxia. Therefore, we investigated the effects of (1) neonatal body temperature and neonatal critical anoxia as well as (2) postanoxic chelation of iron with deferoxamine, on open-field stress-induced behaviour in juvenile rats. The third aim of this study was to compare (after the above-mentioned treatments) circadian changes in spontaneous motor activity and body temperature in juvenile rats permanently protected from any stress. Neonatal anoxia at body temperature adjusted (both during anoxia and 2 h reoxygenation) to a level typical of healthy (37 degrees C) or febrile (39 degrees C) adults led to the stress-induced hyperactivity in juvenile (5-45 days old) rats. Both normal neonatal body temperature of 33 degrees C and chelation of iron prevented the hyperactivity in rats. Neither neonatal body temperature nor neonatal anoxia affected spontaneous motor activity or body temperature of juvenile rats, recorded in their home-cages with implantable transmitters. Circadian rhythmicity was also undisturbed. Presented data support the hypothesis that physiologically reduced neonatal body temperature can provide a protection against iron-mediated postanoxic disturbances of behavioural stress responses in juvenile rats.
Descriptors: animal models, anoxia, body temperature, circadian rhythm, iron, laboratory animals, newborn animals, respiration, stress, rats.

Roughan, J.V. and P.A. Flecknell (2000). **Effects of surgery and analgesic administration on spontaneous behaviour in singly housed rats.** *Research in Veterinary Science* 69(3): 283-288. ISSN: 0034-5288.
NAL Call Number: 41.8 R312
Descriptors: pain, surgery, analgesics, ketoprofen, rats, laparotomy, behavior change, anesthesia, animal behavior, drug effects, buprenorphine.

Sakamoto, K., K. Kadota, and K. Oishi (2004). **Light-induced phase-shifting of the peripheral circadian oscillator in the hearts of food-deprived mice**. *Experimental Animals (Tokyo)* 53(5): 471-474. ISSN: 1341-1357.
Descriptors: mice, food deprived, light induced phase shifting, circadian oscillator, heart, mammalian, constant darkness, fasting.

Salas, S.P., A. Giacaman, and C.P. Vio (2004). **Renal and hormonal effects of water deprivation in late-term pregnant rats**. *Hypertension (Baltimore)* 44(3): 334-339. ISSN: 0194-911X.
Descriptors: pregnant rats, late term, water deprivation, renal effects, hormonal efects, plasma volume, food intake, body weight.

Salazar Juarez, A., R.R. Aguilar, L. Parra, and C. Escobar (2003). **Restricted feeding schedules modulate free-running drinking activity in malnourished rats**. *Biological Rhythm Research* 34(5): 459-473. ISSN: 0929-1016.
Descriptors: rats, resricted feeding, malnourished, drinking activity, light-dark conditions, behavioral patterns, proteins, free running.

Salmon, P.L., E.G.G. Buelens, and A. Sasov (2003). **Performance and limits of in vivo micro-CT imaging of trabecular bone in rats and mice, with consideration of animal welfare and tissue-weighted dosimetry.** *Calcified Tissue International* 72(4): 410. ISSN: 0171-967X.
Descriptors: rats, mice, skeletal system, movement, imaging, trabecular bone, micro computed tomography, animal welfare.
Notes: Meeting Information: 30th European Symposium on Calcified Tissues, May 8-12, 2003, Rome, Italy.

Sato, J., H. Morimae, K. Takanari, Y. Seino, T. Okada, M. Suzuki, and K. Mizumura (2000). **Effects of lowering ambient temperature on pain-related behaviors in a rat model of neuropathic pain**. *Experimental Brain Research* 133(4): 442-449. ISSN: 0014-4819.
Descriptors: rat model, neuropathic pain, pain related behaviors, ambient temperature, lowering, effects, aggravated pain related behaviors.

Scalera, G. (2001). **Taste preference and acceptance in thirsty and dehydrated rats.** *Physiology and Behavior* 71(5): 457-468. ISSN: 0031-9384.

Descriptors: rats, dehydrated, thirsty, preferences, fluid, intake, palatability, body fluid balance.

Schlingmann, F., H.A. Van de Weerd, V. Baumans, R. Remie, and L.F.M. Van Zutphen (1998). **A balance device for the analysis of behavioural patterns of the mouse.** *Animal Welfare* 7(2): 177-188. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: mice, animal behavior, behavior patterns, balances, recording instruments, physical activity, circadian rhythm.

Schradin, C. and N. Pillay (2003). **Paternal care in the social and diurnal striped mouse (*Rhabdomys pumilio*): laboratory and field evidence.** *Journal of Comparative Psychology* 117(3): 317-24. ISSN: 0735-7036.
Descriptors: microtinae psychology, paternal behavior, social environment, laboratory animal psychology, newborn animals, wild animal psychology, circadian rhythm, maternal behavior, nesting behavior, pair bond.

Schwarting, R.K.W. and C.R. Pawlak (2003). **Individual differences of pre-weaning ultrasound vocalization and effects of transient post-weaning housing in isolation on plus-maze and open field behavior in adult Wistar rats.** *Society for NeuroScience Abstract Viewer and Itinerary Planner*: Abstract No. 837.5.
Online: http://sfn.scholarone.com
Descriptors: rats, weaning housing, isolation, open field, behavior, individual differences, ultrasound vocalization.
Notes: Meeting Information: 33rd Annual Meeting of the Society of Neuroscience, November 08-12, 2003, New Orleans, LA, USA.

Seelke, A.M. and M.S. Blumberg (2005). **Thermal and nutritional modulation of sleep in infant rats.** *Behavioral Neuroscience* 119(2): 603-11. ISSN: 0735-7044.
NAL Call Number: QP351.B45
Descriptors: body temperature regulation, sleep physiology, newborn animals, food deprivation, nutritional status, rats, research support, National Institutes of Health, N.I.H., extramural, temperature.

Sefcikova, Z. and S. Mozes (2002). **Effect of early nutritional experience on the feeding behaviour of adult female rats**. *Veterinarni Medicina Uzpi* 47(10-11): 315-322. ISSN: 0375-8427.
Abstract: Female Wistar rats were subjected to food restriction (free access to food for 2 hours daily) as follows: a) during the suckling period, i. e. up to day 15 (SR), b) during the weaning period from day 15 to 30 (WR), c) throughout 30 days post partum (SWR) and d) during adulthood, i.e. from day 60-75 of life (AR). This restriction was then changed to an ad libitum regime. The significantly decreased body weight found in females coming from litters of restrictedly fed mothers showed that these animals were considerably undernourished. Appetitive motivation increased in females that had been exposed to a restricted feeding regime during their infant period but remained unaffected in females restrictedly fed during their adult age. In comparison with the ad libitum fed controls and AR groups, significantly increased mean food intake was observed in all postnatally underfed groups ($P<0.001$). The greatest inclination to hyperphagia and qualitative changes in feeding behaviour were observed in SWR females whose feeding regime was restricted for the longest time. These animals showed hyperphagia even in the new environment regardless whether the whole group or only one female was tested. Our results reveal a) a determinant influence of the feeding regime of the animals at early age (41 %) while environmental and social factors represent only about 17 and 4 %, respectively and that b) changes in feeding habits in adult female rats may significantly depend on the length of postnatal undernutrition.
Descriptors: rats, females, mothers, progeny, animal feeding, unrestricted feeding, restricted feeding, underfeeding, feed intake, body weight, suckling, weaning, social behavior, perinatal period, age, environmental factors, ancestry, behavior, developmental stages, feeding, feeding habits, feeding systems, mammals, parents, Rodentia, sex.

Seki, M., K. Yamaguchi, H. Marumo, and K. Imai (1997). **Effects of food restriction on reproductive and toxicological parameters in rats. In search of suitable feeding regimen in long-term tests**. *Journal of Toxicological Sciences* 22(5): 427-437.
Descriptors: food restriction reproductive, toxicological, rats, effects, feeding regimen, long term tests.

Severinsen, T. and I.C. Munch (1999). **Body core temperature during food restriction in rats**. *Acta Physiologica Scandinavica* 165(3): 299-305. ISSN: 0001-6772.

Abstract: Deep body temperature and locomotor activity of rats fed a reduced food amount (n=9) and of starved rats (n=9), were measured by implanted transmitters. Both groups were then refed ad libitum. The reduction in body temperature was significant for both groups, but larger in the starved rats. There was a displacement of the circadian temperature rhythm in the starved rats. No significant differences in locomotor activity between groups was observed until the start of refeeding. Rats fed reduced food amounts rapidly increased their activity, while the starved group retained a low activity for several days. Thermal conductance was reduced by 30% in both groups. It is concluded that the reduction in thermal conductance may explain how starving and semi-starving rats are able to maintain core temperatures close to normal, even if resting metabolic rates are drastically reduced. The measured reduction in body core temperature signifies a change in the thermoregulatory 'set-point' during starvation.

Descriptors: body temperature, food restriction, starvation, heat production, resting energy exchange, energy metabolism, physical activity, metabolism, rats.

Sharp, J., T. Azar, and D. Lawson (2005). **Selective adaptation of male rats to repeated social encounters and experimental manipulations.** *Contemporary Topics in Laboratory Animal Science* 44(2): 28-31. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Abstract: The objective of the present study was to determine how rats adapt to repeated encounters with an unfamiliar male or group of males and to experimental manipulations. Male rats were instrumented with radiotelemetry transmitters to monitor heart rate (HR), mean arterial blood pressure (MAP), and movements in the home cage as indices of arousal and stress. Groups of eight singly housed rats were exposed in their home cages to encounters with an unfamiliar rat or a group of three rats of the same strain, age, and sex for a period of 18 h (1600 to 1000 h) on four consecutive days. On separate occasions, the instrumented rats were given a subcutaneous injection of sterile saline in the animal room or were transported from the animal room to the laboratory and then injected at 1000 h on four consecutive days. Exposure to an unfamiliar rat or a group of 3 rats induced significant ($P < 0.05$) increases in HR, MAP, and movement in the first 30 min of exposure, and these responses partially but significantly ($P < 0.05$) adapted by the second or third day. Nocturnal movement in the home cage also was significantly ($P < 0.05$) increased on the first night and partially reduced on subsequent nights, but nocturnal HR responses were absent or significantly blunted. Nocturnal MAP was not increased. Subcutaneous injection in the animal room or after transport to the laboratory produced significant ($P < 0.05$) increases in HR, MAP, and movement in the cage 30 min after the injection, and these responses did not adapt over the four days of the experiment. We concluded that male Sprague-Dawley rats adapted quickly, albeit partially, to social encounters but did not adapt to repeated injections, suggesting selective adaptation depending on the type of stimulus used.

Descriptors: social encounters, male rats, adaptation, experimental manipulations, radiotelemetry, Sprague Dawley rats.

