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Information Resources for Animal Facility Sanitation and Cage Wash

AWIC Resource Series No. 19 - February 2003

*Prepared for USUHS Lab Animal Medicine Residency Program
CMO 504
Facility Sanitation Program*

Also see: [Laboratory Animal Facilities and Management, 1995](#)

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Cage Cleaning and Animal Health/Behavior Effects **Selected World Wide Websites**

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MANAGEMENT

Crouch, R. (1996). **Polymer floor and wall solutions.** *Lab Animal* 25(7): 34-36.

NAL call no.: QL55.A1L33

Descriptors: animal housing; materials; laboratories.

Deitrich, E.A. (1982). **Conserve without compromise: a practical application to cage washers.** *Lab Animal* 11(6): 57.

NAL Call Number: QL55.A1L33

Descriptors: laboratory animals; facilities; design; management; cages; washers; maintenance; operations; energy conservation.

Douglas, F.; Harris, H.J. (1993). **Facility design: choosing the right flooring.** *Lab Animal* 22(5): 51-57.

NAL call no.: QL55.A1L33

Descriptors: laboratories; floors; design.

Freson, S.J. (1998). **Animal room finishes: selecting and overseeing a resinous finish system.**

Lab Animal 27(6): 32-36.

NAL call no.: QL55.A1L33

Descriptors: laboratory animals; animal housing; laboratory rearing; design; finishes; resins; floors; floor type; walls; ceilings.

Hempel, P.; Merx, R.; Schulz, M.; Zillmann, U. (2000). **Computerised animal house management system (CAMS).**

AUTHOR EMAIL: m.schulz@dkfz-heidelberg.de *Journal of Experimental Animal Science* 41(4): 149-158.

Descriptors: computer system; housing experimental animal; information processing; practice guideline; health care facility; data base; computer program; computer terminal; laboratory personnel; documentation; control system; animal welfare; breeding; storage; cost benefit analysis; calculation; automation; management; nonhuman; mouse; rat; animal experiment; controlled study.

Iwaki Takamasa (1996). **Environmental control of laboratory animals.** *Tokyo Jikeikai Ika Daigaku Zasshi (Tokyo Jikeikai Medical Journal)* 111(5): 567-581.

Descriptors: laboratory animal; environmental management; breeding machine and tool; rearing box; microorganism contamination; prevention of pollution; cleaning device; air cleaning; dust; indoor air pollution; dung processing machine; automatic control; waste water treatment; research and development; water intake (organism); laboratory organism; organism; management; rearing facilities; pollution; environmental pollution control; countermeasure; preclusion (protection); equipment; cleaning (purification); pollutant; matter; environmental pollution; processing equipment; control; sewage treatment; water and sewage treatment; treatment; development; feeding (food intake); animal behavior.

Leary, S.L.; Majoros, J.A.; Tomson, J.S. (1998). **Making cagewash facility design a priority.** *Lab Animal* 27(6): 28-31.

NAL Call Number: QL55.A1L33

Descriptors: laboratory animals; animal housing; laboratory rearing; design; cleaning and sterilization; cleaning equipment; cages.

Roe, P. (2002). **Cage processing and waste management: a cost-analysis and decision-making exercise.** *Lab Animal* 31(1): 43-46.

NAL Call Number: QL55.A1L33

Descriptors: laboratory workers; laboratory animals; cages; washing; animal wastes; litter; ergonomics; safety at work; cost analysis; labor costs; productivity; automation; decision making.

Ruggiero, R.F. (2002). **Considerations for an automated cage-processing system.** *Lab Animal* 31 (1): 50-56.

NAL Call Number: QL55.A1L33

Descriptors: laboratories; laboratory animals; laboratory workers; cages; washing; power washers; automation; vacuum; robots; cleaning and sterilization; animal wastes; litter; dust control; labor productivity; occupational hazards; planning; design.

Ruggiero, R.F. (1998). **Selecting and installing cage washers.** *Lab Animal* 27(4): 40-42.

