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# Publications

## Information Resources on Big Cats

AWIC Resource Series No. 45
December 2009

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Eastern Cougar

*Puma concolor couguar*
North American mountain lion. *Credit: USFWS*

**About this Document**

The citations in this bibliography pertain to the health, care and housing of big cats. This information will be of use to research facilities, zoos, circuses and conservation programs to assist them in the care, breeding, husbandry and conservation of these animals. It may also be of interest to those who would like additional information on the care and preservation of these seven big cats.

The Federal Animal Welfare Act (AWA) regulates the care, housing and treatment of warm blooded animals used for research, public exhibition, transportation in commerce, or sold in wholesale pet trade. Big cats are exhibited in zoos and circuses, used in some areas of research, used in conservation projects, and occasionally sold or transported in commerce and thus fall under the AWA. USDA, APHIS, Animal Care provides answers to Commonly Asked Big Cat Questions as well as a position statement entitled Large Wild land Exotic Cats Make Dangerous Pets on its website.

For this document, the compiler searched for citations from multiple sources published between the years 1958 to 2008. The sources of information include peer-reviewed journals, conference proceedings, theses, annual reports, dissertations, books, monographs, and reviews. Some URLs are provided for documents available as eDocuments. The searches provide information in 14 different subject areas from anatomy to veterinary medicine, including information on conservation programs. Readers are cautioned as to the dynamic nature of the internet and the fact that Web addresses and content are subject to change. All sites are current as of November 2009.

The National Agricultural Library (NAL) Services web page supplies information on how to request library materials that are included in its collection.

Acknowledgements

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## Information Resources on Big Cats

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### General

Alexander, K.A., N.J. MacLachlan, P.W. Kat, C. House, S.J. O'Brien, N.W. Lerche, M. Sawyer, L.G. Frank, K. Holekamp, L. Smale, J.W. McNutt, M.K. Laurenson, M.G.L. Mills, and B.I. Osburn (1994). **Evidence of natural bluetongue virus infection among African carnivores**. *American Journal of Tropical Medicine and Hygiene* 51(5): 568-576. ISSN: 0002-9637.
**Descriptors:** African carnivores, virus infection, natural bluetongue, evidence, cheetah, *Acinonyx jubatus*, lion, *Panthera leo*, shrews, rodents, dogs, cats, sheep, contaminated vaccine, BLU virus, mortality, abortion, meat, organs, ingestion, infected prey species.

Augustus, P., K. Casavant, N. Troxel, R. Rieches, and F. Bercovitch (2006). **Reproductive life history of South African cheetahs (*Acynonyx jubatus jubatus*) at the San Diego Zoo Wild Animal Park, 1970-2005.** *Zoo Biology* 25(5): 383-390. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** Cheetah, *Acinonyx jubatus*, cubs, zoo animals, reproduction, breeding, life history, females , age, litters, litter size, mortality, sex ratio, California, captive cheetahs, breeding program, reproductive performance.

Averbeck, G.A., K.E. Bjork, C. Packer, and L. Herbst (1990). **Prevalence of hematozoans in lions (*Panthera leo*) and cheetah (*Acinonyx jubatus*) in Serengeti National Park and Ngorongoro Crater, Tanzania.** *Journal of Wildlife Diseases* 26(3): 392-4. ISSN: 0090-3558.
**Abstract:** Lions (*Panthera leo*) and cheetah (*Acinonyx jubatus*) from the Serengeti National Park and Ngorongoro Crater Conservation Area, Tanzania were examined for the presence of blood protozoans. Twenty-eight percent of the lions were infected with *Trypanosoma* sp. and the prevalence of trypanosome infection varied significantly between adjacent habitats. All of the animals were infected with *Hepatozoon* sp. and a *Theileria* sp.-like piroplasm that was morphologically indistinguishable from *Theileria felis*.
**Descriptors:** lions, *Panthera leo*, cheetah, *Acinonyx jubatus*, hematozoans, prevalence, Serengeti National Park, Ngorongoro Crater, trypanosome infection, blood protozoans, *Theileria felis*. Tanzania.

Backues, K.A., J.P. Hoover, J.E. Bauer, M.T. Barrie, J. McCann, S. Citino, and R. Wallace (1997). **Serum lipoprotein, thyroid hormone and resting cortisol levels in normal cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(4): 404-6. ISSN: 1042-7260.

**Abstract:** Blood obtained from 20 cheetahs (*Acinonyx jubatus*) during annual physical examinations was analyzed for serum lipid concentration, for lipoprotein distribution by agarose gel electrophoresis, and for thyroid hormone and resting cortisol levels by solid-phase radioimmunoassay to develop normal reference ranges.

**Descriptors:** *Acinonyx* blood, hydrocortisone blood, lipoproteins blood, thyroid hormones blood, blood cell count veterinary, blood chemical analysis veterinary, electrophoresis agar gel, veterinary, radioimmunoassay veterinary, reference values.

Backues, K.A., J.P. Hoover, J.E. Bauer, G.A. Campbell, and M.T. Barrie (1997). **Hyperlipidemia in four related male cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(4): 476-80. ISSN: 1042-7260.

**Abstract:** Hyperlipidemia was identified in an 11-yr-old male cheetah (*Acinonyx jubatus*) and three related 3-yr-old male cheetah littermates. Hyperlipidemia in these four cheetahs was characterized by hypertriglyceridemia and hypercholesterolemia. The mean percentages of chylomicron and beta-lipoproteins were greater ($P < 0.05$) and the mean percent of alpha-lipoproteins was lower ($P < 0.05$) than the respective means for a group of 20 nonhyperlipidemic and clinically normal cheetahs. The etiology of the hyperlipidemia in these four cheetahs was not determined. However, the older cheetah also had chronic renal insufficiency and a parathyroid adenoma, conditions that have been associated with hyperlipidemia.

**Descriptors:** male cheetah, *Acinonyx jubatus*, blood profile of hyperlipidemias, cholesterol blood, chylomicrons, hyperlipidemias, hyperlipidemias genetics, lipoproteins, ldl blood, triglycerides in blood, veterinary care.

Baron, T., P. Belli, J.Y. Madec, F. Moutou, C. Vitaud, and M. Savey (1997). **Spongiform encephalopathy in an imported cheetah in France.** *Veterinary Record Journal of the British Veterinary Association* 141(11): 270-271. ISSN: 0042-4900.

**NAL Call Number:** 41.8 V641

**Descriptors:** cheetah, *Acinonyx jubatus*, spongiform encephalopathy, symptoms, histopathology, prions, meat, bone meal, case studies, France, Great Britain.

Bauer, J.E. (1997). **Fatty acid metabolism in domestic cats (*Felis catus*) and cheetahs (*Acinonyx jubatas*).** *Proceedings of the Nutrition Society, The* 56(3): 1013-24. ISSN: 0029-6651.

**Descriptors:** cheetah, *Acinonyx jubatus*, metabolism, cats metabolism, fatty acids metabolism, dietary fats administration and dosage, fatty acid desaturases metabolism, fatty acids, essential chemistry, fatty acids, essential metabolism, hyperlipidemias veterinary, lipids blood.

Baxby, D., D.G. Ashton, D.M. Jones, and L.R. Thomsett (1982). **An outbreak of cowpox in captive cheetahs: virological and epidemiological studies.** *Journal of Hygiene, The* 89(3): 365-72. ISSN: 1438-4630.

**Abstract:** This paper describes virological and epidemiological features of an infection which killed two of three affected cheetahs at Whipsnade Park in 1977. Two animals had profuse skin lesions and the third had an acute haemorrhagic pneumonia. The outbreak was shown to be caused by cowpox virus. Cowpox virus is believed to circulate in small wild animals, but the source of infection was not traced despite virological and serological tests on 93 captive and 102 wild animals. Sub-clinical infections did not occur in susceptible contact cheetahs. Immune globulin did not influence the outcome and smallpox vaccine does not take in cheetahs. Management of any future outbreak will rely on prompt diagnosis and segregation of infected animals.

**Descriptors:** cheetahs, *Acinonyx jubatus*, wild and captive animals, microbiology, animals, zoo microbiology, Carnivora microbiology, cat diseases microbiology, management of disease outbreaks, vaccinia vitus, cats, disease outbreaks microbiology.

Bechert, U., J. Mortenson, E.S. Dierenfeld, P. Cheeke, M. Keller, M. Holick, T.C. Chen, and Q. Rogers (2002). **Diet composition and blood values of captive cheetahs (*Acinonyx jubatus*) fed either supplemented meat or commercial food preparations.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 33(1): 16-28. ISSN: 1042-7260.

**Abstract:** Nutrition most certainly affects health and may play a role in the etiology of growth and reproductive problems in captive cheetah (*Acinonyxjubatus*) populations. The objective of our research was to examine nutritional differences between two dietary regimens and quantify their physiologic effects on cheetahs held in captivity. Twelve cheetahs were randomly assigned to either a commercial diet (COM) or a supplemented meat diet (SMD) group. These cats were physically examined and had blood samples taken three times over the course of a year. Representative samples of COM and four separate components of the SMD treatment were analyzed over the same time frame for proximate nutrient composition, digestibility, and concentrations of taurine, fat-soluble

vitamins, and selected minerals. Concentrations of fat, vitamins A and E, Se, Fe, Cu, Na, and Mn were significantly higher in COM compared with those in SMD samples, with the exception of fat content in turkey. Mg content was lower in COM than in SMD; other nutrients did not differ. Mean concentrations of vitamins A and E in COM were markedly higher than in SMD samples (408,140 vs. 29,696 IU/kg dry matter [DM] and 431 vs. 48 IU/kg DM, respectively) and varied dramatically between sampling periods. Percent crude protein and protein-to-fat ratios were high for SMD compared with either whole prey-based or commercial food preparations. Blood urea nitrogen and serum creatinine levels were above normal reference means for domestic cats. Plasma concentrations of vitamins A, D, and E were significantly higher in COM-fed than in SMD-fed cheetahs. Both plasma retinol and tocopherol levels were almost three times higher in COM-fed cats (1.26 +/- 0.06 vs. 0.53 +/- 0.03 microg/ml and 17.5 +/- 0.7 vs. 6.4 +/- 0.02 microg/ml, respectively) and exceeded the normal ranges expected for domestic felids. Significant differences between male and female cheetahs were found for plasma concentrations of vitamin E, Se, and Fe after allowing for effects of diet and time of collection. Excess fat-soluble dietary vitamins can result in direct toxicities as well as nutrient antagonisms and may be linked to reproductive and health issues in captive cheetahs. The high protein levels found in SMD may be linked to chronic renal disease, which was detected in some of these cheetahs.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, diet composition, blood values, fed, supplemented meat, commercial food preparations, nutritional differences, protein levels.

Beehler, B.A. (1982). **Oral therapy for nasal cryptococcosis in a cheetah.** *Journal of the American Veterinary Medical Association* 181(11): 1400-1. ISSN: 0003-1488.
**Descriptors:** cheetah, *Acinonyx jubatus*, Carnivora, cryptococcosis, imidazoles administration and dosage, piperazines administration and dosage, administration, oral, cryptococcosis drug therapy, ketoconazole, nasal cavity.

Beekman, S.P.A., B. Kemp, H.C.M. Louwman, and B. Colenbrander (1999). **Analyses of factors influencing the birth weight and neonatal growth rate of cheetah (*Acinonyx jubatus*) cubs.** *Zoo Biology* 18(2): 129-139. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, birth weight, mortality, neonates, liveweight gain, litter size, gestation period, lactation number, inbreeding depression, artificial rearing, natural rearing, neonatal growth, factors influencing.

Beekman, S.P., M. De Wit, J. Louwman, and H. Louwman (1997). **Breeding and observations on the behaviour of cheetah *Acinonyx jubatus* at Wassenaar Wildlife Breeding Centre**. *International Zoo Yearbook* 35(0): 43-50. ISSN: 0074-9664.
**Descriptors:** cheetah, *Acinonyx jubatus*, animal care, behavior, breeding protocol, captive felid management, husbandry, reproduction, Wassenaar Wildlife Breeding Center.

Bergstrom, J., M. Ueda, Y. Une, X. Sun, S. Misumi, S. Shoji, and Y. Ando (2006). **Analysis of amyloid fibrils in the cheetah (*Acinonyx jubatus*).** *Amyloid the International Journal of Experimental and Clinical Investigation the Official Journal of the International Society of Amyloidosis* 13(2): 93-8. ISSN: 1350-6129.
**Abstract:** Recently, a high prevalence of amyloid A (AA) amyloidosis has been documented among captive cheetahs worldwide. Biochemical analysis of amyloid fibrils extracted from the liver of a Japanese captive cheetah unequivocally showed that protein AA was the main fibril constituent. Further characterization of the AA fibril components by sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) and Western blot analysis revealed three main protein AA bands with approximate molecular weights of 8, 10 and 12 kDa. Mass spectrometry analysis of the 12-kDa component observed in SDS-PAGE and Western blotting confirmed the molecular weight of a 12,381-Da peak. Our finding of a 12-kDa protein AA component provides evidence that the cheetah SAA sequence is longer than the previously reported 90 amino acid residues (approximately 10 kDa), and hence SAA is part of the amyloid fibril.
**Descriptors:** cheetah, *Acinonyx jubatus*, genetics, amyloidosis, serum amyloid a protein genetics, *Acinonyx* metabolism, amino acid sequence, amyloidosis epidemiology, amyloidosis metabolism, amyloidosis pathology, animal diseases epidemiology, animal diseases genetics, animal diseases metabolism, animal diseases pathology, liver diseases epidemiology, liver diseases genetics, liver diseases metabolism, liver diseases pathology, serum amyloid a protein metabolism.

Bernstein, J.J. (1979). ***Cryptococcus osteomyelitis* in a cheetah**. *Feline Practice* 9(5): 23-25. ISSN: 1057-6614.
**Descriptors:** cheetah, *Acinonyx jubatus*, *Cryptococcus osteomyelitis*, bone infection, therapy, amphotericin B methyl ester, iv, increased dosage, recovery.

Berry, W.L., J.E. Jardine, and I.W. Espie (1997). **Pulmonary cryptococcoma and cryptococcal meningoencephalomyelitis in a king cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(4): 485-90. ISSN: 1042-7260.
**Abstract:** A captive king cheetah (*Acinonyx jubatus*) was evaluated for a subacute onset of ataxia in all four limbs. The ataxia appeared to be spinal in origin, evidenced by

apparent conscious proprioceptive deficits in all limbs, and there was no evidence of cerebellar involvement. Anesthesia was performed and survey spinal radiographs were normal. Cerebrospinal fluid analysis revealed an apparently sterile meningitis of unknown etiology. Although transient improvement was noted with glucocorticoid and antimicrobial therapy, the condition deteriorated subsequently and the animal became quadriparetic and paraplegic. Follow-up cerebrospinal fluid analysis and culture revealed the presence of *Cryptococcus neoformans*. Myelography demonstrated obstruction of the subarachnoid space at the level of the seventh cervical vertebra. Pathological examination following euthanasia revealed a solitary pulmonary cryptococcoma and confirmed cryptococcal meningoencephalomyelitis.

**Descriptors:** cheetah, *Acinonyx jubatus*, cryptococcosus, encephalomyelitis, lung diseases, fungal, meningitis, cryptococcal, brain microbiology, brain pathology, cerebrospinal fluid cytology, cerebrospinal fluid microbiology, cryptococcosis diagnosis, *Cryptococcus neoformans* isolation and purification, encephalomyelitis diagnosis, lung microbiology, lung pathology, lung diseases, fungal diagnosis, meningitis, cryptococcal diagnosis, spinal cord pathology.

Bertschinger, H.J., M. Jago, J.O. Nothling, and A. Human (2006). **Repeated use of the GnRH analogue deslorelin to down-regulate reproduction in male cheetahs (*Acinonyx jubatus*).** *Theriogenology* 66(6-7): 1762-7. ISSN: 0093-691X.

**Abstract:** The GnRH analogue deslorelin, as a subcutaneous implant, was initially developed in Australia as an ovulation-inducing agent in mares. Its uses, for the suppression of reproduction in the domestic dog and cat and in other species, including humans, have been developed subsequently. Such implants have been used as a contraceptive modality in a variety of wild carnivores, both males and females. This paper describes the use of deslorelin implants as a contraceptive agent for cheetah males maintained in a semi-captive environment and housed in various camps together with females. Annually, male cheetahs were treated for 1 (n = 2), 2 (n = 7), 3 (n = 9), 4 (n = 3) or 5 (n = 1) consecutive years with an implant containing 4.7, 5.0 or 6.0 mg of deslorelin. On the first day of treatment and then on an annual basis, blood testosterone concentrations were analysed, testicular measurements were taken, appearance of penile spikes was determined, and semen was collected and evaluated. Pregnancy rates of mated or inseminated females were determined. A dose of 6 mg of deslorelin suppressed reproduction for at least 1 year, whereas with 4.7 and 5 mg of deslorelin, 3 of 17 males had a few non-motile spermatozoa in their ejaculates. All testosterone concentrations were basal at 1 year post-implant and no side effects were observed. We concluded that deslorelin implantation, at a dose of 6 mg, was a safe and reliable method of annual contraception in male cheetahs.

**Descriptors:** male cheetahs, *Acinonyx jubatus*, physiology, contraception, contraceptive agents, GnRHanalogue deslorelin, male administration, dosage, triptorelin analogs, derivatives, blood, conservation of natural resources, drug implants, histocytochemistry, longitudinal studies, statistics, nonparametric, testis anatomy, histology, testis physiology, testosterone blood, triptorelin administration and dosage.

Bertschinger, H.J., D.G. Meltzer, and A. van Dyk (2008). **Captive breeding of cheetahs in South Africa--30 years of data from the de Wildt Cheetah and Wildlife Centre.** *Reproduction in Domestic Animals Zuchthygiene* 43(Suppl 2): 66-73. ISSN: (p) 0936-6768; (E) 1439-0531.

**Abstract:** The de Wildt Cheetah and Wildlife Centre was established in 1971 and the first cheetah cubs were born in 1975. During the period 1975-2005, 242 litters were born with a total of 785 cubs. Mean cub survival from 1 to 12 months and greater than 12 months of age was 71.3 and 66.2%, respectively. The majority of losses (84.9%) occurred during the first month postpartum whereas only 15.1% deaths took place between 1 and 12 months of age. Females were first bred at an age of approximately 3 years, reached maximum reproductive age at 6-8 years, where after fertility declined. Males reached peak reproduction at 6 and maintained this for up to 12 years of age. Male fertility was best correlated with sperm morphology. During recent years, for practical purposes, males were allocated to 'good' (>or=70% normal), 'fair' (40-70% normal) and 'poor' (<40% normal) categories according to sperm morphology count. The breeding males were selected from the good (preferably) and fair categories but poor category males were also used at times. Average litter sizes for 'good', 'fair' and 'poor' males were 3.44 (n = 21), 3.14 (n = 18) and 2.28 (n = 18), respectively. In females the heritability for litter size was high at 0.5848 (532 progeny, 1975-2007) and the maternal heritability for cub mortality was estimated to be 0.596. The data from the de Wildt Cheetah and Wildlife Centre and two other centres in the world (Kapama and Wassenaar) demonstrate that cheetah can be bred successfully in captivity.

**Descriptors:** cheetahs, *Acinonyx jubatus*, captive breeding, de Wildt Cheetah and Wildlife Centre, 30 years of data, South Africa.

Bertschinger, H.J., J.O. Nothling, R. Nardini, S. Hemmelder, and M.H. Broekhuisen (2002). **Collection of semen in cheetahs (*Acinonyx jubatus*) using electro-ejaculation: attempts to avoid urine contamination.** *Advances in Ethology* 37: 122. ISSN: 0931-4202.

**Descriptors:** cheetahs, *Acinonyx jubatus*, seman collection, electro ejaculation, urine contamination, attempts to svoid, meeting information.

**Notes:** Meeting Information: 4th International Symposium on Physiology and Behaviour of Wild and Zoo Animals, Berlin, Germany; September 29-October 02, 2002.

Bircher, J.S. and G.A. Noble (1997). **Management of cheetah *Acinonyx jabatus* at Saint Louis Zoological Park**. *International Zoo Yearbook* 35(0): 51-58. ISSN: 0074-9664.
**Descriptors:** Cheetah, *Acinonyx jabatus*, management, St. Louis Zoological Park, husbandry, design, reproductive management, behavioral observations, Missouri U.S..

Bissett, C. and R.T.F. Bernard (2007). **Habitat selection and feeding ecology of the cheetah (*Acinonyx jubatus*) in thicket vegetation: is the cheetah a savanna specialist.** *Journal of Zoology Proceedings of the Zoological Society of London* 271(3): 310-317. ISSN: 0952-8369.
**NAL Call Number:** QL1.J68
**Abstract:** Habitat selection and feeding ecology of a reintroduced population of cheetahs

*Acinonyx jubatus* were studied in a 16 000 ha game reserve in the Eastern Cape Province (South Africa). Seventy per cent of the reserve is characterized by very dense thicket vegetation (valley bushveld) and the remainder is open and savanna-like. The results illustrated a strong effect of sex and group size on the behaviour of cheetahs. The coalition (three adult males) killed significantly larger animals (55% of kills weighed more than 65 kg) than single female cheetahs (less than 2% of kills weighed more than 65 kg). Female cheetahs showed temporal and spatial avoidance of lions by hunting at dawn and dusk and positioning their home ranges [95% utilization distribution (UDs)] significantly farther from the pride of lions than did the coalition. The coalition hunted earlier and later than female cheetahs, and 46% of their kills were made in darkness. In addition, their home range overlapped that of the lions and they showed neither temporal nor spatial avoidance of the lions. The rates of kleptoparasitism were lower and the kill retention times were longer than those reported elsewhere in Africa, and it is suggested that this is a consequence of the cover provided by the thicket vegetation and prey size. The home ranges (95% UDs) of female cheetahs incorporated more thicket vegetation than that of the coalition, indicating that the coalition is less susceptible to predation than single females. These data suggest that cheetahs possess greater behavioural flexibility than previously reported, that they can hunt successfully in thicket vegetation, sometimes in darkness, that they are not restricted to killing small to medium-sized prey, and that they may not be savanna specialists.
**Descriptors:** cheetah, *Acinonyx jubatus*, diet, habitat selection, feeding ecology, adaptability, dense thicket, behavioral flexibiity, gender differences relationship to lions, South Africa.

Bogin, E. (2001). **Animal models for prion diseases**. *Clinical Chemistry and Laboratory Medicine* 39(Special Supplement): S18. ISSN: 1434-6621.
**Descriptors:** animal models, diseases, infection , nervous system, Creutzfeldt Jakob disease, behavioralorders, mental disorders, prion disease, nervous system disease, bovine spongiform encephalopathy, chronic wasting disease, feline spongiform encephalopathy, scrapie, transmissible mink encephalopathy, transmissible spongiform encephalopathia, meeting abstract.
**Notes:** Meeting Information: 14th IFCC-FESCC European Congress of Clinical Chemistry and Laboratory Medicineand 5th Czech National Congress of Clinical Biochemistry, Prague, Czechoslovakia; May 26-31, 2001.

Bolton, L.A., R.G. Lobetti, D.N. Evezard, J.A. Picard, J.W. Nesbit, J. van Heerden, and R.E. Burroughs (1999). **Cryptococcosis in captive cheetah (*Acinonyx jubatus*): two cases.** *Journal of the South African Veterinary Association* 70(1): 35-9. ISSN: 0038-2809.
**Abstract:** *Cryptococcus neoformans* is a yeast-like organism associated with pulmonary, meningoencephalitic, or systemic disease. This case report documents 2 cases of cryptococcosis with central nervous system involvement in captive cheetah (*Acinonyx jubatus*). In both cases the predominant post mortal lesions were pulmonary cryptococcomas and extensive meningoencephalomyelitis. Both cheetahs tested negative for feline immunodeficiency virus and feline leukaemia virus. The organism isolated in Case 2 was classified as *Cryptococcus neoformans* var. gattii, which is mainly associated with disease in immunocompetent hosts.
**Descriptors:** cheetah, *Acinonyx jubatus*, *Cryptococcus neoformans*, classification, meningoencephalitis veterinary, cryptococcosis pathology, cryptococcosis therapy, isolation, purification, lung diseases, fungal pathology, fungal therapy, fungal veterinary, meningoencephalitis pathology, meningoencephalitis therapy, electron microscopy.

Bolton, L.A. and L. Munson (1999). **Glomerulosclerosis in captive cheetahs (*Acinonyx jubatus*).** *Veterinary Pathology* 36(1): 14-22. ISSN: 0300-9858.
**Abstract:** The cheetah (*Acinonyx jubatus*) is an endangered species with low fecundity and premature death in captivity. A previous survey determined that renal failure as a result of glomerulosclerosis was a major cause of death in captive populations. This study characterizes the morphologic, histochemical, and epidemiologic properties of glomerulosclerosis in this population. Kidneys from 87 cheetahs were examined by light microscopy; kidneys from six of those cheetahs were examined by electron and

fluorescent microscopy using special stains specific for collagen, glycoproteins, reticulin, and fibrin. Immunohistochemistry for the advanced glycosylation end products (AGEs), pyrraline and pentosidine, also was performed on these cases. Glomerulosclerosis was present to some degree in 82% of the population, and in 30% of cheetahs the sclerosis was moderate to severe. Affected cheetah kidneys had thickened glomerular and tubular basement membranes, culminating in glomerulosclerosis. Thickened basement membranes were positive for collagen, glycoproteins, reticulin, and AGEs. Ultrastructurally, membrane material was homogeneous and fibrillar without electron-dense deposits. This glomerular lesion in cheetahs resembles diabetic glomerulopathy in humans and chronic progressive nephropathy in rats. No cheetahs had lesions of diabetes. However, adrenal cortical hyperplasia was prevalent and highly correlated with glomerulosclerosis in this population. If cheetahs with glomerulosclerosis had hypercorticoidism, then hyperglycemia and glomerular hypertension could lead to progressive AGE and plasma protein accumulations in membrane lesions. As in rats, daily feeding of high-protein diets and lack of genetic variation in the population may further contribute to the high prevalence of glomerulosclerosis in captive cheetahs.
**Descriptors:** cheetah, *Acinonyx jubatus*, glomerulonephritis, kidney pathology, age factors, zoo animals, cause of death, glomerulonephritis epidemiology, mortality, pathology, kidney failure, chronic etiology, chronic mortality, prevalence, rats, North America.

Bond, J.C. and D.G. Lindburg (1990). **Carcass feeding of captive cheetahs (*Acinonyx jubatus*): the effects of a naturalistic feeding program on oral health and psychological well-being**. *Applied Animal Behaviour Science* 26(4): 373-382. ISSN: 0168-1591.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, behavior, naturalistic feeding program, carcass feeding, effects, oral health, psychological wellbeing, behavior, zoo animals.

Boomker, J. and M.M. Henton (1980). **Pseudotuberculosis in a cheetah (*Acinonyx jubatus*)**. *South African Journal of Wildlife Research* 10(2): 63-66. ISSN: 0379-4369.
**Descriptors:** cheetah, *Acinonyx jubatus*, bacterial diseases, pseudotuberculosis, case reports, wild animals, carnivores, *Corynebacterium ovis*, liver abscesses, lung nodules, *C pseudotuberculosis.*
**Language of Text:** Afrikaans.

Borque, C., S.S. Perez Garnelo, M. Lopez, C. Talavera, M. Delclaux, and J. de la Fuente (2005). **Validating a commercially available enzyme immunoassay for the determination of 17beta-estradiol and progestogens in the feces of cheetahs (*Acinonyx jubatus*): a case report.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 36(1): 54-61. ISSN: 1042-7260.
**Abstract:** Fecal 17beta-estradiol and progestogens excretion was monitored in adult, female cheetahs (*Acinonyx jubatus*; n = 2), ZGG-12301 (born 3 April 1993), gonadotrophin treated and ZGT-3301, (born 19 August 1993), nontreated, for 120 days using commercially available plate enzyme immunoassay kits prepared for human serum or plasma. There were significant differences (P < 0.001) between baseline and peak concentrations of both hormone measures. Female ZGG-12301, which conceived, but this pregnancy resulted in an unobserved spontaneous abortion, showed no significant difference (P > 0.05) between baseline and gestation 17beta-estradiol values; fecal 17beta-estradiol excretion during pregnancy was statistically different (P < 0.001) from excretion during the nonpregnancy period. Baseline progestogen concentrations were different from pregnancy (P < 0.001) and postovulatory (P < 0.01) concentrations, and progestogen concentrations during pregnancy period were different (P < 0.001) from postovulatory concentrations. In the nontreated cheetah (ZGT-3301), basal and increased progestogen concentrations were statistically different (P < 0.01). On the basis of 17beta-estradiol excretory patterns, duration of the estrous cycle (x +/- SEM) was 13.2 +/- 2.2 days. These results suggest that the enzyme-linked immunosorbent methods reported in this study were capable of quantifying reproductive hormones in fecal extracts of cheetahs and could be a practical alternative to other enzyme-linked immunosorbent assays which require more complex procedures.
**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, ELISA, enzyme linked immunosorbent assay, estradiol analysis, feces chemistry, progestins analysis, enzyme linked immunosorbent assay methods, enzyme linked immunosorbent assay standards, estrous cycle physiology, pregnancy physiology.

Briggs, M.B., J.F. Evermann, and A.J. McKeirnan (1986). **Feline infectious peritonitis**. *Feline Practice* 16 (2): 13-16. ISSN: 1057-6614.
**Descriptors:** cheetahs, *Acinonyx jubatus*, animal diseases, viral diseases, zoo animals, feline infectious peritonitis virus, coronavirus, antibodies, immunofluorescence, management of large cats, recommendations.

Briggs, M.B., C.W. Leathers, and W.J. Foreyt (1993). ***Sarcocystis felis* in captive cheetahs (*Acinonyx jubatus*).** *Journal of the Helminthological Society of Washington* 60(2): 277-279. ISSN: 1049-233X.
**NAL Call Number:** QL392.J68
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, *Sarcocystis felis*, new host records,

Oregon, U.S.

Briggs, M.B. and R.L. Ott (1986). **Feline leukemia virus infection in a captive cheetah and the clinical and antibody response of six captive cheetahs to vaccination with a subunit feline leukemia virus vaccine.** *Journal of the American Veterinary Medical Association* 189(9): 1197-1199. ISSN: 0003-1488.
**NAL Call Number:** 41.8 AM3
**Descriptors:** captive cheetah, *Acinonyx jubatus*, leukemia, vaccination, vaccines, immune response, diagnosis, feline oncovirus, Oregon, U.S.

Brown, D.R., L.M. Schumacher, and M.B. Brown (1996). **Gastric *Mycoplasma felifaucium* infection of cheetahs with gastritis**. *Abstracts of the General Meeting of the American Society for Microbiology* 96(0): 285. ISSN: 1060-2011.
**Descriptors:** cheetah, *Acinonyx jubatus*, gastritis, digestive system, infection, *Mycoplasma felifaucium*, microbiology, pathology, diagnosis, meeting abstract.
**Notes:** Meeting Information: 96th General Meeting of the American Society for Microbiology, New Orleans, Louisiana, USA; May 19-23, 1996.

Brown, E.W., R.A. Olmsted, J.S. Martenson, and S.J. O' Brien (1993). **Exposure to FIV and FIPV in wild and captive cheetahs.** *Zoo Biology* 12(1): 135-142. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, feline immunodeficiency virus, wild animals, zoo animals, serological surveys, feline peritonitis virus, FIV, FIPV.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Brown, J.L., D.E. Wildt, N. Wielebnowski, K.L. Goodrowe, L.H. Graham, S. Wells, and J.G. Howard (1996). **Reproductive activity in captive female cheetahs (*Acinonyx jubatus*) assessed by faecal steroids.** *Journal of Reproduction and Fertility* 106(2): 337-346. ISSN: 0022-4251.
**Abstract:** Faecal oestradiol and progestogen metabolite excretion was monitored in adult, female cheetahs (*Acinonyx jubatus*) (n = 26) for 1-24 months. Increased faecal oestradiol excretion was associated with mating or equine chorionic gonadotrophin (eCG) administration for artificial insemination, whereas increased progestogen metabolites were observed during natural and human chorionic gonadotrophin (hCG)-induced pregnant and nonpregnant luteal phases. On the basis of oestradiol excretory patterns, duration of the oestrous cycle (mean +/- SEM) was 13.6 +/- 1.2 days with high oestradiol concentrations lasting for 4.1 +/- 0.8 days. In non-gonadotrophin-treated cheetahs, 75% showed evidence of oestrous cyclicity; however, none evaluated for 1 year or longer were continuously cyclic. Rather, cyclicity was interrupted by periods of anoestrus, often exceeding several months in duration. These inactive ovarian periods were unrelated to season and were not synchronous among females. Mean duration of gestation (breeding to parturition) was 94.2 +/- 0.5 days, whereas duration of faecal progestogen metabolite excretion during the nonpregnant luteal phase was 51.2 +/- 3.5 days. On the basis of progestogen metabolite evaluations, spontaneous ovulation (non-mating induced) occurred only once in two females (2 of 184 oestrous cycles; 1.1%). Peak eCG-stimulated, preovulatory oestradiol concentrations were similar to those associated with natural oestrus, whereas progestogen metabolite profiles after hCG resembled those during pregnant and nonpregnant luteal phases after natural mating. In summary, results confirm that the cheetah is polyoestrus and ovulation is almost always induced. However, new evidence suggests that many females inexplicably experience periods of anoestrus unrelated to season, while 25% of the cheetahs examined expressed no ovarian activity during the study period.
**Descriptors:** cheetahs, *Acinonyx jubatus*, feces, steroids, estrous cycle, zoo animals, biological rhythms, Carnivora, excreta, felidae, mammals, physiological functions, reproduction, sexual reproduction, anestrus.

Burger, B.V., R. Visser, A. Moses, and M. Le Roux (2006). **Elemental sulfur identified in urine of cheetah, *Acinonyx jubatus*.** *Journal of Chemical Ecology* 32(6): 1347-52. ISSN: 0098-0331.
**Abstract:** The urine of the cheetah, *Acinonyx jubatus*, is almost odorless, and probably for this reason, it has not attracted much attention from scientists. Using gas chromatography-mass spectrometry, we identified 27 and 37 constituents in the headspace vapor of the urine of male and female cheetah, respectively. These constituents, composed of hydrocarbons, short-chain ethers, aldehydes, saturated and unsaturated cyclic and acyclic ketones, 2-acetylfuran, dimethyl disulfide, dimethyl sulfone, phenol, myristic acid (tetradecanoic acid), urea, and elemental sulfur, are all present in the headspace vapor in very small quantities; dimethyl disulfide is present in such a low concentration that it cannot be detected by the human nose. This is only the second example of elemental sulfur being secreted or excreted by an animal. It is hypothesized that the conversion of sulfur-containing compounds in the cheetah's diet to elemental sulfur and to practically odorless dimethyl sulfone enables this carnivore to operate as if "invisible" to the olfactory world of its predators as well as its prey, which would increase its chances of survival.
**Descriptors:** cheetah, *Acinonyx jubatus*, urine analysis, sulfur urine, practically oderless urine, gas chromatography mass spectrometry, sensitivity, specificity, volatilization.

Burger, P.A., R. Steinborn, C. Walzer, T. Petit, M. Mueller, and F. Schwarzenberger (2004). **Analysis of the mitochondrial genome of cheetahs (*Acinonyx jubatus*) with neurodegenerative disease.** *Gene* 338(1): 111-9. ISSN: 0378-1119.

**Abstract:** The complete mitochondrial genome of *Acinonyx jubatus* was sequenced and mitochondrial DNA (mtDNA) regions were screened for polymorphisms as candidates for the cause of a neurodegenerative demyelinating disease affecting captive cheetahs. The mtDNA reference sequences were established on the basis of the complete sequences of two diseased and two nondiseased animals as well as partial sequences of 26 further individuals. The *A. jubatus* mitochondrial genome is 17,047-bp long and shows a high sequence similarity (91%) to the domestic cat. Based on single nucleotide polymorphisms (SNPs) in the control region (CR) and pedigree information, the 18 myelopathic and 12 non-myelopathic cheetahs included in this study were classified into haplotypes I, II and III. In view of the phenotypic comparability of the neurodegenerative disease observed in cheetahs and human mtDNA-associated diseases, specific coding regions including the tRNAs leucine UUR, lysine, serine UCN, and partial complex I and V sequences were screened. We identified a heteroplasmic and a homoplasmic SNP at codon 507 in the subunit 5 (MTND5) of complex I. The heteroplasmic haplotype I-specific valine to methionine substitution represents a nonconservative amino acid change and was found in 11 myelopathic and eight non-myelopathic cheetahs with levels ranging from 29% to 79%. The homoplasmic conservative amino acid substitution valine to alanine was identified in two myelopathic animals of haplotype II. In addition, a synonymous SNP in the codon 76 of the MTND4L gene was found in the single haplotype III animal. The amino acid exchanges in the MTND5 gene were not associated with the occurrence of neurodegenerative disease in captive cheetahs.

**Descriptors:** cheetah, *Acinonyx jubatus*, pedigree, genetics, DNA, mitochondrial genetics, neurodegenerative diseases genetics, mitochondrial chemistry, gene order, haplotypes, molecular sequence data, mutation, neurodegenerative diseases pathology, phenotype, polymorphism, single nucleotide, sequence analysis, spinal cord diseases genetics, spinal cord diseases pathology.

Button, C., D.G. Meltzer, and M.S. Mulders (1981). **The electrocardiogram of the cheetah (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 52(3): 233-5. ISSN: 0038-2809.

**Abstract:** Electrocardiograms were recorded on 19 cheetahs immobilized with the steroidal anaesthetic-hypnotic agent Saffan comprising 0,9% m/v alphaxalone and 0,3% alphadolone. Sinus rhythm was recorded in all animals and heart rate was rapid averaging 173 +/- SD 18 beats per minute. The average of mean electrical axes in the frontal plane was + 76 degrees +/- SD 13 degrees. Mean +/- SD durations in milliseconds on lead II were: P 47 +/- 6,5; PR 93 +/- 11,5; QRS 53 +/- 7,5; QT 193 +/- 19,7. The amplitude of limb lead electrocardiographic complexes were low, resembling those of the domestic cat more closely than those of the dog.

**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, carnivora physiology, electrocardiography.

Button, C., D.G. Meltzer, and M.S. Mulders (1981). **Saffan induced poikilothermia in cheetah (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 52(3): 237-8. ISSN: 0038-2809.

**Abstract:** The steroidal anaesthetic agent Saffan (a 1,2% m/v mixture of alphaxalone and alphadolone) induced a state of poikilothermia in cheetahs. On a warm day (maximum temperature 29 degrees C) rectal temperatures rose in 7 of 8 male cheetahs given Saffan. The highest rectal temperature recorded was 41 degrees C. On a cool day (minimum temperature 19,5 degrees C) rectal temperature fell in 6 of 6 male cheetahs. The lowest rectal temperatures recorded was 36,2 degrees C. Saffan at 3 mg/kg intravenously in cheetahs is an excellent and safe hypnotic but should be used with caution on both hot and cold days.

**Descriptors:** cheetah, *Acinonyx jubatus*, alfaxalone, alfadolone mixture pharmacology, drug effects on body temperature, Carnivora, hypnotics, sedatives pharmacology, pulse drug effects, respiration drug effects, temperature, Saffan, steroidal anaesthetic, hot days, cold days, cautions.

Caro, T.M. (1993). **Behavioral solutions to breeding cheetahs in captivity: insights from the wild.** *Zoo Biology* 12(1): 19-30. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, behavioral solutions, wild animals, breeding, reproductive efficiency, zoos, aggression, breeding programs.

**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Caro, T.M. (1995). **Short-term costs and correlates of play in cheetahs**. *Animal Behaviour* 49(2): 333-45. ISSN: 0003-3472.

**Abstract:** A study investigated the costs and benefits of play by observing cheetah, *Acinonyx jubatus*, cubs in the wild. When all of the potential costs of play were considered, the overall costs seemed to be low. The fact that very young cubs demonstrated high rates of locomotor play indicates that play may have immediate instead of delayed benefits, possibly helping cubs escape predation. The components of noncontact social play may be functionally or causally related to approaching prey, and

components of object and contact play may be associated with contacting prey. However, it seems that only some aspects of play may be appropriate for practicing predatory skills.
**Descriptors:** cheetahs, *Acinonyx jubatus*, cubs, cub play behaviors, play short term costs, benefits, wild, locomotor play, prey, practicing predatory skills.

Caro, T.M. (1987). **Indirect costs of play: cheetah cubs reduce maternal hunting success**. *Animal Behaviour* P.: 295-7. ISSN: 0003-3472.
**Descriptors:** cheetah, *Acrinonyx jubatus*, cubs, play, indirect costs, maternal hunting success, reduced.

Caro, T.M. and D.A. Collins (1986). **Male cheetahs of the Serengeti.** *National Geographic Research* 2(1): 75-86. ISSN: 0077-4626.
**NAL Call Number:** G3.N3
**Descriptors:** male cheetahs, *Acinonyx jubatus*, group behavior, reproductive performance, territory, Serengeti National Park, Tanzania.

Caro, T.M., C.D. FitzGibbon, and M.E. Holt (1989). **Physiological costs of behavioural strategies for male cheetahs**. *Animal Behaviour* P.: 309-17. ISSN: 0003-3472.
**Descriptors:** male cheetahs, *Acinonyx jubatus*, behavioral strategies, physiological costs.

Caro, T.M., M.E. Holt, and C.D. FitzGibbon (1987). **Health of adult free-living cheetahs**. *Journal of Zoology* P.: 573-84. ISSN: 0952-8369.
**Descriptors:** cheetahs, *Acinonyx jubatus*, free living, adult, health.

Caro, T.M. and M.J. Kelly (2001). **Cheetahs and their mating system.** *Model Systems in Behavioral Ecology: Integrating Conceptual, Theoretical, and Empirical Approaches. 2001,* Princeton University Press: 41 William Street, Princeton, NJ, 08540, USA, p. 512-532. ISBN: 0691006539.
**Descriptors:** cheetahs, *Acinonyx jubatus*, mating system, behavior, reproduction , behavioral ecology, conservation biology, female choice, group size, male reproductive tactics, male sociality, mating system, reproductive rates, reproductive success.
**Notes:** book chapter.

Caro, T. (2000). **Controversy over behaviour and genetics in cheetah conservation**. *Conservation Biology Series (Cambridge); Behaviour and Conservation,* Cambridge University Press: The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU, UK; Cambridge University Press, 40 West 20th Street, New York, NY, 10011-4211, USA, 2: 221-237 p. ISBN: 0521665539.
**Descriptors:** cheetah, *Acinonyx jubatus*, behavior, conservation, genetics, mortality.
**Notes:** book chapter.

Carstens, A., R.M. Kirberger, T. Spotswood, W.M. Wagner, and R.J. Grimbeek (2006). **Ultrasonography of the Liver, Spleen, and Urinary Tract of the Cheetah (*Acinonyx jubatus*).** *Veterinary Radiology and Ultrasound the Official Journal of the American College of Veterinary Radiology and the International Veterinary Radiology Association* 47(4): 376-383. ISSN: 1058-8183.

**NAL Call Number:** SF757.8.A4
**Abstract:** Diseases of the abdomen of the cheetah (*Acinonyx jubatus*) include those affecting the liver, spleen, and urinary tract. The most common diseases of captive-bred cheetah are gastritis, gastric ulceration, glomerulosclerosis, and hepatic veno-occlusive disease, and are the most frequent causes of mortality in these animals. The purpose of this study was to describe the ultrasonographic anatomy of the normal liver, spleen, kidney, and urinary bladder of the anesthetized captive-bred cheetah. Twenty-one cheetahs were examined. Eight of the 21 animals had subclinical evidence of either gastritis or chronic renal disease. The ultrasonographic appearances of the liver, gall bladder, common bile duct, and spleen were evaluated and various measurements made. Statistical analyses of the measurements were performed on all the healthy and subclinically ill animals taking sex, age, mass, and anesthetic protocol into account. There were no significant differences in any parameters between the healthy and subclinically ill animals (P>0.25) and data were combined for statistical analyses. The mean mass was 41.1 kg (pl8.8) and the mean age was 5.0 years (pl2.2). The mean thickness of the liver medial to the gall bladder was 67.0 mm (pl14.8) and the liver was within the left costal arch in 75% of animals, extended caudal to the right costal arch in 50% of animals for an average of 30 mm, and extended caudal to the sternum in 63% of animals for an average of 32.5 mm. The maximum mean hepatic vein diameter at the entrance to the caudal vena cava was 8.6pl2.8 mm; the mean diameters of the portal vein at the hilus and that of the caudal vena cava as it entered the liver were 7.5pl1.6 and 9.9pl4.1 mm, respectively. The mean diameter of the caudal vena cava was significantly affected by the type of anesthetic used (P<0.10). The mass of the animals was significant in explaining the variance in maximum portal vein diameters (P<0.10). The mean maximum velocity of the hepatic vein flow at the entrance to the caudal vena cava was 25.3pl2.8 cm/s (n=4), the hilar portal vein was 11.7pl3.3 cm/s (n=7), and the caudal vena cava was 33.8pl19.8 cm/s (n=5). The mean maximum gall bladder length and width, and the mean common bile duct diameters were 44.6 mm (pl10.4), 23.3 mm (pl5.0), and 8.1 mm (pl2.4),

respectively. Age was significant in explaining the variance in gall bladder lengths (P<0.10). Urinary tract ultrasonography was performed only in animals that had normal urea and creatinine levels (n=13). Renal cortico-medullary distinction was present in all kidneys and a cortico-medullary rim sign was seen in 21 of 26 kidneys. Mean kidney length, height, and width was 63.9pl5.7, 38.1pl5.2, and 42.1pl5 mm, respectively. The average resistivity index was 0.58 (n=5). Mean urinary bladder length, height, and width were 57.0, 19.2, and 34.9 mm, respectively.
**Descriptors:** cheetahs, *Acinonyx jubatus*, liver, spleen, urinary tract, ultrasonography, radiology, diseases, abdomen gastritis, anatomy.

Caughey, B. and G.S. Baron (2008). **Are cheetahs on the run from prion-like amyloidosis?** *Proceedings of the National Academy of Sciences of the United States of America* 105(20): 7113-7114. ISSN: (p) 0027-8424; online: 1091-6490.
**Descriptors:** cheetah, amyloid chemistry, amyloidosis genetics, *Acinonyx jubatus*, genetic predisposition to disease, kinetics, models, biological, protein binding, protein denaturation, protein folding.
**Notes:** Comment On: Proc Natl Acad Sci U S A. 2008 May 20;105(20):7263-8.

Chatfield, J., S. Citino, L. Munson, and S. Konopka (2004). **Validation of the 13C-urea breath test for use in cheetahs (*Acinonyx jubatus*) with Helicobacter.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 35(2): 137-41. ISSN: 1042-7260.
**Abstract:** Historically, therapeutic monitoring for prescribed eradication treatment of *Helicobacter* in cheetahs (*Acinonyx jubatus*) with associated gastritis has been accomplished only through endoscopic biopsies. The 13C-urea breath test (UBT) can offer an alternative to repeated biopsies for therapeutic monitoring. Five male and five female cheetahs and one male Sumatran tiger (*Panthera tigris*) were studied. All were clinically healthy before and after this investigation. Breath samples of end-tidal expiration were taken before and after administration of a 13C-enriched urea solution through a gastroesophageal tube. Twenty-milliliter breath samples were taken at 10, 20, 30, and 40 min after administration of the urea solution. The results of the breath analysis were compared with the results of rapid urease testing, histopathologic examination, and impression smears of gastric biopsies taken at the time of the breath test. The sensitivity and specificity for the 13C-UBT in this investigation were 100%. and the positive predictive value and negative predictive value were both 100%. Although the 13C-UBT is a good noninvasive diagnostic tool for monitoring the presence of *Helicobacter* sp. in the gastric mucosa, endoscopy should still be used for initial diagnosis and grading of gastritis and for monitoring the progression of disease in cheetahs. The 13C-UBT is a valuable, simple, accurate, and sensitive tool for monitoring eradication of *Helicobacter* during therapy for clinical gastritis.
**Descriptors:** cheetah, *Acinonyx jubatus*, carnivora, gastritis, helicobacter infections, *Helicobacter pylori*, urea analysis, breath tests methods, carbon isotopes diagnostic use, gastritis diagnosis, gastritis pathology, helicobacter infections diagnosis, helicobacter infections pathology, predictive value of tests, sensitivity and specificity, urea diagnostic use.

Chomel, B.B., R.W. Kasten, J.B. Henn and S. Molia (2006). ***Bartonella* infection in domestic cats and wild felids**. *Annals of the New York Academy of Sciences.* Blackwell Publishing: , 9600 Garstngton Rd, Oxford OX4 2DQ, Oxen, UK, p. 410-415. ISBN: 9781573316392.
**Descriptors:** domestic cats, wild felids, *Bartonella* infection, vector borne, gram negative bacteria, bacteremia, cat scratch disease, fleas, transmission.
**Notes:** Meeting Information: 4th International Conference on Rickettsiae and Rickettsial Diseases, Logrono, Spain; June 18 -21, 2005.

Citino, S.B. and L. Munson (2005). **Efficacy and long-term outcome of gastritis therapy in cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 36(3): 401-16. ISSN: 1042-7260.
**Abstract:** A prospective clinical trial evaluating efficacy and long-term outcome of treatments for lymphoplasmacytic gastritis in cheetahs (*Acinonyx jubatus*) was conducted. The study evaluated efficacy of 11 different antibiotic and antiinflammatory treatment protocols in 32 cheetahs (19 male, 13 female) for reducing gastric inflammation and Helicobacter colonization and monitored the course of disease through histologic grading of gastric biopsies. All cheetahs were biopsied up to I wk before treatment and then rebiopsied within 1 mo after treatment. Most animals were reassigned to a second treatment regimen within 6 mo. Each animal received from one to three treatments during the study period. After the trial, gastric biopsies were obtained from each cheetah annually until death or transfer from the facility to assess disease progression. The trial and follow-up period spanned 10 yr. At onset of the trial, all 32 cheetahs had some degree of gastritis, and 26 cheetahs (81%) were colonized with Helicobacter. Inflammatory lesions worsened regardless of treatment or the presence of Helicobacter. No treatment had a significant effect on inflammatory changes except the lansoprazole/clarithromycin/amoxicillin treatment group, which produced a short-term decrease in inflammation when compared to controls. Prednisone had no effect on gastric inflammation. Overall, 65% of colonized cheetahs were initially cleared of histologic evidence of Helicobacter by treatment, with short-term eradication occurring in 100% of

the animals treated with omeprazole/clarithromycin/amoxicillin or tetracycline/metronidazole/Pepto-Bismol for 28 days. Long-term follow-up of treated animals in this study clearly demonstrated that these treatments had little effect on life-long progression of gastritis or on Helicobacter burden in individual cheetahs, although some treatments provided short-term reduction in gastritis and Helicobacter. These results provide evidence that Helicobacter alone is not the cause of gastritis in cheetahs and do not support the use of antibacterial treatments in cheetahs unless significant clinical signs (e.g., frequent vomiting/regurgitation, weight loss) are apparent.
**Descriptors:** cheetah, *Acinonyx jubatus*, anti-bacterial agents therapeutic use, anti inflammatory agents therapeutic use, gastritis veterinary, helicobacter infections, zoo animals, anti bacterial agents administration, dosage, anti inflammatory agents administration, dosage, biopsy, dose response relationship, drug administration schedule, gastric mucosa microbiology, gastric mucosa pathology, gastritis drug therapy, gastritis pathology, helicobacter drug effects, helicobacter growth and development, helicobacter isolation and purification, helicobacter infections drug therapy, helicobacter infections pathology, longitudinal studies, prospective studies, time factors, treatment outcome.

Citino, S.B. (1995). **Chronic, intermittent *Clostridium perfringens* enterotoxicosis in a group of cheetahs (*Acinonyx jubatus jubatus*)**. *Journal of Zoo and Wildlife Medicine* 26(2): 279-285. ISSN: 1042-7260.
**Descriptors:** cheetahs, *Acinonyx jubatus*, *Clostidium perfringens*, enterotoxicosis, diarrhea, mucus, blood, colitis, treatment, tylosin, metronidazole, psyllium fiber.

Clyde, V.L., E.C. Ramsay, and D.A. Bemis (1997). **Fecal shedding of *Salmonella* in exotic felids**. *Journal of Zoo and Wildlife Medicine* 28(2): 148-152. ISSN: 1042-7260.
**Descriptors:** cheetah, *Acinonyx jubatus*, *Salmonella typhimurium*, tigers, leopards, cougars, caracals, lynx, lions, servals, diet, chicken, horse meat contamination, fecal shedding.

Cohn, J.P. (1986). **Surprising cheetah genetics**. *BioScience* P.: 358-62. ISSN: 0006-3568.
**Abstract:** Recent studies of genes from wild and captive cheetahs suggest that challenges to the species' survival may be heightened by the cheetah's lack of genetic diversity. In 1981, scientists at the National Zoo in Washington, D.C., found that sperm samples from cheetahs in South Africa showed an extremely high percentage of abnormalities. Genetic studies confirmed that the animals have a remarkable lack of genetic diversity. The species' susceptibility to feline infectious peritonitis, its high rate of infant mortality, and its general failure to breed in captivity are all consequences of this genetic invariability. Scientists speculate that the cheetahs' loss of genetic diversity occurred some 10,000 years ago, possibly as a result of a population bottleneck. A species survival plan for the cheetah has been developed by the American Association of Zoological Parks and Aquariums.
**Descriptors:** cheetah, genetics, genes, wild, captive, lack of diversity, species survival, sperm samples, abnormalities, survival plan of the American Association of Zoological Parks and Aquariums.

Collett, M.G., W.E. Pomroy, W.G. Guilford, A.C. Johnstone, B.J. Blanchard, and S.G. Mirams (2000). **Gastric *Ollulanus tricuspis* infection identified in captive cheetahs (*Acinonyx jubatus*) with chronic vomiting.** *Journal of the South African Veterinary Association* 71(4): 251-5. ISSN: 0038-2809.
**Abstract:** Gastritis, vomition and weight loss are common in captive cheetahs (*Acinonyx jubatus*). Gastric spiral bacteria (*Helicobacter* spp.) and the very small, viviparous nematode *Ollulanus tricuspis*, a stomach worm of cats, are believed to be important causes. Three sibling cheetahs at Wellington Zoo, New Zealand, developed chronic vomiting, diarrhoea and debility. Their parents were both South African-born. Response to antibacterial treatment was poor. Endoscopic examinations revealed chronic lymphoplasmacytic gastritis and *Ollulanus* infection. Treatment with oxfendazole and pyrantel embonate resulted in clinical improvement; however, 1 cheetah, which died 7 months later as a result of a ruptured liver due to hepatic amyloidosis, still had *Ollulanus* worms present in her stomach. *Ollulanus tricuspis* is a significant cause of gastritis and vomiting in captive cheetahs, lions and tigers, as well as wild cougars and tigers. The parasite has not yet been found in sub-Saharan Africa. Because of the unusual characteristics of this parasite, the literature on its life history and techniques for diagnosis is reviewed.
**Descriptors:** cheetah, *Acinonyx jubatus*, parasitology, vomiting, gastritis, Trichostrongyloidea *Ollulanus tricuspis* isolation, purification, trichostrongyloidiasis, antinematodal agents therapeutic use, chronic disease, endoscopy, gastrointestinal, gastritis diagnosis, gastritis etiology, trichostrongyloidea classification, trichostrongyloidiasis drug therapy, trichostrongyloidiasis parasitology.

Colly, L.P., R. Bengis, and G.K. Bruckner (1996). **Special challenges of maintaining wild animals in captivity: a southern African perspective**. *Revue Scientifique Et Technique Office International Des Epizooties* 15(1): 237-249. ISSN: 0253-1933.
**Descriptors:** wild animals, maintaining in captivity, challenges, ecology, government and law, public health, allied medical sciences, veterinary medicine, wildlife management, conservation, care, husbandry, southern Africa.

Cooper, A.B., N. Pettorelli, and S.M. Durant (2007). **Large carnivore menus: factors affecting hunting decisions by cheetahs in the Serengeti**. *Animal Behaviour* 73(Part 4): 651-659. ISSN: 0003-3472.
**Descriptors:** cheetahs, *Acinonyx jubatus*, hunting decisions, factors affecting, predation, prey, predators, large carnivors, behvior, time of year, abundance, Serengeti Africa.

Coutinho, S.D., J.D. Fedullo, and S.H. Correa (2006). **Isolation of *Malassezia* spp. from cerumen of wild felids**. *Medical Mycology* 44(4): 383-387. ISSN: 1369-3786.
**Descriptors:** Malassezia, cheetah, *Acinonyx jubatus*, ears, cerumen, wild felids, Malassezia spp. isolation, external auditory canal, captivity, [lions, tigers, leopards, jaguars, pumas, small felids] fungi.

Crawshaw, G.J., J.L. Brown, and K.L. Goodrowe (1991). **Investigation of infertility in a male cheetah (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 22(1): 119-124. ISSN: 1042-7260.
**Descriptors:** cheetah, *Acinonyx jubatus*, male, infertility, zoo animal, Felidae, investigation, case study.

Crissey, S.D., K.D. Ange, K.L. Jacobsen, K.A. Slifka, P.E. Bowen, M. Stacewicz Sapuntzakis, C.B. Langman, W. Sadler, S. Kahn, and A. Ward (2003). **Serum concentrations of lipids, vitamin D metabolites, retinol, retinyl esters, tocopherols and selected carotenoids in twelve captive wild felid species at four zoos**. *Journal of Nutrition* 133(1): 160-166. ISSN: 0022-3166.
**Descriptors:** cheetah, twelve captive wild felid species, *Acinonyx jubatus*, lipids, vitamin D metabolites, retinol, retinyl esters, tocopherols, selected carotenoids, serum concentrations, serum nutrient concentrations, comparing.

Crooks, K.R., M.A. Sanjayan, and D.F. Doak (1998). **New insights on cheetah conservation through demographic modeling**. *Conservation Biology* 12(4): 889-95. ISSN: 0888-8892.
**Abstract:** A combination of demographic techniques was used to investigate how variation in survival and reproduction might influence the population persistence of wild cheetahs (*Acinonyx jubatus*). The models used detailed demographic data from recently published, long-term ecological projects on cheetahs of the Serengeti, Tanzania. The findings indicate that juvenile survivorship has a relatively small impact on population growth rate in comparison with the large effects of adult survivorship, a result that is consistent across a range of vital rates and is robust to deviations caused by sampling error and environmental variability. Overall, the findings provide new insights into the current debate on cheetah population dynamics and suggest caution in the interpretation of ecological data for conservation and management.
**Descriptors:** wild cheetahs, *Acinonyx jubatus*, conservation, new insights, demographic modeling, survival, reproduction, wild, juvenile survivorship, adult survivorship, Serengeti, Tanzania.

Crosier, A.E., L. Marker, J. Howard, B.S. Pukazhenthi, J.N. Henghali, and D.E. Wildt (2007). **Ejaculate traits in the Namibian cheetah (*Acinonyx jubatus*): Influence of age, season and captivity.** *Reproduction, Fertility, and Development* 19(2): 370-382. ISSN: 1031-3613.
**Abstract:** The objective was to examine the influence of animal age, season and captivity status on seminal quality in wild-born cheetahs (*Acinonyx jubatus*) in Namibia, Africa. Animals were divided into three age categories: juvenile (14-24 months; n = 16 males, 23 ejaculates); adult (25-120 months; n = 76 males, 172 ejaculates); and aged (>120 months; n = 5 males, 5 ejaculates). Seasons were categorised into hot-wet (January-April), cold-dry (May-August) and hot-dry (September-December). A comparison between freshly wild-caught (n = 29 males, 41 ejaculates) and captive-held cheetahs (n = 68 males, 159 ejaculates) was also conducted. Raw ejaculates contained 69.0 +/- 1.1% motile spermatozoa (mean +/- s.e.m.) with 73.6 +/- 1.5% of these cells containing an intact acrosome. Overall, 18.4 +/- 0.9% of spermatozoa were morphologically normal, with midpiece anomalies being the most prevalent (approximately 39%) defect. Juvenile cheetahs produced ejaculates with poorer sperm motility, forward progressive status, lower seminal volume and fewer total motile spermatozoa than adult and aged animals. Spermatogenesis continued unabated throughout the year and was minimally influenced by season. Proportions of sperm malformations were also not affected by season. Ejaculates from captive cheetahs had increased volume and intact acrosomes, but lower sperm density than wild-caught counterparts. In summary, Namibian cheetahs produce an extraordinarily high proportion of pleiomorphic spermatozoa regardless of age, season or living (captive versus free-ranging) status. Young males less than 2 years of age produce poorer ejaculate quality than adult and aged males. Because (1) all study animals were wild born and (2) there was little difference between freshly caught males and those maintained in captivity for protracted periods, our results affirm that teratospermia in the cheetah is mostly genetically derived. It also appears that an ex situ environment for the Namibian cheetah can ensure sperm quality comparable with that for free-living males.
**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, ejaculation, seasons, spermatozoa cytology, spermatozoa physiology, *Acinonyx* anatomy, histology, age factors, sperm

motility, testis anatomy and histology.

Crosier, A.E., B.S. Pukazhenthi, J.N. Henghali, J. Howard, A.J. Dickman, L. Marker, and D.E. Wildt (2006). **Cryopreservation of spermatozoa from wild-born Namibian cheetahs (*Acinonyx jubatus*) and influence of glycerol on cryosurvival.** *Cryobiology* 52(2): 169-181. ISSN: 0011-2240.

**Abstract:** Sperm cryopreservation is a valuable tool for the genetic management of ex situ populations. This study was conducted to assess: (1) semen characteristics of wild-born cheetahs; and (2) the impact of three types of glycerol influence (duration of exposure, temperature, and method of addition) on sperm cryosensitivity. To evaluate the impact of duration of glycerol exposure, spermatozoa were incubated in Test Yolk Buffer (TYB) with 4% glycerol at ambient temperature (approximately 22 degrees C) for 15 vs. 60 min before cryopreservation. To evaluate the influence of temperature and method of glycerol addition, spermatozoa were resuspended at ambient temperature either in TYB with 0% glycerol followed by addition of 8% glycerol (1:1 v/v; at ambient temperature vs. 5 degrees C) or directly in TYB with 4% glycerol. All samples were cryopreserved in straws over liquid nitrogen vapor and evaluated for sperm motility and acrosomal integrity after thawing. Semen samples (n = 23; n = 13 males) contained a high proportion (78%) of pleiomorphic spermatozoa. Ejaculates also contained a high proportion of acrosome-intact (86%) and motile spermatozoa (78%). Immediately after thawing, a significant proportion of spermatozoa retained intact acrosomes (range, 48-67%) and motility (range, 40-49%). After thawing, incubation in glycerol for 60 min at ambient temperature before freezing decreased ($p < 0.05$) sperm motility and acrosomal integrity at one time-point each (pre-centrifugation and post-centrifugation, respectively). However, method or temperature of glycerol addition had no ($p > 0.05$) impact on sperm cryosurvival. In summary, (1) wild-born cheetahs produce high proportions of pleiomorphic spermatozoa but with a high proportion of intact acrosomes; and (2) resuspension in 4% glycerol, followed by exposure for up to 60 min at ambient temperature, had minimal effect on sperm motility and acrosomal integrity after cryopreservation. Results indicate the feasibility of cryopreserving cheetah spermatozoa under field conditions, providing a user-friendly method to capture and store gametes to enhance genetic management.

**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, cryopreservation, glycerol pharmacology, semen preservation, spermatozoa physiology, cell survival drug effects, Namibia, semen physiology, sperm motility, temperature, time factors.

Crosier, A., P. Comizzoli, T. Baker, B. Pukazhenthi, J. Howard, L. Marker, and D. Wildt (2007). **Oocyte fertilization and uterine morphology in aged female cheetahs (*Acinonyx jubatus)* are similar to younger counterparts.** *Biology of Reproduction*(Sp. Iss. SI): 79. ISSN: 0006-3363.

**Descriptors:** cheetahs, *Acinonyx jubatus*, oocyte fertilization, uterine morphology, aged female, development, reproductive system, reproduction, laparoscopy, therapeutic techniques, prophylactic techniques, diagnostic techniques, clinical techniques, ultrasonography, oocyte maturation, oocyte fertilization., meeting information.

**Notes:** Meeting Information: 40th Annual Meeting of the Society for the-Study of Reproduction, San Antonio, TX, USA; July 21 -25, 2007.

Crosier, A.E., B.S. Pukazhenthi, J.N. Henghali, J. Howard, L.L. Marker, and D.E. Wildt (2004). **Improved acrosomal integrity of cryopreserved cheetah *Acinonyx jubatus* sperm after centrifugation through accudenz.** *Biology of Reproduction*(Sp. Iss. SI): 185. ISSN: 0006-3363.

**Descriptors:** cheetah, *Acinonyx jubatus*, sperm, centrifugation, accudenx, cryopreserved, improved acrosomal integrity, cell biology, reproduction, cryopreservation, laboratory techniques, sperm motility index, percent motility, percent intact motility.

**Notes:** Meeting Information: 37th Annual Meeting of the Society for the Study of Reproduction, Vancouver, Canada; August 01 -04, 2004.

Czekala, N.M., B.S. Durrant, L. Callison, M. Williams, and S. Millard (1994). **Fecal steroid hormone analysis as an indicator of reproductive function in the cheetah.** *Zoo Biology* 13(2): 119-128. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6

**Descriptors:** cheetah, *Acinonyx jubatus*, estrogens, progesterone, feces, ovulation, pregnancy, hormone secretion, reproductive physiology, fecal steroid hormones.

Dailidiene, D., G. Dailide, K. Eaton, G. Cattoli, J.G. Kusters, and D.E. Berg (2003). ***Helicobacter acinonychis*: genetic and rodent infection studies of an h. Pylori-like gastric pathogen of cheetahs and other big cats.** *Abstracts of the General Meeting of the American Society for Microbiology* 103: Z-025. ISSN: 1060-2011.

**Descriptors:** cheetah, *Acinonyx jubatus*, digestive system, ingestion, assimilation, rodent infection, wildlife management, conservation, *Helicobacter acinonychis* infection, gastric pathogen, big cats.

**Notes:** Meeting Information: 103rd American Society for Microbiology General Meeting, Washington, DC, USA; May 18-22, 2003.

Dailidiene, D., G. Dailide, K. Ogura, M. Zhang, A.K. Mukhopadhyay, K.A. Eaton, G. Cattoli, J.G.

Kusters, and D.E. Berg (2004). ***Helicobacter acinonychis*: genetic and rodent infection studies of a *Helicobacter pylori*-like gastric pathogen of cheetahs and other big cats.** *Journal of Bacteriology* 186(2): 356-65. ISSN: (p) 0021-9193; online: 1098-5530 .

**Abstract:** Insights into bacterium-host interactions and genome evolution can emerge from comparisons among related species. Here we studied *Helicobacter acinonychis* (formerly *H. acinonyx*), a species closely related to the human gastric pathogen Helicobacter pylori. Two groups of strains were identified by randomly amplified polymorphic DNA fingerprinting and gene sequencing: one group from six cheetahs in a U.S. zoo and two lions in a European circus, and the other group from a tiger and a lion-tiger hybrid in the same circus. PCR and DNA sequencing showed that each strain lacked the cag pathogenicity island and contained a degenerate vacuolating cytotoxin (vacA) gene. Analyses of nine other genes (glmM, recA, hp519, glr, cysS, ppa, flaB, flaA, and atpA) revealed a approximately 2% base substitution difference, on average, between the two *H. acinonychis* groups and a approximately 8% difference between these genes and their homologs in *H. pylori* reference strains such as 26695. *H. acinonychis* derivatives that could chronically infect mice were selected and were found to be capable of persistent mixed infection with certain *H. pylori* strains. Several variants, due variously to recombination or new mutation, were found after 2 months of mixed infection. *H. acinonychis* ' modest genetic distance from *H. pylori*, its ability to infect mice, and its ability to coexist and recombine with certain *H. pylori* strains in vivo should be useful in studies of Helicobacter infection and virulence mechanisms and studies of genome evolution.

**Descriptors:** cheetah, lions, *Panthera leo*, *Acinonyx jubatus*, tiger, *Panthera tigris*, genetic studies, rodent infection studies, big cats, *Helicobacter* species, gastric pathogen, bacterium-host interactions, genome evolution, DNA fingerprinting, gene sequencing.

Dailidiene, D., G. Dailide, K. Ogura, M. Zhang, A.K. Mukhopadhyay, K. Eaton, G. Cattoli, J.G. Kusters, and D.E. Berg (2004). **: Genetic and rodent infection studies of a *Helicobacter pylori*-like gastric pathogen of cheetahs and other big cats.** *Journal of Bacteriology* 186(2): 356-365. ISSN: 0021-9193.

**Descriptors:** cheetahs, *Acinonyx jubatus*, big cats, gastric pathogen, rodent infection, *Helicobacter acinonychis*, bacterium host interactions, *Helicobacter pylori*, genetic infections, mice.

Davidson, B.C., D. Morsbach, and R.C. Cantrill (1986). **The fatty acid composition of the liver and brain of southern African cheetahs**. *Progress in Lipid Research* 25: 97-99. ISSN: 0163-7827.

**Descriptors:** cheetahs, *Acinonyx jubatus*, brain, liver, fatty acid composition, diet, freshly killed animals, captive diet, compared, South African.

Deem, S.L., J.C. Ko, and S.B. Citino (1998). **Anesthetic and cardiorespiratory effects of tiletamine zolazepam medetomidine in cheetahs.** *Journal of the American Veterinary Medical Association* 213(7): 1022-6. ISSN: 0003-1488.

**Abstract:** OBJECTIVE: To evaluate anesthetic and cardiorespiratory effects of an intramuscular injection of a tiletamine-zolazepam-medetomidine combination in cheetahs. DESIGN: Prospective study. ANIMALS: 17 adult captive cheetahs. PROCEDURE: The anesthetic combination was administered intramuscularly via a dart. Induction quality, duration of lateral recumbency, duration of recovery, and quality of anesthetic reversal with atipamezole were assessed. Cardiorespiratory variables (arterial blood gas partial pressures, arterial blood pressure, heart and respiratory rates, end-tidal CO2, oxygen saturation, and rectal temperature) were measured during anesthesia. RESULTS: Sedation and lateral recumbency developed within 1.9 +/- 1.0 (mean +/- SD) and 4.3 +/- 2.0 minutes of drug administration, respectively. Clinically acceptable cardiorespiratory and blood gas values were recorded for at least 87 minutes after drug administration in all but 1 cheetah. Hypoxemia and arrhythmias developed in 1 cheetah breathing room air but resolved after treatment with oxygen. Hypertension developed in all cheetahs. Significant differences in heart and respiratory rates, mean arterial blood pressure, arterial pH, partial pressure of oxygen, and hemoglobin saturation were found between cheetahs that did and did not receive oxygen supplementation. After administration of atipamezole, sternal recumbency and mobility returned within 6.9 +/- 5.8 and 47.5 +/- 102.2 minutes, respectively. Postreversal sedation, which lasted approximately 4 hours, developed in 4 cheetahs. CLINICAL IMPLICATIONS: Tiletamine-zolazepam-medetomidine delivered via a dart provided an alternative method for induction and maintenance of anesthesia in cheetahs. Atipamezole at the dose used was effective for reversal of this combination in the initial phase of anesthesia.

**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, anesthesia, anesthetics, administration, dosage, hypnotics and sedatives, administration, dosage, imidazoles administration, dosage, imidazoles pharmacology, tiletamine, administration, dosage, zolazepam, administration, dosage, acid base equilibrium, drug effects, adrenergic alpha antagonists pharmacology, blood pressure drug effects, body temperature drug effects, heart rate drug effects, medetomidine, oxygen blood, respiration, drug effects.

Dierenfeld, E.S. (1993). **Nutrition of captive cheetahs: food composition and blood parameters.** *Zoo Biology* 12(1): 143-150. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6
**Descriptors:** *cheetahs*, *Acinonyx jubatus*, animal nutrition, zoos, feed formulation, zoo animals, nutrient requirements, hematologic tests, blood profile.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Doi, O., H. Kusunoki, T. Sato, S. Kawakami, T. Fukuoka, K. Okuda, O. Ito, E. Saito, T. Hayashi, T. Hase, and M. Kamiyosh (2001). **Serum progesterone and estradiol-17beta concentrations, and lapaloscopic observations of the ovary in the cheetah (*Acinonyx jubatus*) with pregnant mare serum gonadotropin and human chorionic gonadotropin treatments.** *Journal of Veterinary Medical Science the Japanese Society of Veterinary Science, The* 63(12): 1361-4. ISSN: (p) 0916-7250; online: 1347-7439.
**Abstract:** In 3 adult female cheetahs, induced-superovulation treatment was conducted, by means of 200 IU of pregnant mare serum gonadotropin (PMSG) and 100 IU of human chorionic gonadotropin (hCG) 80 hr after PMSG. The administration of PMSG created a sharp increase in the estradiol-17beta concentration, resulting in 232 pg/ml 8 hr later in one specimen out of three. The hCG administration showed an increase in the progesterone concentration of 2.29 ng/ml 46 hr later. In addition, after direct observation of the ovary surface by laparoscopy, 5 follicles in the right ovary over 2 mm in diameter, and 7 corpora lutea (5 in the right ovary and 2 in the left) were found. It is assumed that ovulation can be induced with hCG after 80 hr on PMSG during a cheetah's diestrus or proestrus.
**Descriptors:** cheetah, *Acinonyx jubatus*, conservation of natural resources, physiology, chorionic gonadotropin, pharmacology, estradiol blood, gonadotropins, equine pharmacology, ovary drug effects, ovulation induction, progesterone, blood, surgery, chorionic gonadotropin, administration, dosage, methods, gonadotropins, administration, dosage, laparoscopy, ovary physiology, ovulation induction methods.

Doi, O., N. Shibayama, K. Sugiura, H. Kusunoki, T. Sato, T. Tomita, T. Abe, S. Fukushige, M. Sakata, Y. Sasaki, T. Nishikaku, Y. Tasaki, T. Hase, and T. Nakamura (1995). **Changes in plasma concentrations of progesterone and estradiol-17beta in non-pregnant and pregnant cheetahs (*Acinonyx jubatus*).** *Journal of Reproduction and Development (Japan)* 41(3): 235-239. ISSN: 0916-8818.
**Abstract:** Changes in plasma progesterone and estradiol-17beta concentrations in 3 non-pregnant and 2 pregnant cheetahs were determined by radioimmunoassays. Progesterone concentrations inn the non-pregnant cheetahs varied between 0.78 and 6.20 ng/ml and exhibited elevations at intervals of 10 to 12 weeks. There was one cheetah (2-year-old) in which plasma estradiol-17beta concentrations elevated 1 to 2 weeks prior to the peak plasma progesterone concentrations. In the pregnant cheetahs, plasma progesterone concentrations increased at Day 3, rose to a peak (13 ng/ml) at Day 27, and decreased gradually until the time of birth. Plasma estradiol-17beta concentrations in the pregnant cheetah attained a peak value (430 pg/ml) at Day 4 before copulation), decreased gradually until Day 60 and increased again at Day 66 (409 pg/ml). In an aborted cheetah, the estradiol-17beta level showed only a slight increase. These data provide the first assessment of reproductive functions in the female cheetah as monitored by plasma steroid profiles.
**Descriptors:** cheetah, *Acinonyx jubatus*, progesterone, estradiol, changes in plasma concentrations, pregnant, non-pregnant, radioimmune assays, reproductive frunctions.
**Language of Text:** Summary in English.

Donoghue, A.M., J.G. Howard, A.P. Byers, K.L. Goodrowe, M. Bush, E. Blumer, J. Lukas, J. Stover, K. Snodgrass, and D.E. Wildt (1992). **Correlation of sperm viability with gamete interaction and fertilization in vitro in the cheetah (*Acinonyx jubatus*).** *Biology of Reproduction* 46(6): 1047-56. ISSN: 0006-3363.
**Abstract:** Sperm-oocyte interaction in vitro was studied in the cheetah, a species known to produce poor quality ejaculates and to experience low rates of fertility. Twelve female cheetahs were injected (i.m.) with eCG followed by hCG 84 h later. Twenty-four to 26 h post hCG, each was subjected to laparoscopic oocyte aspiration. A sperm motility index (SMI) was calculated for each of 9 cheetah sperm donors that produced ejaculates averaging 41.3 +/- 22.9 x 10(6) motile sperm and 28.4 +/- 4.9% structurally normal sperm. Each ejaculate was used to inseminate cheetah oocytes from 1 or 2 females and salt-stored, domestic cat oocytes. The presence of ovarian follicles (greater than or equal to 1.5 mm in diameter) showed that all females responded to exogenous gonadotropins (range, 11-35 follicles/female). A total of 277 cheetah oocytes was collected from 292 follicles (94.9% recovery; 23.1 +/- 2.2 oocytes/female). Of these, 250 (90.3%) qualified as mature and 27 (9.7%) as degenerate. Of the 214 mature oocytes inseminated, 56 (26.2%) were fertilized, and 37 (17.3%) cleaved to the 2-cell stage in vitro; but the incidence of in vitro fertilization (IVF) varied from 0 to 73.3% (p less than 0.001) among individual males. When oocytes from individual cheetahs (n = 5) were separated into two groups and inseminated with sperm from a male with an SMI greater than 0 after 6 h coincubation versus an SMI = 0 at this time, the mean fertilization rates were 28/44 (63.6%) and 0/37 (0%), respectively (p less than 0.05). Of the 117 domestic cat oocytes coincubated with cheetah sperm, 96.6% contained 1 or more cheetah sperm in the outer half of the zona pellucida (ZP). Although the mean number of cheetah sperm penetrating the outer ZP of the cat oocyte was similar (p greater than 0.05) among all males, there

was a positive correlation between the number of sperm reaching the inner half of the ZP and fertilization rate in vitro (r = 0.82; p less than 0.05). Compared to IVF efficiency in the domestic cat and tiger as reported in earlier studies, IVF efficiency in the cheetah is low. Because oocytes from 11 of 12 cheetahs were fertilized in vitro, there is no evidence that the female gamete is incompetent. Although sperm pleiomorphisms may contribute to poor reproductive performance, examination of the data on the basis of individual sperm donors reveals that effective gamete interaction in the cheetah is dictated, in part, by sperm motility.
**Descriptors:** cheetah, *Acinonyx jubatus*, sperm viability, gamete interaction, fertilization, in vitro, sperm oocyte interaction, sperm motility, reproductive performance.

Durant, S.M. (2000). **Predator avoidance, breeding experience and reproductive success in endangered cheetahs, *Acinonyx jubatus***. *Animal Behaviour* 60(1): 121-130. ISSN: 0003-3472.
**Descriptors:** cheetahs, *Acinonyx jubatus*, behavior, predator avoidance, breeding experience, reproductive success, wildlife management.

Durant, S.M., S. Bashir, T. Maddox, and M.K. Laurenson (2007). **Relating long-term studies to conservation practice: The case of the Serengeti Cheetah Project.** *Conservation Biology* 21(3): 602-611. ISSN: 0888-8892.

**NAL Call Number:** QH75.A1C5
**Abstract:** Ithough detailed, long-term scientific studies provide potentially crucial information for conservation, they are rare. Moreover, there is often a disjunction between scientists and managers that can affect whether scientific results are applied to help solve conservation problems. Long-term studies can promote increased communication between scientists and managers and hence offer an opportunity for constructive engagement between the two groups. We examined direct and indirect impacts of a 30-year study, the Serengeti Cheetah Project (SCP). Much of what is currently known about wild cheetahs comes from the SCP. In particular, the SCP has demonstrated that cheetahs have a combination of semisociality and ranging patterns that is unique among mammals. This system arises because cheetahs need to be mobile to avoid predators and competitors, yet maintain access to prey; this results in densities much lower than for other large carnivores and a requirement for large areas of heterogenous and connected habitat. The SCP started as a research project, but expanded into a national program, developing capacity for carnivore conservation within Tanzania. Long-term studies such as the SCP are uniquely placed to establish effective working relationships between scientists and managers, engage local and national institutions, and strengthen national capacity for biodiversity conservation. This process is best realized through the establishment of frameworks for conservation that seek to align scientific research with management needs. Long-term studies also play an important role in identifying international priorities for conservation. Nonetheless, the integration of science and management in conservation is a two-way process that requires concerted efforts by both sides to improve and maintain dialogue. Ultimately, conservation depends on people, and maintaining a commitment to a particular area over many years--such as through implementation of a long-term research project--helps establish mutual trust and respect, particularly when combined with development of local and national capacity for scientific research and conservation management.
**Descriptors:** Cheetahs, *Acinonyx jubatus*, capacity development, conservation management, long term conservation studies, Serengeti Cheetah Project, Tanzania.