Sharp, J., T. Zammit, T. Azar, and D. Lawson (2003). **Are "by-stander" female Sprague-Dawley rats affected by experimental procedures.** *Contemporary Topics in Laboratory Animal Science* 42(1): 19-27. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, female animals, laboratory animals, animal stress, animal welfare, gender differences, group housing, animal behavior, euthanasia, animal use refinement, heart rate, animal handling, animal physiology, individual housing.

Sharp, J., T. Zammit, T. Azar, and D. Lawson (2003). **Stress-like responses to common procedures in individually and group-housed female rats.** *Contemporary Topics in Laboratory Animal Science* 42(1): 9-18. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory animals, animal stress, animal welfare, animal handling, group housing, gender differences, cages, heart rate, blood pressure, female animals, circadian rhythm, animal use refinement, restraint of animals, subcutaneous injection, odors, intravenous injection, animal behavior, animal physiology, individual

housing.

Sharp, J., T. Zammit, T. Azar, and D. Lawson (2002). **Does witnessing experimental procedures produce stress in male rats?** *Contemporary Topics in Laboratory Animal Science* 41(5): 8-12. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Abstract: The objective of this study was to test the hypotheses that male rats are stressed by being in the same room as animals subjected to common husbandry and experimental procedures and that the level of stress is affected by housing density. Two commonly used indices of stress, heart rate (HR) and mean arterial blood pressure (MAP), were determined by using radiotelemetry for 2 h before and 3 h after rats witnessed the following procedures: decapitation, decapitation and necropsy, cage change, restraint and subcutaneous injection, and restraint and tail-vein injection. In addition, home cage behaviors (sleeping, awake, moving, rearing, and grooming) were scored once each minute for 15 min before and 45 min after the procedures. Witnessing decapitation or decapitation and necropsy of 6 other rats induced small, but significant, increases in HR and MAP in animals housed alone, whereas responses in animals housed with one or three cagemates were more transient or not significant. Witnessing a routine cage change also induced small increases in HR and MAP in rats housed alone or with one cagemate, but HR and MAP decreased in rats housed four per cage. HR and MAP did not change in rats witnessing restraint and a subcutaneous injection of other rats, but these indices were transiently increased when rats witnessed animals being restrained in a rodent restrainer and given a tail-vein injection. Home cage behaviors were significantly altered only in rats witnessing decapitation and necropsy and then only in rats housed alone. We conclude that male Sprague-Dawley rats are not significantly stressed when present in the same room in which decapitation or other common experimental procedures are being performed, especially when the animals are housed with cagemates.
Descriptors: animal husbandry methods, blood pressure physiology, heart rate physiology, stress physiopathology, vision, autopsy, euthanasia, animal housing, injections, photic stimulation, rats, Sprague Dawley rats, physical restraint, specific pathogen free organisms, time factors.

Sharp, J.L., T.G. Zammit, T.A. Azar, and D.M. Lawson (2002). **Stress-like responses to common procedures in male rats housed alone or with other rats.** *Contemporary Topics in Laboratory Animal Science* 41(4): 8-14. ISSN: 1060-0558.
NAL Call Number: SF405.5.A23
Descriptors: rats, laboratory mammals, male animals, stress, stress factors, heart rate, blood pressure, group size, stocking density, cages, physical activity, restraint of animals, injection, odors, animal welfare, animal husbandry, telemetry, data collection, group housing, cage changing.

Sherwin, C.M. (1996). **Preferences of laboratory mice for characteristics of soiling sites**. *Animal Welfare* 5(3): 283-288. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: laboratory animals, animal welfare, mice, cages, defecation, animal housing, excretion, mammals, physiological functions, Rodentia, useful animals.

Sherwin, C.M. (2004). **The motivation of group-housed laboratory mice, *Mus musculus*, for additional space**. *Animal Behaviour* 67(4): 711-717. ISSN: 0003-3472.
NAL Call Number: 410 B77
Abstract: The limited amount of space that we provide for research animals can adversely influence the validity of behavioural data and animal welfare. Consumer demand studies have examined the strength of motivation that animals have for additional space; however, one problem of these studies is that the animals tested were generally of a gregarious species, but were tested in isolation. I trained a single mouse from each of six groups to perform an operant task to gain access to an additional 319, 777, or 1600cm super(2) while group-housed. As the cost of visits increased, the mice continued to gain access to the additional space, although the numbers of visits and the time in the additional space decreased. The slopes of the demand functions for the three amounts of additional space ranged between 0.64 and 0.44, indicating that the mice perceived additional space to be an important resource. The slopes of the demand functions, the areas under the demand functions and the Y-axis intercepts were not significantly different between the three sizes of additional space, thus corroborating previous similar work. These results indicate that group-housed laboratory mice in standard laboratory cages

were highly motivated for additional space, but did not discriminate between the amounts offered.
Descriptors: mice, motivation, additional space, behavior, isolation, welfare, animal care, cage, space, group housing, single housing.

Shimizu, Y. and K. Tonosaki (1999). **Low environmental temperature modulates gustatory nerve activity and behavioral responses to NaCl in rats**. *American Journal of Physiology* 277(2): R368-R373. ISSN: 0002-9513.
NAL Call Number: 447.8 Am3
Abstract: The effects of cold ambient temperature on chorda tympani nerve responses to taste stimuli such as sucrose, NaCl, quinine HCl (QHCl) and HCl were studied in 76 male Wistar rats (6-7 weeks old, 180-230 g). The electrophysiological recordings of the whole chorda tympani nerves from control (22 degrees C) and cold-exposed (4 degrees C) rats revealed that the responses to sucrose, HCl and QHCl were unaffected by cold exposure. In contrast, the nerve responses to NaCl were enhanced time dependently, reaching a maximum 7-14 days after cold exposure. Responses to sodium acetate were likewise increased as they were to NaCl, whereas those to KCl were unchanged after cold exposure. In addition, the residual NaCl responses after lingual application of the sodium-channel blocker amiloride in cold-exposed rats were similar to those in control rats. It is thus most likely that cold exposure potentiates the chorda tympani nerve responses to Na+, but not to Cl-. Behavioural studies with the 2-bottle preference test showed that the cold-exposed rats refused to drink NaCl solutions at 0.05 and 0.1 M, the concentrations being preferred by control rats. It is concluded that the ambient temperature influences taste cell function, and that the enhanced NaCl response of the chorda tympani nerve is related to the avoidance of NaCl intake under cold environment.
Descriptors: environmental temperature, sucrose, taste, sodium chloride, cold stress, feeding behavior, rats.

Shiraishi, T., K. Sasaki, A. Niijima, and Y. Oomura (1998). **Effects of leptin and orexins on the feeding behavior in rats**. *NeuroScience Research Supplement* 22: S262.
Descriptors: rats, feeding behavior, leptin, orexins, effects.
Notes: Meeting Information: 21st Annual Meeting of the Japan Neuroscience Society and the First Joint Meeting of the Japan Neuroscience Society and the Japanese Society for Neurochemistry, September 21-23, 1998, Tokyo, Japan.

Sida, P., M. Koupilova, S. Hynie, and V. Klenerova (2003). **Effects of two types of restraint stress on the learned behaviour in rats.** *Acta Medica Hradec Kralove Universitas Carolina, Facultas Medica Hradec Kralove* 46(4): 153-6. ISSN: 1211-4286.
Abstract: To study the effects of stress on cognitive functions, Wistar and Lewis rats were exposed to restraint (immobilization stressor) (IMO) or restraint combined with partial immersion into water (IMO+C). Learned discriminatory avoidance response in Y-maze, with foot-shock as an unconditioned stimulus, was used as a memory test. The latency to enter the correct arm and number of wrong entries were daily recorded during the training period (20 days) until the criterion was reached, which was set at 90% avoidances (choosing the correct arm). After exposure of rats to one of the stressors for 60 min, the rats were returned to the home cage; the latency to enter the safe arm was recorded in 6 daily trials that started 1 h after application of stressor. Both stressors significantly prolonged the avoidance latencies for 2 or 3 days in Wistar and Lewis rats, respectively; then the latencies returned to the values obtained before the stress exposure. In Lewis rats, the latencies more increased after IMO+C than after IMO stressor, and the maximal increase in latencies was higher in Lewis rats than in Wistar rats. The latency did not reach the time limit for foot-shock delivery, and the number of correct choices remained unchanged in both strains. The results indicate that the used restraint stressors did not affect the long-term memory; rather a transient impairment of retrieval can be considered. Further, differences in response of Lewis and Wistar rats may be interpreted by different activity of hypothalamic-pituitary-adrenal axis activity in used strains.
Descriptors: avoidance learning, immobilization, stress, maze learning, rats, inbred Lewis rats, Wistar rats.

Silva, K.M. and W. Timberlake (1998). **The organization and temporal properties of appetitive behavior in rats**. *Animal Learning and Behavior* 26(2): 182-195. ISSN: 0090-4996.
NAL Call Number: QL785.A725
Abstract: In the presence and absence of an external interfood clock stimulus (a sequence of flashing lights), rats showed a multimodal behavior pattern during successive quarters of interfood intervals (IFI) ranging from

12 to 192 sec. Responses near the feeder peaked before and just after food presentations, whereas locomotion remote from the feeder peaked toward the middle of the IFI. The temporal patterns of nosing in the feeder and remote locomotion were scalar (the time at which a response peaked in the IFI was proportional to the IFI length), whereas the patterns of postfood feeder-directed behavior, rearing, and pawgrooming were time bound (peaking at a fixed time after food, regardless of IFI length). Responses varied in their control by the external clock stimulus. During the last half of the IFI, rats nosed in the feeder more with an external clock, but only at intermediate IFIs. During the first quarter of the IFI, rats pawgroomed more with an external clock, but only at the longest IFI. The general sequence of responses during the interfood clock was consistent with the view that food delivery engages an organized sequence of search states that are expressed through a variety of responses.
Descriptors: rats, feeding habits, animal training, stimuli, biological rhythms, timing, appetite, physical activity, behavior, mammals, nutrition physiology, physiological functions, Rodentia, visual stimuli.

Silva, R.C., N.R. Santos, and M.L. Brandao (2003). **Influence of housing conditions on the effects of serotonergic drugs on feeding behavior in non-deprived rats.** *Neuropsychobiology* 47(2): 98-101. ISSN: 0302-282X.
Descriptors: rats, non deprived, housing conditions, serotonergic drugs, effects, feeding behavior, serotonin.

Sluyter, F. and G.A. Van Oortmerssen (2000). **A mouse is not just a mouse.** *Animal Welfare* 9(2): 193-205. ISSN: 0962-7286.
NAL Call Number: HV4701.A557
Descriptors: mice, inbred lines, line differences, aggressive behavior, adaptability, genetic variation, nesting, biotopes, testing, wild animals, natural selection, genetic effects, age differences, experimental design, animal welfare, animal preferences.