NAL Call Number: QL55.A1L33

Descriptors: laboratory animals; animal housing; cages; cleaning and sterilization; design; decontamination; work flow; equipment.

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VENTILATION and AIR QUALITY

Kacergis, J.B.; Jones, R.B.; Reeb, C.K.; Turner, W.A.; Ohman, J.L.; Ardman, M.R.; Paigen, B. (1996). **Air quality in an animal facility: particulates, ammonia, and volatile organic compounds.** *American Industrial Hygiene Association Journal* 57(7): 634-640.

Descriptors: air pollutants, occupational analysis; indoor air pollution; allergens analysis; ammonia analysis; laboratory animals; hydrocarbons analysis; mice; animal technicians; occupational Exposure, prevention and control; ventilation.

Kowalski, W.J.; Bahnfleth, W.P.; Carey, D.D. (2002). **Engineering control of airborne disease transmission in animal laboratories.** *Contemporary Topics in Laboratory Animal Science* 41 (3): 9-17.

Descriptors: airborne allergens; air UV germicidal irradiation, air treatment method; air filtration, air treatment method; dilution ventilation, air treatment method; pressurization, air treatment method.

Renstrom, A; Larsson, P.H.; Malmberg, P.; Bayard, C. (1997). **A new amplified monoclonal rat allergen assay used for evaluation of ventilation improvements in animal rooms.** *Journal of Allergy and Clinical Immunology* 100(5): 649-655.

Descriptors: indoor air pollution analysis; allergens analysis; allergens urine; evaluation studies; health surveys; methods; mice; mice, inbred BALB C; rats; rats, Sprague-Dawley; Sweden.

Rosas, I.; Yela, A.; Salinas, E.; Lacey, J.; Milton, D. (1996). **Size distribution of particles carrying bacteria and endotoxins in animal care facilities.** *Journal of Endotoxin Research* 3(SUPPL.1): 53.

Descriptors: air conditioning; air sampling; animal care facility; bacteria carrying particle; bacterial toxins; cage washing; endotoxin; endotoxin carrying particle; miscellaneous method; organic dust dispersal; pollution; ventilation.

Worley, M.S.; Manbeck, H.B. (1993). **Modeling contaminant concentrations in ceiling inlet ventilation systems.** Paper presented at the "1993 International Summer Meeting sponsored by The American Society of Agricultural Engineers," June 20-23, 1993, Spokane, Washington, 17p.

NAL Call Number: 290.9 Am32P

Descriptors: air quality; cages; ventilation.

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HEALTH, SAFETY, and ERGONOMICS

Bush, R.K.; Wood R.A.; Eggleston, P.A. (1998). **Laboratory animal allergy.** *Journal of Allergy and Clinical Immunology* 102(1): 99-112.

Descriptors: asthma, immune system disease; respiratory system disease; atopy, immune system disease; laboratory animal allergy, allergy skin testing, diagnostic method; laminar flow caging, laboratory equipment; wet washings.

Carlton, D.L.; Richards, W. (2002). **Affordable noise control in a laboratory animal facility.** *Lab Animal* 31(1): 47-48.

NAL Call Number: QL55.A1L33

Descriptors: laboratory animals; laboratories; noise abatement; acoustic properties; power washers; cages; panels; cost analysis; noise pollution; laboratory workers; laboratory hazards; occupational health; animal welfare, animal use refinement.

Clough, G; Wallace, J; Gamble, M.R.; Merryweather, E.R.; Bailey, E.A. (1995). **Positive, individually ventilated caging system: a local barrier system to protect both animals and personnel.** *Laboratory Animals* 29 (2): 139-51.

Descriptors: laboratory animals; containment of biohazards, instrumentation; animal housing; ventilation; air pollutants, occupational; air pressure; laboratory animals, microbiology; communicable disease control; environmental monitoring; animal housing, legislation and jurisprudence; lighting; mice; sound.

Eggleston, P.A.; Ansari, A.A.; Adkinson, N.F.; Wood, R.A. (1995). **Environmental challenge studies in laboratory animal allergy. Effect of different airborne allergen concentrations.** *American Journal of Respiratory and Critical Care Medicine* 151(3 Pt 1): 640-646.