Durrant, B.S., S.E. Millard, T.S. Peterson, T.S. Everett, and D.M. Zimmerman (1997). **Lifetime semen production in a captive cheetah (*Acinonyx jubatus*)**. *Biology of Reproduction* 56(SUPPL. 1): 106. ISSN: 0006-3363.
**Descriptors:** cheetah, *Acinonyx jubatus*, captive, behavior, reproductive system, lifetime semen production, wildlife management, conservation, sexual behavior.
**Notes:** Meeting Information: Thirtieth Annual Meeting of the Society for the Study of Reproduction, Portland, Oregon, USA; August 2-5, 1997.

Durrant, B.S., S.E. Millard, D.M. Zimmerman, and D.G. Lindburg (2001). **Lifetime semen production in a cheetah (*Acinonyx jubatus*).** *Zoo Biology* 20(5): 359-366. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, spermatozoa, senescence, male fertility, sexual

maturity, motility, age differences, semen characters, ejaculate volume, semen production.

Eaton, K., F.E. Dewhirst, M.J. Radin, J.G. Fox, B.J. Paster, S. Krakowka, and D.R. Morgan (1993). ***Helicobacter acinonyx* new species isolated from cheetahs with gastritis**. *International Journal of Systematic Bacteriology* 43(1): 99-106. ISSN: 0020-7713.
**Descriptors:** cheetah, *Acinonyx jubilatus*, gastritis, new species, *Helicobacter acinonyx*, gram negative, spiral bacteria, isolates, bacterial pathogen.

Eaton, K.A., F.E. Dewhirst, M.J. Radin, J.G. Fox, B.J. Paster, S. Krakowka, and D.R. Morgan

(1993). ***Helicobacter acinonyx* sp. nov., isolated from cheetahs with gastritis.** *International Journal of Systematic Bacteriology* 43(1): 99-106. ISSN: 0020-7713.
**Abstract:** Four strains of a novel Helicobacter species were isolated from the stomachs of cheetahs (*Acinonyx jubilatus*) with gastritis. These isolates were phenotypically similar to *Helicobacter pylori*. The isolates were gram-negative, spiral bacteria which grew under microaerophilic conditions at 37 degrees C, but not at 25 or 42 degrees C, and produced urease, catalase, oxidase, alkaline phosphatase, and gamma-glutamyl transpeptidase. The isolates did not ferment glucose, mannitol, inositol, sorbitol, rhamnose, sucrose, melibiose, amygdalin, or arabinose; hydrolyze hippurate or indoxyl acetate; or reduce nitrate. They did not produce H2S from triple sugar iron agar, and they did not grow in the presence of 1.0% glycine or 1.5% NaCl. They were resistant to nalidixic acid and sensitive to cephalothin and metronidazole. Cells were typically 0.3 by 2.0 microns and possessed tufts of two to five sheathed, monopolar flagella. The G+C content of strain 90-119 was 30 mol%. Cluster analysis of densitometry scans of polyacrylamide protein gels revealed more than 70% similarity of the cheetah isolates to *H. pylori*, less than 60% similarity to *Helicobacter felis*, and less than 50% similarity to *Helicobacter mustelae*. Complete 16S rRNA sequences were determined for two of the cheetah isolates. Phylogenetic analysis was performed by comparing the cheetah sequences to those of 19 reference strains, including *H. pylori*, *H. felis* (two strains), *H. mustelae*, *Helicobacter muridarum*, "*Flexispira rappini*," *Wolinella succinogenes*, *Campylobacter coli, Campylobacter concisus*, *Campylobacter curvus*, *Campylobacter fetus, Campylobacter hyointestinalis, Campylobacter jejuni, Campylobacter lari*, C*ampylobacter rectus*, *Campylobacter sputorum* subsp. bubulus, a *Campylobacter* sp. (pig isolate), [Bacteroides] gracilis, and [Bacteroides] ureolyticus.(Abstract truncated at 250 words)
**Descriptors:** cheetah, *Acinonyx jubatus*, microbiology, gastritis, *Helicobacter* classification, stomach microbiology, bacterial proteins analysis, base composition, base sequence, gastritis microbiology, *Helicobacter* chemistry, growth, development, ultrastructure, molecular sequence data, RNA, ribosomal, 16s genetics, sequence homology, nucleic acid.

Eaton, K.A., M.J. Radin, S. Krakowka, and D.R. Morgan (1991). **Animal models of bacterial gastritis: transmission from cheetahs to mice and kittens**. *Microbial Ecology in Health and Disease* 4(SPECIAL): S151. ISSN: 0891-060X.
**Descriptors:** cheetah, *Acinonyx jubatus*, experimental infection, bacterial gastritis, animal models, cats, Felidae, *Helicobacter*, mice, Spirillaceae.
**Notes:** Meeting Information: VI International Workshop on *Campylobacter Helicobacter* and related organisms, October 7-10, 1991, Sydney, Australia.

Eaton, K.A., M.J. Radin, L. Kramer, R. Wack, R. Sherding, S. Krakowka, J.G. Fox, and D.R. Morgan (1993). **Epizootic gastritis associated with gastric spiral bacilli in cheetahs (*Acinonyx jubatus*).** *Veterinary Pathology* 30(1): 55-63. ISSN: 0300-9858.
**Abstract:** An outbreak of vomiting in a group of captive cheetahs (*Acinonyx jubatus*) was investigated, and histologic examination revealed chronic gastritis characterized by infiltration of lymphocytes and numerous plasma cells and epithelial erosions. Lymphoid follicles, globule leukocytes, scattered neutrophils, and (in one animal) abscessed gastric glands were inconsistent findings. In addition, necropsy of three cheetahs revealed gastric mucosal hyperplasia. Two kinds of bacteria were identified in the stomachs of infected cheetahs. Numerous long, tightly coiled motile *Gastrospirillum*-like organisms were seen in gastric mucus and in Warthin-Starry-stained sections of mucosa. These bacteria could not be cultured but were transmitted to conventional mice in homogenates of gastric mucosa from infected cheetahs. Ultrastructural examination revealed helical filaments on some of these bacteria. In addition, a smaller *Helicobacter* sp. was isolated. This organism could be cultured in vitro under microaerophilic conditions. One or both of these bacterial species was probably responsible for the gastritis in these cheetahs.
**Descriptors:** cheetah, *Acinonyx jubatus*, disease outbreaks, veterinary, gastric mucosa microbiology, gastritis, *Helicobacter* isolation, purification, vomiting, gastric mucosa pathology, gastritis complications, epidemiology, gastritis microbiology, gastritis pathology, hyperplasia, electron microscopy, epidemiology, vomiting epidemiology, vomiting etiology, Ohio.

Eaton, K.A., M.J. Radin, L. Kramer, R. Wack, R. Sherding, S. Krakowka, and D.R. Morgan (1991). **Gastric spiral bacilli in captive cheetahs.** *Scandinavian Journal of Gastroenterology. Supplement* 181: 38-42. ISSN: 9985-5928.
**Abstract:** Two kinds of gastric spiral bacilli were identified in the stomachs of captive cheetahs with naturally occurring gastritis. One type was morphologically similar to '*Gastrospirillum hominis*'. This organism could not be cultured in vitro. Some of these bacteria had superficial helical filaments, and others did not. The other type was morphologically, biochemically, and bacteriologically similar to *Helicobacter pylori*. This organism is most likely a new species of *Helicobacter*. One or both of these bacteria may have been responsible for the gastritis seen in these cheetahs.
**Descriptors:** cheetah, *Acinonyx jubatus*, microbiology, gastritis, gram negative bacteria, classification, helicobacter infections, *Helicobacter pylori*, classification, gastritis microbiology, gram negative bacteria, ultrastructure, helicobacter infections microbiology, *Helicobacter pylori* ultrastructure, restriction mapping.

Ervin, A.M., R.E. Junge, R.E. Miller, and L.P. Thornburg (1988). **Hemangiosarcoma in a cheetah (*Acinonyx jubatus*)**. *Journal of Zoo Animal Medicine* 19(3): 143-145. ISSN: 0093-4526.
**Descriptors:** cheetah, *Acinonyx jubatus*, hemangiosarcoma, case report, metastasis, neoplasms, zoo animals.

Evermann, J.F., J.L. Heeney, A.J. McKeirnan, and S.J. O'Brien (1989). **Comparative features of a coronavirus isolated from a cheetah with feline infectious peritonitis.** *Virus Research* 13(1): 15-27. ISSN: 0168-1702.
**Abstract:** A coronavirus which was isolated from a cheetah (*Acinonyx jubatus*) that succumbed to feline infectious peritonitis was characterized in vitro. The virus was determined to be highly cell-associated with Crandell feline kidney (CrFK) cells and was routinely maintained as a persistent infection (CrFK 83-4497). The cheetah coronavirus was compared with other members of the feline coronavirus group including the feline enteric coronavirus (FECV) 79-1683 and the feline infectious peritonitis viruses (FIPV), 79-1146, and UCD-1. The cheetah coronavirus was demonstrated to have a restricted host-cell range with limited cytopathic effect. Indirect immunofluorescence with antisera to FIPV UCD-1 revealed the concentration of viral antigens in the perinuclear region of cells infected with the cheetah coronavirus. Ultrastructural studies of the cheetah coronavirus indicated a limited number of immature viral particles within cytoplasmic vesicles and at the cell surface. This was in contrast to electron microscopy results of FECV 79-1683 and FIPV 79-1146, which had numerous mature virus particles within the cytoplasmic vesicles, as well as at the cell surface. The cheetah coronavirus was tentatively placed in the feline coronavirus family based upon its antigenic reactivity by immunofluorescence; however, the possibility that it represents a unique coronavirus of cheetahs should not be dismissed without further analyses at the host and genomic levels.
**Descriptors:** cheetah, *Acinonyx jubatus*, microbiology, carnivora microbiology, coronavirus isolation, purification, Coronaviridae infections, peritonitis, cat diseases microbiology, cats, cell line, Coronaviridae immunology, ultrastructure, infections, microbiology, fluorescent antibody technique, electron microscopy, peritonitis microbiology, species specificity.

Evermann, J.F., J.L. Heeney, M.E. Roelke, A.J. McKeirnan, and S.J. O'Brien (1988). **Biological and pathological consequences of feline infectious peritonitis virus infection in the cheetah.** *Archives of Virology* 102(3-4): 155-71. ISSN: 0304-8608.
**Abstract:** An epizootic of feline infectious peritonitis in a captive cheetah population during 1982-1983 served to focus attention on the susceptibility of the cheetah (*Acinoyx jubatus*) to infectious disease. Subsequent observations based upon seroepidemiological surveys and electron microscopy of fecal material verified that cheetahs were indeed capable of being infected by coronaviruses, which were antigenically related to coronaviruses affecting domestic cats, i.e. feline infectious peritonitis virus/feline enteric coronavirus. Coincident with the apparent increased susceptibility of the cheetah to infectious diseases, were observations that the cheetah was genetically unusual insofar as large amounts of enzyme-encoding loci were monomorphic, and that unrelated cheetahs were capable of accepting allogenic skin grafts. These data provided the basis for a hypothesis that the cheetah, through intensive inbreeding, had become more susceptible to viral infections as a result of genetic homogeneity.
**Descriptors:** cheetah, *Acinonyx jubatus*, microbiology, carnivora microbiology, Coronaviridae infections, peritonitis, genetics, zoo microbiology, antibodies, viral analysis, Coronaviridae genetics, growth, development, infections, diagnosis, Coronaviridae infections epidemiology, disease susceptibility, genetic predisposition to disease, inbreeding, peritonitis diagnosis, epidemiology, microbiology, serologic tests, t lymphocytes immunology.

Evermann, J.F., M.K. Laurenson, A.J. McKeirnan, and T.M. Caro (1993). **Infectious disease surveillance in captive and free-living cheetahs: an integral part of the Species Survival Plan.** *Zoo Biology* 12(1): 125-133. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, Coronavirus, Felid herpesvirus 1, wild animals, zoos, zoo animals, serological surveys, disease surveys, captive, free living, survival plan, surveillance, Tanzania.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Exner, C. and J. Unshelm (1996). **Haltungsanspruche von Raubkatzen - Gehegegestaltung und ihre Tierschutzrelevanz.[Environmental requirements of large species of Felidae in zoos. Welfare aspects of cage construction]** . *Aktuelle Arbeiten Zur Artgemassen Tierhaltung*: 219-229. ISSN: 1434-1220.
**Descriptors:** cheetah, *Acinonyx jubatus*, leopards, lions, tigers, animal welfare, housing, zoo animals.
**Language of Text:** German, Summary in English.

Federico, B. and P.G. Bracchi (2001). **Captive bred cheetah behaviour**. *Annali Della Facolta Di Medicina Veterinaria, Universita Di Parma* 21: 47-60. ISSN: 0393-4802.
**Descriptors:** cheetah, *Acinonyx jubatus*, animal behaviour, captive bred, biology, capture of animals, habitats, male animals, maternal behaviour.

**Language of Text:** Italian.

Fickel, J., A. Wagener, and A. Ludwig (2007). **Semen cryopreservation and the conservation of endangered species**. *European Journal of Wildlife Research* 53(2): 81-89. ISSN: 1612-4642.
**Descriptors:** endangered species, semen cryopreservation, conservation, extinction, resource banking, sperm, reproduction techniques.

Freeman, A.R., D.E. MacHugh, S. McKeown, C. Walzer, D.J. McConnell, and D.G. Bradley (2001). **Sequence variation in the mitochondrial DNA control region of wild African cheetahs (*Acinonyx jubatus*).** *Heredity* 86(Pt 3): 355-62. ISSN: 0018-067X.
**Abstract:** Five hundred and twenty-five bp of mitochondrial control region were sequenced and analysed for 20 *Acinonyx jubatus* and one *Felis catus*. These sequences were compared with published sequences from another domestic cat, 20 ocelots (*Leopardus pardalus*) and 11 margays (*Leopardus weidii*). The intraspecific population divergence in cheetahs was found to be less than in the other cats. However variation was present and distinct groups of cheetahs were discernible. The 80 bp RS2 repetitive sequence motif previously described in other felids was found in four copies in cheetah. The repeat units probably have the ability to form secondary structure and may have some function in the regulation of control region replication. The two central repeat units in cheetah show homogenization that may have arisen by convergent evolution.
**Descriptors:** cheetah, *Acinonyx jubatus*, genetics, DNA, mitochondrial genetics, variation genetics, base sequence, carnivora genetics, cats genetics, haplotypes, molecular sequence data, domestic cat, *Felis catus*, ocelots, *Leopardus pardalus*, margays, *Leopardus weidii*, .

Fuga, G., M. Nuti, G. Macchioni, and O. Gadale (1978). **Un caso di larva migrans cutanea recidivante trasmesso dal ghepardo (*Acinonyx jubatus*). [A case of relapsing cutaneous larva migrans transmitted by cheetah (*Acinonyx jubatus*)].** *Parassitologia* 20(1/3): 139-142. ISSN: 0048-2951.
**Descriptors:** cheetah, *Acinonyx jubatus*, case reports, cutaneous larva migrans, helminths, hosts, new host records, parasites, *Ancylostoma caninum*, *Ancylostoma tubaeforme*, hookworms, creeping eruption, treatment, thiabendazole.
**Language of Text:** Italian, Summary in English.

Gaskell, R. and K. Willoughby (1999). **Herpesviruses of carnivores**. *Veterinary Microbiology* 69(1/2): 73-88. ISSN: 0378-1135.
**Descriptors:** cheetah, *Acinonyx jubatus*, carnivores, herpersviruses, clinical aspects, epidemiology, live vaccines, respiratory diseases, reviews, vaccination, carnivores, cats, dogs, felid herpesviruses, Herpesviridae, seals.
**Notes:** Meeting Information: Special Issue: Virology of carnivores. Contributions from the first International Meeting on Virology of Carnivores held in Utrecht, The Netherlands, May 13-15, 1998.

Gillespie, D. and M. Fowler (1984). **Lymphocytic plasmacytic colitis in two cheetahs.** *Journal of the American Veterinary Medical Association* 185(11): 1388-9. ISSN: 0003-1488.
**Descriptors:** cheetah, *Acinonyx jubatus*, zoo animals, carnivora, colitis, food hypersensitivity, animal feed adverse effects, lymphocytic plasmacytic colitis, diet therapy, etiology, complications, diet therapy, lymphocytes, plasma cells, California U.S.

Good, K.M., A. Houser, L. Arntzen, and P.C. Turnbull (2008). **Naturally acquired anthrax antibodies in a cheetah (*Acinonyx jubatus*) in Botswana.** *Journal of Wildlife Diseases* 44(3): 721-3. ISSN: 0090-3558.
**Abstract:** An outbreak of anthrax in the Jwana Game Reserve in Jwaneng, Botswana, was first observed when three cheetahs (*Acinonyx jubatus*) died of the disease in November 2004. In the aftermath of this event, banked serum samples collected from 23 wild-caught cheetahs were examined, by the inhibition enzyme-linked immunoassay (ELISA), for antibodies to the protective antigen (PA) of Bacillus anthracis. Of the 23 cheetahs, 16 regularly accessed the reserve. Antibodies to PA were detected in one cheetah collected in May 2004, indicating the disease was occurring well before it was first noticed. This appears to be the first demonstration of naturally acquired anthrax antibodies in cheetahs. The finding of one antibody-positive animal amongst at least 16 potentially exposed individuals is consistent with existing reports that it is uncommon for cheetahs to develop natural immunity to anthrax.
**Descriptors:** cheetah, *Acinonyx jubatus*, anthrax antibodies, naturally aquired immunity, outbreak, Jwana Game Reserve Botswana.

Good, K.M., C. Marobela, and M. Houser (2005). **A report of anthrax in cheetahs (*Acinonyx jubatus*) in Botswana**. *Journal of the South African Veterinary Association* 76(4): 186. ISSN: 0038-2809.
**Descriptors:** cheetah, *Acinonyx jubatus*, anthrax, infection, bacterial disease, diagnosis, mortality, symptom, Botswana.

Goodrowe, K.L., G.J. Crawshaw, and K.G. Mehren (1991). **Stimulation of ovarian activity and oocyte recovery in the caracal (*Felis caracal*) and cheetah (*Acinonyx jubatus*)**.

*Journal of Zoo and Wildlife Medicine* 22(1): 42-48. ISSN: 1042-7260.
**Descriptors:** cheetah, *Acinonyx jubatus*, caracal, *Felis caraca*, female infertility, Zoo animals, Felidae, ovarian activity, stimulation, ovarian recovery.

Gosselin, S.J., D.L. Loudy, M.J. Tarr, W.F. Balistreri, K.D. Setchell, J.O. Johnston, L.W. Kramer, and B.L. Dresser (1988). **Veno occlusive disease of the liver in captive cheetah.** *Veterinary Pathology* 25(1): 48-57. ISSN: 0300-9858.
**Abstract:** Liver tissues from 126 captive cheetah were evaluated by light microscopy and histochemistry; eight animals were evaluated by electron microscopy. The main hepatic lesion, a vascular lesion resembling veno-occlusive disease (VOD) of the liver and characterized by subendothelial fibrosis and proliferation of smooth muscle-like cells in the central veins, was seen in 60% of the sexually mature cheetah. Although this hepatic vascular lesion was seen in cheetah as young as 1 year of age, the most severe lesions, usually associated with liver failure, were found in cheetah between the ages of 6 and 11. There was no sex predisposition, and in approximately 40% of the VOD cases, liver disease was not suspected clinically or at necropsy. VOD was found in other felidae, especially in the snow leopard. High levels of vitamin A in livers, as well as in diets of the cheetah, could be a contributing factor in the development of VOD in some groups of cheetah.
**Descriptors:** cheetah, *Acinonyx jubatus*, carnivora, liver pathology, animal feed analysis, hepatic veno-occlusive disease pathology, histocytochemistry, liver analysis, liver ultrastructure, electron microscopy, vitamin A analysis.

Gottelli, D., J. Wang, S. Bashir, and S.M. Durant (2007). **Genetic analysis reveals promiscuity among female cheetahs.** *Proceedings. Biological Sciences The Royal Society* 274(1621): 1993-2001. ISSN: (p) 0962-8452; (E) 1471-2945.
**Abstract:** Cheetahs (*Acinonyx jubatus*) have a combination of ranging patterns and social system that is unique in mammals, whereby male coalitions occupy small territories less than 10% of the home range of solitary females. This study uses non-invasive genetic sampling of a long-term study population of cheetah in the Serengeti National Park in Tanzania to infer the mating system. Individual cheetah genotypes at up to 13 microsatellite loci were obtained from 171 faecal samples. A statistical method was adapted to partition the cubs within each litter (n=47) into full-sibling clusters and to infer the father of each cluster using these loci. Our data showed a high rate of multiple paternity in the population; 43% of litters with more than one cub were fathered by more than one male. The results also demonstrated that female fidelity was low, and provided some evidence that females chose to mate with unrelated males within an oestrus cycle. The low rate of paternity assignments indicated that males living outside the study area contributed substantially to the reproduction of the cheetah population.
**Descriptors:** cheetah, *Acinonyx jubatus*, females mating preference, genetic analysis, genotype, female, promiscuity, social dominance, fecal samples, estrus cycle, Serengeti National Park, Tanzania.

Graham, L.H., K.L. Goodrowe, J.I. Raeside, and R.M. Liptrap (1995). **Non-invasive monitoring of ovarian function in several felid species by measurement of fecal estradiol-17 beta and progestins.** *Zoo Biology* 14(3): 223-237. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, lynx, leopards, lions, tigers, felid species, estradiol, ovulation, progesterone, ovarian function, radioimmunoassay, zoos, high performance liquid chromatography.

Grisham, J. (1997). **North American species survival plan for cheetah *Acinonyx jubatus*.** *International Zoo Yearbook* 35(0): 66-70. ISSN: 0074-9664.
**Descriptors:** cheetah, *Acinonyx jubatus*, species survival plan, zoos, North America, long term management, long range goals.

Groote, D.d., F. Haesebrouck, R. Ducatelle, and L. Devriese (1997). ***Helicobacter* spp. en gastro-intestinale problemen bij dieren. [*Helicobacter* spp. and gastrointestinal diseases in animals].** *Vlaams Diergeneeskundig Tijdschrift* 66(1): 8-13. ISSN: 0303-9021.
**Descriptors:** animals, digestive system diseases, gastrointestinal diseases, intestines, pathogenesis, pathology, poultry, stomach, cheetah, *Acinonyx jubatus*, cats, cattle, dogs, ferrets, fowls, *Helicobacter*, mice, monkeys, pigs, rats.
**Language of Text:** Dutch, Summary in English.

Hackendahl, N.C. and S.B. Citino (2005). **Radiographic kidney measurements in captive cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 36(2): 321-2. ISSN: 1042-7260.
**Abstract:** The prevalence of chronic renal disease is substantial among captive cheetahs (*Acinonyx jubatus*). The purpose of this study was to determine kidney measurements from radiographs of captive cheetahs (n = 15) with normal renal function. The ratio of kidney length to length of the body of the second lumbar vertebrae has been established for domestic cats with normal renal function. The mean ratio of renal length to length of the second lumbar vertebra was 1.81 +/- 0.14 in cheetahs. This baseline data may allow an objective evaluation of radiographic kidney size in cheetahs. However, evaluation of a

small number of cheetahs with confirmed renal failure resulted in a similar ratio.
**Descriptors:** cheetah, captive animals, *Acinonyx jubatus*, anatomy, histology, kidney anatomy, histology, kidney radiography, reference values, renal disease, kidney mesurements, radiographs.

Haefner, M., T.J. Burke, B.E. Kitchell, L. Lamont, D.J. Schaeffer, M. Behr, and J.B. Messick (2003). **Identification of *Haemobartonella felis* (*Mycoplasma haemofelis*) in captive nondomestic cats.** *Journal of Zoo and Wildlife Medicine* 34(2): 139-143. ISSN: 1042-7260.
**Descriptors:** cheetahs, *Acinonyx jubatus*, lions, tigers, jaguar, leopards, non domestic cats, feline infectious anemia, *Haemobartonella felis*, *Mycoplasma haemofelis*, blood count, polymerase chain reaction, PCR.

Harley, E.H., I. Baumgarten, and P.S. Rogers (2000). **The use of dna microsatellite markers for determining paternity in a captive cheetah population**. *South African Journal of Wildlife Research* 30(1): 22-25. ISSN: 0379-4369.
**Descriptors:** cheetah, *Acinonyx jubatus*, paternity determination, DNA microsatellite markers, captive population, phenotype, alleles, genetic studies.

Harris, L., B.G. Steinetz, J.B. Bond, S. Lasano, and W.F. Swanson (2008). **Refinement of a commercial bench-top relaxin assay for pregnancy diagnosis using urine from domestic and nondomestic felids**. *Journal of Zoo and Wildlife Medicine* 39(2): 170-179. ISSN: 1042-7260.
**Descriptors:** nondomestic felids, domestic felids, pregnancy diagnosis, commercial bench top relaxin assay, refinement, urinary relaxin, pregnancy.

Hasslinger, M., F.X. . Wittmann, H. Wiesner, and W. Rietschel (1982). **On the incidence of *Ollulanus tricuspis* (Leuckart, 1865) in Felidae of zoological garden**. *Veterinary Medical Review*(2): 220-228. ISSN: 0506-8274.
**Abstract:** At the Munich zoo, Hellabrunn, GFR, *O. tricuspis* infection was diagnosed by gastric irrigation in a cheetah (*Acynonyx jubatus*), a new host record. 3 other cheetahs, plus lions, tigers, leopards and a puma (12 animals altogether) were negative. Inducement of vomiting was not a successful method of diagnosis. *Reproduced with permission of CAB.*
**Descriptors:** Felidae, cats, lions, tigers, leopards, puma, worm, diagnosis, helminths, hosts, new host records, parasites, zoological gardens, cheetah, *Acinonyx jubatus*, Carnivores, Nematoda, *Ollulanus tricuspis*.

Hasslinger, M.A. (1982). ***Ollulanus tricuspis* (Leuckart, 1865), the stomach worm of the cat and his unusual hosts**. *Revista Iberica De Parasitologia* Special Volume: 449-459. ISSN: 0034-9623.
**Descriptors:** *Ollulanus tricuspis*, helminths, parasites, zoological gardens, cheetah, *Acinonyx jubatus*, carnivores, Nematoda, cat, stomach worm, review.
**Language of Text:** Spanish.
**Notes:** Meeting Information: [II Conferencia Mediterranea de Parasitologia].

Hawkey, C.M. and M.G. Hart (1986). **Haematological reference values for adult pumas, lions, tigers, leopards, jaguars and cheetahs.** *Research in Veterinary Science* 41(2): 268-269. ISSN: 0034-5288.
**Abstract:** Normal haematological values and fibrinogen levels were obtained from a number of healthy adult Felidae in the collection of the Zoological Society of London. The group comprised 29 pumas (*Felis concolor*), 32 lions (*Panthera leo*), 27 tigers (*P tigris*), 19 leopards (*P pardus*), 18 jaguars (*P onca*) and 22 cheetahs (*Acinonyx jubatus*). The values provided a basis for identifying abnormalities in the blood of sick individuals of these species and for undertaking interspecies comparisons.
**Descriptors:** cheetah, *Acinonyx jubata*, pumas, *Felis concolor*, lions, *Panthera leo*, tigers, *Panthera tigris*, leopards, *Panthera pardus*, jaguars, *Panthera onca*, adult, fibrinogen levels, blood, hematological reference values.

Heeney, J.L., J.F. Evermann, A.J. McKeirnan, L. Marker Kraus, M.E. Roelke, M. Bush, D.E. Wildt, D.G. Meltzer, L. Colly, and J. Lukas (1990). **Prevalence and implications of feline coronavirus infections of captive and free-ranging cheetahs (*Acinonyx jubatus*).** *Journal of Virology* 64(5): 1964-1972. ISSN: 0022-538X.
**NAL Call Number:** QR360.J6
**Abstract:** The extent and progression of exposure to feline infectious peritonitis (FIP) virus in the cheetah, Acinonyx jubatus, was monitored by a world-wide serological survey with indirect fluorescent antibody titers to coronavirus. The indirect fluorescent antibody assay was validated by Western blots, which showed that all indirect fluorescent antibody-positive cheetah sera detected both domestic cat and cheetah coronavirus structural proteins. There was a poor correlation between indirect fluorescent antibody results and the presence of coronaviruslike particles in cheetah feces, suggesting that electron microscopic detection of shed particles may not be an easily interpreted diagnostic parameter for FIP disease. Low, but verifiable (by Western blots [immunoblots]) antibody titers against coronavirus were detected in eight free-ranging cheetahs from east Africa as well as from captive cheetahs throughout the world. Of 20

North American cheetah facilities screened, 9 had cheetahs with measurable antibodies to feline coronavirus. Five facilities showed patterns of an ongoing epizootic. Retrospective FIP virus titers of an FIP outbreak in a cheetah-breeding facility in Oregon were monitored over a 5-year period and are interpreted here in terms of clinical disease progression. During that outbreak the morbidity was over 90% and the mortality was 60%, far greater than any previously reported epizootic of FIP in any cat species. Age of infection was a significant risk factor in this epizootic, with infants (less than 3 months old) displaying significantly higher risk for mortality than subadults or adults. Based upon these observations, empirical generalizations are drawn which address epidemiologic concerns for cheetahs in the context of this lethal infectious agent.
**Descriptors:** cheetahs, *Acinonyx jubatus*, feline peritonitis virus, coronavirus infections, prevalance, implications, North America, Europe, Africa.

Hildebrand, M. and J.P. Hurley (1985). **Energy of the oscillating legs of a fast-moving cheetah, pronghorn, jackrabbit, and elephant.** *Journal of Morphology* 184(1): 23-31. ISSN: 0362-2525.
**Abstract:** Lifelike models of the oscillating legs treated as three-segment systems show the course of kinetic and potential energy over the locomotor cycle for a cheetah, pronghorn, jackrabbit, and elephant running at speeds approaching their maxima. The models can be adjusted to eliminate differences among the animals in time intervals, mass or length of limb, and joint angles. This facilitates analysis of the influence on total energy of each of these variables and of the distribution of mass among leg segments. Fast-cycling legs of the carnivore type have significantly more energy than those of the hoofed type. This may contribute to the lesser endurance that is usual for carnivores that hunt using a high-speed dash.
**Descriptors:** cheetah, *Acinonyx jubatus*, pronghorn, jackrabbit, elephant, biophysics, leg physiology, oscillating legs, running, fast moving, energy, models.

Holder, E.H., S.B. Citino, N. Businga, L. Cartier, and S.A. Brown (2004). **Measurement of glomerular filtration rate, renal plasma flow, and endogenous creatinine clearance in cheetahs (*Acinonyx jubatus jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 35(2): 175-8. ISSN: 1042-7260.
**Abstract:** Glomerular filtration rate (GFR), renal plasma flow (RPF), and the endogenous creatinine clearance (CCr) rate were determined in 13 captive cheetahs, *Acinonyx jubatus jubatus* (seven females and six males, 1.5-7.5 yr of age, x = 5.02 yr), during general anesthesia with Telazol and isoflurane by measuring the urinary clearances of inulin, para-aminohipppuric acid, and endogenous creatinine, respectively. Methods to determine GFR, RPF, and endogenous CCr in captive cheetahs were evaluated, and the relationship between GFR and CCr for this species was determined. The GFR and the RPF were stable during the procedure, with mean values of 1.59+/-0.17 ml/min/kg body weight and 5.12+/-1.15 ml/min/kg body weight, respectively. Although the mean value for CCr (1.47+/-0.20 ml/min/kg body weight) was significantly less than the corresponding value for GFR, the mean difference (0.11+/-0.02 ml/min/kg weight) between the two measurements was slight, and the values were highly correlated ($R2 = 0.928$; $P < 0.0001$). The measurement of CCr in cheetahs should provide a reliable estimate of GFR, facilitating the early detection of renal disease in this species.
**Descriptors:** cheetahs, *Acinonyx jubatus jubatus*, glomerular filtration rate, renal plasma flow, endogenous creatonine clearance, measurement, anesthesia, renal diseases, detection.

Horii, Y., M. Usui, and T. Yanagida (1981). ***Ancylostoma braziliense* De Faria, 1910 recovered from imported cheetahs**. *Japanese Journal of Parasitology* 30(4): 355-361. ISSN: 0021-5171.
**Abstract:** In 1976 hookworm eggs were recovered from the faeces of cheetahs, *Acinonyx jubatus*, imported to a zoo in Oita, Japan, from Durban, South Africa. Infective larvae were cultured and used to infect dogs and cats from which *Ancylostoma braziliense* were subsequently obtained. Morphological details and photomicrographs are provided. The cheetah is a new host record for this parasite. [From English summary]. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, helminths, hosts, morphology, new host records, parasites, zoological gardens, *Ancylostoma braziliense*.
**Language of Text:** Japanese, Summary in English.

Howard, J., A.M. Donoghue, M.A. Barone, K.L. Goodrowe, E.S. Blumer, K. Snodgrass, D. Starnes, M. Tucker, M. Bush, and D.E. Wildt (1992). **Successful induction of ovarian activity and laparoscopic intrauterine artificial insemination in the cheetah (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 23(3): 288-300. ISSN: 1042-7260.
**NAL Call Number:** 1042-7260
**Descriptors:** cheetah, *Acinonyx jubatus*, artificial insemination, zoo animals, induction of ovarian activity, laparoscopic intrauterine.

Howard, J., L. Munson, D. McAloose, M. Kriete, M. Bush, and D.E. Wildt (1993). **Comparative evaluation of seminal, vaginal, and rectal bacterial flora in the cheetah and domestic cat.** *Zoo Biology* 12(1): 81-96. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, cats, *Escherichia coli*, semen, vagina, rectum, microorganisms, reproductive efficiency, zoos, Gram negative bacteria, fecundity, North America.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Howard, J.G., T.L. Roth, W.F. Swanson, J.L. Buff, M. Bush, J. Grisham, L. Marker Kraus, D. Kraus, and D.E. Wildt (1997). **Successful intercontinental genome resource banking and artificial insemination with cryopreserved sperm in cheetahs**. *Journal of Andrology* 0(SUPPL.): P55. ISSN: 0196-3635.
**Descriptors:** cheetahs, *Acinonyx jubatus*, intercontinenta genome resource banking, artificial insemination, sperm, cryopreserved, meeting information.
**Notes:** 22nd Annual Meeting of the American Society of Andrology, Baltimore, Maryland, USA; February 22-25, 1997.

Huber, C., C. Walzer, and L. Slotta Bachmayr (2001). **Evaluation of long-term sedation in cheetah (*Acinonyx jubatus*) with perphenazine enanthate and zuclopenthixol acetate.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 32(3): 329-35. ISSN: 1042-7260.
**Abstract:** Two long-acting neuroleptics were used to tranquilize nine captive cheetahs (*Acinonyx jubatus*). Perphenazine enanthate (3.0 mg/kg) and zuclopenthixol acetate (0.6 mg/kg) were each administered to separate groups of three cheetahs in a double blind trial. Both products were administered together to a third group of three animals at the same dosages. Behavioral effect, duration of effect, and possible side effects were observed by a predefined protocol. Under standardized holding conditions, the cheetahs were observed 5 days before drug administration and 14 days after administration. Daily activity was defined and statistically evaluated by a U-test. A significant reduction of activity was observed after administration in all three trials. Zuclopenthixol acetate at 0.6 mg/kg alone and in combination with perphenazine enanthate caused inappetence, ataxia, extra pyramidal reactions, akathisia, and prolapse of the third eyelid. Zuclopenthixol acetate should not be used in cheetahs. Perphenazine enanthate did not cause inappetence, reduced appetite, or any of the previously mentioned side effects when used alone. It produced satisfactory tranquilization and is suitable and safe for cheetahs at 3.0 mg/kg. This dosage should be varied depending on health, age, and temperament of the individual cheetah.
**Descriptors:** cheetah, *Acinonyx jubatus*, long term sedation, evaluation, perphenazine enanthate, zuclopenthixol acetate, tranquilizes, neuroleptics, behavioral effects, duration effects, possible side effects.

Husni, M.M., Rama Kumar, and Jit Singh (1990). **Treatment of compound fracture of radius and ulna in a male cheetah (*Acinonyx jubatus*)**. *Indian Journal of Veterinary Surgery* 11(1): 35-37. ISSN: 0254-4105.
**Descriptors:** cheetah, *Acinonyx jubatus*, radius, ulna, compound fracture, case report, fracture fixation, radiography, treatment, zoo animals.

Jager, H.G., H.H. Booker, and O.J. Hubschle (1990). **Anthrax in cheetahs (*Acinonyx jubatus*) in Namibia.** *Journal of Wildlife Diseases* 26(3): 423-4. ISSN: 0090-3558.
**Abstract:** *Bacillus anthracis* caused the death of five cheetahs (*Acinonyx jubatus*) on a farm in the Gobabis district in Namibia. The mode of infection was believed to be a freshly shot baboon (*Papio ursinus*) with a cutaneous anthrax lesion.
**Descriptors:** cheetahs, *Acinonyx jubatus*, anthrax, carnivora, disease outbreaks, anthrax epidemiology, etiology, biological assay, food contamination, contaminated meat, mice, Namibia, baboon, *Papio ursinus*, anthrax lesion.

Janssens, L., W. De Meurichy, and D.L.M. Janssens (1994). **Surgical correction of patellar luxation in a cheetah (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 25(3): 466-471. ISSN: 1042-7260.
**Descriptors:** 7 years old, cheetah, *Acinonyx jubatus*, medial patellar luxation, surgical correction, technique used, bilateral, grade 4, bilateral lameness, clinical recovery.

Johnson, J.H., A.M. Wolf, J.M. Jensen, T. Fossum, D. Rohn, R.W. Green, and M. Willard (1997). **Duodenal perforation in a cheetah (*Acinonyx jubilatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(4): 481-4. ISSN: 1042-7260.
**Abstract:** An 11-yr-old female cheetah (*Acinonyx jubilatus*) from a privately owned breeding center for endangered species was referred for evaluation with a history of vomiting and depression of 10 days' duration. After anesthetic induction with tiletamine and zolazepam and anesthetic maintenance with isoflurane, a complete diagnostic workup was performed, including hematology, serum chemistry, and radiography. The clinical diagnosis was septic suppurative inflammation and hemorrhage in the abdomen, consistent with perforation or rupture of the gastrointestinal tract. An exploratory laparotomy showed a perforated duodenal ulcer, which was resected. Subsequent endoscopy revealed no further evidence of ulceration in the upper gastrointestinal tract. Biopsy of the ulcerated tissue collected from the duodenum revealed *Gastrospirillum*-like organisms. Histologic examination revealed widespread infiltration of lymphocytes and

plasma cells into the lamina propria and submucosa. Intraepithelial leukocytes were present along with attenuation, erosion, and ulceration of the superficial epithelium. Fourteen days after surgery, this cheetah was returned to its breeding compound, and no subsequent vomiting has been observed for 4 yr.
**Descriptors:** cheetah, *Acinonyx jubatus*, duodenal ulcer, peptic ulcer perforation, anti-infective agents, therapeutic use, anti-ulcer agents, biopsy, drug therapy, duodenal ulcer complications, surgery, duodenoscopy, duodenum microbiology, gastroscopy, *Helicobacter* isolation, purification, peptic ulcer perforation diagnosis, surgery, postoperative care, quinolones, ranitidine, sucralfate.

Junge, R.E. and R.E. Miller (1987). **Persistent regurgitation in a cheetah (*Acinonyx jubatus*)**. *Journal of Zoo Animal Medicine* 18(4): 151-152. ISSN: 0093-4526.
**Descriptors:** cheetah, *Acinonyx jubatus*, vomiting, persistant regurgitation, digestive disorders, diazepam, halothane, ketamine.

Junge, R.E., R.E. Miller, W.J. Boever, G. Scherba, and J. Sundberg (1991). **Persistent cutaneous ulcers associated with feline herpesvirus type 1 infection in a cheetah.** *Journal of the American Veterinary Medical Association* 198(6): 1057-8. ISSN: 0003-1488.
**Abstract:** Persistent cutaneous ulcers developed in a female cheetah cub after an episode of rhinotracheitis. When they were 3 weeks old, the cub and a male littermate developed mucopurulent oculonasal discharge consistent with feline herpesvirus type 1 infection (feline viral rhinotracheitis). The male cub was weaned and its lesions resolved. The female cub remained with the dam until the cub was 3 months old, at which time plaque-like lesions developed on the eye margins and muzzle. These plaques regressed over the next month and were replaced with cutaneous ulcers ranging from 1 to 10 mm in diameter. Feline herpesvirus type 1 was isolated from biopsy specimens collected from the ulcers. Cutaneous ulcers are uncommon manifestations of feline herpesvirus infections and have not been reported in other exotic felids. A proposed susceptibility to viral infections related to low genetic diversity has been proposed in cheetahs, and may be involved in the pathogenesis of persistent herpetic ulcers.
**Descriptors:** cheetah, *Acinonyx jubatus*, Herpesviridae infections, skin diseases, infectious, skin ulcer, Herpesviridae isolation, purification, pathology, skin diseases, pathology, skin ulcers.

Jurke, M.H., N.M. Czekala, D.G. Lindburg, and S.E. Millard (1997). **Fecal corticoid metabolite measurement in the cheetah (*Acinonyx jubatus*).** *Zoo Biology* 16(2): 133-147. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, fecal cortocoid metabolite measurement, endangered species, reproduction , cortisol, metabolites, feces, excretion, stress, captive animals.

Kennedy, M., S. Citino, T. Dolorico, A.H. McNabb, A.S. Moffat, and S. Kania (2001). **Detection of feline coronavirus infection in captive cheetahs (*Acinonyx jubatus*) by polymerase chain reaction.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 32(1): 25-30. ISSN: 1042-7260.
**Abstract:** Feline coronavirus genetic elements were detected by polymerase chain reaction from blood, fecal samples, and effusive fluid collected from 33 cheetahs in the U.S.A. Feline coronavirus-specific serum antibodies were also measured by indirect immunofluorescence. Ten cheetahs were positive for viral shedding by polymerase chain reaction, whereas 13 were seropositive by immunofluorescence. Results of serology did not consistently correlate with shedding of virus, and the capture antigen used for detection of feline coronavirus-specific antibodies had a significant impact on results. Testing of samples from one population over a 1-yr period indicated chronic infection in some animals. These relatively healthy carrier animals were a source of virus for contact animals. Screening programs in cheetah populations for feline coronavirus infection may be most reliable if a combination of serologic analysis and viral detection by polymerase chain reaction is used.
**Descriptors:** 33 cheetahs, *Acinonyx jubatus*, feline coronavirus infections, detection, polymerase chain reaction, PCR, blood, fecal samples, effusive fluid, coronavirus specific serum antibodies, indirect immunofluorescence, carrier animals, screening programs.

Kennedy, M., S. Kania, E. Stylianides, H. Bertschinger, D. Keet, and M.v. Vuuren (2003). **Detection of feline coronavirus infection in Southern African nondomestic felids**. *Journal of Wildlife Diseases* 39(3): 529-535. ISSN: 0090-3558.
**Abstract:** Feline coronavirus (FCoV) infects members of the Felidae family with results ranging from seroconversion with no disease to fatal feline infectious peritonitis (FIP). Infection of nondomestic felids with FCoV is of concern, particularly in endangered populations such as cheetahs *Acinonyx jubatus*. In this investigation, we tested 342 animals in the Republic of South Africa and Namibia, including 140 animals from wild populations, for evidence of FCoV infection by serology and/or reverse transcription/nested polymerase chain reaction (RT/nPCR) on faeces from 1999 through 2001. Past or current infection was evaluated. Of these, 195 animals had evidence of infection and included 41 animals from wild populations. Serology (indirect immunofluorescence) did not always correlate with viral RNA detection, as seronegative

animals were occasionally virus-positive, while many seropositive animals were not shedding virus. Serology indicated the infecting virus was most closely related to type I FCoV. Antibody levels in the majority of animals were low, even in those actively infected. Ten of 48 animals tested at more than one time point by RT/nPCR were shedding virus at multiple time points possibly indicating persistent infection. Infection in free-ranging animals was also notable, as over a quarter of the free-ranging animals tested had evidence of current or previous FCoV infection. Testing by serology and RT/nPCR is recommended for screening for FCoV infection. *Reproduced with permission of CAB.*
**Descriptors:** 33 cheetahs, *Acinonyx jubatus*, feline coronavirus, detection, nondomestic felids, case reports, diagnosis, disease prevalence, disease surveys, endangered species, immunofluorescence, polymerase chain reaction, Feline infectious peritonitis virus, Southern Africa, Nambia.

Kennedy, M.A., E. Moore, R.P. Wilkes, S.B. Citino, and S.A. Kania (2006). **Analysis of genetic mutations in the 7a7b open reading frame of coronavirus of cheetahs (*Acinonyx jubatus*).** *American Journal of Veterinary Research* 67(4): 627-632. ISSN: 0002-9645.
**NAL Call Number:** 41.8 Am3A
**Abstract:** Objective-To analyze the 7a7b genes of the feline coronavirus (FCoV) of cheetahs, which are believed to play a role in virulence of this virus. Sample Population-Biologic samples collected during a 4-year period from 5 cheetahs at the same institution and at 1 time point from 4 cheetahs at different institutions. Procedures-Samples were first screened for FCoV via a reverse transcription-PCR procedure involving primers that encompassed the 3'-untranslated region. Samples that yielded positive assay results were analyzed by use of primers that targeted the 7a7b open reading frames. The nucleotide sequences of the 7a7b amplification products were determined and analyzed. Results-In most isolates, substantial deletional mutations in the 7a gene were detected that would result in aberrant or no expression of the 7a product because of altered reading frames. Although the 7b gene was also found to contain mutations, these were primarily point mutations resulting in minor amino acid changes. The coronavirus associated with 1 cheetah with feline infectious peritonitis had intact 7a and 7b genes. Conclusions and Clinical Relevance-The data suggest that mutations arise readily in the 7a region and may remain stable in FCoV of cheetahs. In contrast, an intact 7b gene may be necessary for in vivo virus infection and replication. Persistent infection with FCoV in a cheetah population results in continued virus circulation and may lead to a quasispecies of virus variants.
**Descriptors:** cheetah, *Acinonyx jubatus*, feline coronavirus, microbial genetics, feline infectious peritonitis, mutation, virulence, open reading frames, amino acid sequences, zoo animals, gene expression, chronic diseases, molecular sequence data.

Kirberger, R.M., H.B. Groenewald, and W.M. Wagner (2000). **A radiological study of the sesamoid bones and os meniscus of the cheetah (*Acinonyx jubatus*)**. *Veterinary and Comparative Orthopaedics and Traumatology* 13(4): 172-177. ISSN: 0932-0814.
**NAL Call Number:** SF910.5.V4
**Abstract:** A radiological study of the sesamoids was undertaken in differing numbers of joints from 10 cheetahs. Each sesamoid was described and measured. Sesamoids were not found in the elbow and tarsal joints. A sesamoid was found in the abductor digiti 1 longus muscle as well as paired sesamoids were found at the interosseous muscle insertions palmarly of digits #1-5 and plantarly of digits #2-5. There were significant differences between abaxial and axial lengths of some of these sesamoids and the palmar sesamoids were significantly shorter than their plantar counterparts. In the stifle, a patellar, a popliteal and two gastrocnemius sesamoids were present. The lateral gastrocnemius sesamoid was significantly longer than the medial one and had a peculiar bilobed appearance. An os meniscus was constantly present in the cranial aspect of the medial meniscus. The shape of the sesamoids and the presence of an os meniscus in the cheetah differed from those seen in the domestic dog and cat and were ascribed to differences in form and function. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, radiological study, sesamoid bones, os meniscus, species differences.

Kirkwood, J.K. and A.A. Cunningham (1994). **Epidemiological observations on spongiform encephalopathies in captive wild animals in the British Isles**. *Veterinary Record* 135(13): 296-303. ISSN: 0042-4900.
**Abstract:** Since 1986, scrapie-like spongiform encephalopathy has been diagnosed in 19 captive wild animals of 8 species at or from 8 zoological collections in the British Isles. The affected animals have comprised members of the family Bovidae: one nyala (*Tragelaphus angasi*), 4 eland (*Taurotragus oryx*), and 6 greater kudu (*Tragelaphus strepsiceros*), one gemsbok (*Oryx gazella*), one Arabian oryx (*Oryx leucoryx*), and one scimitar-horned oryx (*Oryx dammah*), and members of the family Felidae: 4 cheetah (*Acinonyx jubatus*) and one puma (*Felis concolor*). In addition, 3 cases of a spongiform encephalopathy of unknown aetiology have been reported in ostriches (*Struthio camellus*) from 2 zoos in north west Germany. Three features suggest that some of these cases may have been caused by the agent of bovine spongiform encephalopathy (BSE). First, they have been temporally and geographically coincident with the BSE epidemic. Secondly, in all the ungulates for which details are available, it is possible that either the affected animal itself, or the herd into which it was born or moved, had been exposed to proprietary feeds containing ruminant-derived protein or other potentially contaminated

material, and all the carnivores had been fed parts of cattle carcases judged unfit for human consumption. Thirdly, the pathological results of inoculating mice with a homogenate of fixed brain tissue from the nyala and from one greater kudu were similar to the results of inoculating mice with BSE brain tissue. *Reproduced with permission of CAB.*

**Descriptors:** captive wild animals, cheetahs, *Acinonyx jubatus*, puma, *Felis concolor*, spongiform encephalopathy, BSE, epidemiology, nervous system diseases, contaminated cattle as food, zoo animals, Bovidae, Felidae, British zoos, German zoos.

Kirkwood, J.K., A.A. Cunningham, E.J. Flach, S.M. Thornton, and G.A.H. Wells (1995). **Spongiform encephalopathy in another captive cheetah (*Acinonyx jubatus*): evidence for variation in susceptibility or incubation periods between species?** *Journal of Zoo and Wildlife Medicine* 26(4): 577-582. ISSN: 1042-7260.

**Abstract:** A fourth case of spongiform encephalopathy (SE) in a captive cheetah is reported. Over a period of 8 weeks, a 7-year-old female cheetah housed at Whipsnade Wild Animal Park, UK, showed signs of a progressive neurological disease. The animal was killed and central nervous system tissue was examined. Light microscopy of haematoxylin and eosin-stained sections revealed SE involving the entire brain axis. Vacuolation of the neuropil, with a similar distribution and regional severity to that seen in feline SE of the domestic cat was the most prominent feature. Electron microscopic examination for fibrils, equivalent to scrapie-associated fibrils, in fresh brain material was positive. The cheetah had been fed tissues from cattle judged unfit for human consumption and which may have been infected with the bovine spongiform encephalopathy (BSE) agent. Some epidemiological aspects of the disease in cheetahs and implications to captive breeding and reintroduction programmes for this species are discussed. Since it is likely that other species of zoo felids have been exposed to food that may have contained the BSE agent, the relatively high incidence of the disease in cheetahs suggests that they may be more susceptible than other species in the family Felidae or that there are variations in incubation period among species. *Reproduced with permission of CAB.*

**Descriptors:** cheetah, *Acinonyx jubatus*, spongiform encephalopathy, bovine spongiform encephalopathy, BSE, case reports, disease transmission, epidemiology, feeds, susceptibility, zoo animals, cattle.

Klein, L. and J. Stover (1993). **Medetomidine-ketamine-isoflurane anesthesia in captive cheetah (*Acinonyx jubatus*) and antagonism with atipamezol**. In: *Proceedings of the American Association of Zoo Veterinarians,St. Louis, Missouri,* p. 144-145.

**Descriptors:** cheetah, *Acinonyx jubatus*, anesthesia, isoflurane, ketamine, medetomidine, zoo animals, Felidae, antagonism, atipamezol.

Koeppel, K.N., H. Bertschinger, M. van Vuuren, J. Picard, J. Steiner, D. Williams, and J. Cardwell (2006). **The use of a probiotic in captive cheetahs (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 77(3): 127-30. ISSN: 0038-2809.

**Abstract:** Juvenile captive cheetahs (*Acinonyx jubatus*) often present with diarrhoea that is commonly associated with bacterial infections. A species-specific probiotic containing *Lactobacillus* Group 2 and *Enterococcus faecium* was prepared from healthy adult cheetahs. Juvenile cheetahs (n = 27) between 8 and 13 months of age were included in the probiotic trial. The animals were observed prior to and after feeding of the probiotic which was made available for 28 days. Feeding of the probiotic resulted in a significantly increased body weight in the treatment group (P = 0.026), while there was no increase in the control group. A relative improvement in the faecal quality in the probiotic group during the treatment period compared with the pre-treatment (P = 0.0363) and post-treatment (P = 0.004) period was observed. This was accompanied by an absence of blood and mucus in the faeces during the treatment period in the probiotic group.

**Descriptors:** cheetahs, young animals, *Acinonyx jubatus*, microbiology, diarrhea, *Enterococcus faecium* growth, development, *Lactobacillus* growth, development, probiotics administration, dosage, diarrhea drug therapy, epidemiology, feces chemistry, microbiology, probiotics pharmacology, weight gain, drug effects.

Koster, L.S., J.P. Schoeman, and D.G. Meltzer (2007). **ACTH stimulation test in the captive cheetah (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 78(3): 133-6. ISSN: 0038-2809.

**Abstract:** Serum cortisol response was assessed in 8 captive cheetahs, of varying ages, after the intravenous administration of 500 microg of tetracosactide (Synacthen Depot, Novartis, Kempton Park) while maintained under general anaesthesia. In addition, 8 cheetahs were anaesthetised and given an equal volume of saline in order to establish baseline cortisol concentrations at similar stages of anaesthesia. A significant difference in the median cortisol concentration measured over time was found following ACTH administration in the ACTH group (P < 0.001). There was no difference between the median cortisol concentrations in the ACTH group at time-points 120, 150 and 180 min after ACTH stimulation (P = 0.867). Thus it appears appropriate to collect serum 120 to 180 min after tetracosactide administration to assess maximal stimulation of the adrenal in the cheetah. No statistically significant rise was seen in the anaesthetised control group following the injection of saline (P = 0.238).

**Descriptors:** cheetahs, *Acinonyx jubatus*, physiology, cosyntropin pharmacokinetics,

hormones pharmacokinetics, hydrocortisone blood, adrenal cortex function tests, methods, adrenocorticotropic hormone blood, area under curve.

Kotsch, V., A. Kubber Heiss, A. Url, C. Walzer, and P. Schmidt (2002). **Krankheiten der Zoogeparden (*Acinonyx jubatus*) innerhalb des Europaischen Erhaltungszuchtprogramms (EEP): eine retrospektive pathohistologische Studie uber 22 Jahre. [Diseases of captive cheetahs (*Acinonyx jubatus*) within the European Endangered Species Program (EEP) - a 22-year retrospective histopathological study].** *Wiener Tierarztliche Monatsschrift* 89(12): 341-350. ISSN: 0043-535X.

**Abstract:** Cheetah populations in the USA, in South Africa and Japan are threatened by three highly prevalent diseases - bacterial gastritis, glomerulosclerosis and veno-occlusive disease - causing premature death of potential breeders. Poor breeding success, inappropriate captive management and a paucity of genetic variability are additional problems of captive cheetahs. Organ samples of 58 cheetahs were collected from 1980-2001 and retrospectively investigated to obtain a general overview of captive cheetah health within the European Endangered Species Programme (EEP). Gastritis (55%) and renal lesions, like glomerulosclerosis (32%), membranous (46%) and membranoproliferative glomerulonephritis (18%), and interstitial nephritis (32%) were most frequently observed, while veno-occlusive disease was not found in Europe. Further priority was given to investigations concerning myelolipomas, which were found mainly in the spleen. In the future, it would be important to initiate additional studies concerning husbandry and stress of captive cheetahs in order to gain insight into the aetiology of the pathological alterations. *Reproduced with permission of CAB.*

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, diseases, European Endangered Species Program, etiology, animal health, disease surveys, bacterial gastritis, histopathology, lipoma, risk factors, vascular diseases, glomerulosclerosis, veno occlusive disease.

**Language of Text:** German, Summary in English.

Krausman, P.R. and S.M. Morales (2005). ***Acinonyx jubatus*.** *Mammalian Species*(771): 1-6. ISSN: 0076-3519.

**Descriptors:** cheetahs, *Acinonyx jubatus*, biogeography, population studies, systematics, taxonomy, geographic distribution, mammals.

Kuenzel, W., A. Probst, and W. Henninger (1998). **Anatomy and radiography of the shoulder joint of the cheetah (*Acinonyx jubatus*)**. *Anatomia Histologia Embryologia* 27(2): 119-124. ISSN: 0340-2096.

**Descriptors:** cheetah, *Acinonyx jubatus*, radiology, shoulder joint, anatomy, anatomical structures, bones, muscles, ligaments, dissection, corrosion casts.

**Language of Text:** German.

Kunzel, W. and A. Probst (1999). **Die anatomischen Verhaltnisse am Karpalgelenk des Geparden (*Acinonyx jubatus*), verglichen mit jenen der Hauskatze (*Felis catus*). [Anatomic features of the carpal joint of the cheetah (*Acinonyx jubatus*), compared with the domestic cat (*Felis catus*)]**. *Anatomia, Histologia, Embryologia* 28(3): 177-182. ISSN: 0340-2096.

**Abstract:** The anatomy of the carpal joint of the cheetah (*Acinonyx jubatus*) was examined in seven specimens using dissection and corrosion casts as well as radiography, and compared to well-known data of the domestic cat (*Felis catus*). It was found that in the cheetah, as in the domestic cat, the intermedioradial, ulnar and accessory carpal bones, as well as the first, second, third and fourth carpal bones and the sesamoid bone of the abductor pollicis longus muscle, develop in a regular manner. The bones had a similar shape and the ligamentous apparatus was comparable, the most striking differences being the connection of all compartments of the joint cavity and the mediocarpal joint, working as a screw joint. The syndesmosis between the intermedioradial and ulnar carpal bones, instead of a synovial connection, is another adaptation for stabilization of the carpus of the cheetah during locomotion. The joint capsule is little spacious and in all three recesses can be differentiated. The first extends proximally palmar the ulnar carpal bone between the styloid process of the ulna and the accessory carpal bone, the second also extends proximally mediopalmar of the intermedioradial bone, and the largest third recess is located on the dorsal surface and extends proximally, laterally to the inserting tendon of the extensor carpi radialis muscle.

**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, histology, carpal bones, histology, joints anatomy, histology, forelimb, muscle, skeletal anatomy, histology, comparison to domestic cats.

**Language of Text:** German.

Kunzel, W. and A. Probst (1998). **Anatomische Besonderheiten am Ellbogengelenk des Geparden (*Acinonyx jubatus*). [Anatomic characteristics of the elbow joint of the cheetah (*Acinonyx jubatus*)]**. *Anatomia, Histologia, Embryologia* 27(3): 167-172. ISSN: 0340-2096.

**Abstract:** Anatomical structures of elbow joints of six cheetahs were examined by dissection, corrosion casts and radiography. As a result, it was observed that the distal end of humerus is divided into the trochlea humeri for articulation with the ulna and the capitulum humeri for articulation with the radius. As the trochlea humeri is posed oblique

and looks like a disc-shaped cone sector, flexion. Flexion of elbow joint is always combined with adduction of the distal parts of the limb, and, respectively, extension with abduction. The cylindrical but also in sagittal direction convex capitulum humeri enables the head of the radius all movements on a spheric sector. Furthermore, advantageous preconditions for rotation in the proximal radioulnar joint are the mighty medical coronoid process, the displacement of the radial tuberosity to the caudal surface of the radius and the insertion of the biceps brachii muscle exclusively on this elevation of the radius. Limiting factors are the insertions of collateral ligaments at the antebrachial skeleton. The lateral collateral ligament inserts only on the radius, the medial collateral ligament mainly on the ulna. The radial anular ligament directly connects the two coronoid processes of the ulna and moreover is intracapsular. The joint capsule is common for both the cubital and the proximal radioulnar joint and five pouches could be described. These were between the lateral epicondyle of humerus and the olecranon, underneath the tendon of origin of the extensor carpi ulnaris muscle, cranially in the bend of the elbow joint, between the head of the radius and the tendon of origin of supinator muscle and the lateral part of radial anular ligament, just as between the medial epicondyle of humerus and the tendons of origin of flexor muscles of the forearm.
**Descriptors:** cheetah, *Acinonyx jubatus*, joints anatomy, histology, forelimb, humerus, radius, ulna.
**Language of Text:** German.

Kunzel, W. and A. Probst (1996). **Anatomy and radiography of the stifle joint of the cheetah (*Acinonyx jubatus*)**. *Wiener Tierarztliche Monatsschrift* 83(2): 43-50. ISSN: 0043-535X.
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, stifle joint, radiography, limbs, Felidae.
**Language of Text:** German.

Kusunoki, H., K. Okuda, K. Ueda, T. Ooe, T. Hayashi, S. Ito, S. Kawakami, E. Saitou, T. Fukuoka, T. Hase, T. Sato, and O. Doi (2006). **Evaluation of semen quality of captive-living cheetahs (*Acinonyx jubatus*) in Japan**. *Japanese Journal of Zoo and Wildlife Medicine* 11(1): 25-30. ISSN: 1342-6133.
**Abstract:** Thirty-one ejaculates from 18 captive-living cheetahs (*A. jubatus*) maintained at three zoological institutions in Japan were collected by rectal probe electrostimulation and evaluated. Thirteen of the males had no reproductive history. Semen characteristics (mean+or-SEM) recorded were as follows: semen volume, 0.9+or- 0.11 ml; semen pH, 8.1+or-0.1; total sperm count per ejaculate, 32.6+or-5.4 million; sperm viability, 84.9+or-1.9%; sperm motility index, 53.7+or-3.8; sperm abnormality, 66.1+or-3.4% and percentage of sperm with a normal acrosome, 68.5+or-5.1%. These values were approximately in the range of the results reported in other cheetahs. These parameters, except for the percentage of sperm with a normal acrosome, were not significantly different between the fertile and subfertile males. The acrosomal integrity in the subfertile males (59.8%) was significantly lower than that in fertile ones (86.9%), but even the values in the former were not necessarily fatally low. This result indicates that their poor semen quality may not inhibit reproductive efficiency in captive male cheetahs in Japan. *Reproduced with permission of CAB.*
**Descriptors:** cheetahs, *Acinonyx jubatus*, seman quality, ejaculate volume, evaluation, infertility, male fertility, motility, pH, semen characters, spermatozoa, zoo animals.
**Language of Text:** Japanese.

La Perle, K.M., R. Wack, L. Kaufman, and E.A. Blomme (1998). **Systemic candidiasis in a cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine* 29(4): 479-483. ISSN: 1042-7260.
**Abstract:** Systemic candidiasis, with involvement of the spleen, liver, kidneys, and lymph nodes, was diagnosed in a geriatric captive cheetah (*Acinonyx jubatus*). The animal had a long clinical history of intermittent chronic gastritis associated with *Helicobacter acinonyx* and chronic renal failure, both of which were repeatedly treated with broad-spectrum antimicrobial therapy. Following euthanasia, a postmortem examination showed numerous microabscesses and granulomas composed of degenerate eosinophils and containing asteroids or Splendore-Hoeppli material throughout the body. Yeast, pseudohyphae, and infrequently branching septate hyphae, demonstrated with special stains, were identified as a Candida sp. by fluorescent antibody testing. Low genetic variation in cheetahs may increase their susceptibility to infectious agents. Additional factors contributing to the overgrowth and dissemination of Candida sp. in this case may have included changes in the bacterial flora of the alimentary tract as a result of repeated antimicrobial therapy and alterations in the topography of the alimentary mucosa caused by chronic gastritis.
**Descriptors:** cheetah, *Acinonyx jubatus*, candidiasis, pathology, kidney pathology, kidney diseases, complications, liver pathology, lymph nodes microbiology, lymph nodes pathology, opportunistic infections, pathology, spleen pathology.

Lane, E., R. Lobetti, and R. Burroughs (2004). **Treatment with omeprazole, metronidazole, and amoxicillin in captive South African cheetahs (*Acinonyx jubatus*) with spiral bacteria infection and gastritis.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 35(1): 15-9. ISSN: 1042-7260.

**Abstract:** Six captive cheetahs (*Acinonyx jubatus*) with severe gastritis diagnosed by gastric endoscopy and mucosal histopathology were treated with omeprazole, metronidazole, and amoxicillin for 3 wk. Endoscopic biopsies were performed before therapy, immediately after treatment, and 3, 7, and 19 mo after treatment. Macroscopic appearance of the stomach, histologic scoring of gastric inflammation, and the presence or absence of spiral bacteria were recorded. Spiral bacteria were absent histologically immediately after treatment but reappeared in endoscopic biopsies by 3 mo after treatment. Gastritis scores fluctuated widely during the trial but improved in five of six cheetahs by 3 mo after treatment. By 19 mo after treatment, scores were close to the pretreatment scores. Therapy with omeprazole, amoxicillin, and metronidazole was associated with temporary improvement in the degree and distribution of gastritis in some cheetahs with gastritis, suggesting that treatment may be warranted once severe gastric inflammation has been diagnosed.
**Descriptors:** cheetahs, captive animals, *Acinonyx jubatus*, spiral bacteria infection, gastritis, treatment, omeprazole, metronidazole, amoxicillin, gastric endoscopy, spiral bacteria.

Laurenson, M.K. (1993). **Early maternal behavior of wild cheetahs: implications for captive husbandry.** *Zoo Biology* 12(1): 31-43. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** wild cheetahs, *Acinonyx jubatus*, early maternal behavior, habitats, captive husbandry, endangered species, Tanzania, mothering ability, lairs.
**Notes:** In the special issue: The cheetah/ edited by D.E. Wildt and J. Grisham.

Laurenson, M.K. (1995). **Behavioural costs and constraints of lactation in free-living cheetahs**. *Animal Behaviour* 50(3): 815-26. ISSN: 0003-3472.
**Abstract:** Changes in the behavior of wild cheetahs, *Acinonyx jubatus*, during lactation and possible extra costs or limits related to denning were investigated. Lactating females nearly doubled their normal food intake, but only mothers with cubs in the lair spent more time drinking. Lactating females with emerged cubs spent an increased amount of time watching and hunting in comparison to time spent at rest and moving. Lactating females with cubs in the lair spent more time traveling each day, traveled further, had limited ranging patterns, and were apt to make more kills in the heat part of the day than when their cubs were with them.
**Descriptors:** cheetah, *Acinonyx jubatus*, free living, constraints of lactation, behavioral costs, food intake, time traveling, range patterns, kills behavior.

Laurenson, M.K. (1995). **Cub growth and maternal care in cheetahs**. *Behavioral Ecology* 6(4): 405-409. ISSN: 1045-2249.
**Descriptors:** cheetahs, *Acinonyx jubatus*, cub growth, maternal care, behavior, development, maternal nutrition, litter size, cub sex, predation mortality.

Laurenson, M.K. (1994). **High juvenile mortality in cheetahs (*Acinonyx jubatus*) and its consequences for maternal care**. *Journal of Zoology (London)* 234(3): 387-408. ISSN: 0952-8369.
**Descriptors:** cheetahs, *Acinonyx jubatus*, high juvenile mortality, concequences, maternal care, predation, starvation, lions, hyeanas.

Laurenson, M.K. and T.M. Caro (1994). **Monitoring the effects of non-trivial handling in free-living cheetahs**. *Animal Behaviour* P.: 547-57. ISSN: 0003-3472.
**Abstract:** Cheetahs, *Acinonyx jubatus*, were examined for detrimental effects due to disturbance and nontrivial experimental handling. Females were unaffected by the use of radio collars weighing less than 2 percent of their body weight or by aerial radio-tracking that involved flying at tree height. Cub predation and maternal care were also unaffected by human entry into lairs to count and weigh cubs in their mother's absence. It was concluded that these potentially sensitive animals are probably not disturbed by considerate field techniques.
**Descriptors:** cheetahs, *Acinonyx jubatus*, free living, non trivial experimental handling, effects, disturbances, detrimental effects, radio collars, field techniques.

Lewandowski, A.H., C.J. Bonar, and S.E. Evans (2002). **Tiletamine-zolazepam, ketamine, and xylazine anesthesia of captive cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 33(4): 332-6. ISSN: 1042-7260.
**Abstract:** Thirty-two anesthetic episodes used a combination of tiletamine-zolezepam (50 mg/ml each), ketamine (80 mg/ml), and xylazine (20 mg/ml) at various dosages for routine diagnostic and minor surgical procedures in 13 captive cheetahs (*Acinonyx jubatus*). The mean dosage (0.023 +/- 0.003 ml/kg) provided rapid induction with a single i.m. injection along with safe predictable working time, good muscle relaxation, and analgesia. Yohimbine administration subsequently accelerated smooth and rapid recovery.
**Descriptors:** cheetah, *Acinonyx jubatus*, anesthesia, anesthetics, tiletamine, zolazepam, ketamine, xylazine, combined, antagonists, inhibitors, adrenergic alpha antagonists pharmacology, body temperature, drug effects, heart rate, ketamine antagonists and inhibitors, respiration drug effects, tiletamine antagonists and inhibitors, time factors, xylazine antagonists and inhibitors, yohimbine pharmacology, zolazepam antagonists and

inhibitors.

Lezmi, S., A. Bencsik, E. Monks, T. Petit, and T. Baron (2003). **First case of feline spongiform encephalopathy in a captive cheetah born in France: PrP(sc) analysis in various tissues revealed unexpected targeting of kidney and adrenal gland.** *Histochemistry and Cell Biology* 119(5): 415-22. ISSN: (p) 0948-6143; (E) 1432-119X.

**Abstract:** Feline spongiform encephalopathy (FSE), affecting domestic and captive feline species, is a prion disease considered to be related to bovine spongiform encephalopathy. Here we report an immunohistological analysis of the first FSE-affected cheetah born in France. The duration of clinical signs, of which ataxia was the main one, was about 8 weeks. The distribution of abnormal prion protein (PrP(sc)) was studied by immunohistochemistry within 27 different tissues. Different antibodies were used to visualise abnormal PrP deposits in situ. PrP(sc )accumulation was detected in the central nervous system (cerebral cortex, cerebellum, brain stem, spinal cord, retina), in peripheral nerves and in lymphoid organs. PrP(sc) deposits were not observed within the enteric nervous system nor in several other organs, such as pancreas, ovary, liver and muscle. More interestingly, unusual PrP(sc )deposits were observed within the zona fasciculata/reticularis of the adrenal gland and within some glomeruli of the kidney raising the question of possible PrP(sc) excretion. The sympathetic innervation of these two organs was visualised and compared to the distribution of PrP(sc) deposits. Our results suggest the possibility that the infectious agent is spread by both haematogenous and nervous pathways.

**Descriptors:** cheetah, *Acinonyx jubatus*, feline spongiform encephalopathy, FSE, first case in France, immunohistological analysis, tissues, targeting, kidney, adrenal gland, clinical signs, ataxia, central nervous system, France.

Lindburg, D.G., B.S. Durrant, S.E. Millard, and J.E. Oosterhuis (1993). **Fertility assessment of cheetah males with poor quality semen.** *Zoo Biology* 12(1): 97-103. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6

**Descriptors:** male cheetahs, *Acinonyx jubatus*, semen, male fertility, reproductive efficiency, homozygosity, zoo animals, males, inbreeding depression, semen characters, breeding programs, California.

**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Lindsey, P.A., R. Alexander, L.G. Frank, A. Mathieson, and S.S. Romaanach (2006). **Potential of trophy hunting to create incentives for wildlife conservation in Africa where alternative wildlife-based land uses may not be viable.** *Animal Conservation* 9(3): 283-291. ISSN: 1367-9430.

**NAL Call Number:** QH75.A1 A54

**Abstract:** There is a lack of consensus among conservationists as to whether trophy hunting represents a legitimate conservation tool in Africa. Hunting advocates stress that trophy hunting can create incentives for conservation where ecotourism is not possible. We assessed the hunting preferences of hunting clients who have hunted or plan to hunt in Africa (n=150), and the perception among African hunting operators (n=127) of client preferences at two US hunting conventions to determine whether this assertion is justified. Clients are most interested in hunting in well-known East and southern African hunting destinations, but some trophy species attract hunters to remote and unstable countries that might not otherwise derive revenues from hunting. Clients are willing to hunt in areas lacking high densities of wildlife or attractive scenery, and where people and livestock occur, stressing the potential for trophy hunting to generate revenues where ecotourism may not be viable. Hunting clients are more averse to hunting under conditions whereby conservation objectives are compromised than operators realize, suggesting that client preferences could potentially drive positive change in the hunting industry, to the benefit of conservation. However, the preferences and attitudes of some clients likely form the basis of some of the problems currently associated with the hunting industry in Africa, stressing the need for an effective regulatory framework.

**Descriptors:** cheetahs, *Acinonyx jubatus*, sport hunting, community conservation, game ranching, African wild dogs, hunting, preferences, attitudes, regulatory framework.

Lloyd, C. and M.F. Stidworthy (2007). **Acute disseminated toxoplasmosis in a juvenile cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 38(3): 475-8. ISSN: 1042-7260.

**Abstract:** A juvenile cheetah *(Acinonyx jubatus*) died with rapidly progressive pyrexia, tachypnea, abdominal effusion, and hepatomegaly. Postmortem examination revealed lesions consistent with acute disseminated infection with *Toxoplasma gondii*. The presence of this organism was confirmed in multiple organs by immunohistochemistry and polymerase chain reaction. To the best of our knowledge, we propose this to be the first reported case of primary acute disseminated toxoplasmosis in a cheetah.

**Descriptors:** cheetah, *Acinonyx jubatus*, acute disseminated toxoplasmosis, pathology, immunohistochemistry, organ specificity, polymerase chain reaction, toxoplasma isolation, purification, complications, progressive pyrexia, tachypnea, abdominal effusion, hepatomegaly.

Lobetti, R., J. Picard, N. Kriek, and P. Rogers (1999). **Prevalence of helicobacteriosis and gastritis in semicaptive cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 30(4): 492-6. ISSN: 1042-7260.

**Abstract:** Endoscopic biopsy specimens were obtained from the cardiac, fundic, and pyloric stomach regions of 28 semicaptive cheetahs (*Acinonyx jubatus*) to look for signs of helicobacteriosis and gastritis. Impression smear cytology and urease tests were positive in 23 and 26 of the cheetahs, respectively. Histopathology showed mild or no lesions in 27 cheetahs; only one cheetah had moderate gastritis. Gastritis was uncommon in these semicaptive cheetahs, and stress could play a major role in the development of helicobacteriosis-associated gastritis in the captive cheetah.

**Descriptors:** cheetah, *Acinonyx jubatus*, heliobacteriosis, gastritis, prevalance, semi captive, endoscopic biopsy, cardiac, fundic, pyloric stomach regions, impression smear cytology, stress.

Londei, T. (2000). **The cheetah (*Acinonyx jubatus*) dewclaw: specialization overlooked**. *Journal of Zoology (London)* 251(4): 535-537. ISSN: 0952-8369.

**Descriptors:** cheetah, *Acinonyx jubatus*, behavior, dew claw, specialization, evolution, adaptation, predatory behavior, rudimentary digits, anatomy.

Macchioni, G. (1995). ***Ancylostoma genettae*, *A. protelesis*, *A. somaliense*: three new species from wild Carnivora in the Somali Republic**. *Parassitologia Roma* 37(2/3): 219-228. ISSN: 0048-2951.

**Abstract:** *Ancylostoma braziliense* was found in Somalia in *Acinonyx jubatus*, dogs, *Canis mesomelas, Crocuta crocuta*, cats, *Felis libyca, Genetta genetta, Otocyon megalotis, Proteles cristatus; A. caninum* in *A. jubatus*, dogs, *Canis mesomelas, Crocuta crocuta; A. duodenale* in *C. crocuta; A. iperodontatum* in Lynx caracal; *A. paraduodenale* in Felis serval; *A. tubaeforme* in *A. jubatus,* cats, *F. libyca; Arthrocephalus gambiense* in *Ichneumia albicauda*; *Uncinaria parvibursata* in *Mellivora capensis*. In addition, three new species of Ancylostoma were collected: *A. genettae* sp. nov. is described from the small intestine of *Genetta genetta*. It is differentiated from *A. caninum* and *A. tubaeformae* by its smaller body size (male 6.5 mm long, 0.33 mm wide; female 7.3 mm long, 0.39 mm wide), length of spicules and having a mouth opening with 3 pairs of short and squat ventral teeth. *A. protelesis* sp. nov., from the small intestine of *Proteles cristatus*, most closely resembles *A. conepati* but differs from it in geographic location (Africa vs South America), choice of host, length of spicules, oesophagus, and female tail. *A. somaliense* sp. nov. is described from the small intestine of *Canis mesomelas*. It closely resembles *A. tubaeformae* but differs from it in the size and shape of the body, mouth opening and spicules. *Reproduced with permission of CAB.*

**Descriptors:** carnivora, helminths, new species, parasites, taxonomy, wild animals, cheetah, *Acinonyx jubatus*, *Ancylostoma braziliense*, *Ancylostoma caninum*, *Ancylostoma duodenale*, *Ancylostoma tubaeforme*, Canidae, *Canis mesomelas*, cats, *Crocuta crocuta*, dogs, Felidae, Herpestidae, Hyaenidae, Mustelidae, Nematoda, Viverridae.

Macchioni, G., A. Marconcini, Abdullahi Ali Herst, Abdullatif Mohamed Abdi, and O.I. Gadale (1982). **Indagine sull'ancilostomiasi dei carnivori selvatici africani in relazione alla dermatite serpiginosa dell'uomo. [Hookworm infections in wild African carnivores and their relationship to human creeping eruption].** *Bollettino Scientifico Della Facolta Di Zootecnia e Veterinaria* 3: 85-90. ISSN: 0254-6019.

**Abstract:** Examination of carnivores in Somalia from 1979 to 1982: revealed *Ancylostoma tubaeforme* in 5 of 6 *Acinonyx jubatus*; *Ancylostoma caninum* in 2 of the *Acinonyx jubatus*, 3 of 7 *Canis mesomelas*, 3 of 21 *Crocuta crocuta* and 2 of 4 *Genetta genetta*; *Ancylostoma braziliense* in 15 of the *C. crocuta; A. duodenale* in 5 of the *C. crocuta*; *A. iperodontatum* in 4 of 5 *Felis caracal; Arthrocephalus gambiensis* in 5 of 13 *Ichneumia albicauda*. Previous reports of these hookworms in wild African carnivores are tabulated. The relationship of these hookworms to human cutaneous larva migrans is discussed. *Reproduced with permission of CAB.*

**Descriptors:** carnivores, helminths, hookworms, parasites, cheetah, *Acinonyx jubatus*, *Ancylostoma*, *Canis mesomelas*, carnivores, *Crocuta crocuta*, Nematoda, creeping eruption.

**Language of Text:** Italian, Summary in English.

Marker Kraus, L. and J. Grisham (1993). **Captive breeding of cheetahs in North American zoos: 1987-1991.** *Zoo Biology* 12(1): 5-18. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, captive breeding, zoos, pedigree, endangered species, studbooks, breeding programs, North America.

**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Marker Kraus, L. (1997). **History of the cheetah *Acinonyx jubatus* in zoos 1829-1994**. *International Zoo Yearbook* 35(0): 27-43. ISSN: 0074-9664.

**Descriptors:** cheetah, *Acinonyx jubatus*, animal care, captive history, captive management programs, pedigree analysis, registry, reproduction, studbook , zoos.

Marker Kraus, L. and D. Kraus (1997). **Conservation of strategies for the long-term survival**

**of the cheetah *Acinonyx jubatus* by the cheetah conservation fund, Windhoek**. *International Zoo Yearbook* 35(0): 59-66. ISSN: 0074-9664.
**Descriptors:** cheetahs, *Acinonyx jubatus*, wildlife management, conservation strategies, farm management, habitat loss, livestock farming, long term survival, conservation fund.

Marker, L., L. Munson, P.A. Basson, and S. Quackenbush (2003). **Multicentric T-cell lymphoma associated with feline leukemia virus infection in a captive Namibian cheetah (*Acinonyx jubatus*).** *Journal of Wildlife Diseases* 39(3): 690-695. ISSN: 0090-3558.
**Abstract:** This case report describes a multicentric lymphoma in a 4 yr old female wildborn captive cheetah (*Acinonyx jubatus*) in Namibia after being housed in an enclosure adjacent to a feline leukemia virus (FeLV) infected cheetah that had previously been in contact with domestic cats. The year prior to the onset of clinical signs, the wild-born cheetah was FeLV antigen negative. The cheetah subsequently developed lymphoma, was found to be infected with FeLV, and then rapidly deteriorated and died. At necropsy, the liver, spleen, lymph nodes, and multiple other organs were extensively infiltrated with neoplastic T-lymphocytes. Feline leukemia virus DNA was identified in neoplastic lymphocytes from multiple organs by polymerase chain reaction and Southern blot analysis. Although the outcome of infection in this cheetah resembles that of FeLV infections in domestic cats, the transmission across an enclosure fence was unusual and may indicate a heightened susceptibility to infection in cheetahs. Caution should be exercised in holding and translocating cheetahs where contact could be made with FeLV-infected domestic, feral, or wild felids.
**Descriptors:** cheetah, *Acinonyx jubatus*, multicentric T-cell lymphoma, feline leukemia virus, FeLV infection, captive, contacts, holding, translocating, infected animals.