Smith, J.W., J.R. Seckl, A.T. Evans, B. Costall, and J.W. Smythe (2004). **Gestational stress induces post-partum depression-like behaviour and alters maternal care in rats.** *Psychoneuroendocrinology* 29(2): 227-44. ISSN: 0306-4530.
Abstract: Gestational stress (GS) produces profound behavioural impairments in the offspring and may permanently programme hypothalamic-pituitary-adrenal (HPA) axis function. We investigated whether or not GS produced changes in the maternal behaviour of rat dams, and measured depression-like behaviour in the dam, which might contribute to effects in the progeny. We used the Porsolt test, which measures immobility in a forced-swim task, and models depression in rodents, while monitoring maternal care (arched-back nursing, licking/grooming, nesting/grouping pups). Pregnant rats underwent daily restraint stress (1 h/day, days 10-20 of gestation), or were left undisturbed (control). On post-parturition days 3 and 4, dams were placed into a swim tank, and time spent immobile was measured. GS significantly elevated immobility scores by approximately 25% above control values on the second test day. Maternal behaviours, in particular arched-back nursing and nesting/grouping pups, were reduced in GS dams over post-natal days 1-10. Adult offspring showed increased immobility in the Porsolt test, and also hypersecreted ACTH and CORT in response to an acute stress challenge. These data show that GS can alter maternal behaviour in mothers, and this might contribute to alterations in the offspring. GS may be an important factor in maternal post-natal depression, which may in turn detrimentally effect the offspring because depressed mothers do not sufficiently care for their offspring.
Descriptors: corticosterone blood, corticotropin blood, depression, postpartum physiopathology, maternal behavior physiology, prenatal exposure delayed effects, stress, psychological physiopathology, analysis of variance, depression, postpartum etiology, animal disease models, hypothalamo hypophyseal system physiopathology, maternal behavior psychology, pituitary adrenal system physiopathology, random allocation, rats,physical restraint, stress, psychological complications.

Smith, K.R. and R.A. Markle (1998). **Capsaicin use in neonatal rats: husbandry and welfare concerns.** *Lab Animal* 27(10): 38-40. ISSN: 0093-7355.
NAL Call Number: QL55.A1L33
Descriptors: rats, capsaicin, newborn animals, urination, dyspnea, animal welfare, skin lesions, complications.

Smorkatcheva, A.V. (2003). **Parental care in the captive mandarin vole, *Lasiopodomys mandarinus*.** *Canadian Journal of Zoology* 81(8): 1339-1345. ISSN: 0008-4301.
Descriptors: mandarin vole, parental care, nest cohabitation, male, female, grooming, nest building, activity,

division of labor.

Soffie, M., K. Hahn, E. Terao, and F. Eclancher (1999). **Behavioural and glial changes in old rats following environmental enrichment.** *Behavioural Brain Research* 101(1): 37-49. ISSN: 0166-4328.

Abstract: The effects of enriched environment on short-term memory for event durations and on astrocytes (cell density, cell area and % of GFAP immunoreactivity) in hippocampus (Hi), frontal cortex (FC) and corpus callosum (CC) were analysed in old rats housed from weaning to the end of behavioural testing (23 months) either in standard (SC) or in enriched (EC) conditions and in young adults (5 months) all housed in SC. Old SC and EC and young SC rats trained (for 2 months) or not, in a Symbolic Delayed Matching to Sample Task, had to discriminate and remember two (2- and 10-s) signals after short retention intervals. Results confirm the aging-related acquisition and memory deficit. EC reduced the slowness of acquisition, reversed the short-term memory deficit and promoted the retention of the short signal (choose short effect). Old SC naive rats had many hypertrophied astrocytes with long processes in Hi and CC while old EC rats had decreased astrocytes number and size. The behavioural testing resulted in young adult SC rats in Hi and CC, in increased astrocytes number, size and GFAP% and in their decrease in old SC rats. EC and testing have additive effects (very low astrocytes number, size and GFAP%) to compensate for the aging-induced gliosis, mostly in Hi.

Descriptors: aging psychology, behavior, animal physiology, brain physiology, environment, neuroglia physiology, astrocytes physiology, brain cytology, cell count, conditioning, operant physiology, corpus callosum cytology, corpus callosum physiology, discrimination psychology physiology, frontal lobe cytology, frontal lobe physiology, glial fibrillary acidic protein immunology, glial fibrillary acidic protein metabolism, hippocampus cytology, hippocampus physiology, immunohistochemistry, memory, short term physiology, neuronal plasticity physiology, Wistar rats.

Solomon, N.G. and T. Rumbaugh (1997). **Odor preferences of weanling and mature male and female pine voles.** *Journal of Chemical Ecology* 23(9): 2133-2143. ISSN: 0098-0331.

NAL Call Number: QD415.A1J6

Abstract: Olfactory cues from conspecifics have strong influences on behavior. Both female and male juveniles are attracted to familiar odors while adults show preferences for odors of opposite-sex conspecifics. Females show an increased preference for male odors as they mature, but no study has examined whether change with age is seen in males. In this experiment, responses of weanling and mature male and female pine voles (*Microtus pinetorum*) to familiar odor cues from their family versus those of an unfamiliar, opposite-sex conspecific were examined. Voles were tested in a three-chambered cage with end chambers containing the stimuli. There was a significant difference in odor preference between weanling and mature females. Weanling females preferred odor cues from their families, and mature females preferred the odors of unfamiliar mature males. The pattern was similar in males but the effect was not as strong. The results support the hypothesis that responses to odor cues change with age in pine voles. At least for females, the change in response to odor cues may be involved in the timing of reproduction and thus dispersal.

Descriptors: voles, odors, olfactory stimulation, sex differences, age differences, sexual maturity.

Spani, D., M. Arras, B. Konig, and T. Rulicke (2003). **Higher heart rate of laboratory mice housed individually vs in pairs.** *Laboratory Animals* 37(1): 54-62. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Many studies have shown that housing mice individually over a long period significantly alters their physiology, but in most cases measurement has required human interference and restraint for sampling. Using a radio-telemetry system with implantable transmitters, we recorded heart rate (HR), motor activity (ACT) and body temperature (BT) of freely moving male mice (NMRI) housed either individually or in pairs with an ovarectomized female. Data for each parameter were collected at 5 min intervals for two consecutive 24 h periods. Even after several weeks of habituation to the social conditions, HR was increased in mice housed individually compared with mice housed in pairs, although their measured ACT did not differ. Additionally, BT tended to be reduced in individually-housed mice. When the data were analysed according to different ACT levels, HR was increased in individually-housed mice during phases of low and high, but not intermediate, motor activity. Furthermore, individually-housed mice had more, but shorter, resting bouts, indicating disruption of the normal circadian sleep pattern. Enhanced HR in individually-housed mice does not necessarily indicate stress, but might be an important physiological indicator of discomfort. The fact that individual housing

alters basic physiological parameters in laboratory mice highlights the need to control for housing-dependent variation, especially in experiments that are sensitive to changes in these parameters.
Descriptors: mice, housing, pairs, individually, heart rate, telemetry, stress, physiological indicator.

Spreekmeester, E.S., J. Menard, S. Sharma, J. Diorio, J. Rochford, M.J. Meaney, and E. Grauer (2001). **Chronic variable stress in female rats: modulation by early life maternal care**. *Society for Neuroscience Abstracts* 27(1): 897. ISSN: 0190-5295.
Descriptors: rate, female, chronic variable stress, maternal care, modulation, early life, anxiety, grooming, behavior, variations, startle response.
Notes: Meeting Information: 31st Annual Meeting of the Society for Neuroscience, November 10-15, 2001, San Diego, California, USA.

Starkey, N.J. and C.A. Hendrie (1998). **Disruption of pairs produces pair-bond disruption in male but not female Mongolian gerbils.** *Physiology and Behavior* 65(3): 497-503. ISSN: 0031-9384.
Abstract: Previous studies have shown that separating gerbils from established male/female pairs has consequences for subsequent social behaviour. In males, this is characterized by decreased initiation of social contact, social investigation, and either decreased aggressive behaviour or increased defense. In females, there is an increase in immobile-in-contact, which serves to terminate social encounters initiated by another animal. Although these data show the effects of disrupting established pairs, they do not, per se, demonstrate the existence of male/female pair-bonds. Three studies were performed to address this issue in more detail. In the first study, separating females from single-sex groups was found to produce similar effects to those seen following separation from male/female pairs. Generally, opposite effects were seen in males. In the second study, the effects of separating females from male/female pairs were not seen when the original cagemate was replaced with a different animal. These effects persisted in males. The third study revealed that the presence of a female until immediately prior to testing was crucial in producing high levels of social investigation and aggression in males and that the observation of decreases in these behaviours following separation from male/female pairs was dependent on this. Together, these data show that, in males, individual housing is not a critical variable, that effects seen following the breaking of male/female pairs are not attenuated by the presence of a new female, and that these effects are not seen following separation from male/male pairs. It is concluded, therefore, that the behavioural consequences of removing males from established male/female pairs are due to separation from a specific female and that this is highly indicative of the existence of a bonding mechanism in male but not female, gerbils.
Descriptors: behavior, animal physiology, pair bond, aggression, Gerbillinae, sex factors, social behavior.

Stefanski, V., G. Knopf, and S. Schulz (2001). **Long-term colony housing in Long Evans rats: immunological, hormonal, and behavioral consequences.** *Journal of Neuroimmunology* 114(1-2): 122-30. ISSN: 0165-5728.
Abstract: The distribution pattern and the function of blood immune cells were investigated for 10 weeks in three mixed-sex colonies of Long Evans rats. After colony formation, a despotic dominance system was established between the males. This paper focuses on differences between subdominant colony and pair-housed control males. A reduced body mass development and hormonal status in subdominant males indicate stressful colony conditions. Subdominant males had lower numbers of CD4 and CD8 T cells, pronounced granulocytosis and reduced lymphocyte proliferation rates as compared with controls. The persistency of changes in subdominant males offers the opportunity to investigate the effects of long-term immuno-modulation on health.
Descriptors: Long Evans rats, colony housing, long term, behavior, immunological, pair housed, males.

Stern, J.M. (1996). **Somatosensation and maternal care in Norway rats**. In: *Advances in the Study of Behavior; Parental Care: Evolution, Mechanisms, and Adaptive Significance.* Vol. 25, Academic Press Inc.: San Diego, CA, USA; London, England, UK, p. 243-294.
Descriptors: Norway rats, maternal care, behavior, development, reproduction, female, licking behavior, nursing behavior, parental care, somatosensation.

Stricker, K.A., C. Burlet, and B. Beck (1998). **Behavioral deficits in monosodium glutamate rats: specific changes in the structure of feeding behavior**. *Life Sciences* 62(23): 2127-2132. ISSN: 0024-3205.
Descriptors: feeding behavior, deficits, rats, monosodium glutamate, specific changes, structure.

Suchomelova, E., P. Munclinger, and D. Frynta (1998). **New evidence of pseudosexual behaviour and female aggression in mice: neutral cage interactions in *Mus spicilegus* and *Mus spretus* (Rodentia: Muridae).** *Folia Zoologica* 47(4): 241-247. ISSN: 0139-7893.
Descriptors: *Mus spicilegus*, *Mus spretus*, behavioral sex differences, interspecific variation, behavioral variation, agonistic behavior, social behavior, neutral cage interactions, interspecific and sex differences, female aggression and pseudosexual behavior, comparative study.