Descriptors: air pollutants, occupational analysis; allergens analysis; laboratory animals, immunology; asthma immunology; immunoglobulin E immunology; laboratory personnel; occupational diseases immunology; adult; occupational air pollutants, adverse effects; allergens adverse effects; asthma diagnosis; asthma physiopathology; bronchial hyperreactivity immunology; bronchial provocation tests; dose-response relationship, immunologic; occupational diseases diagnosis; occupational diseases physiopathology; radioallergosorbent test; rats; rats, Sprague-Dawley immunology; skin tests.

Fox, J.G.; Donahue, P.R.; Essigmann, J.M. (1980). **Efficacy of inactivation of representative chemical carcinogens utilizing commercial alkaline and acidic cage washing compounds.** *Journal of Environmental Pathology and Toxicology* 4(1): 97-105.

NAL Call Number: RB152.J6

Descriptors: carcinogens analysis; detergents; animal housing; surface active agents; 9,10-Dimethyl-1,2-benzanthracene analysis; aflatoxin-B1; aflatoxins analysis; chemistry; chromatography; high-pressure-liquid.

Gordon, S; Fisher, S.W.; Raymond, R.H. (2001). **Elimination of mouse allergens in the working environment: assessment of individually ventilated cage systems and ventilated cabinets in the containment of mouse allergens.** *Journal of Allergy and Clinical Immunology* 108(2): 288-294.

Descriptors: allergens; asthma prevention and control; animal housing; occupational exposure, prevention and control; ventilation; alpha-globulins immunology; containment of biohazards methods; laboratory animal science instrumentation; mice.

Gordon, S.; Kiernan, L.A.; Nieuwenhuijsen, M.J.; Cook, A.D.; Tee, R.D.; Taylor, A.J.N. (1997). **Measurement of exposure to mouse urinary proteins in an epidemiological study.** *Occupational and Environmental Medicine* 54(2): 135-140.

Descriptors: humans; laboratory workers; laboratory work; rodents; biochemical analysis; dust analysis; occupational exposure; air sampling; exposure levels; airborne particles; laboratory animals.

Gordon, S.; Tee, R.D.; Lawson, D.; Wallace, J.; Newman Taylor, A.J. (1992). **Reduction of airborne allergenic urinary proteins from laboratory rats.** *British Journal of Industrial Medicine* 49(6): 416-422.

Descriptors: indoor air pollution, prevention and control; allergens, urine; laboratory animal science methods; air analysis; allergens analysis; asthma immunology; asthma prevention and control; hypersensitivity immunology; hypersensitivity prevention and control; laboratory animal science instrumentation; laboratory personnel; occupational diseases immunology; occupational diseases prevention and control; population density; rats; rats, inbred strains.

Gordon, S.; Wallace, J.; Cook, A.; Tee, R.D.; Newman Taylor, A.J. (1997). **Reduction of exposure to laboratory animal allergens in the workplace.** *Clinical and Experimental Allergy: Journal of the British Society for Allergy and Clinical Immunology* 27(7): 744-751.

Descriptors: air pollutants, occupational analysis; allergens analysis; animal technicians; laboratory animals; hypersensitivity prevention and control; occupational air pollutants, adverse effects; allergens, adverse effects; animal husbandry instrumentation; hypersensitivity etiology; mice; rats; safety; ventilation.

Hollander, A.; Gordon, S.; Renstrom, A.; Thyssen, J.; Daces, G.; Larsson, P.H.; Malmberg, P.; Vendables, KM; Heederik, D. (1999). **Comparison of methods to assess airborne rat and mouse allergen levels. I. Analysis of air samples.** *Allergy* 54(2): 142-149.

Descriptors: environmental air pollutants analysis; allergens analysis; mice immunology; rats immunology; Allergens, urine; detergents pharmacology; immunoassay; rabbits.

Hollander, A.; Heederik, D.; Daces, G.; Kromhout, H. (1998). **Determinants of airborne rat and mouse urinary allergen exposure.** *Scandinavian Journal of Work, Environment & Health* 24(3): 228-35.