Marker, L.L., A.J. Dickman, M.G.L. Mills, R.M. Jeo, and D.W. Macdonald (2008). **Spatial ecology of cheetahs on north-central Namibian farmlands.** *Journal of Zoology* 274(3): 226-238. ISSN: 0952-8369.

**NAL Call Number:** QL1.J68
**Abstract:** Knowledge of a species' ranging behaviour is both fundamental to understanding its behavioural ecology and a prerequisite to planning its management. Few data exist on the spatial ecology of cheetahs *Acinonyx jubatus* outside protected areas, but such areas are particularly important to their conservation. Cheetahs on Namibian farmlands occupied exceptionally large home ranges, averaging 1651 kmpo (pl1594 kmpo), with no detectable effect of sex, social grouping or seasonality. Despite such large ranges, cheetahs tended to utilize intensively only a small fraction of that area: 50% of the fixes were located within an average of 13.9pl5.3% of the home range. Ranges were not exclusive, overlapping on average by 15.8pl17.0%, with male cheetahs showing more intra-sexual range overlap than did females. Coalitions of males appeared to select for a dense, prey-rich habitat, but this preference was not apparent for other social groupings. Conflict with humans is an important contributor to the species' decline, and these large, overlapping cheetah home ranges result in the movements of each individual cheetah encompassing many farms (21 based on the average home-range size). Consequently, many cheetahs may be exposed to a minority of farmers attempting to kill them, and also that many farmers may see the same cheetahs, thereby gaining an exaggerated impression of their abundance. Conservation priorities for cheetahs outside protected areas are the development of techniques for conflict resolution, as well as the maintenance and restoration of suitable habitat and promotion of land-management practices compatible with the continued existence of large carnivores.
**Descriptors:** cheetahs, *Acinonyx jubatus*, ranging behavior, carnivores, home range size, ecology, Namibian farmlands, conservation, Namibia.

Marker, L.L., A.J. Wilkerson, R.J. Sarno, J. Martenson, C. Breitenmoser Wursten, S.J. O'Brien, and W.E. Johnson (2008). **Molecular genetic insights on cheetah (*Acinonyx jubatus*) ecology and conservation in Namibia.** *Journal of Heredity* 99(1): 2-13. ISSN: 0022-1503.
**Abstract:** The extent and geographic patterns of molecular genetic diversity of the largest remaining free-ranging cheetah population were described in a survey of 313 individuals from throughout Namibia. Levels of relatedness, including paternity/maternity (parentage), were assessed across all individuals using 19 polymorphic microsatellite loci, and unrelated cheetahs (n = 89) from 7 regions were genotyped at 38 loci to document broad geographical patterns. There was limited differentiation among regions, evidence that this is a generally panmictic population. Measures of genetic variation were similar among all regions and were comparable with Eastern African cheetah populations. Parentage analyses confirmed several observations based on field studies, including 21 of 23 previously hypothesized family groups, 40 probable parent/offspring pairs, and 8 sibling groups. These results also verified the successful integration and reproduction of several cheetahs following natural dispersal or translocation. Animals within social groups (family groups, male coalitions, or sibling groups) were generally related. Within the main study area, radio-collared female cheetahs were more closely interrelated than similarly compared males, a pattern consistent with greater male dispersal. The long-term maintenance of current patterns of genetic variation in Namibia depends on retaining habitat characteristics that promote natural dispersal and gene flow of cheetahs.
**Descriptors:** cheetahs, *Acinonyx jubatus*, genetics diversity, conservation of natural

resources, ecology, molecular biology, population, homing behavior, microsatellite repeats, social behavior, Namibia.

Marker, L.L. and A.J. Dickman (2003). **Morphology, physical condition, and growth of the cheetah (*Acinonyx jubatus jubatus*).** *Journal of Mammalogy* 84(3): 840-850. ISSN: 0022-2372.
**Descriptors:** cheetah, *Acinonyx jubatus jubatus*, physical condition, growth, morphology, sexual dimorpism.

Marker, L.L., A.J. Dickman, L.L. Marker, A.J.P. Wilkerson, Sarno Ronald J, J. Martenson, C. Breitenmoser Wuersten, S.J. O'brien, and W.E. Johnson (2004-2008). **Dental anomalies and incidence of palatal erosion in namibian cheetahs (*Acinonyx jubatus jubatus*).Molecular genetic insights on cheetah (*Acinonyx jubatus*) ecology and conservation in Namibia**. *Journal of Mammalogy/ Journal of Heredity* 85-99(11): 19-242-13. ISSN: 0022-2372/ 0022-1503.
**Descriptors:** cheetahs, *Acinonyx jubatus jubatus*, dental anomalies, palatal erosion, dental and oral system, ingestion, focal palatine erosion, \, FPE, dental and oral disease, Namibia.

Mclean, L., J.L. Hurst, C.J. Gaskell, J.C.M. Lewis, and R.J. Beynon (2007). **Characterization of cauxin in the urine of domestic and big cats**. *Journal of Chemical Ecology* 33(10): 1997-2009. ISSN: 0098-0331.
**Descriptors:** big cats, domestic cats, cauxin in the urine, characterization, protein, big cat level lower.

Meltzer, D.G.A. (1999). **Medical management of a cheetah breeding facility in South Africa**. In: M.E. Fowler and R.E. Miller (Editors), *Zoo and Wild Animal Medicine: Current Therapy,* 4th edition, p. 415-423. ISBN: 0721686648.
**Descriptors:** cheetah, *Acinonyx jubatus*, medical management, cheetah breeding facility, animal health, conservation, veterinary medicine, wild animals, zoo animals, South Africa.

Meredith, A.L. and A. Beasey (1991). **Ivermectin treatment of ascarids in captive cheetahs (*Acinonyx jubatus*)**. *Veterinary Record* 129(11): 241-242. ISSN: 0042-4900.
**Abstract:** The efficacy of ivermectin was studied in 13 cheetahs (aged between 2 months and 12 years), at Whipsnade Wild Animal Park, UK, and naturally infected with *Toxocara cati* and *Toxascaris leonina*. Individual faecal samples were obtained from 7 singly housed mature animals, and pooled samples from 2 immature siblings (10 months old) housed together. Adult cheetahs were injected by means of a dart gun, with ivermectin (200 micro g/kg bwt). The cubs were injected sc at the same dose rate, and were re-treated 20 and 52 days later. All the faeces present in the enclosures were collected daily from 2 days before treatment until day 8 following treatment, and then weekly until day 77. All the adult cheetahs shed eggs of both *Toxocara cati* and *Toxascaris leonina* but had higher counts of the latter. Only *Toxascaris leonina* eggs were found in the faeces of the siblings, whereas most of the eggs shed by the cubs were of *Toxocara cati*. Faecal egg count had decreased to zero in all the cheetahs by days 7 and 8. Eggs of *Toxascaris leonina* were next seen in 2 animals on day 56 and those of *Toxocara cati* on day 70. By day 77 all the animals were positive for one or both parasites. It is concluded that this dose of ivermectin (200 micro g/kg bwt) completely eliminated the ascarids in the cheetahs, which then subsequently became reinfected, suggesting a short persistence of ivermectin in the animals. *Reproduced with permission of CAB.*
**Descriptors:** cheetahs, *Acinonyx jubatus*, ascarids, anthelmintics, drug therapy, helminths, Ivermectin, treatment, parasites, zoo animals, Ascarididae, Carnivores, Felidae, Nematoda, *Toxascaris leonina*, *Toxocara cati*.

Merola, M. (1994). **A reassessment of homozygosity and the case for inbreeding depression in the cheetah, *Acinonyx jubatus*: implications for conservation**. *Conservation Biology* 8(4): 961-971. ISSN: 0888-8892.
**Descriptors:** cheetahs, *Acinonyx jubatus*, homozygosity, inbreeding depression, population genetics, population studies, genetic diversity, wildlife management.

Miller Edge, M. and M. Worley (1991). **In vitro mitogen responses and lymphocyte subpopulations in cheetahs.** *Veterinary Immunology and Immunopathology* 28(3-4): 337-49. ISSN: 0165-2427.
**Abstract:** Lack of genetic variability and apparent susceptibility of cheetahs (*Acinonyx jubatus jubatus*) to coronavirus infection has lead to speculation that this species may have immune system deficits. To establish a foundation for evaluation of the immune function, cheetah peripheral blood mononuclear cells (PBM) were stimulated by a panel of six mitogens, and responses compared with those of domestic cat PBM. Individual responses in both species were variable, but evenly distributed throughout the range of stimulation for each mitogen. Proliferation by PBM from domestic cats occurred within the same range as that of the cheetahs. However, a significantly lower response to peanut agglutinin (PNA) was observed with domestic cat PBM. Although responses varied between animals, certain individual cheetahs were consistent low responders. The decreased values could not be explained by lack of IL-2 responsiveness since exogenous IL-2 significantly enhanced mitogen-stimulated proliferation in 11 of 12 cheetahs tested.

The phenotypic distribution of domestic cat and cheetah lymphocyte subpopulations was similar as assessed by immunofluorescence staining for surface immunoglobulin (sIg) and cytotoxic T (Tc) cells (using a specific monoclonal antibody, FT2). Values for B cells (31.2% sIg+) and Tc (28.7% FT2+) were slightly higher in domestic cats as compared with cheetah PBM (13.3% sIg+; 19.0% FT2+). Even though no species-specific deficits were detected, a significant negative correlation between PHA-stimulated proliferation and percent FT2+ (Tc) cheetah cells was observed. This indicates that proliferation can be used indirectly to assess relative numbers of functional T helper cells in cheetahs. Our studies suggest that these aspects of the cheetah's immune system are comparable with the domestic cat, and establish a basis for in vitro assays evaluating antigen-specific responses.

**Descriptors:** cheetah, *Acinonyx jubatus*, lymphocyte subpopulations, in vitro mitogen responses, genetic variability, susceptibility, coronavirus, immune system deficits, in vitro assays, immune system comparable with domestic cat.

Miller Edge, M.A. and M.B. Worley (1992). **In vitro responses of cheetah mononuclear cells to feline herpesvirus-1 and *Cryptococcus neoformans*.** *Veterinary Immunology and Immunopathology* 30(2-3): 261-74. ISSN: 0165-2427.

**Abstract:** In vitro T cell function by domestic cats and cheetahs to two common pathogens, feline herpesvirus-1 (FHV-1) and *Cryptococcus neoformans*, was assessed. Peripheral blood mononuclear cells (PBM) were stimulated with two strains of UV-inactivated FHV-1, whole heat-killed organisms or capsular antigen of *Cryptococcus neoformans*, and proliferative responses measured. As a group, cheetah PBM responded significantly poorer than domestic cat PBM when cultured with FHV-1. However, individual cheetah responses varied widely. Supplementation of cultures with exogenous interleukin 2 (IL-2) significantly increased the level of response of individual cheetahs to both strains of FHV-1. Cheetah sera contained slightly higher neutralizing antibody titers to FHV-1 than did domestic cat sera, suggesting that B cells function adequately in cheetahs. When stimulated with *Cryptococcus neoformans*, both species had similar incidences of positive proliferative responses. These data demonstrate that cheetahs exhibit heterogeneous responses to specific antigens, similar to domestic cats. However, a lower group response to FHV-1 in cheetahs suggests species differences occur. In addition, level of variability in major histocompatibility complex (MHC) class I-like genes, as determined by Southern blot hybridization, does not appear to correlate with a uniform response in in vitro functional assays. Therefore, additional mechanisms influence the final outcome of the immune response.

**Descriptors:** cheetah, *Acinonyx jubatus*, feline herpesvirus, *Cryptococcus neoformans*, mononuclear cells, in vitro response, peripheral blood mononuclear cells, species differences, immune response.

Millward, I.R. and M.C. Williams (2005). ***Cryptococcus neoformans* granuloma in the lung and spinal cord of a free-ranging cheetah (*Acinonyx jubatus*). A clinical report and literature review.** *Journal of the South African Veterinary Association* 76(4): 228-32. ISSN: 0038-2809.

**Abstract:** A 6-year-old, male, wild-born, free-ranging cheetah (*Acinonyx jubatus*) was evaluated for acute onset of progressive lameness in the right hind limb. Survey radiographs were unrewarding and myelography indicated an intramedullary compressive mass at the L3-L4 region. A fine needle aspirate of the lesion indicated the presence of Cryptococcus organisms. Necropsy confirmed the presence of granulomas (cryptococcoma) in the lung and the spinal cord (meningomyelitis) caused by *Cryptococcus neoformans* var. gattii. *Cryptococcus neoformans* is a yeast-like organism that is a potential pathogen to many species. Initial infection is thought to be of respiratory origin and then it commonly disseminates systemically from the nasal cavity or lungs to the skin, eyes and central nervous system in particular. The cheetah tested negative for both feline leukaemia virus (FeLV) and feline immunodeficiency virus (FIV), as have all the previously reported cheetah cases. *C. neoformans* is a non-contagious, opportunistic organism and is the most common systemic mycoses in domestic cats and the cheetah.

**Descriptors:** cheetah, male, *Acinonyx jubatus*, lung, spinal cord, granuloma, *Cryptococcus neoformans*, progressive lameness, meningomyelitis, systemic mycoses, clinical report, literature review.

Molia, S., B.B. Chomel, R.W. Kasten, C.M. Leutenegger, B.R. Steele, L. Marker, J.S. Martenson, D.F. Keet, R.G. Bengis, R.P. Peterson, L. Munson, and S.J. O'Brien (2004). **Prevalence of *Bartonella* infection in wild African lions (*Panthera leo*) and cheetahs (*Acinonyx jubatus*).** *Veterinary Microbiology* 100(1-2): 31-41. ISSN: 0378-1135.

**Abstract:** *Bartonella* species are emerging pathogens that have been isolated worldwide from humans and other mammals. Our objective was to estimate the prevalence of *Bartonella* infection in free-ranging African lions (*Panthera leo*) and cheetahs (*Acinonyx jubatus*). Blood and/or serum samples were collected from a convenience sample of 113 lions and 74 cheetahs captured in Africa between 1982 and 2002. Whole blood samples available from 58 of the lions and 17 of the cheetahs were cultured for evidence of *Bartonella* spp., and whole blood from 54 of the 58 lions and 73 of the 74 cheetahs tested for the presence of *Bartonella* DNA by TaqMan PCR. Serum samples from the 113 lions and 74 cheetahs were tested for the presence of antibodies against *Bartonella henselae*

using an immunofluorescence assay. Three (5.2%) of the 58 lions and one (5.9%) of the 17 cheetahs were bacteremic. Two lions were infected with *B. henselae*, based on PCR/RFLP of the citrate synthase gene. The third lion and the cheetah were infected with previously unidentified *Bartonella* strains. Twenty-three percent of the 73 cheetahs and 3.7% of the 54 lions tested by TaqMan PCR were positive for Bartonella spp. *B. henselae* antibody prevalence was 17% (19/113) for the lions and 31% (23/74) for the cheetahs. The prevalence of seropositivity, bacteremia, and positive TaqMan PCR was not significantly different between sexes and age categories (juvenile versus adult) for both lions and cheetahs. Domestic cats are thus no longer the only known carriers of *Bartonella* spp. in Africa. Translocation of *B. henselae* seronegative and TaqMan PCR negative wild felids might be effective in limiting the spread of *Bartonella* infection.
**Descriptors:** cheetah, *Acinonyx jubatus*, lion, *Panthera leo*, *Bartonella* infection, free ranging, blood samples, serum samples, DNA, antibodies, carriers, Africa.

Munson, L. (1993). **Diseases of captive cheetahs (*Acinonyx jubatus*): results of the Cheetah Research Council Pathology Survey, 1989-1992.** *Zoo Biology* 12(1): 105-124. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetahs, *Acinonyx jubatus*, captive, gastritis, liver, fibrosis, kidneys, glomerulonephritis, nephritis, pancreatitis, zoos, surveys, zoo animals, circulatory disorders, feline peritonitis virus, pathology, veins, veno occlusive disease, United States.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Munson, L., L. Marker, E. Dubovi, J.A. Spencer, J.F. Evermann, and S.J. O'Brien (2004). **Serosurvey of viral infections in free-ranging Namibian cheetahs (*Acinonyx jubatus*).** *Journal of Wildlife Diseases* 40(1): 23-31. ISSN: 0090-3558.
**Abstract:** Cheetahs (*Acinonyx jubatus*) in captivity have unusually high morbidity and mortality from infectious diseases, a trait that could be an outcome of population homogeneity or the immunomodulating effects of chronic stress. Free-ranging Namibian cheetahs share ancestry with captive cheetahs, but their susceptibility to infectious diseases has not been investigated. The largest remaining population of free-ranging cheetahs resides on Namibian farmlands, where they share habitat with domestic dogs and cats known to carry viruses that affect cheetah health. To assess the extent to which free-ranging cheetahs are exposed to feline and canine viruses, sera from 81 free-ranging cheetahs sampled between 1992 and 1998 were evaluated for antibodies against canine distemper virus (CDV), feline coronavirus (feline infectious peritonitis virus; FCoV/ FIPV), feline herpesvirus 1 (FHV1), feline panleukopenia virus (FPV), feline immunodeficiency virus (FIV), and feline calicivirus (FCV) and for feline leukemia virus (FeLV) antigens. Antibodies against CDV, FCoV/FIPV, FHV1, FPV, and FCV were detected in 24, 29, 12, 48, and 65% of the free-ranging population, respectively, although no evidence of viral disease was present in any animal at the time of sample collection. Neither FIV antibodies nor FeLV antigens were present in any free-ranging cheetah tested. Temporal variation in FCoV/FIPV seroprevalence during the study period suggested that this virus is not endemic in the free-ranging population. Antibodies against CDV were detected in cheetahs of all ages sampled between 1995 and 1998, suggesting the occurrence of an epidemic in Namibia during the time when CDV swept through other parts of sub-Saharan Africa. This evidence in free-ranging Namibian cheetahs of exposure to viruses that cause severe disease in captive cheetahs should direct future guidelines for translocations, including quarantine of seropositive cheetahs and preventing contact between cheetahs and domestic pets.
**Descriptors:** cheetahs, *Acinonyx jubatus*, viral infections, serosurvey, free ranging, Namibian farmlands, feline viruses, canine viruses, carriers, exposure, corona virus, herpesvirus, domestic pets, translocation, quarentine, Namibia.

Munson, L., J.W. Nesbit, D.G. Meltzer, L.P. Colly, L. Bolton, and N.P. Kriek (1999). **Diseases of captive cheetahs (*Acinonyx jubatus jubatus*) in South Africa: a 20-year retrospective survey.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 30(3): 342-7. ISSN: 1042-7260.
**Abstract:** As part of an ongoing study to determine the basis for high prevalences of veno-occlusive disease, glomerulosclerosis, and chronic lymphoplasmacytic gastritis in cheetahs, a retrospective pathology survey of captive cheetahs in the Republic of South Africa (RSA) was conducted. The RSA population was selected because its genetic composition and captive management were similar to those of the cheetah population in U.S. zoos, in which these diseases are common. For this study, archived pathology materials at the University of Pretoria Faculty of Veterinary Sciences in Onderstepoort and the Faculty of Veterinary Science, MEDUNSA, from 69 cheetahs that died between 1975 and 1995 were reviewed, and prevalences of common lesions were compared with those in the U.S. population. Gastritis associated with Helicobacter-like organisms was the most prevalent disease, accounting for close to 40% of the mortalities, including several cheetahs < 3 yr old. Glomerulosclerosis and veno-occlusive disease also were major causes of mortality in RSA cheetahs. RSA cheetahs also had adrenal cortical hyperplasia, cardiac fibrosis, lymphocytic depletion of the spleen, systemic amyloidosis, and splenic myelolipomas. The presence in the captive RSA cheetah population of the same unusual diseases that are common in U.S. cheetahs suggests a species predilection to develop these diseases in captivity.

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, gastritis, glomerulosclerosis, hepatic veno occlusive disease, amyloidosis, epidemiology, pathology, zoo animals, *Helicobacter* isolation, purification, kidney pathology, liver pathology, prevalence, retrospective studies, 20 year survey, South Africa.

Munson, L., K.A. Terio, M. Worley, M. Jago, A. Bagot Smith, and L. Marker (2005). **Extrinsic factors significantly affect patterns of disease in free-ranging and captive cheetah (*Acinonyx jubatus*) populations.** *Journal of Wildlife Diseases* 41(3): 542-548. ISSN: 0090-3558.

**Abstract:** The cheetah (*Acinonyx jubatus*) has been considered a paradigm for disease vulnerability due to loss of genetic diversity. This species monomorphism has been suspected to be the basis for their general poor health and dwindling populations in captivity. North American and South African captive populations have high prevalences of hepatic veno-occlusive disease, glomerulosclerosis, gastritis, and systemic amyloidosis, diseases that are rare in other species. Unusually severe inflammatory reactions to common infectious agents have also been documented in captive cheetahs. The current study compared disease prevalences in free-ranging Namibian cheetahs with those in two captive populations of similar ages. The occurrence of diseases in the free-ranging population was determined from 49 necropsies and 27 gastric biopsies obtained between 1986 and 2003 and compared with prevalences in 147 North American and 80 South African captive cheetahs. Except for two cheetahs, the free-ranging population was in robust health with only mild lesions present, in contrast with significantly higher prevalences in the captive populations. Despite widespread heavy Helicobacter colonization in wild cheetahs, only 3% of the free-ranging population had moderate to severe gastritis, in contrast with 64% of captive cheetahs. No severe inflammatory reactions to viral infections were detected in the free-ranging animals. Because free-ranging Namibian cheetahs are as genetically impoverished as captive cheetahs, these findings caution against attributing loss of fitness solely to genetic factors and attest to the fundamental importance of extrinsic factors in wildlife health.

**Descriptors:** cheetah, free ranging, *Acinonyx jubatus*, patterns of disease, extrinsic factors, significantly affect, genetics, immunology, physiology, disease susceptibility, environment, *Helicobacter* infections, epidemiology, stress.

Munson, L., R. Wack, M. Duncan, R.J. Montali, D. Boon, I. Stalis, G.J. Crawshaw, K.N. Cameron, J. Mortenson, S. Citino, J. Zuba, and R.E. Junge (2004). **Chronic eosinophilic dermatitis associated with persistent feline herpes virus infection in cheetahs (*Acinonyx jubatus*).** *Veterinary Pathology* 41(2): 170-6. ISSN: 0300-9858.

**Abstract:** A chronic ulcerative and eosinophilic dermatitis occurred in 20 captive cheetahs (*Acinonyx jubatus*) with persistent feline herpes virus 1 (FHV1) infection. Affected animals had erythematous, ulcerated plaques primarily on the face and forelegs in sites of contact with lachrymal and salivary secretions. The dermatitis was characterized by dense infiltrates of eosinophils and plasma cells and pseudoepitheliomatous hyperplasia. Rare keratinocytes within the lesions had nuclei with marginated chromatin and small eosinophilic inclusions composed of herpes virus nucleocapsids. Virus isolated from lesions was confirmed to be FHV1. Lesions persisted and progressed unless removed by cryoexcision. The occurrence of this unusual reaction to FHV1 in approximately 5% of captive North American cheetahs suggests a species propensity for a Th2-dominant response to herpes virus infection. This atypical immune reaction may indicate a heritable trait or modulation of the immune response by other factors such as chronic stress.

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, chronic ulcerative eosinophilic dermatitis, persistent feline herpes virus infection, ulcerated plaques, eosinophils, hyperplasia, immunereaction, atypical, chronic stress.

Munson, L. and Charles Louis Davis D.V.M. Foundation for the Advancement of Veterinary and Comparative Pathology. (1999). ***Diseases of Wild Felids.***, [Gurnee, Ill.]: The Foundation, [1999].: 2 videocassettes: sd., col.; 1/2 in. p.

**NAL Call Number:** Videocassette.no. 3151

**Abstract:** Lectures with slides illustrating diseases of wild felids, with emphasis on African lions and cheetahs.

**Descriptors:** Lions, *Panthera leo*, Diseases, Cheetah, *Acinonyx jubatus*, wild Felids Diseases, video cassettes.

**Notes:** At head of title: Veterinary pathology. "13 September 1999." VHS.Contents: tape 1. Lectures 1 & 2 (ca. 99 min.) -- tape 2. Lectures 3 & 4 (ca. 89 min.).

Muntifering, J.R., A.J. Dickman, L.M. Perlow, T. Hruska, P.G. Ryan, L.L. Marker, and R.M. Jeo (2006). **Managing the matrix for large carnivores: a novel approach and perspective from cheetah (*Acinonyx jubatus*) habitat suitability modelling.** *Animal Conservation* 9(1): 103-112. ISSN: 1367-9430.

**NAL Call Number:** QH75.A1 A54

**Abstract:** Effective management within the human-dominated matrix, outside of formally protected areas, is of paramount importance to wide-ranging carnviores. For instance, the largest extant population of cheetahs *Acinonyx jubatus* currently persists on privately owned Namibian ranchlands, and provides an excellent case study to examine and design matrix conservation approaches. Although human-caused mortality is likely the principal

threat to this population, ancedotal evidence suggests that 'bush encroachment', the widespread conversion of mixed woodland and savannah habitats to dense, Acacia-dominated thickets, is another probable threat. A better understanding of cheetah habitat use, outside of protected areas, could be used to directly influence habitat management strategies and design local restoration and conflict mitigation efforts. To identify specific habitat characteristics associated with cheetah use, we used radio-telemetry locations to identify areas used intensively by cheetahs on commercial Namibian farms. We then compared the habitat characteristics of these 'high-use' areas with adjacent 'low-use' areas. A binary logistic regression model correctly categorized 92% of plot locations as high or low use, and suggested that cheetahs may be utilizing 'rewarding patches' with better sighting visibility and greater grass cover. We discuss the possible reasons for kudu Tragelaphus strepsiceros, Namibian cheetahs' preferred prey, exhibiting significantly lower abundance in high-use areas. Using habitat characteristics to identify areas intensively utilized by cheetahs has important implications for guiding future habitat restoration and developing effective predator conflict mitigation efforts.
**Descriptors:** cheetah, *Acinonyx jubatus*, carnivores, habitat use, habitat modeling, habitat characteristics, effective management, protected areas, Nambia.

Mwanzia, J.M., R.A. Kock, J.M. Wambua, N. Kock, and O. Jarret (1995). **An outbreak of sarcoptic mange in free living cheetah (*Acinonyx jubatus*) in the Mara region of Kenya**. In: *Proceedings, American Association of Zoo Veterinarians, Wildlife Disease Association, American Association of Wildlife Veterinarians Joint Conference,East Lansing, Michigan,* p. 105-114.
**Abstract:** *Sarcoptes scabiei* was identified in skin scrapings from 9 of 12 temporarily captured cheetahs. Affected animals were injected with ivermectin at 0.3 mu g/kg before recovery from the immobilizing anaesthetic. Mange did not seem to affect other species in the vicinity. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, acaricides, avermectins, chemical control, ectoparasites, ivermectin, mange, mite control, skin diseases, wild animals, Acari, Arachnida, Felidae, mites, *Sarcoptes*, *Sarcoptes scabiei*.

Neiffer, D.L., A.D. Pardo, and E.C. Klein (2000). **Use of pyloroplasty (Y-U) to treat presumed delayed gastric emptying in a cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 31(4): 552-7. ISSN: 1042-7260.
**Abstract:** A 4-yr-old cheetah (*Acinonyx jubatus*) with a 2-yr history of chronic intermittent vomiting and spiral bacteria-associated gastritis presented with dramatically increased vomiting frequency and marked intermittent abdominal distention. Physical examination revealed loss of muscle mass and poor fur coat quality. Contrast radiography was consistent with delayed gastric emptying due to presumed gastric outlet obstruction. Both Y-U pyloroplasty and incisional gastropexy were performed, and no subsequent vomiting has been observed for 3 yr with the exception of three episodes during the immediate postoperative period. The cause of delayed gastric emptying was not determined, although a gastric motility disorder associated with gastric bacterial infection and elevated gastrin levels was suspected.
**Descriptors:** cheetah, *Acinonyx jubatus*, gastric emptying, pylorus surgery, Y-U, pyloroplasty, stomach diseases, gastrins blood, gastritis complications, gastritis, gastrointestinal motility, increased vomiting, spiral bacteria associated gastritis, abdominal distention, delayed gastric emptying.

Nomura, Y. and Y. Une (2004). **Pathological study on enteric *Helicobacter* infection in captive cheetahs (*Acinonyx jubatus*) in Japan**. *Journal of Azabu University*(9/10): 127-132. ISSN: 1346-5880.
**Abstract:** There has been no report on the prevalence and pathogenicity of enteric *Helicobacter* in large felids, including cheetahs. The pathogenicity of most enteric Helicobacters still remains unknown. Pathological examination of 63 captive cheetahs revealed a high incidence of lymphocytic enteritis. However, no relationship between enteritis and *Helicobacter* infection of the intestine was found. The relationship of amyloid and *Helicobacter* infection of the intestine and its pathogenicity in captive cheetahs were studied to identify the cause of this disease. Pathological studies were carried out on 43 of the 63 cheetahs that died in captivity. Amyloid was deposited in 36 cheetah (83.7%) and was frequently observed in the small intestine. There was no relationship between amyloid and *Helicobacter* infection of intestine. Molecular biological examination distinguished that the bacteria derived from two cheetahs were *H. bilis*, *Flexispira rappini* and *H. cinaedi*. The relationship of enteritis and *Helicobacter* infection of the intestine was still unclear because the small number of cheetahs where *Helicobacter* was isolated. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, *Heliobacter* infection, pathological study, pathology, enteritis, pathogenicity, amyloid, *Heliobacter bilis*, *Flexispira rappini* and *H. cinaedi.*
**Language of Text:** Japanese, Summary in English.

Nothling, J.O., O. Knesl, P. Irons, and E. Lane (2002). **Uterine prolapse with an interesting vascular anomaly in a cheetah: a case report.** *Theriogenology.* 58(9): 1705-1712. ISSN: 0093-691X.

**NAL Call Number:** QP251.A1T5
**Abstract:** A 5-year-old cheetah suffered a complete prolapse of the left uterine horn after the birth of her second litter. Two attempts to reduce the prolapse transvaginally failed. The animal was hospitalized 13 days after the prolapse first occurred, and an ovariohysterectomy was performed to resolve the prolapse. The prolapsed uterine horn had been mutilated: its tip, together with the ipsilateral ovary was absent. Laparotomy revealed no sign of recent or past hemorrhage or adhesions, or any signs of the left ovarian artery or left ovarian vein in the remnants of the left mesovarium. A large vein crossed the uterine body from the left uterine horn to join the right uterine vein, presumably serving as the only route of venous drainage for the prolapsed uterine horn. A possible cause for the prolapse is excessive mobility of the uterus due to prior rupture of its mesial support. The animal died 24 days after surgery due to chronic renal failure, as a result of severe renal amyloidosis.
**Descriptors:** cheetah, *Acinonyx jubatus*, zoo animals, uterine prolapse, ovariectomy, uterus, blood chemistry, leukopenia, renal failure, blood circulation, blood vessels, ovaries, females, case studies, anemia, hematocrit, hysterectomy, abnormalities.

O'Brien, S.J., M.E. Roelke, L. Marker, A. Newman, C.A. Winkler, D. Meltzer, L. Colly, J.F. Evermann, M. Bush, and D.E. Wildt (1985). **Genetic basis for species vulnerability in the cheetah.** *Science* 227(4693): 1428-34. ISSN: 0036-8075.
**Abstract:** A population genetic survey of over 200 structural loci previously revealed that the South African cheetah (*Acinonyx jubatus jubatus*) has an extreme paucity of genetic variability, probably as a consequence of a severe population bottleneck in its recent past. The genetic monomorphism of the species is here extended to the major histocompatibility complex, since 14 reciprocal skin grafts between unrelated cheetahs were accepted. The apparent consequences of such genetic uniformity to the species include (i) great difficulty in captive breeding, (ii) a high degree of juvenile mortality in captivity and in the wild, and (iii) a high frequency of spermatozoal abnormalities in ejaculates. The species vulnerability of the cheetah was demonstrated by an epizootic of coronavirus-associated feline infectious peritonitis in an Oregon breeding colony in 1983. Exposure and spread of the coronavirus, which has a very low morbidity in domestic cats (approximately 1 percent), has decimated a heretofore productive and healthy captive population. The extreme genetic monomorphism, especially at the major histocompatibility complex, and the apparent hypersensitivity of the cheetah to a viral pathogen may be related, and provide a biological basis for understanding the adaptive significance of abundant genetic variation in outbred mammalian species.
**Descriptors:** cheetah, *Acinonyx jubatus*, paucity of genetic variability, population bottleneck, genetic survey, genetic uniformity, spermatozoal abnormalities, coronavirus, genetic monomorphism, difficulty in captive breeding.

O'donovan, D., J.E. Hindle, S. Mckeown, and S. O'donovan (1993). **Effects of visitors on the behaviour of female cheetahs *Acinonyx jubatus* and cubs**. *International Zoo Yearbook* 32(0): 238-244. ISSN: 0074-9664.
**Descriptors:** cheetahs, females, cubs, behavior, visitors effects, conservation, development, wildlife management, adult.

O'regan, H.J. (2002). **Defining cheetahs, a multivariate analysis of skull shape in big cats**. *Mammal Review* 32(1): 58-62. ISSN: 0305-1838.
**Descriptors:** cheetahs, *Acinonyx jubatus*, skull shape, multivariate analysis, skeletal system, big cats, movement, support.

Ofri, R., R.Y. Barishak, G. Eshkar, and I. Aizenberg (1996). **Feline central retinal degeneration in captive cheetahs (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 27(1): 101-108. ISSN: 1042-7260.
**Descriptors:** cheetahs, *Acinonyx jubatus*, feline central retinal degeneration, captive, nutrition, sense organs, dietary supplementation, dietary taurine deficiency, eye disease, vision loss.

Ohale, L.O. and H.B. Groenewald (2003). **The morphological characteristics of the antebrachiocarpal joint of the cheetah (*Acinonyx jubatus*).** *Onderstepoort Journal of Veterinary Research, The* 70(1): 15-20. ISSN: 0030-2465.
**Abstract:** A morphological study of the structures of the antebrachiocarpal (AC) joint of the cheetah was carded out by dissection of eight forelimbs obtained from four adult cheetahs culled from the Kruger National Park, Republic of South Africa. The aim was to evaluate the deviations of this joint from the normal feline pattern and to consider their possible relationship to the cheetah's adaptation to speed. Although published data on the AC joint of the other felids show general resemblance to that of the cheetah, there are nevertheless slight, but significant variations and modifications which tend to suggest adaptation to speed. The shafts of the radius and ulna of the cheetah are relatively straight and slender, with poorly developed distal ends. The ulnar notch is reduced to a very shallow concavity while the corresponding ulnar facet is a barely noticeable convexity, separated from the distal ulnar articular facet by an ill-defined groove. The movement of the distal radio-ulnar joint is highly restricted by the presence of a fibro-cartilaginous structure and a strong interrosseous membrane, limiting pronation and supination normally achieved by the rotation of the radius around the ulna. The extensor

grooves at the distal extremity of the radius are deep and narrow and are guarded by prominent ridges. A thick extensor retinaculum anchors the strong extensor tendons in these grooves. The distal articular surface of the radius is concave in all directions except at the point where it moves into its stylold process. At this point it is convex in the dorsopalmar direction, with a surface that is rather deep and narrow. The proximal row of carpal bones presents a strongly convex surface, which is more pronounced in the dorsopalmar direction with the greatest convexity on the lateral aspect. Medially, there is a ridge-like concavity across the base of the tubercle, which rocks on the flexor surface of the radius, limiting excessive flexion as well as restricting lateral deviation of the AC joint.
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, histology, carpal bones, joints anatomy, histology, running physiology, adaptation, forelimb, radius anatomy, antebrachiocarpal joint, dissection, deviations, normal feline pattern.

Olmsted, R.A., R. Langley, M.E. Roelke, R.M. Goeken, D. Adger Johnson, J.P. Goff, J.P. Albert, C. Packer, M.K. Laurenson, T.M. Caro, L. Scheepers, D.E. Wildt, M. Bush, J.S. Martenson, and S.J. O'Brien (1992). **Worlwide prevalence of lentivirus infection in wild feline species: epidemiologic and phylogenetic aspects**. *Journal of Virology* 66(10): 6008-6018. ISSN: 0022-538X.
**Abstract:** The natural occurrence of lentiviruses closely related to feline immunodeficiency virus (FIV) in nondomestic field species was shown to be worldwide. Cross-reactive antibodies to FIV were common in several free-ranging populations of large cats, including East African lions and cheetahs of the Serengeti ecosystem and in puma, (cougar or mountain lion) populations throughout North America. Infectious puma lentivirus (PLV) was isolated from several Florida panthers, a severely endangered relict puma subspecies inhabiting the Big Cypress Swamp and Everglades ecosystems in southern Florida. Phylogenetic analysis of PLV genomic sequences from disparate geographical isolates showed appreciable divergence from domestic cat FIV sequences as well as between PLV sequences found in different North American areas. The level of sequences divergence between PLV and FIV was greater than the level of divergence between human and some simian immunodeficiency viruses, suggesting that the transmission of FIV between feline species is infrequent and parallels in time the emergence of HIV from simian ancestors. *Reproduced with permission of CAB.*
**Descriptors:** wild feline species, cheetah, *Acinonyx jubatus*, viral diseases, Cats, Felidae, Feline immunodeficiency virus, *Felis concolor*, lentivirus, Lions, cougar, mountain lion, panthers.

Osofsky, S.A., W.D. Hardy, and K.J. Hirsch (1994). **Serologic evaluation of free-ranging lions (*Panthera leo*), leopards (*Panthera pardus*) and cheetahs (*Acinonyx jubatus*) for feline lentivirus and feline leukaemia virus in Botswana**. In: *Proceedings American Association of Zoo Veterinarians and Association of Reptilian and Amphibian Veterinarians Annual Conference,Pittsburg, Pennsylvania,* American Association of Zoo Veterinarians: Lawrence, Kansas, USA, p. 398-402.
**Descriptors:** felids, free ranging, lions, *Panthera leo*, leopards, *Panthera pardus*, cheetahs, *Acinonyx jubatus*, serological surveys, wild animals, Felidae, feline immunodeficiency virus, feline oncovirus, lentivirus, feline leukemia virus, conference proceedings, Botswana.

Osofsky, S.A., K.J. Hirsch, E.E. Zuckerman, and W.D. Hardy (1996). **Feline lentivirus and feline oncovirus status of free-ranging lions (*Panthera leo*), leopards (*Panthera pardus*), and cheetahs (*Acinonyx jubatus*) in Botswana: a regional perspective**. *Journal of Zoo and Wildlife Medicine* 27(4): 453-467. ISSN: 1042-7260.
**Abstract:** Botswana lions, leopards and cheetahs were evaluated for evidence of feline lentivirus infection by assaying for antibodies against test antigens derived from a puma lentivirus isolate (PLV< sub>CGZ</ sub>) and a domestic cat feline immunodeficiency virus (FIV) and for oncovirus (feline leukemia virus (FeLV)) infection using an ELISA for detection of antigen. Blood collection filter paper kits were distributed countrywide to safari hunters and Department of Wildlife and National Parks field officers involved in problem predator management. All sampling was opportunistic; no cats were captured, anaesthetized or killed for this project. Five different assays for antibodies to lentivirus were used on most samples: PLV< sub>CGZ</ sub> indirect immunofluorescence assay (IFA), PLV< sub>CGZ</ sub> western immunoblot (WB), FIV ELISA, FIV IFA and FIV WB. One test was used for detection of oncovirus antigen: domestic cat FeLV ELISA. None of the cats tested positive for FeLV infection. Evidence of lentivirus infection (defined as a positive result on at least the PLV< sub>CGZ</ sub> WB) was found in all 3 species: 8 of 31 lions (25.8%), 3 of 18 leopards (16.7%), and 1 of 4 cheetahs (25%). Seropositive cats were found in geographically diverse parts of the country. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, leopards, *Panthera pardus*, feline lentivirus, feline oncovirus, disease surveys, viral diseases, feline immunodeficiency virus, feline leukemia virus, lions, panthera, Botswana.

Osthoff, G., A. Hugo, and M. de Wit (2006). **The composition of cheetah (*Acinonyx jubatus*) milk.** *Comparative Biochemistry and Physiology. Part B, Biochemistry and Molecular Biology* 145(3-4): 265-9. ISSN: 1096-4959.
**Abstract:** Milk was obtained from two captive bred cheetahs. The nutrient content was

99.6 g protein; 64.8 g fat; and 40.21 g lactose per kg milk. Small amounts of oligosaccharides, glucose, galactose and fucose were noted. The protein fraction respectively consisted of 34.2 g caseins per kg milk and of 65.3 g whey proteins per kg milk. Very little variation in milk composition among the individual cheetahs was noted. Electrophoresis and identification of protein bands showed a similar migrating sequence of proteins as seen in lion's and cat's milk, with small differences in the beta-caseins. The lipid fraction contains 290.4 g saturated and 337.3 g mono-unsaturated fatty acids per kg milk fat respectively. The high content of 279.5 g kg(-1) milk fat of polyunsaturated fatty acids is due to a high content in alpha-linolenic acid. No short chain fatty acids, but substantial levels of uneven carbon chain fatty acids were observed.
**Descriptors:** cheetah, *Acinonyx jubatus*, cheetah milk, composition, chemistry, fatty acids analysis, lactation physiology, lactose analysis, milk proteins analysis, nutrient content, whey proteins, lipid fraction, nutrient content.

Pablo, L.S., L. Young, J. Schumacher, J. Bailey, and J.C.H. Ko (1995). **Epidural morphine in a cheetah (*Acinonyx jubatus*) undergoing total hip replacement**. *Journal of Zoo and Wildlife Medicine* 26(3): 436-439. ISSN: 1042-7260.
**Abstract:** To provide intraoperative and postoperative analgesia, morphine (0.1 mg/kg) was administered into the epidural space of a cheetah that required a total hip replacement. The epidural administration was performed 45 minutes before surgery after the cheetah had been anaesthetized with a combination of tiletamine and zolazepam (TelazolReg.) at a dosage of 2.5 mg/kg i.m. and isoflurane in oxygen. The cardiopulmonary status of the cheetah was stable throughout the anaesthetic period except for a short period of systemic hypertension during surgery and mild to moderate hypercapnia. There was no evidence of increased motor activity or excitement attributable to the epidural morphine. The cheetah appeared quiet and showed normal behaviour 3 hours after anaesthesia. Preoperative epidural administration of morphine appears to be a suitable and safe technique for providing analgesia in cheetahs that require hind limb surgery. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, anesthesia, analgesics, hip replacement, epidural morphine, postoperative care, tiletamine, zolazepam, isoflurane, hind limb surgery.

Palmer, A.C., J.J. Callanan, L.A. Guerin, B.J. Sheahan, N. Stronach, and R.J. Franklin (2001). **Progressive encephalomyelopathy and cerebellar degeneration in 10 captive-bred cheetahs.** *Veterinary Record* 149(2): 49-54. ISSN: 0042-4900.
**Abstract:** rogressive ataxia, with head tremor, developed in 10 captive-born cheetah cubs under six months of age. The condition was usually preceded by coryza and an ocular discharge. Initially the ataxia and weakness affected the hindquarters, then the forelegs, and head tremor developed later. Significant pathological changes were confined to the central nervous system. There was widespread Wallerian degeneration in the funiculi of the spinal cord (except those in the dorsal columns), in the medulla and in the cerebellum. In the cerebellum there was degeneration of Purkinje cells and of the molecular and granular cell layers. There was chromatolysis in the Purkinje cells, the ventral horn cells of the spinal cord and in the neurons of the lateral vestibular nucleus. The olivary nucleus was necrotic. There were foci of inflammatory cells in the molecular layer of the cerebellum and in the medulla. The cause of the disease remains unknown.
**Descriptors:** cheetah cubs, *Acinonyx jubatus*, encephalomyelopathy, cerebellar degeneration, captive bred, progressive ataxia, head tremor, central nervous system diseases, wallerian degeneration, spinal cord, medulla, cerebellum, Purkinje cells.

Papendick, R.E., L. Munson, T.D. O'Brien, and K.H. Johnson (1997). **Systemic AA amyloidosis in captive cheetahs (*Acinonyx jubatus*).** *Veterinary Pathology* 34(6): 549-56. ISSN: 0300-9858.
**Abstract:** Ongoing disease surveillance of necropsied captive cheetahs (*Acinonyx jubatus*) (n = 141) revealed a high prevalence of renal amyloidosis (n = 54 [38%]; age 1 to 16 years). The prevalence increased from 20% in pre- 1990 necropsies to 70% of cheetahs necropsied in 1995. In 74% of the cheetahs with amyloidosis, renal failure was determined to be the sole or partial cause of death. Papillary necrosis was seen only in affected cheetahs and involved 25% of these animals. Amyloid was present predominantly in the medullary interstitium, with minimal glomerular involvement. The amyloid deposits were immunohistochemically identified as AA type using antisera to both human and canine protein AA. A high percentage (52%) of animals with renal amyloid also had subsinusoidal hepatic AA amyloid deposits. Inflammatory diseases were identified in 100% of affected cheetahs. The most common inflammatory disease was chronic lymphoplasmacytic gastritis. The prevalence and severity of gastritis was higher in cheetahs with amyloidosis, and the prevalence of severe gastritis increased from 16% to 43%, coinciding with the increase in prevalence of amyloidosis. These findings suggest that cheetahs have a high prevalence of systemic amyloidosis in response to inflammation and that renal amyloidosis is an increasingly significant cause of morbidity and mortality in captive cheetah populations. Factors of potential importance in the apparent high prevalence of AA amyloidosis in cheetahs are currently being investigated in our laboratories.
**Descriptors:** cheetah, *Acinonyx jubatus*, renal amyloidosis, high prevalence, renal failure, AA amyloidosis, inflammatory diseases, chronic lymphoplasmacytic gastritis, systemic

amyloidosis.

Parham, P. (1991). **The pros and cons of polymorphism: a brighter future for cheetahs?** *Research in Immunology* 142(5-6): 447-8. ISSN: 0923-2494.
**Descriptors:** cheetahs, *Acinonyx jubatus*, genetics, polymorphism, genetic genetics, evolution, major histocompatibility complex genetics, variation genetics.

Pearks Wilkerson, A.J., E.C. Teeling, J.L. Troyer, G.K. Bar Gal, M. Roelke, L. Marker, J. Pecon Slattery, and S.J. O'Brien (2004). **Coronavirus outbreak in cheetahs: lessons for SARS.** *Current Biology CB* 14(6): R227-8. ISSN: 0960-9822.
**Descriptors:** cheetahs, *Acinonyx jubatus*, virology, coronavirus infections, epidemiology, feline genetics, disease outbreaks, phylogeny, models, SARS virus, sequence analysis, DNA, variation genetics.

Peet, R.L. and J.M. Curran (1992). **Spongiform encephalopathy in an imported cheetah**. *Australian Veterinary Journal* 69(7): 171. ISSN: 0005-0423.
**Abstract:** A 5.5-year-old cheetah at the Broome Zoo was observed to be ataxic and disorientated during December 1991. Blood samples showed a strong positive titre to toxoplasmosis. The animal was killed 4 weeks after the onset of clinical symptoms when it exhibited falling, locomotory weakness and distress. PM examination showed no visible lesions. Histopathology showed widespread axonal degeneration and demyelination of all tracts in the spinal cord. Severe spongiform change was visible in the grey matter of the neuroaxis, especially in the corpus striatum, midbrain and thalamic areas. On the basis of neuropathology, a diagnosis of spongiform encephalopathy was made and samples were forwarded to the reference laboratory in Weybridge, UK. The presence of fibrils was confirmed by electron microscopy. Meanwhile, a quarantine order was placed on the zoo and the previously buried carcasses were disinterred and incinerated. The cheetah was born at Marwell Zoo in England on 16 June 1986 and imported together with 2 littermates to Australia on 9 May 1989. Marwell Zoo practised a 'feeding in' of culled carcasses to other zoo animals, particularly felids and canids. The cheetah probably ingested the infective agent while still in England. This is the first diagnosis of spongiform encephalopathy in a cheetah and of spongiform encephalopathy in a zoo animal outside the UK. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, spongiform encephalopathy, case reports, laboratory diagnosis, nervous system diseases, pathology, zoo animals, Felidae.

Peirce, M.A., M.K. Laurenson, and S.C. Gascoyne (1995). **Hepatozoonosis in cheetahs and wild dogs in the Serengeti ecosystem**. *African Journal of Ecology* 33(3): 273-275. ISSN: 0141-6707.
**Abstract:** Between 1987 and 1991, blood was collected from 24 *Acinonyx jubatus* and 16 *Lycaon pictus* living in the Serengeti, Tanzania, and examined for parasites. Microscopical examination revealed the presence of Hepatozoon in leukocytes from 13 *A. jubatus* (54.2%) and 13 *L. pictus* (81.5%). Highest parasitaemias occurred in October and November in *A. jubatus* but no seasonal variation was observed in *L. pictus*. This represents the first record of Hepatozoon in African *L. pictus*. The morphology of Hepatozoon gametocytes indicated differences between those in *A. jubatus* and *L. pictus. Reproduced with permission of CAB.*
**Descriptors:** cheetahs, *Acinonyx jubatus*, wild dogs, *Lycaon pictus*, disease prevalence, epidemiology, parasites, wild animals, Hepatozoon, protozoa, parasite levels.

Penzhorn, B.L., L.M. Booth, and D.G.A. Meltzer (1994). ***Isopora rivolta* recovered from cheetahs.** *Journal of the South African Veterinary Association* 65(1): 2. ISSN: 0301-0732.
**NAL Call Number:** 41.8 So8
**Descriptors:** cheetahs, *Acinonyx jubatus*, oocytes, feces, length, width, sporocysts, *Isospora rivolta*, South Africa.

Pernikoff, D.S., W.J. Boever, M. Gado, and L.A. Gilula (1986). **Vertebral body fracture in a captive cheetah.** *Journal of the American Veterinary Medical Association* 189(9): 1199-200. ISSN: 0003-1488.
**Descriptors:** captive cheetah, *Acinonyx jubatus*, injuries, bone fractures, lumbar vertebrae injuries, fractures, bone radiography, myelography, tomography, x ray computed.

Pfeifer, M.L., J.F. Evermann, M.E. Roelke, A.M. Gallina, R.L. Ott, and A.J. McKeirnan (1983). **Feline infectious peritonitis in a captive cheetah.** *Journal of the American Veterinary Medical Association* 183(11): 1317-9. ISSN: 0003-1488.
**Descriptors:** captive cheetah, *Acinonyx jubatus*, microbiology, zoo animals, microbiology, carnivora microbiology, Coronaviridae infections, peritonitis, Coronaviridae isolation, purification, Coronaviridae infections, microbiology, peritonitis, microbiology.

Plessis, L.d., A.J. Botha, F. Reyers, and K. Stevens (2004). **Blood platelets of the cheetah (*Acinonyx jubatus*)**. *Zoo Biology* 23(3): 263-272. ISSN: 0733-3188.
**Abstract:** The blood platelet count and platelet morphology of 22 adult cheetahs was
investigated. The platelet counts of the animals displayed a normal distribution, with a

mean count of 344x109/l and a mean platelet volume of 11 fl. Morphological and ultrastructural features of the cheetah platelets revealed the typical platelet morphology of anuclear cells, with granules scattered throughout the cytoplasm. The characteristic surface canalicular system and microtubules were present. True cross-sections of the platelets had a mean area of 2.146 micro m2, circumference of 6.805 micro m, and mean minimum and maximum projections of 1.000 micro m and 2.933 micro m, respectively. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, zoo animals, cell ultrastructure, cytoplasm, morphology, blood platelet count, platelets, ultrastructural features.

Poddar Sarkar, M. and R.L. Brahmachary (1997). **Putative semiochemicals in the African cheetah (*Acinonyx jubatus*).** *Journal of Lipid Mediators and Cell Signalling* 15(3): 285-7. ISSN: 0929-7855.
**Descriptors:** cheetah, *Acinonyx jubatus*, pheromones chemistry, gas chromatography, thin layer chromatography, diglycerides analysis, fatty acids analysis, fatty acids chemistry, lipids analysis, sterols analysis, triglycerides analysis, Africa.

Pukazhenthi, B., L. Penfold, D. Wildt, and J. Howard (2002). **Direct assessment of cooling-induced changes in cheetah spermatozoa**. *Biology of Reproduction* 66(Supplement 1): 240. ISSN: 0006-3363.
**Descriptors:** cheetah, *Acinonyx jubatus*, reproductive system, reproduction, spermatozoa, cooling induced changes, assessment, percent sperm motility, percent sperm viability.
**Notes:** 35th Annual Meeting of the Society for the Study of Reproduction, Baltimore, Maryland, USA; July 28-31, 2002.

Radcliffe, R.W., S. Osofsky, D. Decker, B. Wolfe, and M. Bush (1995). **Laparoscopic vasectomy: a simple technique for sterilization of the male cheetah (*Acinonyx jubatus*)**. *Proceedings of a Joint Conference American Association of Zoo Veterinarians, Wildlife Disease Association, and American Association of Wildlife Veterinarians, East Lansing, Michigan, USA; August 12-17, 1995,*Vol. 1995, p. 435-437.
**Descriptors:** male cheetah, *Acinonyx jubatus*, sterilization, laparoscopic vasectomy, simple technique, case report.

Radin, M.J., K.A. Eaton, L. Kramer, R. Wack, R. Sherding, S. Krakowka, and D.R. Morgan (1991). **Diagnosis of gastric spiral bacteria in the cheetah**. *Veterinary Clinical Pathology* 20(1): 17. ISSN: 0275-6382.
**Descriptors:** cheetah, *Acinonyx jubatus*, biopsy, case reports, gastritis, stomach diseases, gastric spiral bacteria, diagnosis.
**Notes:** Meeting Information: 25th Annual Meeting of American Society for Veterinary Clinical Pathology.

Roth, T.L., W.F. Swanson, E. Blumer, and D.E. Wildt (1995). **Enhancing zona penetration by spermatozoa from a teratospermic species, the cheetah (*Acinonyx jubatus*).** *Journal of Experimental Zoology.* 271(4): 323-30. ISSN: 0022-104X.
**Abstract:** Cheetahs (*Acinonyx jubatus*) produce poor quality ejaculates that can limit the efficiency of standard assisted reproduction including artificial insemination (AI) and in vitro fertilization (IVF). The purpose of this study was to: (1) further study sperm-oocyte interaction in this teratospermic species by examining the ability of malformed sperm to interact with various oocyte barriers; and (2) assess the potential of zona piercing for assisting IVF in a teratospermic felid. Zonae of salt-stored (SS), domestic cat oocytes were mechanically pierced (ZnPd) three times each. Semen was collected by electroejaculation from six male cheetahs and ejaculates were processed for IVF. Sperm aliquots from each ejaculate were assessed for a sperm motility index (SMI) over time. Zona-intact (ZnIn-SS) oocytes (n = 78) and ZnPd-SS oocytes (n = 74) were coincubated with spermatozoa in vitro for 6 h. The proportion of morphologically abnormal spermatozoa per ejaculate was high for all males (range 81.5% to 95.9%). SMI values at 0 and 6 h were variable, ranging from 50 to 75 and 0 to 40, respectively. Spermatozoa from all ejaculates bound to and penetrated the outer zona pellucida of ZnIn-SS and ZnPd-SS oocytes similarly ($P > 0.05$). The proportion of oocytes containing spermatozoa within the inner zona layer and the average number of spermatozoa per oocyte in this region were greater ($P < 0.05$) for the ZnPd-SS than ZnIn-SS oocytes (39.2% and 1.0 versus 12.8% and 0.2, respectively). Although zona piercing enhanced sperm penetration, there was no increase ($P > 0.05$) in pleiomorphic spermatozoa penetrating the inner zona pellucida or PVS.(ABSTRACT TRUNCATED AT 250 WORDS)
**Descriptors:** cheetahs, *Acinonyx jubatus*, physiology, sperm ovum interactions, spermatozoa abnormalities, zona pellucida physiology, analysis of variance, domestic cats, sperm motility.

Ruiz Miranda, C.R., S. Wells, R. Golden, and J. Seidensticker (1998). **Vocalization and other behavioral responses of male cheetahs (*Acinonyx jubatus*) during experimental separation and reunion trials**. *Zoo Biology* 17(1): 1-16. ISSN: 0733-3188.
**Descriptors:** male cheetahs, *Acinonyx jubatus*, vocalization, other behavioral responses, experimental separation and reunion trials, psychological attachment, husbandry technique.

Russell, A.P. and H.N. Bryant (2001). **Claw retraction and protraction in the carnivora: the cheetah (*Acinonyx jubatus*) as an atypical felid**. *Journal of Zoology (London)* 254(1): 67-76. ISSN: 0952-8369.
**Descriptors:** cheetah, *Acinonyx jubatus*, claw retraction, protraction, felid, phalanges, morphology, manipulative capabilities, forelimb, forepaws.

Russell, P. and H.N. Bryant (1997). **Claw retraction in felids: how the cheetah cheats**. *Journal of Morphology* 232(3): 318. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skeletal system, movement, support, paws, feet, claw retraction, manus, morphology, pes, phalanges, phalanx, felids, meeting information.
**Notes:** Fifth International Congress of Vertebrate Morphology, Bristol, England, UK; July 12-17, 1997.

Sanjayan, M.A. and K. Crooks (1996). **Skin grafts and cheetahs.** *Nature* 381(6583): 566. ISSN: (p) 0028-0836; (E) 1476-4687.
**Descriptors:** cheetahs, *Acinonyx jubatus*, skin grafts, *acinonyx* immunology, skin transplantation, immunology, DNA fingerprinting, homozygote, rodentia genetics, rodentia immunology, transplantation, homologous, variation genetics.

Scherba, G., A.M. Hajjar, D.S. Pernikoff, J.P. Sundberg, E.J. Basgall, M. Leon Monzon, L. Nerurkar, and M.E. Reichmann (1988). **Comparison of a cheetah herpesvirus isolate to feline herpesvirus type 1.** *Archives of Virology* 100(1-2): 89-97. ISSN: 0304-8608.
**Abstract:** A cytopathogenic virus with size and structural characteristics of a Herpesviridae was isolated from a cheetah with severe ulcerative dermatitis. Restriction endonuclease analysis and cross-hybridization studies revealed that the isolate was related to feline herpesvirus type 1 (FHV-1). Antigenic comparison studies using anti-FHV-1 serum demonstrated the presence of common antigens in the FHV-1 and the isolate from the cheetah.
**Descriptors:** cheetah, *Acinonyx jubatus*, cheetah herpesevirus, comparison, feline herpesevirus type 1, ulcerative dermatitis, cytopathogenic virus, size, structural characteristics.

Schulz, J., E.E. Hammond, M. Haymon, A. Ramis, J. Martorell, and R.F. Aguilar (2003). **Magnetic resonance imaging as a method of diagnosing leukoencephalopathy in a cheetah (*Acinonyx jubatus*)**. In: *Erkrankungen der Zootiere: Verhandlungsbericht des 41 Internationalen Symposiums uber die Erkrankungen der Zoo und Wildtiere. [Proceedings of the Institute for Zoo and Wildlife Research, Berlin, No. 5],Rome, Italy,* Berlin, p. 11-15.

**Abstract:** Leukoencephalopathy is a recently described disease of cheetahs characterized with white matter degeneration in specific areas of the brain. A 12-year-old male cheetah (*Acinonyx jubatus*) is presented with progressive hind limb ataxia and incoordination for 22 months. Magnetic resonance imaging was utilized as a diagnostic technique. The regions of interest were defined as brain and spinal cord. Images produced by magnetic resonance did not show any changes in the intensity of the cerebral white matter consistent with a chronic degenerative process. The absence of clear lesions on the MRI implied a final diagnosis cannot be made until the animals' signs worsen, and a follow up MRI showed unequivocal lesions, or until central nervous system lesions can be detected postmortem by means of histopathology. The animal's chronic neurologic signs, apparent occasional blindness, and slow recovery from anaesthesia, associated with severe neurologic signs during recovery, indicated it will remain a strong clinical suspect of leukoencephalopathy. Should the animal in this case be found positive, it would suggest that the disease may be suspected clinically before magnetic resonance imaging is a diagnostic option. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, leukoencephalopathy, diagnosing, magnetic resonance imaging, method, diagnostic techniques, encephalopathy, lesions, conference information.
**Notes:** Erkrankungen der Zootiere: Verhandlungsbericht des 41. Internationalen Symposiums uber die Erkrankungen der Zoo und Wildtiere, Rome, Italy, 28 May - 1 June, 2003.

Schumacher, J., P. Snyder, S.B. Citino, R.A. Bennett, and L.D. Dvorak (2003). **Radiographic and electrocardiographic evaluation of cardiac morphology and function in captive cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 34(4): 357-63. ISSN: 1042-7260.
**Abstract:** In a prospective study, eight (four males and four females) healthy, adult captive cheetahs (*Acinonyx jubatus*) were immobilized with a combination of tiletamine-zolazepam (4 mg/kg, i.m.), administered with a remote drug delivery system, to define normal cardiac morphology and function. Standard lateral and ventrodorsal (VD) radiographs were then taken to measure heart and thorax using a metric and vertebral scale system. Standard six-lead electrocardiograms were obtained with the animals in right lateral recumbency under isoflurane anesthesia. Mean chest depth and width was 18.7 +/- 1.3 cm and 13.0 +/- 0.6 cm, respectively. The mean lateral cardiac short axis (X) was 9.1 +/- 0.6 cm. the mean cardiac long axis (Y) was 13.6 +/- 0.7 cm, and the mean lateral heart sum (X + Y) was 22.6 +/- 1.2 cm. In the VD projection, mean cardiac

short axis (V) was 10.1 +/- 0.7 cm, mean cardiac long axis (W) was 14.9 +/- 1.2 cm, and the heart sum (V + W) was 24.9 +/- 1.8 cm. The vertebral heart size was 8.2 +/- 0.9. All cheetahs had sinus rhythm, and no arrhythmias were noted. Mean heart rate was 126 +/- 15 beats/min, and the mean electrical axis was 82 + 5 degrees. P waves were always positive on lead II and had a width of 0.04 +/- 0.01 sec and a height between 0.1 and 0.3 mV. PR intervals were 0.11 +/- 0.01 sec. The height of the QRS complex was 1.25 +/- 0.24 mV and the width 0.06 +/- 0.01 sec. The ST segment was 0.04 sec, and the T wave (height: 0.25 +/- 0.05 mV) was positive in all cheetahs examined. Although these cardiac and thoracic measurements were larger than those of domestic cats (*Felis catus*), ratios of cardiac parameters were similar in both species. Electrocardiographic findings were similar to those reported from domestic cats.
**Descriptors:** captive adult cheetahs, males and females, *Acinonyx jubatus*, anatomy, histology, physiology, heart physiology, heart radiography, anesthetics, combined anesthetics, anti-anxiety agents, electrocardiography, veterinary immobilization, prospective studies, reference values, tiletamine, zolazepam.

Setchell, K.D., S.J. Gosselin, M.B. Welsh, J.O. Johnston, W.F. Balistreri, L.W. Kramer, B.L. Dresser, and M.J. Tarr (1987). **Dietary estrogens--a probable cause of infertility and liver disease in captive cheetahs.** *Gastroenterology* 93(2): 225-33. ISSN: 0016-5085.
**Abstract:** The cheetah in the wild is "racing towards extinction" mostly due to habitat destruction. Its survival will probably depend on accelerated captive breeding. At this time, however, reproductive failure and liver disease threaten the future of the captive cheetah population. Histopathological evaluation of more than 100 cheetah livers identified venocclusive disease as the main hepatic lesion responsible for liver disease in this species. Analysis of the commercial feline diet by high-performance liquid chromatography and gas-liquid chromatography-mass spectrometry revealed large amounts of two phytoestrogens identified as daidzein and genistein. These compounds were found to be derived from a soybean product that was a component of the cheetah diet, and their concentrations both ranged from 18 to 35 micrograms/g diet. The adult cheetah consequently consumes approximately 50 mg/day of these weak estrogens. When extracts of the diet were tested for estrogenicity using a bioassay, a dose-related increase in uterine weight was observed. In 4 cheetahs studied, withdrawal of this feline diet by substitution with a chicken diet resulted in an improvement in conventional liver function tests and a normalization in the appearance of hepatic mitochondria. We conclude that the relatively high concentrations of phytoestrogens from soybean protein present in the commercial diet fed to captive cheetahs in North American zoos may be one of the major factors in the decline of fertility and in the etiology of liver disease in this species. The survival of the captive cheetah population could depend upon a simple change of diet by excluding exogenous estrogen.
**Descriptors:** cheetah, *Acinonyx jubatus*, growth, development, animal feed adverse effects, growth, development, cat diseases chemically induced, estrogens adverse effects, estrogens non-steroidal, infertility, isoflavones, liver diseases, soybeans, biological assay, cat diseases, pathology, cats, chromatography, high pressure liquid gas chromatography, mass spectrometry, hepatic veno occlusive disease, liver pathology, liver ultrastructure, liver function tests, mice, phytoestrogens, plant preparations, rats.

Sharp, N.C.C. (1997). **Timed running speed of a cheetah (*Acinonyx jubatus*)**. *Journal of Zoology (London)* 241(3): 493-494. ISSN: 0952-8369.
**Descriptors:** cheetah, *Acinonyx jubatus*, running speed, timed, systematics, locomotion, highest running speed for any animal.

Shibly, S., P. Schmidt, N. Robert, C. Walzer, and A. Url (2006). **Immunohistochemical screening for viral agents in cheetahs (*Acinonyx jubatus*) with myelopathy.** *Veterinary Rcord, The* 159(17): 557-61. ISSN: 0042-4900.
**Abstract:** Numerous cases of acute-onset progressive ataxia, hindlimb paresis and paralysis of unknown aetiology occurred during 1993 to 2003 in cheetahs (*Acinonyx jubatus*) within the European Endangered Species Programme (eep). This study describes the immunohistochemical investigation of a possible viral aetiology of the "cheetah myelopathy". Antibodies to feline herpesvirus type 1, canine distemper virus, canine parvovirus and Borna disease virus were applied to formalin-fixed and paraffin-embedded brain and spinal cord sections from 25 affected cheetahs aged between three-and-a-half months and 13 years. Using the avidin-biotin complex technique, none of the antibodies gave positive immunosignals in either the brain or the spinal cord tissue.
**Descriptors:** cheetah, *Acinonyx jubatus*, myelopathy, immunohistochemical screening, viral agents, ataxia, hindlimb paralysis, antibodies, viral etiology.

Sims, C. (2001). **Morphological distinctions in skulls of five felids (*Puma concolor, Panthera onca, Panthera pardus, Uncia uncia, and Acinonyx jubatus*)**. *Journal of Morphology* 248(3): 285. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skull, morphological distinctions, skeletal system, cougar, jaguar, leopard, snow leopard, species comparison study.
**Notes:** Sixth International Congress of Vertebrate Morphology, Jena, Germany; July 21-26, 2001.

Skibiel, A.L., H.S. Trevino, and K. Naugher (2007). **Comparison of several types of**

**enrichment for captive felids**. *Zoo Biology* 26(5): 371-381. ISSN: 0733-3188.
**Abstract:** Enrichment can increase the complexity of the captive environment and

possibly enhance captive animals' well-being by stimulating active behaviors and reducing stereotypical behaviors commonly seen in zoo felids. In this study, three different enrichment items were added to outdoor enclosures of felids at the Montgomery Zoo to test their effects on activity levels and stereotypic pacing. Bones, frozen fish, and spices (cinnamon, chili powder, and cumin) were presented over a 3-month period to six species of felids: cheetah, cougar, jaguar, lion, ocelot, and tiger. Proportion of time spent engaging in active behaviors and stereotypic pacing were compared before, during, and after treatments. All treatments resulted in a significant increase in activity level from baseline (bones: +15.59%; frozen fish: +35.7%; spices: +12.38%). Effects of enrichment items on activity levels were not sustained 7 days after removal. Proportion of time spent pacing significantly decreased during presentation of spices (-21.25%) and frozen fish (-26.58%), but not with the addition of bones. However, only the effect of frozen fish on stereotypic behavior was sustained 7 days after removal of the enrichment item. In conclusion, bones, spices, and frozen fish are inexpensive and easy-to-administer enrichment items that may be used to increase active behaviors of captive felids. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, *Felis concolor*, jaguars, lions, ocelots, tigers, captive felids, enrichment types, comparison, abnormal behavior, animal behavior, animal welfare, bones, frozen fish, physical activity, spices, zoo animals.

Spencer, J.A. (1993). **Lymphocyte blast transformation responses and restriction fragment length analysis in the cheetah.** *Onderstepoort Journal of Veterinary Research.* 60(3): 211-7. ISSN: 0030-2465.
**NAL Call Number:** 41.8 On1
**Abstract:** An extensive genetic and physiological analysis of the cheetah by O'Brien et al. (1983; 1985; 1987) indicated that the cheetah showed monomorphism at the major histocompatability complex. This led O'Brien (1985) to propose that the cheetah suffered from an immunodeficiency and was highly susceptible to diseases. It was therefore decided to investigate cell-mediated and humoral immune responses and to apply the limited restriction fragment length analysis (using Pst 1 and Bam H1 enzymes) of the cheetah MHC I and MHC II genes. Antibody responses to antigens (feline viruses), as well as mitogen-induced lymphocyte blast transformation responses, were shown to be intact and comparable with that of the domestic cat, indicating a competent immune system in the cheetah. It was also suggested by the results that some polymorphism does exist in the MHC class II genes, but possibly not in the MHC class I genes.
**Descriptors:** cheetah, *Acinonyx jubatus*, immunology, lymphocyte activation immunology, blast transformation response, restriction fragment length, genetic analysis, immunodeficiency, monomorphism.

Spencer, J.A. (1991). **Lack of antibodies to coronaviruses in a captive cheetah (*Acinonyx jubatus*) population.** *Journal of the South African Veterinary Association* 62(3): 124-5. ISSN: 0038-2809.
**Abstract:** Cheetahs (*Acinonyx jubatus*) (n = 40) were tested by means of an immunofluorescent test (IFT) for the presence of antibodies to the feline coronavirus group. All cheetahs tested negatively and this was further confirmed by virus serum neutralisation.
**Descriptors:** captive cheetas, *Ainonyx jubatus*, antibodies, viral analysis, coronavirus, feline immunology, cats, feline infectious peritonitis immunology.

Spencer, J.A. and R. Burroughs (1992). **Decline in maternal immunity and antibody response to vaccine in captive cheetah (*Acinonyx jubatus*) cubs.** *Journal of Wildlife Diseases* 28(1): 102-4. ISSN: 0090-3558.
**Abstract:** Blood was collected from captive cheetah cubs (*Acinonyx jubatus*) from the ages of 4 to 12 wk and monitored for the decline in maternally derived antibodies to feline panleukopenia, herpes and calici viruses. A steady decrease was seen in most of the cubs. Antibody responses to inactivated and/or modified live virus (MLV) vaccine also were measured. The strongest responses were seen post vaccination with MLV vaccine only.
**Descriptors:** captive cheetah, *Acinonyx jubatus*, maternal immunity, antibody response, vaccine, cubs, decline, feline panleukopenia, herpes, calic viruses, vaccination.

Spencer, J.A. and R. Burroughs (1991). **Antibody response of captive cheetahs to modified-live feline virus vaccine.** *Journal of Wildlife Diseases* 27(4): 578-83. ISSN: 0090-3558.
**Abstract:** The antibody response of cheetahs (*Acinonyx jubatus*) to modified live virus vaccine against feline panleukopenia (FPLV), herpes (FHV) and calici (FCV) viruses was assessed by means of an enzyme-linked immunosorbent assay (ELISA). In the first year of study, 82 cheetahs were bled pre-vaccination. Of these, antibody levels to FPLV were found in 100% of the animals. Only 54% were found to have antibodies to FHV and 99% had antibodies to FCV. One month after booster vaccination with the same vaccine, increased antibodies to FPLV, FHV and FCV were seen in 19 (58%), 18 (55%) and 25 (76%) of these animals, respectively (n = 33). In the second year of study, 65 cheetahs were bled pre-vaccination. Fifty three of these animals were negative for antibodies to FPLV while 28 were positive for FHV and 64 were positive for FCV. These animals were

then bled 1, 2 and 6 mo post booster vaccination. The antibody levels to the various viruses showed different trends with time.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, antibody response, modified live feline virus vaccine, panleukopenia, herpes, calici viruses, vaccination.

Stegmann, G.F. and M. Jago (2006). **Cardiopulmonary effects of medetomidine or midazolam in combination with ketamine or tiletamine/zolazepam for the immobilisation of captive cheetahs (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 77(4): 205-9. ISSN: 0038-2809.
**Abstract:** Captive cheetah (*Acinonyx jubatus*) scheduled for either general health examination or dental surgery were immobilised with combinations of medetomidine-ketamine (K/DET, n = 19), midazolam-ketamine (K/MID, n = 4) or medetomidine-tiletamine-zolazepam (Z/DET, n = 5). Induction time and arterial blood pressure was not statistically significantly (P > 0.05) different between treatment groups. Transient seizures were observed in the K/DET treated animals during induction. Hypertension was present in all groups during anaesthesia with mean (+/- SD) systolic pressure of 30.7 +/- 5.0 kPa for the K/DET group, 27.7 +/- 2.7 kPa for the K/MID group, and 33.1 +/- 4.6 kPa for the Z/DET group. Heart rate was statistically significantly (P < 0.05) lower in the K/DET group (69 +/- 13.2 beats/min) compared to the K/MID group (97 +/- 22.6 beats/min), and ventilation rate was statistically significantly (P < 0.05) lower in the K/MID group (15 +/- 0.0 breaths/min) compared with the K/DET group (21 +/- 4.6). A metabolic acidosis and hypoxia were observed during anaesthesia when breathing air. Oxygen (O2) administration resulted in a statistically significant (P < 0.05) increase in the arterial partial pressure of carbon dioxide (hypercapnoea), arterial partial pressure of O2, and % oxyhaemoglobin saturation.
**Descriptors:** captive cheetah, *Acinonyx jubatus*, anesthesia, cardiopulmonary effects, medetomidine, midazolam, ketamine, tiletamine, zolazepam, immobilization, induction time, arterial blood pressure, transient seizures, hypertension, heart rate, ventilation rate.

Steinel, A., L. Munson, M. Van Vuuren, and U. Truyen (2000). **Genetic characterization of feline parvovirus sequences from various carnivores**. *Journal of General Virology* 81(2): 345-350. ISSN: 0022-1317.
**Descriptors:** various carnivores, feline parvovirus sequences, genetic characterization, feline panleukopenia virus, mink enteritis virus, canine parvovirus, viral DNA, species susceptibility.

Storms, T.N., V.L. Clyde, L. Munson, and E.C. Ramsay (2003). **Blastomycosis in nondomestic felids.** *Journal of Zoo and Wildlife Medicine* 34(3): 231-238. ISSN: 1042-7260.
**Abstract:**

**Descriptors:** nondomestic felids, Blastomycosis, Asian lions, *Panthera leo persicus*, African lion, *Panthera leo*, Siberian tiger, *Panthera tigris*, cheetah, *Acinonyx jubatus*, snow leopard, *Panthera uncia*, radiography, cytologic examination, serology.

Terio, K.A., J.L. Brown, R. Moreland, and L. Munson (2002). **Comparison of different drying and storage methods on quantifiable concentrations of fecal steroids in the cheetah**. *Zoo Biology* 21(3): 215-222. ISSN: 0733-3188.

**Abstract:** Fecal steroid analysis is a powerful tool that can provide important information on the health, physiology, and reproductive status of nondomestic species. However, studying free-ranging animals requires that feces be stored and transported from the collection site to the laboratory in a manner that prevents degradation or alteration of steroid metabolites. To determine the effects of different handling and storage methods on fecal steroids, 30 fresh fecal samples from five captive cheetahs were collected, thoroughly mixed, separated into aliquots, and processed (stored or dried) under different conditions. Concentrations of gonadal and adrenal steroid hormones were analyzed in feces stored frozen at -20 degrees C or at room temperature in 95% ethanol. Both frozen and ethanol-stored aliquots were desiccated using a lyophilizer, solar oven, or conventional oven. The steroid values from aliquots stored and desiccated using the different methods were compared to those obtained using the optimal storage method of freezing at -20 degrees C and desiccating in a lyophilizer (control). Concentrations of corticoid, estrogen, progestogen, and androgen metabolites in fecal extracts were quantified by radioimmunoassay. Androgen metabolite concentrations were not significantly affected (P<0.05) by storage or drying methods. Fecal samples stored at room temperature in ethanol and lyophilized also had steroid concentrations that did not differ (P<0.05) from controls. However, the concentrations of corticoid and estrogen metabolites were significantly lower (P<0.05), and progestogen metabolites were significantly higher (P<0.05) in samples desiccated in solar and conventional ovens without regard to storage method. These results suggest that storage of fecal samples at room temperature in ethanol is the best alternative to freezing for subsequent analysis of steroid hormone concentrations. Differences in measured concentrations of hormones in oven-desiccated samples could be due to hormone degradation or shifts in the immunodominant metabolite. Therefore, validation of storage and processing techniques should be included in the development of any new fecal steroid analysis methodology.

*Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, androgens, corticoids, drying methods, storage methods, fecal steroids, metabolites, methodology, oestrogens, steroid hormones, steroids, comparison.

Terio, K.A., S.B. Citino, and J.L. Brown (1999). **Fecal cortisol metabolite analysis for noninvasive monitoring of adrenocortical function in the cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine* 30(4): 484-491. ISSN: 1042-7260.
**Abstract:** A radioimmunoassay was validated for quantifying excreted cortisol metabolites in cheetah (*Acinonyx jubatus*) feces. High-performance liquid chromatography analysis indicated that immunoreactivity was associated with a water-soluble metabolite in fecal extracts from males and females. None of the immunoreactivity corresponded with free cortisol or corticosterone but rather was associated with a more polar, unidentified metabolite. To determine the biologic relevance of excreted immunoreactive cortisol metabolites, cheetahs were exposed to a variety of situations anticipated to increase cortisol secretion. First, to assess acute changes in adrenal activity, adrenocorticotropic hormone (ACTH; 400 IU i.m.) was administered to two adult males and two adult females. Pre-ACTH baseline serum cortisol and fecal cortisol metabolite concentrations varied among individuals. Serum cortisol concentrations were elevated above baseline within 10 min of ACTH injection, followed by corresponding increases in fecal cortisol metabolite concentrations (690-4,194% above baseline) 48 hr later in three of four cheetahs. In the fourth cheetah, a smaller increase (334% above baseline) in fecal cortisol metabolite excretion was observed 96 hr after ACTH injection. Seven cheetah females also were subjected to a variety of potentially stressful manipulations, including immobilization, translocation, and introduction to a male to assess the ability of this technique to detect physiologic changes in adrenal activity. Increased fecal corticoid metabolite excretion was observed 24-72 hr after exposure to these exogenous stressors. Results indicate that adrenocortical activity can be monitored noninvasively in the cheetah through analysis of these metabolites. This technique could be valuable for evaluating, and thus optimizing, environmental and management conditions and for investigating the role of stress in disease pathogenesis and the usually poor reproductive performance of this species in captivity.
**Descriptors:** cheetah, *Acinonyx jubatus*, fecal cortisol metabolite analysis, adrenocortical function, noninvasive monitoring, radioimmunoassay, disease, stress, environment, management.

Terio, K.A., L. Marker, and L. Munson (2004). **Evidence for chronic stress in captive but not free-ranging cheetahs (*Acinonyx jubatus*) based on adrenal morphology and function.** *Journal of Wildlife Diseases* 40(2): 259-66. ISSN: 0090-3558.
**Abstract:** The cheetah (*Acinonyx jubatus*) is highly endangered because of loss of habitat in the wild and failure to thrive in captivity. Cheetahs in zoos reproduce poorly and have high prevalences of unusual diseases that cause morbidity and mortality. These diseases are rarely observed in free-ranging cheetahs but have been documented in cheetahs that have been captured and held in captive settings either temporarily or permanently. Because captivity may be stressful for this species and stress is suspected as contributing to poor health and reproduction, this study aimed to measure chronic stress by comparing baseline concentrations of fecal corticoid metabolites and adrenal gland morphology between captive and free-ranging cheetahs. Additionally, concentrations of estradiol and testosterone metabolites were quantified to determine whether concentrations of gonadal steroids correlated with corticoid concentration and to assure that corticosteroids in the free-ranging samples were not altered by environmental conditions. Concetntrations of fecal corticoids, estradiol, and testosterone were quantified by radioimmunoassay in 20 free-ranging and 20 captive cheetahs from samples collected between 1994 and 1999. Concentrations of baseline fecal corticoids were significantly higher ($p = 0.005$) in captive cheetahs (196.08 +/- 36.20 ng/g dry feces) than free-ranging cheetahs (71.40 +/- 14.35 ng/g dry feces). Testosterone concentrations were lower in captive male cheetahs (9.09 +/- 2.84 ng/g dry feces) than in free-ranging cheetahs (34.52 +/- 12.11 ng/g dry feces), which suggests suppression by elevated corticoids in the captive males. Evidence for similar sulppression of estradiol concentrations in females was not present. Adrenal corticomedullary ratios were determined on midsagittal sections of adrenal glands from 13 free-ranging and 13 captive cheetahs obtained between 1991 and 2002. The degree of vacuolation of cortical cells in the zona fasciculata was graded for each animal. Corticomedullary ratios were larger ($p = 0.05$) in captive cheetahs; however, there was no difference ($p = 0.31$) in the degree of corticocyte vacnolation between the two populations. These data proxile both mnorphologic and functional evidence suggestive of chronic stress in captive cheetahs. Further research into the role of hypercortisolemia in the pathogenesis of the reproductive abnormalities and unusual diseases of captive cheetahs is needed.
**Descriptors:** cheetahs, *Acinonyx jubatus*, captive, chronic stress, adrenal morphology, function, poor reproduction, high prevalences of diseases, measure chronic stress, baseline concentration, fecal corticoid metabolites, free ranging cheetahs.