Sudo, M., T. Moriya, M. Akiyama, and S. Shibata (2000). **Behavioral free-running and rhythmic expression of the clock genes under constant lighting conditions in mice**. *NeuroScience Research* 24(Supplement): S168. ISSN: 0921-8696.
Descriptors: mice, constant lighting conditions, clock genes, behavior, free running, rhythmic expression.
Notes: Meeting Information: 23rd Annual Meeting of the Japan Neuroscience Society and the 10th Annual Meeting of the Japanese Neural Network Society, 2000, Yokohama, Japan.

Surjo, D. and S.S. Arndt (2001). **The Mutant Mouse Behaviour network, a medium to present and discuss methods for the behavioural phenotyping.** *Physiology and Behavior* 73(5): 691-4. ISSN: 0031-9384.
Abstract: The nonprofit international Mutant Mouse Behaviour network "MMB" was founded within the framework of the conference "Behavioural Phenotyping of Mouse Mutants", February 2000, held in Cologne, Germany. It intends to be a forum for presenting and discussing all topics dealing with the behavioural phenotyping of mice. The major aim of the MMB is to support the interdisciplinary finding of a consensus on the methods and techniques used for behavioural phenotyping of mouse mutants. That means that scientist involved in the development of mouse models have to consent to the fact that a consideration of all the parameters that might affect the behaviour is necessary. Finding and establishing a consensus is a fluent process based on a continuous exchange of information. The network will provide a standardised database that includes detailed descriptions of test methods and of the relevant background parameters that might influence the behaviour of mice. Information will range from detailed descriptions of test methods, specifications of the equipment used, housing conditions, and specifications of the animals used according to the international nomenclature. The detailed descriptions will help in making behavioural tests and their results comprehensible and reproducible. A mailing list has been established to provide a platform for the continuous exchange of information between the network members. It will be a forum for discussing all topics related to behavioural phenotyping (see above). Scientists from all research areas involved are free to provide detailed information about their experimental work, and will, in return, get a quick response to their questions. Furthermore, the mailing list will be a useful medium to determine which information should be incorporated.
Descriptors: behavior, animal physiology, databases, mice, neurologic mutants genetics, phenotype, consensus development conferences, genetics, behavioral, international cooperation, mice.

Symes, P.A., S. Mcbennett, and J.F. Andrews (1997). **Feeding and behavioral thermoregulation in obese mice**. *Proceedings of the Nutrition Society* 56(1A): 76A. ISSN: 0029-6651.
Descriptors: mice, thermoregulation, feeding, behavioral, obese.
Notes: Meeting Information: Meeting of the Nutrition Society, June 24-28, 1996, Ulster, Coleraine.

Szczypka, M.S., M.A. Rainey, D.S. Kim, W.A. Alaynick, B.T. Marck, A.M. Matsumoto, and R.D. Palmiter (1999). **Feeding behavior in dopamine-deficient mice**. *Proceedings of the National Academy of Sciences of the United States of America* 96(21): 12138-12143. ISSN: 0027-8424.
Descriptors: mice, dopamine deficient, feeding, behavior.

Tang, X., S.M. Orchard, and L.D. Sanford (2002). **Home cage activity and behavioral performance in inbred and hybrid mice.** *Behavioural Brain Research* 136(2): 555-69. ISSN: 0166-4328.
Descriptors: behavior, animal physiology, motor activity physiology, anxiety genetics, anxiety psychology, defecation, exploratory behavior physiology, light, mice, inbred BALB c mice, inbred C57BL mice, inbred DBA mice, inbred mice strains, species specificity.

Tang, X. and L.D. Sanford (2005). **Home cage activity and activity-based measures of anxiety in 129P3/J, 129X1/SvJ and C57BL/6J mice.** *Physiology and Behavior* 84(1): 105-115. ISSN: 0031-9384.

Abstract: We investigated the home cage activity and emotional behavior in mouse strains used as background for many studies of altered genes [C57BL/6J (B6, n=20), 129X1/SvJ (X1, n=20) and 129P3/J (P3, n=19)]. In their home cages, X1 and P3 mice exhibited less locomotion than did B6 mice, and the X1 mice showed significantly greater rearing than B6 and P3 mice did. A battery of three tests conducted in an open field (open field, emergence and novel object) revealed strain rankings of B6>X1>P3 or B6>X1=P3 in most activity variables. Significant correlations were found between home cage activity and activity in each of three tests, but not in all observation periods. Strain rankings on the elevated zero maze test were B6=X1>P3 in the number of stretched-attend body postures (SAPS) during the initial 6-min exposure for naive mice. Naive and nonnaive mice showed significantly different behaviors on the elevated zero maze. The results suggest that rankings on anxiety are P3>X1>B6 and that B6 mice have greater exploration in a novel environment compared with X1 and P3 mice. However, anxiety-like behaviors differed among strains in open-field-based tests and in the zero maze, and testing experience impacted performance on the zero maze. The findings illustrate that test variations and experience can influence performance and suggest the need for the consideration of how these factors interact with background strains in assessing gene-altered mice.
Descriptors: mice, home cage activity, anxiety, locomotion, behavior, X1 mice, P3 mice, B6 mice.

Terranova, M.L., G. Laviola, L. De Acetis, and E. Alleva (1998). **A description of the ontogeny of mouse agonistic behavior.** *Journal of Comparative Psychology* 112(1): 3-12. ISSN: 0735-7036.
Abstract: The development of agonistic behavior was characterized in outbred Swiss CD-1 male *Mus domesticus*. At weaning (postnatal day [PND] 21), mice were housed either individually or as male pairs. Social encounters were carried out between dyads of initially unfamiliar same-age and same-housing subjects every 3rd day, from PND 23 to 47. The majority of both offensive and defensive elements had their onset around PND 29. Overall, their expression increased around puberty (i.e., on PND 35), which also represented the peak of an inverted U-shaped profile for the frequency of the "ambivalent" tail rattling behavior. A stability of dominance-submission relationships over development appeared, and early short latencies to display either the first crouched posture (subordinate) or the first attack (dominant) turned out to be possible predictors of adult social status. Ongoing individual housing was associated with a greater expression and an earlier onset of fighting behavior.
Descriptors: aging psychology, agonistic behavior, mice, dominance subordination, habituation psychophysiology, hierarchy, social, reaction time, sexual maturation, social environment, social isolation.

Thon, R., J. Lassen, A.K. Hansen, I.M. Jegstrp, and M. Ritskes Hoitinga (2002). **Welfare evaluation of genetically modified mice: an inventory study of reports to the Danish Animal Experiments Inspectorate**. *Scandinavian Journal of Laboratory Animal Science* 29(1): 45-53. ISSN: 0901-3393.
Descriptors: laboratory animals, mice, animal welfare, transgenic animals, pain, genetically modified organisms, mammals, Rodentia, transgenics, useful animals.
Language of Text: Danish summary.

Timm, R.M. and C. Vriesendorp (2003). **Observations on feeding behavior in the Vesper mouse, *Nyctomys sumichrasti.*** *Mammalian Biology* 68(2): 126-128. ISSN: 1616-5047.
Descriptors: Vesper mouse, feeding behavior, observations, social activity.

Toropila, M., M. Ondrasovic, J. Danko, M. Falis, and E. Svicky (2000). **Circadian oscillations of activities of rat liver adaptive enzymes during a short-term feed deprivation**. *Folia Veterinaria* 44(1): 21-24. ISSN: 0015-5748.
Abstract: After a 3-week period of adaptation to a standard artificial light regimen: light : darkness - 12 h : 12 h (07.00-19.00 h light, 19.00-07.00 h darkness), the experimental animals, male rats of Wistar strain SPF breeding, were deprived of feed starting at 08.00 h. During the subsequent 48 h (animals were deprived of feed for 0 - 48 h), activities of selected adaptive enzymes, tyrosine aminotransferase (TAT), tryptophan-2-3-dioxygenase (TO), aspartate aminotransferase (AST), and alanine aminotransferase (ALT) were determined in the liver cytosol fraction at 3-h intervals.Although the rhythm of circadian oscillations of selected enzyme activities was preserved in the animals fasting for different periods, some characteristics of the activities changed in comparison with well-fed animals, particularly during the dark period of the day.
Descriptors: rats, liver, enzyme activators, body parts, digestive system, mammals, Rodentia.

Touma, C., R. Palme, and N. Sachser (2004). **Non-invasive monitoring of stress hormones in mice: a technique opening new perspectives in biomedical and animal welfare research.** *Animal Welfare* 13, Supplement: S256-S257. ISSN: 0962-7286.

NAL Call Number: HV4701.A557

Descriptors: mice, animal welfare, stress hormones, monitoring, non invasive technique, new perspective, biomedical research.

Notes: Meeting Information: Universities Federation for Animal Welfare (UFAW) Symposium on Science in the Service of Animal Welfare, Animal Welfare, Edinburgh, UK, April 02-04, 2003.

Trentini III, J.F., B. Thompson, and J.S. Erlichman (2005). **The antinociceptive effect of acupressure in rats**. *American Journal of Chinese Medicine* 33(1): 143-150. ISSN: 0192-415X.

Abstract: Acupuncture and acupressure points correlate well with sites on the body that have low transcutaneous electrical resistance (TER). Using lightly sedated, adult Sprague-Dawley rats, we identified an acupoint (i.e. site with low TER) located on the hind limb of the rat and compared the effects of acupressure at this site on the nociceptive threshold to an adjacent, non-acupoint site (i.e. site with high TER). Focal pressure (55.42 +/- 2.2 g) was applied to the site for 10 minutes and the tail flick response (TFR) was determined by draping the distal portion of the tail over a heated wire (75 +/- 5 degrees C). Three trials were performed during each of three randomized conditions (i.e. acupoint, placebo and control) and the trials were averaged. All rats tested (515) showed a statistically significant increase in TFR following 10 minutes of acupressure at the acupoint compared to placebo or control trials (p = 0.007). Acupressure at the placebo point resulted in a TFR that was not statistically different from the control. Systemic administration of naloxone completely abolished the tail-flick inhibition induced by acupressure at the acupoint. These data suggest that acupressure elicits an antinociceptive effect in rats that is mediated by the endogenous release of opioids.

Descriptors: behavior, nervous system, neural coordination, acupressure, therapeutic and prophylactic techniques, clinical techniques, tail flick response, laboratory techniques, acupuncture, antinociceptive effect, transcutaneous electrical resistance.

Turner, P.V., M.A. Albassam, and R.M. Walker (2001). **The effects of overnight fasting, feeding, or sucrose supplementation prior to necropsy in rats.** *Contemporary Topics in Laboratory Animal Science* 40(4): 36-40. ISSN: 1060-0558.