Descriptors: indoor air pollution analysis; laboratory animals urine; environmental monitoring methods; laboratory personnel; occupational diseases immunology; occupational exposure analysis; allergens, adverse effects; analysis of variance; animal housing standards; mice; Netherlands; occupational diseases epidemiology; occupational diseases etiology; particle size; prevalence; rats; regression analysis; risk factors; ventilation.

Kerst, J.; et al (2003). **An ergonomics process for the care and use of research animals.** *ILAR Journal* 44(1): 3-12.

Descriptors: animal experimentation; human engineering; musculoskeletal diseases etiology; occupational health; safety; workplace; biomechanics; musculoskeletal diseases, prevention and control; organizational policy; posture; risk assessment.

Langley, R. (1999). **Physical hazards of animal handlers.** *Occupational Medicine* 14(2): 181-194.

Descriptors: occupational accidents, statistics and numerical data; animal husbandry, statistics and numerical data; animal technicians, statistics and numerical data; bites and stings epidemiology; bites and stings etiology; occupational health; veterinarians, statistics and numerical data; wounds and injuries epidemiology; wounds and injuries etiology; bites and stings prevention and control; population surveillance; risk factors; United States epidemiology; wounds and injuries prevention and control.

Lieutier-Colas, F.; Meyer, P.; Larsson, P.; Malmberg, P.; Frossard, N.; Pauli, G.; de Blay, F. (2001). **Difference in exposure to airborne major rat allergen (Rat n 1) and to endotoxin in rat quarters according to tasks.** *Clinical and Experimental Allergy: Journal of the British Society for Allergy and Clinical Immunology* 31(9): 1449-1456.

Descriptors: occupational air pollutants, adverse effects; air pollutants, occupation analysis; allergens adverse effects; allergens analysis; endotoxins adverse effects; endotoxins analysis; occupational exposure, adverse effects; occupational exposure analysis; rats immunology; respiratory hypersensitivity immunology; animal husbandry methods; animal technicians; France; animal housing; laboratory personnel; task performance and analysis; workplace.

Minakami, K.; Obara, T.; Yamauchi, C. (1986). **Filter efficiency of commercial face masks of particles and airborne bacteria.** *Experimental Animals* 35(3): 293-298.

Descriptors: glasswool, surgery mask, three-sheet synthetic fiber mask, charcoal single-sheet synthetic fiber mask, gauze mask, gas mask.

Pelkonen, K.H.O. (1993). **Ergonomy in the laboratory animal unit.** *Lab Animal* 22(4): 37-41.

NAL call no.: QL55.A1L33

Descriptors: laboratories; ergonomics.

Olfert, E.D. (1993). **Allergies to laboratory animals--aspects of monitoring and control.**

Lab Animal 22(2): 32-35.

NAL call no.: QL55.A1L33

Descriptors: allergies; laboratory animals.

Peterson, T.; Farley, J. (2001). **Unique design for fixed ventilated changing station.** *Lab Animal* 30(4): 43-46.

NAL call no.: QL55.A1L33

Descriptors: mice; design; laboratory infections; disease control; barrier husbandry; allergens; occupational disorders; stress; safety at work; ergonomics.

Priddy, D.C.; Cunningham, J.J. (1995). **Ergonomically designed hand tools for rodent water bottle maintenance.**

Lab Animal 24(9): 45.

NAL call no.: QL55.A1L33

Descriptors: laboratory equipment; bottles; maintenance; ergonomics.

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

NAL call no.: QL55.A1L3

Descriptors: mice; laboratory mammals; cages; design; artificial ventilation; animal husbandry; allergens; occupational hazards; laboratory hazards; laboratory workers; safety at work; ergonomics.

Rosas, I.; Calderon, C.; Salinas, E.; Martinez, L.; Alfaro-Moreno, E.; Milton, D.K.; Osornio-Vargas, A.R. (2001). **Animal and worker exposure to dust and biological particles in animal care houses.** *Aerobiologia* (Netherlands) 17(1): 49-59.