Terio, K.A., L. Munson, L. Marker, B.M. Aldridge, and J.V. Solnick (2005). **Comparison of *Helicobacter* spp. in cheetahs (*Acinonyx jubatus*) with and without gastritis.** *Journal of Clinical Microbiology* 43(1): 229-34. ISSN: 0095-1137.

**Abstract:** Chronic gastritis causes significant morbidity and mortality in captive cheetahs but is rare in wild cheetahs despite colonization by abundant spiral bacteria. This research aimed to identify the Helicobacter species that were associated with gastritis in captive cheetahs but are apparently commensal in wild cheetahs. Helicobacter species were characterized by PCR amplification and sequencing of the 16S rRNA, urease, and cagA genes and by transmission electron microscopy of frozen or formalin-fixed paraffin-embedded gastric samples from 33 cheetahs infected with Helicobacter organisms (10 wild without gastritis and 23 captive with gastritis). Samples were screened for mixed infections by denaturant gel gradient electrophoresis of the 16S rRNA gene and by transmission electron microscopy. There was no association between Helicobacter infection and the presence or severity of gastritis. Eight cheetahs had 16S rRNA sequences that were most similar (98 to 99%) to *H. pylori.* Twenty-five cheetahs had sequences that were most similar (97 to 99%) to "*H. heilmannii*" or *H. felis*. No cheetahs had mixed infections. The ultrastructural morphology of all bacteria was most consistent with "*H. heilmannii*," even when 16S rRNA sequences were *H. pylori*-like. The urease gene from *H. pylori*-like bacteria could not be amplified with primers for either "*H. heilmanni*i" or *H. pylori* urease, suggesting that this bacteria is neither *H. pylori* nor "*H. heilmannii*." The cagA gene was not identified in any case. These findings question a direct role for *Helicobacter* infection in the pathogenesis of gastritis and support the premise that host factors account for the differences in disease between captive and wild cheetah populations.
**Descriptors:** cheetahs, *Acinonyx jubatus*, gastitis, *Heliobacter* species, chronic gastritis, captive, spiral bacteria, wild, cheetahs, comparison.

Terio, K., L. Munson, and J.V. Solnick (2000). **Infection with *H.pylori*-Like organisms is associated with gastritis in captive but not wild cheetahs**. *Gastroenterology* 118(4 Suppl. 2 Part 1): AGA A746-AGA A747. ISSN: 0016-5085.
**Descriptors:** cheetah, *Acinonyx jubatus*, infection, *H. pylorii* like organism, captive cheetahs, wild cheetahs, meeting information.
**Notes:** 101st Annual Meeting of the American Gastroenterological Association and the Digestive Disease Week, San Diego, California, USA; May 21-24, 2000.

Terrell, S.P., D.K. Fontenot, M.A. Miller, and M.A. Weber (2003). **Chylous ascites in a cheetah (*Acinonyx jubatus*) with venoocclusive liver disease.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 34(4): 380-4. ISSN: 1042-7260.
**Abstract:** An 11-yr-old female cheetah (*Acinonyx jubatus*) was diagnosed clinically with hepatic and renal disease and euthanatized after an extended illness. Postmortem examination revealed 8-10 L of milky white fluid in the abdominal cavity and markedly dilated lymphatic vessels within the intestinal mesentery. The abdominal fluid was a chylous effusion based on the cytologic predominance of lymphocytes and macrophages and comparison of cholesterol and triglyceride levels in the fluid and in serum. Gross and histopathologic lesions in the liver were consistent with a diagnosis of venoocclusive liver disease. Chylous ascites is uncommon with human chronic liver disease and is rarely identified in animals.
**Descriptors:** cheetah, *Acinonyx jubatus*, chylous ascites, hepatic veno occlusive liverdisease, pathology, radiography, liver pathology, hepatic disease, renal disease.

Travis, E.K., M. Duncan, M. Weber, M.J. Adkesson, and R.E. Junge (2007). **Ileocecocolic strictures in two captive cheetahs (*Acinonyx jubatus jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 38(4): 574-8. ISSN: 1042-7260.
**Abstract:** Intestinal strictures were diagnosed in two captive cheetahs (*Acinonyx jubatus jubatus*). The cheetahs presented with lethargy, anorexia, diarrhea, and weight loss. The first cheetah had a stricture of the ileocecocolic junction diagnosed at necropsy. The second had an ileocecocolic stricture causing obstruction that was diagnosed at surgery. After resection and anastomosis, the cheetah recovered well. The etiology of the strictures remains undetermined. Intestinal stricture, particularly of the ileocecocolic junction, should be considered as a differential diagnosis for cheetahs with nonspecific gastrointestinal signs.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, iliocecocolic strictures, lethargy, anorexia, diarrhea, weight loss, intestinal strictures, gastrointestinal signs, differential diagnosis, resection, anastomosis.

Turnbull, P.C., B.W. Tindall, J.D. Coetzee, C.M. Conradie, R.L. Bull, P.M. Lindeque, and O.J. Huebschle (2004). **Vaccine-induced protection against anthrax in cheetah (*Acinonyx jubatus*) and black rhinoceros (*Diceros bicornis*).** *Vaccine* 22(25-26): 3340-7. ISSN: 0264-410X.
**Abstract:** Institution of a policy of vaccination in endangered species with a vaccine not previously administered to it cannot be undertaken lightly. This applies even more in the case of cheetah (*Acinonyx jubatus*) with their unusually monomorphic gene pool and the potential restrictions this places on their immune responses. However, the recently observed mortalities from anthrax in these animals in the Etosha National Park, Namibia, made it imperative to evaluate vaccination. Black rhinoceros (*Diceros bicornis*), another endangered species in the park, have been vaccinated for over three decades but the

effectiveness of this has never been evaluated. Passive protection tests in A/J mice using sera from 12 cheetahs together with enzyme immunoassay indicated that cheetah are able to mount seemingly normal primary and secondary humoral immune responses to the Sterne 34F2 live spore livestock vaccine. Overall protection rates in mice injected with the sera rose and fell in concert with rises and declines in antibody titres, although fine analysis showed that the correlation between titre and protection was complex. Once a high level of protection (96% of mice 1 month after a second booster in the cheetahs) had been achieved, the duration of substantial protection appeared good (60% of the mice 5 months after the second booster). Protection conferred on mice by sera from three of four vaccinated rhino was almost complete, but, obscurely, none of the mice receiving serum from the fourth rhino were protected. Sera from three park lions with naturally acquired high antibody titres, included as controls, also conferred high levels of protection. For the purposes of wildlife management, the conclusions were that vaccination of cheetah with the standard animal anthrax vaccine causes no observable ill effect in the animals and does appear to confer protective immunity. At least one well-separated booster does appear to be desirable. Vaccination of rhino also appears to be justified from the limited data obtained.
**Descriptors:** cheetah, *Acinonyx jubatus*, anthrax, black rhinoceros, *Diceros bicornis*, vaccine induced protection, immunity, vaccination evaluation.

Une, Y. (2000). **Ultrastructural details of *Helicobacter* species from cheetahs**. *Journal of Veterinary Medicine, Japan* 53(11): 933-938. ISSN: 0447-0192.
**Descriptors:** cheetah, *Acinonyx jubatus*, morphology, reviews, ultrastructure, *Helicobacter* species.
**Language of Text:** Japanese.

Valicek, L., B. Smid, and J. Vahala (1993). **Demonstration of parvovirus in diarrhoeic African cheetahs (*Acinonyx jubatus jubatus* Schreber, 1775).** *Veterinarni Medicina* 38(4): 245-9. ISSN: 0375-8427.
**Abstract:** Parvovirus was demonstrated in the intestinal content of diarrhoeic African cheetahs by electron microscopy. The virus was isolated in a feline kidney cell line inoculated with a filtrate of the intestinal content. Its growth characteristics, cytopathic effect, agglutination of porcine erythrocytes, structure, and results of immunoelectron microscopic examination were indistinguishable from those of feline panleukopenia virus.
**Descriptors:** cheetah, *Acinonyx jubatus*, parvovirus, diarrhea, Africans, intestinal content, electron microscopy, feline kidney cell line, growth characteristics, cytopathic effect, feline panleukopenia virus.

Valkenburgh, B.v., J. Theodor, A. Friscia, A. Pollack, and T. Rowe (2004). **Respiratory turbinates of canids and felids: a quantitative comparison**. *Journal of Zoology* 264(3): 281-293. ISSN: 0952-8369.
**Abstract:** The respiratory turbinates of mammals are complex bony plates within the
nasal chamber that are covered with moist epithelium and provide an extensive surface area for the exchange of heat and water. Given their functional importance, maxilloturbinate size and structure are expected to vary predictably among species adapted to different environments. Here the first quantitative analysis is provided of maxilloturbinate structure based on high-resolution computed tomography (CT) scans of the skulls of eight canid and seven felid species. The key parameters examined were the density of the maxilloturbinate bones within the nasal chamber and how that density varied along the air pathway. In both canids and felids, total maxilloturbinate chamber volume and bone volume increased with body size, with canids having c. 1.5-2.0 times the volume of maxilloturbinate than felids of similar size. In all species, the volume of the maxilloturbinates varies from rostral to caudal, with the peak volume occurring approximately midway, close to where airway cross-sectional area is greatest. Interspecific differences among canids or felids in maxilloturbinate density were not consistent with adaptive explanations, i.e. the densest maxilloturbinates were not associated with species living in arid or cold habitats. Some of the observed variation in maxilloturbinate form might reflect a need for both low- and high-resistance pathways for airflow under alternative conditions. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, animal anatomy, computed tomography, quantitative analysis, respiration, skull, *Alopex lagopus*, coyotes, lions, *Lycaon pictus*, *Lynx rufus*, ocelots, *Vulpes cinereoargenteus*, *Vulpes vulpes*, wolves.

van den Ingh, T.S., P. Zwart, and A. Heldstab (1981). **Veno-occlusive disease (VOD) of the liver in cheetahs and snowleopards**. *Schweizer Archiv Fur Tierheilkunde* 123(6): 323-327. ISSN: 0036-7281.
**Abstract:** In a retrospective study of autopsy material, two cheetahs and three snowleopards showed occlusive lesions of the centrilobular and sublobular hepatic veins. These consisted of a loosely arranged or quite dense collagen and reticulin network. Secondary changes in the surrounding liver parenchyma were congestion, collapse and fibrosis. Because the larger hepatic veins and the posterior caval vein were unaffected, and no changes could be found suggesting central circulatory failure, this resembles veno-occlusive disease of the liver in man. No conclusive evidence for a specific aetiology could be obtained. *Reproduced with permission of CAB.*

**Descriptors:** cheetah, *Acinonyx jubatus*, circulatory disorders, veno occulusive disease, liver diseases, snow leopard, *Uncia uncia*, pathology, centrilobular vein, sublobular hepatic vein, zoo animals.
**Language of Text:** German, French, and Italian.

Van Rensburg, I.B. and M.A. Silkstone (1984). **Concomitant feline infectious peritonitis and toxoplasmosis in a cheetah (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 55(4): 205-207. ISSN: 0038-2809.
**Abstract:** Three wild caught littermate cheetahs succumbed to feline infectious peritonitis (FIP) after being in captivity for approximately 9 weeks. A necropsy and histopathological examination on one revealed typical signs of FIP as well as histopathological lesions in the liver and brain of concomitant toxoplasmosis. Hypochromic anaemia, neutrophilia, lymphopaenia, eosinopaenia and elevations of alpha 2-globulin and gamma-globulin fractions of the blood were present in the one animal examined. These findings together with some clinical signs are reported.
**Descriptors:** cheetah, *Acinonyx jubatus*, feline infectious peritonitis, toxoplasmosis, mixed infections, parasites, pathology.

van Vuuren, M., T. Goosen, and P. Rogers (1999). **Feline herpesvirus infection in a group of semi-captive cheetahs.** *Journal of the South African Veterinary Association* 70(3): 132-134. ISSN: 0038-2809.
**Abstract:** Clinical disease caused by feline herpesvirus type-1 in wild felid species is similar to that in domestic cats. Herpesviruses are endemic in free-ranging lions in South Africa but actual clinical disease due to them has not been reported in free-ranging felids. The first reports of feline herpesvirus infection associated with clinical disease in wild felids came from Australia and the USA in 1970. Subsequent reports of clinical disease in cheetahs and other wild felid species were limited to captive animals. This report deals with clinical disease in a group of semi-captive cheetahs in which 18 animals were affected, and included 12 adult males, 4 adult females and 2 subadults. No mortalities occurred in this group, the most common clinical signs being sneezing, nasal discharge and loss of appetite.
**Descriptors:** cheetahs, semi-captive, *Acinonyx jubatus*, feline herpesvirus, infection, clinical disease, clinical signs, sneezing, nasal discharge, loss of appetite.

Venter, E.H., M. van Vuuren, J. Carstens, M.L. van der Walt, B. Nieuwoudt, H. Steyn, and N.P. Kriek (2003). **A molecular epidemiologic investigation of Salmonella from a meat source to the feces of captive cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 34(1): 76-81. ISSN: 1042-7260.
**Abstract:** Low cheetah (*Acinonyx jubatus*) birth rates were observed for a long time in a captive breeding facility in which Salmonella, which was possibly present in contaminated beef, was isolated from still-born lion (*Panthera leo*) cubs. Salmonella, including 14 isolates of *Salmonella serovar typhimurium* and 19 isolates of *Salmonella serovar muenchen*, was subsequently isolated 47 times from 378 meat samples at the facility during a 13-mo period. Salmonella, including 26 isolates of *S. serovar typhimurium*, 10 of S. serovar muenchen, and 11 other serovars, also was isolated 54 times from 119 fecal samples. Only three plasmid profiles were identified in 59 *S. typhimurium* isolates from both meat and fecal samples. Although random-amplified polymorphic DNA fingerprinting using different primers in the polymerase chain reaction was able to distinguish between *S. typhimurium* and *S. muenchen* and to demonstrate similar chromosomal DNA fingerprints in some of the isolates from meat and feces, the results were not consistent enough to prove that the Salmonella in the feces originated from contaminated meat. However, the predominance of only two serovars in the meat fed to carnivores and in the feces of these animals suggests that the meat was the source of the Salmonella organisms in the feces.
**Descriptors:** captive cheetah, *Acinonyx jubatus*, Salmonella, meat source, contaminated beef, feces, microbiology, stil born lion, microbiology, salmonella isolation and purification, animal transmission, epidemiologic investigation.

Vester, B.M., S.L. Burke, C.L. Dikeman, L.G. Simmons, and K.S. Swanson (2008). **Nutrient digestibility and fecal characteristics are different among captive exotic felids fed a beef-based raw diet**. *Zoo Biology* 27(2): 126-136. ISSN: 0733-3188.
**Abstract:** Nutrient digestibility has not been well characterized in exotic felids. The

objective of this experiment was to evaluate differences in nutrient digestibility and fecal characteristics in five large exotic captive felid species, including bobcats, jaguars, cheetahs, Indochinese tigers, and Siberian tigers. All animals were individually housed and adapted to a beef-based raw diet (Nebraska BrandReg. Special Beef Feline, North Platte, NE) for 16 d. Total fecal collections were conducted from days 17 to 20. Fecal samples were weighed and scored on collection. Diet and fecal samples were evaluated for dry matter, organic matter, protein, fat, and energy to determine total tract digestibility. Fresh fecal samples were collected to determine fecal pH, ammonia, phenol, indole, short-chain fatty acid, and branched-chain fatty acid concentrations. Fecal scores were greater ($P<0.01$) in Indochinese tigers when compared with all other species, and cheetahs had greater ($P<0.01$) fecal scores than jaguars and bobcats. Fat digestibility

was greater (P<0.01) in Siberian tigers, Indochinese tigers, and bobcats (96%) compared with cheetahs and jaguars (94%). Digestible energy was greater (P<0.05) in bobcats and Indochinese tigers at 93.5 and 92.9%, respectively, compared with cheetahs and jaguars, 91.6%. Fecal pH was greater (P<0.01) in bobcats compared with all other species evaluated. Indole concentrations were greater (P<0.05) in cheetahs and jaguars compared with bobcats and Indochinese tigers. Fecal ammonia concentrations were increased (P<0.05) in cheetahs compared with all other species. The beef-based raw diet was highly digestible; however, differences in fat and digestible energy suggest that species should be considered when determining caloric needs of exotic felids. *Reproduced with permission of CAB.*

**Descriptors:** cheetah, *Acinonyx jubatus*, ammonia, beef, branched chain fatty acids, digestibility, digestible energy, dry matter, energy, faeces, fat, indoles, nutritive value, organic matter, pH, phenol, protein, short chain fatty acids, species differences, zoo animals, jaguars, *Lynx rufus*, tigers.

Vester, B.M., S.L. Burke, C.L. Dikeman, L.G. Simmons, and K.S. Swanson (2007). **Nutrient digestibility and fecal characteristics of exotic felids fed a beef-based raw diet**. *Poultry Science* 86(Suppl. 1): 196. ISSN: 0032-5791.

**Descriptors:** exoltic felids, beef based raw diet, nutritient digestibility, digestive system, fecal characteristics, ingestion, assimilation, nutrient content, bobcats, meeting information.

**Notes:** Joint Annual Meeting of the American Dairy Science Association;Poultry Science Association; Asociacion Mexicana de Produccion Animal; and American Society of Animal Science, San Antonio, TX, USA; July 08 -12, 2007.

Volodina, E.V. and I. Volodin (2000). **Bioacoustic features of self-esteem in the cheetah**. *Advances in Ethology*(35): 60. ISSN: 0931-4202.

**Descriptors:** cheetah, *Acinonyx jubatus*, self esteem, bioacoustic features, behavior, communication, captive, courtship, vocal performance, vocalization, Moscow zoo, meeting abstract.

**Notes:** 3rd International Symposium on Physiology and Ethology of Wild and Zoo Animals, Berlin, Germany; October 04-07, 2000.

Wack, R. (2000). **Infectious diseases of captive cheetahs.** *Proceedings of the North American Veterinary Conference* 14(14): 1054-1055. ISSN: 0003-1488.

**NAL Call Number:** SF605.N672

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, infectious diseases, meeting information, conference proceedings.

**Notes:** Meeting held on January 15-19, 2000, Orlando, Florida.

Wack, R. (2000). **Management and preventive medicine for captive cheetahs.** *Proceedings of the North American Veterinary Conference* 14(14): 1051-1053. ISSN: 0003-1488.

**NAL Call Number:** SF605.N672

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, animal husbandry, management, preventive medicine, conference proceedings.

**Notes:** Meeting held on January 15-19, 2000, Orlando, Florida.

Wack, R.F. (1999). **Gastritis in cheetahs**. In: M.E. Fowler and R.E. Miller (Editors), *Zoo and Wild Animal Medicine: Current Therapy 4,* 4th edition, Philadelphia, USA: W.B. Saunders., p. 458-460. ISBN: 0721686648.

**Descriptors:** cheetah, *Acinonyx jubatus*, clinical aspects, diagnosis, gastritis, stomach diseases, treatment, zoo animals, book chapter.

Wack, R.F., K.A. Eaton, and L.W. Kramer (1997). **Treatment of gastritis in cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(3): 260-6. ISSN: 1042-7260.

**Abstract:** Three cheetahs (*Acinonyx jubatus*) had a clinical history of chronic spiral bacteria-associated gastritis and three cheetahs had no clinical history of gastritis. Gastric biopsies were obtained from all six cheetahs prior to treatment for gastritis and 3 wk and 1 yr posttreatment. The cheetahs were treated with tetracycline hydrochloride 500 mg p.o. q.i.d., metronidazole 250 mg p.o. q.i.d., and bismuth subsalicylate 300 mg p.o. q.i.d. Each drug was administered concurrently for 7 days. Following this treatment, each cheetah was maintained on 300 mg bismuth subsalicylate p.o. s.i.d. for 1 yr. The three cheetahs with a history of gastritis were culture positive for *Helicobacter acinonyx* and remained positive during the entire study. The three cheetahs with no clinical history of gastritis were culture negative for *H. acinonyx*, but gastric biopsies revealed *Gastrospirillum*-like bacteria (tentatively named *Helicobacter heilmannii*) pretreatment. Gastric biopsies were negative for *H. heilmannii* on subsequent examinations. Although the treatment did not eradicate *H. acinonyx,* it did provide symptomatic relief from the vomiting, anorexia, and weight loss associated with clinical gastritis. The use of endoscopically guided gastric mucosal biopsies for urease testing and histopathologic examination of Warthin-Starry-stained sections is a sensitive and specific method of diagnosing spiral bacteria-associated gastritis. Treatment of spiral bacteria-associated gastritis in cheetahs should include the rational use of antibiotics (tetracycline or amoxicillin and metronidazole), bismuth compounds, and omeprazole and evaluation of

husbandry methods to reduce stress.
**Descriptors:** cheetah, *Acinonyx jubatus*, gastritis, treatment, spiral bacteria, *Heliobacter*, gastric biopsies, tetracycline hydrochloride, metronidazole, bismuth subsalicylate, gastric mucosal biopsies, urease testing, histopathologic examination, husbandry methods, stress.

Wack, R.F., L.W. Kramer, and W. Cupps (1992). **Griseofulvin toxicity in four cheetahs (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 23(4): 442-446. ISSN: 1042-7260.
**Abstract:** A case of suspected griseofulvin toxicity is reported in an adult lactating cheetah and her 3 cubs. The adult dam received 23 mg/kg oral griseofulvin twice daily and the cubs 48-73 mg/kg, for a skin infection with *Microsporum canis*. The adult female died 11 d after griseofulvin treatment was started. After 4 d of treatment, all 3 cubs showed signs of severe bone marrow suppression, but recovered after prolonged nursing care. The *M. canis* infection was successfully treated with oral ketoconazole for 60 d and weekly lime-sulfur immersion dips for 6 wk. *Reproduced with permission of CAB.*
**Descriptors:** cheetahs, *Acinonyx jubatus*, cubs, lactating female, Antifungal agents, griseofulvin, case reports, severe bone marrow suppression, ketoconazole, poisoning, therapy, toxicity, zoo animals, Felidae, *Microsporum canis*.

Wack, R.F., L.W. Kramer, W.L. Cupps, S. Clawson, and D.R. Hustead (1993). **The response of cheetahs (*Acinonyx jubatus*) to routine vaccination**. *Journal of Zoo and Wildlife Medicine* 24(2): 109-117. ISSN: 1042-7260.
**Abstract:** Seven cheetah cubs (*Acinonyx jubatus*) were inoculated with 1 ml of a killed feline rhinotracheitis/calicivirus/panleukopenia virus vaccine (Fel-O-Vax PCT, Fort Dodge Laboratories, Fort Dodge, Iowa, USA) every 2 wk from 8 to 16 wk of age. Four cubs were vaccinated every 4 wk from 8 to 16 wk of age. Blood samples were drawn at 8, 10, 12, 14, 16, 20, 28, 40, 52 and 64 wk. Serum neutralization titres were determined for feline herpesvirus, calicivirus, and panleukopenia virus. Six adult cheetahs were vaccinated, and blood was sampled at 0, 3, 6, 9, and 12 months after vaccination. Cubs should be vaccinated every 2 wk from 8 to 16 wk of age, receive a booster at 28 wk of age, and begin annual vaccination at 52 wk of age. Adult cheetahs at high risk should be vaccinated twice yearly. *Reproduced with permission of CAB.*
**Descriptors:** cheetahs, *Acinonyx jubatus*, vaccination, immunization, response, viral diseases, felid herpesviruses, Felidae, feline calicivirus, feline panleukopenia virus, routine vaccination.

Walzer, C. (1994). **"Myelolipome" - in der Milz des Gepards (*Acinonyx jubatus*). [Nodular lipomatosis (myelolipomas) in the spleen of cheetahs. of dissertation [Nodulare Lipomatose].** *Wiener Tierarztliche Monatsschrift* 81(1): 24. ISSN: 0043-535X.
**Descriptors:** cheetah, *Acinonyx jubatus*, nodular lipomatosis, myelipomas, neoplasms, spleen, zoo animals, felidae.
**Language of Text:** German.

Walzer, C., K. Hittmair, and C. Walzer Wagner (1996). **Ultrasonographic identification and characterization of splenic nodular lipomatosis or myelolipomas in cheetahs (*Acinonyx jubatus*)**. *Veterinary Radiology and Ultrasound* 37(4): 289-292. ISSN: 1058-8183.
**NAL Call Number:** SF757.8.A4
**Abstract:** 44 live cheetahs were examined ultrasonographically between 1989 and 1994; 17 originated from 4 European zoos and 27 were examined in 3 facilities in Namibia. Examination of the cheetahs included a clinical examination, abdominal ultrasound, and complete blood chemistry. Splenic myelolipomas were diagnosed ultrasonographically in 11 cheetahs. In 7 cheetahs the diagnosis was confirmed PM. Nine of the 14 cheetahs in Europe had myelolipomas in the spleen, while in the African cheetahs there were only 2 with myelolipomas. Histologically these lesions were characterized by fatty nodules. A more fitting term of nodular lipomatosis of the spleen is suggested. All cheetahs with nodular lipomatosis of the spleen had concurrent chronic diseases. An indicator function of splenic nodular lipomatosis for chronic disease and/or stress is possible. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, splenic nodular lipomatosis, myelolipomas, ultrasonic identification, characterization, spleen, blood chemistry, abdominal ultrasound, clinical examination, disease, chronic stress.

Walzer, C. and C. Huber (2002). **Partial antagonism of tiletamine-zolazepam anesthesia in cheetah.** *Journal of Wildlife Diseases* 38(2): 468-72. ISSN: 0090-3558.
**Abstract:** This study evaluated partial antagonism of tiletamine-zolazepam (TZ) anesthesia in cheetahs (*Acinonyx jubatus*) and differences between two benzodiazepine antagonists, flumazenil and sarmazenil, in this species. Four cheetahs were anesthetized three times at an interval of 14 days with an average intramuscular dose of 4.2 mg/kg TZ. In trials 2 and 3 flumazenil at 0.031 mg/kg and sarmazenil at 0.1 mg/kg, respectively, were applied intramuscularly 30 min after initial TZ injection. There was a highly significant difference between the duration of TZ anesthesia with and without antagonist. Use of the antagonists significantly shortened duration and recovery and eliminated excitatory behavior during the recovery phase. No significant differences could

be determined between the two antagonists. We recommend the use of sarmazenil and flumazenil to antagonize TZ anesthesia in cheetahs.
**Descriptors:** cheetah, *Acinonyx jubatus*, anesthetics, antagonism, tiletamine, zolazepam, differences, flumazenil, sarmazenil, benzodiazepine antagonists, dose, intramuscular, shortened duration and recovery, excitatory behavior eliminated, combined administration, anti-anxiety agents administration, dosages.

Walzer, C. and A. Kubber Heiss (1995). **Progressive hind limb paralysis in adult cheetahs (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 26(3): 430-435. ISSN: 1042-7260.
**Abstract:** Five adult cheetahs from an Austrian zoo demonstrated identical clinical symptoms within a period of 2 years; progressive hind limb ataxia, loss of proprioception, and eventual recumbency. The progress of the disease could not be influenced by drug therapy. Haematological, blood chemistry, and cerebrospinal fluid values were within normal ranges. Plain radiographs and contrast myelography were unremarkable. Following euthanasia, histological examinations revealed a massive demyelination of the spinal cord in all 5 cheetahs. The lesions were most predominant in the medullary white matter from T6 to L3. The specific cause of this degenerative myelopathy could not be identified. Similar syndromes have been seen in other species. Various possible causes, such as vitamin B< sub>12</ sub> or copper deficiency or organophosphate poisoning, and a possible genetic basis for this disorder are discussed. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, progressive hind limb paralysis, diseases, ataxia, paralysis, pathology, spinal cord, massive demyelination, possible causes.

Walzer, C., A. Kubber Heiss, and B. Bauder (2003). **Spontaneous uterine fibroleiomyoma in a captive cheetah.** *Journal of Veterinary Medicine. A, Physiology, Pathology, Clinical Medicine* 50(7): 363-5. ISSN: 0931-184X.
**Abstract:** Information on uterine neoplasia in felids and more so in non-domestic felids is sparse. In non-domestic felids, this may be due to the small sample size. A uterine fibroleiomyoma is described in a 17-year-old captive cheetah. The multicentric nodular tumour masses were situated in the myometrium, were well demarcated, non-encapsulated and did not show infiltrative growth. Between the neoplastic cells, numerous of varying width, and irregularly braided bundles and whorls of collagen and reticular fibres were demonstrated. Immunohistochemical examinations revealed positive reactions for both desmin, the marker for smooth and skeletal muscle cells, and vimentin, the marker for fibrocyte-derived cells.
**Descriptors:** cheetah, *Acinonyx jubatus*, spontaneous uterine fibroleiomyoma, uterine neoplasms, differntial diagnosis, immunohistochemistry, pathology, ultrasonography, case study.

Walzer, C., A. Kubber Heiss, and N. Robert (2002). **A simple field method for spinal cord removal demonstrated in the cheetah (*Acinonyx jubatus*).** *Journal of Veterinary Diagnostic Investigation* 14(1): 76-79. ISSN: 1040-6387.
**Abstract:** Removal of the spinal cord is considered time consuming and difficult. A delay in the necropsy procedure, especially in the central nervous system, can result in significant tissue autolysis and subsequent diagnostic difficulties. In the field, where many necropsies are performed, suitable electric saws are mostly unavailable. A technically simple and rapid method for spinal cord removal, requiring only a straightforward tool, has been devised. No necropsy-induced structural damage has been noted on histopathologic examination.
**Descriptors:** cheetah, *Acinonyx jubatus*, surgery, autopsy methods, spinal cord removal, simple method.

Walzer, C., A. Url, N. Robert, A. Kubber Heiss, N. Nowotny, and P. Schmidt (2003). **Idiopathic acute onset myelopathy in cheetah (*Acinonyx jubatus*) cubs.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 34(1): 36-46. ISSN: 1042-7260.
**Abstract:** Numerous cases of ataxia, hind limb paresis, and paralysis have occurred in cheetah (*Acinonyx jubatus*) cubs over the past 10 yr within the European Endangered Species Program population, including 12 in mainland Europe, two in the British Isles, one in Namibia, and one in Dubai. The condition is the most important medical factor limiting European cheetah population growth. Eight cubs at the Salzburg Zoo, Austria, were affected. They demonstrated upper motor neuron lesions when alive and bilateral, symmetrical myelin degeneration of the spinal cord on necropsy. Ballooning of myelin sheaths surrounded mostly preserved axons, and no spheroids, characteristic of acute axonal degeneration, were found. Myelin loss markedly exceeded axonal degeneration. The syndrome's etiology is unclear, although viral, bacterial, parasitic, genetic, nutritional-metabolic, toxic, and physical causes have been considered.
**Descriptors:** cheetah *Acinonyx jubatus*, ataxia, spinal cord diseases, acute disease, myelin loss, myelopathy, Idiopathic, acute onset, hind limb paralysis, eye diseases complications, neurologic examination, nose diseases complications, spinal cord pathology, ultrastructure, spinal cord diseases, diagnosis, therapy, Austria.

Weber, W.J., B.L. Raphael, and H.W.J. Boothe (1984). **Struvite uroliths in a cheetah.** *Journal of*

*the American Veterinary Medical Association* 185(11): 1389-90. ISSN: 0003-1488.
**Descriptors:** cheetah, *Acinonyx jubatus*, surgery, struvite uroliths, surgery, kidney calculi, ureteral calculi, zoo animals, cats, dogs, hemostatics, diagnosis, therapy, diagnosis.

Weissengruber, G.E., G. Forstenpointner, G. Peters, A. Kubber Heiss, and W.T. Fitch (2002). **Hyoid apparatus and pharynx in the lion (*Panthera leo*), jaguar (*Panthera onca*), tiger (*Panthera tigris*), cheetah (*Acinonyx jubatus*) and domestic cat (*Felis silvestris f. catus*).** *Journal of Anatomy* 201(3): 195-209. ISSN: 0021-8782.
**Abstract:** Structures of the hyoid apparatus, the pharynx and their topographical positions in the lion, tiger, jaguar, cheetah and domestic cat were described in order to determine morphological differences between species or subfamilies of the Felidae. In the lion, tiger and jaguar (species of the subfamily Pantherinae) the Epihyoideum is an elastic ligament lying between the lateral pharyngeal muscles and the Musculus (M.) thyroglossus rather than a bony element like in the cheetah or the domestic cat. The M. thyroglossus was only present in the species of the Pantherinae studied. In the lion and the jaguar the Thyrohyoideum and the thyroid cartilage are connected by an elastic ligament, whereas in the tiger there is a synovial articulation. In adult individuals of the lion, tiger and jaguar the ventral end of the tympanohyal cartilage is rotated and therefore the ventral end of the attached Stylohyoideum lies caudal to the Tympanohyoideum and the cranial base. In newborn jaguars the Apparatus hyoideus shows a similar topographical position as in adult cheetahs or domestic cats. In adult Pantherinae, the Basihyoideum and the attached larynx occupy a descended position: they are situated near the cranial thoracic aperture, the pharyngeal wall and the soft palate are caudally elongated accordingly. In the Pantherinae examined the caudal end of the soft palate lies dorsal to the glottis. Differences in these morphological features between the subfamilies of the Felidae have an influence on specific structural characters of their vocalizations.
**Descriptors:** cheetah, *Acinonyx jubatus*, lion, *Panthera leo*, jaguar, *Panthera onca*, tiger, *Panthera tigris*, domestic cat, *Felis silvestris f. catus*, anatomy, histology, hyoid apparatus, pharynx, anatomy, histology, hyoid bone growth, development, pharyngeal muscles anatomy, histology, pharyngeal muscles growth, development, pharynx, growth, development.

Wells, A., K.A. Terio, M.H. Ziccardi, and L. Munson (2004). **The stress response to environmental change in captive cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 35(1): 8-14. ISSN: 1042-7260.
**Abstract:** The captive North American cheetah (*Acinonyx jubatus*) population is not self-sustaining because of high prevalences of unusual diseases and poor reproductive success. Cheetahs are commonly moved between zoos for breeding purposes to maintain genetic diversity within the captive population, and movement may exacerbate infertility and disease. Fecal corticoids were analyzed by radioimmunoassay to measure the stress response of cheetahs to movement between facilities. Fecal samples were collected from 15 cheetahs for 14 days before movement and for at least 30 days after movement. For each cheetah, premovement fecal corticoid concentrations were used to determine baseline and then compared with trends in postmovement concentrations. In general, postmovement corticoid concentrations either increased (n = 8), did not change (n = 2), or decreased (n = 5). Although individual animal differences occurred, corticoid concentrations increased for most animals moved on-exhibit and decreased in animals moved off-exhibit. Animals moving on-exhibit had an 18-times greater risk of having corticoids elevated more than two standard deviations above baseline for 30 days after movement compared with animals that moved off-exhibit. In addition, greater day-to-day variation in corticoids occurred in animals moved on-exhibit. In general, animals with initially low baseline corticoid concentrations had a greater postmovement corticoid response than cheetahs with initially high baseline levels. These results indicate that some cheetahs have a prolonged stress response when moved between facilities, and the magnitude and character of this response is influenced by the exhibit environment.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, stress response, environmental and location change, physiology, adrenal cortex hormones analysis, feces chemistry, transportation, radioimmunoassay, stress metabolism.

Wielebnowski, N. (1996). **Reassessing the relationship between juvenile mortality and genetic monomorphism in captive cheetahs.** *Zoo Biology* 15(4): 353-369. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetahs, *Acinonyx jubatus*, zoo animals, mortality, litter size, homozygosity, animal breeding, endangered species, reproductive performance, juvenile animals, captive breeding.

Wielebnowski, N. and J.L. Brown (1998). **Behavioral correlates of physiological estrus in cheetahs.** *Zoo Biology* 17(3): 193-209. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetahs, *Acinonyx jubatus*, estrus, animal behavior, monitoring, feces, estradiol, metabolites, estrus, age, individual characteristics, behavior change, feces

composition.

Wielebnowski, N.C. (1999). **Behavioral differences as predictors of breeding status in captive cheetahs**. *Zoo Biology* 18(4): 335-349. ISSN: 0733-3188.
**Descriptors:** cheetahs, *Acinonyx jubatus*, captive born, behavioral differences, predictors, breeding status, behavioral variation, husbandry regimens, breeding problems.

Wielebnowski, N.C., K. Ziegler, D.E. Wildt, J. Lukas, and J.L. Brown (2002). **Impact of social management on reproductive, adrenal and behavioural activity in the cheetah (*Acinonyx jubatus*).** *Animal Conservation* 5(4): 291-301. ISSN: 1367-9430.
**Descriptors:** cheetah, *Acinonyx jubatus*, social management, impact, reproductive activity, adrenal activity, behavioral activity, husbandry regimen, social behavior, non-invasive hormone monitoring.

Wildt, D.E., J.L. Brown, M. Bush, M.A. Barone, K.A. Cooper, J. Grisham, and J.G. Howard (1993). **Reproductive status of cheetahs (*Acinonyx jubatus*) in North American zoos: the benefits of physiological surveys for strategic planning.** *Zoo Biology* 12(1): 45-80. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetahs, *Acinonyx jubatus*, zoos, reproductive efficiency, spermatozoa, ovaries, hormones, zoo animals, Graafian follicles, animal breeding, breeding programs, semen characters, reproductive performance, North America.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Wildt, D.E., M. Bush, J.G. Howard, S.J. O'Brien, D. Meltzer, A. Van Dyk, H. Ebedes, and D.J. Brand (1983). **Unique seminal quality in the South African cheetah and a comparative evaluation in the domestic cat.** *Biology of Reproduction* 29(4): 1019-25. ISSN: (p) 0006-3363; online: 1529-7268.
**Abstract:** Analysis of 40 semen samples collected by electroejaculation from 18 cheetahs revealed no major differences in seminal traits among Transvaal, South West (Namibia) or hybrid (Transvaal X South West) males. However, mean spermatozoal concentration (14.5 X 10(6) spermatozoa/ml of ejaculate) and percent motility (54.0%) were less in cheetahs than in domestic cats (147.0 X 10(6) spermatozoa/ml of ejaculate, 77.0% motility) subjected to the same electroejaculation regimen. On the average, cheetah ejaculates contained 71.0% morphologically abnormal spermatozoa compared to 29.1% aberrant spermatozoal forms in the domestic cat. These results indicate that seminal characteristics in the cheetah are markedly inferior compared to the domestic cat, particularly with respect to the incidence of pleiomorphic spermatozoa. Because a recent parallel study demonstrates that the cheetah lacks genetic variation, it appears likely that spermatozoal abnormalities are a genetic consequence of genomic homozygosity characteristic of this endangered species.
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, histology, carnivora anatomy, histology, cats anatomy, histology, semen cytology, spermatozoa cytology, species specificity, sperm motility, spermatozoa abnormalities, South Africa.

Wildt, D.E., P.K. Chakraborty, D. Meltzer, and M. Bush (1984). **Pituitary and gonadal response to LH releasing hormone administration in the female and male cheetah.** *Journal of Endocrinology, The* 101(1): 51-6. ISSN: 0022-0795.
**Abstract:** Luteinizing hormone releasing hormone (LHRH, 50 micrograms) or saline was administered (i.m.) to adult female and male cheetahs under anaesthesia to evaluate pituitary and gonadal response. Serum LH levels did not fluctuate over a 120-min sampling period in saline-treated animals. Serum LH concentrations were raised (P less than 0.05) in both female and male cheetahs after LHRH injection, the temporal response being similar to previously reported results in unanaesthetized, domestic carnivores. The magnitude of the LHRH-induced LH response was sex-dependent. Over a 120-min post-injection period both saline control and LHRH-induced LH levels were about twofold greater in males than females. Although LHRH had no acute influence on ovarian oestradiol-17 beta production in the female, serum testosterone levels were raised (P less than 0.05) in male cheetahs by 60 min after treatment. This study (1) provides introductory endocrine information on the cheetah, an endangered species, and (2) indicates that exogenous LHRH is effective in acutely altering pituitary (female) and pituitary/gonadal (male) function in an anaesthetized, non-domestic felid.
**Descriptors:** cheetah, *Acinonyx jubatus*, blood, gonadotropin releasing hormone, pharmacology, ovary drug effects, pituitary gland drug effects, testis drug effects, general anesthesia, estradiol blood, luteinizing hormone blood, radioimmunoassay, testosterone blood.

Wildt, D.E., D. Meltzer, P.K. Chakraborty, and M. Bush (1984). **Adrenal-testicular-pituitary relationships in the cheetah subjected to anesthesia / electroejaculation.** *Biology of Reproduction* 30(3): 665-72. ISSN: (p) 0006-3363; online: 1529-7268.
**Abstract:** The influence of electroejaculation on the acute response in serum cortisol, testosterone and luteinizing hormone (LH) was studied in the South African cheetah . Males were either anesthetized with CT-1341 and 1) serially bled only (controls, n = 7) or 2) serially bled during and following a regimented protocol of rectal probe electroejaculation (n = 14). In the control cheetahs , mean cortisol concentrations

declined over time (P less than 0.05) and neither testosterone nor LH varied over the 145-min sampling interval. Serum cortisol rose immediately in electroejaculated cheetahs , peaked at the end of electroejaculation in 13 of 14 males and then declined during the next 90 min. Temporal profiles and serum levels of testosterone and LH were similar in the electroejaculated and control groups (P greater than 0.05). Within individual cheetahs , serum levels of LH and testosterone were highly correlated (r = 0.77, P less than 0.01). Awake (n = 2) and CT-1341 anesthetized (n = 2) cheetahs also were bled and then challenged with an i.m. injection of 25 IU adrenocorticotropic hormone (ACTH, Cortrosyn). Serial blood samples were collected during the next 2 h and assayed. Cortisol concentrations prior to ACTH administration were greater in awake than in anesthetized males. In all animals, cortisol rose immediately and peaked within 30-60 min of injection. Whereas all 4 ACTH-treated cheetahs produced cortisol titers in excess of 200 ng/ml, only 4 of 14 electroejaculated males produced cortisol levels comparable to this concentration range. Neither testosterone nor LH profiles were affected by ACTH-induced elevations in cortisol.(ABSTRACT TRUNCATED AT 250 WORDS)

**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, adrenal cortex physiology, ejaculation, drug effects, pituitary gland, anterior physiology, testis physiology, adrenocorticotropic hormone administration, dosage, electric stimulation, hydrocortisone blood, luteinizing hormone blood, radioimmunoassay, testosterone blood.

Wildt, D.E., S.J. O'Brien, J.G. Howard, T.M. Caro, M.E. Roelke, J.L. Brown, and M. Bush (1987). **Similarity in ejaculate-endocrine characteristics in captive versus free-ranging cheetahs of two subspecies.** *Biology of Reproduction* 36(2): 351-60. ISSN: (p) 0006-3363; online: 1529-7268.

**Abstract:** Ejaculate-endocrine characteristics were measured in 23 captive cheetahs (*Acinonyx jubatus jubatus*) in North American zoos and in 8 free-ranging cheetahs (A.j. raineyi) in eastern Africa (Tanzania). A standardized electroejaculation protocol was used, and numbers of motile spermatozoa were similar (p greater than 0.05) between groups. Of the spermatozoa collected by electroejaculation, 70.6 +/- 3.3% and 75.9 +/- 4.4% were morphologically abnormal in the captive "North American" and in the free-ranging, eastern African populations, respectively. Adrenal activity, as measured by an acute, temporal rise and fall in serum cortisol levels during and after electroejaculation, was no different (p greater than 0.05) between groups. Although serum luteinizing hormone (LH) levels were less (p less than 0.05) in the free-ranging than in the captive animals, serum testosterone concentrations were similar. The data indicate that the comparatively poor reproductive performance of cheetahs maintained in zoological parks is not attributable to a captivity-induced response afflicting the male. Furthermore, there is no evidence that ejaculate/endocrine characteristics differ between the two subspecies. Because adrenal/gonadal activity and the number of pleiomorphic spermatozoa are similar between the test groups, the results suggest that spermatozoal diversity originates as a result of the extreme genetic monomorphism observed universally in the species.

**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, ejaculation, endocrine glands physiology, *Acinonyx* genetics, luteinizing hormone blood, reproduction, species specificity, testosterone blood, variation genetics.

Wildt, D.E., L.G. Phillips, L.G. Simmons, P.K. Chakraborty, J.L. Brown, J.G. Howard, A. Teare, and M. Bush (1988). **A comparative analysis of ejaculate and hormonal characteristics of the captive male cheetah, tiger, leopard, and puma.** *Biology of Reproduction* 38(2): 245-255. ISSN: (p) 0006-3363; online: 1529-7268.

**Abstract:** ale cheetahs, tigers, leopards, and pumas maintained under the same conditions were anesthetized and 1) serially bled before, during, and after electroejaculation (EE); 2) serially bled only (AO); or 3) serially bled before and after receiving adrenocorticotropin hormone (ACTH). Ejaculates from leopards contained higher (p less than 0.05) sperm concentrations than cheetahs and pumas but lower (p less than 0.05) sperm motility ratings than all other species. Tigers produced a larger seminal volume and the greatest number of motile sperm/ejaculate (p less than 0.05). The percentage of morphologically abnormal spermatozoa was greater (p less than 0.05) in cheetahs (64.6%), leopards (79.5%), and pumas (73.5%) than in tigers (37.5%). The most prevalent spermatozoal deformities included a tightly coiled or bent flagellum, a deranged midpiece, or a residual cytoplasmic droplet. Mean baseline serum cortisol concentrations in leopards were 2- and 4-fold greater (p less than 0.05) than in tigers and cheetahs, respectively. Basal cortisol concentrations in pumas were similar to those of tigers, but irrespective of treatment increased 2-fold (p less than 0.01) during the bleeding period. An acute rise and fall in cortisol attributable to EE was observed only in cheetahs. In tigers and leopards, mean peak cortisol concentrations after ACTH were similar to maximal values observed after EE. However, peak cortisol levels in cheetahs and pumas after ACTH were greater (p less than 0.01) than the concentrations measured after EE, indicating that these manipulatory procedures were not eliciting a maximal adrenal response. In the EE groups, luteinizing hormone (LH) and testosterone levels in cheetahs were lower (p less than 0.05) than in other species, whereas levels of both hormones were comparable (p greater than 0.05) in tigers, leopards, and pumas. Elevated cortisol levels in cheetahs and pumas had no discernible effect on LH/testosterone patterns; however, the results were equivocal in tigers, and, among leopards, testosterone concentrations consistently declined over time. In this study, using

a standardized approach, we identify different ejaculate and endocrine characteristics of captive cheetahs, tigers, leopards, and pumas. The data extend earlier observations and demonstrate that some, but not all, Felidae species ejaculate high numbers of pleiomorphic spermatozoa. However, inter-species differences in sperm integrity do not appear related to inter-species variations in cortisol, LH, or testosterone. The observation of continuously declining testosterone concentrations only in leopards after AO, EE, or ACTH treatment suggests that rising and/or elevated cortisol appears to exert a species-specific influence on reproductive hormone activity.
**Descriptors:** cheetah, *Acinonyx jubatus*, tigers, leopards, pumas, ejaculate, comparative analysis, hormonal characteristics, captive, anesthetized, testosterone concentrations.

Wildt, D.E., C.C. Platz, S.W. Seager, and M. Bush (1981). **Induction of ovarian activity in the cheetah (*Acinonyx jubatus*).** *Biology of Reproduction* 24(1): 217-22. ISSN: (p) 0006-3363; online: 1529-7268.
**Descriptors:** cheetah, *Acinonyx jubatus*, ovarian activity, induction, physiology, follicle stimulating hormone, ovary physiology, chorionic gonadotropin pharmacology, corpus luteum physiology, ovary drug effects.

Wildt, D.E. and T.L. Roth (1997). **Assisted reproduction for managing and conserving threatened felids**. *International Zoo Yearbook* 35(0): 164-172. ISSN: 0074-9664.
**Abstract:** I
**Descriptors:** threatened felids, conserving, managing, assisted reproduction, artificial insenination, invitro fertilization, embryo transfer, cryopreservation, overview.

Williams, B.G., N.K. Waran, J. Carruther, and R.J. Young (1996). **The effect of a moving bait on the behaviour of captive cheetahs (*Acinonyx jubatus*).** *Animal Welfare* 5(3): 271-281. ISSN: 0962-7286.
**NAL Call Number:** HV4701.A557
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, zoo animals, animal behavior, moving bait, effect, behavior, environmental enrichment, behavior patterns, hunting behavior, enrichment device.

Williams, T.M., G.P. Dobson, O. Mathieu Costello, D. Morsbach, M.B. Worley, and J.A. Phillips (1997). **Skeletal muscle histology and biochemistry of an elite sprinter, the African cheetah.** *Journal of Comparative Physiology. B, Biochemical, Systemic, and Environmental Physiology* 167(8): 527-35. ISSN: (p) 0174-1578; online; 1432-136X.
**Abstract:** To establish a skeletal muscle profile for elite sprinters, we obtained muscle biopsy samples from the vastus lateralis, gastrocnemius and soleus of African cheetahs (*Acinonyx jubatus*). Muscle ultrastructure was characterized by the fiber type composition and mitochondrial volume density of each sample. Maximum enzyme activity, myoglobin content and mixed fiber metabolite content were used to assess the major biochemical pathways. The results demonstrate a preponderance of fast-twitch fibers in the locomotor muscles of cheetahs; 83% of the total number of fibers examined in the vastus lateralis and nearly 61% of the gastrocnemius were comprised of fast-twitch fibers. The total mitochondrial volume density of the limb muscles ranged from 2.0 to 3.9% for two wild cheetahs. Enzyme activities reflected the sprinting capability of the cheetah. Maximum activities for pyruvate kinase and lactate dehydrogenase in the vastus lateralis were 1519.00 +/- 203.60 and 1929.25 +/- 482.35 mumol min-1.g wet wt-1, respectively, and indicated a high capacity for glycolysis. This study demonstrates that the locomotor muscles of cheetahs are poised for anaerobically based exercise. Fiber type composition, mitochondrial content and glycolytic enzyme capacities in the locomotor muscles of these sprinting cats are at the extreme range of values for other sprinters bred or trained for this activity including greyhounds, thoroughbred horses and elite human athletes.
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, histology, metabolism, skeletal muscle cytology, skeletal metabolism, dogs, glycolysis, horses, locomotion, muscle fibers, fast twitch ultrastructure, skeletal ultrastructure, pyruvate kinase metabolism.

Woodroffe, R., L.G. Frank, P.A. Lindsey, S.M.K. ole Ranah, and S. Romaclach (2007). **Livestock husbandry as a tool for carnivore conservation in Africa's community rangelands: a case-control study.** *Biodiversity and Conservation* 16(4): 1245-1260. ISSN: 0960-3115.

**NAL Call Number:** QH75.A1 B562
**Abstract:** Conflict between people and wildlife is a major issue in both wildlife conservation and rural development. In African rangelands, species such as African wild dogs (*Lycaon pictus*), cheetahs (*Acinonyx jubatus*), lions (*Panthera leo*), leopards (*Panthera pardus*), and spotted hyaenas (*Crocuta crocuta*) may kill livestock and are therefore themselves killed by local pastoralists. Such conflict has led to the extirpation of these species from many areas, and also impacts the livelihoods of local livestock farmers. To investigate the possibilities for coexistence of people, livestock, and large predators in community rangelands, we measured the effectiveness of traditional livestock husbandry in reducing depredation by wild carnivores, using a case-control approach. Different measures were effective against different predator species but, overall, the risk of predator attack by day was lowest for small herds, accompanied by herd dogs as well as human herders, grazing in open habitat. By night, the risk of attack

was lowest for herds held in enclosures ('bomas') with dense walls, pierced by few gates, where both men and domestic dogs were present. Unexpectedly, the presence of scarecrows increased the risks of attack on bomas. Our findings suggest that improvements to livestock husbandry can contribute to the conservation and recovery of large carnivores in community rangelands, although other measures such as prey conservation and control of domestic dog diseases are also likely to be necessary for some species.

**Descriptors:** *Lycaon pictus*, *Acinonyx jubatus*, predator control, African lion, carnivore-conservation, Community conservation, human wildlife conflict, livestock depredation, livestock husbandry, vertebrate pest-management.

Young, K.M., S.L. Walker, C. Lanthier, W.T. Waddell, S.L. Monfort, and J.L. Brown (2004). **Noninvasive monitoring of adrenocortical activity in carnivores by fecal glucocorticoid analyses**. *General and Comparative Endocrinology* 137(2): 148-165. ISSN: 0016-6480.

**Abstract:** Measurement of glucocorticoid metabolites in faeces has become an accepted method for the noninvasive evaluation of adrenocortical activity. The objective of this study was to determine if a simple cortisol enzyme immunoassay (EIA) was suitable for monitoring adrenocortical activity in a variety of carnivore species. Performance of the cortisol EIA was gauged by comparison to a corticosterone radioimmunoassay (RIA) that has been used for measuring glucocorticoid metabolites in faeces of numerous species. Tests for parallelism and extraction efficiency were used to compare the cortisol EIA and corticosterone RIA across eight species of carnivores (Himalayan black bear, sloth bear, domestic cat, cheetah, clouded leopard, black-footed ferret, slender-tailed meerkat, and red wolf). The biological relevance of immunoreactive glucocorticoid metabolites in faeces was established for at least one species of each Carnivora family studied with an adrenocorticotropic hormone (ACTH) challenge. High performance liquid chromatography (HPLC) analysis of faecal extracts for each species revealed (1) the presence of multiple immunoreactive glucocorticoid metabolites in faeces, but (2) the two immunoassays measured different metabolites, and (3) there were differences across species in the number and polarities of metabolites identified between assay systems. ACTH challenge studies revealed increases in faecal metabolite concentrations measured by the cortisol EIA and corticosterone RIA of ~228-1145% and ~231-4150% above pre-treatment baseline, respectively, within 1-2 days of injection. Concentrations of faecal glucocorticoid metabolites measured by the cortisol EIA and corticosterone RIA during longitudinal evaluation (i.e., >50 days) of several species were significantly correlated ($P<0.0025$, correlation coefficient range 0.383-0.975). Adrenocortical responses to physical and psychological stressors during longitudinal evaluations varied with the type of stimulus, between episodes of the same stimulus, and among species. Significant elevations of glucocorticoid metabolites were observed following some potentially stressful situations [anesthesia (2 of 3 subjects), restraint and saline injection (2 of 2 subjects), restraint and blood sampling (2 of 6 episodes), medical treatment (1 of 1 subject)], but not in all cases [e.g., gonadotropin injection (n=4), physical restraint only (n=1), mate introduction/breeding (n=1), social tension (n=1), construction (n=2) or relocation (n=1)]. Results reinforced the importance of an adequate baseline period of faecal sampling and frequent collections to assess adrenocortical status. The corticosterone RIA detected greater adrenocortical responses to exogenous ACTH and stressful exogenous stimuli in the Himalayan black bear, domestic cat (female), cheetah, clouded leopard, slender-tailed meerkat, and red wolf, whereas the cortisol EIA proved superior to resolving adrenocortical responses in the black-footed ferret and domestic cat (male). Overall results suggest the cortisol EIA tested in this study offers a practical method for laboratories restricted in the usage of radioisotopes (e.g., zoological institutions and field facilities) to integrate noninvasive monitoring of adrenocortical activity into studies of carnivore behaviour and physiology. *Reproduced with permission of CAB.*

**Descriptors:** cheetah, *Acinonyx jubatus*, adrenocortical activity, carnivores, noninvasive monitoring, fecal glucocortcoid analyses, accuracy, adrenal cortex, enzyme immunoassay, feces, hydrocortisone, stress, wild animals, *Bradypus variegatus*, Canis, cats, ferrets, Herpestidae, *Neofelis nebulosa*, *Selenarctos thibetanus*.

Zhang, B., Y. Une, X. Fu, J. Yan, F. Ge, J. Yao, J. Sawashita, M. Mori, H. Tomozawa, F. Kametani, and K. Higuchi (2008). **Fecal transmission of AA amyloidosis in the cheetah contributes to high incidence of disease.** *Proceedings of the National Academy of Sciences of the United States of America* 105(20): 7263-7268. ISSN: (p) 0027-8424; (E) 1091-6490.

**Abstract:** AA amyloidosis is one of the principal causes of morbidity and mortality in captive cheetahs (*Acinonyx jubatus*), which are in danger of extinction, but little is known about the underlying mechanisms. Given the transmissible characteristics of AA amyloidosis, transmission between captive cheetahs may be a possible mechanism involved in the high incidence of AA amyloidosis. In this study of animals with AA amyloidosis, we found that cheetah feces contained AA amyloid fibrils that were different from those of the liver with regard to molecular weight and shape and had greater transmissibility. The infectious activity of fecal AA amyloid fibrils was reduced or abolished by the protein denaturants 6 M guanidine.HCl and formic acid or by AA immunodepletion. Thus, we propose that feces are a vehicle of transmission that may accelerate AA

amyloidosis in captive cheetah populations. These results provide a pathogenesis for AA amyloidosis and suggest possible measures for rescuing cheetahs from extinction.
**Descriptors:** cheetah, *Acinonyx jubatus*, AA amyloidosis, fecal transmission, high incidence of disease, transmissibility, infectious activity, amyloid fibrils, pathogenesis.
**Notes:** Comment In: Proc Natl Acad Sci U S A. 2008 May 20;105(20):7113-4.

Zhang, B., Y. Une, F. Ge, X. Fu, J. Qian, P. Zhang, J. Sawashita, K. Higuchi, and M. Mori (2008). **Characterization of the cheetah serum amyloid A1 gene: critical role and functional polymorphism of a cis-acting element.** *Journal of Heredity, The* 99(4): 355-63. ISSN: 0022-1503.
**Abstract:** Amyloid A (AA) amyloidosis is one of the principal causes of morbidity and mortality in captive cheetahs (*Acinonyx jubatus*), which are in danger of extinction. For practical conservation of this species, therefore, it is critical to elucidate the etiology of AA amyloidosis, especially to understand the mechanisms of transcriptional regulation of serum amyloid A (SAA), a precursor protein of the AA protein. In this study, the structure and nucleotide sequence of the cheetah SAA1 gene including the 5'-flanking promoter/enhancer region was determined. Putative nuclear factor kappa-B (NF-kappaB) and CCAAT/enhancer binding protein beta (C/EBPbeta) cis-acting elements, which play key roles in SAA1 transcriptional induction in response to inflammation, were identified in the 5'-flanking region of the cheetah SAA1 gene. Fortuitously, a single nucleotide polymorphism was identified in the captive cheetah cohort in the putative NF-kappaB cis-acting element and had a remarkable effect on SAA1 transcriptional induction. These results provide a foundation not only for clarifying the etiology of AA amyloidosis in the cheetah but also for contriving a strategy for conservation of this species.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, serum amyloid A1 gene, characterization, critical role, functional polymorphism, Amyloid A amyloidosis, morbitity, mortality, etiology, nucleotide polymorphism, conservation.

Zinkl, J.G., S.E. McDonald, A.B. Kier, S.J. Cippa, and P.J. Small (1981). **Cytauxzoon-like organisms in erythrocytes of two cheetahs**. *Journal of the American Veterinary Medical Association* 179(11): 1261-1262. ISSN: 0003-1488.
**Abstract:** Erythrocytic inclusions similar to those in domestic cats with cytauxzoonosis were found in 2 captive-borne *Acinonyx jubatus* in the USA. The inclusions were round, signet-ring shaped, 0.8 to 1.2 mu m in diameter. The density of infected erythrocytes was <1/1000. An attempt to transmit the infection to a domestic cat failed. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, blood cells, erythrocytes, fractures, lameness, parasites, protozoal infections, zoo animals, Cytauxzoon, Felidae, inclusions, signet ring shaped.

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### Cheetah - Anesthesia and Analgesia

Button, C., D.G. Meltzer, and M.S. Mulders (1981). **Saffan induced poikilothermia in cheetah (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 52(3): 237-8. ISSN: 0038-2809.

**Abstract:** The steroidal anaesthetic agent Saffan (a 1,2% m/v mixture of alphaxalone and alphadolone) induced a state of poikilothermia in cheetahs. On a warm day (maximum temperature 29 degrees C) rectal temperatures rose in 7 of 8 male cheetahs given Saffan. The highest rectal temperature recorded was 41 degrees C. On a cool day (minimum temperature 19,5 degrees C) rectal temperature fell in 6 of 6 male cheetahs. The lowest rectal temperatures recorded was 36,2 degrees C. Saffan at 3 mg/kg intravenously in cheetahs is an excellent and safe hypnotic but should be used with caution on both hot and cold days.

**Descriptors:** cheetah, *Acinonyx jubatus*, alfaxalone, alfadolone mixture pharmacology, drug effects on body temperature, Carnivora, hypnotics, sedatives pharmacology, pulse drug effects, respiration drug effects, temperature, Saffan, steroidal anaesthetic, hot days, cold days, cautions.

Deem, S.L., J.C. Ko, and S.B. Citino (1998). **Anesthetic and cardiorespiratory effects of tiletamine zolazepam medetomidine in cheetahs.** *Journal of the American Veterinary Medical Association* 213(7): 1022-6. ISSN: 0003-1488.

**Abstract:** OBJECTIVE: To evaluate anesthetic and cardiorespiratory effects of an intramuscular injection of a tiletamine-zolazepam-medetomidine combination in cheetahs. DESIGN: Prospective study. ANIMALS: 17 adult captive cheetahs. PROCEDURE: The anesthetic combination was administered intramuscularly via a dart. Induction quality, duration of lateral recumbency, duration of recovery, and quality of anesthetic reversal with atipamezole were assessed. Cardiorespiratory variables (arterial blood gas partial pressures, arterial blood pressure, heart and respiratory rates, end-tidal CO2, oxygen saturation, and rectal temperature) were measured during anesthesia. RESULTS: Sedation and lateral recumbency developed within 1.9 +/- 1.0 (mean +/- SD) and 4.3 +/- 2.0 minutes of drug administration, respectively. Clinically acceptable cardiorespiratory and blood gas values were recorded for at least 87 minutes after drug administration in all but 1 cheetah. Hypoxemia and arrhythmias developed in 1 cheetah breathing room air but resolved after treatment with oxygen. Hypertension developed in all cheetahs. Significant differences in heart and respiratory rates, mean arterial blood pressure, arterial pH, partial pressure of oxygen, and hemoglobin saturation were found between cheetahs that did and did not receive oxygen supplementation. After administration of atipamezole, sternal recumbency and mobility returned within 6.9 +/- 5.8 and 47.5 +/- 102.2 minutes, respectively. Postreversal sedation, which lasted approximately 4 hours, developed in 4 cheetahs. CLINICAL IMPLICATIONS: Tiletamine-zolazepam-medetomidine delivered via a dart provided an alternative method for induction and maintenance of anesthesia in cheetahs. Atipamezole at the dose used was effective for reversal of this combination in the initial phase of anesthesia.

**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, anesthesia, anesthetics, administration, dosage, hypnotics and sedatives, administration, dosage, imidazoles administration, dosage, imidazoles pharmacology, tiletamine, administration, dosage,

zolazepam, administration, dosage, acid base equilibrium, drug effects, adrenergic alpha antagonists pharmacology, blood pressure drug effects, body temperature drug effects, heart rate drug effects, medetomidine, oxygen blood, respiration, drug effects.

Huber, C., C. Walzer, and L. Slotta Bachmayr (2001). **Evaluation of long-term sedation in cheetah (*Acinonyx jubatus*) with perphenazine enanthate and zuclopenthixol acetate.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 32(3): 329-35. ISSN: 1042-7260.

**Abstract:** Two long-acting neuroleptics were used to tranquilize nine captive cheetahs (*Acinonyx jubatus*). Perphenazine enanthate (3.0 mg/kg) and zuclopenthixol acetate (0.6 mg/kg) were each administered to separate groups of three cheetahs in a double blind trial. Both products were administered together to a third group of three animals at the same dosages. Behavioral effect, duration of effect, and possible side effects were observed by a predefined protocol. Under standardized holding conditions, the cheetahs were observed 5 days before drug administration and 14 days after administration. Daily activity was defined and statistically evaluated by a U-test. A significant reduction of activity was observed after administration in all three trials. Zuclopenthixol acetate at 0.6 mg/kg alone and in combination with perphenazine enanthate caused inappetence, ataxia, extra pyramidal reactions, akathisia, and prolapse of the third eyelid. Zuclopenthixol acetate should not be used in cheetahs. Perphenazine enanthate did not cause inappetence, reduced appetite, or any of the previously mentioned side effects when used alone. It produced satisfactory tranquilization and is suitable and safe for cheetahs at 3.0 mg/kg. This dosage should be varied depending on health, age, and temperament of the individual cheetah.

**Descriptors:** cheetah, *Acinonyx jubatus*, long term sedation, evaluation, perphenazine enanthate, zuclopenthixol acetate, tranquilizes, neuroleptics, behavioral effects, duration effects, possible side effects.

Klein, L. and J. Stover (1993). **Medetomidine-ketamine-isoflurane anesthesia in captive cheetah (*Acinonyx jubatus*) and antagonism with atipamezol**. In: *Proceedings of the American Association of Zoo Veterinarians,St. Louis, Missouri,* p. 144-145.

**Descriptors:** cheetah, *Acinonyx jubatus*, anesthesia, isoflurane, ketamine, medetomidine, zoo animals, Felidae, antagonism, atipamezol.

Lewandowski, A.H., C.J. Bonar, and S.E. Evans (2002). **Tiletamine-zolazepam, ketamine, and xylazine anesthesia of captive cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 33(4): 332-6. ISSN: 1042-7260.

**Abstract:** Thirty-two anesthetic episodes used a combination of tiletamine-zolezepam (50 mg/ml each), ketamine (80 mg/ml), and xylazine (20 mg/ml) at various dosages for routine diagnostic and minor surgical procedures in 13 captive cheetahs (*Acinonyx jubatus*). The mean dosage (0.023 +/- 0.003 ml/kg) provided rapid induction with a single i.m. injection along with safe predictable working time, good muscle relaxation, and analgesia. Yohimbine administration subsequently accelerated smooth and rapid recovery.

**Descriptors:** cheetah, *Acinonyx jubatus*, anesthesia, anesthetics, tiletamine, zolazepam, ketamine, xylazine, combined, antagonists, inhibitors, adrenergic alpha antagonists pharmacology, body temperature, drug effects, heart rate, ketamine antagonists and inhibitors, respiration drug effects, tiletamine antagonists and inhibitors, time factors, xylazine antagonists and inhibitors, yohimbine pharmacology, zolazepam antagonists and inhibitors.

Pablo, L.S., L. Young, J. Schumacher, J. Bailey, and J.C.H. Ko (1995). **Epidural morphine in a cheetah (*Acinonyx jubatus*) undergoing total hip replacement**. *Journal of Zoo and Wildlife Medicine* 26(3): 436-439. ISSN: 1042-7260.

**Abstract:** To provide intraoperative and postoperative analgesia, morphine (0.1 mg/kg) was administered into the epidural space of a cheetah that required a total hip replacement. The epidural administration was performed 45 minutes before surgery after the cheetah had been anaesthetized with a combination of tiletamine and zolazepam (TelazolReg.) at a dosage of 2.5 mg/kg i.m. and isoflurane in oxygen. The cardiopulmonary status of the cheetah was stable throughout the anaesthetic period except for a short period of systemic hypertension during surgery and mild to moderate hypercapnia. There was no evidence of increased motor activity or excitement attributable to the epidural morphine. The cheetah appeared quiet and showed normal behaviour 3 hours after anaesthesia. Preoperative epidural administration of morphine appears to be a suitable and safe technique for providing analgesia in cheetahs that require hind limb surgery. *Reproduced with permission of CAB.*

**Descriptors:** cheetah, *Acinonyx jubatus*, anesthesia, analgesics, hip replacement, epidural morphine, postoperative care, tiletamine, zolazepam, isoflurane, hind limb surgery.

Stegmann, G.F. and M. Jago (2006). **Cardiopulmonary effects of medetomidine or midazolam in combination with ketamine or tiletamine/zolazepam for the immobilisation of captive cheetahs (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 77(4): 205-9. ISSN: 0038-2809.

**Abstract:** Captive cheetah (*Acinonyx jubatus*) scheduled for either general health

examination or dental surgery were immobilised with combinations of medetomidine-ketamine (K/DET, n = 19), midazolam-ketamine (K/MID, n = 4) or medetomidine-tiletamine-zolazepam (Z/DET, n = 5). Induction time and arterial blood pressure was not statistically significantly (P > 0.05) different between treatment groups. Transient seizures were observed in the K/DET treated animals during induction. Hypertension was present in all groups during anaesthesia with mean (+/- SD) systolic pressure of 30.7 +/- 5.0 kPa for the K/DET group, 27.7 +/- 2.7 kPa for the K/MID group, and 33.1 +/- 4.6 kPa for the Z/DET group. Heart rate was statistically significantly (P < 0.05) lower in the K/DET group (69 +/- 13.2 beats/min) compared to the K/MID group (97 +/- 22.6 beats/min), and ventilation rate was statistically significantly (P < 0.05) lower in the K/MID group (15 +/- 0.0 breaths/min) compared with the K/DET group (21 +/- 4.6). A metabolic acidosis and hypoxia were observed during anaesthesia when breathing air. Oxygen (O2) administration resulted in a statistically significant (P < 0.05) increase in the arterial partial pressure of carbon dioxide (hypercapnoea), arterial partial pressure of O2, and % oxyhaemoglobin saturation.

**Descriptors:** captive cheetah, *Acinonyx jubatus*, anesthesia, cardiopulmonary effects, medetomidine, midazolam, ketamine, tiletamine, zolazepam, immobilization, induction time, arterial blood pressure, transient seizures, hypertension, heart rate, ventilation rate.

Walzer, C. and C. Huber (2002). **Partial antagonism of tiletamine-zolazepam anesthesia in cheetah.** *Journal of Wildlife Diseases* 38(2): 468-72. ISSN: 0090-3558.

**Abstract:** This study evaluated partial antagonism of tiletamine-zolazepam (TZ) anesthesia in cheetahs (*Acinonyx jubatus*) and differences between two benzodiazepine antagonists, flumazenil and sarmazenil, in this species. Four cheetahs were anesthetized three times at an interval of 14 days with an average intramuscular dose of 4.2 mg/kg TZ. In trials 2 and 3 flumazenil at 0.031 mg/kg and sarmazenil at 0.1 mg/kg, respectively, were applied intramuscularly 30 min after initial TZ injection. There was a highly significant difference between the duration of TZ anesthesia with and without antagonist. Use of the antagonists significantly shortened duration and recovery and eliminated excitatory behavior during the recovery phase. No significant differences could be determined between the two antagonists. We recommend the use of sarmazenil and flumazenil to antagonize TZ anesthesia in cheetahs.

**Descriptors:** cheetah, *Acinonyx jubatus*, anesthetics, antagonism, tiletamine, zolazepam, differences, flumazenil, sarmazenil, benzodiazepine antagonists, dose, intramuscular, shortened duration and recovery, excitatory behavior eliminated, combined administration, anti-anxiety agents administration, dosages.

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### Cheetah - Anatomy

Carstens, A., R.M. Kirberger, T. Spotswood, W.M. Wagner, and R.J. Grimbeek (2006). **Ultrasonography of the Liver, Spleen, and Urinary Tract of the Cheetah (*Acinonyx jubatus*).** *Veterinary Radiology and Ultrasound the Official Journal of the American College of Veterinary Radiology and the International Veterinary Radiology Association* 47(4): 376-383. ISSN: 1058-8183.

**NAL Call Number:** SF757.8.A4

**Abstract:** Diseases of the abdomen of the cheetah (*Acinonyx jubatus*) include those affecting the liver, spleen, and urinary tract. The most common diseases of captive-bred cheetah are gastritis, gastric ulceration, glomerulosclerosis, and hepatic veno-occlusive disease, and are the most frequent causes of mortality in these animals. The purpose of this study was to describe the ultrasonographic anatomy of the normal liver, spleen, kidney, and urinary bladder of the anesthetized captive-bred cheetah. Twenty-one cheetahs were examined. Eight of the 21 animals had subclinical evidence of either gastritis or chronic renal disease. The ultrasonographic appearances of the liver, gall bladder, common bile duct, and spleen were evaluated and various measurements made. Statistical analyses of the measurements were performed on all the healthy and subclinically ill animals taking sex, age, mass, and anesthetic protocol into account. There were no significant differences in any parameters between the healthy and subclinically ill animals (P>0.25) and data were combined for statistical analyses. The mean mass was 41.1 kg (pl8.8) and the mean age was 5.0 years (pl2.2). The mean thickness of the liver medial to the gall bladder was 67.0 mm (pl14.8) and the liver was within the left costal arch in 75% of animals, extended caudal to the right costal arch in 50% of animals for an average of 30 mm, and extended caudal to the sternum in 63% of animals for an average of 32.5 mm. The maximum mean hepatic vein diameter at the entrance to the caudal vena cava was 8.6pl2.8 mm; the mean diameters of the portal vein at the hilus and that of the caudal vena cava as it entered the liver were 7.5pl1.6 and 9.9pl4.1 mm, respectively. The mean diameter of the caudal vena cava was significantly affected by the type of anesthetic used (P<0.10). The mass of the animals was significant in explaining the variance in maximum portal vein diameters (P<0.10). The mean maximum velocity of the hepatic vein flow at the entrance to the caudal vena cava was 25.3pl2.8 cm/s (n=4), the hilar portal vein was 11.7pl3.3 cm/s (n=7), and the caudal vena cava was 33.8pl19.8 cm/s (n=5). The mean maximum gall bladder length and width, and the mean common bile duct diameters were 44.6 mm (pl10.4), 23.3 mm (pl5.0), and 8.1 mm (pl2.4), respectively. Age was significant in explaining the variance in gall bladder lengths (P<0.10). Urinary tract ultrasonography was performed only in animals that had normal urea and creatinine levels (n=13). Renal cortico-medullary distinction was present in all kidneys and a cortico-medullary rim sign was seen in 21 of 26 kidneys. Mean kidney length, height, and width was 63.9pl5.7, 38.1pl5.2, and 42.1pl5 mm, respectively. The average resistivity index was 0.58 (n=5). Mean urinary bladder length, height, and width were 57.0, 19.2, and 34.9 mm, respectively.

**Descriptors:** cheetahs, *Acinonyx jubatus*, liver, spleen, urinary tract, ultrasonography, radiology, diseases, abdomen gastritis, anatomy.

Hackendahl, N.C. and S.B. Citino (2005). **Radiographic kidney measurements in captive cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 36(2): 321-2. ISSN: 1042-7260.
**Abstract:** The prevalence of chronic renal disease is substantial among captive cheetahs (*Acinonyx jubatus*). The purpose of this study was to determine kidney measurements from radiographs of captive cheetahs (n = 15) with normal renal function. The ratio of kidney length to length of the body of the second lumbar vertebrae has been established for domestic cats with normal renal function. The mean ratio of renal length to length of the second lumbar vertebra was 1.81 +/- 0.14 in cheetahs. This baseline data may allow an objective evaluation of radiographic kidney size in cheetahs. However, evaluation of a small number of cheetahs with confirmed renal failure resulted in a similar ratio.
**Descriptors:** cheetah, captive animals, *Acinonyx jubatus*, anatomy, histology, kidney anatomy, histology, kidney radiography, reference values, renal disease, kidney mesurements, radiographs.

Kirberger, R.M., H.B. Groenewald, and W.M. Wagner (2000). **A radiological study of the sesamoid bones and os meniscus of the cheetah (*Acinonyx jubatus*)**. *Veterinary and Comparative Orthopaedics and Traumatology* 13(4): 172-177. ISSN: 0932-0814.
**NAL Call Number:** SF910.5.V4
**Abstract:** A radiological study of the sesamoids was undertaken in differing numbers of joints from 10 cheetahs. Each sesamoid was described and measured. Sesamoids were not found in the elbow and tarsal joints. A sesamoid was found in the abductor digiti 1 longus muscle as well as paired sesamoids were found at the interosseous muscle insertions palmarly of digits #1-5 and plantarly of digits #2-5. There were significant differences between abaxial and axial lengths of some of these sesamoids and the palmar sesamoids were significantly shorter than their plantar counterparts. In the stifle, a patellar, a popliteal and two gastrocnemius sesamoids were present. The lateral gastrocnemius sesamoid was significantly longer than the medial one and had a peculiar bilobed appearance. An os meniscus was constantly present in the cranial aspect of the medial meniscus. The shape of the sesamoids and the presence of an os meniscus in the cheetah differed from those seen in the domestic dog and cat and were ascribed to differences in form and function. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, radiological study, sesamoid bones, os meniscus, species differences.

Kuenzel, W., A. Probst, and W. Henninger (1998). **Anatomy and radiography of the shoulder joint of the cheetah (*Acinonyx jubatus*)**. *Anatomia Histologia Embryologia* 27(2): 119-124. ISSN: 0340-2096.
**Descriptors:** cheetah, *Acinonyx jubatus*, radiology, shoulder joint, anatomy, anatomical structures, bones, muscles, ligaments, dissection, corrosion casts.
**Language of Text:** German.

Kunzel, W. and A. Probst (1999). **Die anatomischen Verhaltnisse am Karpalgelenk des Geparden (*Acinonyx jubatus*), verglichen mit jenen der Hauskatze (*Felis catus*). [Anatomic features of the carpal joint of the cheetah (*Acinonyx jubatus*), compared with the domestic cat (*Felis catus*)]**. *Anatomia, Histologia, Embryologia* 28(3): 177-182. ISSN: 0340-2096.
**Abstract:** The anatomy of the carpal joint of the cheetah (*Acinonyx jubatus*) was examined in seven specimens using dissection and corrosion casts as well as radiography, and compared to well-known data of the domestic cat (*Felis catus*). It was found that in the cheetah, as in the domestic cat, the intermedioradial, ulnar and accessory carpal bones, as well as the first, second, third and fourth carpal bones and the sesamoid bone of the abductor pollicis longus muscle, develop in a regular manner. The bones had a similar shape and the ligamentous apparatus was comparable, the most striking differences being the connection of all compartments of the joint cavity and the mediocarpal joint, working as a screw joint. The syndesmosis between the intermedioradial and ulnar carpal bones, instead of a synovial connection, is another adaptation for stabilization of the carpus of the cheetah during locomotion. The joint capsule is little spacious and in all three recesses can be differentiated. The first extends proximally palmar the ulnar carpal bone between the styloid process of the ulna and the accessory carpal bone, the second also extends proximally mediopalmar of the intermedioradial bone, and the largest third recess is located on the dorsal surface and extends proximally, laterally to the inserting tendon of the extensor carpi radialis muscle.
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, histology, carpal bones, histology, joints anatomy, histology, forelimb, muscle, skeletal anatomy, histology, comparison to domestic cats.
**Language of Text:** German.

Kunzel, W. and A. Probst (1998). **Anatomische Besonderheiten am Ellbogengelenk des Geparden (*Acinonyx jubatus*). [Anatomic characteristics of the elbow joint of the cheetah (*Acinonyx jubatus*)]**. *Anatomia, Histologia, Embryologia* 27(3): 167-172. ISSN: 0340-2096.
**Abstract:** Anatomical structures of elbow joints of six cheetahs were examined by dissection, corrosion casts and radiography. As a result, it was observed that the distal end of humerus is divided into the trochlea humeri for articulation with the ulna and the

capitulum humeri for articulation with the radius. As the trochlea humeri is posed oblique and looks like a disc-shaped cone sector, flexion. Flexion of elbow joint is always combined with adduction of the distal parts of the limb, and, respectively, extension with abduction. The cylindrical but also in sagittal direction convex capitulum humeri enables the head of the radius all movements on a spheric sector. Furthermore, advantageous preconditions for rotation in the proximal radioulnar joint are the mighty medical coronoid process, the displacement of the radial tuberosity to the caudal surface of the radius and the insertion of the biceps brachii muscle exclusively on this elevation of the radius. Limiting factors are the insertions of collateral ligaments at the antebrachial skeleton. The lateral collateral ligament inserts only on the radius, the medial collateral ligament mainly on the ulna. The radial anular ligament directly connects the two coronoid processes of the ulna and moreover is intracapsular. The joint capsule is common for both the cubital and the proximal radioulnar joint and five pouches could be described. These were between the lateral epicondyle of humerus and the olecranon, underneath the tendon of origin of the extensor carpi ulnaris muscle, cranially in the bend of the elbow joint, between the head of the radius and the tendon of origin of supinator muscle and the lateral part of radial anular ligament, just as between the medial epicondyle of humerus and the tendons of origin of flexor muscles of the forearm.
**Descriptors:** cheetah, *Acinonyx jubatus*, joints anatomy, histology, forelimb, humerus, radius, ulna.
**Language of Text:** German.