NAL Call Number: SF405.5.A23

Descriptors: rats, laboratory mammals, blood chemistry, starvation, postmortem examinations, sucrose, body weight, liver, histology, glycogen, weight, feed intake, leukocyte count, neutrophils, blood sugar, alkaline phosphatase, alanine aminotransferase, enzyme activity, digestive tract, stomach, sex differences, animal welfare, animal use refinement.

Umezawa, M., K. Kogishi, H. Tojo, S. Yoshimura, N. Seriu, A. Ohta, T. Takeda, and M. Hosokawa (1999). **High-linoleate and high-alpha-linolenate diets affect learning ability and natural behavior in SAMR1 mice.** *Journal of Nutrition* 129(2): 431-437. ISSN: 0022-3166.

NAL Call Number: 389.8 J82

Abstract: Semipurified diets incorporating either perilla oil [high in alpha-linolenate, 18:3(n-3)] or safflower oil [high in linoleate, 18:2(n-6)] were fed to senescence-resistant SAMR1 mouse dams and their pups. Male offspring at 15 mo were examined using behavioral tests. In the open field test, locomotor activity during a 5-min period was significantly higher in the safflower oil group than in the perilla oil group. Observations of the circadian rhythm (48 h) of spontaneous motor activity indicated that the safflower oil group was more active than the perilla oil group during the first and second dark periods. The total number of responses to positive and negative stimuli was higher in the safflower oil group than in the perilla oil group in the light and dark discrimination learning test, but the correct response ratio was lower in the safflower oil group. The difference in the (n-6)/(n-3) ratios of the diets reflected the proportions of (n-6) polyunsaturated fatly acids, rather than those of (n-3) polyunsaturated fatty acids in the brain total fatty acids, and in the proportions of (n-6) and (n-3) polyunsaturated fatty acids in the total polyunsaturated fatty acids of the brain phospholipids. These results suggest that in SAMR1 mice, the dietary alpha-linolenate/linoleate balance affects the (n-6)/(n-3) ratio of brain phospholipids, and this may modify emotional reactivity and learning ability.

Descriptors: linoleic acid, linolenic acid diet, nutrient intake, mental ability, behavior, experimental diets, dams

mothers, pups, safflower oil, perilla, plant oils, mice, circadian rhythm, polyenoic fatty acids, ratios, brain, phosphatidylethanolamines, phosphatidylcholines, animal models, field activity, motor activity, light and dark discrimination, omega 3 fatty acids, omega 6 fatty acids.

Valsecchi, P., I. Bosellini, F. Sabatini, M. Mainardi, and G. Fiorito (2002). **Behavioral analysis of social effects on the problem-solving ability in the house mouse**. *Ethology* 108(12): 1115-1134. ISSN: 0179-1613.

Abstract: The effects of the social context on the problem-solving ability in the house mouse was evaluated by means of a puzzle box containing food, which could be opened by rotating a revolving door. The aim of the study was to clarify which mechanisms of social learning promote the acquisition of this complex motor skill. Young mice were exposed to the puzzle box in the presence of (i) demonstrators opening of the puzzle box; (ii) adults unable to open the puzzle box; and (iii) adults confined in one part of the cage and not manipulating the puzzle box. Results of the detailed analysis of the sequence of behaviors showed that (i) young mice successful in opening the puzzle box did not copy the sequence of actions performed by demonstrators; and (ii) the presence of adult conspecifics in proximity of the problem apparatus increased the rate of success of young mice. Results suggest that trial-and-error learning, social exposure and stimulus enhancement all play a role in the acquisition of the opening ability.

Descriptors: social environment, cognitive ability, environmental effects, enrichment, observational learning, mice.

Van der Harst, J.E., P.C.J. Fermont, A.E. Bilstra, and B.M. Spruijt (2003). **Access to enriched housing is rewarding to rats as reflected by their anticipatory behaviour**. *Animal Behaviour* 66(3): 493-504. ISSN: 0003-3472.

NAL Call Number: 410 B77

Descriptors: enrichment, housing, environmental effects, reinforcement, classical conditioning, appetitive behavior, arousal, anticipation, rats.

Van der Meer, M., P. Costa, V. Baumans, B. Olivier, and B. Van Zutphen (1999). **Welfare assessment of transgenic animals: behavioural responses and morphological development of newborn mice.** *ATLA, Alternatives to Laboratory Animals* 27(Supplement 1): 857-868. ISSN: 0261-1929.

NAL Call Number: Z7994.L3A5

Abstract: Four groups of mice of the same inbred strain, but with different transgenic backgrounds (no treatment; integration of a functional corticotrophin-releasing factor [CRF] gene construct; integration of a non-functional CRF gene construct; transgenic technique without integration of a DNA construct) were compared, in order to identify and quantify indicators of discomfort in transgenic animals. This approach enables us to differentiate between the effects of the technique of transgenesis and the effects caused by the expression of the transgene. This paper emphasises the search for differences in the early post-natal development of the animals. To this end, newborn mice have been subjected to various behavioural tests; moreover, their growth and morphological characteristics were measured from birth up to the age of 3 weeks. The results indicate that the presence of the microinjected DNA-construct influences the survival rate during the first 2-3 days after birth. The average loss of pups was about 10%, in contrast to the groups without the DNA construct, in which none of the pups died. The increase in the relative body weight of pups with a functional CRF construct was significantly lower than in the other groups, but only during the first 11 days. No significant differences in morphological characteristics or behavioural development were observed between the four groups. This approach was found to be adequate for detecting a broad variety of behavioural and morphological characteristics. Before general conclusions about the extent to which the technique of transgenesis affects animal welfare can be drawn, more transgenic lines should be studied in this way.

Descriptors: mice, transgenic animals, animal welfare, inbred strains, gene expression, postnatal development, perinatal mortality, liveweight gain, body weight, animal behavior, locomotion, strength.

Van der Meer, M., A. Rolls, V. Baumans, B. Olivier, and L.F.M. Van Zutphen (2001). **Use of score sheets for welfare assessment of transgenic mice.** *Laboratory Animals* 35(4): 379-389. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: The use of transgenic mice has increased dramatically in recent years and continues to increase further. However, because transgenesis may alter a balanced genotype and produce unpredictable effects, careful monitoring of health and welfare of the transgenic animal is advised. The present study assessed the

feasibility of the use of score sheets for monitoring transgenic mice, as part of daily routine, in a transgenic unit. The score sheets used were based on parameters which are sensitive and easy to determine. The score sheets were used by two animal technicians and a thorough evaluation showed that the score sheets, as described in this paper, are useful for routine monitoring in a transgenic unit and may result in the early detection of animal welfare problems. However, notwithstanding the limited number of parameters included and the restricted age-span covered by the screening, the monitoring system was considered to be time consuming. Large-scale implementation of such a scoring system during the first weeks of life would increase daily care time by at least 15-20 min for an average litter of 4-6 pups. Nevertheless, the use of score sheets seems to be a prerequisite for monitoring the animal's welfare in the course of producing transgenic lines.

Descriptors: mice, transgenic animals, laboratory mammals, animal welfare, monitoring, mortality, morbidity, postnatal development, young animals, weaning, postweaning interval, animal husbandry, animal care, welfare assessment, score sheets, animal welfare problems, daily routine.

Van der Staay, F.J. and T. Steckler (2001). **Behavioural phenotyping of mouse mutants.** *Behavioural Brain Research* 125(1-2): 3-12. ISSN: 0166-4328.

Abstract: Behavioural phenotyping of mouse mutants is not a goal in itself but serves to characterise the behavioural effects of naturally occurring or experimentally induced mutations. Genetically engineered mouse mutants are valuable tools to elucidate the genetic control of behaviour and the interaction between genetic and environmental factors. However, a prerequisite for their use is the ability to assess different elements of behaviour. To this end, a battery of tests, which should be flexible enough to meet the needs of a particular study, should be used to characterise the behavioural phenotype. Detailed and extensive information about the effects of gene mutations is crucial for model building and model evaluation. Model building is an iterative process, switching between experimental data and theory formation. In order to facilitate this process and to allow comparison of results within and between laboratories, the standardisation of breeding, housing, and testing conditions is essential. The development and standardisation of sensitive, valid behavioural tests which are suited to phenotype mouse mutants is both a responsibility and a challenge to investigators of mouse behaviour.

Descriptors: behavioral genetics, mice, mutant strains genetics, phenotype, genetic engineering, mice, transgenic mice, models, genetic, social environment.

Van Loo, P.L., H.A. Van de Weerd, L.F. Van Zutphen, and V. Baumans (2004). **Preference for social contact versus environmental enrichment in male laboratory mice.** *Laboratory Animals* 38(2): 178-88. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: Due to their aggressive nature, male mice are less frequently used than female mice in biomedical research. When aggressive males are being used, individual housing is common practice. The question arises whether this is an acceptable housing for a social species. The present study was designed to gain more insight into the nature of inter-male social contact and into the potential of a form of environmental enrichment (nesting material) to compensate for the lack of social contact. In a series of tests, we analysed whether male mice of different ages preferred to spend time (1) near a familiar cage mate versus an empty cage, or (2) near to a familiar cage mate versus direct contact with nesting material (tissues). Dwelling time in each of the test cages and sleeping sites was recorded, as was the behaviour of the test mice. Results indicated that when other conditions were similar, male mice preferred to sleep in close proximity to their familiar cage mate. Furthermore, the need to engage in active social behaviour increased with age. Tissues were used to a large extent for sleeping and sleep-related behaviour. It is concluded that single housing in order to avoid aggression between male mice is a solution with evident negative consequences for the animals. When individual housing is inevitable due to excessive aggressive behaviour, the presence of nesting material could partly compensate for the deprivation of social contact.

Descriptors: agonistic behavior, animal welfare, animal behavior, inbred BALB c mice psychology, social dominance, animal housing, mice, inbred BALB c mice physiology, random allocation.

Van Loo, P.L., L.F. Van Zutphen, and V. Baumans (2003). **Male management: Coping with aggression problems in male laboratory mice.** *Laboratory Animals* 37(4): 300-13. ISSN: 0023-6772.

NAL Call Number: QL55.A1L3

Abstract: In a laboratory environment, aggressive interactions between male mice may exceed normal levels

leading to negative effects both on the well-being of the animals and on the validity of experimental results. In this paper we review results from the literature and our own research with regard to coping with excessive aggressive behaviour in male laboratory mice. Based on this review practical recommendations concerning the housing and care of male laboratory mice are formulated. In short, it is recommended to avoid individual housing, to transfer odour cues from the nesting area during cage cleaning and to apply nesting material as environmental enrichment. Furthermore, group size should be optimized to three animals per cage. Further research, in particular into the effects of frequency, duration, type and severity of disturbances during an experiment on the degree of aggression, is recommended.

Descriptors: aggression, laboratory animals, sex characteristics, animal husbandry, animal behavior, environment, animal housing, mice, species specificity, male mice, aggression problems, coping, management, negative effects, review, recommendations, care, cage cleaning.