Descriptors: environmental exposure; organic dust worker; air conditioning; room ventilation; fungus identification; bacterium identification; fungus culture; bacterium culture; fungus spore; gravimetry; parameter; lung lavage; cage; atmospheric dispersion; indoor air pollution; air quality; Basidiomycetes; Ascomycetes; bed; cell count; airborne particle; human; nonhuman; rat; controlled study; review.

Sharpnack, D.D.; Hull, R.D. (1996). **Strategies for safe use of chemicals in animal research.** *Working Safely with Research Animals, Proceedings of the 4th National Symposium on Biosafety, Atlanta, Georgia, January 27-31, 1996*, J. Y. Richmond, Editor; p. 71-75.

Descriptors: laboratory animals; health survey; chemical manufacturing industry; chemical processing; inhalants; skin exposure; occupational exposure.

Thulin, Hans; Bjorkdahl, Marianne; Karlsson, Anne-Sophie; Renstrom, Anne (2002). **Reduction of exposure to laboratory animal allergens in a research laboratory.** *Annals of Occupational Hygiene* 46(1): 61-68.

Descriptors: air pollutants, occupation analysis; allergens analysis; laboratory animals; hypersensitivity prevention and control; occupational exposure prevention and control; immunoglobulin E, blood; laboratory personnel; mice; questionnaires; ventilation.

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CLEANING and STERILIZATION

- Andersen, H.E.A.; Fosse, K.; Fosse, R.T. (1998). **Microbiological quality control of a cage washing machine by means of a thin film culture system (Petrifilm™).** *Scandinavian Journal of Laboratory Animal Science* 25 (2): 74-80.
Descriptors: cages; hygiene; quality controls; washing; animal housing; laboratory animals; detergents.
- Banerjee, A.K.; Angulo, A.F.; Kershof, A.M. (1985). **The use and microbiological monitoring of specialised washing equipment for a central animal laboratory.** *Zeitschrift für Versuchstierkunde* 27(5): 209-213.
Descriptors: animal diseases; disease prevention; disinfectants; animal housing; hygiene; cages; laboratory animals.
- Bozik, R.; Nebiar, F.; Greenstein, G.; Drozdowicz, C.K. (1995). **A comparative study of an automated diagnostic system with standard manual techniques for microbiologic water analysis in an animal facility environment.** *Contemporary Topics in Laboratory Animal Science* 34(1): 52-55.
NAL call no.: SF405.5.A23
Descriptors: water quality; bacterial count; microbial contamination; testing; automation; culture techniques; reverse osmosis.
- Ednie, D.L.; Wilson, R.P.; Lang, C.M. (1998). **Comparison of two sanitation monitoring methods in an animal research facility.** *Contemporary Topics in Laboratory Animal Science* 37(6): 71-74.
NAL call no.: SF405.5.A23
Descriptors: laboratory animals; animal housing; monitoring; cleaning and sterilization; plate count; rapid methods; atp; detection; luminescence; correlation; cost analysis.
- Faith, R.E.; McCarty, D.R. (1986). **Effectiveness of cage washers operated without detergents.** *Laboratory Animal Science* 36(5): 581.
Descriptors: abstract; laboratory animals; sanitation.
- Farrell, T.M.; Ridgway, R.L.; Thakur, A.K.; Ridder, W.E. (1997). **Determination of microbiological contamination during long-term storage of sanitized equipment.** *Contemporary Topics in Laboratory Animal Science* 36(2): 60-61.
NAL call no.: SF405.5.A23
Descriptors: laboratory equipment; microbial contamination; cleaning and sterilization; storage; duration; animal experiments.
- Klein, H.; Frankenberg, L.; Conboy, T.; Frankenfield, D.; Trogstam, M. (1999). **Development, design, and operation of a robotic rodent cage washing and waste handling system.** *Lab Animal* 28(7): 34-37.
NAL Call Number: QL55.A1L33
Descriptors: cages; rodents; robots; washing; waste treatment.
- Krause, J.; McDonnell, G.; Riedesel, H. (2001). **Biodecontamination of animal rooms and heat-sensitive equipment with vaporized hydrogen peroxide.** *Contemporary Topics in Laboratory Animal Science* 40(6): 18-21.
Descriptors: laboratory animals; animals, local anti-infective agents, pharmacology; decontamination methods; animal housing; hydrogen peroxide pharmacology; ventilation; *Bacillus stearothermophilus* isolation and purification; heat; laboratories; volatilization. M
- Kuchowicz, E.; Rydzynski, K. (1998). **Risk assessment of morpholine (tetrahydro-2H-1,4-oxazine): A time for reevaluation of current occupational exposure standards?** *Applied Occupational and Environmental Hygiene* 13(2): 113-121.