Kunzel, W. and A. Probst (1996). **Anatomy and radiography of the stifle joint of the cheetah (*Acinonyx jubatus*)**. *Wiener Tierarztliche Monatsschrift* 83(2): 43-50. ISSN: 0043-535X.
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, stifle joint, radiography, limbs, Felidae.
**Language of Text:** German.

Londei, T. (2000). **The cheetah (*Acinonyx jubatus*) dewclaw: specialization overlooked**. *Journal of Zoology (London)* 251(4): 535-537. ISSN: 0952-8369.
**Descriptors:** cheetah, *Acinonyx jubatus*, behavior, dew claw, specialization, evolution, adaptation, predatory behavior, rudimentary digits, anatomy.

O'regan, H.J. (2002). **Defining cheetahs, a multivariate analysis of skull shape in big cats**. *Mammal Review* 32(1): 58-62. ISSN: 0305-1838.
**Descriptors:** cheetahs, *Acinonyx jubatus*, skull shape, multivariate analysis, skeletal system, big cats, movement, support.

Ohale, L.O. and H.B. Groenewald (2003). **The morphological characteristics of the antebrachiocarpal joint of the cheetah (*Acinonyx jubatus*).** *Onderstepoort Journal of Veterinary Research, The* 70(1): 15-20. ISSN: 0030-2465.
**Abstract:** A morphological study of the structures of the antebrachiocarpal (AC) joint of the cheetah was carded out by dissection of eight forelimbs obtained from four adult cheetahs culled from the Kruger National Park, Republic of South Africa. The aim was to evaluate the deviations of this joint from the normal feline pattern and to consider their possible relationship to the cheetah's adaptation to speed. Although published data on the AC joint of the other felids show general resemblance to that of the cheetah, there are nevertheless slight, but significant variations and modifications which tend to suggest adaptation to speed. The shafts of the radius and ulna of the cheetah are relatively straight and slender, with poorly developed distal ends. The ulnar notch is reduced to a very shallow concavity while the corresponding ulnar facet is a barely noticeable convexity, separated from the distal ulnar articular facet by an ill-defined groove. The movement of the distal radio-ulnar joint is highly restricted by the presence of a fibro-cartilaginous structure and a strong interrosseous membrane, limiting pronation and supination normally achieved by the rotation of the radius around the ulna. The extensor grooves at the distal extremity of the radius are deep and narrow and are guarded by prominent ridges. A thick extensor retinaculum anchors the strong extensor tendons in these grooves. The distal articular surface of the radius is concave in all directions except at the point where it moves into its stylold process. At this point it is convex in the dorsopalmar direction, with a surface that is rather deep and narrow. The proximal row of carpal bones presents a strongly convex surface, which is more pronounced in the dorsopalmar direction with the greatest convexity on the lateral aspect. Medially, there is a ridge-like concavity across the base of the tubercle, which rocks on the flexor surface of the radius, limiting excessive flexion as well as restricting lateral deviation of the AC joint.
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, histology, carpal bones, joints anatomy, histology, running physiology, adaptation, forelimb, radius anatomy, antebrachiocarpal joint, dissection, deviations, normal feline pattern.

Russell, A.P. and H.N. Bryant (2001). **Claw retraction and protraction in the carnivora: the cheetah (*Acinonyx jubatus*) as an atypical felid**. *Journal of Zoology (London)* 254(1): 67-76. ISSN: 0952-8369.
**Descriptors:** cheetah, *Acinonyx jubatus*, claw retraction, protraction, felid, phalanges, morphology, manipulative capabilities, forelimb, forepaws.

Russell, P. and H.N. Bryant (1997). **Claw retraction in felids: how the cheetah cheats**.

*Journal of Morphology* 232(3): 318. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skeletal system, movement, support, paws, feet, claw retraction, manus, morphology, pes, phalanges, phalanx, felids, meeting information.
**Notes:** Fifth International Congress of Vertebrate Morphology, Bristol, England, UK; July 12-17, 1997.

Sims, C. (2001). **Morphological distinctions in skulls of five felids (*Puma concolor, Panthera onca, Panthera pardus, Uncia uncia, and Acinonyx jubatus*)**. *Journal of Morphology* 248(3): 285. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skull, morphological distinctions, skeletal system, cougar, jaguar, leopard, snow leopard, species comparison study.
**Notes:** Sixth International Congress of Vertebrate Morphology, Jena, Germany; July 21-26, 2001.

Valkenburgh, B.v., J. Theodor, A. Friscia, A. Pollack, and T. Rowe (2004). **Respiratory turbinates of canids and felids: a quantitative comparison**. *Journal of Zoology* 264(3): 281-293. ISSN: 0952-8369.

**Abstract:** The respiratory turbinates of mammals are complex bony plates within the nasal chamber that are covered with moist epithelium and provide an extensive surface area for the exchange of heat and water. Given their functional importance, maxilloturbinate size and structure are expected to vary predictably among species adapted to different environments. Here the first quantitative analysis is provided of maxilloturbinate structure based on high-resolution computed tomography (CT) scans of the skulls of eight canid and seven felid species. The key parameters examined were the density of the maxilloturbinate bones within the nasal chamber and how that density varied along the air pathway. In both canids and felids, total maxilloturbinate chamber volume and bone volume increased with body size, with canids having c. 1.5-2.0 times the volume of maxilloturbinate than felids of similar size. In all species, the volume of the maxilloturbinates varies from rostral to caudal, with the peak volume occurring approximately midway, close to where airway cross-sectional area is greatest. Interspecific differences among canids or felids in maxilloturbinate density were not consistent with adaptive explanations, i.e. the densest maxilloturbinates were not associated with species living in arid or cold habitats. Some of the observed variation in maxilloturbinate form might reflect a need for both low- and high-resistance pathways for airflow under alternative conditions. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, animal anatomy, computed tomography, quantitative analysis, respiration, skull, *Alopex lagopus*, coyotes, lions, *Lycaon pictus*, *Lynx rufus*, ocelots, *Vulpes cinereoargenteus*, *Vulpes vulpes*, wolves.

Williams, T.M., G.P. Dobson, O. Mathieu Costello, D. Morsbach, M.B. Worley, and J.A. Phillips (1997). **Skeletal muscle histology and biochemistry of an elite sprinter, the African cheetah.** *Journal of Comparative Physiology. B, Biochemical, Systemic, and Environmental Physiology* 167(8): 527-35. ISSN: (p) 0174-1578; online; 1432-136X.
**Abstract:** To establish a skeletal muscle profile for elite sprinters, we obtained muscle biopsy samples from the vastus lateralis, gastrocnemius and soleus of African cheetahs (*Acinonyx jubatus*). Muscle ultrastructure was characterized by the fiber type composition and mitochondrial volume density of each sample. Maximum enzyme activity, myoglobin content and mixed fiber metabolite content were used to assess the major biochemical pathways. The results demonstrate a preponderance of fast-twitch fibers in the locomotor muscles of cheetahs; 83% of the total number of fibers examined in the vastus lateralis and nearly 61% of the gastrocnemius were comprised of fast-twitch fibers. The total mitochondrial volume density of the limb muscles ranged from 2.0 to 3.9% for two wild cheetahs. Enzyme activities reflected the sprinting capability of the cheetah. Maximum activities for pyruvate kinase and lactate dehydrogenase in the vastus lateralis were 1519.00 +/- 203.60 and 1929.25 +/- 482.35 mumol min-1.g wet wt-1, respectively, and indicated a high capacity for glycolysis. This study demonstrates that the locomotor muscles of cheetahs are poised for anaerobically based exercise. Fiber type composition, mitochondrial content and glycolytic enzyme capacities in the locomotor muscles of these sprinting cats are at the extreme range of values for other sprinters bred or trained for this activity including greyhounds, thoroughbred horses and elite human athletes.
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, histology, metabolism, skeletal muscle cytology, skeletal metabolism, dogs, glycolysis, horses, locomotion, muscle fibers, fast twitch ultrastructure, skeletal ultrastructure, pyruvate kinase metabolism.

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### Cheetah - Behavior

Bissett, C. and R.T.F. Bernard (2007). **Habitat selection and feeding ecology of the cheetah (*Acinonyx jubatus*) in thicket vegetation: is the cheetah a savanna specialist.** *Journal of Zoology Proceedings of the Zoological Society of London* 271(3): 310-317. ISSN: 0952-8369.

**NAL Call Number:** QL1.J68
**Abstract:** Habitat selection and feeding ecology of a reintroduced population of cheetahs *Acinonyx jubatus* were studied in a 16 000 ha game reserve in the Eastern Cape Province (South Africa). Seventy per cent of the reserve is characterized by very dense thicket vegetation (valley bushveld) and the remainder is open and savanna-like. The results illustrated a strong effect of sex and group size on the behaviour of cheetahs. The coalition (three adult males) killed significantly larger animals (55% of kills weighed more than 65 kg) than single female cheetahs (less than 2% of kills weighed more than 65 kg). Female cheetahs showed temporal and spatial avoidance of lions by hunting at dawn and dusk and positioning their home ranges [95% utilization distribution (UDs)] significantly farther from the pride of lions than did the coalition. The coalition hunted earlier and later than female cheetahs, and 46% of their kills were made in darkness. In addition, their home range overlapped that of the lions and they showed neither temporal nor spatial avoidance of the lions. The rates of kleptoparasitism were lower and the kill retention times were longer than those reported elsewhere in Africa, and it is suggested that this is a consequence of the cover provided by the thicket vegetation and prey size. The home ranges (95% UDs) of female cheetahs incorporated more thicket vegetation than that of the coalition, indicating that the coalition is less susceptible to predation than single females. These data suggest that cheetahs possess greater behavioural flexibility than previously reported, that they can hunt successfully in thicket vegetation, sometimes in darkness, that they are not restricted to killing small to medium-sized prey, and that they may not be savanna specialists.
**Descriptors:** cheetah, *Acinonyx jubatus*, diet, habitat selection, feeding ecology, adaptability, dense thicket, behavioral flexibiity, gender differences relationship to lions, South Africa.

Caro, T.M. (1993). **Behavioral solutions to breeding cheetahs in captivity: insights from the wild.** *Zoo Biology* 12(1): 19-30. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, behavioral solutions, wild animals, breeding, reproductive efficiency, zoos, aggression, breeding programs.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Caro, T.M. (1995). **Short-term costs and correlates of play in cheetahs**. *Animal Behaviour* 49(2): 333-45. ISSN: 0003-3472.
**Abstract:** A study investigated the costs and benefits of play by observing cheetah, *Acinonyx jubatus*, cubs in the wild. When all of the potential costs of play were considered, the overall costs seemed to be low. The fact that very young cubs demonstrated high rates of locomotor play indicates that play may have immediate

instead of delayed benefits, possibly helping cubs escape predation. The components of noncontact social play may be functionally or causally related to approaching prey, and components of object and contact play may be associated with contacting prey. However, it seems that only some aspects of play may be appropriate for practicing predatory skills.
**Descriptors:** cheetahs, *Acinonyx jubatus*, cubs, cub play behaviors, play short term costs, benefits, wild, locomotor play, prey, practicing predatory skills.

Caro, T.M. (1987). **Indirect costs of play: cheetah cubs reduce maternal hunting success**. *Animal Behaviour* P.: 295-7. ISSN: 0003-3472.
**Descriptors:** cheetah, *Acrinonyx jubatus*, cubs, play, indirect costs, maternal hunting success, reduced.

Caro, T.M., C.D. FitzGibbon, and M.E. Holt (1989). **Physiological costs of behavioural strategies for male cheetahs**. *Animal Behaviour* P.: 309-17. ISSN: 0003-3472.
**Descriptors:** male cheetahs, *Acinonyx jubatus*, behavioral strategies, physiological costs.

Cooper, A.B., N. Pettorelli, and S.M. Durant (2007). **Large carnivore menus: factors affecting hunting decisions by cheetahs in the Serengeti**. *Animal Behaviour* 73(Part 4): 651-659. ISSN: 0003-3472.
**Descriptors:** cheetahs, *Acinonyx jubatus*, hunting decisions, factors affecting, predation, prey, predators, large carnivors, behvior, time of year, abundance, Serengeti Africa.

Durant, S.M. (2000). **Predator avoidance, breeding experience and reproductive success in endangered cheetahs, *Acinonyx jubatus***. *Animal Behaviour* 60(1): 121-130. ISSN: 0003-3472.
**Descriptors:** cheetahs, *Acinonyx jubatus*, behavior, predator avoidance, breeding experience, reproductive success, wildlife management.

Federico, B. and P.G. Bracchi (2001). **Captive bred cheetah behaviour**. *Annali Della Facolta Di Medicina Veterinaria, Universita Di Parma* 21: 47-60. ISSN: 0393-4802.
**Descriptors:** cheetah, *Acinonyx jubatus*, animal behaviour, captive bred, biology, capture of animals, habitats, male animals, maternal behaviour.
**Language of Text:** Italian.

Laurenson, M.K. (1993). **Early maternal behavior of wild cheetahs: implications for captive husbandry.** *Zoo Biology* 12(1): 31-43. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** wild cheetahs, *Acinonyx jubatus*, early maternal behavior, habitats, captive husbandry, endangered species, Tanzania, mothering ability, lairs.
**Notes:** In the special issue: The cheetah/ edited by D.E. Wildt and J. Grisham.

Laurenson, M.K. (1995). **Behavioural costs and constraints of lactation in free-living cheetahs**. *Animal Behaviour* 50(3): 815-26. ISSN: 0003-3472.
**Abstract:** Changes in the behavior of wild cheetahs, *Acinonyx jubatus*, during lactation and possible extra costs or limits related to denning were investigated. Lactating females nearly doubled their normal food intake, but only mothers with cubs in the lair spent more time drinking. Lactating females with emerged cubs spent an increased amount of time watching and hunting in comparison to time spent at rest and moving. Lactating females with cubs in the lair spent more time traveling each day, traveled further, had limited ranging patterns, and were apt to make more kills in the heat part of the day than when their cubs were with them.
**Descriptors:** cheetah, *Acinonyx jubatus*, free living, constraints of lactation, behavioral costs, food intake, time traveling, range patterns, kills behavior.

Laurenson, M.K. and T.M. Caro (1994). **Monitoring the effects of non-trivial handling in free-living cheetahs**. *Animal Behaviour* P.: 547-57. ISSN: 0003-3472.
**Abstract:** Cheetahs, *Acinonyx jubatus*, were examined for detrimental effects due to disturbance and nontrivial experimental handling. Females were unaffected by the use of radio collars weighing less than 2 percent of their body weight or by aerial radio-tracking that involved flying at tree height. Cub predation and maternal care were also unaffected by human entry into lairs to count and weigh cubs in their mother's absence. It was concluded that these potentially sensitive animals are probably not disturbed by considerate field techniques.
**Descriptors:** cheetahs, *Acinonyx jubatus*, free living, non trivial experimental handling, effects, disturbances, detrimental effects, radio collars, field techniques.

O'donovan, D., J.E. Hindle, S. Mckeown, and S. O'donovan (1993). **Effects of visitors on the behaviour of female cheetahs *Acinonyx jubatus* and cubs**. *International Zoo Yearbook* 32(0): 238-244. ISSN: 0074-9664.
**Descriptors:** cheetahs, females, cubs, behavior, visitors effects, conservation, development, wildlife management, adult.

Ruiz Miranda, C.R., S. Wells, R. Golden, and J. Seidensticker (1998). **Vocalization and other behavioral responses of male cheetahs (*Acinonyx jubatus*) during experimental separation and reunion trials**. *Zoo Biology* 17(1): 1-16. ISSN: 0733-3188.
**Descriptors:** male cheetahs, *Acinonyx jubatus*, vocalization, other behavioral responses,

experimental separation and reunion trials, psychological attachment, husbandry technique.

Sharp, N.C.C. (1997). **Timed running speed of a cheetah (*Acinonyx jubatus*)**. *Journal of Zoology (London)* 241(3): 493-494. ISSN: 0952-8369.
**Descriptors:** cheetah, *Acinonyx jubatus*, running speed, timed, systematics, locomotion, highest running speed for any animal.

Wielebnowski, N. and J.L. Brown (1998). **Behavioral correlates of physiological estrus in cheetahs.** *Zoo Biology* 17(3): 193-209. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetahs, *Acinonyx jubatus*, estrus, animal behavior, monitoring, feces, estradiol, metabolites, estrus, age, individual characteristics, behavior change, feces composition.

Wielebnowski, N.C. (1999). **Behavioral differences as predictors of breeding status in captive cheetahs**. *Zoo Biology* 18(4): 335-349. ISSN: 0733-3188.
**Descriptors:** cheetahs, *Acinonyx jubatus*, captive born, behavioral differences, predictors, breeding status, behavioral variation, husbandry regimens, breeding problems.

Williams, B.G., N.K. Waran, J. Carruther, and R.J. Young (1996). **The effect of a moving bait on the behaviour of captive cheetahs (*Acinonyx jubatus*).** *Animal Welfare* 5(3): 271-281. ISSN: 0962-7286.
**NAL Call Number:** HV4701.A557
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, zoo animals, animal behavior, moving bait, effect, behavior, environmental enrichment, behavior patterns, hunting behavior, enrichment device.

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### Cheetah - Breeding and Reproduction

Augustus, P., K. Casavant, N. Troxel, R. Rieches, and F. Bercovitch (2006). **Reproductive life history of South African cheetahs (*Acynonyx jubatus jubatus*) at the San Diego Zoo Wild Animal Park, 1970-2005.** *Zoo Biology* 25(5): 383-390. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** Cheetah, *Acinonyx jubatus*, cubs, zoo animals, reproduction, breeding, life history, females , age, litters, litter size, mortality, sex ratio, California, captive cheetahs, breeding program, reproductive performance.

Beekman, S.P., M. De Wit, J. Louwman, and H. Louwman (1997). **Breeding and observations on the behaviour of cheetah *Acinonyx jubatus* at Wassenaar Wildlife Breeding Centre**. *International Zoo Yearbook* 35(0): 43-50. ISSN: 0074-9664.
**Descriptors:** cheetah, *Acinonyx jubatus*, animal care, behavior, breeding protocol, captive felid management, husbandry, reproduction, Wassenaar Wildlife Breeding Center.

Bertschinger, H.J., M. Jago, J.O. Nothling, and A. Human (2006). **Repeated use of the GnRH analogue deslorelin to down-regulate reproduction in male cheetahs (*Acinonyx jubatus*).** *Theriogenology* 66(6-7): 1762-7. ISSN: 0093-691X.
**Abstract:** The GnRH analogue deslorelin, as a subcutaneous implant, was initially developed in Australia as an ovulation-inducing agent in mares. Its uses, for the suppression of reproduction in the domestic dog and cat and in other species, including humans, have been developed subsequently. Such implants have been used as a contraceptive modality in a variety of wild carnivores, both males and females. This paper describes the use of deslorelin implants as a contraceptive agent for cheetah males maintained in a semi-captive environment and housed in various camps together with females. Annually, male cheetahs were treated for 1 (n = 2), 2 (n = 7), 3 (n = 9), 4 (n = 3) or 5 (n = 1) consecutive years with an implant containing 4.7, 5.0 or 6.0 mg of deslorelin. On the first day of treatment and then on an annual basis, blood testosterone concentrations were analysed, testicular measurements were taken, appearance of penile spikes was determined, and semen was collected and evaluated. Pregnancy rates of mated or inseminated females were determined. A dose of 6 mg of deslorelin suppressed reproduction for at least 1 year, whereas with 4.7 and 5 mg of deslorelin, 3 of 17 males had a few non-motile spermatozoa in their ejaculates. All testosterone concentrations were basal at 1 year post-implant and no side effects were observed. We concluded that deslorelin implantation, at a dose of 6 mg, was a safe and reliable method of annual contraception in male cheetahs.
**Descriptors:** male cheetahs, *Acinonyx jubatus*, physiology, contraception, contraceptive agents, GnRHanalogue deslorelin, male administration, dosage, triptorelin analogs, derivatives, blood, conservation of natural resources, drug implants, histocytochemistry, longitudinal studies, statistics, nonparametric, testis anatomy, histology, testis physiology, testosterone blood, triptorelin administration and dosage.

Bertschinger, H.J., D.G. Meltzer, and A. van Dyk (2008). **Captive breeding of cheetahs in South Africa--30 years of data from the de Wildt Cheetah and Wildlife Centre.**

*Reproduction in Domestic Animals Zuchthygiene* 43(Suppl 2): 66-73. ISSN: (p) 0936-6768; (E) 1439-0531.

**Abstract:** The de Wildt Cheetah and Wildlife Centre was established in 1971 and the first cheetah cubs were born in 1975. During the period 1975-2005, 242 litters were born with a total of 785 cubs. Mean cub survival from 1 to 12 months and greater than 12 months of age was 71.3 and 66.2%, respectively. The majority of losses (84.9%) occurred during the first month postpartum whereas only 15.1% deaths took place between 1 and 12 months of age. Females were first bred at an age of approximately 3 years, reached maximum reproductive age at 6-8 years, where after fertility declined. Males reached peak reproduction at 6 and maintained this for up to 12 years of age. Male fertility was best correlated with sperm morphology. During recent years, for practical purposes, males were allocated to 'good' (>or=70% normal), 'fair' (40-70% normal) and 'poor' (<40% normal) categories according to sperm morphology count. The breeding males were selected from the good (preferably) and fair categories but poor category males were also used at times. Average litter sizes for 'good', 'fair' and 'poor' males were 3.44 (n = 21), 3.14 (n = 18) and 2.28 (n = 18), respectively. In females the heritability for litter size was high at 0.5848 (532 progeny, 1975-2007) and the maternal heritability for cub mortality was estimated to be 0.596. The data from the de Wildt Cheetah and Wildlife Centre and two other centres in the world (Kapama and Wassenaar) demonstrate that cheetah can be bred successfully in captivity.

**Descriptors:** cheetahs, *Acinonyx jubatus*, captive breeding, de Wildt Cheetah and Wildlife Centre, 30 years of data, South Africa.

Bertschinger, H.J., J.O. Nothling, R. Nardini, S. Hemmelder, and M.H. Broekhuisen (2002). **Collection of semen in cheetahs (*Acinonyx jubatus*) using electro-ejaculation: attempts to avoid urine contamination.** *Advances in Ethology* 37: 122. ISSN: 0931-4202.

**Descriptors:** cheetahs, *Acinonyx jubatus*, seman collection, electro ejaculation, urine contamination, attempts to svoid, meeting information.

**Notes:** Meeting Information: 4th International Symposium on Physiology and Behaviour of Wild and Zoo Animals, Berlin, Germany; September 29-October 02, 2002.

Borque, C., S.S. Perez Garnelo, M. Lopez, C. Talavera, M. Delclaux, and J. de la Fuente (2005). **Validating a commercially available enzyme immunoassay for the determination of 17beta-estradiol and progestogens in the feces of cheetahs (*Acinonyx jubatus*): a case report.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 36(1): 54-61. ISSN: 1042-7260.

**Abstract:** Fecal 17beta-estradiol and progestogens excretion was monitored in adult, female cheetahs (*Acinonyx jubatus*; n = 2), ZGG-12301 (born 3 April 1993), gonadotrophin treated and ZGT-3301, (born 19 August 1993), nontreated, for 120 days using commercially available plate enzyme immunoassay kits prepared for human serum or plasma. There were significant differences (P < 0.001) between baseline and peak concentrations of both hormone measures. Female ZGG-12301, which conceived, but this pregnancy resulted in an unobserved spontaneous abortion, showed no significant difference (P > 0.05) between baseline and gestation 17beta-estradiol values; fecal 17beta-estradiol excretion during pregnancy was statistically different (P < 0.001) from excretion during the nonpregnancy period. Baseline progestogen concentrations were different from pregnancy (P < 0.001) and postovulatory (P < 0.01) concentrations, and progestogen concentrations during pregnancy period were different (P < 0.001) from postovulatory concentrations. In the nontreated cheetah (ZGT-3301), basal and increased progestogen concentrations were statistically different (P < 0.01). On the basis of 17beta-estradiol excretory patterns, duration of the estrous cycle (x +/- SEM) was 13.2 +/- 2.2 days. These results suggest that the enzyme-linked immunosorbent methods reported in this study were capable of quantifying reproductive hormones in fecal extracts of cheetahs and could be a practical alternative to other enzyme-linked immunosorbent assays which require more complex procedures.

**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, ELISA, enzyme linked immunosorbent assay, estradiol analysis, feces chemistry, progestins analysis, enzyme linked immunosorbent assay methods, enzyme linked immunosorbent assay standards, estrous cycle physiology, pregnancy physiology.

Brown, J.L., D.E. Wildt, N. Wielebnowski, K.L. Goodrowe, L.H. Graham, S. Wells, and J.G. Howard (1996). **Reproductive activity in captive female cheetahs (*Acinonyx jubatus*) assessed by faecal steroids.** *Journal of Reproduction and Fertility* 106(2): 337-346. ISSN: 0022-4251.

**Abstract:** Faecal oestradiol and progestogen metabolite excretion was monitored in adult, female cheetahs (*Acinonyx jubatus*) (n = 26) for 1-24 months. Increased faecal oestradiol excretion was associated with mating or equine chorionic gonadotrophin (eCG) administration for artificial insemination, whereas increased progestogen metabolites were observed during natural and human chorionic gonadotrophin (hCG)-induced pregnant and nonpregnant luteal phases. On the basis of oestradiol excretory patterns, duration of the oestrous cycle (mean +/- SEM) was 13.6 +/- 1.2 days with high oestradiol concentrations lasting for 4.1 +/- 0.8 days. In non-gonadotrophin-treated cheetahs, 75% showed evidence of oestrous cyclicity; however, none evaluated for 1 year or longer were continuously cyclic. Rather, cyclicity was interrupted by periods of anoestrus, often

exceeding several months in duration. These inactive ovarian periods were unrelated to season and were not synchronous among females. Mean duration of gestation (breeding to parturition) was 94.2 +/- 0.5 days, whereas duration of faecal progestogen metabolite excretion during the nonpregnant luteal phase was 51.2 +/- 3.5 days. On the basis of progestogen metabolite evaluations, spontaneous ovulation (non-mating induced) occurred only once in two females (2 of 184 oestrous cycles; 1.1%). Peak eCG-stimulated, preovulatory oestradiol concentrations were similar to those associated with natural oestrus, whereas progestogen metabolite profiles after hCG resembled those during pregnant and nonpregnant luteal phases after natural mating. In summary, results confirm that the cheetah is polyoestrus and ovulation is almost always induced. However, new evidence suggests that many females inexplicably experience periods of anoestrus unrelated to season, while 25% of the cheetahs examined expressed no ovarian activity during the study period.
**Descriptors:** cheetahs, *Acinonyx jubatus*, feces, steroids, estrous cycle, zoo animals, biological rhythms, Carnivora, excreta, felidae, mammals, physiological functions, reproduction, sexual reproduction, anestrus.

Caro, T.M. (1993). **Behavioral solutions to breeding cheetahs in captivity: insights from the wild.** *Zoo Biology* 12(1): 19-30. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, behavioral solutions, wild animals, breeding, reproductive efficiency, zoos, aggression, breeding programs.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Caro, T.M. and M.J. Kelly (2001). **Cheetahs and their mating system.** *Model Systems in Behavioral Ecology: Integrating Conceptual, Theoretical, and Empirical Approaches. 2001,* Princeton University Press: 41 William Street, Princeton, NJ, 08540, USA, p. 512-532. ISBN: 0691006539.
**Descriptors:** cheetahs, *Acinonyx jubatus*, mating system, behavior, reproduction , behavioral ecology, conservation biology, female choice, group size, male reproductive tactics, male sociality, mating system, reproductive rates, reproductive success.
**Notes:** book chapter.

Crawshaw, G.J., J.L. Brown, and K.L. Goodrowe (1991). **Investigation of infertility in a male cheetah (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 22(1): 119-124. ISSN: 1042-7260.
**Descriptors:** cheetah, *Acinonyx jubatus*, male, infertility, zoo animal, Felidae, investigation, case study.

Crosier, A.E., L. Marker, J. Howard, B.S. Pukazhenthi, J.N. Henghali, and D.E. Wildt (2007). **Ejaculate traits in the Namibian cheetah (*Acinonyx jubatus*): Influence of age, season and captivity.** *Reproduction, Fertility, and Development* 19(2): 370-382. ISSN: 1031-3613.
**Abstract:** The objective was to examine the influence of animal age, season and captivity status on seminal quality in wild-born cheetahs (*Acinonyx jubatus*) in Namibia, Africa. Animals were divided into three age categories: juvenile (14-24 months; n = 16 males, 23 ejaculates); adult (25-120 months; n = 76 males, 172 ejaculates); and aged (>120 months; n = 5 males, 5 ejaculates). Seasons were categorised into hot-wet (January-April), cold-dry (May-August) and hot-dry (September-December). A comparison between freshly wild-caught (n = 29 males, 41 ejaculates) and captive-held cheetahs (n = 68 males, 159 ejaculates) was also conducted. Raw ejaculates contained 69.0 +/- 1.1% motile spermatozoa (mean +/- s.e.m.) with 73.6 +/- 1.5% of these cells containing an intact acrosome. Overall, 18.4 +/- 0.9% of spermatozoa were morphologically normal, with midpiece anomalies being the most prevalent (approximately 39%) defect. Juvenile cheetahs produced ejaculates with poorer sperm motility, forward progressive status, lower seminal volume and fewer total motile spermatozoa than adult and aged animals. Spermatogenesis continued unabated throughout the year and was minimally influenced by season. Proportions of sperm malformations were also not affected by season. Ejaculates from captive cheetahs had increased volume and intact acrosomes, but lower sperm density than wild-caught counterparts. In summary, Namibian cheetahs produce an extraordinarily high proportion of pleiomorphic spermatozoa regardless of age, season or living (captive versus free-ranging) status. Young males less than 2 years of age produce poorer ejaculate quality than adult and aged males. Because (1) all study animals were wild born and (2) there was little difference between freshly caught males and those maintained in captivity for protracted periods, our results affirm that teratospermia in the cheetah is mostly genetically derived. It also appears that an ex situ environment for the Namibian cheetah can ensure sperm quality comparable with that for free-living males.
**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, ejaculation, seasons, spermatozoa cytology, spermatozoa physiology, *Acinonyx* anatomy, histology, age factors, sperm motility, testis anatomy and histology.

Crosier, A.E., B.S. Pukazhenthi, J.N. Henghali, J. Howard, A.J. Dickman, L. Marker, and D.E. Wildt (2006). **Cryopreservation of spermatozoa from wild-born Namibian cheetahs (*Acinonyx jubatus*) and influence of glycerol on cryosurvival.** *Cryobiology* 52(2):

169-181. ISSN: 0011-2240.
**Abstract:** Sperm cryopreservation is a valuable tool for the genetic management of ex situ populations. This study was conducted to assess: (1) semen characteristics of wild-born cheetahs; and (2) the impact of three types of glycerol influence (duration of exposure, temperature, and method of addition) on sperm cryosensitivity. To evaluate the impact of duration of glycerol exposure, spermatozoa were incubated in Test Yolk Buffer (TYB) with 4% glycerol at ambient temperature (approximately 22 degrees C) for 15 vs. 60 min before cryopreservation. To evaluate the influence of temperature and method of glycerol addition, spermatozoa were resuspended at ambient temperature either in TYB with 0% glycerol followed by addition of 8% glycerol (1:1 v/v; at ambient temperature vs. 5 degrees C) or directly in TYB with 4% glycerol. All samples were cryopreserved in straws over liquid nitrogen vapor and evaluated for sperm motility and acrosomal integrity after thawing. Semen samples (n = 23; n = 13 males) contained a high proportion (78%) of pleiomorphic spermatozoa. Ejaculates also contained a high proportion of acrosome-intact (86%) and motile spermatozoa (78%). Immediately after thawing, a significant proportion of spermatozoa retained intact acrosomes (range, 48-67%) and motility (range, 40-49%). After thawing, incubation in glycerol for 60 min at ambient temperature before freezing decreased ($p < 0.05$) sperm motility and acrosomal integrity at one time-point each (pre-centrifugation and post-centrifugation, respectively). However, method or temperature of glycerol addition had no ($p > 0.05$) impact on sperm cryosurvival. In summary, (1) wild-born cheetahs produce high proportions of pleiomorphic spermatozoa but with a high proportion of intact acrosomes; and (2) resuspension in 4% glycerol, followed by exposure for up to 60 min at ambient temperature, had minimal effect on sperm motility and acrosomal integrity after cryopreservation. Results indicate the feasibility of cryopreserving cheetah spermatozoa under field conditions, providing a user-friendly method to capture and store gametes to enhance genetic management.
**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, cryopreservation, glycerol pharmacology, semen preservation, spermatozoa physiology, cell survival drug effects, Namibia, semen physiology, sperm motility, temperature, time factors.

Crosier, A., P. Comizzoli, T. Baker, B. Pukazhenthi, J. Howard, L. Marker, and D. Wildt (2007). **Oocyte fertilization and uterine morphology in aged female cheetahs (*Acinonyx jubatus)* are similar to younger counterparts.** *Biology of Reproduction*(Sp. Iss. SI): 79. ISSN: 0006-3363.
**Descriptors:** cheetahs, *Acinonyx jubatus*, oocyte fertilization, uterine morphology, aged female, development, reproductive system, reproduction, laparoscopy, therapeutic techniques, prophylactic techniques, diagnostic techniques, clinical techniques, ultrasonography, oocyte maturation, oocyte fertilization., meeting information.
**Notes:** Meeting Information: 40th Annual Meeting of the Society for the-Study of Reproduction, San Antonio, TX, USA; July 21 -25, 2007.

Crosier, A.E., B.S. Pukazhenthi, J.N. Henghali, J. Howard, L.L. Marker, and D.E. Wildt (2004). **Improved acrosomal integrity of cryopreserved cheetah *Acinonyx jubatus* sperm after centrifugation through accudenz.** *Biology of Reproduction*(Sp. Iss. SI): 185. ISSN: 0006-3363.
**Descriptors:** cheetah, *Acinonyx jubatus*, sperm, centrifugation, accudenx, cryopreserved, improved acrosomal integrity, cell biology, reproduction, cryopreservation, laboratory techniques, sperm motility index, percent motility, percent intact motility.
**Notes:** Meeting Information: 37th Annual Meeting of the Society for the Study of Reproduction, Vancouver, Canada; August 01 -04, 2004.

Czekala, N.M., B.S. Durrant, L. Callison, M. Williams, and S. Millard (1994). **Fecal steroid hormone analysis as an indicator of reproductive function in the cheetah.** *Zoo Biology* 13(2): 119-128. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, estrogens, progesterone, feces, ovulation, pregnancy, hormone secretion, reproductive physiology, fecal steroid hormones.

Doi, O., H. Kusunoki, T. Sato, S. Kawakami, T. Fukuoka, K. Okuda, O. Ito, E. Saito, T. Hayashi, T. Hase, and M. Kamiyosh (2001). **Serum progesterone and estradiol-17beta concentrations, and lapaloscopic observations of the ovary in the cheetah (*Acinonyx jubatus*) with pregnant mare serum gonadotropin and human chorionic gonadotropin treatments.** *Journal of Veterinary Medical Science the Japanese Society of Veterinary Science, The* 63(12): 1361-4. ISSN: (p) 0916-7250; online: 1347-7439.
**Abstract:** In 3 adult female cheetahs, induced-superovulation treatment was conducted, by means of 200 IU of pregnant mare serum gonadotropin (PMSG) and 100 IU of human chorionic gonadotropin (hCG) 80 hr after PMSG. The administration of PMSG created a sharp increase in the estradiol-17beta concentration, resulting in 232 pg/ml 8 hr later in one specimen out of three. The hCG administration showed an increase in the progesterone concentration of 2.29 ng/ml 46 hr later. In addition, after direct observation of the ovary surface by laparoscopy, 5 follicles in the right ovary over 2 mm in diameter, and 7 corpora lutea (5 in the right ovary and 2 in the left) were found. It is assumed that ovulation can be induced with hCG after 80 hr on PMSG during a cheetah's diestrus or

proestrus.
**Descriptors:** cheetah, *Acinonyx jubatus*, conservation of natural resources, physiology, chorionic gonadotropin, pharmacology, estradiol blood, gonadotropins, equine pharmacology, ovary drug effects, ovulation induction, progesterone, blood, surgery, chorionic gonadotropin, administration, dosage, methods, gonadotropins, administration, dosage, laparoscopy, ovary physiology, ovulation induction methods.

Doi, O., N. Shibayama, K. Sugiura, H. Kusunoki, T. Sato, T. Tomita, T. Abe, S. Fukushige, M. Sakata, Y. Sasaki, T. Nishikaku, Y. Tasaki, T. Hase, and T. Nakamura (1995). **Changes in plasma concentrations of progesterone and estradiol-17beta in non-pregnant and pregnant cheetahs (*Acinonyx jubatus*).** *Journal of Reproduction and Development (Japan)* 41(3): 235-239. ISSN: 0916-8818.
**Abstract:** Changes in plasma progesterone and estradiol-17beta concentrations in 3 non-pregnant and 2 pregnant cheetahs were determined by radioimmunoassays. Progesterone concentrations inn the non-pregnant cheetahs varied between 0.78 and 6.20 ng/ml and exhibited elevations at intervals of 10 to 12 weeks. There was one cheetah (2-year-old) in which plasma estradiol-17beta concentrations elevated 1 to 2 weeks prior to the peak plasma progesterone concentrations. In the pregnant cheetahs, plasma progesterone concentrations increased at Day 3, rose to a peak (13 ng/ml) at Day 27, and decreased gradually until the time of birth. Plasma estradiol-17beta concentrations in the pregnant cheetah attained a peak value (430 pg/ml) at Day 4 before copulation), decreased gradually until Day 60 and increased again at Day 66 (409 pg/ml). In an aborted cheetah, the estradiol-17beta level showed only a slight increase. These data provide the first assessment of reproductive functions in the female cheetah as monitored by plasma steroid profiles.
**Descriptors:** cheetah, *Acinonyx jubatus*, progesterone, estradiol, changes in plasma concentrations, pregnant, non-pregnant, radioimmune assays, reproductive frunctions.
**Language of Text:** Summary in English.

Donoghue, A.M., J.G. Howard, A.P. Byers, K.L. Goodrowe, M. Bush, E. Blumer, J. Lukas, J. Stover, K. Snodgrass, and D.E. Wildt (1992). **Correlation of sperm viability with gamete interaction and fertilization in vitro in the cheetah (*Acinonyx jubatus*).** *Biology of Reproduction* 46(6): 1047-56. ISSN: 0006-3363.
**Abstract:** Sperm-oocyte interaction in vitro was studied in the cheetah, a species known to produce poor quality ejaculates and to experience low rates of fertility. Twelve female cheetahs were injected (i.m.) with eCG followed by hCG 84 h later. Twenty-four to 26 h post hCG, each was subjected to laparoscopic oocyte aspiration. A sperm motility index (SMI) was calculated for each of 9 cheetah sperm donors that produced ejaculates averaging 41.3 +/- 22.9 x 10(6) motile sperm and 28.4 +/- 4.9% structurally normal sperm. Each ejaculate was used to inseminate cheetah oocytes from 1 or 2 females and salt-stored, domestic cat oocytes. The presence of ovarian follicles (greater than or equal to 1.5 mm in diameter) showed that all females responded to exogenous gonadotropins (range, 11-35 follicles/female). A total of 277 cheetah oocytes was collected from 292 follicles (94.9% recovery; 23.1 +/- 2.2 oocytes/female). Of these, 250 (90.3%) qualified as mature and 27 (9.7%) as degenerate. Of the 214 mature oocytes inseminated, 56 (26.2%) were fertilized, and 37 (17.3%) cleaved to the 2-cell stage in vitro; but the incidence of in vitro fertilization (IVF) varied from 0 to 73.3% (p less than 0.001) among individual males. When oocytes from individual cheetahs (n = 5) were separated into two groups and inseminated with sperm from a male with an SMI greater than 0 after 6 h coincubation versus an SMI = 0 at this time, the mean fertilization rates were 28/44 (63.6%) and 0/37 (0%), respectively (p less than 0.05). Of the 117 domestic cat oocytes coincubated with cheetah sperm, 96.6% contained 1 or more cheetah sperm in the outer half of the zona pellucida (ZP). Although the mean number of cheetah sperm penetrating the outer ZP of the cat oocyte was similar (p greater than 0.05) among all males, there was a positive correlation between the number of sperm reaching the inner half of the ZP and fertilization rate in vitro (r = 0.82; p less than 0.05). Compared to IVF efficiency in the domestic cat and tiger as reported in earlier studies, IVF efficiency in the cheetah is low. Because oocytes from 11 of 12 cheetahs were fertilized in vitro, there is no evidence that the female gamete is incompetent. Although sperm pleiomorphisms may contribute to poor reproductive performance, examination of the data on the basis of individual sperm donors reveals that effective gamete interaction in the cheetah is dictated, in part, by sperm motility.
**Descriptors:** cheetah, *Acinonyx jubatus*, sperm viability, gamete interaction, fertilization, in vitro, sperm oocyte interaction, sperm motility, reproductive performance.

Durrant, B.S., S.E. Millard, T.S. Peterson, T.S. Everett, and D.M. Zimmerman (1997). **Lifetime semen production in a captive cheetah (*Acinonyx jubatus*)**. *Biology of Reproduction* 56(SUPPL. 1): 106. ISSN: 0006-3363.
**Descriptors:** cheetah, *Acinonyx jubatus*, captive, behavior, reproductive system, lifetime semen production, wildlife management, conservation, sexual behavior.
**Notes:** Meeting Information: Thirtieth Annual Meeting of the Society for the Study of Reproduction, Portland, Oregon, USA; August 2-5, 1997.

Durrant, B.S., S.E. Millard, D.M. Zimmerman, and D.G. Lindburg (2001). **Lifetime semen production in a cheetah (*Acinonyx jubatus*).** *Zoo Biology* 20(5): 359-366. ISSN:

0733-3188.

**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, spermatozoa, senescence, male fertility, sexual maturity, motility, age differences, semen characters, ejaculate volume, semen production.

Goodrowe, K.L., G.J. Crawshaw, and K.G. Mehren (1991). **Stimulation of ovarian activity and oocyte recovery in the caracal (*Felis caracal*) and cheetah (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 22(1): 42-48. ISSN: 1042-7260.
**Descriptors:** cheetah, *Acinonyx jubatus*, caracal, *Felis caraca*, female infertility, Zoo animals, Felidae, ovarian activity, stimulation, ovarian recovery.

Gottelli, D., J. Wang, S. Bashir, and S.M. Durant (2007). **Genetic analysis reveals promiscuity among female cheetahs.** *Proceedings. Biological Sciences The Royal Society* 274(1621): 1993-2001. ISSN: (p) 0962-8452; (E) 1471-2945.
**Abstract:** Cheetahs (*Acinonyx jubatus*) have a combination of ranging patterns and social system that is unique in mammals, whereby male coalitions occupy small territories less than 10% of the home range of solitary females. This study uses non-invasive genetic sampling of a long-term study population of cheetah in the Serengeti National Park in Tanzania to infer the mating system. Individual cheetah genotypes at up to 13 microsatellite loci were obtained from 171 faecal samples. A statistical method was adapted to partition the cubs within each litter (n=47) into full-sibling clusters and to infer the father of each cluster using these loci. Our data showed a high rate of multiple paternity in the population; 43% of litters with more than one cub were fathered by more than one male. The results also demonstrated that female fidelity was low, and provided some evidence that females chose to mate with unrelated males within an oestrus cycle. The low rate of paternity assignments indicated that males living outside the study area contributed substantially to the reproduction of the cheetah population.
**Descriptors:** cheetah, *Acinonyx jubatus*, females mating preference, genetic analysis, genotype, female, promiscuity, social dominance, fecal samples, estrus cycle, Serengeti National Park, Tanzania.

Graham, L.H., K.L. Goodrowe, J.I. Raeside, and R.M. Liptrap (1995). **Non-invasive monitoring of ovarian function in several felid species by measurement of fecal estradiol-17 beta and progestins.** *Zoo Biology* 14(3): 223-237. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, lynx, leopards, lions, tigers, felid species, estradiol, ovulation, progesterone, ovarian function, radioimmunoassay, zoos, high performance liquid chromatography.

Harley, E.H., I. Baumgarten, and P.S. Rogers (2000). **The use of dna microsatellite markers for determining paternity in a captive cheetah population**. *South African Journal of Wildlife Research* 30(1): 22-25. ISSN: 0379-4369.
**Descriptors:** cheetah, *Acinonyx jubatus*, paternity determination, DNA microsatellite markers, captive population, phenotype, alleles, genetic studies.

Harris, L., B.G. Steinetz, J.B. Bond, S. Lasano, and W.F. Swanson (2008). **Refinement of a commercial bench-top relaxin assay for pregnancy diagnosis using urine from domestic and nondomestic felids**. *Journal of Zoo and Wildlife Medicine* 39(2): 170-179. ISSN: 1042-7260.
**Descriptors:** nondomestic felids, domestic felids, pregnancy diagnosis, commercial bench top relaxin assay, refinement, urinary relaxin, pregnancy.

Howard, J., A.M. Donoghue, M.A. Barone, K.L. Goodrowe, E.S. Blumer, K. Snodgrass, D. Starnes, M. Tucker, M. Bush, and D.E. Wildt (1992). **Successful induction of ovarian activity and laparoscopic intrauterine artificial insemination in the cheetah (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 23(3): 288-300. ISSN: 1042-7260.
**NAL Call Number:** 1042-7260
**Descriptors:** cheetah, *Acinonyx jubatus*, artificial insemination, zoo animals, induction of ovarian activity, laparoscopic intrauterine.

Howard, J.G., T.L. Roth, W.F. Swanson, J.L. Buff, M. Bush, J. Grisham, L. Marker Kraus, D. Kraus, and D.E. Wildt (1997). **Successful intercontinental genome resource banking and artificial insemination with cryopreserved sperm in cheetahs**. *Journal of Andrology* 0(SUPPL.): P55. ISSN: 0196-3635.
**Descriptors:** cheetahs, *Acinonyx jubatus*, intercontinenta genome resource banking, artificial insemination, sperm, cryopreserved, meeting information.
**Notes:** 22nd Annual Meeting of the American Society of Andrology, Baltimore, Maryland, USA; February 22-25, 1997.

Kusunoki, H., K. Okuda, K. Ueda, T. Ooe, T. Hayashi, S. Ito, S. Kawakami, E. Saitou, T. Fukuoka, T. Hase, T. Sato, and O. Doi (2006). **Evaluation of semen quality of captive-living cheetahs (*Acinonyx jubatus*) in Japan**. *Japanese Journal of Zoo and Wildlife Medicine* 11(1): 25-30. ISSN: 1342-6133.
**Abstract:** Thirty-one ejaculates from 18 captive-living cheetahs (*A. jubatus*) maintained

at three zoological institutions in Japan were collected by rectal probe electrostimulation and evaluated. Thirteen of the males had no reproductive history. Semen characteristics (mean+or-SEM) recorded were as follows: semen volume, 0.9+or- 0.11 ml; semen pH, 8.1+or-0.1; total sperm count per ejaculate, 32.6+or-5.4 million; sperm viability, 84.9+or-1.9%; sperm motility index, 53.7+or-3.8; sperm abnormality, 66.1+or-3.4% and percentage of sperm with a normal acrosome, 68.5+or-5.1%. These values were approximately in the range of the results reported in other cheetahs. These parameters, except for the percentage of sperm with a normal acrosome, were not significantly different between the fertile and subfertile males. The acrosomal integrity in the subfertile males (59.8%) was significantly lower than that in fertile ones (86.9%), but even the values in the former were not necessarily fatally low. This result indicates that their poor semen quality may not inhibit reproductive efficiency in captive male cheetahs in Japan. *Reproduced with permission of CAB.*
**Descriptors:** cheetahs, *Acinonyx jubatus*, seman quality, ejaculate volume, evaluation, infertility, male fertility, motility, pH, semen characters, spermatozoa, zoo animals.
**Language of Text:** Japanese.

Lindburg, D.G., B.S. Durrant, S.E. Millard, and J.E. Oosterhuis (1993). **Fertility assessment of cheetah males with poor quality semen.** *Zoo Biology* 12(1): 97-103. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** male cheetahs, *Acinonyx jubatus*, semen, male fertility, reproductive efficiency, homozygosity, zoo animals, males, inbreeding depression, semen characters, breeding programs, California.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Marker Kraus, L. and J. Grisham (1993). **Captive breeding of cheetahs in North American zoos: 1987-1991.** *Zoo Biology* 12(1): 5-18. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, captive breeding, zoos, pedigree, endangered species, studbooks, breeding programs, North America.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

O'Brien, S.J., M.E. Roelke, L. Marker, A. Newman, C.A. Winkler, D. Meltzer, L. Colly, J.F. Evermann, M. Bush, and D.E. Wildt (1985). **Genetic basis for species vulnerability in the cheetah.** *Science* 227(4693): 1428-34. ISSN: 0036-8075.
**Abstract:** A population genetic survey of over 200 structural loci previously revealed that the South African cheetah (*Acinonyx jubatus jubatus*) has an extreme paucity of genetic variability, probably as a consequence of a severe population bottleneck in its recent past. The genetic monomorphism of the species is here extended to the major histocompatibility complex, since 14 reciprocal skin grafts between unrelated cheetahs were accepted. The apparent consequences of such genetic uniformity to the species include (i) great difficulty in captive breeding, (ii) a high degree of juvenile mortality in captivity and in the wild, and (iii) a high frequency of spermatozoal abnormalities in ejaculates. The species vulnerability of the cheetah was demonstrated by an epizootic of coronavirus-associated feline infectious peritonitis in an Oregon breeding colony in 1983. Exposure and spread of the coronavirus, which has a very low morbidity in domestic cats (approximately 1 percent), has decimated a heretofore productive and healthy captive population. The extreme genetic monomorphism, especially at the major histocompatibility complex, and the apparent hypersensitivity of the cheetah to a viral pathogen may be related, and provide a biological basis for understanding the adaptive significance of abundant genetic variation in outbred mammalian species.
**Descriptors:** cheetah, *Acinonyx jubatus*, paucity of genetic variability, population bottleneck, genetic survey, genetic uniformity, spermatozoal abnormalities, coronavirus, genetic monomorphism, difficulty in captive breeding.

Pukazhenthi, B., L. Penfold, D. Wildt, and J. Howard (2002). **Direct assessment of cooling-induced changes in cheetah spermatozoa**. *Biology of Reproduction* 66(Supplement 1): 240. ISSN: 0006-3363.
**Descriptors:** cheetah, *Acinonyx jubatus*, reproductive system, reproduction, spermatozoa, cooling induced changes, assessment, percent sperm motility, percent sperm viability.
**Notes:** 35th Annual Meeting of the Society for the Study of Reproduction, Baltimore, Maryland, USA; July 28-31, 2002.

Radcliffe, R.W., S. Osofsky, D. Decker, B. Wolfe, and M. Bush (1995). **Laparoscopic vasectomy: a simple technique for sterilization of the male cheetah (*Acinonyx jubatus*)**. *Proceedings of a Joint Conference American Association of Zoo Veterinarians, Wildlife Disease Association, and American Association of Wildlife Veterinarians, East Lansing, Michigan, USA; August 12-17, 1995,*Vol. 1995, p. 435-437.
**Descriptors:** male cheetah, *Acinonyx jubatus*, sterilization, laparoscopic vasectomy, simple technique, case report.

Roth, T.L., W.F. Swanson, E. Blumer, and D.E. Wildt (1995). **Enhancing zona penetration by spermatozoa from a teratospermic species, the cheetah (*Acinonyx jubatus*).**

*Journal of Experimental Zoology.* 271(4): 323-30. ISSN: 0022-104X.
**Abstract:** Cheetahs (*Acinonyx jubatus*) produce poor quality ejaculates that can limit the efficiency of standard assisted reproduction including artificial insemination (AI) and in vitro fertilization (IVF). The purpose of this study was to: (1) further study sperm-oocyte interaction in this teratospermic species by examining the ability of malformed sperm to interact with various oocyte barriers; and (2) assess the potential of zona piercing for assisting IVF in a teratospermic felid. Zonae of salt-stored (SS), domestic cat oocytes were mechanically pierced (ZnPd) three times each. Semen was collected by electroejaculation from six male cheetahs and ejaculates were processed for IVF. Sperm aliquots from each ejaculate were assessed for a sperm motility index (SMI) over time. Zona-intact (ZnIn-SS) oocytes (n = 78) and ZnPd-SS oocytes (n = 74) were coincubated with spermatozoa in vitro for 6 h. The proportion of morphologically abnormal spermatozoa per ejaculate was high for all males (range 81.5% to 95.9%). SMI values at 0 and 6 h were variable, ranging from 50 to 75 and 0 to 40, respectively. Spermatozoa from all ejaculates bound to and penetrated the outer zona pellucida of ZnIn-SS and ZnPd-SS oocytes similarly ($P > 0.05$). The proportion of oocytes containing spermatozoa within the inner zona layer and the average number of spermatozoa per oocyte in this region were greater ($P < 0.05$) for the ZnPd-SS than ZnIn-SS oocytes (39.2% and 1.0 versus 12.8% and 0.2, respectively). Although zona piercing enhanced sperm penetration, there was no increase ($P > 0.05$) in pleiomorphic spermatozoa penetrating the inner zona pellucida or PVS.(ABSTRACT TRUNCATED AT 250 WORDS)
**Descriptors:** cheetahs, *Acinonyx jubatus*, physiology, sperm ovum interactions, spermatozoa abnormalities, zona pellucida physiology, analysis of variance, domestic cats, sperm motility.

Setchell, K.D., S.J. Gosselin, M.B. Welsh, J.O. Johnston, W.F. Balistreri, L.W. Kramer, B.L. Dresser, and M.J. Tarr (1987). **Dietary estrogens--a probable cause of infertility and liver disease in captive cheetahs.** *Gastroenterology* 93(2): 225-33. ISSN: 0016-5085.
**Abstract:** The cheetah in the wild is "racing towards extinction" mostly due to habitat destruction. Its survival will probably depend on accelerated captive breeding. At this time, however, reproductive failure and liver disease threaten the future of the captive cheetah population. Histopathological evaluation of more than 100 cheetah livers identified venocclusive disease as the main hepatic lesion responsible for liver disease in this species. Analysis of the commercial feline diet by high-performance liquid chromatography and gas-liquid chromatography-mass spectrometry revealed large amounts of two phytoestrogens identified as daidzein and genistein. These compounds were found to be derived from a soybean product that was a component of the cheetah diet, and their concentrations both ranged from 18 to 35 micrograms/g diet. The adult cheetah consequently consumes approximately 50 mg/day of these weak estrogens. When extracts of the diet were tested for estrogenicity using a bioassay, a dose-related increase in uterine weight was observed. In 4 cheetahs studied, withdrawal of this feline diet by substitution with a chicken diet resulted in an improvement in conventional liver function tests and a normalization in the appearance of hepatic mitochondria. We conclude that the relatively high concentrations of phytoestrogens from soybean protein present in the commercial diet fed to captive cheetahs in North American zoos may be one of the major factors in the decline of fertility and in the etiology of liver disease in this species. The survival of the captive cheetah population could depend upon a simple change of diet by excluding exogenous estrogen.
**Descriptors:** cheetah, *Acinonyx jubatus*, growth, development, animal feed adverse effects, growth, development, cat diseases chemically induced, estrogens adverse effects, estrogens non-steroidal, infertility, isoflavones, liver diseases, soybeans, biological assay, cat diseases, pathology, cats, chromatography, high pressure liquid gas chromatography, mass spectrometry, hepatic veno occlusive disease, liver pathology, liver ultrastructure, liver function tests, mice, phytoestrogens, plant preparations, rats.

Wielebnowski, N. (1996). **Reassessing the relationship between juvenile mortality and genetic monomorphism in captive cheetahs.** *Zoo Biology* 15(4): 353-369. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetahs, *Acinonyx jubatus*, zoo animals, mortality, litter size, homozygosity, animal breeding, endangered species, reproductive performance, juvenile animals, captive breeding.

Wielebnowski, N. and J.L. Brown (1998). **Behavioral correlates of physiological estrus in cheetahs.** *Zoo Biology* 17(3): 193-209. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetahs, *Acinonyx jubatus*, estrus, animal behavior, monitoring, feces, estradiol, metabolites, estrus, age, individual characteristics, behavior change, feces composition.

Wielebnowski, N.C. (1999). **Behavioral differences as predictors of breeding status in captive cheetahs**. *Zoo Biology* 18(4): 335-349. ISSN: 0733-3188.
**Descriptors:** cheetahs, *Acinonyx jubatus*, captive born, behavioral differences, predictors, breeding status, behavioral variation, husbandry regimens, breeding problems.

Wildt, D.E., J.L. Brown, M. Bush, M.A. Barone, K.A. Cooper, J. Grisham, and J.G. Howard (1993). **Reproductive status of cheetahs (*Acinonyx jubatus*) in North American zoos: the benefits of physiological surveys for strategic planning.** *Zoo Biology* 12(1): 45-80. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetahs, *Acinonyx jubatus*, zoos, reproductive efficiency, spermatozoa, ovaries, hormones, zoo animals, Graafian follicles, animal breeding, breeding programs, semen characters, reproductive performance, North America.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Wildt, D.E., M. Bush, J.G. Howard, S.J. O'Brien, D. Meltzer, A. Van Dyk, H. Ebedes, and D.J. Brand (1983). **Unique seminal quality in the South African cheetah and a comparative evaluation in the domestic cat.** *Biology of Reproduction* 29(4): 1019-25. ISSN: (p) 0006-3363; online: 1529-7268.
**Abstract:** Analysis of 40 semen samples collected by electroejaculation from 18 cheetahs revealed no major differences in seminal traits among Transvaal, South West (Namibia) or hybrid (Transvaal X South West) males. However, mean spermatozoal concentration (14.5 X 10(6) spermatozoa/ml of ejaculate) and percent motility (54.0%) were less in cheetahs than in domestic cats (147.0 X 10(6) spermatozoa/ml of ejaculate, 77.0% motility) subjected to the same electroejaculation regimen. On the average, cheetah ejaculates contained 71.0% morphologically abnormal spermatozoa compared to 29.1% aberrant spermatozoal forms in the domestic cat. These results indicate that seminal characteristics in the cheetah are markedly inferior compared to the domestic cat, particularly with respect to the incidence of pleiomorphic spermatozoa. Because a recent parallel study demonstrates that the cheetah lacks genetic variation, it appears likely that spermatozoal abnormalities are a genetic consequence of genomic homozygosity characteristic of this endangered species.
**Descriptors:** cheetah, *Acinonyx jubatus*, anatomy, histology, carnivora anatomy, histology, cats anatomy, histology, semen cytology, spermatozoa cytology, species specificity, sperm motility, spermatozoa abnormalities, South Africa.

Wildt, D.E., P.K. Chakraborty, D. Meltzer, and M. Bush (1984). **Pituitary and gonadal response to LH releasing hormone administration in the female and male cheetah.** *Journal of Endocrinology, The* 101(1): 51-6. ISSN: 0022-0795.
**Abstract:** Luteinizing hormone releasing hormone (LHRH, 50 micrograms) or saline was administered (i.m.) to adult female and male cheetahs under anaesthesia to evaluate pituitary and gonadal response. Serum LH levels did not fluctuate over a 120-min sampling period in saline-treated animals. Serum LH concentrations were raised (P less than 0.05) in both female and male cheetahs after LHRH injection, the temporal response being similar to previously reported results in unanaesthetized, domestic carnivores. The magnitude of the LHRH-induced LH response was sex-dependent. Over a 120-min post-injection period both saline control and LHRH-induced LH levels were about twofold greater in males than females. Although LHRH had no acute influence on ovarian oestradiol-17 beta production in the female, serum testosterone levels were raised (P less than 0.05) in male cheetahs by 60 min after treatment. This study (1) provides introductory endocrine information on the cheetah, an endangered species, and (2) indicates that exogenous LHRH is effective in acutely altering pituitary (female) and pituitary/gonadal (male) function in an anaesthetized, non-domestic felid.
**Descriptors:** cheetah, *Acinonyx jubatus*, blood, gonadotropin releasing hormone, pharmacology, ovary drug effects, pituitary gland drug effects, testis drug effects, general anesthesia, estradiol blood, luteinizing hormone blood, radioimmunoassay, testosterone blood.

Wildt, D.E., D. Meltzer, P.K. Chakraborty, and M. Bush (1984). **Adrenal-testicular-pituitary relationships in the cheetah subjected to anesthesia/electroejaculation.** *Biology of Reproduction* 30(3): 665-72. ISSN: (p) 0006-3363; online: 1529-7268.
**Abstract:** The influence of electroejaculation on the acute response in serum cortisol, testosterone and luteinizing hormone (LH) was studied in the South African cheetah . Males were either anesthetized with CT-1341 and 1) serially bled only (controls, n = 7) or 2) serially bled during and following a regimented protocol of rectal probe electroejaculation (n = 14). In the control cheetahs , mean cortisol concentrations declined over time (P less than 0.05) and neither testosterone nor LH varied over the 145-min sampling interval. Serum cortisol rose immediately in electroejaculated cheetahs , peaked at the end of electroejaculation in 13 of 14 males and then declined during the next 90 min. Temporal profiles and serum levels of testosterone and LH were similar in the electroejaculated and control groups (P greater than 0.05). Within individual cheetahs , serum levels of LH and testosterone were highly correlated (r = 0.77, P less than 0.01). Awake (n = 2) and CT-1341 anesthetized (n = 2) cheetahs also were bled and then challenged with an i.m. injection of 25 IU adrenocorticotropic hormone (ACTH, Cortrosyn). Serial blood samples were collected during the next 2 h and assayed. Cortisol concentrations prior to ACTH administration were greater in awake than in anesthetized males. In all animals, cortisol rose immediately and peaked within 30-60 min of injection. Whereas all 4 ACTH-treated cheetahs produced cortisol titers in excess of 200 ng/ml, only 4 of 14 electroejaculated males produced cortisol levels comparable to this concentration range. Neither testosterone nor LH profiles were affected by ACTH-induced elevations in

cortisol.(ABSTRACT TRUNCATED AT 250 WORDS)
**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, adrenal cortex physiology, ejaculation, drug effects, pituitary gland, anterior physiology, testis physiology, adrenocorticotropic hormone administration, dosage, electric stimulation, hydrocortisone blood, luteinizing hormone blood, radioimmunoassay, testosterone blood.

Wildt, D.E., S.J. O'Brien, J.G. Howard, T.M. Caro, M.E. Roelke, J.L. Brown, and M. Bush (1987). **Similarity in ejaculate-endocrine characteristics in captive versus free-ranging cheetahs of two subspecies.** *Biology of Reproduction* 36(2): 351-60. ISSN: (p) 0006-3363; online: 1529-7268.
**Abstract:** Ejaculate-endocrine characteristics were measured in 23 captive cheetahs (*Acinonyx jubatus jubatus*) in North American zoos and in 8 free-ranging cheetahs (A.j. raineyi) in eastern Africa (Tanzania). A standardized electroejaculation protocol was used, and numbers of motile spermatozoa were similar (p greater than 0.05) between groups. Of the spermatozoa collected by electroejaculation, 70.6 +/- 3.3% and 75.9 +/- 4.4% were morphologically abnormal in the captive "North American" and in the free-ranging, eastern African populations, respectively. Adrenal activity, as measured by an acute, temporal rise and fall in serum cortisol levels during and after electroejaculation, was no different (p greater than 0.05) between groups. Although serum luteinizing hormone (LH) levels were less (p less than 0.05) in the free-ranging than in the captive animals, serum testosterone concentrations were similar. The data indicate that the comparatively poor reproductive performance of cheetahs maintained in zoological parks is not attributable to a captivity-induced response afflicting the male. Furthermore, there is no evidence that ejaculate/endocrine characteristics differ between the two subspecies. Because adrenal/gonadal activity and the number of pleiomorphic spermatozoa are similar between the test groups, the results suggest that spermatozoal diversity originates as a result of the extreme genetic monomorphism observed universally in the species.
**Descriptors:** cheetah, *Acinonyx jubatus*, physiology, ejaculation, endocrine glands physiology, *Acinonyx* genetics, luteinizing hormone blood, reproduction, species specificity, testosterone blood, variation genetics.

Wildt, D.E., L.G. Phillips, L.G. Simmons, P.K. Chakraborty, J.L. Brown, J.G. Howard, A. Teare, and M. Bush (1988). **A comparative analysis of ejaculate and hormonal characteristics of the captive male cheetah, tiger, leopard, and puma.** *Biology of Reproduction* 38(2): 245-255. ISSN: (p) 0006-3363; online: 1529-7268.

**Abstract:** Male cheetahs, tigers, leopards, and pumas maintained under the same conditions were anesthetized and 1) serially bled before, during, and after electroejaculation (EE); 2) serially bled only (AO); or 3) serially bled before and after receiving adrenocorticotropin hormone (ACTH). Ejaculates from leopards contained higher (p less than 0.05) sperm concentrations than cheetahs and pumas but lower (p less than 0.05) sperm motility ratings than all other species. Tigers produced a larger seminal volume and the greatest number of motile sperm/ejaculate (p less than 0.05). The percentage of morphologically abnormal spermatozoa was greater (p less than 0.05) in cheetahs (64.6%), leopards (79.5%), and pumas (73.5%) than in tigers (37.5%). The most prevalent spermatozoal deformities included a tightly coiled or bent flagellum, a deranged midpiece, or a residual cytoplasmic droplet. Mean baseline serum cortisol concentrations in leopards were 2- and 4-fold greater (p less than 0.05) than in tigers and cheetahs, respectively. Basal cortisol concentrations in pumas were similar to those of tigers, but irrespective of treatment increased 2-fold (p less than 0.01) during the bleeding period. An acute rise and fall in cortisol attributable to EE was observed only in cheetahs. In tigers and leopards, mean peak cortisol concentrations after ACTH were similar to maximal values observed after EE. However, peak cortisol levels in cheetahs and pumas after ACTH were greater (p less than 0.01) than the concentrations measured after EE, indicating that these manipulatory procedures were not eliciting a maximal adrenal response. In the EE groups, luteinizing hormone (LH) and testosterone levels in cheetahs were lower (p less than 0.05) than in other species, whereas levels of both hormones were comparable (p greater than 0.05) in tigers, leopards, and pumas. Elevated cortisol levels in cheetahs and pumas had no discernible effect on LH/testosterone patterns; however, the results were equivocal in tigers, and, among leopards, testosterone concentrations consistently declined over time. In this study, using a standardized approach, we identify different ejaculate and endocrine characteristics of captive cheetahs, tigers, leopards, and pumas. The data extend earlier observations and demonstrate that some, but not all, Felidae species ejaculate high numbers of pleiomorphic spermatozoa. However, inter-species differences in sperm integrity do not appear related to inter-species variations in cortisol, LH, or testosterone. The observation of continuously declining testosterone concentrations only in leopards after AO, EE, or ACTH treatment suggests that rising and/or elevated cortisol appears to exert a species-specific influence on reproductive hormone activity.
**Descriptors:** cheetah, *Acinonyx jubatus*, tigers, leopards, pumas, ejaculate, comparative analysis, hormonal characteristics, captive, anesthetized, testosterone concentrations.

Wildt, D.E., C.C. Platz, S.W. Seager, and M. Bush (1981). **Induction of ovarian activity in the cheetah (*Acinonyx jubatus*).** *Biology of Reproduction* 24(1): 217-22. ISSN: (p) 0006-3363; online: 1529-7268.

**Descriptors:** cheetah, *Acinonyx jubatus*, ovarian activity, induction, physiology, follicle stimulating hormone, ovary physiology, chorionic gonadotropin pharmacology, corpus luteum physiology, ovary drug effects.

Wildt, D.E. and T.L. Roth (1997). **Assisted reproduction for managing and conserving threatened felids**. *International Zoo Yearbook* 35(0): 164-172. ISSN: 0074-9664.
**Descriptors:** threatened felids, conserving, managing, assisted reproduction, artificial insenination, invitro fertilization, embryo transfer, cryopreservation, overview.

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## Information Resources on Big Cats

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### Cheetah - Conditions and Diseases

Alexander, K.A., N.J. MacLachlan, P.W. Kat, C. House, S.J. O'Brien, N.W. Lerche, M. Sawyer, L.G. Frank, K. Holekamp, L. Smale, J.W. McNutt, M.K. Laurenson, M.G.L. Mills, and B.I. Osburn (1994). **Evidence of natural bluetongue virus infection among African carnivores**. *American Journal of Tropical Medicine and Hygiene* 51(5): 568-576. ISSN: 0002-9637.
**Descriptors:** African carnivores, virus infection, natural bluetongue, evidence, cheetah, *Acinonyx jubatus*, lion, *Panthera leo*, shrews, rodents, dogs, cats, sheep, contaminated vaccine, BLU virus, mortality, abortion, meat, organs, ingestion, infected prey species.

Averbeck, G.A., K.E. Bjork, C. Packer, and L. Herbst (1990). **Prevalence of hematozoans in lions (*Panthera leo*) and cheetah (*Acinonyx jubatus*) in Serengeti National Park and Ngorongoro Crater, Tanzania.** *Journal of Wildlife Diseases* 26(3): 392-4. ISSN: 0090-3558.
**Abstract:** Lions (*Panthera leo*) and cheetah (*Acinonyx jubatus*) from the Serengeti National Park and Ngorongoro Crater Conservation Area, Tanzania were examined for the presence of blood protozoans. Twenty-eight percent of the lions were infected with *Trypanosoma* sp. and the prevalence of trypanosome infection varied significantly between adjacent habitats. All of the animals were infected with *Hepatozoon* sp. and a *Theileria* sp.-like piroplasm that was morphologically indistinguishable from *Theileria felis*.
**Descriptors:** lions, *Panthera leo*, cheetah, *Acinonyx jubatus*, hematozoans, prevalence, Serengeti National Park, Ngorongoro Crater, trypanosome infection, blood protozoans, *Theileria felis*. Tanzania.

Backues, K.A., J.P. Hoover, J.E. Bauer, G.A. Campbell, and M.T. Barrie (1997). **Hyperlipidemia in four related male cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(4): 476-80. ISSN: 1042-7260.
**Abstract:** Hyperlipidemia was identified in an 11-yr-old male cheetah (*Acinonyx jubatus*) and three related 3-yr-old male cheetah littermates. Hyperlipidemia in these four cheetahs was characterized by hypertriglyceridemia and hypercholesterolemia. The mean percentages of chylomicron and beta-lipoproteins were greater ($P < 0.05$) and the mean percent of alpha-lipoproteins was lower ($P < 0.05$) than the respective means for a group of 20 nonhyperlipidemic and clinically normal cheetahs. The etiology of the hyperlipidemia in these four cheetahs was not determined. However, the older cheetah also had chronic renal insufficiency and a parathyroid adenoma, conditions that have been associated with hyperlipidemia.
**Descriptors:** male cheetah, *Acinonyx jubatus*, blood profile of hyperlipidemias, cholesterol blood, chylomicrons, hyperlipidemias, hyperlipidemias genetics, lipoproteins, ldl blood, triglycerides in blood, veterinary care.

Baron, T., P. Belli, J.Y. Madec, F. Moutou, C. Vitaud, and M. Savey (1997). **Spongiform encephalopathy in an imported cheetah in France.** *Veterinary Record Journal of the British Veterinary Association* 141(11): 270-271. ISSN: 0042-4900.
**NAL Call Number:** 41.8 V641
**Descriptors:** cheetah, *Acinonyx jubatus*, spongiform encephalopathy, symptoms,

histopathology, prions, meat, bone meal, case studies, France, Great Britain.

Baxby, D., D.G. Ashton, D.M. Jones, and L.R. Thomsett (1982). **An outbreak of cowpox in captive cheetahs: virological and epidemiological studies.** *Journal of Hygiene, The* 89(3): 365-72. ISSN: 1438-4630.

**Abstract:** This paper describes virological and epidemiological features of an infection which killed two of three affected cheetahs at Whipsnade Park in 1977. Two animals had profuse skin lesions and the third had an acute haemorrhagic pneumonia. The outbreak was shown to be caused by cowpox virus. Cowpox virus is believed to circulate in small wild animals, but the source of infection was not traced despite virological and serological tests on 93 captive and 102 wild animals. Sub-clinical infections did not occur in susceptible contact cheetahs. Immune globulin did not influence the outcome and smallpox vaccine does not take in cheetahs. Management of any future outbreak will rely on prompt diagnosis and segregation of infected animals.

**Descriptors:** cheetahs, *Acinonyx jubatus*, wild and captive animals, microbiology, animals, zoo microbiology, Carnivora microbiology, cat diseases microbiology, management of disease outbreaks, vaccinia vitus, cats, disease outbreaks microbiology.

Beehler, B.A. (1982). **Oral therapy for nasal cryptococcosis in a cheetah.** *Journal of the American Veterinary Medical Association* 181(11): 1400-1. ISSN: 0003-1488.

**Descriptors:** cheetah, *Acinonyx jubatus*, Carnivora, cryptococcosis, imidazoles administration and dosage, piperazines administration and dosage, administration, oral, cryptococcosis drug therapy, ketoconazole, nasal cavity.

Bergstrom, J., M. Ueda, Y. Une, X. Sun, S. Misumi, S. Shoji, and Y. Ando (2006). **Analysis of amyloid fibrils in the cheetah (*Acinonyx jubatus*).** *Amyloid the International Journal of Experimental and Clinical Investigation the Official Journal of the International Society of Amyloidosis* 13(2): 93-8. ISSN: 1350-6129.

**Abstract:** Recently, a high prevalence of amyloid A (AA) amyloidosis has been documented among captive cheetahs worldwide. Biochemical analysis of amyloid fibrils extracted from the liver of a Japanese captive cheetah unequivocally showed that protein AA was the main fibril constituent. Further characterization of the AA fibril components by sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) and Western blot analysis revealed three main protein AA bands with approximate molecular weights of 8, 10 and 12 kDa. Mass spectrometry analysis of the 12-kDa component observed in SDS-PAGE and Western blotting confirmed the molecular weight of a 12,381-Da peak. Our finding of a 12-kDa protein AA component provides evidence that the cheetah SAA sequence is longer than the previously reported 90 amino acid residues (approximately 10 kDa), and hence SAA is part of the amyloid fibril.

**Descriptors:** cheetah, *Acinonyx jubatus*, genetics, amyloidosis, serum amyloid a protein genetics, *Acinonyx* metabolism, amino acid sequence, amyloidosis epidemiology, amyloidosis metabolism, amyloidosis pathology, animal diseases epidemiology, animal diseases genetics, animal diseases metabolism, animal diseases pathology, liver diseases epidemiology, liver diseases genetics, liver diseases metabolism, liver diseases pathology, serum amyloid a protein metabolism.

Bernstein, J.J. (1979). ***Cryptococcus osteomyelitis* in a cheetah**. *Feline Practice* 9(5): 23-25. ISSN: 1057-6614.

**Descriptors:** cheetah, *Acinonyx jubatus*, *Cryptococcus osteomyelitis*, bone infection, therapy, amphotericin B methyl ester, iv, increased dosage, recovery.

Berry, W.L., J.E. Jardine, and I.W. Espie (1997). **Pulmonary cryptococcoma and cryptococcal meningoencephalomyelitis in a king cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(4): 485-90. ISSN: 1042-7260.

**Abstract:** A captive king cheetah (*Acinonyx jubatus*) was evaluated for a subacute onset of ataxia in all four limbs. The ataxia appeared to be spinal in origin, evidenced by apparent conscious proprioceptive deficits in all limbs, and there was no evidence of cerebellar involvement. Anesthesia was performed and survey spinal radiographs were normal. Cerebrospinal fluid analysis revealed an apparently sterile meningitis of unknown etiology. Although transient improvement was noted with glucocorticoid and antimicrobial therapy, the condition deteriorated subsequently and the animal became quadriparetic and paraplegic. Follow-up cerebrospinal fluid analysis and culture revealed the presence of *Cryptococcus neoformans*. Myelography demonstrated obstruction of the subarachnoid space at the level of the seventh cervical vertebra. Pathological examination following euthanasia revealed a solitary pulmonary cryptococcoma and confirmed cryptococcal meningoencephalomyelitis.

**Descriptors:** cheetah, *Acinonyx jubatus*, cryptococcosus, encephalomyelitis, lung diseases, fungal, meningitis, cryptococcal, brain microbiology, brain pathology, cerebrospinal fluid cytology, cerebrospinal fluid microbiology, cryptococcosis diagnosis, *Cryptococcus neoformans* isolation and purification, encephalomyelitis diagnosis, lung microbiology, lung pathology, lung diseases, fungal diagnosis, meningitis, cryptococcal diagnosis, spinal cord pathology.

Bolton, L.A., R.G. Lobetti, D.N. Evezard, J.A. Picard, J.W. Nesbit, J. van Heerden, and R.E.

Burroughs (1999). **Cryptococcosis in captive cheetah (*Acinonyx jubatus*): two cases.** *Journal of the South African Veterinary Association* 70(1): 35-9. ISSN: 0038-2809.
**Abstract:** *Cryptococcus neoformans* is a yeast-like organism associated with pulmonary, meningoencephalitic, or systemic disease. This case report documents 2 cases of cryptococcosis with central nervous system involvement in captive cheetah (*Acinonyx jubatus*). In both cases the predominant post mortal lesions were pulmonary cryptococcomas and extensive meningoencephalomyelitis. Both cheetahs tested negative for feline immunodeficiency virus and feline leukaemia virus. The organism isolated in Case 2 was classified as *Cryptococcus neoformans* var. gattii, which is mainly associated with disease in immunocompetent hosts.
**Descriptors:** cheetah, *Acinonyx jubatus*, *Cryptococcus neoformans*, classification, meningoencephalitis veterinary, cryptococcosis pathology, cryptococcosis therapy, isolation, purification, lung diseases, fungal pathology, fungal therapy, fungal veterinary, meningoencephalitis pathology, meningoencephalitis therapy, electron microscopy.

Bolton, L.A. and L. Munson (1999). **Glomerulosclerosis in captive cheetahs (*Acinonyx jubatus*).** *Veterinary Pathology* 36(1): 14-22. ISSN: 0300-9858.
**Abstract:** The cheetah (*Acinonyx jubatus*) is an endangered species with low fecundity and premature death in captivity. A previous survey determined that renal failure as a result of glomerulosclerosis was a major cause of death in captive populations. This study characterizes the morphologic, histochemical, and epidemiologic properties of glomerulosclerosis in this population. Kidneys from 87 cheetahs were examined by light microscopy; kidneys from six of those cheetahs were examined by electron and fluorescent microscopy using special stains specific for collagen, glycoproteins, reticulin, and fibrin. Immunohistochemistry for the advanced glycosylation end products (AGEs), pyrraline and pentosidine, also was performed on these cases. Glomerulosclerosis was present to some degree in 82% of the population, and in 30% of cheetahs the sclerosis was moderate to severe. Affected cheetah kidneys had thickened glomerular and tubular basement membranes, culminating in glomerulosclerosis. Thickened basement membranes were positive for collagen, glycoproteins, reticulin, and AGEs. Ultrastructurally, membrane material was homogeneous and fibrillar without electron-dense deposits. This glomerular lesion in cheetahs resembles diabetic glomerulopathy in humans and chronic progressive nephropathy in rats. No cheetahs had lesions of diabetes. However, adrenal cortical hyperplasia was prevalent and highly correlated with glomerulosclerosis in this population. If cheetahs with glomerulosclerosis had hypercorticoidism, then hyperglycemia and glomerular hypertension could lead to progressive AGE and plasma protein accumulations in membrane lesions. As in rats, daily feeding of high-protein diets and lack of genetic variation in the population may further contribute to the high prevalence of glomerulosclerosis in captive cheetahs.
**Descriptors:** cheetah, *Acinonyx jubatus*, glomerulonephritis, kidney pathology, age factors, zoo animals, cause of death, glomerulonephritis epidemiology, mortality, pathology, kidney failure, chronic etiology, chronic mortality, prevalence, rats, North America.

Boomker, J. and M.M. Henton (1980). **Pseudotuberculosis in a cheetah (*Acinonyx jubatus*)**. *South African Journal of Wildlife Research* 10(2): 63-66. ISSN: 0379-4369.
**Descriptors:** cheetah, *Acinonyx jubatus*, bacterial diseases, pseudotuberculosis, case reports, wild animals, carnivores, *Corynebacterium ovis*, liver abscesses, lung nodules, *C pseudotuberculosis.*
**Language of Text:** Afrikaans.

Briggs, M.B., J.F. Evermann, and A.J. McKeirnan (1986). **Feline infectious peritonitis**. *Feline Practice* 16 (2): 13-16. ISSN: 1057-6614.
**Descriptors:** cheetahs, *Acinonyx jubatus*, animal diseases, viral diseases, zoo animals, feline infectious peritonitis virus, coronavirus, antibodies, immunofluorescence, management of large cats, recommendations.