Van Loo, P.L.P., A.C. De Groot, B.F.M. Van Zutphen, and V. Baumans (2001). **Do male mice prefer or avoid each other's company? influence of hierarchy, kinship, and familiarity.** *Journal of Applied Animal Welfare Science* 4(2): 91-103. ISSN: 1088-8705.

NAL Call Number: HV4701.J68

Descriptors: mice, male animals, laboratory mammals, social dominance, animal welfare, cages, group size, aggressive behavior, feed intake, water intake, nests, animal preferences.

Varlinskaya, E.I., L.P. Spear, and N.E. Spear (1999). **Social behavior and social motivation in adolescent rats: role of housing conditions and partner's activity.** *Physiology and Behavior* 67(4): 475-82. ISSN: 0031-9384.

Abstract: The present study investigated 1) the effects of individual and grouped housing on social investigation, social contact behavior, and play behavior in adolescent rats tested with low socially active (grouped) and high socially active (isolated) play partners; and 2) the effects of long-term (8 days) and short-term (24 h) isolation on social behavioral manifestations and social motivation in terms of preference or avoidance of play partners. Social isolation of adolescent rats activated play behavior and social behaviors different from play, but play was predominantly affected under the conditions of this study. Long-term isolation was more effective than short-term, and resulted in greater manifestation of play and social preference. Adolescent rats were able to modify their social behaviors in response to social activity of the play partner: in isolated animals exposed to low socially active group-housed partners, play behavior was transformed into social activities unrelated to play; exposure of group-housed adolescents to high socially active previously isolated partners resulted in an increase of play behavior. Testing that allowed avoidance of social contacts revealed a dissociation between manifestations of play behavior and social motivation: group-housed play partners of isolated animals showed elevated levels of play behavior but a tendency to avoid their isolated pairmates.

Descriptors: rats, housing, social behavior, social environment, aging, activity, social isolation, play.

Varty, G.B., M.P. Paulus, D.L. Braff, and M.A. Geyer (2000). **Environmental enrichment and isolation rearing in the rat: effects on locomotor behavior and startle response plasticity.** *Biological Psychiatry* 47(10): 864-73. ISSN: 0006-3223.

Abstract: BACKGROUND: Laboratory rats exhibit behavioral changes that reflect a continuum of early life experience, from isolation-reared to socially reared to enrichment-reared conditions. In this study, we further characterize the behavioral effects of isolation, social, and enriched rearing on locomotor activity, patterns of movement and exploration, startle reactivity, prepulse inhibition (PPI), and habituation in adult rats. METHODS: Male Sprague-Dawley rat pups (21 days old) were housed under enrichment (three per cage with toys and exposure to enriched environments), normal social (three per cage), or isolation (one per cage) conditions. Eight weeks later, locomotor and exploratory behaviors, acoustic startle reactivity, PPI, and habituation were measured in the three groups. RESULTS: Enrichment-reared rats exhibited reduced exploration and rapid habituation of locomotor activity, increased startle reactivity, and normal PPI and startle habituation compared with socially reared controls. Isolation-reared rats exhibited increased exploration and normal habituation of locomotor activity, increased startle reactivity, reduced PPI, and normal startle habituation. CONCLUSIONS: Isolation- and enrichment-reared rats exhibited opposite changes in some behaviors and similar changes in other behaviors. Specifically, rats raised in enriched conditions appear more efficient at assimilating stimuli from their environment than do rats reared in isolation. Nevertheless, both

enrichment- and isolation-rearing conditions increased startle reactivity, whereas only isolation rearing led to disruptions of PPI in adulthood. These results suggest that isolation- and enrichment-rearing conditions produce some common and some differential effects on how rats process environmental stimuli. For studies of isolation-rearing effects on PPI, however, the complex and resource-intensive enrichment condition seems to offer few advantages over the normal social condition.
Descriptors: locomotion physiology, social environment, social isolation, startle reaction physiology, auditory perception physiology, behavior, animal physiology, exploratory behavior physiology, habituation psychophysiology physiology, rats, Sprague Dawley rats psychology, social behavior, spatial behavior physiology.

Veening, J.G., J.A. Bouwknecht, H.J.J. Joosten, P.J. Dederen, T.J.J. Zethof, L. Groenink, J. Van der Gugten, and B. Olivier (2004). **Stress-induced hyperthermia in the mouse: c-FOS expression, corticosterone and temperature changes**. *Progress in Neuro Psychopharmacology and Biological Psychiatry* 28(4): 699-707. ISSN: 0278-5846.
Descriptors: mouse, hyperthermia, stress induced, corticosterone changes, temperature changes, thermoregulatory response.

Vila, R., C. Adan, M.M. Grasa, R. Massanes, M. Esteve, C. Cabot, J. Estruch, J.A. Fernandez Lopez, X. Remesar, and M. Alemany (1998). **Food deprivation does not affect the levels of fatty-acyl-estrone in rat plasma**. *International Journal of Obesity* 22(Supplement 3): S186. ISSN: 0307-0565.
Descriptors: food deprivation, fatty-acyl-estrone, levels, rat, plasma, affect.
Notes: Meeting Information: Eighth International Congress on Obesity, August 29-September 3, 1998, Paris, France.

Von Frijtag, J.C., M. Schot, R. Van den Bos, and B.M. Spruijt (2002). **Individual housing during the play period results in changed responses to and consequences of a psychosocial stress situation in rats.** *Developmental Psychobiology* 41(1): 58-69. ISSN: 0012-1630.
Descriptors: aggression psychology, animal behavior physiology, animal housing, animal, play and playthings psychology, social behavior, social isolation psychology, stress psychology, analysis of variance, body weight physiology, rats, Wistar rats.

Walton, J.M. and K.E. Wynne Edwards (1997). **Paternal care reduces maternal hyperthermia in Djungarian hamsters (*Phodopus campbelli*).** *Physiology and Behavior* 63(1): 41-7. ISSN: 0031-9384.
Abstract: Throughout lactation, maternal body temperature, nest attendance, activity level and reproductive success of solitary female Djungarian hamsters housed at the recommended ambient temperature of 23 degrees C (Canadian Council on Animal Care guidelines) were compared with those of paired females housed at the same temperature and with solitary females housed at the natural burrow temperature of 18 degrees C. As expected, cooler ambient temperature improved pup survival and weaning weight. Likewise, paternal presence largely compensated for the poor pup growth typical at 23 degrees C. However, the mechanisms were not the same. Females at reduced ambient temperatures were as hyperthermic as females at the higher temperature and spent the same proportion of their day at very high body temperatures. However, the steeper temperature gradient available for passive cooling allowed those females to enhance maternal care by shortening their nest bout absences. In contrast, body temperatures of paired females were tightly regulated compared to the hyperthermia of solitary females and rarely included the highest body temperatures. This alleviation of maternal hyperthermia was not achieved through a reduction in nest attendance. Therefore, maternal hyperthermia in Djungarian hamsters is not essential and may be considered a substantial cost to females when males are not present.
Descriptors: fever physiopathology, maternal behavior, paternal behavior, fever psychology, growth physiology, hamsters, nesting behavior, *Phodopus*, survival, telemetry, temperature, time factors.

Wan, R., S. Camandola, and M.P. Mattson (2003). **Intermittent food deprivation improves cardiovascular and neuroendocrine responses to stress in rats.** *Journal of Nutrition* 133(6): 1921-1929. ISSN: 0022-3166.
NAL Call Number: 389.8 J82
Descriptors: rate, stress, responses, food deprivation, intermittent, cardiovascular, neuroendocrine, metabolism,

disease.

Warburton, H.J. and C.J. Nicol (2001). **The relationship between behavioural priorities and animal welfare: a test using the laboratory mouse *Mus musculus*.** *Acta Agriculturae Scandinavica Section A, Animal Science* 51(Supplement 30): 124-130. ISSN: 0906-4702.
Descriptors: mouse, behavioral priorities, animal welfare, relationship, test.

Weinandy, R. and R. Gattermann (1999). **Parental care and time sharing in the Mongolian gerbil**. *Zeitschrift Fuer Saeugetierkunde* 64(3): 169-175. ISSN: 0044-3468.
Descriptors: Mongolian gerbil, parental care, time sharing, birth, weaning, nestbuilding, behavior, biparental care.

Westenbroek, C., J.A. Den Boer, M. Gerrits, and G.J. Ter Horst (2003). **Chronic stress coping in isolated and socially housed male and female rats.** *Hormones and Behavior* 44(1): 83. ISSN: 0018-506X.
Descriptors: rats, male, female, housing, isolated, socially, chronic stress, coping, behavior.
Notes: Meeting Information: Society for Behavioral Neuroendocrinology Annual Meeting, June 25-28, 2003, Cincinnati, OH, USA.

Westenbroek, C., J.A. Den Boer, M. Veenhuis, and G.J. Ter Horst (2004). **Chronic stress and social housing differentially affect neurogenesis in male and female rats.** *Brain Research Bulletin* 64(4): 303-308. ISSN: 0361-9230.
Abstract: Stress plays an important role in the development of affective disorders. Women show a higher prevalence for these disorders than men. The course of a depression is thought to be positively influenced by social support. We have used a chronic stress model in which rats received foot-shocks daily for 3 weeks. Since rats are social animals we hypothesised that 'social support' might reduce the adverse effects of chronic stress. To test this hypothesis, male and female rats were housed individually or socially in unisex groups of four rats. The proliferation marker bromodeoxyuridine (BrdU) was injected 2 weeks before the sacrifice to investigate if stress and social housing influenced the survival of proliferating cells in the dentate gyrus (DG). To investigate changes in proliferation, another group of rats was sacrificed the day after the last BrdU injection. Stress significantly decreased BrdU labelling in individually housed males and not significantly in socially housed males. In individually housed females stress increased BrdU labelling, which was prevented by social housing. The increase found in females is most likely caused by differences in survival rate, since cell proliferation was not affected by stress or housing conditions. These results indicate that social support can affect neurogenesis in both female and male rats, however in a different way.
Descriptors: chronic stress, social housing, neurogenesis, effect, rats, male, female.

Wolfer, D.P., O. Litvin, S. Morf, R.M. Nitsch, H.P. Lipp, and H. Wurbel (2004). **Laboratory animal welfare: cage enrichment and mouse behaviour.** *Nature* 432(7019): 821-2. ISSN: 1476-4687.
Abstract: Mice housed in standard cages show impaired brain development, abnormal repetitive behaviours (stereotypies) and an anxious behavioural profile, all of which can be lessened by making the cage environment more stimulating. But concerns have been raised that enriched housing might disrupt standardization and so affect the precision and reproducibility of behavioural-test results (for example, see ref. 4). Here we show that environmental enrichment increases neither individual variability in behavioural tests nor the risk of obtaining conflicting data in replicate studies. Our findings indicate that the housing conditions of laboratory mice can be markedly improved without affecting the standardization of results.
Descriptors: animal welfare standards, laboratory animal physiology, laboratory animal psychology, animal behavior, animal physiology, animal housing, analysis of variance, laboratory animal genetics, brain physiology, brain physiopathology, hybridization, genetic, maze learning, mice, inbred C57BL mice, inbred DBA mice, phenotype, reproducibility of results.