Descriptors: eye injury epidemiology; nose irritation epidemiology; risk assessment; occupational exposure; rubber industry; laundry; textile industry; occupational hazard; carcinogenicity; human; nonhuman.

Macheak, M.E.; Claus, K.D. (1970). **Effects of certain anticorrosives in steam on clostridia.** *American Journal of Veterinary Research* 31(12): 2301-2304.

Descriptors: amines pharmacology; bacteriological techniques; clostridium, drug effects; cyclohexanes pharmacology; heart; morpholines pharmacology; oxazines pharmacology; clostridium, growth and development; culture media.

Mayeux, P.; Dupepe, L.; Dunn, K.; Balsamo, J.; Domer, J. (1995). **Massive fungal contamination in animal care facilities traced to bedding supply.** *Applied and Environmental Microbiology* 61 (6): 2297-2301.

Descriptors: feeds; contamination; litter; air; animal housing; digestive tract; laboratory animals
Cryptococcus uniguttulatus.

Musachio, M.B.; Karamian, N.A. (1969). **Volatile amines in hospital steam systems.** *Hospital* 43 (15): 70-72.

Descriptors: amines; gases; maintenance and engineering, hospital; steam; sterilization.

Orlando, R.A.; Lao, Y.J. (1993). **An assessment of exposure to cyclohexylamine arising from steam humidification of indoor air.** *Journal of Environmental Health* 56(5): 6-9.

Descriptors: boiler; indoor air pollution air sampling; article; environmental exposure; humidifier; United States; volatilization.

Pan, T.M.; Shimoda, K.; Maejima, K.; Kuhara, T.; Tsukumi, K.; Urano, T. (1992). **[Efficacy of ozone fumigation for laboratory animal sanitation]** *Jikken Dobutsu. (Experimental Animals)* 41(2): 181-187.

Descriptors: laboratory animals; fumigation; ozone pharmacology; sanitation; Bacillus, drug effects; dogs; animal housing; mice; rabbits; rats; spores, drug effects; sterilization methods.

Porter, J.D.; Lyons, R.M. (2002). **Virucidal effects of rodent cage-cleaning practices on the viability of adenovirus vectors.** *Contemporary Topics in Laboratory Animal Science* 41(5): 43-46.

Descriptors: Adenoviridae physiology; Adenoviridae infections, prevention and control; containment of biohazards methods; disinfection methods; animal housing; animal husbandry; genetic vectors physiology; Rodentia.

Sebesteny, A.; Milite, G.; Martelossi, P. (1992). **Microbiologically monitored fumigation of a newly built SPF laboratory rodent facility.** *Laboratory Animals* 26(2): 132-139.

NAL call no.: QL55.A1L3

Descriptors: rats; mice; laboratories; fumigation; gnotobiotic animals; sterilizing; methyl bromide; monitoring; specific pathogen free laboratories.

Smith, M.D. (4 Jan 2000). **Britz-Heidbrink Inc. Mini-CRADA, Powder Coating of Animal Enclosures.** Kansas City Plant, Kansas City, MO (US). Sponsor: Department of Energy, Washington, DC. Report Number: KCP-613-6196; CRADA 96-KCP-1040 9p. Journal Announcement: USGRDR0124

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Descriptors: animal enclosures; coatings; animals; phosphoric acid; stainless steels; testing; powder coatings.