Briggs, M.B., C.W. Leathers, and W.J. Foreyt (1993). ***Sarcocystis felis* in captive cheetahs (*Acinonyx jubatus*).** *Journal of the Helminthological Society of Washington* 60(2): 277-279. ISSN: 1049-233X.
**NAL Call Number:** QL392.J68
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, *Sarcocystis felis*, new host records, Oregon, U.S.

Briggs, M.B. and R.L. Ott (1986). **Feline leukemia virus infection in a captive cheetah and the clinical and antibody response of six captive cheetahs to vaccination with a subunit feline leukemia virus vaccine.** *Journal of the American Veterinary Medical Association* 189(9): 1197-1199. ISSN: 0003-1488.
**NAL Call Number:** 41.8 AM3
**Descriptors:** captive cheetah, *Acinonyx jubatus*, leukemia, vaccination, vaccines, immune response, diagnosis, feline oncovirus, Oregon, U.S.

Brown, D.R., L.M. Schumacher, and M.B. Brown (1996). **Gastric *Mycoplasma felifaucium* infection of cheetahs with gastritis**. *Abstracts of the General Meeting of the American*

*Society for Microbiology* 96(0): 285. ISSN: 1060-2011.
**Descriptors:** cheetah, *Acinonyx jubatus*, gastritis, digestive system, infection, *Mycoplasma felifaucium*, microbiology, pathology, diagnosis, meeting abstract.
**Notes:** Meeting Information: 96th General Meeting of the American Society for Microbiology, New Orleans, Louisiana, USA; May 19-23, 1996.

Brown, E.W., R.A. Olmsted, J.S. Martenson, and S.J. O' Brien (1993). **Exposure to FIV and FIPV in wild and captive cheetahs.** *Zoo Biology* 12(1): 135-142. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, feline immunodeficiency virus, wild animals, zoo animals, serological surveys, feline peritonitis virus, FIV, FIPV.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Burger, P.A., R. Steinborn, C. Walzer, T. Petit, M. Mueller, and F. Schwarzenberger (2004). **Analysis of the mitochondrial genome of cheetahs (*Acinonyx jubatus*) with neurodegenerative disease.** *Gene* 338(1): 111-9. ISSN: 0378-1119.
**Abstract:** The complete mitochondrial genome of *Acinonyx jubatus* was sequenced and mitochondrial DNA (mtDNA) regions were screened for polymorphisms as candidates for the cause of a neurodegenerative demyelinating disease affecting captive cheetahs. The mtDNA reference sequences were established on the basis of the complete sequences of two diseased and two nondiseased animals as well as partial sequences of 26 further individuals. The *A. jubatus* mitochondrial genome is 17,047-bp long and shows a high sequence similarity (91%) to the domestic cat. Based on single nucleotide polymorphisms (SNPs) in the control region (CR) and pedigree information, the 18 myelopathic and 12 non-myelopathic cheetahs included in this study were classified into haplotypes I, II and III. In view of the phenotypic comparability of the neurodegenerative disease observed in cheetahs and human mtDNA-associated diseases, specific coding regions including the tRNAs leucine UUR, lysine, serine UCN, and partial complex I and V sequences were screened. We identified a heteroplasmic and a homoplasmic SNP at codon 507 in the subunit 5 (MTND5) of complex I. The heteroplasmic haplotype I-specific valine to methionine substitution represents a nonconservative amino acid change and was found in 11 myelopathic and eight non-myelopathic cheetahs with levels ranging from 29% to 79%. The homoplasmic conservative amino acid substitution valine to alanine was identified in two myelopathic animals of haplotype II. In addition, a synonymous SNP in the codon 76 of the MTND4L gene was found in the single haplotype III animal. The amino acid exchanges in the MTND5 gene were not associated with the occurrence of neurodegenerative disease in captive cheetahs.
**Descriptors:** cheetah, *Acinonyx jubatus*, pedigree, genetics, DNA, mitochondrial genetics, neurodegenerative diseases genetics, mitochondrial chemistry, gene order, haplotypes, molecular sequence data, mutation, neurodegenerative diseases pathology, phenotype, polymorphism, single nucleotide, sequence analysis, spinal cord diseases genetics, spinal cord diseases pathology.

Caughey, B. and G.S. Baron (2008). **Are cheetahs on the run from prion-like amyloidosis?** *Proceedings of the National Academy of Sciences of the United States of America* 105(20): 7113-7114. ISSN: (p) 0027-8424; online: 1091-6490.
**Descriptors:** cheetah, amyloid chemistry, amyloidosis genetics, *Acinonyx jubatus*, genetic predisposition to disease, kinetics, models, biological, protein binding, protein denaturation, protein folding.
**Notes:** Comment On: Proc Natl Acad Sci U S A. 2008 May 20;105(20):7263-8.

Chatfield, J., S. Citino, L. Munson, and S. Konopka (2004). **Validation of the 13C-urea breath test for use in cheetahs (*Acinonyx jubatus*) with Helicobacter.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 35(2): 137-41. ISSN: 1042-7260.
**Abstract:** Historically, therapeutic monitoring for prescribed eradication treatment of *Helicobacter* in cheetahs (*Acinonyx jubatus*) with associated gastritis has been accomplished only through endoscopic biopsies. The 13C-urea breath test (UBT) can offer an alternative to repeated biopsies for therapeutic monitoring. Five male and five female cheetahs and one male Sumatran tiger (*Panthera tigris*) were studied. All were clinically healthy before and after this investigation. Breath samples of end-tidal expiration were taken before and after administration of a 13C-enriched urea solution through a gastroesophageal tube. Twenty-milliliter breath samples were taken at 10, 20, 30, and 40 min after administration of the urea solution. The results of the breath analysis were compared with the results of rapid urease testing, histopathologic examination, and impression smears of gastric biopsies taken at the time of the breath test. The sensitivity and specificity for the 13C-UBT in this investigation were 100%. and the positive predictive value and negative predictive value were both 100%. Although the 13C-UBT is a good noninvasive diagnostic tool for monitoring the presence of *Helicobacter* sp. in the gastric mucosa, endoscopy should still be used for initial diagnosis and grading of gastritis and for monitoring the progression of disease in cheetahs. The 13C-UBT is a valuable, simple, accurate, and sensitive tool for monitoring eradication of *Helicobacter* during therapy for clinical gastritis.
**Descriptors:** cheetah, *Acinonyx jubatus*, carnivora, gastritis, helicobacter infections, *Helicobacter pylori*, urea analysis, breath tests methods, carbon isotopes diagnostic use,

gastritis diagnosis, gastritis pathology, helicobacter infections diagnosis, helicobacter infections pathology, predictive value of tests, sensitivity and specificity, urea diagnostic use.

Chomel, B.B., R.W. Kasten, J.B. Henn and S. Molia (2006). ***Bartonella* infection in domestic cats and wild felids**. *Annals of the New York Academy of Sciences.* Blackwell Publishing: , 9600 Garstngton Rd, Oxford OX4 2DQ, Oxen, UK, p. 410-415. ISBN: 9781573316392.
**Descriptors:** domestic cats, wild felids, *Bartonella* infection, vector borne, gram negative bacteria, bacteremia, cat scratch disease, fleas, transmission.
**Notes:** Meeting Information: 4th International Conference on Rickettsiae and Rickettsial Diseases, Logrono, Spain; June 18 -21, 2005.

Citino, S.B. and L. Munson (2005). **Efficacy and long-term outcome of gastritis therapy in cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 36(3): 401-16. ISSN: 1042-7260.
**Abstract:** A prospective clinical trial evaluating efficacy and long-term outcome of treatments for lymphoplasmacytic gastritis in cheetahs (*Acinonyx jubatus*) was conducted. The study evaluated efficacy of 11 different antibiotic and antiinflammatory treatment protocols in 32 cheetahs (19 male, 13 female) for reducing gastric inflammation and Helicobacter colonization and monitored the course of disease through histologic grading of gastric biopsies. All cheetahs were biopsied up to I wk before treatment and then rebiopsied within 1 mo after treatment. Most animals were reassigned to a second treatment regimen within 6 mo. Each animal received from one to three treatments during the study period. After the trial, gastric biopsies were obtained from each cheetah annually until death or transfer from the facility to assess disease progression. The trial and follow-up period spanned 10 yr. At onset of the trial, all 32 cheetahs had some degree of gastritis, and 26 cheetahs (81%) were colonized with Helicobacter. Inflammatory lesions worsened regardless of treatment or the presence of Helicobacter. No treatment had a significant effect on inflammatory changes except the lansoprazole/clarithromycin/amoxicillin treatment group, which produced a short-term decrease in inflammation when compared to controls. Prednisone had no effect on gastric inflammation. Overall, 65% of colonized cheetahs were initially cleared of histologic evidence of Helicobacter by treatment, with short-term eradication occurring in 100% of the animals treated with omeprazole/clarithromycin/amoxicillin or tetracycline/metronidazole/Pepto-Bismol for 28 days. Long-term follow-up of treated animals in this study clearly demonstrated that these treatments had little effect on life-long progression of gastritis or on Helicobacter burden in individual cheetahs, although some treatments provided short-term reduction in gastritis and Helicobacter. These results provide evidence that Helicobacter alone is not the cause of gastritis in cheetahs and do not support the use of antibacterial treatments in cheetahs unless significant clinical signs (e.g., frequent vomiting/regurgitation, weight loss) are apparent.
**Descriptors:** cheetah, *Acinonyx jubatus*, anti-bacterial agents therapeutic use, anti inflammatory agents therapeutic use, gastritis veterinary, helicobacter infections, zoo animals, anti bacterial agents administration, dosage, anti inflammatory agents administration, dosage, biopsy, dose response relationship, drug administration schedule, gastric mucosa microbiology, gastric mucosa pathology, gastritis drug therapy, gastritis pathology, helicobacter drug effects, helicobacter growth and development, helicobacter isolation and purification, helicobacter infections drug therapy, helicobacter infections pathology, longitudinal studies, prospective studies, time factors, treatment outcome.

Citino, S.B. (1995). **Chronic, intermittent *Clostridium perfringens* enterotoxicosis in a group of cheetahs (*Acinonyx jubatus jubatus*)**. *Journal of Zoo and Wildlife Medicine* 26(2): 279-285. ISSN: 1042-7260.
**Descriptors:** cheetahs, *Acinonyx jubatus*, *Clostidium perfringens*, enterotoxicosis, diarrhea, mucus, blood, colitis, treatment, tylosin, metronidazole, psyllium fiber.

Clyde, V.L., E.C. Ramsay, and D.A. Bemis (1997). **Fecal shedding of *Salmonella* in exotic felids**. *Journal of Zoo and Wildlife Medicine* 28(2): 148-152. ISSN: 1042-7260.
**Descriptors:** cheetah, *Acinonyx jubatus*, *Salmonella typhimurium*, tigers, leopards, cougars, caracals, lynx, lions, servals, diet, chicken, horse meat contamination, fecal shedding.

Collett, M.G., W.E. Pomroy, W.G. Guilford, A.C. Johnstone, B.J. Blanchard, and S.G. Mirams (2000). **Gastric *Ollulanus tricuspis* infection identified in captive cheetahs (*Acinonyx jubatus*) with chronic vomiting.** *Journal of the South African Veterinary Association* 71(4): 251-5. ISSN: 0038-2809.
**Abstract:** Gastritis, vomition and weight loss are common in captive cheetahs (*Acinonyx jubatus*). Gastric spiral bacteria (*Helicobacter* spp.) and the very small, viviparous nematode *Ollulanus tricuspis*, a stomach worm of cats, are believed to be important causes. Three sibling cheetahs at Wellington Zoo, New Zealand, developed chronic vomiting, diarrhoea and debility. Their parents were both South African-born. Response to antibacterial treatment was poor. Endoscopic examinations revealed chronic lymphoplasmacytic gastritis and *Ollulanus* infection. Treatment with oxfendazole and pyrantel embonate resulted in clinical improvement; however, 1 cheetah, which died 7 months later as a result of a ruptured liver due to hepatic amyloidosis, still had *Ollulanus*

worms present in her stomach. *Ollulanus tricuspis* is a significant cause of gastritis and vomiting in captive cheetahs, lions and tigers, as well as wild cougars and tigers. The parasite has not yet been found in sub-Saharan Africa. Because of the unusual characteristics of this parasite, the literature on its life history and techniques for diagnosis is reviewed.
**Descriptors:** cheetah, *Acinonyx jubatus*, parasitology, vomiting, gastritis, Trichostrongyloidea *Ollulanus tricuspis* isolation, purification, trichostrongyloidiasis, antinematodal agents therapeutic use, chronic disease, endoscopy, gastrointestinal, gastritis diagnosis, gastritis etiology, trichostrongyloidea classification, trichostrongyloidiasis drug therapy, trichostrongyloidiasis parasitology.

Coutinho, S.D., J.D. Fedullo, and S.H. Correa (2006). **Isolation of *Malassezia* spp. from cerumen of wild felids**. *Medical Mycology* 44(4): 383-387. ISSN: 1369-3786.
**Descriptors:** Malassezia, cheetah, *Acinonyx jubatus*, ears, cerumen, wild felids,

Malassezia spp. isolation, external auditory canal, captivity, [lions, tigers, leopards, jaguars, pumas, small felids] fungi.

Dailidiene, D., G. Dailide, K. Eaton, G. Cattoli, J.G. Kusters, and D.E. Berg (2003). ***Helicobacter acinonychis*: genetic and rodent infection studies of an h. Pylori-like gastric pathogen of cheetahs and other big cats.** *Abstracts of the General Meeting of the American Society for Microbiology* 103: Z-025. ISSN: 1060-2011.
**Descriptors:** cheetah, *Acinonyx jubatus*, digestive system, ingestion, assimilation, rodent infection, wildlife management, conservation, *Helicobacter acinonychis* infection, gastric pathogen, big cats.
**Notes:** Meeting Information: 103rd American Society for Microbiology General Meeting, Washington, DC, USA; May 18-22, 2003.

Dailidiene, D., G. Dailide, K. Ogura, M. Zhang, A.K. Mukhopadhyay, K.A. Eaton, G. Cattoli, J.G. Kusters, and D.E. Berg (2004). ***Helicobacter acinonychis*: genetic and rodent infection studies of a *Helicobacter pylori*-like gastric pathogen of cheetahs and other big cats.** *Journal of Bacteriology* 186(2): 356-65. ISSN: (p) 0021-9193; online: 1098-5530.

**Abstract:** Insights into bacterium-host interactions and genome evolution can emerge from comparisons among related species. Here we studied *Helicobacter acinonychis* (formerly *H. acinonyx*), a species closely related to the human gastric pathogen Helicobacter pylori. Two groups of strains were identified by randomly amplified polymorphic DNA fingerprinting and gene sequencing: one group from six cheetahs in a U.S. zoo and two lions in a European circus, and the other group from a tiger and a lion-tiger hybrid in the same circus. PCR and DNA sequencing showed that each strain lacked the cag pathogenicity island and contained a degenerate vacuolating cytotoxin (vacA) gene. Analyses of nine other genes (glmM, recA, hp519, glr, cysS, ppa, flaB, flaA, and atpA) revealed a approximately 2% base substitution difference, on average, between the two *H. acinonychis* groups and a approximately 8% difference between these genes and their homologs in *H. pylori* reference strains such as 26695. *H. acinonychis* derivatives that could chronically infect mice were selected and were found to be capable of persistent mixed infection with certain *H. pylori* strains. Several variants, due variously to recombination or new mutation, were found after 2 months of mixed infection. *H. acinonychis* ' modest genetic distance from *H. pylori*, its ability to infect mice, and its ability to coexist and recombine with certain *H. pylori* strains in vivo should be useful in studies of Helicobacter infection and virulence mechanisms and studies of genome evolution.
**Descriptors:** cheetah, lions, *Panthera leo*, *Acinonyx jubatus*, tiger, *Panthera tigris*, genetic studies, rodent infection studies, big cats, *Helicobacter* species, gastric pathogen, bacterium-host interactions, genome evolution, DNA fingerprinting, gene sequencing.

Dailidiene, D., G. Dailide, K. Ogura, M. Zhang, A.K. Mukhopadhyay, K. Eaton, G. Cattoli, J.G. Kusters, and D.E. Berg (2004). **: Genetic and rodent infection studies of a *Helicobacter pylori*-like gastric pathogen of cheetahs and other big cats.** *Journal of Bacteriology* 186(2): 356-365. ISSN: 0021-9193.
**Descriptors:** cheetahs, *Acinonyx jubatus*, big cats, gastric pathogen, rodent infection, *Helicobacter acinonychis*, bacterium host interactions, *Helicobacter pylori*, genetic infections, mice.

Eaton, K., F.E. Dewhirst, M.J. Radin, J.G. Fox, B.J. Paster, S. Krakowka, and D.R. Morgan (1993). ***Helicobacter acinonyx* new species isolated from cheetahs with gastritis**. *International Journal of Systematic Bacteriology* 43(1): 99-106. ISSN: 0020-7713.
**Descriptors:** cheetah, *Acinonyx jubilatus*, gastritis, new species, *Helicobacter acinonyx*, gram negative, spiral bacteria, isolates, bacterial pathogen.

Eaton, K.A., F.E. Dewhirst, M.J. Radin, J.G. Fox, B.J. Paster, S. Krakowka, and D.R. Morgan (1993). ***Helicobacter acinonyx* sp. nov., isolated from cheetahs with gastritis.** *International Journal of Systematic Bacteriology* 43(1): 99-106. ISSN: 0020-7713.
**Abstract:** Four strains of a novel Helicobacter species were isolated from the stomachs of

cheetahs (*Acinonyx jubilatus*) with gastritis. These isolates were phenotypically similar to *Helicobacter pylori*. The isolates were gram-negative, spiral bacteria which grew under microaerophilic conditions at 37 degrees C, but not at 25 or 42 degrees C, and produced urease, catalase, oxidase, alkaline phosphatase, and gamma-glutamyl transpeptidase. The isolates did not ferment glucose, mannitol, inositol, sorbitol, rhamnose, sucrose, melibiose, amygdalin, or arabinose; hydrolyze hippurate or indoxyl acetate; or reduce nitrate. They did not produce H2S from triple sugar iron agar, and they did not grow in the presence of 1.0% glycine or 1.5% NaCl. They were resistant to nalidixic acid and sensitive to cephalothin and metronidazole. Cells were typically 0.3 by 2.0 microns and possessed tufts of two to five sheathed, monopolar flagella. The G+C content of strain 90-119 was 30 mol%. Cluster analysis of densitometry scans of polyacrylamide protein gels revealed more than 70% similarity of the cheetah isolates to *H. pylori*, less than 60% similarity to *Helicobacter felis*, and less than 50% similarity to *Helicobacter mustelae*. Complete 16S rRNA sequences were determined for two of the cheetah isolates. Phylogenetic analysis was performed by comparing the cheetah sequences to those of 19 reference strains, including *H. pylori*, *H. felis* (two strains), *H. mustelae*, *Helicobacter muridarum*, "*Flexispira rappini*," *Wolinella succinogenes*, *Campylobacter coli, Campylobacter concisus*, *Campylobacter curvus*, *Campylobacter fetus, Campylobacter hyointestinalis, Campylobacter jejuni, Campylobacter lari*, *Campylobacter rectus*, *Campylobacter sputorum* subsp. bubulus, a *Campylobacter* sp. (pig isolate), [Bacteroides] gracilis, and [Bacteroides] ureolyticus.(Abstract truncated at 250 words)

**Descriptors:** cheetah, *Acinonyx jubatus*, microbiology, gastritis, *Helicobacter* classification, stomach microbiology, bacterial proteins analysis, base composition, base sequence, gastritis microbiology, *Helicobacter* chemistry, growth, development, ultrastructure, molecular sequence data, RNA, ribosomal, 16s genetics, sequence homology, nucleic acid.

Eaton, K.A., M.J. Radin, L. Kramer, R. Wack, R. Sherding, S. Krakowka, J.G. Fox, and D.R. Morgan (1993). **Epizootic gastritis associated with gastric spiral bacilli in cheetahs (*Acinonyx jubatus*).** *Veterinary Pathology* 30(1): 55-63. ISSN: 0300-9858.

**Abstract:** An outbreak of vomiting in a group of captive cheetahs (*Acinonyx jubatus*) was investigated, and histologic examination revealed chronic gastritis characterized by infiltration of lymphocytes and numerous plasma cells and epithelial erosions. Lymphoid follicles, globule leukocytes, scattered neutrophils, and (in one animal) abscessed gastric glands were inconsistent findings. In addition, necropsy of three cheetahs revealed gastric mucosal hyperplasia. Two kinds of bacteria were identified in the stomachs of infected cheetahs. Numerous long, tightly coiled motile *Gastrospirillum*-like organisms were seen in gastric mucus and in Warthin-Starry-stained sections of mucosa. These bacteria could not be cultured but were transmitted to conventional mice in homogenates of gastric mucosa from infected cheetahs. Ultrastructural examination revealed helical filaments on some of these bacteria. In addition, a smaller *Helicobacter* sp. was isolated. This organism could be cultured in vitro under microaerophilic conditions. One or both of these bacterial species was probably responsible for the gastritis in these cheetahs.

**Descriptors:** cheetah, *Acinonyx jubatus*, disease outbreaks, veterinary, gastric mucosa microbiology, gastritis, *Helicobacter* isolation, purification, vomiting, gastric mucosa pathology, gastritis complications, epidemiology, gastritis microbiology, gastritis pathology, hyperplasia, electron microscopy, epidemiology, vomiting epidemiology, vomiting etiology, Ohio.

Eaton, K.A., M.J. Radin, L. Kramer, R. Wack, R. Sherding, S. Krakowka, and D.R. Morgan (1991). **Gastric spiral bacilli in captive cheetahs.** *Scandinavian Journal of Gastroenterology. Supplement* 181: 38-42. ISSN: 9985-5928.

**Abstract:** Two kinds of gastric spiral bacilli were identified in the stomachs of captive cheetahs with naturally occurring gastritis. One type was morphologically similar to '*Gastrospirillum hominis*'. This organism could not be cultured in vitro. Some of these bacteria had superficial helical filaments, and others did not. The other type was morphologically, biochemically, and bacteriologically similar to *Helicobacter pylori*. This organism is most likely a new species of *Helicobacter*. One or both of these bacteria may have been responsible for the gastritis seen in these cheetahs.

**Descriptors:** cheetah, *Acinonyx jubatus*, microbiology, gastritis, gram negative bacteria, classification, helicobacter infections, *Helicobacter pylori*, classification, gastritis microbiology, gram negative bacteria, ultrastructure, helicobacter infections microbiology, *Helicobacter pylori* ultrastructure, restriction mapping.

Ervin, A.M., R.E. Junge, R.E. Miller, and L.P. Thornburg (1988). **Hemangiosarcoma in a cheetah (*Acinonyx jubatus*)**. *Journal of Zoo Animal Medicine* 19(3): 143-145. ISSN: 0093-4526.

**Descriptors:** cheetah, *Acinonyx jubatus*, hemangiosarcoma, case report, metastasis, neoplasms, zoo animals.

Evermann, J.F., J.L. Heeney, A.J. McKeirnan, and S.J. O'Brien (1989). **Comparative features of a coronavirus isolated from a cheetah with feline infectious peritonitis.** *Virus Research* 13(1): 15-27. ISSN: 0168-1702.

**Abstract:** A coronavirus which was isolated from a cheetah (*Acinonyx jubatus*) that succumbed to feline infectious peritonitis was characterized in vitro. The virus was determined to be highly cell-associated with Crandell feline kidney (CrFK) cells and was

routinely maintained as a persistent infection (CrFK 83-4497). The cheetah coronavirus was compared with other members of the feline coronavirus group including the feline enteric coronavirus (FECV) 79-1683 and the feline infectious peritonitis viruses (FIPV), 79-1146, and UCD-1. The cheetah coronavirus was demonstrated to have a restricted host-cell range with limited cytopathic effect. Indirect immunofluorescence with antisera to FIPV UCD-1 revealed the concentration of viral antigens in the perinuclear region of cells infected with the cheetah coronavirus. Ultrastructural studies of the cheetah coronavirus indicated a limited number of immature viral particles within cytoplasmic vesicles and at the cell surface. This was in contrast to electron microscopy results of FECV 79-1683 and FIPV 79-1146, which had numerous mature virus particles within the cytoplasmic vesicles, as well as at the cell surface. The cheetah coronavirus was tentatively placed in the feline coronavirus family based upon its antigenic reactivity by immunofluorescence; however, the possibility that it represents a unique coronavirus of cheetahs should not be dismissed without further analyses at the host and genomic levels.

**Descriptors:** cheetah, *Acinonyx jubatus*, microbiology, carnivora microbiology, coronavirus isolation, purification, Coronaviridae infections, peritonitis, cat diseases microbiology, cats, cell line, Coronaviridae immunology, ultrastructure, infections, microbiology, fluorescent antibody technique, electron microscopy, peritonitis microbiology, species specificity.

Evermann, J.F., J.L. Heeney, M.E. Roelke, A.J. McKeirnan, and S.J. O'Brien (1988). **Biological and pathological consequences of feline infectious peritonitis virus infection in the cheetah.** *Archives of Virology* 102(3-4): 155-71. ISSN: 0304-8608.

**Abstract:** An epizootic of feline infectious peritonitis in a captive cheetah population during 1982-1983 served to focus attention on the susceptibility of the cheetah (*Acinoyx jubatus*) to infectious disease. Subsequent observations based upon seroepidemiological surveys and electron microscopy of fecal material verified that cheetahs were indeed capable of being infected by coronaviruses, which were antigenically related to coronaviruses affecting domestic cats, i.e. feline infectious peritonitis virus/feline enteric coronavirus. Coincident with the apparent increased susceptibility of the cheetah to infectious diseases, were observations that the cheetah was genetically unusual insofar as large amounts of enzyme-encoding loci were monomorphic, and that unrelated cheetahs were capable of accepting allogenic skin grafts. These data provided the basis for a hypothesis that the cheetah, through intensive inbreeding, had become more susceptible to viral infections as a result of genetic homogeneity.

**Descriptors:** cheetah, *Acinonyx jubatus*, microbiology, carnivora microbiology, Coronaviridae infections, peritonitis, genetics, zoo microbiology, antibodies, viral analysis, Coronaviridae genetics, growth, development, infections, diagnosis, Coronaviridae infections epidemiology, disease susceptibility, genetic predisposition to disease, inbreeding, peritonitis diagnosis, epidemiology, microbiology, serologic tests, t lymphocytes immunology.

Evermann, J.F., M.K. Laurenson, A.J. McKeirnan, and T.M. Caro (1993). **Infectious disease surveillance in captive and free-living cheetahs: an integral part of the Species Survival Plan.** *Zoo Biology* 12(1): 125-133. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6

**Descriptors:** cheetah, *Acinonyx jubatus*, Coronavirus, Felid herpesvirus 1, wild animals, zoos, zoo animals, serological surveys, disease surveys, captive, free living, survival plan, surveillance, Tanzania.

**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Fuga, G., M. Nuti, G. Macchioni, and O. Gadale (1978). **Un caso di larva migrans cutanea recidivante trasmesso dal ghepardo (*Acinonyx jubatus*). [A case of relapsing cutaneous larva migrans transmitted by cheetah (*Acinonyx jubatus*)].** *Parassitologia* 20(1/3): 139-142. ISSN: 0048-2951.

**Descriptors:** cheetah, *Acinonyx jubatus*, case reports, cutaneous larva migrans, helminths, hosts, new host records, parasites, *Ancylostoma caninum*, *Ancylostoma tubaeforme*, hookworms, creeping eruption, treatment, thiabendazole.

**Language of Text:** Italian, Summary in English.

Gaskell, R. and K. Willoughby (1999). **Herpesviruses of carnivores**. *Veterinary Microbiology* 69(1/2): 73-88. ISSN: 0378-1135.

**Descriptors:** cheetah, *Acinonyx jubatus*, carnivores, herpersviruses, clinical aspects, epidemiology, live vaccines, respiratory diseases, reviews, vaccination, carnivores, cats, dogs, felid herpesviruses, Herpesviridae, seals.

**Notes:** Meeting Information: Special Issue: Virology of carnivores. Contributions from the first International Meeting on Virology of Carnivores held in Utrecht, The Netherlands, May 13-15, 1998.

Gillespie, D. and M. Fowler (1984). **Lymphocytic plasmacytic colitis in two cheetahs.** *Journal of the American Veterinary Medical Association* 185(11): 1388-9. ISSN: 0003-1488.

**Descriptors:** cheetah, *Acinonyx jubatus*, zoo animals, carnivora, colitis, food hypersensitivity, animal feed adverse effects, lymphocytic plasmacytic colitis, diet

therapy, etiology, complications, diet therapy, lymphocytes, plasma cells, California U.S.

Good, K.M., A. Houser, L. Arntzen, and P.C. Turnbull (2008). **Naturally acquired anthrax antibodies in a cheetah (*Acinonyx jubatus*) in Botswana.** *Journal of Wildlife Diseases* 44(3): 721-3. ISSN: 0090-3558.
**Abstract:** An outbreak of anthrax in the Jwana Game Reserve in Jwaneng, Botswana, was first observed when three cheetahs (*Acinonyx jubatus*) died of the disease in November 2004. In the aftermath of this event, banked serum samples collected from 23 wild-caught cheetahs were examined, by the inhibition enzyme-linked immunoassay (ELISA), for antibodies to the protective antigen (PA) of Bacillus anthracis. Of the 23 cheetahs, 16 regularly accessed the reserve. Antibodies to PA were detected in one cheetah collected in May 2004, indicating the disease was occurring well before it was first noticed. This appears to be the first demonstration of naturally acquired anthrax antibodies in cheetahs. The finding of one antibody-positive animal amongst at least 16 potentially exposed individuals is consistent with existing reports that it is uncommon for cheetahs to develop natural immunity to anthrax.
**Descriptors:** cheetah, *Acinonyx jubatus*, anthrax antibodies, naturally aquired immunity, outbreak, Jwana Game Reserve Botswana.

Good, K.M., C. Marobela, and M. Houser (2005). **A report of anthrax in cheetahs (*Acinonyx jubatus*) in Botswana**. *Journal of the South African Veterinary Association* 76(4): 186. ISSN: 0038-2809.
**Descriptors:** cheetah, *Acinonyx jubatus*, anthrax, infection, bacterial disease, diagnosis, mortality, symptom, Botswana.

Gosselin, S.J., D.L. Loudy, M.J. Tarr, W.F. Balistreri, K.D. Setchell, J.O. Johnston, L.W. Kramer, and B.L. Dresser (1988). **Veno occlusive disease of the liver in captive cheetah.** *Veterinary Pathology* 25(1): 48-57. ISSN: 0300-9858.
**Abstract:** Liver tissues from 126 captive cheetah were evaluated by light microscopy and histochemistry; eight animals were evaluated by electron microscopy. The main hepatic lesion, a vascular lesion resembling veno-occlusive disease (VOD) of the liver and characterized by subendothelial fibrosis and proliferation of smooth muscle-like cells in the central veins, was seen in 60% of the sexually mature cheetah. Although this hepatic vascular lesion was seen in cheetah as young as 1 year of age, the most severe lesions, usually associated with liver failure, were found in cheetah between the ages of 6 and 11. There was no sex predisposition, and in approximately 40% of the VOD cases, liver disease was not suspected clinically or at necropsy. VOD was found in other felidae, especially in the snow leopard. High levels of vitamin A in livers, as well as in diets of the cheetah, could be a contributing factor in the development of VOD in some groups of cheetah.
**Descriptors:** cheetah, *Acinonyx jubatus*, carnivora, liver pathology, animal feed analysis, hepatic veno-occlusive disease pathology, histocytochemistry, liver analysis, liver ultrastructure, electron microscopy, vitamin A analysis.

Groote, D.d., F. Haesebrouck, R. Ducatelle, and L. Devriese (1997). ***Helicobacter* spp. en gastro-intestinale problemen bij dieren. [*Helicobacter* spp. and gastrointestinal diseases in animals].** *Vlaams Diergeneeskundig Tijdschrift* 66(1): 8-13. ISSN: 0303-9021.
**Descriptors:** animals, digestive system diseases, gastrointestinal diseases, intestines, pathogenesis, pathology, poultry, stomach, cheetah, *Acinonyx jubatus*, cats, cattle, dogs, ferrets, fowls, *Helicobacter*, mice, monkeys, pigs, rats.
**Language of Text:** Dutch, Summary in English.

Haefner, M., T.J. Burke, B.E. Kitchell, L. Lamont, D.J. Schaeffer, M. Behr, and J.B. Messick (2003). **Identification of *Haemobartonella felis* (*Mycoplasma haemofelis*) in captive nondomestic cats.** *Journal of Zoo and Wildlife Medicine* 34(2): 139-143. ISSN: 1042-7260.
**Descriptors:** cheetahs, *Acinonyx jubatus*, lions, tigers, jaguar, leopards, non domestic cats, feline infectious anemia, *Haemobartonella felis*, *Mycoplasma haemofelis*, blood count, polymerase chain reaction, PCR.

Hasslinger, M., F.X. . Wittmann, H. Wiesner, and W. Rietschel (1982). **On the incidence of *Ollulanus tricuspis* (Leuckart, 1865) in Felidae of zoological garden**. *Veterinary Medical Review*(2): 220-228. ISSN: 0506-8274.
**Abstract:** At the Munich zoo, Hellabrunn, GFR, *O. tricuspis* infection was diagnosed by gastric irrigation in a cheetah (*Acynonyx jubatus*), a new host record. 3 other cheetahs, plus lions, tigers, leopards and a puma (12 animals altogether) were negative. Inducement of vomiting was not a successful method of diagnosis. *Reproduced with permission of CAB.*
**Descriptors:** Felidae, cats, lions, tigers, leopards, puma, worm, diagnosis, helminths, hosts, new host records, parasites, zoological gardens, cheetah, *Acinonyx jubatus*, Carnivores, Nematoda, *Ollulanus tricuspis*.

Hasslinger, M.A. (1982). ***Ollulanus tricuspis* (Leuckart, 1865), the stomach worm of the cat and his unusual hosts**. *Revista Iberica De Parasitologia* Special Volume: 449-459.

ISSN: 0034-9623.
**Descriptors:** *Ollulanus tricuspis*, helminths, parasites, zoological gardens, cheetah, *Acinonyx jubatus*, carnivores, Nematoda, cat, stomach worm, review.
**Language of Text:** Spanish.
**Notes:** Meeting Information: [II Conferencia Mediterranea de Parasitologia].

Heeney, J.L., J.F. Evermann, A.J. McKeirnan, L. Marker Kraus, M.E. Roelke, M. Bush, D.E. Wildt, D.G. Meltzer, L. Colly, and J. Lukas (1990). **Prevalence and implications of feline coronavirus infections of captive and free-ranging cheetahs (*Acinonyx jubatus*).** *Journal of Virology* 64(5): 1964-1972. ISSN: 0022-538X.
**NAL Call Number:** QR360.J6
**Abstract:** The extent and progression of exposure to feline infectious peritonitis (FIP) virus in the cheetah, Acinonyx jubatus, was monitored by a world-wide serological survey with indirect fluorescent antibody titers to coronavirus. The indirect fluorescent antibody assay was validated by Western blots, which showed that all indirect fluorescent antibody-positive cheetah sera detected both domestic cat and cheetah coronavirus structural proteins. There was a poor correlation between indirect fluorescent antibody results and the presence of coronaviruslike particles in cheetah feces, suggesting that electron microscopic detection of shed particles may not be an easily interpreted diagnostic parameter for FIP disease. Low, but verifiable (by Western blots [immunoblots]) antibody titers against coronavirus were detected in eight free-ranging cheetahs from east Africa as well as from captive cheetahs throughout the world. Of 20 North American cheetah facilities screened, 9 had cheetahs with measurable antibodies to feline coronavirus. Five facilities showed patterns of an ongoing epizootic. Retrospective FIP virus titers of an FIP outbreak in a cheetah-breeding facility in Oregon were monitored over a 5-year period and are interpreted here in terms of clinical disease progression. During that outbreak the morbidity was over 90% and the mortality was 60%, far greater than any previously reported epizootic of FIP in any cat species. Age of infection was a significant risk factor in this epizootic, with infants (less than 3 months old) displaying significantly higher risk for mortality than subadults or adults. Based upon these observations, empirical generalizations are drawn which address epidemiologic concerns for cheetahs in the context of this lethal infectious agent.
**Descriptors:** cheetahs, *Acinonyx jubatus*, feline peritonitis virus, coronavirus infections, prevalance, implications, North America, Europe, Africa.

Horii, Y., M. Usui, and T. Yanagida (1981). ***Ancylostoma braziliense* De Faria, 1910 recovered from imported cheetahs**. *Japanese Journal of Parasitology* 30(4): 355-361. ISSN: 0021-5171.
**Abstract:** In 1976 hookworm eggs were recovered from the faeces of cheetahs, *Acinonyx jubatus*, imported to a zoo in Oita, Japan, from Durban, South Africa. Infective larvae were cultured and used to infect dogs and cats from which *Ancylostoma braziliense* were subsequently obtained. Morphological details and photomicrographs are provided. The cheetah is a new host record for this parasite. [From English summary]. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, helminths, hosts, morphology, new host records, parasites, zoological gardens, *Ancylostoma braziliense*.
**Language of Text:** Japanese, Summary in English.

Jager, H.G., H.H. Booker, and O.J. Hubschle (1990). **Anthrax in cheetahs (*Acinonyx jubatus*) in Namibia.** *Journal of Wildlife Diseases* 26(3): 423-4. ISSN: 0090-3558.
**Abstract:** *Bacillus anthracis* caused the death of five cheetahs (*Acinonyx jubatus*) on a farm in the Gobabis district in Namibia. The mode of infection was believed to be a freshly shot baboon (*Papio ursinus*) with a cutaneous anthrax lesion.
**Descriptors:** cheetahs, *Acinonyx jubatus*, anthrax, carnivora, disease outbreaks, anthrax epidemiology, etiology, biological assay, food contamination, contaminated meat, mice, Namibia, baboon, *Papio ursinus*, anthrax lesion.

Junge, R.E. and R.E. Miller (1987). **Persistent regurgitation in a cheetah (*Acinonyx jubatus*)**. *Journal of Zoo Animal Medicine* 18(4): 151-152. ISSN: 0093-4526.
**Descriptors:** cheetah, *Acinonyx jubatus*, vomiting, persistant regurgitation, digestive disorders, diazepam, halothane, ketamine.

Junge, R.E., R.E. Miller, W.J. Boever, G. Scherba, and J. Sundberg (1991). **Persistent cutaneous ulcers associated with feline herpesvirus type 1 infection in a cheetah.** *Journal of the American Veterinary Medical Association* 198(6): 1057-8. ISSN: 0003-1488.
**Abstract:** Persistent cutaneous ulcers developed in a female cheetah cub after an episode of rhinotracheitis. When they were 3 weeks old, the cub and a male littermate developed mucopurulent oculonasal discharge consistent with feline herpesvirus type 1 infection (feline viral rhinotracheitis). The male cub was weaned and its lesions resolved. The female cub remained with the dam until the cub was 3 months old, at which time plaque-like lesions developed on the eye margins and muzzle. These plaques regressed over the next month and were replaced with cutaneous ulcers ranging from 1 to 10 mm in diameter. Feline herpesvirus type 1 was isolated from biopsy specimens collected from the ulcers. Cutaneous ulcers are uncommon manifestations of feline herpesvirus infections and have not been reported in other exotic felids. A proposed susceptibility to

viral infections related to low genetic diversity has been proposed in cheetahs, and may be involved in the pathogenesis of persistent herpetic ulcers.
**Descriptors:** cheetah, *Acinonyx jubatus*, Herpesviridae infections, skin diseases, infectious, skin ulcer, Herpesviridae isolation, purification, pathology, skin diseases, pathology, skin ulcers.

Kennedy, M., S. Citino, T. Dolorico, A.H. McNabb, A.S. Moffat, and S. Kania (2001). **Detection of feline coronavirus infection in captive cheetahs (*Acinonyx jubatus*) by polymerase chain reaction.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 32(1): 25-30. ISSN: 1042-7260.
**Abstract:** Feline coronavirus genetic elements were detected by polymerase chain reaction from blood, fecal samples, and effusive fluid collected from 33 cheetahs in the U.S.A. Feline coronavirus-specific serum antibodies were also measured by indirect immunofluorescence. Ten cheetahs were positive for viral shedding by polymerase chain reaction, whereas 13 were seropositive by immunofluorescence. Results of serology did not consistently correlate with shedding of virus, and the capture antigen used for detection of feline coronavirus-specific antibodies had a significant impact on results. Testing of samples from one population over a 1-yr period indicated chronic infection in some animals. These relatively healthy carrier animals were a source of virus for contact animals. Screening programs in cheetah populations for feline coronavirus infection may be most reliable if a combination of serologic analysis and viral detection by polymerase chain reaction is used.
**Descriptors:** 33 cheetahs, *Acinonyx jubatus*, feline coronavirus infections, detection, polymerase chain reaction, PCR, blood, fecal samples, effusive fluid, coronavirus specific serum antibodies, indirect immunofluorescence, carrier animals, screening programs.

Kennedy, M., S. Kania, E. Stylianides, H. Bertschinger, D. Keet, and M.v. Vuuren (2003). **Detection of feline coronavirus infection in Southern African nondomestic felids**. *Journal of Wildlife Diseases* 39(3): 529-535. ISSN: 0090-3558.
**Abstract:** Feline coronavirus (FCoV) infects members of the Felidae family with results ranging from seroconversion with no disease to fatal feline infectious peritonitis (FIP). Infection of nondomestic felids with FCoV is of concern, particularly in endangered populations such as cheetahs *Acinonyx jubatus*. In this investigation, we tested 342 animals in the Republic of South Africa and Namibia, including 140 animals from wild populations, for evidence of FCoV infection by serology and/or reverse transcription/nested polymerase chain reaction (RT/nPCR) on faeces from 1999 through 2001. Past or current infection was evaluated. Of these, 195 animals had evidence of infection and included 41 animals from wild populations. Serology (indirect immunofluorescence) did not always correlate with viral RNA detection, as seronegative animals were occasionally virus-positive, while many seropositive animals were not shedding virus. Serology indicated the infecting virus was most closely related to type I FCoV. Antibody levels in the majority of animals were low, even in those actively infected. Ten of 48 animals tested at more than one time point by RT/nPCR were shedding virus at multiple time points possibly indicating persistent infection. Infection in free-ranging animals was also notable, as over a quarter of the free-ranging animals tested had evidence of current or previous FCoV infection. Testing by serology and RT/nPCR is recommended for screening for FCoV infection. *Reproduced with permission of CAB.*
**Descriptors:** 33 cheetahs, *Acinonyx jubatus*, feline coronavirus, detection, nondomestic felids, case reports, diagnosis, disease prevalence, disease surveys, endangered species, immunofluorescence, polymerase chain reaction, Feline infectious peritonitis virus, Southern Africa, Nambia.

Kirkwood, J.K. and A.A. Cunningham (1994). **Epidemiological observations on spongiform encephalopathies in captive wild animals in the British Isles**. *Veterinary Record* 135(13): 296-303. ISSN: 0042-4900.
**Abstract:** Since 1986, scrapie-like spongiform encephalopathy has been diagnosed in 19 captive wild animals of 8 species at or from 8 zoological collections in the British Isles. The affected animals have comprised members of the family Bovidae: one nyala (*Tragelaphus angasi*), 4 eland (*Taurotragus oryx*), and 6 greater kudu (*Tragelaphus strepsiceros*), one gemsbok (*Oryx gazella*), one Arabian oryx (*Oryx leucoryx*), and one scimitar-horned oryx (*Oryx dammah*), and members of the family Felidae: 4 cheetah (*Acinonyx jubatus*) and one puma (*Felis concolor*). In addition, 3 cases of a spongiform encephalopathy of unknown aetiology have been reported in ostriches (*Struthio camellus*) from 2 zoos in north west Germany. Three features suggest that some of these cases may have been caused by the agent of bovine spongiform encephalopathy (BSE). First, they have been temporally and geographically coincident with the BSE epidemic. Secondly, in all the ungulates for which details are available, it is possible that either the affected animal itself, or the herd into which it was born or moved, had been exposed to proprietary feeds containing ruminant-derived protein or other potentially contaminated material, and all the carnivores had been fed parts of cattle carcases judged unfit for human consumption. Thirdly, the pathological results of inoculating mice with a homogenate of fixed brain tissue from the nyala and from one greater kudu were similar to the results of inoculating mice with BSE brain tissue. *Reproduced with permission of CAB.*
**Descriptors:** captive wild animals, cheetahs, *Acinonyx jubatus*, puma, *Felis concolor*,

spongiform encephalopathy, BSE, epidemiology, nervous system diseases, contaminated cattle as food, zoo animals, Bovidae, Felidae, British zoos, German zoos.

Kirkwood, J.K., A.A. Cunningham, E.J. Flach, S.M. Thornton, and G.A.H. Wells (1995). **Spongiform encephalopathy in another captive cheetah (*Acinonyx jubatus*): evidence for variation in susceptibility or incubation periods between species?** *Journal of Zoo and Wildlife Medicine* 26(4): 577-582. ISSN: 1042-7260.

**Abstract:** A fourth case of spongiform encephalopathy (SE) in a captive cheetah is reported. Over a period of 8 weeks, a 7-year-old female cheetah housed at Whipsnade Wild Animal Park, UK, showed signs of a progressive neurological disease. The animal was killed and central nervous system tissue was examined. Light microscopy of haematoxylin and eosin-stained sections revealed SE involving the entire brain axis. Vacuolation of the neuropil, with a similar distribution and regional severity to that seen in feline SE of the domestic cat was the most prominent feature. Electron microscopic examination for fibrils, equivalent to scrapie-associated fibrils, in fresh brain material was positive. The cheetah had been fed tissues from cattle judged unfit for human consumption and which may have been infected with the bovine spongiform encephalopathy (BSE) agent. Some epidemiological aspects of the disease in cheetahs and implications to captive breeding and reintroduction programmes for this species are discussed. Since it is likely that other species of zoo felids have been exposed to food that may have contained the BSE agent, the relatively high incidence of the disease in cheetahs suggests that they may be more susceptible than other species in the family Felidae or that there are variations in incubation period among species. *Reproduced with permission of CAB.*

**Descriptors:** cheetah, *Acinonyx jubatus*, spongiform encephalopathy, bovine spongiform encephalopathy, BSE, case reports, disease transmission, epidemiology, feeds, susceptibility, zoo animals, cattle.

Kotsch, V., A. Kubber Heiss, A. Url, C. Walzer, and P. Schmidt (2002). **Krankheiten der Zoogeparden (*Acinonyx jubatus*) innerhalb des Europaischen Erhaltungszuchtprogramms (EEP): eine retrospektive pathohistologische Studie uber 22 Jahre. [Diseases of captive cheetahs (*Acinonyx jubatus*) within the European Endangered Species Program (EEP) - a 22-year retrospective histopathological study].** *Wiener Tierarztliche Monatsschrift* 89(12): 341-350. ISSN: 0043-535X.

**Abstract:** Cheetah populations in the USA, in South Africa and Japan are threatened by three highly prevalent diseases - bacterial gastritis, glomerulosclerosis and veno-occlusive disease - causing premature death of potential breeders. Poor breeding success, inappropriate captive management and a paucity of genetic variability are additional problems of captive cheetahs. Organ samples of 58 cheetahs were collected from 1980-2001 and retrospectively investigated to obtain a general overview of captive cheetah health within the European Endangered Species Programme (EEP). Gastritis (55%) and renal lesions, like glomerulosclerosis (32%), membranous (46%) and membranoproliferative glomerulonephritis (18%), and interstitial nephritis (32%) were most frequently observed, while veno-occlusive disease was not found in Europe. Further priority was given to investigations concerning myelolipomas, which were found mainly in the spleen. In the future, it would be important to initiate additional studies concerning husbandry and stress of captive cheetahs in order to gain insight into the aetiology of the pathological alterations. *Reproduced with permission of CAB.*

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, diseases, European Endangered Species Program, etiology, animal health, disease surveys, bacterial gastritis, histopathology, lipoma, risk factors, vascular diseases, glomerulosclerosis, veno occlusive disease.

**Language of Text:** German, Summary in English.

La Perle, K.M., R. Wack, L. Kaufman, and E.A. Blomme (1998). **Systemic candidiasis in a cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine* 29(4): 479-483. ISSN: 1042-7260.

**Abstract:** Systemic candidiasis, with involvement of the spleen, liver, kidneys, and lymph nodes, was diagnosed in a geriatric captive cheetah (*Acinonyx jubatus*). The animal had a long clinical history of intermittent chronic gastritis associated with *Helicobacter acinonyx* and chronic renal failure, both of which were repeatedly treated with broad-spectrum antimicrobial therapy. Following euthanasia, a postmortem examination showed numerous microabscesses and granulomas composed of degenerate eosinophils and containing asteroids or Splendore-Hoeppli material throughout the body. Yeast, pseudohyphae, and infrequently branching septate hyphae, demonstrated with special stains, were identified as a Candida sp. by fluorescent antibody testing. Low genetic variation in cheetahs may increase their susceptibility to infectious agents. Additional factors contributing to the overgrowth and dissemination of Candida sp. in this case may have included changes in the bacterial flora of the alimentary tract as a result of repeated antimicrobial therapy and alterations in the topography of the alimentary mucosa caused by chronic gastritis.

**Descriptors:** cheetah, *Acinonyx jubatus*, candidiasis, pathology, kidney pathology, kidney diseases, complications, liver pathology, lymph nodes microbiology, lymph nodes pathology, opportunistic infections, pathology, spleen pathology.

Lane, E., R. Lobetti, and R. Burroughs (2004). **Treatment with omeprazole, metronidazole,**

**and amoxicillin in captive South African cheetahs (*Acinonyx jubatus*) with spiral bacteria infection and gastritis.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 35(1): 15-9. ISSN: 1042-7260.

**Abstract:** Six captive cheetahs (*Acinonyx jubatus*) with severe gastritis diagnosed by gastric endoscopy and mucosal histopathology were treated with omeprazole, metronidazole, and amoxicillin for 3 wk. Endoscopic biopsies were performed before therapy, immediately after treatment, and 3, 7, and 19 mo after treatment. Macroscopic appearance of the stomach, histologic scoring of gastric inflammation, and the presence or absence of spiral bacteria were recorded. Spiral bacteria were absent histologically immediately after treatment but reappeared in endoscopic biopsies by 3 mo after treatment. Gastritis scores fluctuated widely during the trial but improved in five of six cheetahs by 3 mo after treatment. By 19 mo after treatment, scores were close to the pretreatment scores. Therapy with omeprazole, amoxicillin, and metronidazole was associated with temporary improvement in the degree and distribution of gastritis in some cheetahs with gastritis, suggesting that treatment may be warranted once severe gastric inflammation has been diagnosed.

**Descriptors:** cheetahs, captive animals, *Acinonyx jubatus*, spiral bacteria infection, gastritis, treatment, omeprazole, metronidazole, amoxicillin, gastric endoscopy, spiral bacteria.

Lezmi, S., A. Bencsik, E. Monks, T. Petit, and T. Baron (2003). **First case of feline spongiform encephalopathy in a captive cheetah born in France: PrP(sc) analysis in various tissues revealed unexpected targeting of kidney and adrenal gland.** *Histochemistry and Cell Biology* 119(5): 415-22. ISSN: (p) 0948-6143; (E) 1432-119X.

**Abstract:** Feline spongiform encephalopathy (FSE), affecting domestic and captive feline species, is a prion disease considered to be related to bovine spongiform encephalopathy. Here we report an immunohistological analysis of the first FSE-affected cheetah born in France. The duration of clinical signs, of which ataxia was the main one, was about 8 weeks. The distribution of abnormal prion protein (PrP(sc)) was studied by immunohistochemistry within 27 different tissues. Different antibodies were used to visualise abnormal PrP deposits in situ. PrP(sc )accumulation was detected in the central nervous system (cerebral cortex, cerebellum, brain stem, spinal cord, retina), in peripheral nerves and in lymphoid organs. PrP(sc) deposits were not observed within the enteric nervous system nor in several other organs, such as pancreas, ovary, liver and muscle. More interestingly, unusual PrP(sc )deposits were observed within the zona fasciculata/reticularis of the adrenal gland and within some glomeruli of the kidney raising the question of possible PrP(sc) excretion. The sympathetic innervation of these two organs was visualised and compared to the distribution of PrP(sc) deposits. Our results suggest the possibility that the infectious agent is spread by both haematogenous and nervous pathways.

**Descriptors:** cheetah, *Acinonyx jubatus*, feline spongiform encephalopathy, FSE, first case in France, immunohistological analysis, tissues, targeting, kidney, adrenal gland, clinical signs, ataxia, central nervous system, France.

Lloyd, C. and M.F. Stidworthy (2007). **Acute disseminated toxoplasmosis in a juvenile cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 38(3): 475-8. ISSN: 1042-7260.

**Abstract:** A juvenile cheetah *(Acinonyx jubatus*) died with rapidly progressive pyrexia, tachypnea, abdominal effusion, and hepatomegaly. Postmortem examination revealed lesions consistent with acute disseminated infection with *Toxoplasma gondii*. The presence of this organism was confirmed in multiple organs by immunohistochemistry and polymerase chain reaction. To the best of our knowledge, we propose this to be the first reported case of primary acute disseminated toxoplasmosis in a cheetah.

**Descriptors:** cheetah, *Acinonyx jubatus*, acute disseminated toxoplasmosis, pathology, immunohistochemistry, organ specificity, polymerase chain reaction, toxoplasma isolation, purification, complications, progressive pyrexia, tachypnea, abdominal effusion, hepatomegaly.

Lobetti, R., J. Picard, N. Kriek, and P. Rogers (1999). **Prevalence of helicobacteriosis and gastritis in semicaptive cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 30(4): 492-6. ISSN: 1042-7260.

**Abstract:** Endoscopic biopsy specimens were obtained from the cardiac, fundic, and pyloric stomach regions of 28 semicaptive cheetahs (*Acinonyx jubatus*) to look for signs of helicobacteriosis and gastritis. Impression smear cytology and urease tests were positive in 23 and 26 of the cheetahs, respectively. Histopathology showed mild or no lesions in 27 cheetahs; only one cheetah had moderate gastritis. Gastritis was uncommon in these semicaptive cheetahs, and stress could play a major role in the development of helicobacteriosis-associated gastritis in the captive cheetah.

**Descriptors:** cheetah, *Acinonyx jubatus*, heliobacteriosis, gastritis, prevalance, semi captive, endoscopic biopsy, cardiac, fundic, pyloric stomach regions, impression smear cytology, stress.

Macchioni, G. (1995). ***Ancylostoma genettae*, *A. protelesis*, *A. somaliense*: three new**

**species from wild Carnivora in the Somali Republic**. *Parassitologia Roma* 37(2/3): 219-228. ISSN: 0048-2951.
**Abstract:** *Ancylostoma braziliense* was found in Somalia in *Acinonyx jubatus*, dogs, *Canis mesomelas, Crocuta crocuta*, cats, *Felis libyca, Genetta genetta, Otocyon megalotis, Proteles cristatus; A. caninum* in *A. jubatus*, dogs, *Canis mesomelas, Crocuta crocuta; A. duodenale* in *C. crocuta; A. iperodontatum* in Lynx caracal; *A. paraduodenale* in Felis serval; *A. tubaeforme* in *A. jubatus,* cats, *F. libyca; Arthrocephalus gambiense* in *Ichneumia albicauda*; *Uncinaria parvibursata* in *Mellivora capensis*. In addition, three new species of Ancylostoma were collected: *A. genettae* sp. nov. is described from the small intestine of *Genetta genetta*. It is differentiated from *A. caninum* and *A. tubaeformae* by its smaller body size (male 6.5 mm long, 0.33 mm wide; female 7.3 mm long, 0.39 mm wide), length of spicules and having a mouth opening with 3 pairs of short and squat ventral teeth. *A. protelesis* sp. nov., from the small intestine of *Proteles cristatus*, most closely resembles *A. conepati* but differs from it in geographic location (Africa vs South America), choice of host, length of spicules, oesophagus, and female tail. *A. somaliense* sp. nov. is described from the small intestine of *Canis mesomelas*. It closely resembles *A. tubaeformae* but differs from it in the size and shape of the body, mouth opening and spicules. *Reproduced with permission of CAB.*
**Descriptors:** carnivora, helminths, new species, parasites, taxonomy, wild animals, cheetah, *Acinonyx jubatus*, *Ancylostoma braziliense*, *Ancylostoma caninum*, *Ancylostoma duodenale*, *Ancylostoma tubaeforme*, Canidae, *Canis mesomelas*, cats, *Crocuta crocuta*, dogs, Felidae, Herpestidae, Hyaenidae, Mustelidae, Nematoda, Viverridae.

Macchioni, G., A. Marconcini, Abdullahi Ali Herst, Abdullatif Mohamed Abdi, and O.I. Gadale (1982). **Indagine sull'ancilostomiasi dei carnivori selvatici africani in relazione alla dermatite serpiginosa dell'uomo. [Hookworm infections in wild African carnivores and their relationship to human creeping eruption].** *Bollettino Scientifico Della Facolta Di Zootecnia e Veterinaria* 3: 85-90. ISSN: 0254-6019.
**Abstract:** Examination of carnivores in Somalia from 1979 to 1982: revealed *Ancylostoma tubaeforme* in 5 of 6 *Acinonyx jubatus*; *Ancylostoma caninum* in 2 of the *Acinonyx jubatus*, 3 of 7 *Canis mesomelas*, 3 of 21 *Crocuta crocuta* and 2 of 4 *Genetta genetta*; *Ancylostoma braziliense* in 15 of the *C. crocuta; A. duodenale* in 5 of the *C. crocuta*; *A. iperodontatum* in 4 of 5 *Felis caracal; Arthrocephalus gambiensis* in 5 of 13 *Ichneumia albicauda*. Previous reports of these hookworms in wild African carnivores are tabulated. The relationship of these hookworms to human cutaneous larva migrans is discussed. *Reproduced with permission of CAB.*
**Descriptors:** carnivores, helminths, hookworms, parasites, cheetah, *Acinonyx jubatus*, *Ancylostoma*, *Canis mesomelas*, carnivores, *Crocuta crocuta*, Nematoda, creeping eruption.
**Language of Text:** Italian, Summary in English.

Marker, L., L. Munson, P.A. Basson, and S. Quackenbush (2003). **Multicentric T-cell lymphoma associated with feline leukemia virus infection in a captive Namibian cheetah (*Acinonyx jubatus*).** *Journal of Wildlife Diseases* 39(3): 690-695. ISSN: 0090-3558.
**Abstract:** This case report describes a multicentric lymphoma in a 4 yr old female wildborn captive cheetah (*Acinonyx jubatus*) in Namibia after being housed in an enclosure adjacent to a feline leukemia virus (FeLV) infected cheetah that had previously been in contact with domestic cats. The year prior to the onset of clinical signs, the wild-born cheetah was FeLV antigen negative. The cheetah subsequently developed lymphoma, was found to be infected with FeLV, and then rapidly deteriorated and died. At necropsy, the liver, spleen, lymph nodes, and multiple other organs were extensively infiltrated with neoplastic T-lymphocytes. Feline leukemia virus DNA was identified in neoplastic lymphocytes from multiple organs by polymerase chain reaction and Southern blot analysis. Although the outcome of infection in this cheetah resembles that of FeLV infections in domestic cats, the transmission across an enclosure fence was unusual and may indicate a heightened susceptibility to infection in cheetahs. Caution should be exercised in holding and translocating cheetahs where contact could be made with FeLV-infected domestic, feral, or wild felids.
**Descriptors:** cheetah, *Acinonyx jubatus*, multicentric T-cell lymphoma, feline leukemia virus, FeLV infection, captive, contacts, holding, translocating, infected animals.

Marker, L.L., A.J. Dickman, L.L. Marker, A.J.P. Wilkerson, Sarno Ronald J, J. Martenson, C. Breitenmoser Wuersten, S.J. O'brien, and W.E. Johnson (2004-2008). **Dental anomalies and incidence of palatal erosion in namibian cheetahs (*Acinonyx jubatus jubatus*).Molecular genetic insights on cheetah (*Acinonyx jubatus*) ecology and conservation in Namibia**. *Journal of Mammalogy/ Journal of Heredity* 85-99(11): 19-242-13. ISSN: 0022-2372/ 0022-1503.
**Descriptors:** cheetahs, *Acinonyx jubatus jubatus*, dental anomalies, palatal erosion, dental and oral system, ingestion, focal palatine erosion, \, FPE, dental and oral disease, Namibia.

Millward, I.R. and M.C. Williams (2005). ***Cryptococcus neoformans* granuloma in the lung and spinal cord of a free-ranging cheetah (*Acinonyx jubatus*). A clinical report and literature review.** *Journal of the South African Veterinary Association* 76(4): 228-32. ISSN: 0038-2809.

**Abstract:** A 6-year-old, male, wild-born, free-ranging cheetah (*Acinonyx jubatus*) was evaluated for acute onset of progressive lameness in the right hind limb. Survey radiographs were unrewarding and myelography indicated an intramedullary compressive mass at the L3-L4 region. A fine needle aspirate of the lesion indicated the presence of Cryptococcus organisms. Necropsy confirmed the presence of granulomas (cryptococcoma) in the lung and the spinal cord (meningomyelitis) caused by *Cryptococcus neoformans* var. gattii. *Cryptococcus neoformans* is a yeast-like organism that is a potential pathogen to many species. Initial infection is thought to be of respiratory origin and then it commonly disseminates systemically from the nasal cavity or lungs to the skin, eyes and central nervous system in particular. The cheetah tested negative for both feline leukaemia virus (FeLV) and feline immunodeficiency virus (FIV), as have all the previously reported cheetah cases. *C. neoformans* is a non-contagious, opportunistic organism and is the most common systemic mycoses in domestic cats and the cheetah.
**Descriptors:** cheetah, male, *Acinonyx jubatus*, lung, spinal cord, granuloma, *Cryptococcus neoformans*, progressive lameness, meningomyelitis, systemic mycoses, clinical report, literature review.

Molia, S., B.B. Chomel, R.W. Kasten, C.M. Leutenegger, B.R. Steele, L. Marker, J.S. Martenson, D.F. Keet, R.G. Bengis, R.P. Peterson, L. Munson, and S.J. O'Brien (2004). **Prevalence of *Bartonella* infection in wild African lions (*Panthera leo*) and cheetahs (*Acinonyx jubatus*).** *Veterinary Microbiology* 100(1-2): 31-41. ISSN: 0378-1135.
**Abstract:** *Bartonella* species are emerging pathogens that have been isolated worldwide from humans and other mammals. Our objective was to estimate the prevalence of *Bartonella* infection in free-ranging African lions (*Panthera leo*) and cheetahs (*Acinonyx jubatus*). Blood and/or serum samples were collected from a convenience sample of 113 lions and 74 cheetahs captured in Africa between 1982 and 2002. Whole blood samples available from 58 of the lions and 17 of the cheetahs were cultured for evidence of *Bartonella* spp., and whole blood from 54 of the 58 lions and 73 of the 74 cheetahs tested for the presence of *Bartonella* DNA by TaqMan PCR. Serum samples from the 113 lions and 74 cheetahs were tested for the presence of antibodies against *Bartonella henselae* using an immunofluorescence assay. Three (5.2%) of the 58 lions and one (5.9%) of the 17 cheetahs were bacteremic. Two lions were infected with *B. henselae*, based on PCR/RFLP of the citrate synthase gene. The third lion and the cheetah were infected with previously unidentified *Bartonella* strains. Twenty-three percent of the 73 cheetahs and 3.7% of the 54 lions tested by TaqMan PCR were positive for Bartonella spp. *B. henselae* antibody prevalence was 17% (19/113) for the lions and 31% (23/74) for the cheetahs. The prevalence of seropositivity, bacteremia, and positive TaqMan PCR was not significantly different between sexes and age categories (juvenile versus adult) for both lions and cheetahs. Domestic cats are thus no longer the only known carriers of *Bartonella* spp. in Africa. Translocation of *B. henselae* seronegative and TaqMan PCR negative wild felids might be effective in limiting the spread of *Bartonella* infection.
**Descriptors:** cheetah, *Acinonyx jubatus*, lion, *Panthera leo*, *Bartonella* infection, free ranging, blood samples, serum samples, DNA, antibodies, carriers, Africa.

Munson, L. (1993). **Diseases of captive cheetahs (*Acinonyx jubatus*): results of the Cheetah Research Council Pathology Survey, 1989-1992.** *Zoo Biology* 12(1): 105-124. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetahs, *Acinonyx jubatus*, captive, gastritis, liver, fibrosis, kidneys, glomerulonephritis, nephritis, pancreatitis, zoos, surveys, zoo animals, circulatory disorders, feline peritonitis virus, pathology, veins, veno occlusive disease, United States.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Munson, L., L. Marker, E. Dubovi, J.A. Spencer, J.F. Evermann, and S.J. O'Brien (2004). **Serosurvey of viral infections in free-ranging Namibian cheetahs (*Acinonyx jubatus*).** *Journal of Wildlife Diseases* 40(1): 23-31. ISSN: 0090-3558.
**Abstract:** Cheetahs (*Acinonyx jubatus*) in captivity have unusually high morbidity and mortality from infectious diseases, a trait that could be an outcome of population homogeneity or the immunomodulating effects of chronic stress. Free-ranging Namibian cheetahs share ancestry with captive cheetahs, but their susceptibility to infectious diseases has not been investigated. The largest remaining population of free-ranging cheetahs resides on Namibian farmlands, where they share habitat with domestic dogs and cats known to carry viruses that affect cheetah health. To assess the extent to which free-ranging cheetahs are exposed to feline and canine viruses, sera from 81 free-ranging cheetahs sampled between 1992 and 1998 were evaluated for antibodies against canine distemper virus (CDV), feline coronavirus (feline infectious peritonitis virus; FCoV/ FIPV), feline herpesvirus 1 (FHV1), feline panleukopenia virus (FPV), feline immunodeficiency virus (FIV), and feline calicivirus (FCV) and for feline leukemia virus (FeLV) antigens. Antibodies against CDV, FCoV/FIPV, FHV1, FPV, and FCV were detected in 24, 29, 12, 48, and 65% of the free-ranging population, respectively, although no evidence of viral disease was present in any animal at the time of sample collection. Neither FIV antibodies nor FeLV antigens were present in any free-ranging cheetah tested. Temporal variation in FCoV/FIPV seroprevalence during the study period suggested that this virus is not endemic in the free-ranging population. Antibodies against CDV were detected in

cheetahs of all ages sampled between 1995 and 1998, suggesting the occurrence of an epidemic in Namibia during the time when CDV swept through other parts of sub-Saharan Africa. This evidence in free-ranging Namibian cheetahs of exposure to viruses that cause severe disease in captive cheetahs should direct future guidelines for translocations, including quarantine of seropositive cheetahs and preventing contact between cheetahs and domestic pets.

**Descriptors:** cheetahs, *Acinonyx jubatus*, viral infections, serosurvey, free ranging, Namibian farmlands, feline viruses, canine viruses, carriers, exposure, corona virus, herpesvirus, domestic pets, translocation, quarentine, Namibia.

Munson, L., J.W. Nesbit, D.G. Meltzer, L.P. Colly, L. Bolton, and N.P. Kriek (1999). **Diseases of captive cheetahs (*Acinonyx jubatus jubatus*) in South Africa: a 20-year retrospective survey.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 30(3): 342-7. ISSN: 1042-7260.

**Abstract:** As part of an ongoing study to determine the basis for high prevalences of veno-occlusive disease, glomerulosclerosis, and chronic lymphoplasmacytic gastritis in cheetahs, a retrospective pathology survey of captive cheetahs in the Republic of South Africa (RSA) was conducted. The RSA population was selected because its genetic composition and captive management were similar to those of the cheetah population in U.S. zoos, in which these diseases are common. For this study, archived pathology materials at the University of Pretoria Faculty of Veterinary Sciences in Onderstepoort and the Faculty of Veterinary Science, MEDUNSA, from 69 cheetahs that died between 1975 and 1995 were reviewed, and prevalences of common lesions were compared with those in the U.S. population. Gastritis associated with Helicobacter-like organisms was the most prevalent disease, accounting for close to 40% of the mortalities, including several cheetahs < 3 yr old. Glomerulosclerosis and veno-occlusive disease also were major causes of mortality in RSA cheetahs. RSA cheetahs also had adrenal cortical hyperplasia, cardiac fibrosis, lymphocytic depletion of the spleen, systemic amyloidosis, and splenic myelolipomas. The presence in the captive RSA cheetah population of the same unusual diseases that are common in U.S. cheetahs suggests a species predilection to develop these diseases in captivity.

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, gastritis, glomerulosclerosis, hepatic veno occlusive disease, amyloidosis, epidemiology, pathology, zoo animals, *Helicobacter* isolation, purification, kidney pathology, liver pathology, prevalence, retrospective studies, 20 year survey, South Africa.

Munson, L., K.A. Terio, M. Worley, M. Jago, A. Bagot Smith, and L. Marker (2005). **Extrinsic factors significantly affect patterns of disease in free-ranging and captive cheetah (*Acinonyx jubatus*) populations.** *Journal of Wildlife Diseases* 41(3): 542-548. ISSN: 0090-3558.

**Abstract:** The cheetah (*Acinonyx jubatus*) has been considered a paradigm for disease vulnerability due to loss of genetic diversity. This species monomorphism has been suspected to be the basis for their general poor health and dwindling populations in captivity. North American and South African captive populations have high prevalences of hepatic veno-occlusive disease, glomerulosclerosis, gastritis, and systemic amyloidosis, diseases that are rare in other species. Unusually severe inflammatory reactions to common infectious agents have also been documented in captive cheetahs. The current study compared disease prevalences in free-ranging Namibian cheetahs with those in two captive populations of similar ages. The occurrence of diseases in the free-ranging population was determined from 49 necropsies and 27 gastric biopsies obtained between 1986 and 2003 and compared with prevalences in 147 North American and 80 South African captive cheetahs. Except for two cheetahs, the free-ranging population was in robust health with only mild lesions present, in contrast with significantly higher prevalences in the captive populations. Despite widespread heavy Helicobacter colonization in wild cheetahs, only 3% of the free-ranging population had moderate to severe gastritis, in contrast with 64% of captive cheetahs. No severe inflammatory reactions to viral infections were detected in the free-ranging animals. Because free-ranging Namibian cheetahs are as genetically impoverished as captive cheetahs, these findings caution against attributing loss of fitness solely to genetic factors and attest to the fundamental importance of extrinsic factors in wildlife health.

**Descriptors:** cheetah, free ranging, *Acinonyx jubatus*, patterns of disease, extrinsic factors, significantly affect, genetics, immunology, physiology, disease susceptibility, environment, *Helicobacter* infections, epidemiology, stress.

Munson, L., R. Wack, M. Duncan, R.J. Montali, D. Boon, I. Stalis, G.J. Crawshaw, K.N. Cameron, J. Mortenson, S. Citino, J. Zuba, and R.E. Junge (2004). **Chronic eosinophilic dermatitis associated with persistent feline herpes virus infection in cheetahs (*Acinonyx jubatus*).** *Veterinary Pathology* 41(2): 170-6. ISSN: 0300-9858.

**Abstract:** A chronic ulcerative and eosinophilic dermatitis occurred in 20 captive cheetahs (*Acinonyx jubatus*) with persistent feline herpes virus 1 (FHV1) infection. Affected animals had erythematous, ulcerated plaques primarily on the face and forelegs in sites of contact with lachrymal and salivary secretions. The dermatitis was characterized by dense infiltrates of eosinophils and plasma cells and pseudoepitheliomatous hyperplasia. Rare keratinocytes within the lesions had nuclei with marginated chromatin and small eosinophilic inclusions composed of herpes virus nucleocapsids. Virus isolated from lesions

was confirmed to be FHV1. Lesions persisted and progressed unless removed by cryoexcision. The occurrence of this unusual reaction to FHV1 in approximately 5% of captive North American cheetahs suggests a species propensity for a Th2-dominant response to herpes virus infection. This atypical immune reaction may indicate a heritable trait or modulation of the immune response by other factors such as chronic stress.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, chronic ulcerative eosinophilic dermatitis, persistent feline herpes virus infection, ulcerated plaques, eosinophils, hyperplasia, immunereaction, atypical, chronic stress.

Munson, L. and Charles Louis Davis D.V.M. Foundation for the Advancement of Veterinary and Comparative Pathology. (1999). ***Diseases of Wild Felids.***, [Gurnee, Ill.]: The Foundation, [1999].: 2 videocassettes: sd., col.; 1/2 in. p.
**NAL Call Number:** Videocassette.no. 3151
**Abstract:** Lectures with slides illustrating diseases of wild felids, with emphasis on African lions and cheetahs.
**Descriptors:** Lions, *Panthera leo*, Diseases, Cheetah, *Acinonyx jubatus*, wild Felids Diseases, video cassettes.
**Notes:** At head of title: Veterinary pathology. "13 September 1999." VHS.Contents: tape 1. Lectures 1 & 2 (ca. 99 min.) -- tape 2. Lectures 3 & 4 (ca. 89 min.).

Mwanzia, J.M., R.A. Kock, J.M. Wambua, N. Kock, and O. Jarret (1995). **An outbreak of sarcoptic mange in free living cheetah (*Acinonyx jubatus*) in the Mara region of Kenya**. In: *Proceedings, American Association of Zoo Veterinarians, Wildlife Disease Association, American Association of Wildlife Veterinarians Joint Conference,East Lansing, Michigan,* p. 105-114.
**Abstract:** *Sarcoptes scabiei* was identified in skin scrapings from 9 of 12 temporarily captured cheetahs. Affected animals were injected with ivermectin at 0.3 mu g/kg before recovery from the immobilizing anaesthetic. Mange did not seem to affect other species in the vicinity. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, acaricides, avermectins, chemical control, ectoparasites, ivermectin, mange, mite control, skin diseases, wild animals, Acari, Arachnida, Felidae, mites, *Sarcoptes*, *Sarcoptes scabiei*.

Nomura, Y. and Y. Une (2004). **Pathological study on enteric *Helicobacter* infection in captive cheetahs (*Acinonyx jubatus*) in Japan**. *Journal of Azabu University*(9/10): 127-132. ISSN: 1346-5880.
**Abstract:** There has been no report on the prevalence and pathogenicity of enteric *Helicobacter* in large felids, including cheetahs. The pathogenicity of most enteric Helicobacters still remains unknown. Pathological examination of 63 captive cheetahs revealed a high incidence of lymphocytic enteritis. However, no relationship between enteritis and *Helicobacter* infection of the intestine was found. The relationship of amyloid and *Helicobacter* infection of the intestine and its pathogenicity in captive cheetahs were studied to identify the cause of this disease. Pathological studies were carried out on 43 of the 63 cheetahs that died in captivity. Amyloid was deposited in 36 cheetah (83.7%) and was frequently observed in the small intestine. There was no relationship between amyloid and *Helicobacter* infection of intestine. Molecular biological examination distinguished that the bacteria derived from two cheetahs were *H. bilis*, *Flexispira rappini* and *H. cinaedi*. The relationship of enteritis and *Helicobacter* infection of the intestine was still unclear because the small number of cheetahs where *Helicobacter* was isolated. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, *Heliobacter* infection, pathological study, pathology, enteritis, pathogenicity, amyloid, *Heliobacter bilis*, *Flexispira rappini* and *H. cinaedi.*
**Language of Text:** Japanese, Summary in English.

Ofri, R., R.Y. Barishak, G. Eshkar, and I. Aizenberg (1996). **Feline central retinal degeneration in captive cheetahs (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 27(1): 101-108. ISSN: 1042-7260.
**Descriptors:** cheetahs, *Acinonyx jubatus*, feline central retinal degeneration, captive, nutrition, sense organs, dietary supplementation, dietary taurine deficiency, eye disease, vision loss.

Olmsted, R.A., R. Langley, M.E. Roelke, R.M. Goeken, D. Adger Johnson, J.P. Goff, J.P. Albert, C. Packer, M.K. Laurenson, T.M. Caro, L. Scheepers, D.E. Wildt, M. Bush, J.S. Martenson, and S.J. O'Brien (1992). **Worlwide prevalence of lentivirus infection in wild feline species: epidemiologic and phylogenetic aspects**. *Journal of Virology* 66(10): 6008-6018. ISSN: 0022-538X.
**Abstract:** The natural occurrence of lentiviruses closely related to feline immunodeficiency virus (FIV) in nondomestic field species was shown to be worldwide. Cross-reactive antibodies to FIV were common in several free-ranging populations of large cats, including East African lions and cheetahs of the Serengeti ecosystem and in puma, (cougar or mountain lion) populations throughout North America. Infectious puma lentivirus (PLV) was isolated from several Florida panthers, a severely endangered relict puma subspecies inhabiting the Big Cypress Swamp and Everglades ecosystems in southern Florida. Phylogenetic analysis of PLV genomic sequences from disparate

geographical isolates showed appreciable divergence from domestic cat FIV sequences as well as between PLV sequences found in different North American areas. The level of sequences divergence between PLV and FIV was greater than the level of divergence between human and some simian immunodeficiency viruses, suggesting that the transmission of FIV between feline species is infrequent and parallels in time the emergence of HIV from simian ancestors. *Reproduced with permission of CAB.*
**Descriptors:** wild feline species, cheetah, *Acinonyx jubatus*, viral diseases, Cats, Felidae, Feline immunodeficiency virus, *Felis concolor*, lentivirus, Lions, cougar, mountain lion, panthers.

Osofsky, S.A., W.D. Hardy, and K.J. Hirsch (1994). **Serologic evaluation of free-ranging lions (*Panthera leo*), leopards (*Panthera pardus*) and cheetahs (*Acinonyx jubatus*) for feline lentivirus and feline leukaemia virus in Botswana**. In: *Proceedings American Association of Zoo Veterinarians and Association of Reptilian and Amphibian Veterinarians Annual Conference,Pittsburg, Pennsylvania,* American Association of Zoo Veterinarians: Lawrence, Kansas, USA, p. 398-402.
**Descriptors:** felids, free ranging, lions, *Panthera leo*, leopards, *Panthera pardus*, cheetahs, *Acinonyx jubatus*, serological surveys, wild animals, Felidae, feline immunodeficiency virus, feline oncovirus, lentivirus, feline leukemia virus, conference proceedings, Botswana.

Osofsky, S.A., K.J. Hirsch, E.E. Zuckerman, and W.D. Hardy (1996). **Feline lentivirus and feline oncovirus status of free-ranging lions (*Panthera leo*), leopards (*Panthera pardus*), and cheetahs (*Acinonyx jubatus*) in Botswana: a regional perspective**. *Journal of Zoo and Wildlife Medicine* 27(4): 453-467. ISSN: 1042-7260.
**Abstract:** Botswana lions, leopards and cheetahs were evaluated for evidence of feline lentivirus infection by assaying for antibodies against test antigens derived from a puma lentivirus isolate (PLV< sub>CGZ</ sub>) and a domestic cat feline immunodeficiency virus (FIV) and for oncovirus (feline leukemia virus (FeLV)) infection using an ELISA for detection of antigen. Blood collection filter paper kits were distributed countrywide to safari hunters and Department of Wildlife and National Parks field officers involved in problem predator management. All sampling was opportunistic; no cats were captured, anaesthetized or killed for this project. Five different assays for antibodies to lentivirus were used on most samples: PLV< sub>CGZ</ sub> indirect immunofluorescence assay (IFA), PLV< sub>CGZ</ sub> western immunoblot (WB), FIV ELISA, FIV IFA and FIV WB. One test was used for detection of oncovirus antigen: domestic cat FeLV ELISA. None of the cats tested positive for FeLV infection. Evidence of lentivirus infection (defined as a positive result on at least the PLV< sub>CGZ</ sub> WB) was found in all 3 species: 8 of 31 lions (25.8%), 3 of 18 leopards (16.7%), and 1 of 4 cheetahs (25%). Seropositive cats were found in geographically diverse parts of the country. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, leopards, *Panthera pardus*, feline lentivirus, feline oncovirus, disease surveys, viral diseases, feline immunodeficiency virus, feline leukemia virus, lions, panthera, Botswana.

Palmer, A.C., J.J. Callanan, L.A. Guerin, B.J. Sheahan, N. Stronach, and R.J. Franklin (2001). **Progressive encephalomyelopathy and cerebellar degeneration in 10 captive-bred cheetahs.** *Veterinary Record* 149(2): 49-54. ISSN: 0042-4900.
**Abstract:** Progressive ataxia, with head tremor, developed in 10 captive-born cheetah cubs under six months of age. The condition was usually preceded by coryza and an ocular discharge. Initially the ataxia and weakness affected the hindquarters, then the forelegs, and head tremor developed later. Significant pathological changes were confined to the central nervous system. There was widespread Wallerian degeneration in the funiculi of the spinal cord (except those in the dorsal columns), in the medulla and in the cerebellum. In the cerebellum there was degeneration of Purkinje cells and of the molecular and granular cell layers. There was chromatolysis in the Purkinje cells, the ventral horn cells of the spinal cord and in the neurons of the lateral vestibular nucleus. The olivary nucleus was necrotic. There were foci of inflammatory cells in the molecular layer of the cerebellum and in the medulla. The cause of the disease remains unknown.
**Descriptors:** cheetah cubs, *Acinonyx jubatus*, encephalomyelopathy, cerebellar degeneration, captive bred, progressive ataxia, head tremor, central nervous system diseases, wallerian degeneration, spinal cord, medulla, cerebellum, Purkinje cells.