Wommack, J.C. and Y. Delville (2003). **Repeated social stress and the development of agonistic behavior: individual differences in coping responses in male golden hamsters.** *Physiology and Behavior* 80(2-3): 303-8. ISSN: 0031-9384.
Abstract: In male golden hamsters, repeated social subjugation during puberty accelerates the development of

adult aggressive behavior and enhances its intensity in the presence of smaller individuals. The current study is focused on the characterization of the hormonal and behavioral responses to social subjugation during puberty. Subjugation consisted of daily exposure to an aggressive adult for 20-min periods from postnatal day 28 (P-28) to P-42, while controls were placed into an empty clean cage. Plasma cortisol levels were measured prior to or immediately after treatment on P-28 and P-42. On P-28, exposure to an aggressive adult or a clean and empty cage caused an increase in plasma cortisol levels. However, only social subjugation resulted in elevated cortisol levels on P-42, showing that juvenile hamsters habituate to an unfamiliar environment but not to social subjugation. In addition, we found a relationship between the frequency of submissive responses during social subjugation and the development of aggressive behavior. The transition from play fighting to adult aggression was most accelerated in the least submissive animals. These data show that behavioral response to social subjugation determines the development of aggressive behavior in golden hamsters. Our data also suggest that submissive behavior is a form of coping that attenuates the behavioral consequences of social subjugation in male golden hamsters.

Descriptors: adaptation, psychological physiology, aggression physiology, agonistic behavior physiology, individuality, stress, psychological physiopathology, aging, newborn animals, animal behavior, dominance subordination, hamsters, hydrocortisone blood, *Mesocricetus*, social behavior, social isolation psychology.

Wommack, J.C., A. Salinas, R.H.J. Melloni, and Y. Delville (2004). **Behavioural and neuroendocrine adaptations to repeated stress during puberty in male golden hamsters.** *Journal of Neuroendocrinology* 16(9): 767-75. ISSN: 0953-8194.

Abstract: In adult animals, the consequences of stress are often severe and long lasting. Repeated subjugation in adult male golden hamsters inhibits aggression and increases submissive and avoidant behaviours. By contrast, subjugation during puberty enhances offensive aggression. The goals of this study were to characterize behavioural and neuroendocrine responses of naive and repeatedly subjugated juveniles to social defeat and to assess potential recovery from social stress. From the onset of puberty on postnatal day 28 (P28) to mid puberty (P42), animals were either socially subjugated or placed in a clean and empty cage for 20 min daily. The subjugated and control groups were further divided into subgroups and sacrificed under basal conditions or after social defeat on P28, P35 (early puberty), P45 (mid puberty) and P70 (early adulthood). On P35 and P45, repeatedly subjugated juveniles showed a complete inhibition of olfactory investigation (i.e. risk assessment) towards aggressive adults. Repeatedly subjugated also animals had lower postdefeat cortisol levels than controls on P45. Interestingly, basal cortisol levels increased gradually during puberty but did not differ between treatment groups at any point. Repeated subjugation was also associated with increased tyrosine hydroxylase immunoreactivity (ir-TH) within the extended medial amygdala. After a 4-week recovery period, none of these variables differed between subjugated and control groups. In an additional experiment, subjugated adults also had increased ir-TH in the medial extended amygdala, suggesting that these neurones are particularly responsive to social stress. In conclusion, puberty may be a developmental period characterized by behavioural and neuroendocrine plasticity in stress responsiveness. Furthermore, peri-pubertal changes in stress hormones may explain why juvenile hamsters are more resilient to social stress than adults.

Descriptors: amygdala enzymology, dominance subordination, hydrocortisone blood, sexual maturation physiology, stress physiopathology, tyrosine 3 monooxygenase metabolism, adaptation, physiological physiology, psychological physiology, chronic disease, animal disease models, hamsters, *Mesocricetus*, social environment, stress.

Wright, G.L., R. Morrison, M.E. Fultz, G. Wright, W. McCumbee, P. Wehner, and M. Studeny (2003). **Effect of fasting on vascular contractility in lean and obese Zucker rats.** *Clinical Nutrition* 22(4): 359-363. ISSN: 0261-5614.

Descriptors: Zucker rats, obese, lean, fasting, effect, vascular contractility, blood pressure, body weight.

Wright, S.L. and R.E. Brown (2000). **Maternal behavior, paternal behavior, and pup survival in CD-1 albino mice (*Mus musculus*) in three different housing conditions.** *Journal of Comparative Psychology* 114(2): 183-92. ISSN: 0735-7036.

Abstract: Parental behavior, food consumption, and pup development in litters of CD-1 albino mice (*Mus musculus*) with single mothers or paired mothers in 3 different housing conditions were compared. Fewer pups survived when parents were required to run in a wheel to obtain food, and these pups had lower weights than

pups in the wheel-noncontingent and no-wheel groups. The presence of the male facilitated pup survival in the wheel-contingent group but had no effect on pup growth. Mice in the wheel-contingent group ran more revolutions than those in the wheel-noncontingent group and spent less time in parental care. In the wheel-contingent group, males spent more time running and ate less food than females, suggesting that males may indirectly facilitate pup development by providing food for the mother. The results suggest that the presence of the male increases pup care and may facilitate maternal behavior under appropriate environmental conditions.
Descriptors: appetitive behavior, animal behavior, maternal behavior, inbred mice strains psychology, paternal behavior, litter size, mice, survival.

Wurbel, H., R. Chapman, and C. Rutland (1998). **Effect of feed and environmental enrichment on development of stereotypic wire-gnawing in laboratory mice.** *Applied Animal Behaviour Science* 60(1): 69-81. ISSN: 0168-1591.
NAL Call Number: QL750.A6
Descriptors: mice, cages, enrichment, abnormal behavior, animal welfare, behavior patterns, physical activity, grooming, tubes, pelleted feeds, hardness, stereotypies, cardboard tubes.

Yabe, T. (2004). **Feeding behavior and harming mechanism in commensal rodents**. *Medical Entomology and Zoology* 55(4): 259-268. ISSN: 0424-7086.
Abstract: I discussed the relationships between harming mechanisms and feeding behavior such as commensalism, food habits, water requirements and responses to starvation in *Rattus rattus, R. norvegicus, R. exulans* and *Mus musculus*. Because of their commensalism they seasonally migrate between houses and the outdoors, and accidentally bring pathogens into houses. *R. norvegicus* is omnivorous and the others are basically herbivorous. However, they show unusual food habits and, for example, *R. rattus* eats bark and an excessive amount of insects when starving. Renal functions and food habits prove that *R. norvegicus* is the most prone to thirst, whereas *M. musculus* thrives in dry habitats. Feeding behavior is peculiar to rodent species and has characteristic relationship with harming mechanisms. Therefore, feeding behavior of involved species is a key factor to solve harming mechanisms.
Descriptors: behavior, pest assessment control and management, population studies, commensalism, feeding behavior, food habits, harming mechanism, renal function, starvation response, water requirements.

Yakovleva, T.V., N.M. Bazhan, and E.N. Makarova (1997). **Effects of food deprivation in early pregnancy on the development of ovaries and adrenals in female progeny of the water vole (*Arvicola terrestris*)**. *Comparative Biochemistry and Physiology, Part C, Pharmacology, Toxicology and Endocrinology* 116(1): 103-109. ISSN: 1367-8280.
Descriptors: food deprivation, early pregnancy, ovaries, adrenals, development, female progeny, water voles.

Yeboah, S. and K.B. Dakwa (2002). **Aspects of the feeding habits and reproductive biology of the Ghana mole-rat *Cryptomys zechi* (Rodentia, Bathyergidae)**. *African Journal of Ecology* 40(2): 110-119. ISSN: 0141-6707.
Descriptors: Ghana mole-rat, feeding habits, reproductive biology, aspects, stomach content, plant food source, breeding, birth weights.

Yi, I. and F.K. Stephan (1998). **The effects of food deprivation, nutritive and non-nutritive feeding and wheel running on gastric stress ulcers in rats.** *Physiology and Behavior* 63(2): 219-25. ISSN: 0031-9384.
Abstract: Feeding and housing conditions that induce gastric lesions were investigated. Rats were housed in activity wheels or in hanging cages and exposed to food deprivation, ad lib cellulose or 6 g of cellulose per day for 5 days. Food-deprived rats in both housing conditions had ulcers in the rumen but many rats also had mucosal ulcers. Cellulose prevented rumenal ulcers but produced a tendency toward more severe mucosal ulcers. Ulcers in wheel-housed rats were somewhat larger but the difference was not significant. In a second experiment, rats were fed 6 g/day laboratory chow or 6 g/day chow + ad lib cellulose until b.wt. reached a preset criterion. On the average, about 10 days on the feeding regimen were required to induce ulcers in these groups. None of the rats had rumenal ulcers. Mucosal ulcers were reliably larger in rats that received cellulose in addition to 6 g of chow. There was no difference in ulcer area between wheel-housed and cage-housed rats. The results indicate that solid bulk, regardless of its caloric value or amount, protects the nonglandular stomach whereas noncaloric bulk tends to aggravate ulcers in the glandular stomach. A small amount of chow delays the

rate of b.wt. loss and consequently ulcer formation. Furthermore, wheel running is not necessary to produce mucosal ulcers when food intake is insufficient to maintain b.wt. and b.wt. at sacrifice seems to be a good predictor of ulcer formation.

Descriptors: cellulose administration and dosage, food deprivation physiology, motor activity physiology, stomach ulcer physiopathology, stress physiopathology, body weight physiology, diet, energy intake, rats, Sprague Dawley rats.

Yigit, N., E. Colak, M. Sozen, S. Ozkurt, and R. Verimli (2001). **Observations on the feeding biology and behaviour of the fat dormouse, *Glis glis orientalis* nehring, 1903 (Mammalia: Rodentia) in captivity**. *Zoology in the Middle East* 22: 17-24. ISSN: 0939-7140.

Descriptors: fat dormouse, feeding biology, behavior, observations, captivity, gnawing patterns, hibernation, Rodentia.

Yoda, T., L.I. Crawshaw, K. Yoshida, L. Su, T. Hosono, O. Shido, S. Sakurada, Y. Fukuda, and K. Kanosue (2000). **Effects of food deprivation on daily changes in body temperature and behavioral thermoregulation in rats**. *American Journal of Physiology* 278(1, Part 2): R134-R139. ISSN: 0002-9513.