Wardrip, C.L.; Artwohl, J.E.; Oswald, J.; Bennett, B.T. (2000). **Verification of bacterial killing effects of cage wash time and temperature combinations using standard penicylinder methods.** *Contemporary Topics in Laboratory Animal Science* 39(4): 9-12.

Descriptors: laboratory animals; anti-infective agents; bacteria; animal housing; infection control methods; temperature; time factors.

Zwarun, A.A.; Weisbroth, S.H. (1979). **Development of an 82.2 degrees C (180 degrees F) temperature indicator system for monitoring equipment washing and sanitizing programs.** *Laboratory Animal Science* 29(3): 395-397.
Descriptors: animal housing; sanitation standards; temperature; thermometers.

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CAGE CLEANING and ANIMAL HEALTH / BEHAVIOR EFFECTS

Carissimi, A.S.; Chaguri, L.C.A.A.; Teixeira, M.A.; Mori, C.M.C.; Macchione, M.; Sant' Anna, E.T.G.; Saldiva, P.H.N.; Souza, N.L.; Merusse, J.B.L. (2000). **Effects of two ventilation systems and bedding change frequency on cage environmental factors in rats (*Rattus norvegicus*).** *Animal Technology : Journal of the Institute of Animal Technicians* 51(3): 161-170.

NAL Call Number: QL55.I5

Descriptors: rats; laboratory animals; litter; cleaning; frequency; ventilation; ammonia; air flow; epithelium; nose; respiratory system; membrane potential; cilia; activity.

Davis, T.S.; Virgous, C.K. (2000). **Healthy looking rabbit with a decreased appetite.** *Lab Animal* 29(8): 19-21.

NAL Call Number: QL55.A1L33

Descriptors: rabbits; laboratory animals; appetite; feed intake; feed dispensers; pelleted feeds; alfalfa meal; anorexia; animal husbandry; cage cleaning.

Duke, J.L.; Zammit, T.G.; Lawson, D.M. (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.

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.

Fox, J.G.; Helfrich-Smith, M.E. (1980). **Chemical contamination of animal feeding systems: evaluation of two caging systems and standard cage-washing equipment.** *Laboratory Animal Science* 30(6): 967-973.

NAL Call Number: 410.9 P94

Descriptors: sanitation; animal feed.

Gray, S. Hurst, J.L. (1995). **The effects of cage cleaning on aggression within groups of male laboratory mice.** *Animal Behaviour* 49(pt.3): 821-826.

NAL call no.: 410 B77

Descriptors: mice; aggressive behavior; cages; cleaning; odors; male animals

Loo, P.L.P. van; Kruitwagen, C.L.J.J.; Zutphen, L.F.M. van; Koolhaas, J.M.; Baumans, V. (2000). **Modulation of aggression in male mice: influence of cage cleaning regime and scent marks.** *Animal Welfare* 9(3): 281-295.

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.

Milligan, S.R.; Sales, G.D.; Khirnykh, K. (1993). **Sound levels in rooms housing laboratory animals: an uncontrolled daily variable.** *Physiology & Behavior* 53(6): 1067-76.

Descriptors: animal welfare; laboratory animals; arousal; noise; social environment; callithrix; cats; circadian rhythm; ferrets; loudness perception; mice; pitch perception; psychoacoustics; rabbits; rats; sound spectrography; species specificity; ultrasonics.

Pellowski, M.W.; Rosenwasser, A.M. (1996). **Circadian phase shifting associated with routine cage maintenance: A retrospective analysis.** *Biological Rhythm Research* 27(2): 130-137.

Descriptors: behavior; biosynchronization; physiology; sense organs (sensory reception); Cricetidae; Rodentia; Syrian hamster; cage cleaning; lighting conditions; phase response curve.

Reeb-Whitaker, C.K. Paigen, B.; Beamer, W.G.; Bronson, R.T.; Churchill, G.A.; Schweitzer, I.B.; Myers, D.D. (2001). **The impact of reduced frequency of cage changes on the health of mice housed in ventilated cages.** *Laboratory Animals* 35(1): 58-73.