Papendick, R.E., L. Munson, T.D. O'Brien, and K.H. Johnson (1997). **Systemic AA amyloidosis in captive cheetahs (*Acinonyx jubatus*).** *Veterinary Pathology* 34(6): 549-56. ISSN: 0300-9858.
**Abstract:** Ongoing disease surveillance of necropsied captive cheetahs (*Acinonyx jubatus*) (n = 141) revealed a high prevalence of renal amyloidosis (n = 54 [38%]; age 1 to 16 years). The prevalence increased from 20% in pre- 1990 necropsies to 70% of cheetahs necropsied in 1995. In 74% of the cheetahs with amyloidosis, renal failure was determined to be the sole or partial cause of death. Papillary necrosis was seen only in affected cheetahs and involved 25% of these animals. Amyloid was present predominantly in the medullary interstitium, with minimal glomerular involvement. The amyloid deposits were immunohistochemically identified as AA type using antisera to both human and canine protein AA. A high percentage (52%) of animals with renal amyloid

also had subsinusoidal hepatic AA amyloid deposits. Inflammatory diseases were identified in 100% of affected cheetahs. The most common inflammatory disease was chronic lymphoplasmacytic gastritis. The prevalence and severity of gastritis was higher in cheetahs with amyloidosis, and the prevalence of severe gastritis increased from 16% to 43%, coinciding with the increase in prevalence of amyloidosis. These findings suggest that cheetahs have a high prevalence of systemic amyloidosis in response to inflammation and that renal amyloidosis is an increasingly significant cause of morbidity and mortality in captive cheetah populations. Factors of potential importance in the apparent high prevalence of AA amyloidosis in cheetahs are currently being investigated in our laboratories.
**Descriptors:** cheetah, *Acinonyx jubatus*, renal amyloidosis, high prevalence, renal failure, AA amyloidosis, inflammatory diseases, chronic lymphoplasmacytic gastritis, systemic amyloidosis.

Pearks Wilkerson, A.J., E.C. Teeling, J.L. Troyer, G.K. Bar Gal, M. Roelke, L. Marker, J. Pecon Slattery, and S.J. O'Brien (2004). **Coronavirus outbreak in cheetahs: lessons for SARS.** *Current Biology CB* 14(6): R227-8. ISSN: 0960-9822.
**Descriptors:** cheetahs, *Acinonyx jubatus*, virology, coronavirus infections, epidemiology, feline genetics, disease outbreaks, phylogeny, models, SARS virus, sequence analysis, DNA, variation genetics.

Peet, R.L. and J.M. Curran (1992). **Spongiform encephalopathy in an imported cheetah**. *Australian Veterinary Journal* 69(7): 171. ISSN: 0005-0423.
**Abstract:** A 5.5-year-old cheetah at the Broome Zoo was observed to be ataxic and disorientated during December 1991. Blood samples showed a strong positive titre to toxoplasmosis. The animal was killed 4 weeks after the onset of clinical symptoms when it exhibited falling, locomotory weakness and distress. PM examination showed no visible lesions. Histopathology showed widespread axonal degeneration and demyelination of all tracts in the spinal cord. Severe spongiform change was visible in the grey matter of the neuroaxis, especially in the corpus striatum, midbrain and thalamic areas. On the basis of neuropathology, a diagnosis of spongiform encephalopathy was made and samples were forwarded to the reference laboratory in Weybridge, UK. The presence of fibrils was confirmed by electron microscopy. Meanwhile, a quarantine order was placed on the zoo and the previously buried carcasses were disinterred and incinerated. The cheetah was born at Marwell Zoo in England on 16 June 1986 and imported together with 2 littermates to Australia on 9 May 1989. Marwell Zoo practised a 'feeding in' of culled carcasses to other zoo animals, particularly felids and canids. The cheetah probably ingested the infective agent while still in England. This is the first diagnosis of spongiform encephalopathy in a cheetah and of spongiform encephalopathy in a zoo animal outside the UK. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, spongiform encephalopathy, case reports, laboratory diagnosis, nervous system diseases, pathology, zoo animals, Felidae.

Peirce, M.A., M.K. Laurenson, and S.C. Gascoyne (1995). **Hepatozoonosis in cheetahs and wild dogs in the Serengeti ecosystem**. *African Journal of Ecology* 33(3): 273-275. ISSN: 0141-6707.
**Abstract:** Between 1987 and 1991, blood was collected from 24 *Acinonyx jubatus* and 16 *Lycaon pictus* living in the Serengeti, Tanzania, and examined for parasites. Microscopical examination revealed the presence of Hepatozoon in leukocytes from 13 *A. jubatus* (54.2%) and 13 *L. pictus* (81.5%). Highest parasitaemias occurred in October and November in *A. jubatus* but no seasonal variation was observed in *L. pictus*. This represents the first record of Hepatozoon in African *L. pictus*. The morphology of Hepatozoon gametocytes indicated differences between those in *A. jubatus* and *L. pictus. Reproduced with permission of CAB.*
**Descriptors:** cheetahs, *Acinonyx jubatus*, wild dogs, *Lycaon pictus*, disease prevalence, epidemiology, parasites, wild animals, Hepatozoon, protozoa, parasite levels.

Penzhorn, B.L., L.M. Booth, and D.G.A. Meltzer (1994). ***Isopora rivolta* recovered from cheetahs.** *Journal of the South African Veterinary Association* 65(1): 2. ISSN: 0301-0732.
**NAL Call Number:** 41.8 So8
**Descriptors:** cheetahs, *Acinonyx jubatus*, oocytes, feces, length, width, sporocysts, *Isospora rivolta*, South Africa.

Pfeifer, M.L., J.F. Evermann, M.E. Roelke, A.M. Gallina, R.L. Ott, and A.J. McKeirnan (1983). **Feline infectious peritonitis in a captive cheetah.** *Journal of the American Veterinary Medical Association* 183(11): 1317-9. ISSN: 0003-1488.
**Descriptors:** captive cheetah, *Acinonyx jubatus*, microbiology, zoo animals, microbiology, carnivora microbiology, Coronaviridae infections, peritonitis, Coronaviridae isolation, purification, Coronaviridae infections, microbiology, peritonitis, microbiology.

Radin, M.J., K.A. Eaton, L. Kramer, R. Wack, R. Sherding, S. Krakowka, and D.R. Morgan (1991). **Diagnosis of gastric spiral bacteria in the cheetah**. *Veterinary Clinical Pathology* 20(1): 17. ISSN: 0275-6382.
**Descriptors:** cheetah, *Acinonyx jubatus*, biopsy, case reports, gastritis, stomach

diseases, gastric spiral bacteria, diagnosis.
**Notes:** Meeting Information: 25th Annual Meeting of American Society for Veterinary Clinical Pathology.

Scherba, G., A.M. Hajjar, D.S. Pernikoff, J.P. Sundberg, E.J. Basgall, M. Leon Monzon, L. Nerurkar, and M.E. Reichmann (1988). **Comparison of a cheetah herpesvirus isolate to feline herpesvirus type 1.** *Archives of Virology* 100(1-2): 89-97. ISSN: 0304-8608.
**Abstract:** A cytopathogenic virus with size and structural characteristics of a Herpesviridae was isolated from a cheetah with severe ulcerative dermatitis. Restriction endonuclease analysis and cross-hybridization studies revealed that the isolate was related to feline herpesvirus type 1 (FHV-1). Antigenic comparison studies using anti-FHV-1 serum demonstrated the presence of common antigens in the FHV-1 and the isolate from the cheetah.
**Descriptors:** cheetah, *Acinonyx jubatus*, cheetah herpesevirus, comparison, feline herpesevirus type 1, ulcerative dermatitis, cytopathogenic virus, size, structural characteristics.

Spencer, J.A. (1991). **Lack of antibodies to coronaviruses in a captive cheetah (*Acinonyx jubatus*) population.** *Journal of the South African Veterinary Association* 62(3): 124-5. ISSN: 0038-2809.
**Abstract:** Cheetahs (*Acinonyx jubatus*) (n = 40) were tested by means of an immunofluorescent test (IFT) for the presence of antibodies to the feline coronavirus group. All cheetahs tested negatively and this was further confirmed by virus serum neutralisation.
**Descriptors:** captive cheetas, *Ainonyx jubatus*, antibodies, viral analysis, coronavirus, feline immunology, cats, feline infectious peritonitis immunology.

Storms, T.N., V.L. Clyde, L. Munson, and E.C. Ramsay (2003). **Blastomycosis in nondomestic felids.** *Journal of Zoo and Wildlife Medicine* 34(3): 231-238. ISSN: 1042-7260.
**Descriptors:** nondomestic felids, Blastomycosis, Asian lions, *Panthera leo persicus*, African lion, *Panthera leo*, Siberian tiger, *Panthera tigris*, cheetah, *Acinonyx jubatus*, snow leopard, *Panthera uncia*, radiography, cytologic examination, serology.

Terio, K.A., L. Munson, L. Marker, B.M. Aldridge, and J.V. Solnick (2005). **Comparison of *Helicobacter* spp. in cheetahs (*Acinonyx jubatus*) with and without gastritis.** *Journal of Clinical Microbiology* 43(1): 229-34. ISSN: 0095-1137.
**Abstract:** Chronic gastritis causes significant morbidity and mortality in captive cheetahs but is rare in wild cheetahs despite colonization by abundant spiral bacteria. This research aimed to identify the Helicobacter species that were associated with gastritis in captive cheetahs but are apparently commensal in wild cheetahs. Helicobacter species were characterized by PCR amplification and sequencing of the 16S rRNA, urease, and cagA genes and by transmission electron microscopy of frozen or formalin-fixed paraffin-embedded gastric samples from 33 cheetahs infected with Helicobacter organisms (10 wild without gastritis and 23 captive with gastritis). Samples were screened for mixed infections by denaturant gel gradient electrophoresis of the 16S rRNA gene and by transmission electron microscopy. There was no association between Helicobacter infection and the presence or severity of gastritis. Eight cheetahs had 16S rRNA sequences that were most similar (98 to 99%) to *H. pylori.* Twenty-five cheetahs had sequences that were most similar (97 to 99%) to "*H. heilmannii*" or *H. felis*. No cheetahs had mixed infections. The ultrastructural morphology of all bacteria was most consistent with "*H. heilmannii*," even when 16S rRNA sequences were *H. pylori*-like. The urease gene from *H. pylori*-like bacteria could not be amplified with primers for either "*H. heilmannii*" or *H. pylori* urease, suggesting that this bacteria is neither *H. pylori* nor "*H. heilmannii*." The cagA gene was not identified in any case. These findings question a direct role for *Helicobacter* infection in the pathogenesis of gastritis and support the premise that host factors account for the differences in disease between captive and wild cheetah populations.
**Descriptors:** cheetahs, *Acinonyx jubatus*, gastitis, *Heliobacter* species, chronic gastritis, captive, spiral bacteria, wild, cheetahs, comparison.

Terio, K., L. Munson, and J.V. Solnick (2000). **Infection with *H.pylori*-Like organisms is associated with gastritis in captive but not wild cheetahs**. *Gastroenterology* 118(4 Suppl. 2 Part 1): AGA A746-AGA A747. ISSN: 0016-5085.
**Descriptors:** cheetah, *Acinonyx jubatus*, infection, *H. pylorii* like organism, captive cheetahs, wild cheetahs, meeting information.
**Notes:** 101st Annual Meeting of the American Gastroenterological Association and the Digestive Disease Week, San Diego, California, USA; May 21-24, 2000.

Terrell, S.P., D.K. Fontenot, M.A. Miller, and M.A. Weber (2003). **Chylous ascites in a cheetah (*Acinonyx jubatus*) with venoocclusive liver disease.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 34(4): 380-4. ISSN: 1042-7260.
**Abstract:** An 11-yr-old female cheetah (*Acinonyx jubatus*) was diagnosed clinically with hepatic and renal disease and euthanatized after an extended illness. Postmortem examination revealed 8-10 L of milky white fluid in the abdominal cavity and markedly

dilated lymphatic vessels within the intestinal mesentery. The abdominal fluid was a chylous effusion based on the cytologic predominance of lymphocytes and macrophages and comparison of cholesterol and triglyceride levels in the fluid and in serum. Gross and histopathologic lesions in the liver were consistent with a diagnosis of venoocclusive liver disease. Chylous ascites is uncommon with human chronic liver disease and is rarely identified in animals.
**Descriptors:** cheetah, *Acinonyx jubatus*, chylous ascites, hepatic veno occlusive liverdisease, pathology, radiography, liver pathology, hepatic disease, renal disease.

Travis, E.K., M. Duncan, M. Weber, M.J. Adkesson, and R.E. Junge (2007). **Ileocecocolic strictures in two captive cheetahs (*Acinonyx jubatus jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 38(4): 574-8. ISSN: 1042-7260.
**Abstract:** Intestinal strictures were diagnosed in two captive cheetahs (*Acinonyx jubatus jubatus*). The cheetahs presented with lethargy, anorexia, diarrhea, and weight loss. The first cheetah had a stricture of the ileocecocolic junction diagnosed at necropsy. The second had an ileocecocolic stricture causing obstruction that was diagnosed at surgery. After resection and anastomosis, the cheetah recovered well. The etiology of the strictures remains undetermined. Intestinal stricture, particularly of the ileocecocolic junction, should be considered as a differential diagnosis for cheetahs with nonspecific gastrointestinal signs.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, iliocecocolic strictures, lethargy, anorexia, diarrhea, weight loss, intestinal strictures, gastrointestinal signs, differential diagnosis, resection, anastomosis.

Une, Y. (2000). **Ultrastructural details of *Helicobacter* species from cheetahs**. *Journal of Veterinary Medicine, Japan* 53(11): 933-938. ISSN: 0447-0192.
**Descriptors:** cheetah, *Acinonyx jubatus*, morphology, reviews, ultrastructure, *Helicobacter* species.
**Language of Text:** Japanese.

Valicek, L., B. Smid, and J. Vahala (1993). **Demonstration of parvovirus in diarrhoeic African cheetahs (*Acinonyx jubatus jubatus* Schreber, 1775).** *Veterinarni Medicina* 38(4): 245-9. ISSN: 0375-8427.
**Abstract:** Parvovirus was demonstrated in the intestinal content of diarrhoeic African cheetahs by electron microscopy. The virus was isolated in a feline kidney cell line inoculated with a filtrate of the intestinal content. Its growth characteristics, cytopathic effect, agglutination of porcine erythrocytes, structure, and results of immunoelectron microscopic examination were indistinguishable from those of feline panleukopenia virus.
**Descriptors:** cheetah, *Acinonyx jubatus*, parvovirus, diarrhea, Africans, intestinal content, electron microscopy, feline kidney cell line, growth characteristics, cytopathic effect, feline panleukopenia virus.

van den Ingh, T.S., P. Zwart, and A. Heldstab (1981). **Veno-occlusive disease (VOD) of the liver in cheetahs and snowleopards**. *Schweizer Archiv Fur Tierheilkunde* 123(6): 323-327. ISSN: 0036-7281.
**Abstract:** In a retrospective study of autopsy material, two cheetahs and three snowleopards showed occlusive lesions of the centrilobular and sublobular hepatic veins. These consisted of a loosely arranged or quite dense collagen and reticulin network. Secondary changes in the surrounding liver parenchyma were congestion, collapse and fibrosis. Because the larger hepatic veins and the posterior caval vein were unaffected, and no changes could be found suggesting central circulatory failure, this resembles veno-occlusive disease of the liver in man. No conclusive evidence for a specific aetiology could be obtained. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, circulatory disorders, veno occulusive disease, liver diseases, snow leopard, *Uncia uncia*, pathology, centrilobular vein, sublobular hepatic vein, zoo animals.
**Language of Text:** German, French, and Italian.

Van Rensburg, I.B. and M.A. Silkstone (1984). **Concomitant feline infectious peritonitis and toxoplasmosis in a cheetah (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 55(4): 205-207. ISSN: 0038-2809.
**Abstract:** Three wild caught littermate cheetahs succumbed to feline infectious peritonitis (FIP) after being in captivity for approximately 9 weeks. A necropsy and histopathological examination on one revealed typical signs of FIP as well as histopathological lesions in the liver and brain of concomitant toxoplasmosis. Hypochromic anaemia, neutrophilia, lymphopaenia, eosinopaenia and elevations of alpha 2-globulin and gamma-globulin fractions of the blood were present in the one animal examined. These findings together with some clinical signs are reported.
**Descriptors:** cheetah, *Acinonyx jubatus*, feline infectious peritonitis, toxoplasmosis, mixed infections, parasites, pathology.

van Vuuren, M., T. Goosen, and P. Rogers (1999). **Feline herpesvirus infection in a group of semi-captive cheetahs.** *Journal of the South African Veterinary Association* 70(3): 132-134. ISSN: 0038-2809.

**Abstract:** Clinical disease caused by feline herpesvirus type-1 in wild felid species is similar to that in domestic cats. Herpesviruses are endemic in free-ranging lions in South Africa but actual clinical disease due to them has not been reported in free-ranging felids. The first reports of feline herpesvirus infection associated with clinical disease in wild felids came from Australia and the USA in 1970. Subsequent reports of clinical disease in cheetahs and other wild felid species were limited to captive animals. This report deals with clinical disease in a group of semi-captive cheetahs in which 18 animals were affected, and included 12 adult males, 4 adult females and 2 subadults. No mortalities occurred in this group, the most common clinical signs being sneezing, nasal discharge and loss of appetite.
**Descriptors:** cheetahs, semi-captive, *Acinonyx jubatus*, feline herpesvirus, infection, clinical disease, clinical signs, sneezing, nasal discharge, loss of appetite.

Venter, E.H., M. van Vuuren, J. Carstens, M.L. van der Walt, B. Nieuwoudt, H. Steyn, and N.P. Kriek (2003). **A molecular epidemiologic investigation of Salmonella from a meat source to the feces of captive cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 34(1): 76-81. ISSN: 1042-7260.
**Abstract:** Low cheetah (*Acinonyx jubatus*) birth rates were observed for a long time in a captive breeding facility in which Salmonella, which was possibly present in contaminated beef, was isolated from still-born lion (*Panthera leo*) cubs. Salmonella, including 14 isolates of *Salmonella serovar typhimurium* and 19 isolates of *Salmonella serovar muenchen*, was subsequently isolated 47 times from 378 meat samples at the facility during a 13-mo period. Salmonella, including 26 isolates of *S. serovar typhimurium*, 10 of S. serovar muenchen, and 11 other serovars, also was isolated 54 times from 119 fecal samples. Only three plasmid profiles were identified in 59 *S. typhimurium* isolates from both meat and fecal samples. Although random-amplified polymorphic DNA fingerprinting using different primers in the polymerase chain reaction was able to distinguish between *S. typhimurium* and *S. muenchen* and to demonstrate similar chromosomal DNA fingerprints in some of the isolates from meat and feces, the results were not consistent enough to prove that the Salmonella in the feces originated from contaminated meat. However, the predominance of only two serovars in the meat fed to carnivores and in the feces of these animals suggests that the meat was the source of the Salmonella organisms in the feces.
**Descriptors:** captive cheetah, *Acinonyx jubatus*, Salmonella, meat source, contaminated beef, feces, microbiology, stil born lion, microbiology, salmonella isolation and purification, animal transmission, epidemiologic investigation.

Wack, R. (2000). **Infectious diseases of captive cheetahs.** *Proceedings of the North American Veterinary Conference* 14(14): 1054-1055. ISSN: 0003-1488.
**NAL Call Number:** SF605.N672
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, infectious diseases, meeting information, conference proceedings.
**Notes:** Meeting held on January 15-19, 2000, Orlando, Florida.

Wack, R.F. (1999). **Gastritis in cheetahs**. In: M.E. Fowler and R.E. Miller (Editors), *Zoo and Wild Animal Medicine: Current Therapy 4,* 4th edition, Philadelphia, USA: W.B. Saunders., p. 458-460. ISBN: 0721686648.
**Descriptors:** cheetah, *Acinonyx jubatus*, clinical aspects, diagnosis, gastritis, stomach diseases, treatment, zoo animals, book chapter.

Wack, R.F., K.A. Eaton, and L.W. Kramer (1997). **Treatment of gastritis in cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(3): 260-6. ISSN: 1042-7260.
**Abstract:** Three cheetahs (*Acinonyx jubatus*) had a clinical history of chronic spiral bacteria-associated gastritis and three cheetahs had no clinical history of gastritis. Gastric biopsies were obtained from all six cheetahs prior to treatment for gastritis and 3 wk and 1 yr posttreatment. The cheetahs were treated with tetracycline hydrochloride 500 mg p.o. q.i.d., metronidazole 250 mg p.o. q.i.d., and bismuth subsalicylate 300 mg p.o. q.i.d. Each drug was administered concurrently for 7 days. Following this treatment, each cheetah was maintained on 300 mg bismuth subsalicylate p.o. s.i.d. for 1 yr. The three cheetahs with a history of gastritis were culture positive for *Helicobacter acinonyx* and remained positive during the entire study. The three cheetahs with no clinical history of gastritis were culture negative for *H. acinonyx*, but gastric biopsies revealed *Gastrospirillum*-like bacteria (tentatively named *Helicobacter heilmannii*) pretreatment. Gastric biopsies were negative for *H. heilmannii* on subsequent examinations. Although the treatment did not eradicate *H. acinonyx,* it did provide symptomatic relief from the vomiting, anorexia, and weight loss associated with clinical gastritis. The use of endoscopically guided gastric mucosal biopsies for urease testing and histopathologic examination of Warthin-Starry-stained sections is a sensitive and specific method of diagnosing spiral bacteria-associated gastritis. Treatment of spiral bacteria-associated gastritis in cheetahs should include the rational use of antibiotics (tetracycline or amoxicillin and metronidazole), bismuth compounds, and omeprazole and evaluation of husbandry methods to reduce stress.
**Descriptors:** cheetah, *Acinonyx jubatus*, gastritis, treatment, spiral bacteria, *Heliobacter*,

gastric biopsies, tetracycline hydrochloride, metronidazole, bismuth subsalicylate, gastric mucosal biopsies, urease testing, histopathologic examination, husbandry methods, stress.

Walzer, C. (1994). **"Myelolipome" - in der Milz des Gepards (*Acinonyx jubatus*). [Nodular lipomatosis (myelolipomas) in the spleen of cheetahs. of dissertation [Nodulare Lipomatose].** *Wiener Tierarztliche Monatsschrift* 81(1): 24. ISSN: 0043-535X.
**Descriptors:** cheetah, *Acinonyx jubatus*, nodular lipomatosis, myelipomas, neoplasms, spleen, zoo animals, felidae.
**Language of Text:** German.

Walzer, C., K. Hittmair, and C. Walzer Wagner (1996). **Ultrasonographic identification and characterization of splenic nodular lipomatosis or myelolipomas in cheetahs (*Acinonyx jubatus*)**. *Veterinary Radiology and Ultrasound* 37(4): 289-292. ISSN: 1058-8183.
**NAL Call Number:** SF757.8.A4
**Abstract:** 44 live cheetahs were examined ultrasonographically between 1989 and 1994; 17 originated from 4 European zoos and 27 were examined in 3 facilities in Namibia. Examination of the cheetahs included a clinical examination, abdominal ultrasound, and complete blood chemistry. Splenic myelolipomas were diagnosed ultrasonographically in 11 cheetahs. In 7 cheetahs the diagnosis was confirmed PM. Nine of the 14 cheetahs in Europe had myelolipomas in the spleen, while in the African cheetahs there were only 2 with myelolipomas. Histologically these lesions were characterized by fatty nodules. A more fitting term of nodular lipomatosis of the spleen is suggested. All cheetahs with nodular lipomatosis of the spleen had concurrent chronic diseases. An indicator function of splenic nodular lipomatosis for chronic disease and/or stress is possible. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, splenic nodular lipomatosis, myelolipomas, ultrasonic identification, characterization, spleen, blood chemistry, abdominal ultrasound, clinical examination, disease, chronic stress.

Walzer, C. and A. Kubber Heiss (1995). **Progressive hind limb paralysis in adult cheetahs (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 26(3): 430-435. ISSN: 1042-7260.
**Abstract:** Five adult cheetahs from an Austrian zoo demonstrated identical clinical symptoms within a period of 2 years; progressive hind limb ataxia, loss of proprioception, and eventual recumbency. The progress of the disease could not be influenced by drug therapy. Haematological, blood chemistry, and cerebrospinal fluid values were within normal ranges. Plain radiographs and contrast myelography were unremarkable. Following euthanasia, histological examinations revealed a massive demyelination of the spinal cord in all 5 cheetahs. The lesions were most predominant in the medullary white matter from T6 to L3. The specific cause of this degenerative myelopathy could not be identified. Similar syndromes have been seen in other species. Various possible causes, such as vitamin B< sub>12</ sub> or copper deficiency or organophosphate poisoning, and a possible genetic basis for this disorder are discussed. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, progressive hind limb paralysis, diseases, ataxia, paralysis, pathology, spinal cord, massive demyelination, possible causes.

Walzer, C., A. Kubber Heiss, and B. Bauder (2003). **Spontaneous uterine fibroleiomyoma in a captive cheetah.** *Journal of Veterinary Medicine. A, Physiology, Pathology, Clinical Medicine* 50(7): 363-5. ISSN: 0931-184X.
**Abstract:** Information on uterine neoplasia in felids and more so in non-domestic felids is sparse. In non-domestic felids, this may be due to the small sample size. A uterine fibroleiomyoma is described in a 17-year-old captive cheetah. The multicentric nodular tumour masses were situated in the myometrium, were well demarcated, non-encapsulated and did not show infiltrative growth. Between the neoplastic cells, numerous of varying width, and irregularly braided bundles and whorls of collagen and reticular fibres were demonstrated. Immunohistochemical examinations revealed positive reactions for both desmin, the marker for smooth and skeletal muscle cells, and vimentin, the marker for fibrocyte-derived cells.
**Descriptors:** cheetah, *Acinonyx jubatus*, spontaneous uterine fibroleiomyoma, uterine neoplasms, differntial diagnosis, immunohistochemistry, pathology, ultrasonography, case study.

Walzer, C., A. Url, N. Robert, A. Kubber Heiss, N. Nowotny, and P. Schmidt (2003). **Idiopathic acute onset myelopathy in cheetah (*Acinonyx jubatus*) cubs.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 34(1): 36-46. ISSN: 1042-7260.
**Abstract:** Numerous cases of ataxia, hind limb paresis, and paralysis have occurred in cheetah (*Acinonyx jubatus*) cubs over the past 10 yr within the European Endangered Species Program population, including 12 in mainland Europe, two in the British Isles, one in Namibia, and one in Dubai. The condition is the most important medical factor limiting European cheetah population growth. Eight cubs at the Salzburg Zoo, Austria, were affected. They demonstrated upper motor neuron lesions when alive and bilateral,

symmetrical myelin degeneration of the spinal cord on necropsy. Ballooning of myelin sheaths surrounded mostly preserved axons, and no spheroids, characteristic of acute axonal degeneration, were found. Myelin loss markedly exceeded axonal degeneration. The syndrome's etiology is unclear, although viral, bacterial, parasitic, genetic, nutritional-metabolic, toxic, and physical causes have been considered.
**Descriptors:** cheetah *Acinonyx jubatus*, ataxia, spinal cord diseases, acute disease, myelin loss, myelopathy, Idiopathic, acute onset, hind limb paralysis, eye diseases complications, neurologic examination, nose diseases complications, spinal cord pathology, ultrastructure, spinal cord diseases, diagnosis, therapy, Austria.

Weber, W.J., B.L. Raphael, and H.W.J. Boothe (1984). **Struvite uroliths in a cheetah.** *Journal of the American Veterinary Medical Association* 185(11): 1389-90. ISSN: 0003-1488.
**Descriptors:** cheetah, *Acinonyx jubatus*, surgery, struvite uroliths, surgery, kidney calculi, ureteral calculi, zoo animals, cats, dogs, hemostatics, diagnosis, therapy, diagnosis.

Wells, A., K.A. Terio, M.H. Ziccardi, and L. Munson (2004). **The stress response to environmental change in captive cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 35(1): 8-14. ISSN: 1042-7260.
**Abstract:** The captive North American cheetah (*Acinonyx jubatus*) population is not self-sustaining because of high prevalences of unusual diseases and poor reproductive success. Cheetahs are commonly moved between zoos for breeding purposes to maintain genetic diversity within the captive population, and movement may exacerbate infertility and disease. Fecal corticoids were analyzed by radioimmunoassay to measure the stress response of cheetahs to movement between facilities. Fecal samples were collected from 15 cheetahs for 14 days before movement and for at least 30 days after movement. For each cheetah, premovement fecal corticoid concentrations were used to determine baseline and then compared with trends in postmovement concentrations. In general, postmovement corticoid concentrations either increased (n = 8), did not change (n = 2), or decreased (n = 5). Although individual animal differences occurred, corticoid concentrations increased for most animals moved on-exhibit and decreased in animals moved off-exhibit. Animals moving on-exhibit had an 18-times greater risk of having corticoids elevated more than two standard deviations above baseline for 30 days after movement compared with animals that moved off-exhibit. In addition, greater day-to-day variation in corticoids occurred in animals moved on-exhibit. In general, animals with initially low baseline corticoid concentrations had a greater postmovement corticoid response than cheetahs with initially high baseline levels. These results indicate that some cheetahs have a prolonged stress response when moved between facilities, and the magnitude and character of this response is influenced by the exhibit environment.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, stress response, environmental and location change, physiology, adrenal cortex hormones analysis, feces chemistry, transportation, radioimmunoassay, stress metabolism.

Zhang, B., Y. Une, X. Fu, J. Yan, F. Ge, J. Yao, J. Sawashita, M. Mori, H. Tomozawa, F. Kametani, and K. Higuchi (2008). **Fecal transmission of AA amyloidosis in the cheetah contributes to high incidence of disease.** *Proceedings of the National Academy of Sciences of the United States of America* 105(20): 7263-7268. ISSN: (p) 0027-8424; (E) 1091-6490.
**Abstract:** AA amyloidosis is one of the principal causes of morbidity and mortality in captive cheetahs (*Acinonyx jubatus*), which are in danger of extinction, but little is known about the underlying mechanisms. Given the transmissible characteristics of AA amyloidosis, transmission between captive cheetahs may be a possible mechanism involved in the high incidence of AA amyloidosis. In this study of animals with AA amyloidosis, we found that cheetah feces contained AA amyloid fibrils that were different from those of the liver with regard to molecular weight and shape and had greater transmissibility. The infectious activity of fecal AA amyloid fibrils was reduced or abolished by the protein denaturants 6 M guanidine.HCl and formic acid or by AA immunodepletion. Thus, we propose that feces are a vehicle of transmission that may accelerate AA amyloidosis in captive cheetah populations. These results provide a pathogenesis for AA amyloidosis and suggest possible measures for rescuing cheetahs from extinction.
**Descriptors:** cheetah, *Acinonyx jubatus*, AA amyloidosis, fecal transmission, high incidence of disease, transmissibility, infectious activity, amyloid fibrils, pathogenesis.
**Notes:** Comment In: Proc Natl Acad Sci U S A. 2008 May 20;105(20):7113-4.

Zinkl, J.G., S.E. McDonald, A.B. Kier, S.J. Cippa, and P.J. Small (1981). **Cytauxzoon-like organisms in erythrocytes of two cheetahs**. *Journal of the American Veterinary Medical Association* 179(11): 1261-1262. ISSN: 0003-1488.
**Abstract:** Erythrocytic inclusions similar to those in domestic cats with cytauxzoonosis were found in 2 captive-borne *Acinonyx jubatus* in the USA. The inclusions were round, signet-ring shaped, 0.8 to 1.2 mu m in diameter. The density of infected erythrocytes was <1/1000. An attempt to transmit the infection to a domestic cat failed. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, blood cells, erythrocytes, fractures, lameness, parasites, protozoal infections, zoo animals, Cytauxzoon, Felidae, inclusions, signet ring

shaped.

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### Cheetah - Conservation

Caro, T. (2000). **Controversy over behaviour and genetics in cheetah conservation**. *Conservation Biology Series (Cambridge); Behaviour and Conservation,* Cambridge University Press: The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU, UK; Cambridge University Press, 40 West 20th Street, New York, NY, 10011-4211, USA, 2: 221-237 p. ISBN: 0521665539.
**Descriptors:** cheetah, *Acinonyx jubatus*, behavior, conservation, genetics, mortality.
**Notes:** book chapter.

Crooks, K.R., M.A. Sanjayan, and D.F. Doak (1998). **New insights on cheetah conservation through demographic modeling**. *Conservation Biology* 12(4): 889-95. ISSN: 0888-8892.
**Abstract:** A combination of demographic techniques was used to investigate how variation in survival and reproduction might influence the population persistence of wild cheetahs (*Acinonyx jubatus*). The models used detailed demographic data from recently published, long-term ecological projects on cheetahs of the Serengeti, Tanzania. The findings indicate that juvenile survivorship has a relatively small impact on population growth rate in comparison with the large effects of adult survivorship, a result that is consistent across a range of vital rates and is robust to deviations caused by sampling error and environmental variability. Overall, the findings provide new insights into the current debate on cheetah population dynamics and suggest caution in the interpretation of ecological data for conservation and management.
**Descriptors:** wild cheetahs, *Acinonyx jubatus*, conservation, new insights, demographic modeling, survival, reproduction, wild, juvenile survivorship, adult survivorship, Serengeti, Tanzania.

Durant, S.M., S. Bashir, T. Maddox, and M.K. Laurenson (2007). **Relating long-term studies to conservation practice: The case of the Serengeti Cheetah Project.** *Conservation Biology* 21(3): 602-611. ISSN: 0888-8892.

**NAL Call Number:** QH75.A1C5
**Abstract:** Although detailed, long-term scientific studies provide potentially crucial information for conservation, they are rare. Moreover, there is often a disjunction between scientists and managers that can affect whether scientific results are applied to help solve conservation problems. Long-term studies can promote increased communication between scientists and managers and hence offer an opportunity for constructive engagement between the two groups. We examined direct and indirect impacts of a 30-year study, the Serengeti Cheetah Project (SCP). Much of what is currently known about wild cheetahs comes from the SCP. In particular, the SCP has demonstrated that cheetahs have a combination of semisociality and ranging patterns that is unique among mammals. This system arises because cheetahs need to be mobile to avoid predators and competitors, yet maintain access to prey; this results in densities much lower than for other large carnivores and a requirement for large areas of heterogenous and connected habitat. The SCP started as a research project, but expanded into a national program, developing capacity for carnivore conservation within

Tanzania. Long-term studies such as the SCP are uniquely placed to establish effective working relationships between scientists and managers, engage local and national institutions, and strengthen national capacity for biodiversity conservation. This process is best realized through the establishment of frameworks for conservation that seek to align scientific research with management needs. Long-term studies also play an important role in identifying international priorities for conservation. Nonetheless, the integration of science and management in conservation is a two-way process that requires concerted efforts by both sides to improve and maintain dialogue. Ultimately, conservation depends on people, and maintaining a commitment to a particular area over many years--such as through implementation of a long-term research project--helps establish mutual trust and respect, particularly when combined with development of local and national capacity for scientific research and conservation management.
**Descriptors:** Cheetahs, *Acinonyx jubatus*, capacity development, conservation management, long term conservation studies, Serengeti Cheetah Project, Tanzania.

Fickel, J., A. Wagener, and A. Ludwig (2007). **Semen cryopreservation and the conservation of endangered species**. *European Journal of Wildlife Research* 53(2): 81-89. ISSN: 1612-4642.
**Descriptors:** endangered species, semen cryopreservation, conservation, extinction, resource banking, sperm, reproduction techniques.

Grisham, J. (1997). **North American species survival plan for cheetah *Acinonyx jubatus***. *International Zoo Yearbook* 35(0): 66-70. ISSN: 0074-9664.
**Descriptors:** cheetah, *Acinonyx jubatus*, species survival plan, zoos, North America, long term management, long range goals.

Lindsey, P.A., R. Alexander, L.G. Frank, A. Mathieson, and S.S. Romaanach (2006). **Potential of trophy hunting to create incentives for wildlife conservation in Africa where alternative wildlife-based land uses may not be viable.** *Animal Conservation* 9(3): 283-291. ISSN: 1367-9430.

**NAL Call Number:** QH75.A1 A54
**Abstract:** There is a lack of consensus among conservationists as to whether trophy hunting represents a legitimate conservation tool in Africa. Hunting advocates stress that trophy hunting can create incentives for conservation where ecotourism is not possible. We assessed the hunting preferences of hunting clients who have hunted or plan to hunt in Africa (n=150), and the perception among African hunting operators (n=127) of client preferences at two US hunting conventions to determine whether this assertion is justified. Clients are most interested in hunting in well-known East and southern African hunting destinations, but some trophy species attract hunters to remote and unstable countries that might not otherwise derive revenues from hunting. Clients are willing to hunt in areas lacking high densities of wildlife or attractive scenery, and where people and livestock occur, stressing the potential for trophy hunting to generate revenues where ecotourism may not be viable. Hunting clients are more averse to hunting under conditions whereby conservation objectives are compromised than operators realize, suggesting that client preferences could potentially drive positive change in the hunting industry, to the benefit of conservation. However, the preferences and attitudes of some clients likely form the basis of some of the problems currently associated with the hunting industry in Africa, stressing the need for an effective regulatory framework.
**Descriptors:** cheetahs, *Acinonyx jubatus*, sport hunting, community conservation, game ranching, African wild dogs, hunting, preferences, attitudes, regulatory framework.

Marker Kraus, L. and D. Kraus (1997). **Conservation of strategies for the long-term survival of the cheetah *Acinonyx jubatus* by the cheetah conservation fund, Windhoek**. *International Zoo Yearbook* 35(0): 59-66. ISSN: 0074-9664.
**Descriptors:** cheetahs, *Acinonyx jubatus*, wildlife management, conservation strategies, farm management, habitat loss, livestock farming, long term survival, conservation fund.

Marker, L.L., A.J. Dickman, M.G.L. Mills, R.M. Jeo, and D.W. Macdonald (2008). **Spatial ecology of cheetahs on north-central Namibian farmlands.** *Journal of Zoology* 274(3): 226-238. ISSN: 0952-8369.

**NAL Call Number:** QL1.J68
**Abstract:** Knowledge of a species' ranging behaviour is both fundamental to understanding its behavioural ecology and a prerequisite to planning its management. Few data exist on the spatial ecology of cheetahs *Acinonyx jubatus* outside protected areas, but such areas are particularly important to their conservation. Cheetahs on Namibian farmlands occupied exceptionally large home ranges, averaging 1651 kmpo (pl1594 kmpo), with no detectable effect of sex, social grouping or seasonality. Despite such large ranges, cheetahs tended to utilize intensively only a small fraction of that area: 50% of the fixes were located within an average of 13.9pl5.3% of the home range. Ranges were not exclusive, overlapping on average by 15.8pl17.0%, with male cheetahs showing more intra-sexual range overlap than did females. Coalitions of males appeared to select for a dense, prey-rich habitat, but this preference was not apparent for other social groupings. Conflict with humans is an important contributor to the species' decline,

and these large, overlapping cheetah home ranges result in the movements of each individual cheetah encompassing many farms (21 based on the average home-range size). Consequently, many cheetahs may be exposed to a minority of farmers attempting to kill them, and also that many farmers may see the same cheetahs, thereby gaining an exaggerated impression of their abundance. Conservation priorities for cheetahs outside protected areas are the development of techniques for conflict resolution, as well as the maintenance and restoration of suitable habitat and promotion of land-management practices compatible with the continued existence of large carnivores.
**Descriptors:** cheetahs, *Acinonyx jubatus*, ranging behavior, carnivores, home range size, ecology, Namibian farmlands, conservation, Namibia.

Marker, L.L., A.J. Wilkerson, R.J. Sarno, J. Martenson, C. Breitenmoser Wursten, S.J. O'Brien, and W.E. Johnson (2008). **Molecular genetic insights on cheetah (*Acinonyx jubatus*) ecology and conservation in Namibia.** *Journal of Heredity* 99(1): 2-13. ISSN: 0022-1503.
**Abstract:** The extent and geographic patterns of molecular genetic diversity of the largest remaining free-ranging cheetah population were described in a survey of 313 individuals from throughout Namibia. Levels of relatedness, including paternity/maternity (parentage), were assessed across all individuals using 19 polymorphic microsatellite loci, and unrelated cheetahs (n = 89) from 7 regions were genotyped at 38 loci to document broad geographical patterns. There was limited differentiation among regions, evidence that this is a generally panmictic population. Measures of genetic variation were similar among all regions and were comparable with Eastern African cheetah populations. Parentage analyses confirmed several observations based on field studies, including 21 of 23 previously hypothesized family groups, 40 probable parent/offspring pairs, and 8 sibling groups. These results also verified the successful integration and reproduction of several cheetahs following natural dispersal or translocation. Animals within social groups (family groups, male coalitions, or sibling groups) were generally related. Within the main study area, radio-collared female cheetahs were more closely interrelated than similarly compared males, a pattern consistent with greater male dispersal. The long-term maintenance of current patterns of genetic variation in Namibia depends on retaining habitat characteristics that promote natural dispersal and gene flow of cheetahs.
**Descriptors:** cheetahs, *Acinonyx jubatus*, genetics diversity, conservation of natural resources, ecology, molecular biology, population, homing behavior, microsatellite repeats, social behavior, Namibia.

Marker, L.L. and A.J. Dickman (2003). **Morphology, physical condition, and growth of the cheetah (*Acinonyx jubatus jubatus*).** *Journal of Mammalogy* 84(3): 840-850. ISSN: 0022-2372.
**Descriptors:** cheetah, *Acinonyx jubatus jubatus*, physical condition, growth, morphology, sexual dimorpism.

Merola, M. (1994). **A reassessment of homozygosity and the case for inbreeding depression in the cheetah, *Acinonyx jubatus*: implications for conservation**. *Conservation Biology* 8(4): 961-971. ISSN: 0888-8892.
**Descriptors:** cheetahs, *Acinonyx jubatus*, homozygosity, inbreeding depression, population genetics, population studies, genetic diversity, wildlife management.

Muntifering, J.R., A.J. Dickman, L.M. Perlow, T. Hruska, P.G. Ryan, L.L. Marker, and R.M. Jeo (2006). **Managing the matrix for large carnivores: a novel approach and perspective from cheetah (*Acinonyx jubatus*) habitat suitability modelling.** *Animal Conservation* 9(1): 103-112. ISSN: 1367-9430.

**NAL Call Number:** QH75.A1 A54
**Abstract:** Effective management within the human-dominated matrix, outside of formally protected areas, is of paramount importance to wide-ranging carnviores. For instance, the largest extant population of cheetahs *Acinonyx jubatus* currently persists on privately owned Namibian ranchlands, and provides an excellent case study to examine and design matrix conservation approaches. Although human-caused mortality is likely the principal threat to this population, ancedotal evidence suggests that 'bush encroachment', the widespread conversion of mixed woodland and savannah habitats to dense, Acacia-dominated thickets, is another probable threat. A better understanding of cheetah habitat use, outside of protected areas, could be used to directly influence habitat management strategies and design local restoration and conflict mitigation efforts. To identify specific habitat characteristics associated with cheetah use, we used radio-telemetry locations to identify areas used intensively by cheetahs on commercial Namibian farms. We then compared the habitat characteristics of these 'high-use' areas with adjacent 'low-use' areas. A binary logistic regression model correctly categorized 92% of plot locations as high or low use, and suggested that cheetahs may be utilizing 'rewarding patches' with better sighting visibility and greater grass cover. We discuss the possible reasons for kudu Tragelaphus strepsiceros, Namibian cheetahs' preferred prey, exhibiting significantly lower abundance in high-use areas. Using habitat characteristics to identify areas intensively utilized by cheetahs has important implications for guiding future habitat restoration and developing effective predator conflict mitigation efforts.
**Descriptors:** cheetah, *Acinonyx jubatus*, carnivores, habitat use, habitat modeling,

habitat characteristics, effective management, protected areas, Nambia.

Wielebnowski, N.C., K. Ziegler, D.E. Wildt, J. Lukas, and J.L. Brown (2002). **Impact of social management on reproductive, adrenal and behavioural activity in the cheetah (*Acinonyx jubatus*).** *Animal Conservation* 5(4): 291-301. ISSN: 1367-9430.
**Descriptors:** cheetah, *Acinonyx jubatus*, social management, impact, reproductive activity, adrenal activity, behavioral activity, husbandry regimen, social behavior, non-invasive hormone monitoring.

Woodroffe, R., L.G. Frank, P.A. Lindsey, S.M.K. ole Ranah, and S. Romaclach (2007). **Livestock husbandry as a tool for carnivore conservation in Africa's community rangelands: a case-control study.** *Biodiversity and Conservation* 16(4): 1245-1260. ISSN: 0960-3115.

**NAL Call Number:** QH75.A1 B562http://dx.doi.org/10.1007/s10531-006-9124-8
**Abstract:** Conflict between people and wildlife is a major issue in both wildlife conservation and rural development. In African rangelands, species such as African wild dogs (*Lycaon pictus*), cheetahs (*Acinonyx jubatus*), lions (*Panthera leo*), leopards (*Panthera pardus*), and spotted hyaenas (*Crocuta crocuta*) may kill livestock and are therefore themselves killed by local pastoralists. Such conflict has led to the extirpation of these species from many areas, and also impacts the livelihoods of local livestock farmers. To investigate the possibilities for coexistence of people, livestock, and large predators in community rangelands, we measured the effectiveness of traditional livestock husbandry in reducing depredation by wild carnivores, using a case-control approach. Different measures were effective against different predator species but, overall, the risk of predator attack by day was lowest for small herds, accompanied by herd dogs as well as human herders, grazing in open habitat. By night, the risk of attack was lowest for herds held in enclosures ('bomas') with dense walls, pierced by few gates, where both men and domestic dogs were present. Unexpectedly, the presence of scarecrows increased the risks of attack on bomas. Our findings suggest that improvements to livestock husbandry can contribute to the conservation and recovery of large carnivores in community rangelands, although other measures such as prey conservation and control of domestic dog diseases are also likely to be necessary for some species.
**Descriptors:** *Lycaon pictus*, *Acinonyx jubatus*, predator control, African lion, carnivore-conservation, Community conservation, human wildlife conflict, livestock depredation, livestock husbandry, vertebrate pest-management.

Zhang, B., Y. Une, F. Ge, X. Fu, J. Qian, P. Zhang, J. Sawashita, K. Higuchi, and M. Mori (2008). **Characterization of the cheetah serum amyloid A1 gene: critical role and functional polymorphism of a cis-acting element.** *Journal of Heredity, The* 99(4): 355-63. ISSN: 0022-1503.
**Abstract:** Amyloid A (AA) amyloidosis is one of the principal causes of morbidity and mortality in captive cheetahs (*Acinonyx jubatus*), which are in danger of extinction. For practical conservation of this species, therefore, it is critical to elucidate the etiology of AA amyloidosis, especially to understand the mechanisms of transcriptional regulation of serum amyloid A (SAA), a precursor protein of the AA protein. In this study, the structure and nucleotide sequence of the cheetah SAA1 gene including the 5'-flanking promoter/enhancer region was determined. Putative nuclear factor kappa-B (NF-kappaB) and CCAAT/enhancer binding protein beta (C/EBPbeta) cis-acting elements, which play key roles in SAA1 transcriptional induction in response to inflammation, were identified in the 5'-flanking region of the cheetah SAA1 gene. Fortuitously, a single nucleotide polymorphism was identified in the captive cheetah cohort in the putative NF-kappaB cis-acting element and had a remarkable effect on SAA1 transcriptional induction. These results provide a foundation not only for clarifying the etiology of AA amyloidosis in the cheetah but also for contriving a strategy for conservation of this species.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, serum amyloid A1 gene, characterization, critical role, functional polymorphism, Amyloid A amyloidosis, morbitity, mortality, etiology, nucleotide polymorphism, conservation.

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### Cheetah - Diet and Nutrition

Bechert, U., J. Mortenson, E.S. Dierenfeld, P. Cheeke, M. Keller, M. Holick, T.C. Chen, and Q. Rogers (2002). **Diet composition and blood values of captive cheetahs (*Acinonyx jubatus*) fed either supplemented meat or commercial food preparations.** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 33(1): 16-28. ISSN: 1042-7260.

**Abstract:** Nutrition most certainly affects health and may play a role in the etiology of growth and reproductive problems in captive cheetah (*Acinonyxjubatus*) populations. The objective of our research was to examine nutritional differences between two dietary regimens and quantify their physiologic effects on cheetahs held in captivity. Twelve cheetahs were randomly assigned to either a commercial diet (COM) or a supplemented meat diet (SMD) group. These cats were physically examined and had blood samples taken three times over the course of a year. Representative samples of COM and four separate components of the SMD treatment were analyzed over the same time frame for proximate nutrient composition, digestibility, and concentrations of taurine, fat-soluble vitamins, and selected minerals. Concentrations of fat, vitamins A and E, Se, Fe, Cu, Na, and Mn were significantly higher in COM compared with those in SMD samples, with the exception of fat content in turkey. Mg content was lower in COM than in SMD; other nutrients did not differ. Mean concentrations of vitamins A and E in COM were markedly higher than in SMD samples (408,140 vs. 29,696 IU/kg dry matter [DM] and 431 vs. 48 IU/kg DM, respectively) and varied dramatically between sampling periods. Percent crude protein and protein-to-fat ratios were high for SMD compared with either whole prey-based or commercial food preparations. Blood urea nitrogen and serum creatinine levels were above normal reference means for domestic cats. Plasma concentrations of vitamins A, D, and E were significantly higher in COM-fed than in SMD-fed cheetahs. Both plasma retinol and tocopherol levels were almost three times higher in COM-fed cats (1.26 +/- 0.06 vs. 0.53 +/- 0.03 microg/ml and 17.5 +/- 0.7 vs. 6.4 +/- 0.02 microg/ml, respectively) and exceeded the normal ranges expected for domestic felids. Significant differences between male and female cheetahs were found for plasma concentrations of vitamin E, Se, and Fe after allowing for effects of diet and time of collection. Excess fat-soluble dietary vitamins can result in direct toxicities as well as nutrient antagonisms and may be linked to reproductive and health issues in captive cheetahs. The high protein levels found in SMD may be linked to chronic renal disease, which was detected in some of these cheetahs.

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, diet composition, blood values, fed, supplemented meat, commercial food preparations, nutritional differences, protein levels.

Beekman, S.P.A., B. Kemp, H.C.M. Louwman, and B. Colenbrander (1999). **Analyses of factors influencing the birth weight and neonatal growth rate of cheetah (*Acinonyx jubatus*) cubs.** *Zoo Biology* 18(2): 129-139. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6

**Descriptors:** cheetah, *Acinonyx jubatus*, birth weight, mortality, neonates, liveweight gain, litter size, gestation period, lactation number, inbreeding depression, artificial rearing, natural rearing, neonatal growth, factors influencing.

Bond, J.C. and D.G. Lindburg (1990). **Carcass feeding of captive cheetahs (*Acinonyx jubatus*): the effects of a naturalistic feeding program on oral health and psychological well-being**. *Applied Animal Behaviour Science* 26(4): 373-382. ISSN: 0168-1591.
**Descriptors:** captive cheetahs, *Acinonyx jubatus*, behavior, naturalistic feeding program, carcass feeding, effects, oral health, psychological wellbeing, behavior, zoo animals.

Crissey, S.D., K.D. Ange, K.L. Jacobsen, K.A. Slifka, P.E. Bowen, M. Stacewicz Sapuntzakis, C.B. Langman, W. Sadler, S. Kahn, and A. Ward (2003). **Serum concentrations of lipids, vitamin D metabolites, retinol, retinyl esters, tocopherols and selected carotenoids in twelve captive wild felid species at four zoos**. *Journal of Nutrition* 133(1): 160-166. ISSN: 0022-3166.
**Descriptors:** cheetah, twelve captive wild felid species, *Acinonyx jubatus*, lipids, vitamin D metabolites, retinol, retinyl esters, tocopherols, selected carotenoids, serum concentrations, serum nutrient concentrations, comparing.

Dierenfeld, E.S. (1993). **Nutrition of captive cheetahs: food composition and blood parameters.** *Zoo Biology* 12(1): 143-150. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** *cheetahs*, *Acinonyx jubatus*, animal nutrition, zoos, feed formulation, zoo animals, nutrient requirements, hematologic tests, blood profile.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Osthoff, G., A. Hugo, and M. de Wit (2006). **The composition of cheetah (*Acinonyx jubatus*) milk.** *Comparative Biochemistry and Physiology. Part B, Biochemistry and Molecular Biology* 145(3-4): 265-9. ISSN: 1096-4959.
**Abstract:** Milk was obtained from two captive bred cheetahs. The nutrient content was 99.6 g protein; 64.8 g fat; and 40.21 g lactose per kg milk. Small amounts of oligosaccharides, glucose, galactose and fucose were noted. The protein fraction respectively consisted of 34.2 g caseins per kg milk and of 65.3 g whey proteins per kg milk. Very little variation in milk composition among the individual cheetahs was noted. Electrophoresis and identification of protein bands showed a similar migrating sequence of proteins as seen in lion's and cat's milk, with small differences in the beta-caseins. The lipid fraction contains 290.4 g saturated and 337.3 g mono-unsaturated fatty acids per kg milk fat respectively. The high content of 279.5 g kg(-1) milk fat of polyunsaturated fatty acids is due to a high content in alpha-linolenic acid. No short chain fatty acids, but substantial levels of uneven carbon chain fatty acids were observed.
**Descriptors:** cheetah, *Acinonyx jubatus*, cheetah milk, composition, chemistry, fatty acids analysis, lactation physiology, lactose analysis, milk proteins analysis, nutrient content, whey proteins, lipid fraction, nutrient content.

Vester, B.M., S.L. Burke, C.L. Dikeman, L.G. Simmons, and K.S. Swanson (2008). **Nutrient digestibility and fecal characteristics are different among captive exotic felids fed a beef-based raw diet**. *Zoo Biology* 27(2): 126-136. ISSN: 0733-3188.
**Abstract:** Nutrient digestibility has not been well characterized in exotic felids. The

objective of this experiment was to evaluate differences in nutrient digestibility and fecal characteristics in five large exotic captive felid species, including bobcats, jaguars, cheetahs, Indochinese tigers, and Siberian tigers. All animals were individually housed and adapted to a beef-based raw diet (Nebraska BrandReg. Special Beef Feline, North Platte, NE) for 16 d. Total fecal collections were conducted from days 17 to 20. Fecal samples were weighed and scored on collection. Diet and fecal samples were evaluated for dry matter, organic matter, protein, fat, and energy to determine total tract digestibility. Fresh fecal samples were collected to determine fecal pH, ammonia, phenol, indole, short-chain fatty acid, and branched-chain fatty acid concentrations. Fecal scores were greater ($P<0.01$) in Indochinese tigers when compared with all other species, and cheetahs had greater ($P<0.01$) fecal scores than jaguars and bobcats. Fat digestibility was greater ($P<0.01$) in Siberian tigers, Indochinese tigers, and bobcats (96%) compared with cheetahs and jaguars (94%). Digestible energy was greater ($P<0.05$) in bobcats and Indochinese tigers at 93.5 and 92.9%, respectively, compared with cheetahs and jaguars, 91.6%. Fecal pH was greater ($P<0.01$) in bobcats compared with all other species evaluated. Indole concentrations were greater ($P<0.05$) in cheetahs and jaguars compared with bobcats and Indochinese tigers. Fecal ammonia concentrations were increased ($P<0.05$) in cheetahs compared with all other species. The beef-based raw diet was highly digestible; however, differences in fat and digestible energy suggest that species should be considered when determining caloric needs of exotic felids. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, ammonia, beef, branched chain fatty acids, digestibility, digestible energy, dry matter, energy, faeces, fat, indoles, nutritive value, organic matter, pH, phenol, protein, short chain fatty acids, species differences, zoo animals, jaguars, *Lynx rufus*, tigers.

Vester, B.M., S.L. Burke, C.L. Dikeman, L.G. Simmons, and K.S. Swanson (2007). **Nutrient digestibility and fecal characteristics of exotic felids fed a beef-based raw diet**. *Poultry Science* 86(Suppl. 1): 196. ISSN: 0032-5791.

**Descriptors:** exoltic felids, beef based raw diet, nutritient digestibility, digestive system, fecal characteristics, ingestion, assimilation, nutrient content, bobcats, meeting information.
**Notes:** Joint Annual Meeting of the American Dairy Science Association;Poultry Science Association; Asociacion Mexicana de Produccion Animal; and American Society of Animal Science, San Antonio, TX, USA; July 08 -12, 2007.

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### Cheetah - Research

Backues, K.A., J.P. Hoover, J.E. Bauer, M.T. Barrie, J. McCann, S. Citino, and R. Wallace (1997). **Serum lipoprotein, thyroid hormone and resting cortisol levels in normal cheetahs (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(4): 404-6. ISSN: 1042-7260.
**Abstract:** Blood obtained from 20 cheetahs (*Acinonyx jubatus*) during annual physical examinations was analyzed for serum lipid concentration, for lipoprotein distribution by agarose gel electrophoresis, and for thyroid hormone and resting cortisol levels by solid-phase radioimmunoassay to develop normal reference ranges.
**Descriptors:** *Acinonyx* blood, hydrocortisone blood, lipoproteins blood, thyroid hormones blood, blood cell count veterinary, blood chemical analysis veterinary, electrophoresis agar gel, veterinary, radioimmunoassay veterinary, reference values.

Bauer, J.E. (1997). **Fatty acid metabolism in domestic cats (*Felis catus*) and cheetahs (*Acinonyx jubatas*).** *Proceedings of the Nutrition Society, The* 56(3): 1013-24. ISSN: 0029-6651.
**Descriptors:** cheetah, *Acinonyx jubatus*, metabolism, cats metabolism, fatty acids metabolism, dietary fats administration and dosage, fatty acid desaturases metabolism, fatty acids, essential chemistry, fatty acids, essential metabolism, hyperlipidemias veterinary, lipids blood.

Bogin, E. (2001). **Animal models for prion diseases**. *Clinical Chemistry and Laboratory Medicine* 39(Special Supplement): S18. ISSN: 1434-6621.
**Descriptors:** animal models, diseases, infection , nervous system, Creutzfeldt Jakob disease, behavioralorders, mental disorders, prion disease, nervous system disease, bovine spongiform encephalopathy, chronic wasting disease, feline spongiform encephalopathy, scrapie, transmissible mink encephalopathy, transmissible spongiform encephalopathia, meeting abstract.
**Notes:** Meeting Information: 14th IFCC-FESCC European Congress of Clinical Chemistry and Laboratory Medicineand 5th Czech National Congress of Clinical Biochemistry, Prague, Czechoslovakia; May 26-31, 2001.

Burger, B.V., R. Visser, A. Moses, and M. Le Roux (2006). **Elemental sulfur identified in urine of cheetah, *Acinonyx jubatus*.** *Journal of Chemical Ecology* 32(6): 1347-52. ISSN: 0098-0331.
**Abstract:** The urine of the cheetah, *Acinonyx jubatus*, is almost odorless, and probably for this reason, it has not attracted much attention from scientists. Using gas chromatography-mass spectrometry, we identified 27 and 37 constituents in the headspace vapor of the urine of male and female cheetah, respectively. These constituents, composed of hydrocarbons, short-chain ethers, aldehydes, saturated and unsaturated cyclic and acyclic ketones, 2-acetylfuran, dimethyl disulfide, dimethyl sulfone, phenol, myristic acid (tetradecanoic acid), urea, and elemental sulfur, are all present in the headspace vapor in very small quantities; dimethyl disulfide is present in such a low concentration that it cannot be detected by the human nose. This is only the second example of elemental sulfur being secreted or excreted by an animal. It is

hypothesized that the conversion of sulfur-containing compounds in the cheetah's diet to elemental sulfur and to practically odorless dimethyl sulfone enables this carnivore to operate as if "invisible" to the olfactory world of its predators as well as its prey, which would increase its chances of survival.
**Descriptors:** cheetah, *Acinonyx jubatus*, urine analysis, sulfur urine, practically oderless urine, gas chromatography mass spectrometry, sensitivity, specificity, volatilization.

Cohn, J.P. (1986). **Surprising cheetah genetics**. *BioScience* P.: 358-62. ISSN: 0006-3568.
**Abstract:** Recent studies of genes from wild and captive cheetahs suggest that challenges to the species' survival may be heightened by the cheetah's lack of genetic diversity. In 1981, scientists at the National Zoo in Washington, D.C., found that sperm samples from cheetahs in South Africa showed an extremely high percentage of abnormalities. Genetic studies confirmed that the animals have a remarkable lack of genetic diversity. The species' susceptibility to feline infectious peritonitis, its high rate of infant mortality, and its general failure to breed in captivity are all consequences of this genetic invariability. Scientists speculate that the cheetahs' loss of genetic diversity occurred some 10,000 years ago, possibly as a result of a population bottleneck. A species survival plan for the cheetah has been developed by the American Association of Zoological Parks and Aquariums.
**Descriptors:** cheetah, genetics, genes, wild, captive, lack of diversity, species survival, sperm samples, abnormalities, survival plan of the American Association of Zoological Parks and Aquariums.

Davidson, B.C., D. Morsbach, and R.C. Cantrill (1986). **The fatty acid composition of the liver and brain of southern African cheetahs**. *Progress in Lipid Research* 25: 97-99. ISSN: 0163-7827.
**Descriptors:** cheetahs, *Acinonyx jubatus*, brain, liver, fatty acid composition, diet, freshly killed animals, captive diet, compared, South African.

Eaton, K.A., M.J. Radin, S. Krakowka, and D.R. Morgan (1991). **Animal models of bacterial gastritis: transmission from cheetahs to mice and kittens**. *Microbial Ecology in Health and Disease* 4(SPECIAL): S151. ISSN: 0891-060X.
**Descriptors:** cheetah, *Acinonyx jubatus*, experimental infection, bacterial gastritis, animal models, cats, Felidae, *Helicobacter*, mice, Spirillaceae.
**Notes:** Meeting Information: VI International Workshop on *Campylobacter Helicobacter* and related organisms, October 7-10, 1991, Sydney, Australia.

Freeman, A.R., D.E. MacHugh, S. McKeown, C. Walzer, D.J. McConnell, and D.G. Bradley (2001). **Sequence variation in the mitochondrial DNA control region of wild African cheetahs (*Acinonyx jubatus*).** *Heredity* 86(Pt 3): 355-62. ISSN: 0018-067X.
**Abstract:** Five hundred and twenty-five bp of mitochondrial control region were sequenced and analysed for 20 *Acinonyx jubatus* and one *Felis catus*. These sequences were compared with published sequences from another domestic cat, 20 ocelots (*Leopardus pardalus*) and 11 margays (*Leopardus weidii*). The intraspecific population divergence in cheetahs was found to be less than in the other cats. However variation was present and distinct groups of cheetahs were discernible. The 80 bp RS2 repetitive sequence motif previously described in other felids was found in four copies in cheetah. The repeat units probably have the ability to form secondary structure and may have some function in the regulation of control region replication. The two central repeat units in cheetah show homogenization that may have arisen by convergent evolution.
**Descriptors:** cheetah, *Acinonyx jubatus*, genetics, DNA, mitochondrial genetics, variation genetics, base sequence, carnivora genetics, cats genetics, haplotypes, molecular sequence data, domestic cat, *Felis catus*, ocelots, *Leopardus pardalus*, margays, *Leopardus weidii*, .

Hildebrand, M. and J.P. Hurley (1985). **Energy of the oscillating legs of a fast-moving cheetah, pronghorn, jackrabbit, and elephant.** *Journal of Morphology* 184(1): 23-31. ISSN: 0362-2525.
**Abstract:** Lifelike models of the oscillating legs treated as three-segment systems show the course of kinetic and potential energy over the locomotor cycle for a cheetah, pronghorn, jackrabbit, and elephant running at speeds approaching their maxima. The models can be adjusted to eliminate differences among the animals in time intervals, mass or length of limb, and joint angles. This facilitates analysis of the influence on total energy of each of these variables and of the distribution of mass among leg segments. Fast-cycling legs of the carnivore type have significantly more energy than those of the hoofed type. This may contribute to the lesser endurance that is usual for carnivores that hunt using a high-speed dash.
**Descriptors:** cheetah, *Acinonyx jubatus*, pronghorn, jackrabbit, elephant, biophysics, leg physiology, oscillating legs, running, fast moving, energy, models.

Holder, E.H., S.B. Citino, N. Businga, L. Cartier, and S.A. Brown (2004). **Measurement of glomerular filtration rate, renal plasma flow, and endogenous creatinine clearance in cheetahs (*Acinonyx jubatus jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 35(2): 175-8. ISSN: 1042-7260.

**Abstract:** Glomerular filtration rate (GFR), renal plasma flow (RPF), and the endogenous creatinine clearance (CCr) rate were determined in 13 captive cheetahs, *Acinonyx jubatus jubatus* (seven females and six males, 1.5-7.5 yr of age, x = 5.02 yr), during general anesthesia with Telazol and isoflurane by measuring the urinary clearances of inulin, para-aminohipppuric acid, and endogenous creatinine, respectively. Methods to determine GFR, RPF, and endogenous CCr in captive cheetahs were evaluated, and the relationship between GFR and CCr for this species was determined. The GFR and the RPF were stable during the procedure, with mean values of 1.59+/-0.17 ml/min/kg body weight and 5.12+/-1.15 ml/min/kg body weight, respectively. Although the mean value for CCr (1.47+/-0.20 ml/min/kg body weight) was significantly less than the corresponding value for GFR, the mean difference (0.11+/-0.02 ml/min/kg weight) between the two measurements was slight, and the values were highly correlated (R2 = 0.928; P < 0.0001). The measurement of CCr in cheetahs should provide a reliable estimate of GFR, facilitating the early detection of renal disease in this species.
**Descriptors:** cheetahs, *Acinonyx jubatus jubatus*, glomerular filtration rate, renal plasma flow, endogenous creatonine clearance, measurement, anesthesia, renal diseases, detection.

Howard, J., L. Munson, D. McAloose, M. Kriete, M. Bush, and D.E. Wildt (1993). **Comparative evaluation of seminal, vaginal, and rectal bacterial flora in the cheetah and domestic cat.** *Zoo Biology* 12(1): 81-96. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, cats, *Escherichia coli*, semen, vagina, rectum, microorganisms, reproductive efficiency, zoos, Gram negative bacteria, fecundity, North America.
**Notes:** In the special issue: The cheetah / edited by D.E. Wildt and J. Grisham.

Jurke, M.H., N.M. Czekala, D.G. Lindburg, and S.E. Millard (1997). **Fecal corticoid metabolite measurement in the cheetah (*Acinonyx jubatus*).** *Zoo Biology* 16(2): 133-147. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** cheetah, *Acinonyx jubatus*, fecal cortocoid metabolite measurement, endangered species, reproduction , cortisol, metabolites, feces, excretion, stress, captive animals.

Kennedy, M.A., E. Moore, R.P. Wilkes, S.B. Citino, and S.A. Kania (2006). **Analysis of genetic mutations in the 7a7b open reading frame of coronavirus of cheetahs (*Acinonyx jubatus*).** *American Journal of Veterinary Research* 67(4): 627-632. ISSN: 0002-9645.
**NAL Call Number:** 41.8 Am3A
**Abstract:** Objective-To analyze the 7a7b genes of the feline coronavirus (FCoV) of cheetahs, which are believed to play a role in virulence of this virus. Sample Population-Biologic samples collected during a 4-year period from 5 cheetahs at the same institution and at 1 time point from 4 cheetahs at different institutions. Procedures-Samples were first screened for FCoV via a reverse transcription-PCR procedure involving primers that encompassed the 3'-untranslated region. Samples that yielded positive assay results were analyzed by use of primers that targeted the 7a7b open reading frames. The nucleotide sequences of the 7a7b amplification products were determined and analyzed. Results-In most isolates, substantial deletional mutations in the 7a gene were detected that would result in aberrant or no expression of the 7a product because of altered reading frames. Although the 7b gene was also found to contain mutations, these were primarily point mutations resulting in minor amino acid changes. The coronavirus associated with 1 cheetah with feline infectious peritonitis had intact 7a and 7b genes. Conclusions and Clinical Relevance-The data suggest that mutations arise readily in the 7a region and may remain stable in FCoV of cheetahs. In contrast, an intact 7b gene may be necessary for in vivo virus infection and replication. Persistent infection with FCoV in a cheetah population results in continued virus circulation and may lead to a quasispecies of virus variants.
**Descriptors:** cheetah, *Acinonyx jubatus*, feline coronavirus, microbial genetics, feline infectious peritonitis, mutation, virulence, open reading frames, amino acid sequences, zoo animals, gene expression, chronic diseases, molecular sequence data.

Koeppel, K.N., H. Bertschinger, M. van Vuuren, J. Picard, J. Steiner, D. Williams, and J. Cardwell (2006). **The use of a probiotic in captive cheetahs (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 77(3): 127-130. ISSN: 0038-2809.
**Abstract:** Juvenile captive cheetahs (*Acinonyx jubatus*) often present with diarrhoea that is commonly associated with bacterial infections. A species-specific probiotic containing *Lactobacillus* Group 2 and *Enterococcus faecium* was prepared from healthy adult cheetahs. Juvenile cheetahs (n = 27) between 8 and 13 months of age were included in the probiotic trial. The animals were observed prior to and after feeding of the probiotic which was made available for 28 days. Feeding of the probiotic resulted in a significantly increased body weight in the treatment group (P = 0.026), while there was no increase in the control group. A relative improvement in the faecal quality in the probiotic group during the treatment period compared with the pre-treatment (P = 0.0363) and post-treatment (P = 0.004) period was observed. This was accompanied by an absence of blood and mucus in the faeces during the treatment period in the probiotic group.
**Descriptors:** cheetahs, young animals, *Acinonyx jubatus*, microbiology, diarrhea,

*Enterococcus faecium* growth, development, *Lactobacillus* growth, development, probiotics administration, dosage, diarrhea drug therapy, epidemiology, feces chemistry, microbiology, probiotics pharmacology, weight gain, drug effects.

Koster, L.S., J.P. Schoeman, and D.G. Meltzer (2007). **ACTH stimulation test in the captive cheetah (*Acinonyx jubatus*).** *Journal of the South African Veterinary Association* 78(3): 133-6. ISSN: 0038-2809.

**Abstract:** Serum cortisol response was assessed in 8 captive cheetahs, of varying ages, after the intravenous administration of 500 microg of tetracosactide (Synacthen Depot, Novartis, Kempton Park) while maintained under general anaesthesia. In addition, 8 cheetahs were anaesthetised and given an equal volume of saline in order to establish baseline cortisol concentrations at similar stages of anaesthesia. A significant difference in the median cortisol concentration measured over time was found following ACTH administration in the ACTH group ($P < 0.001$). There was no difference between the median cortisol concentrations in the ACTH group at time-points 120, 150 and 180 min after ACTH stimulation ($P = 0.867$). Thus it appears appropriate to collect serum 120 to 180 min after tetracosactide administration to assess maximal stimulation of the adrenal in the cheetah. No statistically significant rise was seen in the anaesthetised control group following the injection of saline ($P = 0.238$).

**Descriptors:** cheetahs, *Acinonyx jubatus*, physiology, cosyntropin pharmacokinetics, hormones pharmacokinetics, hydrocortisone blood, adrenal cortex function tests, methods, adrenocorticotropic hormone blood, area under curve.

Mclean, L., J.L. Hurst, C.J. Gaskell, J.C.M. Lewis, and R.J. Beynon (2007). **Characterization of cauxin in the urine of domestic and big cats**. *Journal of Chemical Ecology* 33(10): 1997-2009. ISSN: 0098-0331.

**Descriptors:** big cats, domestic cats, cauxin in the urine, characterization, protein, big cat level lower.

Miller Edge, M. and M. Worley (1991). **In vitro mitogen responses and lymphocyte subpopulations in cheetahs.** *Veterinary Immunology and Immunopathology* 28(3-4): 337-49. ISSN: 0165-2427.

**Abstract:** Lack of genetic variability and apparent susceptibility of cheetahs (*Acinonyx jubatus jubatus*) to coronavirus infection has lead to speculation that this species may have immune system deficits. To establish a foundation for evaluation of the immune function, cheetah peripheral blood mononuclear cells (PBM) were stimulated by a panel of six mitogens, and responses compared with those of domestic cat PBM. Individual responses in both species were variable, but evenly distributed throughout the range of stimulation for each mitogen. Proliferation by PBM from domestic cats occurred within the same range as that of the cheetahs. However, a significantly lower response to peanut agglutinin (PNA) was observed with domestic cat PBM. Although responses varied between animals, certain individual cheetahs were consistent low responders. The decreased values could not be explained by lack of IL-2 responsiveness since exogenous IL-2 significantly enhanced mitogen-stimulated proliferation in 11 of 12 cheetahs tested. The phenotypic distribution of domestic cat and cheetah lymphocyte subpopulations was similar as assessed by immunofluorescence staining for surface immunoglobulin (sIg) and cytotoxic T (Tc) cells (using a specific monoclonal antibody, FT2). Values for B cells (31.2% sIg+) and Tc (28.7% FT2+) were slightly higher in domestic cats as compared with cheetah PBM (13.3% sIg+; 19.0% FT2+). Even though no species-specific deficits were detected, a significant negative correlation between PHA-stimulated proliferation and percent FT2+ (Tc) cheetah cells was observed. This indicates that proliferation can be used indirectly to assess relative numbers of functional T helper cells in cheetahs. Our studies suggest that these aspects of the cheetah's immune system are comparable with the domestic cat, and establish a basis for in vitro assays evaluating antigen-specific responses.

**Descriptors:** cheetah, *Acinonyx jubatus*, lymphocyte subpopulations, in vitro mitogen responses, genetic variability, susceptibility, coronavirus, immune system deficits, in vitro assays, immune system comparable with domestic cat.

Miller Edge, M.A. and M.B. Worley (1992). **In vitro responses of cheetah mononuclear cells to feline herpesvirus-1 and *Cryptococcus neoformans*.** *Veterinary Immunology and Immunopathology* 30(2-3): 261-74. ISSN: 0165-2427.

**Abstract:** In vitro T cell function by domestic cats and cheetahs to two common pathogens, feline herpesvirus-1 (FHV-1) and *Cryptococcus neoformans*, was assessed. Peripheral blood mononuclear cells (PBM) were stimulated with two strains of UV-inactivated FHV-1, whole heat-killed organisms or capsular antigen of *Cryptococcus neoformans*, and proliferative responses measured. As a group, cheetah PBM responded significantly poorer than domestic cat PBM when cultured with FHV-1. However, individual cheetah responses varied widely. Supplementation of cultures with exogenous interleukin 2 (IL-2) significantly increased the level of response of individual cheetahs to both strains of FHV-1. Cheetah sera contained slightly higher neutralizing antibody titers to FHV-1 than did domestic cat sera, suggesting that B cells function adequately in cheetahs. When stimulated with *Cryptococcus neoformans*, both species had similar incidences of positive proliferative responses. These data demonstrate that cheetahs exhibit heterogeneous responses to specific antigens, similar to domestic cats. However, a lower group response

to FHV-1 in cheetahs suggests species differences occur. In addition, level of variability in major histocompatibility complex (MHC) class I-like genes, as determined by Southern blot hybridization, does not appear to correlate with a uniform response in in vitro functional assays. Therefore, additional mechanisms influence the final outcome of the immune response.
**Descriptors:** cheetah, *Acinonyx jubatus*, feline herpesvirus, *Cryptococcus neoformans*, mononuclear cells, in vitro response, peripheral blood mononuclear cells, species differences, immune response.

Poddar Sarkar, M. and R.L. Brahmachary (1997). **Putative semiochemicals in the African cheetah (*Acinonyx jubatus*).** *Journal of Lipid Mediators and Cell Signalling* 15(3): 285-7. ISSN: 0929-7855.
**Descriptors:** cheetah, *Acinonyx jubatus*, pheromones chemistry, gas chromatography, thin layer chromatography, diglycerides analysis, fatty acids analysis, fatty acids chemistry, lipids analysis, sterols analysis, triglycerides analysis, Africa.

Shibly, S., P. Schmidt, N. Robert, C. Walzer, and A. Url (2006). **Immunohistochemical screening for viral agents in cheetahs (*Acinonyx jubatus*) with myelopathy.** *Veterinary Rcord, The* 159(17): 557-61. ISSN: 0042-4900.
**Abstract:** Numerous cases of acute-onset progressive ataxia, hindlimb paresis and paralysis of unknown aetiology occurred during 1993 to 2003 in cheetahs (*Acinonyx jubatus*) within the European Endangered Species Programme (eep). This study describes the immunohistochemical investigation of a possible viral aetiology of the "cheetah myelopathy". Antibodies to feline herpesvirus type 1, canine distemper virus, canine parvovirus and Borna disease virus were applied to formalin-fixed and paraffin-embedded brain and spinal cord sections from 25 affected cheetahs aged between three-and-a-half months and 13 years. Using the avidin-biotin complex technique, none of the antibodies gave positive immunosignals in either the brain or the spinal cord tissue.
**Descriptors:** cheetah, *Acinonyx jubatus*, myelopathy, immunohistochemical screening, viral agents, ataxia, hindlimb paralysis, antibodies, viral etiology.

Spencer, J.A. (1993). **Lymphocyte blast transformation responses and restriction fragment length analysis in the cheetah.** *Onderstepoort Journal of Veterinary Research.* 60(3): 211-7. ISSN: 0030-2465.
**NAL Call Number:** 41.8 On1
**Abstract:** An extensive genetic and physiological analysis of the cheetah by O'Brien et al. (1983; 1985; 1987) indicated that the cheetah showed monomorphism at the major histocompatability complex. This led O'Brien (1985) to propose that the cheetah suffered from an immunodeficiency and was highly susceptible to diseases. It was therefore decided to investigate cell-mediated and humoral immune responses and to apply the limited restriction fragment length analysis (using Pst 1 and Bam H1 enzymes) of the cheetah MHC I and MHC II genes. Antibody responses to antigens (feline viruses), as well as mitogen-induced lymphocyte blast transformation responses, were shown to be intact and comparable with that of the domestic cat, indicating a competent immune system in the cheetah. It was also suggested by the results that some polymorphism does exist in the MHC class II genes, but possibly not in the MHC class I genes.
**Descriptors:** cheetah, *Acinonyx jubatus*, immunology, lymphocyte activation immunology, blast transformation response, restriction fragment length, genetic analysis, immunodeficiency, monomorphism.

Spencer, J.A. and R. Burroughs (1992). **Decline in maternal immunity and antibody response to vaccine in captive cheetah (*Acinonyx jubatus*) cubs.** *Journal of Wildlife Diseases* 28(1): 102-4. ISSN: 0090-3558.
**Abstract:** Blood was collected from captive cheetah cubs (*Acinonyx jubatus*) from the ages of 4 to 12 wk and monitored for the decline in maternally derived antibodies to feline panleukopenia, herpes and calici viruses. A steady decrease was seen in most of the cubs. Antibody responses to inactivated and/or modified live virus (MLV) vaccine also were measured. The strongest responses were seen post vaccination with MLV vaccine only.
**Descriptors:** captive cheetah, *Acinonyx jubatus*, maternal immunity, antibody response, vaccine, cubs, decline, feline panleukopenia, herpes, calic viruses, vaccination.

Spencer, J.A. and R. Burroughs (1991). **Antibody response of captive cheetahs to modified-live feline virus vaccine.** *Journal of Wildlife Diseases* 27(4): 578-83. ISSN: 0090-3558.
**Abstract:** The antibody response of cheetahs (*Acinonyx jubatus*) to modified live virus vaccine against feline panleukopenia (FPLV), herpes (FHV) and calici (FCV) viruses was assessed by means of an enzyme-linked immunosorbent assay (ELISA). In the first year of study, 82 cheetahs were bled pre-vaccination. Of these, antibody levels to FPLV were found in 100% of the animals. Only 54% were found to have antibodies to FHV and 99% had antibodies to FCV. One month after booster vaccination with the same vaccine, increased antibodies to FPLV, FHV and FCV were seen in 19 (58%), 18 (55%) and 25 (76%) of these animals, respectively (n = 33). In the second year of study, 65 cheetahs were bled pre-vaccination. Fifty three of these animals were negative for antibodies to FPLV while 28 were positive for FHV and 64 were positive for FCV. These animals were then bled 1, 2 and 6 mo post booster vaccination. The antibody levels to the various viruses showed different trends with time.

**Descriptors:** captive cheetahs, *Acinonyx jubatus*, antibody response, modified live feline virus vaccine, panleukopenia, herpes, calici viruses, vaccination.