NAL Call Number: 447.8 Am3

Abstract: Homeothermic animals regulate body temperature (Tb) by using both autonomic and behavioral mechanisms. In the latter process, animals seek out cooler or warmer places when they are exposed to excessively hot or cold environments. Thermoregulation is affected by the state of energy reserves in the body. In the present study, we examine the effects of 4-day food deprivation on circadian changes in Tb and on cold-escape and heat-escape behaviors in rats. Continuous measurement of Tb during food deprivation indicated that the peak Tb amplitude was not different from baseline values, but the trough amplitude continuously decreased after the onset of food deprivation. Cold-escape behavior was facilitated by food deprivation, whereas heat-escape behavior was unchanged. After the termination of food deprivation, the lowered Tb returned to normal on the first day. However, cold-escape behavior was still facilitated on the third day after food reintroduction. Autonomic and behavioral thermoregulatory effectors are modulated in the face of food shortage so as to maintain optimal performance during the active period, whereas increasing energy conservation occurs during the quiescent phase.

Descriptors: body temperature, deprivation, food deprivation, thermoregulation, energy conservation, effects, animal models, rats.

Yoon, H., W.S. Chung, Y.Y. Park, and I.H. Cho (2005). **Effects of stress on female rat sexual function.** *International Journal of Impotence Research* 17(1): 33-8. ISSN: 0955-9930.

Abstract: This study was undertaken to investigate whether prolonged stress interferes with sexual behavior and changes biochemical and physiologic mechanisms. Experiments were repeated three times with different rats in each period. In all, 63 female Sprague-Dawley rats were employed, with 21 rats in each period, and the control group was maintained at room temperature with free access to food and water. The stress group was maintained under a scheduled stress condition for 10 days, and seven rats from the group were randomly selected and exposed to the control environment for 10 days as the recovery group. Sexual behavior, hormonal values, and neuronal and endothelial nitric oxide synthase (nNOS and eNOS) expressions of vaginal tissue were analyzed and compared. Serum testosterone levels were significantly elevated in the stress and recovery groups ($P<0.05$). Female rats in the stress group showed reduced receptivity to their male mates ($P<0.05$). Western blot analysis demonstrated that nNOS and eNOS expressions were significantly lower in the stress group ($P<0.05$) than in the other groups. We conclude that chronic physical stress modifies the sexual behavior of female rats through a mechanism believed to involve complex changes in sex hormones, endocrine factors, and neurotransmitters.

Descriptors: sex behavior, animal physiology, stress, psychological psychology, western blotting, cold, gonadal steroid hormones blood, hormones blood, muscle relaxation physiology, muscle, smooth physiology, nerve tissue proteins metabolism, nitric oxide synthase metabolism, rats, Sprague Dawley rats, restraint, physical, starvation psychology, vagina enzymology.

Yoshioka, M., H. Togashi, T. Yamaguchi, and M. Matsumoto (2005). **Emotional stress and functional development of the rat brain**. *Folia Pharmacologica Japonica* 125(2): 77-82. ISSN: 0015-5691.

Descriptors: rat, brain, functional development, emotional stress, behavior, nervous system, neural

coordination, behavioral and mental disorders, fear conditioning, fear response.

Youngblood, B.D., D.H. Ryan, and R.B.S. Harris (1997). **Appetitive operant behavior and free-feeding in rat exposed to acute stress**. *Physiology and Behavior* 62(4): 827-830. ISSN: 0031-9384.
Descriptors: rat, acute stress, exposed, free feeding, appetitive operant behavior.

Yupaporn, S. **Kan suksa phruttikam khong krachong-nu nai krong liang. [Study on the behavior of lesser mouse-deer in captivity].** *Journal of Wildlife in Thailand [Warasan Satpa Muang Thai]* 4(2): 77-82. ISSN: 0858-396X.
Abstract: Study on behavior of Lesser Mouse-deer in captivity at Khok Mai Reau Wildlife Breeding Center, spaned 7 years from January 1986 to October 1993. Lesser Mouse-deer were kept in two different sizes of enclosures. The 18*18*1.2 cubic m. enclosure was used to keep large group of mixed sexes and each of thirty 2.5*2.5*1.2 cubic m enclosures was used to keep one pair of Lesser Mouse-deer. In mating season, mortality rates of males were high in large group of mixed sexes due to fighting among males for female. Single fawns were born after a gestation of 138-142 days, and 6veraged weight was 256.8 g. Weaning period was at the age of 3 month when fawns started to feed on vegetative parts and fruits. Fawns were marked with eartages at the age of 4 month and juvenile reached sexual maturity at the age of 5 month.
Descriptors: wild animals, behavior, captivity, cages, animal housing, wildlife.
Language of Text: Thai with English and Thai summaries.

Zadeh, A.R.B. and P.W. Emery (1997). **The effect of surgical trauma on feeding behaviour in the rat**. *Proceedings of the Nutrition Society* 56(2): 240A. ISSN: 0029-6651.
Descriptors: rat, feeding behavior, surgical trauma, effect.
Notes: Meeting Information: Joint Meeting of the Clinical Nutrition and Metabolism Group of the Nutrition Society and the British Association for Parenteral and Enteral Nutrition, December 3-5, 1996, Blackpool, England, UK.

Zhang, S., T. Amsteint, J. Shen, F.R. Brush, and H.K. Gershenfeldt (2005). **Molecular correlates of emotional learning using genetically selected rat lines**. *Genes Brain and Behavior* 4(2): 99-109. ISSN: 1601-1848.
Abstract: The genetic contributions to active avoidance learning in rodents have been well established, yet the molecular basis for genetically selected line differences remains poorly understood. To identify candidate genes influencing this active avoidance paradigm, we utilized the bidirectionally selected Syracuse high- and low-avoidance (SHA and SLA) rat lines that markedly differ in their two-way active avoidance behavior. Rats were phenotyped, rested to allow recovery from testing stress and then hippocampi were dissected for gene expression profiling (Affymetrix U34A chips; approximately 7000 known genes), comparing SLA to SHA. Next, a subset of differentially expressed genes was confirmed by real-time PCR (RT-PCR) in hippocampi. Additional studies at the protein level were performed for some genes. Using triplicate arrays on pooled hippocampal samples, differentially expressed genes were identified by MICROARRAY SUITE 5.0 and robust multi-array average analyses. By RT-PCR analysis in hippocampi, eight genes were nominated as potential candidate genes consistent with the differential expression from the microarray data. Four genes, Veli1 (mlin-7B), SLC3a1, Ptpro and Ykt6p, showed higher expression in SHA hippocampi than SLA. Four genes, SLC6A4, Aldh1a4, Id3a, and Cd74, showed higher expression in SLA hippocampi than SHA. The active avoidance behavioral difference between lines probably emerges from 'many small things'. These potential candidate genes generate hypotheses for future testing in human association and rodent studies. Differences in levels of a pleiotropic gene like Ptpro and SLC6A4 suggest that small differences over a lifespan may contribute to large behavioral differences.
Descriptors: behavior, nervous system, neural coordination, molecular genetics, biochemistry and molecular biophysics, gene expression profiling, laboratory techniques, genetic techniques, real time reverse transcriptase polymerase chain reaction, affymetriix U34A chip, laboratory equipment, microarray suite 5.0, computer software, emotional learning.

Zivkovic, I.P., A.K. Rakin, D.M. Petrovic Djergovic, D.J. Kosec, and M.V. Micic (2005). **Exposure to forced swim stress alters morphofunctional characteristics of the rat thymus**. *Journal of Neuroimmunology* 160(1-2): 77-86. ISSN: 0165-5728.

Descriptors: biochemistry and molecular biophysics, blood and lymphatics, transport and circulation, immune system, chemical coordination and homeostasis, endocrine system, chronic stress, behavioral and mental disorders, apoptosis.

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Animal Welfare Information Center
United States Department of Agriculture
National Agricultural Library

Information Resources on the Care and Welfare of Rodents

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Selected Web Sites

Comfortable Quarters for Rats in Research Institutions. *Lawlor, M.M.*
Online: http://awionline.org/pubs/cq02/Cq-rats.html
Description: A discussion of the currently recommended caging parameters for rats and suggestion that a revision needs to take into account the basic behavioral, physiological, and exercise needs of the animals who live in such enclosures.

Environmental Enrichment for Laboratory Mice: Preferences and Consequences. *van der Weerd, H.A.*
Online: http://igitur-archive.library.uu.nl/dissertations/01801846/inhoud.htm
Description: This thesis indicates that the degree of complexity of environmental enrichment affects the behavior and physiology of mice. Individual chapters are viewed as PDF documents.

Environmental Enrichment for Rats. *Patternson-Kane, E.*
Online: http://www.awionline.org/pubs/Quarterly/Spring02/eerats.htm
Description: An article about providing enrichment for rats and published in the Animal Welfare Institute Quarterly, Spring 2002 issue.

Fact Sheets. *Australian and New Zealand Council for the Care of Animals in Research and Teaching Ltd. (ANZCCART)*.
Online: http://www.adelaide.edu.au/ANZCCART/publications/facts.html
Description: These fact sheets discuss the nutrition, housing, husbandry, and veterinary care of various animal species, including rodents, in laboratory environments.

Guidelines for the Housing of Rats in Scientific Institutions.
Online: http://www.animalethics.org.au/reader/housing-rats
Description: Provides guidance on best practice standards for housing rats based on published scientific information and practices employed in New South Wales, Australia.

Mouse Genome Informatics. *The Jackson Laboratory*.
Online: http://www.informatics.jax.org/
Description: Provides integrated access to information on the genetics and biology of the laboratory mouse.

Pain and Distress in Laboratory Rodents and Lagormorphs (PDF|139 KB).
Online: http://www.lal.org.uk/pdffiles/FelasaPain.pdf
Description: Report of the Federation of European Laboratory Animal Science Associations (FELASA) Working Group on Pain and Distress accepted by the FELASA Board of Management November 1992. The

FELASA Working Group considered the nature of pain and distress in laboratory rodents and lagomorphs because they constitute the vast majority of subjects used in experimentation. The information is arranged in sections, although these are not always mutually exclusive.

Report of the ACLAM Task Force on Rodent Euthanasia (PDF|148 KB). *American College of Laboratory Animal Medicine*.
Online: http://www.aclam.org/print/report_rodent_euth.pdf
Description: This 2005 report focuses on three issues: euthanasia of fetal and neonatal rodents, the use of carbon dioxide for rodent euthanasia, and the impact of euthanasia techniques on data.

Rodents: Housing and Husbandry. *National Centre for the Replacement, R.a.R.o.A.i.R.N.*
Online: http://www.nc3rs.org.uk/category.asp?catID=39
Description: Provides information and links on rodent housing, husbandry, and enrichment.

The Laboratory Rat: A Natural History. *Berdoy, M.*
Online: http://www.ratlife.org/
Description: Information and footage from a short film that follows the lives of domestic rats after being released in a large outdoor enclosure where they have to compete, like their wild cousins, for food, shelter and mates.

Variables, Refinement and Environmental Enrichment for Rodents and Rabbits kept in Research Institutions. *Reinhardt, V. and A. Reinhardt*.
Online: http://www.awionline.org/pubs/rabrodent/rodrab.html
Description: This online book discusses refinement and environmental improvement techniques for rodents and rabbits kept in research facilities.

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