NAL call no.: QL55.A1L3

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;

Saibaba, P.; Sales, G.D.; Stodulski, G.; Hau, J. (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.

NAL call no.: QL55.A1L3

Descriptors: rats; activity sampling; diurnal activity; animal husbandry

Sales, G.D.; Milligan, S.R.; Khirnykh, K. (1999). **Sources of sound in the laboratory animal environment: A survey of the sounds produced by procedures and equipment.** *Animal Welfare* 8 (2): 97-115. May, 1999

Descriptors: animal welfare; laboratory animal environment; laboratory noise; sound sources.

Sales, G.D.; Wilson, K.J.; Spencer, K.E.V.; Milligan, S.R. (1988). **Environmental ultrasound in laboratories and animal houses: a possible cause for concern in the welfare and use of laboratory animals.** *Laboratory Animals* (London) 22(4): 369-375.

NAL Call Number: QL55.A1L3

Descriptors: laboratory animals; animal experiments; animal welfare; animal housing; laboratories; ultrasound; environment.

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SELECTED WORLD WIDE WEBSITES

Biosafety in Biomedical and Microbiological Laboratories

<http://www.cdc.gov/OD/ohs/biosfty/bmb15/bmb15toc.htm>

Cage Wash Caustic Odor Exhaust. A Case Study.

<http://www.strobicair.com/pdf/CageWash.pdf>

Cleaning Mickey's Mess—How do you clean house for 130,000 mice? Article on cage cleaning robots.

<http://www.emory.edu/WHSC/HSNEWS/PUB/Momentum/Spring02/lastword.html>

Detach Robotic Cage Wash System (Steris Corporation USA)--The system utilizes robots, one at each end of the cage washer. The robot with its interchangeable mechanical gripper is programmed to handle different cage types, baskets containing bottles or cage lids, and the pallets on which the cages are transported.

<http://www.steris.com/>

IWT Cage and Rack Washers, Cabinet Washers, Bottle Washers and Fillers, Kronos, Tunnel Washers [IWT is part of the Techniplast Group]

<http://www.tecniplast.it/en-us/>

Lab Animal Buyers' Guide--Husbandry

<http://guide.labanimal.com/guide/product2.jsp?a=4>

NIH Policies Related to Occupational Safety and Health in the Care and Use Laboratory Animals

http://oacu.od.nih.gov/safety/program_sum.htm

Pharmaceutical Research Laboratories Alkaline Detergents, Urine Scale Removers, Disinfectants, Neutralizers-Floor Cleaners -Foam Boosters -Deodorants, Antimicrobial Skin Care, Monitoring Products, Material Safety Data Sheets, Automatic Chemical Dispensing Systems for Rack, Tunnel and Bottle Washing Machines, Drum Handling Equipment, Spill Containment Pallets

<http://www.pharmaceutical.com/chemicaldiv.htm>

Roe Bio-Medical Products Vacuum Disposal System, Automatic Dump Station, Bulk Vacuum Transfer System, Automatic Bedding Dispenser

<http://www.roebiomed.com/>

Steris Cage and Rack Washing Cleaners, Cage and Rack Washing-Bedding Equipment, Chemical Indicators, Biological Indicators

<http://www.steris.com/>

Tecniplast Washing Division Introduces Kronos Bottle Automation Technologies

<http://www.tecniplastusa.com/washkronos.html>

Techniplast Waste Disposal and Cage Changing Units

<http://www.tecniplast.it/laminar.php>

SANITATION SOPS

University of California at San Francisco--Occupational Health and Safety

in the Care and Use of Research Animals

<http://www.iacuc.ucsf.edu/Safe/OHSpdf.pdf>

University of Nebraska at Lincoln—Institutional Animal Care and Use Committee

<http://research.unl.edu/orr/useccomm.shtml>

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The Animal Welfare Information Center, <http://awic.nal.usda.gov/contact-us>

<http://www.nal.usda.gov/awic/pubs/cagewash.htm>

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