Steinel, A., L. Munson, M. Van Vuuren, and U. Truyen (2000). **Genetic characterization of feline parvovirus sequences from various carnivores**. *Journal of General Virology* 81(2): 345-350. ISSN: 0022-1317.

**Descriptors:** various carnivores, feline parvovirus sequences, genetic characterization, feline panleukopenia virus, mink enteritis virus, canine parvovirus, viral DNA, species susceptibility.

Terio, K.A., J.L. Brown, R. Moreland, and L. Munson (2002). **Comparison of different drying and storage methods on quantifiable concentrations of fecal steroids in the cheetah**. *Zoo Biology* 21(3): 215-222. ISSN: 0733-3188.

**Abstract:** Fecal steroid analysis is a powerful tool that can provide important information on the health, physiology, and reproductive status of nondomestic species. However, studying free-ranging animals requires that feces be stored and transported from the collection site to the laboratory in a manner that prevents degradation or alteration of steroid metabolites. To determine the effects of different handling and storage methods on fecal steroids, 30 fresh fecal samples from five captive cheetahs were collected, thoroughly mixed, separated into aliquots, and processed (stored or dried) under different conditions. Concentrations of gonadal and adrenal steroid hormones were analyzed in feces stored frozen at -20 degrees C or at room temperature in 95% ethanol. Both frozen and ethanol-stored aliquots were desiccated using a lyophilizer, solar oven, or conventional oven. The steroid values from aliquots stored and desiccated using the different methods were compared to those obtained using the optimal storage method of freezing at -20 degrees C and desiccating in a lyophilizer (control). Concentrations of corticoid, estrogen, progestogen, and androgen metabolites in fecal extracts were quantified by radioimmunoassay. Androgen metabolite concentrations were not significantly affected ($P<0.05$) by storage or drying methods. Fecal samples stored at room temperature in ethanol and lyophilized also had steroid concentrations that did not differ ($P<0.05$) from controls. However, the concentrations of corticoid and estrogen metabolites were significantly lower ($P<0.05$), and progestogen metabolites were significantly higher ($P<0.05$) in samples desiccated in solar and conventional ovens without regard to storage method. These results suggest that storage of fecal samples at room temperature in ethanol is the best alternative to freezing for subsequent analysis of steroid hormone concentrations. Differences in measured concentrations of hormones in oven-desiccated samples could be due to hormone degradation or shifts in the immunodominant metabolite. Therefore, validation of storage and processing techniques should be included in the development of any new fecal steroid analysis methodology. *Reproduced with permission of CAB.*

**Descriptors:** cheetah, *Acinonyx jubatus*, androgens, corticoids, drying methods, storage methods, fecal steroids, metabolites, methodology, oestrogens, steroid hormones, steroids, comparison.

Young, K.M., S.L. Walker, C. Lanthier, W.T. Waddell, S.L. Monfort, and J.L. Brown (2004). **Noninvasive monitoring of adrenocortical activity in carnivores by fecal glucocorticoid analyses**. *General and Comparative Endocrinology* 137(2): 148-165. ISSN: 0016-6480.

**Abstract:** Measurement of glucocorticoid metabolites in faeces has become an accepted method for the noninvasive evaluation of adrenocortical activity. The objective of this study was to determine if a simple cortisol enzyme immunoassay (EIA) was suitable for monitoring adrenocortical activity in a variety of carnivore species. Performance of the cortisol EIA was gauged by comparison to a corticosterone radioimmunoassay (RIA) that has been used for measuring glucocorticoid metabolites in faeces of numerous species. Tests for parallelism and extraction efficiency were used to compare the cortisol EIA and corticosterone RIA across eight species of carnivores (Himalayan black bear, sloth bear, domestic cat, cheetah, clouded leopard, black-footed ferret, slender-tailed meerkat, and red wolf). The biological relevance of immunoreactive glucocorticoid metabolites in faeces was established for at least one species of each Carnivora family studied with an adrenocorticotropic hormone (ACTH) challenge. High performance liquid chromatography (HPLC) analysis of faecal extracts for each species revealed (1) the presence of multiple immunoreactive glucocorticoid metabolites in faeces, but (2) the two immunoassays measured different metabolites, and (3) there were differences across species in the number and polarities of metabolites identified between assay systems. ACTH challenge studies revealed increases in faecal metabolite concentrations measured by the cortisol EIA and corticosterone RIA of ~228-1145% and ~231-4150% above pre-treatment baseline, respectively, within 1-2 days of injection. Concentrations of faecal glucocorticoid metabolites measured by the cortisol EIA and corticosterone RIA during longitudinal evaluation (i.e., >50 days) of several species were significantly correlated ($P<0.0025$, correlation coefficient range 0.383-0.975). Adrenocortical responses to physical and psychological stressors during longitudinal evaluations varied with the type of stimulus, between episodes of the same stimulus, and among species. Significant elevations of glucocorticoid metabolites were observed following some potentially stressful situations

[anesthesia (2 of 3 subjects), restraint and saline injection (2 of 2 subjects), restraint and blood sampling (2 of 6 episodes), medical treatment (1 of 1 subject)], but not in all cases [e.g., gonadotropin injection (n=4), physical restraint only (n=1), mate introduction/breeding (n=1), social tension (n=1), construction (n=2) or relocation (n=1)]. Results reinforced the importance of an adequate baseline period of faecal sampling and frequent collections to assess adrenocortical status. The corticosterone RIA detected greater adrenocortical responses to exogenous ACTH and stressful exogenous stimuli in the Himalayan black bear, domestic cat (female), cheetah, clouded leopard, slender-tailed meerkat, and red wolf, whereas the cortisol EIA proved superior to resolving adrenocortical responses in the black-footed ferret and domestic cat (male). Overall results suggest the cortisol EIA tested in this study offers a practical method for laboratories restricted in the usage of radioisotopes (e.g., zoological institutions and field facilities) to integrate noninvasive monitoring of adrenocortical activity into studies of carnivore behaviour and physiology. *Reproduced with permission of CAB.*

**Descriptors:** cheetah, *Acinonyx jubatus*, adrenocortical activity, carnivores, noninvasive monitoring, fecal glucocortcoid analyses, accuracy, adrenal cortex, enzyme immunoassay, feces, hydrocortisone, stress, wild animals, *Bradypus variegatus*, Canis, cats, ferrets, Herpestidae, *Neofelis nebulosa*, *Selenarctos thibetanus*.

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### Cheetah - Veterinary

Bertschinger, H.J., M. Jago, J.O. Nothling, and A. Human (2006). **Repeated use of the GnRH analogue deslorelin to down-regulate reproduction in male cheetahs (*Acinonyx jubatus*).** *Theriogenology* 66(6-7): 1762-7. ISSN: 0093-691X.

**Abstract:** The GnRH analogue deslorelin, as a subcutaneous implant, was initially developed in Australia as an ovulation-inducing agent in mares. Its uses, for the suppression of reproduction in the domestic dog and cat and in other species, including humans, have been developed subsequently. Such implants have been used as a contraceptive modality in a variety of wild carnivores, both males and females. This paper describes the use of deslorelin implants as a contraceptive agent for cheetah males maintained in a semi-captive environment and housed in various camps together with females. Annually, male cheetahs were treated for 1 (n = 2), 2 (n = 7), 3 (n = 9), 4 (n = 3) or 5 (n = 1) consecutive years with an implant containing 4.7, 5.0 or 6.0 mg of deslorelin. On the first day of treatment and then on an annual basis, blood testosterone concentrations were analysed, testicular measurements were taken, appearance of penile spikes was determined, and semen was collected and evaluated. Pregnancy rates of mated or inseminated females were determined. A dose of 6 mg of deslorelin suppressed reproduction for at least 1 year, whereas with 4.7 and 5 mg of deslorelin, 3 of 17 males had a few non-motile spermatozoa in their ejaculates. All testosterone concentrations were basal at 1 year post-implant and no side effects were observed. We concluded that deslorelin implantation, at a dose of 6 mg, was a safe and reliable method of annual contraception in male cheetahs.

**Descriptors:** male cheetahs, *Acinonyx jubatus*, physiology, contraception, contraceptive agents, GnRHanalogue deslorelin, male administration, dosage, triptorelin analogs, derivatives, blood, conservation of natural resources, drug implants, histocytochemistry, longitudinal studies, statistics, nonparametric, testis anatomy, histology, testis physiology, testosterone blood, triptorelin administration and dosage.

Carstens, A., R.M. Kirberger, T. Spotswood, W.M. Wagner, and R.J. Grimbeek (2006). **Ultrasonography of the Liver, Spleen, and Urinary Tract of the Cheetah (*Acinonyx jubatus*).** *Veterinary Radiology and Ultrasound the Official Journal of the American College of Veterinary Radiology and the International Veterinary Radiology Association* 47(4): 376-383. ISSN: 1058-8183.

**NAL Call Number:** SF757.8.A4

**Abstract:** Diseases of the abdomen of the cheetah (*Acinonyx jubatus*) include those affecting the liver, spleen, and urinary tract. The most common diseases of captive-bred cheetah are gastritis, gastric ulceration, glomerulosclerosis, and hepatic veno-occlusive disease, and are the most frequent causes of mortality in these animals. The purpose of this study was to describe the ultrasonographic anatomy of the normal liver, spleen, kidney, and urinary bladder of the anesthetized captive-bred cheetah. Twenty-one cheetahs were examined. Eight of the 21 animals had subclinical evidence of either gastritis or chronic renal disease. The ultrasonographic appearances of the liver, gall bladder, common bile duct, and spleen were evaluated and various measurements made. Statistical analyses of the measurements were performed on all the healthy and

subclinically ill animals taking sex, age, mass, and anesthetic protocol into account. There were no significant differences in any parameters between the healthy and subclinically ill animals (P>0.25) and data were combined for statistical analyses. The mean mass was 41.1 kg (pl8.8) and the mean age was 5.0 years (pl2.2). The mean thickness of the liver medial to the gall bladder was 67.0 mm (pl14.8) and the liver was within the left costal arch in 75% of animals, extended caudal to the right costal arch in 50% of animals for an average of 30 mm, and extended caudal to the sternum in 63% of animals for an average of 32.5 mm. The maximum mean hepatic vein diameter at the entrance to the caudal vena cava was 8.6pl2.8 mm; the mean diameters of the portal vein at the hilus and that of the caudal vena cava as it entered the liver were 7.5pl1.6 and 9.9pl4.1 mm, respectively. The mean diameter of the caudal vena cava was significantly affected by the type of anesthetic used (P<0.10). The mass of the animals was significant in explaining the variance in maximum portal vein diameters (P<0.10). The mean maximum velocity of the hepatic vein flow at the entrance to the caudal vena cava was 25.3pl2.8 cm/s (n=4), the hilar portal vein was 11.7pl3.3 cm/s (n=7), and the caudal vena cava was 33.8pl19.8 cm/s (n=5). The mean maximum gall bladder length and width, and the mean common bile duct diameters were 44.6 mm (pl10.4), 23.3 mm (pl5.0), and 8.1 mm (pl2.4), respectively. Age was significant in explaining the variance in gall bladder lengths (P<0.10). Urinary tract ultrasonography was performed only in animals that had normal urea and creatinine levels (n=13). Renal cortico-medullary distinction was present in all kidneys and a cortico-medullary rim sign was seen in 21 of 26 kidneys. Mean kidney length, height, and width was 63.9pl5.7, 38.1pl5.2, and 42.1pl5 mm, respectively. The average resistivity index was 0.58 (n=5). Mean urinary bladder length, height, and width were 57.0, 19.2, and 34.9 mm, respectively.
**Descriptors:** cheetahs, *Acinonyx jubatus*, liver, spleen, urinary tract, ultrasonography, radiology, diseases, abdomen gastritis, anatomy.

Husni, M.M., Rama Kumar, and Jit Singh (1990). **Treatment of compound fracture of radius and ulna in a male cheetah (*Acinonyx jubatus*)**. *Indian Journal of Veterinary Surgery* 11(1): 35-37. ISSN: 0254-4105.
**Descriptors:** cheetah, *Acinonyx jubatus*, radius, ulna, compound fracture, case report, fracture fixation, radiography, treatment, zoo animals.

Janssens, L., W. De Meurichy, and D.L.M. Janssens (1994). **Surgical correction of patellar luxation in a cheetah (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 25(3): 466-471. ISSN: 1042-7260.
**Descriptors:** 7 years old, cheetah, *Acinonyx jubatus*, medial patellar luxation, surgical correction, technique used, bilateral, grade 4, bilateral lameness, clinical recovery.

Johnson, J.H., A.M. Wolf, J.M. Jensen, T. Fossum, D. Rohn, R.W. Green, and M. Willard (1997). **Duodenal perforation in a cheetah (*Acinonyx jubilatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 28(4): 481-4. ISSN: 1042-7260.
**Abstract:** An 11-yr-old female cheetah (*Acinonyx jubilatus*) from a privately owned breeding center for endangered species was referred for evaluation with a history of vomiting and depression of 10 days' duration. After anesthetic induction with tiletamine and zolazepam and anesthetic maintenance with isoflurane, a complete diagnostic workup was performed, including hematology, serum chemistry, and radiography. The clinical diagnosis was septic suppurative inflammation and hemorrhage in the abdomen, consistent with perforation or rupture of the gastrointestinal tract. An exploratory laparotomy showed a perforated duodenal ulcer, which was resected. Subsequent endoscopy revealed no further evidence of ulceration in the upper gastrointestinal tract. Biopsy of the ulcerated tissue collected from the duodenum revealed *Gastrospirillum*-like organisms. Histologic examination revealed widespread infiltration of lymphocytes and plasma cells into the lamina propria and submucosa. Intraepithelial leukocytes were present along with attenuation, erosion, and ulceration of the superficial epithelium. Fourteen days after surgery, this cheetah was returned to its breeding compound, and no subsequent vomiting has been observed for 4 yr.
**Descriptors:** cheetah, *Acinonyx jubatus*, duodenal ulcer, peptic ulcer perforation, anti-infective agents, therapeutic use, anti-ulcer agents, biopsy, drug therapy, duodenal ulcer complications, surgery, duodenoscopy, duodenum microbiology, gastroscopy, *Helicobacter* isolation, purification, peptic ulcer perforation diagnosis, surgery, postoperative care, quinolones, ranitidine, sucralfate.

Meltzer, D.G.A. (1999). **Medical management of a cheetah breeding facility in South Africa**. In: M.E. Fowler and R.E. Miller (Editors), *Zoo and Wild Animal Medicine: Current Therapy,* 4th edition, p. 415-423. ISBN: 0721686648.
**Descriptors:** cheetah, *Acinonyx jubatus*, medical management, cheetah breeding facility, animal health, conservation, veterinary medicine, wild animals, zoo animals, South Africa.

Meredith, A.L. and A. Beasey (1991). **Ivermectin treatment of ascarids in captive cheetahs (*Acinonyx jubatus*)**. *Veterinary Record* 129(11): 241-242. ISSN: 0042-4900.
**Abstract:** The efficacy of ivermectin was studied in 13 cheetahs (aged between 2 months and 12 years), at Whipsnade Wild Animal Park, UK, and naturally infected with *Toxocara cati* and *Toxascaris leonina*. Individual faecal samples were obtained from 7 singly housed

mature animals, and pooled samples from 2 immature siblings (10 months old) housed together. Adult cheetahs were injected by means of a dart gun, with ivermectin (200 micro g/kg bwt). The cubs were injected sc at the same dose rate, and were re-treated 20 and 52 days later. All the faeces present in the enclosures were collected daily from 2 days before treatment until day 8 following treatment, and then weekly until day 77. All the adult cheetahs shed eggs of both *Toxocara cati* and *Toxascaris leonina* but had higher counts of the latter. Only *Toxascaris leonina* eggs were found in the faeces of the siblings, whereas most of the eggs shed by the cubs were of *Toxocara cati*. Faecal egg count had decreased to zero in all the cheetahs by days 7 and 8. Eggs of *Toxascaris leonina* were next seen in 2 animals on day 56 and those of *Toxocara cati* on day 70. By day 77 all the animals were positive for one or both parasites. It is concluded that this dose of ivermectin (200 micro g/kg bwt) completely eliminated the ascarids in the cheetahs, which then subsequently became reinfected, suggesting a short persistence of ivermectin in the animals. *Reproduced with permission of CAB.*

**Descriptors:** cheetahs, *Acinonyx jubatus*, ascarids, anthelmintics, drug therapy, helminths, Ivermectin, treatment, parasites, zoo animals, Ascarididae, Carnivores, Felidae, Nematoda, *Toxascaris leonina*, *Toxocara cati*.

Neiffer, D.L., A.D. Pardo, and E.C. Klein (2000). **Use of pyloroplasty (Y-U) to treat presumed delayed gastric emptying in a cheetah (*Acinonyx jubatus*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 31(4): 552-7. ISSN: 1042-7260.

**Abstract:** A 4-yr-old cheetah (*Acinonyx jubatus*) with a 2-yr history of chronic intermittent vomiting and spiral bacteria-associated gastritis presented with dramatically increased vomiting frequency and marked intermittent abdominal distention. Physical examination revealed loss of muscle mass and poor fur coat quality. Contrast radiography was consistent with delayed gastric emptying due to presumed gastric outlet obstruction. Both Y-U pyloroplasty and incisional gastropexy were performed, and no subsequent vomiting has been observed for 3 yr with the exception of three episodes during the immediate postoperative period. The cause of delayed gastric emptying was not determined, although a gastric motility disorder associated with gastric bacterial infection and elevated gastrin levels was suspected.

**Descriptors:** cheetah, *Acinonyx jubatus*, gastric emptying, pylorus surgery, Y-U, pyloroplasty, stomach diseases, gastrins blood, gastritis complications, gastritis, gastrointestinal motility, increased vomiting, spiral bacteria associated gastritis, abdominal distention, delayed gastric emptying.

Nothling, J.O., O. Knesl, P. Irons, and E. Lane (2002). **Uterine prolapse with an interesting vascular anomaly in a cheetah: a case report.** *Theriogenology.* 58(9): 1705-1712. ISSN: 0093-691X.

**NAL Call Number:** QP251.A1T5

**Abstract:** A 5-year-old cheetah suffered a complete prolapse of the left uterine horn after the birth of her second litter. Two attempts to reduce the prolapse transvaginally failed. The animal was hospitalized 13 days after the prolapse first occurred, and an ovariohysterectomy was performed to resolve the prolapse. The prolapsed uterine horn had been mutilated: its tip, together with the ipsilateral ovary was absent. Laparotomy revealed no sign of recent or past hemorrhage or adhesions, or any signs of the left ovarian artery or left ovarian vein in the remnants of the left mesovarium. A large vein crossed the uterine body from the left uterine horn to join the right uterine vein, presumably serving as the only route of venous drainage for the prolapsed uterine horn. A possible cause for the prolapse is excessive mobility of the uterus due to prior rupture of its mesial support. The animal died 24 days after surgery due to chronic renal failure, as a result of severe renal amyloidosis.

**Descriptors:** cheetah, *Acinonyx jubatus*, zoo animals, uterine prolapse, ovariectomy, uterus, blood chemistry, leukopenia, renal failure, blood circulation, blood vessels, ovaries, females, case studies, anemia, hematocrit, hysterectomy, abnormalities.

Pernikoff, D.S., W.J. Boever, M. Gado, and L.A. Gilula (1986). **Vertebral body fracture in a captive cheetah.** *Journal of the American Veterinary Medical Association* 189(9): 1199-200. ISSN: 0003-1488.

**Descriptors:** captive cheetah, *Acinonyx jubatus*, injuries, bone fractures, lumbar vertebrae injuries, fractures, bone radiography, myelography, tomography, x ray computed.

Radcliffe, R.W., S. Osofsky, D. Decker, B. Wolfe, and M. Bush (1995). **Laparoscopic vasectomy: a simple technique for sterilization of the male cheetah (*Acinonyx jubatus*).** *Proceedings of a Joint Conference American Association of Zoo Veterinarians, Wildlife Disease Association, and American Association of Wildlife Veterinarians, East Lansing, Michigan, USA; August 12-17, 1995,*Vol. 1995, p. 435-437.

**Descriptors:** male cheetah, *Acinonyx jubatus*, sterilization, laparoscopic vasectomy, simple technique, case report.

Sanjayan, M.A. and K. Crooks (1996). **Skin grafts and cheetahs.** *Nature* 381(6583): 566. ISSN: (p) 0028-0836; (E) 1476-4687.

**Descriptors:** cheetahs, *Acinonyx jubatus*, skin grafts, *acinonyx* immunology, skin

transplantation, immunology, DNA fingerprinting, homozygote, rodentia genetics, rodentia immunology, transplantation, homologous, variation genetics.

Schulz, J., E.E. Hammond, M. Haymon, A. Ramis, J. Martorell, and R.F. Aguilar (2003). **Magnetic resonance imaging as a method of diagnosing leukoencephalopathy in a cheetah (*Acinonyx jubatus*)**. In: *Erkrankungen der Zootiere: Verhandlungsbericht des 41 Internationalen Symposiums uber die Erkrankungen der Zoo und Wildtiere. [Proceedings of the Institute for Zoo and Wildlife Research, Berlin, No. 5],Rome, Italy,* Berlin, p. 11-15.

**Abstract:** Leukoencephalopathy is a recently described disease of cheetahs characterized with white matter degeneration in specific areas of the brain. A 12-year-old male cheetah (*Acinonyx jubatus*) is presented with progressive hind limb ataxia and incoordination for 22 months. Magnetic resonance imaging was utilized as a diagnostic technique. The regions of interest were defined as brain and spinal cord. Images produced by magnetic resonance did not show any changes in the intensity of the cerebral white matter consistent with a chronic degenerative process. The absence of clear lesions on the MRI implied a final diagnosis cannot be made until the animals' signs worsen, and a follow up MRI showed unequivocal lesions, or until central nervous system lesions can be detected postmortem by means of histopathology. The animal's chronic neurologic signs, apparent occasional blindness, and slow recovery from anaesthesia, associated with severe neurologic signs during recovery, indicated it will remain a strong clinical suspect of leukoencephalopathy. Should the animal in this case be found positive, it would suggest that the disease may be suspected clinically before magnetic resonance imaging is a diagnostic option. *Reproduced with permission of CAB.*
**Descriptors:** cheetah, *Acinonyx jubatus*, leukoencephalopathy, diagnosing, magnetic resonance imaging, method, diagnostic techniques, encephalopathy, lesions, conference information.
**Notes:** Erkrankungen der Zootiere: Verhandlungsbericht des 41. Internationalen Symposiums uber die Erkrankungen der Zoo und Wildtiere, Rome, Italy, 28 May - 1 June, 2003.

Wack, R.F., L.W. Kramer, and W. Cupps (1992). **Griseofulvin toxicity in four cheetahs (*Acinonyx jubatus*)**. *Journal of Zoo and Wildlife Medicine* 23(4): 442-446. ISSN: 1042-7260.
**Abstract:** A case of suspected griseofulvin toxicity is reported in an adult lactating cheetah and her 3 cubs. The adult dam received 23 mg/kg oral griseofulvin twice daily and the cubs 48-73 mg/kg, for a skin infection with *Microsporum canis*. The adult female died 11 d after griseofulvin treatment was started. After 4 d of treatment, all 3 cubs showed signs of severe bone marrow suppression, but recovered after prolonged nursing care. The *M. canis* infection was successfully treated with oral ketoconazole for 60 d and weekly lime-sulfur immersion dips for 6 wk. *Reproduced with permission of CAB.*
**Descriptors:** cheetahs, *Acinonyx jubatus*, cubs, lactating female, Antifungal agents, griseofulvin, case reports, severe bone marrow suppression, ketoconazole, poisoning, therapy, toxicity, zoo animals, Felidae, *Microsporum canis*.

Walzer, C., A. Kubber Heiss, and N. Robert (2002). **A simple field method for spinal cord removal demonstrated in the cheetah (*Acinonyx jubatus*).** *Journal of Veterinary Diagnostic Investigation* 14(1): 76-79. ISSN: 1040-6387.
**Abstract:** Removal of the spinal cord is considered time consuming and difficult. A delay in the necropsy procedure, especially in the central nervous system, can result in significant tissue autolysis and subsequent diagnostic difficulties. In the field, where many necropsies are performed, suitable electric saws are mostly unavailable. A technically simple and rapid method for spinal cord removal, requiring only a straightforward tool, has been devised. No necropsy-induced structural damage has been noted on histopathologic examination.
**Descriptors:** cheetah, *Acinonyx jubatus*, surgery, autopsy methods, spinal cord removal, simple method.

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### Clouded Leopard - General

Austin, S.C. and M.E. Tewes (1999). **Ecology of the clouded leopard in Khao Yai National Park, Thailand.** *Cat News* 31: 17-18. ISSN: 1027-2992.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, felidae, activity patterns, home range, distribution within habitat, habitat preference, National Park, Khao Yai National Park,Thailand.

Austin, S.C., M.E. Tewes, L.I.J. Grassman, and N.J. Silvy (2007). **Ecology and conservation of the leopard cat *Prionailurus bengalensis* and clouded leopard *Neofelis nebulosa* in Khao Yai National Park, Thailand.** *Acta Zoologica Sinica* 53(1): 1-14. ISSN: 0001-7302.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Leopard cat, *Prionailurus bengalensis*, conservation, activity patterns, ecology, Khao Yai National Park, Biology, Conservation, Thailand.
**Language of Text:** Chinese and English.

Brown, J.L., D.E. Wildt, L.H. Graham, A.P. Byers, L. Collins, S. Barrett, and J.G. Howard (1995). **Natural versus chorionic gonadotropin-induced ovarian responses in the clouded leopard (*Neofelis nebulosa*) assessed by fecal steroid analysis.** *Biology of Reproduction* 53(1): 93-102. ISSN: 0006-3363.
**NAL Call Number:** QL876.B5
**Abstract:** The clouded leopard (*Neofelis nebulosa*) is an endangered species difficult to propagate in captivity because of sexual incompatibility between paired individuals. Fecal estradiol (E2) and progesterone (P4) metabolites were quantified in 14 females to noninvasively monitor seasonal reproductive patterns and compare ovarian responses to natural mating vs. exogenous gonadotropins. Increased E2 excretion was associated with behavioral estrus or eCG treatment, whereas elevated P4 metabolites were observed during natural and hCG-induced pregnant and nonpregnant luteal phases. On the basis of fecal E2 profiles, duration of the estrous cycle was 24 +/- 2 days, with estrus lasting 6 +/- 1 days. Mean gestation length was 89 +/- 2 days, whereas duration of the nonpregnant luteal phase was 47 +/- 2 days. Females experienced a seasonal anestrus

during the late summer and early fall. One female demonstrated a lactational anestrus after the birth of three cubs. On nine occasions, clouded leopards ovulated spontaneously (based on elevated fecal P4 metabolite concentrations) in the absence of mating. Patterns of eCG-stimulated E2 excretion were similar to those associated with natural estrus and were unaffected by eCG dosage (25, 50, or 100 IU). In contrast, post-hCG P4 metabolite profiles varied considerably, with responses including anovulation, attenuated luteal P4 metabolite production, and hyperstimulated luteal function. In some females, compromised luteal function after ovulation induction appeared to be due to the presence of mature CL from previous spontaneous (without copulation) ovulations at the time of gonadotropin treatment. Duration of post-hCG P4 metabolite excretion was reduced approximately 40% in these individuals compared to females with no evidence of active luteal activity. In sum, these are the first data describing the ovarian cycle of this endangered species. The information is important because it is based on the longitudinal assessment of multiple females using a completely atraumatic approach, thereby eliminating the potential confounding impact of stress. Data indicate that spontaneous ovulations and the presence of active luteal tissue on the ovary can profoundly affect ovarian responses to exogenous gonadotropin therapy. Therefore, fecal steroid monitoring can serve as a useful adjunct to developing assisted reproduction techniques, especially the hormonal induction of ovulation for planned artificial insemination.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, estrus, estrous cycle, ovulation , feces, estradiol, progesterone, excretion, hormone supplements, human chorionic gonadotropin, seasonal variation, anestrus, gestation period, pregnancy, endangered species, zoo animals, comparisons, chorionic gonadotropin, induced ovulation.

Brown, J.L., D.E. Wildt, and J. Howard (1995). **Natural versus chorionic gonadotropin-induced ovarian responses in clouded leopards assessed by fecal steroids**. *Biology of Reproduction* 52(SUPPL. 1): 147. ISSN: 0006-3363; online: 1529-7268.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, ovarian responses, natural and chorionic gonadotropin induced responses, fecal steroids, assessmrnt.
**Notes:** Meeting Information: Twenty-Eighth Annual Meeting of the Society for the Study of Reproduction, Davis, California, USA; July 9-12, 1995.

Cai, J. and et al (1988). **Studies on viral enteritis in *Neofelis nebulosa*: identification of the virus.** *Chinese Journal of Veterinary Science and Technology* 1988(4): 6-8. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, viral enteritis, virus identification.
**Language of Text:** Chinese.

Choudhury, A. (1997). **The clouded leopard in Manipur and Nagaland**. *Journal of the Bombay Natural History Society* 94(2): 389-391. ISSN: 0006-6982.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, wildlife management, conservation , biogeography, population studies, habitat loss, poaching , note.

Christiansen, P. (2006). **Sabertooth characters in the clouded leopard (*Neofelis nebulosa* griffiths 1821)**. *Journal of Morphology* 267(10): 1186-1198. ISSN: 0362-2525.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, skeletal system, movement, support, dental and oral system, ingestion, assimilation, skull morphology, sabertooth characteristics.

Citino, S.B. (1986). **Transient FeLV viremia in a clouded leopard.** *Journal of Zoo Animal Medicine* 17(1): 5-7. ISSN: 0093-4526.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, feline leukemia, transient viremia.

Cooley, P.L. (2001). **Phacoemulsification in a clouded leopard (*Neofelis nebulosa*).** *Veterinary Ophthalmology* 4(2): 113-117. ISSN: 1463-5216.
**NAL Call Number:** SF891.V47
**Descriptors:** clouded leopard, *Neofelis nebulosa*, cataract, surgery, methodology, anesthesia, vision, case studies, inheritance, genetics, clinical examination, treatment.

Crissey, S.D., K.A. Slifka, K.L. Jacobsen, P.J. Shumway, R. Mathews, and J. Harper (2001). **Irradiation of diets fed to captive exotic felids: microbial destruction, consumption, and fecal consistency**. *Journal of Zoo and Wildlife Medicine* 32(3): 324-328. ISSN: 1042-7260.
**Descriptors:** lions, tigers, leopard, caracals, bobcat, fishing cats, captive exotic felids, irradiated diets, microbial destrruction, fecal consistancy, consumption, animal care, behavior, foods, nutrition, food processing method, frozen raw horse meat, Nebraska brand canine diet.

Cunningham, A.A. and A.P. Dhillon (1998). **Pleural malignant mesothelioma in a captive clouded leopard (*Neofelis nebulosa nebulosa*).** *Veterinary Record Journal of the British Veterinary Association* 143(1): 22-24. ISSN: 0042-4900.
**NAL Call Number:** 41.8 V641
**Descriptors:** clouded leopard, *Neofelis nebulosa*, mesothelioma, pleura, case studies,

pathology, malignant course.

Erdakov, L.N., N.L. Chybykina, and R.A. Shilo (1983). **Activity rhythms peculiarities of leopard (*Pantera pardys saxicolor*) and clouded leopard (*Neofelis nebulosa*).** *Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR Seriya Biologicheskikh Nauk* 1983(2): 98-103. ISSN: 0568-6547.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, leopard, *Panthera pardus saxicolor*, Felidae, diel activity pattern, in captivity, Russia.
**Language of Text:** Russian, Summary in English.

Graham, L.H. and J.L. Brown (1997). **Non-invasive assessment of gonadal and adrenocortical function in felid species via faecal steroid analysis**. *Zeitschrift Fuer Saeugetierkunde* 62(suppl. 2): 78-82. ISSN: 0044-3468.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, non-invasive assessment, gonadal, adrenocortical function, felid species, fecal steroid analysis, radioimmunoassays.

Grassman, L.I.J., S.C. Austin, M.E. Tewes, and N.J. Silvy (2004). **Comparative immobilization of wild felids in Thailand**. *Journal of Wildlife Diseases* 40(3): 575-578. ISSN: 0090-3558.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, leopard cat, *Prionailurus bengalensis*, Asiatic golden cat, *Catopuma temminckii*, marbled cat, *Pardofelis marmorata*, immobilized, ketamine hydrochloride, xylazine hydrochloride, tiletamine hydrochloride, zolazepam hydrochloride, comparison, duration, induction time, recovery time.

Hartmann, M. and M. Schiess (1997). **Ropes as climbing structures for clouded leopards (*Neofelis nebulosa* Griffith 1821).** B. Holst (Ed.), *Proceedings of the 2nd International Conference on Environmental Enrichment, 21-25 August 1995, Copenhagen,* Copenhagen Zoo. Frederiksberg. 1997, p. Chapter pagination: 62-71. ISBN: 8789431146.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, zoos and wildlife parks, husbandry techniques, rope climbing structures, evaluation as enrichment devices, Switzerland, Zurich zoo, conference proceedings.

Hast, M.H. (1989). **The larynx of roaring and non-roaring cats.** *Journal of Anatomy* 163: 117-121. ISSN: 0021-8782.
**Descriptors:** cats, felidae, roaring, non roaring, larynx, functional morphology, comparisons of roaring and non roaring cat taxa, sound production mechanism, sound production, larynx functional morphology comparisons.

He, G., X. Zheng, and H. Xu (1995). **Determination of blood physiologycal [sic] parameter of the clouded leoperd [sic].** *Chinese Journal of Zoology* 30(1): 43-45. ISSN: 0250-3263.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, blood, physiological parameters determination.
**Language of Text:** Chinese, Summary in Chinese.

Hildebrandt, T., R. Ippen, H.E. Kaiser, and R.J. Montali (1995). **Leiomyomas in the genital tract of captive exotic mammals**. *Anticancer Research* 15(5A): 1754. ISSN: 0250-7005.
**Descriptors:** captive exotic animals, leiomyomas, genital tract, reproductive system, reproduction, Asian elephant, Asian lion, cervical, lesser grison, uterine, vaginal tumors, meeting abstract.
**Notes:** Meeting Information: Fifth International Conference of Anticancer Research, Corfu, Greece; October 17-22, 1995.

Howard, J., A.P. Byers, J.L. Brown, S.J. Barrett, M.Z. Evans, R.J. Schwartz, and D.E. Wildt (1996). **Successful ovulation induction laparoscopic intrauterine artificial insemination in the clouded leopard (*Neofelis nebulosa*).** *Zoo Biology* 15(1): 55-69. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** clouded leopard, *Neofelis nebulosa*, zoo animals, endangered species, pregnant mare serum gonadotropin, human chorionic gonadotropin, dosage, ovulation, artificial insemination, pregnancy, efficacy, stimulation, captive breeding.

Howard, J.G., T.L. Roth, A.P. Byers, W.F. Swanson, and D.E. Wildt (1997). **Sensitivity to exogenous gonadotropins for ovulation induction and laparoscopic artificial insemination in the cheetah and clouded leopard.** *Biology of Reproduction* 56(4): 1059-1068. ISSN: 0006-3363.
**NAL Call Number:** QL876.B5
**Abstract:** Ovarian sensitivity to exogenous gonadotropins was assessed in the cheetah (*Acinonyx jubatus*) and clouded leopard (*Neofelis nebulosa*)to help optimize artificial insemination (AI). Eighteen female cheetahs were used on 29 occasions and were given i.m. injections of 100, 200, or 400 IU eCG and 100 or 250 IU hCG 80 h later. Twenty-three female clouded leopards were treated i.m. on 27 occasions with 25, 50, 75, 100, 200, or 400 IU eCG followed 80 h later with 75, 140, or 280 IU hCG. Ovaries were examined laparoscopically at 43-48 h after hCG in cheetahs and 39-50 h in clouded leopards. All gonadotropin dosages stimulated ovarian activity in both species, but ovulation success and corpus luteum (CL) morphology varied ($p < 0.03$) with treatment.

For both species, the highest and intermediate eCG dosages resulted in ovulation in a high proportion (72-100%) of females. The lowest eCG dosage, although capable of stimulating follicular development, compromised ovulation and resulted in few (< 26%) postovulatory females. For each species, small CL (24-mm diameter) were observed with the highest and lowest eCG dosage, and large CL (5-8 mm diameter) were associated with intermediate eCG dosages. Aged CL (10-12-mm diameter) were observed in 4 of 23 (17.4%) clouded leopards with no prior male exposure, indicating occasional spontaneous ovulation. Nineteen laparoscopic intrauterine AI procedures were performed in eCG/hCG-treated postovulatory cheetahs. Eighteen AI procedures were conducted in ecG/hCG-treated postovulatory clouded leopards. Six of the 13 cheetahs (46%), all in the 200-IU eCG/100-IU hCG group, became pregnant, in contrast to none of the clouded leopards. This study has revealed differences in ovarian activity in two wild felid species as a result of changes in exogenous gonadotropin dosage. Because of this dose-effect response, this comparative approach is necessary to identify a gonadotropin regimen that can mimic "normalcy". Even then, the relatively high AI success in the cheetah compared to the clouded leopard suggests that factors other than ovarian response can dictate the efficiency of assisted reproduction in this taxon.
**Descriptors:** cheetah, *Acinonyx jubatus*, clouded leopard, *Neofelis nebulosa*, human chorionic gonadotropin, ovulation, dosage, artificial insemination, laparoscopy, Graafian follicles, corpus luteum, anatomy, morphology, progesterone, estradiol, pregnancy, zoo animals, equine chorionic gonadotropin, species differences, induction, chorionic gonadotropin.

Howard, J., A.P. Byers, J.L. Brown, S.J. Barrett, M.Z. Evans, R.J. Schwartz, and D.E. Wildt (1996). **Successful ovulation induction and laparoscopic intrauterine artificial insemination in the clouded leopard (*Neofelis nebulosa*).** *Zoo Biology* 15(1): 55-69. ISSN: 0733-3188.
**Descriptors:** clouded leopard, *Neofelis nebulos*a, succesful ovulation induction, breeding programs, laparoscopic intrauterine artificial insemination, reproductive techniques, hormones, exogenous gonadotropin treatment, ovulation induction responses, ovary.

Hubbard, C.J. and V.L. Naples (2007). **Comparative analysis of hind limb muscles in the clouded leopard, *Neofelis nebulosa*, and domestic cat (*Felis catus*)**. *FASEB Journal* 21(6): A967. ISSN: 0892-6638.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, domestic cat, *Felis catus*, comparative analysis, hind limb muscles, skeletal system, movement, support, muscular system, muscle attachment.
**Notes:** Meeting Information: Experimental Biology 2007 Annual Meeting, Washington, DC, USA; April 28 -May 02, 2007.

Irven, P. (1993). **The clouded leopard (*Neofelis nebulosa*). A short review of the species' desperate situation at present.** *Ratel* 20(3): 93-98. ISSN: 0305-1218.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, breeding programmes, endangered status, species desperate situation, reduced populations, review.

Johnson, K. (2000). **The clouded leopard: the "littlest" big cat.** *Endangered Species Update* 17(2): 40-43. ISSN: 1081-3705.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, disturbance by humans, conservation measures, endangered status, threats, mammalian prey, distribution, biology, research, conservation, China, oriental region.

Kitchener, A.C. (1999). **Mate killing in clouded leopards: a hypothesis.** *IZN (International Zoo News)* 46(4): 221-224; No 293. ISSN: 0020-9155.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, care in captivity, mate killing by males in captivity, misdirected predatory behavior, hypothesis, management suggestions, instinctive behavior, misdirected predatory behavior, hypothesis for mate killing in captivity, abnormal behavior.

Kitchener, A.C., M.A. Beaumont, and D. Richardson (2006). **Geographical variation in the clouded leopard, *Neofelis nebulosa*, reveals two species**. *Current Biology* 16(23): 2377-2383. ISSN: 0960-9822.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, geographical variation, two species, morphological variation, genetic analysis, Sumatra, Borneo, southeast Asia.

Law, G. and P. Tatner (1998). **Behaviour of a captive pair of clouded leopards (*Neofelis nebulosa*): introduction without injury.** *Animal Welfare* 7(1): 57-76. ISSN: 0962-7286.
**NAL Call Number:** HV4701.A557
**Descriptors:** clouded leopard, *Neofelis nebulosa*, zoo animals, endangered species, animal behavior, animal welfare, behavior, sexual reproduction, mating, introduction, behavior patterns, captive breeding.

Long, J.A., B.S. Pukazhenthi, D.E. Wildt, S. Murray, S. Barrett, and J.G. Howard (1996). **Capacitation of clouded leopard sperm: i. Effect of protein on acrosome reaction and zona penetration**. *Journal of Andrology* 0(SUPPL.): P46. ISSN: 0196-3635.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, capacitation of clouded leopard sperm,

effect of protein on acrosome, zona penetration, reproductive system, reproduction, electrophysiology, meeting abstract, sperm motility.
**Notes:** 21st Annual Meeting of the American Society of Andrology, Minneapolis, Minnesota, USA; April 25-29, 1996.

McGovern, I.M. (1998). **Bringing out the reclusive leopard: hand-rearing clouded leopards (*Neofelis nebulosa*).** *Animal Keepers' Forum* 25(7): 275-279. ISSN: 0164-9531.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, rearing techniques, young development, Florida, zoological park, hand rearing, case notes.

Okada, R., S. Imai, and T. Ishii (1983). **Clouded leopard, *Neofelis nebulosa*, new host for *Dirofilaria immitis*.** *Japanese Journal of Veterinary Science* 45(6): 849-852. ISSN: 0021-5295.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, *Dirofilaria immitis*, nematoda, general morphology, mammalian hosts, Panthera, new host record, Ueno zoo, Japan, Tokyo.
**Language of Text:** Japanese.

Patton, S. and A.R. Rabinowitz (1994). **Parasites of wild felidae in Thailand: a coprological survey**. *Journal of Wildlife Diseases* 30(3): 472-475. ISSN: 0090-3558.
**Descriptors:** Clouded leopard, *Neofelis nebulosa*, wild Felidae, parasites, coprological survey, leopards, tigers, leopard cats, Thailand.

Pelican, K.M., D.E. Wildt, and J.G. Howard (2001). **Short-term inhibition of ovarian activity using the GnRH agonist, leuprolide acetate, in the clouded leopard**. *Theriogenology* 55(1): 394. ISSN: 0093-691X.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, ovarian activity, short term inhibition, gnrh agonist, leuprolide acetate, reproductive system, intrauterine artificial insemination, assisted reproduction, fertilization method, meeting abstract.
**Notes:** Annual Conference of the International Embryo Transfer Society, Omaha, Nebraska, USA; January 13-16, 2001.

Pelican, K.M., D.E. Wildt, and J.G. Howard (2006). **GnRH agonist lupron (r) (leuprolide acetate) pre-treatments prevent ovulation in response to gonadotropin stimulation in the clouded leopard (*Neofelis nebulosa*)**. *Theriogenology* 66(6-7, Sp. Iss. SI): 1768-1777. ISSN: 0093-691X.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, GnRH agonist, leuprolide acetate, pre treatments, prevents ovulation, gonadotropin stimulation, reproductive system, artificial insemination, laboratory techniques, ovulation.

Penny, G. (1984). **Rimau-dahan, tree tiger, clouded leopard.** *Zoonooz* 57(8): 11-13. ISSN: 0044-5282.
**Descriptors:** clouded leopard, Panthera, *Neofelis nebulosa*, Felidae, oriental region, distribution, natural history account.

Pospisil J, Kase F, and Vahala J (1987). **Basic hematological values in carnivores ii. The Felidae**. *Comparative Biochemistry and Physiology A* 87(2): 387-392. ISSN: 0300-9629.
**Abstract:** .
**Descriptors:** clouded leopard, *Neofelis nebulosa*, carnivores, Felidae, basic hematological values, Lynx, *Lynx lynx lynx*, Cougar, *Puma concolor missolensis*, Jaguar, *Panthera onca*, Lion, *Panthera leo leo*, Leopard, *Panthera pardus saxicolor*, Tiger, *Panthera tigris corbetti*, Tiger, *Panthera tigris altaica*, Cheetah, *Acinonyx jubatus jubatus*, erythrocyte count hematocrit hemoglobin leukocyte count.

Pukazhenthi, B.S., J.A. Lond, D.E. Wildt, M. Bush, and J.G. Howard (1996). **Capacitation of clouded leopard sperm: ii. Effect of calcium and cyclic amp on acrosome reaction and zona penetration**. *Journal of Andrology* 0(SUPPL.): P46. ISSN: 0196-3635.
**Descriptors:** clouded leopard sperm, capacitation, effect of calcium, cyclic amp, acrosime reaction, zona penetration, reproductive system, reproduction, *Neofelis nebulosa*, meeting abstract, sperm motility.
**Notes:** Meeting Information: 21st Annual Meeting of the American Society of Andrology, Minneapolis, Minnesota, USA; April 25-29, 1996.

Pukazhenthi, B., D. Laroe, A. Crosier, L.M. Bush, R. Spindler, K.M. Pelican, M. Bush, J.G. Howard, and D.E. Wildt (2006). **Challenges in cryopreservation of clouded leopard (*Neofelis nebulosa*) spermatozoa.** *Theriogenology* 66(6-7): 1790-1796. ISSN: 0093-691X.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, spermatazoa, cryopreservation, challenges, semen collection, techniques evaluation, seminal fluid, semen.

Pukazhenthi, B., R. Spindler, D. Wildt, L.M. Bush, and J. Howard (2002). **Osmotic properties of spermatozoa from felids producing different proportions of pleiomorphisms: Influence of adding and removing cryoprotectant.** *Cryobiology* 44(3): 288-300. ISSN: 0011-2240.
**Abstract:** The spermatozoon of felids (cats) survives cryopreservation inconsistently. Using ejaculates from three species (domestic cat [normospermic versus teratospermic], the normospermic serval and the teratospermic clouded leopard), this study (1) determined the influence of adding and removing two permeating cryoprotectants

(glycerol and dimethylsulfoxide) and (2) assessed the impact of one-step versus multi-step cryoprotectant removal on sperm motility and membrane integrity. Spermatozoa were exposed in a single step to various anisotonic solutions or to 1 M solutions of glycerol or dimethyl-sulfoxide. In both cases, sperm then were returned to near isotonic conditions in a single or multi-step with de-ionized water, Ham's F10 medium or saline. Percentage of sperm motility was measured subjectively, and plasma membrane integrity was assessed using a dual fluorescent stain and flow cytometry. Sperm motility was more sensitive to anisotonic conditions than membrane integrity. Rapid dilution into various test solutions and removal of cryoprotectant with de-ionized water reduced (P<0.01) sperm motility compared to control spermatozoa maintained in Ham's F10. Exposing sperm from all species to a 1 M solution of either cryoprotectant resulted in >85% spermatozoa retaining intact membranes. However, return to isotonicity with de-ionized water in a single step or multiple steps always caused severe plasma membrane disruption. In contrast, sperm motility and membrane integrity in all species and populations remained unaffected (P>0.05) when spermatozoa were returned to isotonicity in multiple steps with Ham's F10 medium or 0.9% sodium chloride. Results demonstrate that: (1) felid spermatozoa are resistant to hypertonic stress; (2) sperm motility is more sensitive to changes in osmolality than membrane integrity; and (3) removal of cryoprotectant in multiple steps with an isotonic solution minimizes loss of sperm motility and membrane disruption in both normospermic and teratospermic males.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, serval, *felis serval*, Felidae, semen collection, sperm cryopreservation, cryoprotectant addition, removal, effects on sperm motility, membrane integrity.

Singh, S., C. Singh, A. Kumar, K.K. Sinha, and P.C. Mishra (1999). **Hematology of tigers (*Panthera tigris tigris*), leopards (*Panthera pardus*) and clouded leopards (*Neofelis nebulosa*) in captivity.** *Zoos' Print Journal* 14(4): 7-8. ISSN: print: 0971-6378; online: 0973-2543.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, leopards, *Panthera pardus*, tigers, *Panthera tigris tigris*, Felidae, blood, normal hematological values in captivity.

Spencer, J.A., M.J. Higginbotham, and B.L. Blagburn (2003). **Seroprevalence of *Neospora caninum* and *Toxoplasma gondii* in captive and free-ranging nondomestic felids in the United States.** *Journal of Zoo and Wildlife Medicine* 34(3): 246-249. ISSN: 1042-7260.
**Descriptors:** nondomestic felids, captive, free ranging, seroprevalence, *Neospora caninum*, *Toxoplasma gondii*, indirect fluorescent antibody, pathogens.

Volf, J. (1997). **Some remarks on rearing and breeding of clouded leopard, *Neofelis nebulosa* (griffith, 1821), at the Prague zoo**. *Zoologische Garten* 67(3): 153-163. ISSN: 0044-5169.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, rearing, breeding, animal care, captive, disease, life span, Prague zoo, reproduction, husbandry.
**Language of Text:** German.

Wada, Y., H. Kondo, G. Bando, M. Kosuge, Y. Ishikawa, and K. Kadota (1996). **Intestinal adenocarcinoma with neuroendocrine cells in a clouded leopard (*Neofelis nebulosa*).** *Journal of Comparative Pathology* 115(3): 305-310. ISSN: 0021-9975.
**NAL Call Number:** 41.8 J82
**Descriptors:** clouded leopard, *Neofelis nebulosa*, intestinal adenocarcinoma, neuroendocrine cells, small intestine, histopathology, case studies, goblet cells.

Wielebnowski, N.C., N. Fletchall, K. Carlstead, J.M. Busso, and J.L. Brown (2002). **Noninvasive assessment of adrenal activity associated with husbandry and behavioral factors in the North American clouded leopard population.** *Zoo Biology* 21(1): 77-98. ISSN: 0733-3188.
**Abstract:** The North American clouded leopard (*Neofelis nebulosa*) population is far from self-sustaining. Breeding success is poor and behavioral problems (i.e., fur-plucking, tail-chewing, excessive hiding or pacing, and intersexual aggression that results in mate killing) are common. This study was undertaken to investigate whether some of these problems may be indicators of chronic stress (as reflected by persistently elevated glucocorticoid levels) and whether they are associated with specific management factors. A fecal corticoid metabolite assay was validated to monitor adrenal activity in clouded leopards. Adrenocorticotropic hormone (ACTH) challenges conducted in four clouded leopards established the biological relevance of the assay system. Fecal corticoid concentrations increased 14-fold above baseline within 24 hours after ACTH administration. Adrenal activity then was monitored in 72 (36 males; 36 females) clouded leopards (65% of the North American Species Survival Plan population) during a 6-week period and compared to husbandry and behavior data. There was a significant (P<0.01) gender difference in fecal corticoid concentrations, with females producing higher concentrations than males. Multiple regression analyses revealed negative associations (P<0.01) between enclosure height, number of hours keepers spent with each animal per week, and corticoid concentrations. A positive correlation (P<0.001) was found between the number of keepers caring for an individual and corticoid concentrations. Higher fecal corticoid concentrations (P[ltoreq]0.05) were measured in clouded leopards kept on public

display or near potential predators compared to individuals maintained off exhibit or in the absence of predators. Individuals that performed self-injuring behaviors also had elevated fecal corticoids (P<0.01). Spearman-rank correlation analysis of keeper ratings and hormone data revealed positive associations (P[ltoreq]0.05) between some behaviors (pace, sleep, hide, and fearful/tense) and fecal corticoid concentrations. Overall these results indicate that noninvasive fecal corticoid monitoring has enormous potential for investigating how management and behavioral problems are related to animal well-being. If conducted under carefully controlled experimental paradigms, this technique could allow researchers and managers to identify problem areas of captive management for clouded leopards (e.g., enclosure height, keeper time) and evaluate the efficacy of strategies designed to promote animal welfare and increased reproductive success.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, physiological techniques, adrenal activity, assessment, physiological condition, stress, adrenal activity, non-invasive assessment, association with husbandry, behavior, captivity, feces, adrenal gland, behaviour, abnormal behavior.

Wildt, D.E., J. Howard, and M. Bush (1985). **Ejaculate characteristics and adrenal-pituitary-gonadal relationships in clouded leopards evaluated throughout the year.** *American Association of Zoo Veterinarians Annual Proceedings* 1985: 33-34. ISSN: 0095-0610.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, seasonal functions, ejaculate characteristics, adrenal pituitary gonadal relationships, hormone levels, sperm counts, quality, seasonal levels.

Wildt, D.E., J.G. Howard, P.K. Chakraborty, and M. Bush (1986). **Reproductive physiology of the clouded leopard. 2. A circannual analysis of adrenal-pituitary-testicular relationships during electroejaculation or after an adrenocorticotropin hormone challenge.** *Biology of Reproduction* 34(5): 949-959. ISSN: 0006-3363.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, seasonal functions, LH and testosterone levels, hormones, cortisol, circannual analysis, adrenal pituitary testicular relationships, during ejaculation, after adrenocorticotrophin hormone challenge.

Wildt, D.E., J.G. Howard, L.L. Hall, and M. Bush (1986). **Reproductive physiology of the clouded leopard: 1. Electroejaculates contain high proportions of pleiomorphic spermatozoa throughout the year.** *Biology of Reproduction* 34(5): 937-947. ISSN: 0006-3363.
**Descriptors:** clouded leopards, *Neofelis nebulosa*, physiological condition, stress in captivity, seasonal functions, sperm abnormalities, breeding, reproductive physiology, electroejaculates, pleiomorphic spematozoa, high proportions.

Wildt, D., B. Pukazhenthi, J. Brown, S. Monfort, J. Howard, and T. Roth (1995). **Spermatology for understanding, managing and conserving rare species.** *Reproduction Fertility and Development* 7(4): 811-824. ISSN: 1031-3613.
**Descriptors:** mammalia, breeding programes, reproductive techniques, spermatology studies, endocrinology, reproduction, reproductive biology, conservation, review.

Wilting, A., F. Fischer, S. Abu Bakar, and K.E. Linsenmair (2006). **Clouded leopards, the secretive top-carnivore of south-east asian rainforests: their distribution, status and conservation needs in Sabah, Malaysia**. *BMC Ecology* 6 ISSN: 1472-6785.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, souteast Asian rainforests, distribution, status, conservation needs, Sahah Malaysia.

Wu, J. and et al (1988). **Investigations of hemorrhagic enteritis in *Panthera uncia* and *Neofelis nebulosa*.** *Chinese Journal of Veterinary Science and Technology* 1988(6): 22-23. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, snow leopard, *Panthera uncia*, felidae, viral diseases, hemorrhagic enteritis, investigations.
**Language of Text:** Chinese.

Wu, X., T. Zheng, and Z. Jiang (2007). **The mitochondrial genome structure of the clouded leopard (*Neofelis nebulosa*)**. *Genome* 50(2): 252-7. ISSN: (p) 0831-2796; online: 1480-3321.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, mitochondrial genome structure.

Yamada, J.K. and B.S. Durrant (1989). **Reproductive parameters of clouded leopards (*Neofelis nebulosa*).** *Zoo Biology* 8(3): 223-231. ISSN: 0733-3188.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, age, sexual maturation in captivity, seasonal functions, breeding in captivity, reproductive parameters, gestation period, ovarian cycle, duration, captive observations.
**Language of Text:** .

Yanai, T., T. Tomita, H. Sakai, K. Isowa, H. Takeda, Y. Yamamoto, H. Hori, and T. Masegi (1996). **Lung carcinoma in a clouded leopard (*Neofelis nebulosa*).** *Japanese Journal of Zoo and Wildlife Medicine* 1(1): 45-48. ISSN: 1342-6133.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, neoplastic diseases, lung carcinoma.
**Language of Text:** English and Japanese.

Yang, L. and J. Zhang (1993). **Studies on serum protein and ldh isoenzymes in *Panthera tigris amoyensis*, *Panthera pardus* and *Neofelis nebulosa***. *Acta Theriologica Sinica* 13(2): 151. ISSN: 1000-1050.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, tiger, *Panthera tigris amoyensis*, panther, *Panthera pardus*, studies, serum protein, 1dh isoenzymes.
**Language of Text:** Chinese.

Zahedi, M., S. Vellayan, J. Jeffery, and M. Krishnasamy (1986). **A case of double infection with *Brugia pahangi* Buckley and Edeson 1956, and *Dirofilaria immitis* Leidy 1856, in a Malaysian clouded leopard, *Neofelis nebulosa*.** *Veterinary Parasitology* 21(2): 135-137. ISSN: 0304-4017.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, *Brugia pahangi*, *Dirofilaria immitis*, nematoda, mammalian hosts, panthera, new host record, Malaysia, Kuala Lumpur, zoological garden.

Zhang, D., S. Chen, J. Li, R. Wu, G. Chen, and X. Hu (1993). **Determination of the erythrocytic C3b receptors of *Panthera tigris amurensis*, *Neofelis nebulosa* and *Felis temmincki*.** *Acta Theriologica Sinica* 13(4): 256-259. ISSN: 1000-1050.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, tiger, *Panthera tigris amurensis*, *Felis temmincki*, felidae, blood cells, erythrocytes, immune response, rosetting ratio, erythrocytic C3b receptors.
**Language of Text:** Chinese, Summaries in Chinese and English.

Zhang, K. (1993). **Study on electrocardiogram of clouded leopard.** *Chinese Wildlife* 3: 37-39. ISSN: 1000-0127.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, felidae, heart beat, ecg analysis, electocardiogram.
**Language of Text:** Chinese.

Zhang, K., X. Jin, X. Yang, W. Zeng, and H. Xu (1994). **Determination on electrocardiogram of cloudy leopard**. *Acta Theriologica Sinica* 14(1): 69-70. ISSN: 1000-1050.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, nervous system, neural coordination, systematics, taxonomy, electrocardiogram.
**Language of Text:** Chinese.

Zhang, Z. and et al (1988). **Studies on viral enteritis in *Neofelis nebulosa*: animal experimental infection.** *Chinese Journal of Veterinary Science and Technology* 1988(5): 18-20. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, enteritis, experimental infection.
**Language of Text:** Chinese.

Zhang, Z. and et al (1988). **Studies on viral enteritis in *Neofelis nebulosa*: properties of the disease.** *Chinese Journal of Veterinary Science and Technology* 1988(3): 3-5. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, enteritis, properties.
**Language of Text:** Chinese.

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### Clouded Leopard - Anatomy

Christiansen, P. (2006). **Sabertooth characters in the clouded leopard (*Neofelis nebulosa* griffiths 1821)**. *Journal of Morphology* 267(10): 1186-1198. ISSN: 0362-2525.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, skeletal system, movement, support, dental and oral system, ingestion, assimilation, skull morphology, sabertooth characteristics.

Hast, M.H. (1989). **The larynx of roaring and non-roaring cats.** *Journal of Anatomy* 163: 117-121. ISSN: 0021-8782.
**Descriptors:** cats, felidae, roaring, non roaring, larynx, functional morphology, comparisons of roaring and non roaring cat taxa, sound production mechanism, sound production, larynx functional morphology comparisons.

Hubbard, C.J. and V.L. Naples (2007). **Comparative analysis of hind limb muscles in the clouded leopard, *Neofelis nebulosa*, and domestic cat (*Felis catus*)**. *FASEB Journal* 21(6): A967. ISSN: 0892-6638.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, domestic cat, *Felis catus*, comparative analysis, hind limb muscles, skeletal system, movement, support, muscular system, muscle attachment.
**Notes:** Meeting Information: Experimental Biology 2007 Annual Meeting, Washington, DC, USA; April 28 -May 02, 2007.

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### Clouded Leopard - Behavior

Erdakov, L.N., N.L. Chybykina, and R.A. Shilo (1983). **Activity rhythms peculiarities of leopard (*Pantera pardys saxicolor*) and clouded leopard (*Neofelis nebulosa*).** *Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR Seriya Biologicheskikh Nauk* 1983(2): 98-103. ISSN: 0568-6547.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, leopard, *Panthera pardus saxicolor*, Felidae, diel activity pattern, in captivity, Russia.
**Language of Text:** Russian, Summary in English.

Kitchener, A.C. (1999). **Mate killing in clouded leopards: a hypothesis.** *IZN (International Zoo News)* 46(4): 221-224; No 293. ISSN: 0020-9155.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, care in captivity, mate killing by males in captivity, misdirected predatory behavior, hypothesis, management suggestions, instinctive behavior, misdirected predatory behavior, hypothesis for mate killing in captivity, abnormal behavior.

Law, G. and P. Tatner (1998). **Behaviour of a captive pair of clouded leopards (*Neofelis nebulosa*): introduction without injury.** *Animal Welfare* 7(1): 57-76. ISSN: 0962-7286.
**NAL Call Number:** HV4701.A557
**Descriptors:** clouded leopard, *Neofelis nebulosa*, zoo animals, endangered species, animal behavior, animal welfare, behavior, sexual reproduction, mating, introduction, behavior patterns, captive breeding.

Wielebnowski, N.C., N. Fletchall, K. Carlstead, J.M. Busso, and J.L. Brown (2002). **Noninvasive assessment of adrenal activity associated with husbandry and behavioral factors in the North American clouded leopard population.** *Zoo Biology* 21(1): 77-98. ISSN: 0733-3188.
**Abstract:** The North American clouded leopard (*Neofelis nebulosa*) population is far from self-sustaining. Breeding success is poor and behavioral problems (i.e., fur-plucking, tail-chewing, excessive hiding or pacing, and intersexual aggression that results in mate killing) are common. This study was undertaken to investigate whether some of these problems may be indicators of chronic stress (as reflected by persistently elevated glucocorticoid levels) and whether they are associated with specific management factors. A fecal corticoid metabolite assay was validated to monitor adrenal activity in clouded leopards. Adrenocorticotropic hormone (ACTH) challenges conducted in four clouded leopards established the biological relevance of the assay system. Fecal corticoid concentrations increased 14-fold above baseline within 24 hours after ACTH administration. Adrenal activity then was monitored in 72 (36 males; 36 females) clouded leopards (65% of the North American Species Survival Plan population) during a 6-week period and compared to husbandry and behavior data. There was a significant ($P<0.01$) gender difference in fecal corticoid concentrations, with females producing higher concentrations than males. Multiple regression analyses revealed negative associations ($P<0.01$) between enclosure height, number of hours keepers spent with each animal per week, and corticoid concentrations. A positive correlation ($P<0.001$) was found between

the number of keepers caring for an individual and corticoid concentrations. Higher fecal corticoid concentrations (P[ltoreq]0.05) were measured in clouded leopards kept on public display or near potential predators compared to individuals maintained off exhibit or in the absence of predators. Individuals that performed self-injuring behaviors also had elevated fecal corticoids (P<0.01). Spearman-rank correlation analysis of keeper ratings and hormone data revealed positive associations (P[ltoreq]0.05) between some behaviors (pace, sleep, hide, and fearful/tense) and fecal corticoid concentrations. Overall these results indicate that noninvasive fecal corticoid monitoring has enormous potential for investigating how management and behavioral problems are related to animal well-being. If conducted under carefully controlled experimental paradigms, this technique could allow researchers and managers to identify problem areas of captive management for clouded leopards (e.g., enclosure height, keeper time) and evaluate the efficacy of strategies designed to promote animal welfare and increased reproductive success.

**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, physiological techniques, adrenal activity, assessment, physiological condition, stress, adrenal activity, non-invasive assessment, association with husbandry, behavior, captivity, feces, adrenal gland, behavior, abnormal behavior.

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### Clouded Leopard - Breeding and Reproduction

Brown, J.L., D.E. Wildt, L.H. Graham, A.P. Byers, L. Collins, S. Barrett, and J.G. Howard (1995). **Natural versus chorionic gonadotropin-induced ovarian responses in the clouded leopard (*Neofelis nebulosa*) assessed by fecal steroid analysis.** *Biology of Reproduction* 53(1): 93-102. ISSN: 0006-3363.

**NAL Call Number:** QL876.B5

**Abstract:** The clouded leopard (*Neofelis nebulosa*) is an endangered species difficult to propagate in captivity because of sexual incompatibility between paired individuals. Fecal estradiol (E2) and progesterone (P4) metabolites were quantified in 14 females to noninvasively monitor seasonal reproductive patterns and compare ovarian responses to natural mating vs. exogenous gonadotropins. Increased E2 excretion was associated with behavioral estrus or eCG treatment, whereas elevated P4 metabolites were observed during natural and hCG-induced pregnant and nonpregnant luteal phases. On the basis of fecal E2 profiles, duration of the estrous cycle was 24 +/- 2 days, with estrus lasting 6 +/- 1 days. Mean gestation length was 89 +/- 2 days, whereas duration of the nonpregnant luteal phase was 47 +/- 2 days. Females experienced a seasonal anestrus during the late summer and early fall. One female demonstrated a lactational anestrus after the birth of three cubs. On nine occasions, clouded leopards ovulated spontaneously (based on elevated fecal P4 metabolite concentrations) in the absence of mating. Patterns of eCG-stimulated E2 excretion were similar to those associated with natural estrus and were unaffected by eCG dosage (25, 50, or 100 IU). In contrast, post-hCG P4 metabolite profiles varied considerably, with responses including anovulation, attenuated luteal P4 metabolite production, and hyperstimulated luteal function. In some females, compromised luteal function after ovulation induction appeared to be due to the presence of mature CL from previous spontaneous (without copulation) ovulations at the time of gonadotropin treatment. Duration of post-hCG P4 metabolite excretion was reduced approximately 40% in these individuals compared to females with no evidence of active luteal activity. In sum, these are the first data describing the ovarian cycle of this endangered species. The information is important because it is based on the longitudinal assessment of multiple females using a completely atraumatic approach, thereby eliminating the potential confounding impact of stress. Data indicate that spontaneous ovulations and the presence of active luteal tissue on the ovary can profoundly affect ovarian responses to exogenous gonadotropin therapy. Therefore, fecal steroid monitoring can serve as a useful adjunct to developing assisted reproduction techniques, especially the hormonal induction of ovulation for planned artificial insemination.

**Descriptors:** clouded leopard, *Neofelis nebulosa*, estrus, estrous cycle, ovulation , feces, estradiol, progesterone, excretion, hormone supplements, human chorionic gonadotropin, seasonal variation, anestrus, gestation period, pregnancy, endangered species, zoo animals, comparisons, chorionic gonadotropin, induced ovulation.

Brown, J.L., D.E. Wildt, and J. Howard (1995). **Natural versus chorionic gonadotropin-induced ovarian responses in clouded leopards assessed by fecal steroids**. *Biology of Reproduction* 52(SUPPL. 1): 147. ISSN: 0006-3363; online: 1529-7268.

**Descriptors:** clouded leopard, *Neofelis nebulosa*, ovarian responses, natural and chorionic gonadotropin induced responses, fecal steroids, assessmrnt.

**Notes:** Meeting Information: Twenty-Eighth Annual Meeting of the Society for the Study of Reproduction, Davis, California, USA; July 9-12, 1995.

Graham, L.H. and J.L. Brown (1997). **Non-invasive assessment of gonadal and adrenocortical function in felid species via faecal steroid analysis**. *Zeitschrift Fuer Saeugetierkunde* 62(suppl. 2): 78-82. ISSN: 0044-3468.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, non-invasive assessment, gonadal, adrenocortical function, felid species, fecal steroid analysis, radioimmunoassays.

Howard, J., A.P. Byers, J.L. Brown, S.J. Barrett, M.Z. Evans, R.J. Schwartz, and D.E. Wildt (1996). **Successful ovulation induction laparoscopic intrauterine artificial insemination in the clouded leopard (*Neofelis nebulosa*).** *Zoo Biology* 15(1): 55-69. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** clouded leopard, *Neofelis nebulosa*, zoo animals, endangered species, pregnant mare serum gonadotropin, human chorionic gonadotropin, dosage, ovulation, artificial insemination, pregnancy, efficacy, stimulation, captive breeding.

Howard, J.G., T.L. Roth, A.P. Byers, W.F. Swanson, and D.E. Wildt (1997). **Sensitivity to exogenous gonadotropins for ovulation induction and laparoscopic artificial insemination in the cheetah and clouded leopard.** *Biology of Reproduction* 56(4): 1059-1068. ISSN: 0006-3363.
**NAL Call Number:** QL876.B5
**Abstract:** Ovarian sensitivity to exogenous gonadotropins was assessed in the cheetah (*Acinonyx jubatus*) and clouded leopard (*Neofelis nebulosa*)to help optimize artificial insemination (AI). Eighteen female cheetahs were used on 29 occasions and were given i.m. injections of 100, 200, or 400 IU eCG and 100 or 250 IU hCG 80 h later. Twenty-three female clouded leopards were treated i.m. on 27 occasions with 25, 50, 75, 100, 200, or 400 IU eCG followed 80 h later with 75, 140, or 280 IU hCG. Ovaries were examined laparoscopically at 43-48 h after hCG in cheetahs and 39-50 h in clouded leopards. All gonadotropin dosages stimulated ovarian activity in both species, but ovulation success and corpus luteum (CL) morphology varied ($p < 0.03$) with treatment. For both species, the highest and intermediate eCG dosages resulted in ovulation in a high proportion (72-100%) of females. The lowest eCG dosage, although capable of stimulating follicular development, compromised ovulation and resulted in few (< 26%) postovulatory females. For each species, small CL (24-mm diameter) were observed with the highest and lowest eCG dosage, and large CL (5-8 mm diameter) were associated with intermediate eCG dosages. Aged CL (10-12-mm diameter) were observed in 4 of 23 (17.4%) clouded leopards with no prior male exposure, indicating occasional spontaneous ovulation. Nineteen laparoscopic intrauterine AI procedures were performed in eCG/hCG-treated postovulatory cheetahs. Eighteen AI procedures were conducted in ecG/hCG-treated postovulatory clouded leopards. Six of the 13 cheetahs (46%), all in the 200-IU eCG/100-IU hCG group, became pregnant, in contrast to none of the clouded leopards. This study has revealed differences in ovarian activity in two wild felid species as a result of changes in exogenous gonadotropin dosage. Because of this dose-effect response, this comparative approach is necessary to identify a gonadotropin regimen that can mimic "normalcy". Even then, the relatively high AI success in the cheetah compared to the clouded leopard suggests that factors other than ovarian response can dictate the efficiency of assisted reproduction in this taxon.
**Descriptors:** cheetah, *Acinonyx jubatus*, clouded leopard, *Neofelis nebulosa*, human chorionic gonadotropin, ovulation, dosage, artificial insemination, laparoscopy, Graafian follicles, corpus luteum, anatomy, morphology, progesterone, estradiol, pregnancy, zoo animals, equine chorionic gonadotropin, species differences, induction, chorionic gonadotropin.

Howard, J., A.P. Byers, J.L. Brown, S.J. Barrett, M.Z. Evans, R.J. Schwartz, and D.E. Wildt (1996). **Successful ovulation induction and laparoscopic intrauterine artificial insemination in the clouded leopard (*Neofelis nebulosa*).** *Zoo Biology* 15(1): 55-69. ISSN: 0733-3188.
**Descriptors:** clouded leopard, *Neofelis nebulos*a, succesful ovulation induction, breeding programs, laparoscopic intrauterine artificial insemination, reproductive techniques, hormones, exogenous gonadotropin treatment, ovulation induction responses, ovary.

Long, J.A., B.S. Pukazhenthi, D.E. Wildt, S. Murray, S. Barrett, and J.G. Howard (1996). **Capacitation of clouded leopard sperm: i. Effect of protein on acrosome reaction and zona penetration**. *Journal of Andrology* 0(SUPPL.): P46. ISSN: 0196-3635.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, capacitation of clouded leopard sperm, effect of protein on acrosome, zona penetration, reproductive system, reproduction, electrophysiology, meeting abstract, sperm motility.
**Notes:** 21st Annual Meeting of the American Society of Andrology, Minneapolis, Minnesota, USA; April 25-29, 1996.

Pelican, K.M., D.E. Wildt, and J.G. Howard (2001). **Short-term inhibition of ovarian activity using the GnRH agonist, leuprolide acetate, in the clouded leopard**. *Theriogenology* 55(1): 394. ISSN: 0093-691X.

**Descriptors:** clouded leopard, *Neofelis nebulosa*, ovarian activity, short term inhibition, gnrh agonist, leuprolide acetate, reproductive system, intrauterine artificial insemination, assisted reproduction, fertilization method, meeting abstract.
**Notes:** Annual Conference of the International Embryo Transfer Society, Omaha, Nebraska, USA; January 13-16, 2001.

Pelican, K.M., D.E. Wildt, and J.G. Howard (2006). **GnRH agonist lupron (r) (leuprolide acetate) pre-treatments prevent ovulation in response to gonadotropin stimulation in the clouded leopard (*Neofelis nebulosa*)**. *Theriogenology* 66(6-7, Sp. Iss. SI): 1768-1777. ISSN: 0093-691X.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, GnRH agonist, leuprolide acetate, pre treatments, prevents ovulation, gonadotropin stimulation, reproductive system, artificial insemination, laboratory techniques, ovulation.

Pukazhenthi, B.S., J.A. Lond, D.E. Wildt, M. Bush, and J.G. Howard (1996). **Capacitation of clouded leopard sperm: ii. Effect of calcium and cyclic amp on acrosome reaction and zona penetration**. *Journal of Andrology* 0(SUPPL.): P46. ISSN: 0196-3635.
**Descriptors:** clouded leopard sperm, capacitation, effect of calcium, cyclic amp, acrosime reaction, zona penetration, reproductive system, reproduction, *Neofelis nebulosa*, meeting abstract, sperm motility.
**Notes:** Meeting Information: 21st Annual Meeting of the American Society of Andrology, Minneapolis, Minnesota, USA; April 25-29, 1996.

Pukazhenthi, B., D. Laroe, A. Crosier, L.M. Bush, R. Spindler, K.M. Pelican, M. Bush, J.G. Howard, and D.E. Wildt (2006). **Challenges in cryopreservation of clouded leopard (*Neofelis nebulosa*) spermatozoa.** *Theriogenology* 66(6-7): 1790-1796. ISSN: 0093-691X.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, spermatazoa, cryopreservation, challenges, semen collection, techniques evaluation, seminal fluid, semen.

Pukazhenthi, B., R. Spindler, D. Wildt, L.M. Bush, and J. Howard (2002). **Osmotic properties of spermatozoa from felids producing different proportions of pleiomorphisms: Influence of adding and removing cryoprotectant.** *Cryobiology* 44(3): 288-300. ISSN: 0011-2240.
**Abstract:** The spermatozoon of felids (cats) survives cryopreservation inconsistently. Using ejaculates from three species (domestic cat [normospermic versus teratospermic], the normospermic serval and the teratospermic clouded leopard), this study (1) determined the influence of adding and removing two permeating cryoprotectants (glycerol and dimethylsulfoxide) and (2) assessed the impact of one-step versus multi-step cryoprotectant removal on sperm motility and membrane integrity. Spermatozoa were exposed in a single step to various anisotonic solutions or to 1 M solutions of glycerol or dimethyl-sulfoxide. In both cases, sperm then were returned to near isotonic conditions in a single or multi-step with de-ionized water, Ham's F10 medium or saline. Percentage of sperm motility was measured subjectively, and plasma membrane integrity was assessed using a dual fluorescent stain and flow cytometry. Sperm motility was more sensitive to anisotonic conditions than membrane integrity. Rapid dilution into various test solutions and removal of cryoprotectant with de-ionized water reduced ($P<0.01$) sperm motility compared to control spermatozoa maintained in Ham's F10. Exposing sperm from all species to a 1 M solution of either cryoprotectant resulted in >85% spermatozoa retaining intact membranes. However, return to isotonicity with de-ionized water in a single step or multiple steps always caused severe plasma membrane disruption. In contrast, sperm motility and membrane integrity in all species and populations remained unaffected ($P>0.05$) when spermatozoa were returned to isotonicity in multiple steps with Ham's F10 medium or 0.9% sodium chloride. Results demonstrate that: (1) felid spermatozoa are resistant to hypertonic stress; (2) sperm motility is more sensitive to changes in osmolality than membrane integrity; and (3) removal of cryoprotectant in multiple steps with an isotonic solution minimizes loss of sperm motility and membrane disruption in both normospermic and teratospermic males.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, serval, *felis serval*, Felidae, semen collection, sperm cryopreservation, cryoprotectant addition, removal, effects on sperm motility, membrane integrity.

Volf, J. (1997). **Some remarks on rearing and breeding of clouded leopard, *Neofelis nebulosa* (griffith, 1821), at the Prague zoo**. *Zoologische Garten* 67(3): 153-163. ISSN: 0044-5169.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, rearing, breeding, animal care, captive, disease, life span, Prague zoo, reproduction, husbandry.
**Language of Text:** German.

Wildt, D.E., J. Howard, and M. Bush (1985). **Ejaculate characteristics and adrenal-pituitary-gonadal relationships in clouded leopards evaluated throughout the year.** *American Association of Zoo Veterinarians Annual Proceedings* 1985: 33-34. ISSN: 0095-0610.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, seasonal functions, ejaculate characteristics, adrenal pituitary gonadal relationships, hormone levels, sperm counts, quality, seasonal levels.

Wildt, D.E., J.G. Howard, P.K. Chakraborty, and M. Bush (1986). **Reproductive physiology of the clouded leopard. 2. A circannual analysis of adrenal-pituitary-testicular relationships during electroejaculation or after an adrenocorticotropin hormone challenge.** *Biology of Reproduction* 34(5): 949-959. ISSN: 0006-3363.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, seasonal functions, LH and testosterone levels, hormones, cortisol, circannual analysis, adrenal pituitary testicular relationships, during ejaculation, after adrenocorticotrophin hormone challenge.

Wildt, D.E., J.G. Howard, L.L. Hall, and M. Bush (1986). **Reproductive physiology of the clouded leopard: 1. Electroejaculates contain high proportions of pleiomorphic spermatozoa throughout the year.** *Biology of Reproduction* 34(5): 937-947. ISSN: 0006-3363.
**Descriptors:** clouded leopards, *Neofelis nebulosa*, physiological condition, stress in captivity, seasonal functions, sperm abnormalities, breeding, reproductive physiology, electroejaculates, pleiomorphic spematozoa, high proportions.

Wildt, D., B. Pukazhenthi, J. Brown, S. Monfort, J. Howard, and T. Roth (1995). **Spermatology for understanding, managing and conserving rare species.** *Reproduction Fertility and Development* 7(4): 811-824. ISSN: 1031-3613.
**Descriptors:** mammalia, breeding programes, reproductive techniques, spermatology studies, endocrinology, reproduction, reproductive biology, conservation, review.

Yamada, J.K. and B.S. Durrant (1989). **Reproductive parameters of clouded leopards (*Neofelis nebulosa*).** *Zoo Biology* 8(3): 223-231. ISSN: 0733-3188.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, age, sexual maturation in captivity, seasonal functions, breeding in captivity, reproductive parameters, gestation period, ovarian cycle, duration, captive observations.
**Language of Text:** .

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### Clouded Leopard - Cardiovascular

He, G., X. Zheng, and H. Xu (1995). **Determination of blood physiologycal [sic] parameter of the clouded leoperd [sic].** *Chinese Journal of Zoology* 30(1): 43-45. ISSN: 0250-3263.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, blood, physiological parameters determination.
**Language of Text:** Chinese, Summary in Chinese.

Pospisil J, Kase F, and Vahala J (1987). **Basic hematological values in carnivores ii. The Felidae**. *Comparative Biochemistry and Physiology A* 87(2): 387-392. ISSN: 0300-9629.
**Abstract:** .
**Descriptors:** clouded leopard, *Neofelis nebulosa*, carnivores, Felidae, basic hematological values, Lynx, *Lynx lynx lynx*, Cougar, *Puma concolor missolensis*, Jaguar, *Panthera onca*, Lion, *Panthera leo leo*, Leopard, *Panthera pardus saxicolor*, Tiger, *Panthera tigris corbetti*, Tiger, *Panthera tigris altaica*, Cheetah, *Acinonyx jubatus jubatus*, erythrocyte count hematocrit hemoglobin leukocyte count.

Singh, S., C. Singh, A. Kumar, K.K. Sinha, and P.C. Mishra (1999). **Hematology of tigers (*Panthera tigris tigris*), leopards (*Panthera pardus*) and clouded leopards (*Neofelis nebulosa*) in captivity.** *Zoos' Print Journal* 14(4): 7-8. ISSN: print: 0971-6378; online: 0973-2543.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, leopards, *Panthera pardus*, tigers, *Panthera tigris tigris*, Felidae, blood, normal hematological values in captivity.

Zhang, K. (1993). **Study on electrocardiogram of clouded leopard.** *Chinese Wildlife* 3: 37-39. ISSN: 1000-0127.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, felidae, heart beat, ecg analysis, electocardiogram.
**Language of Text:** Chinese.

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### Clouded Leopard - Care and Husbandry

Hartmann, M. and M. Schiess (1997). **Ropes as climbing structures for clouded leopards (*Neofelis nebulosa* Griffith 1821).** B. Holst (Ed.), *Proceedings of the 2nd International Conference on Environmental Enrichment, 21-25 August 1995, Copenhagen,* Copenhagen Zoo. Frederiksberg. 1997, p. Chapter pagination: 62-71. ISBN: 8789431146.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, zoos and wildlife parks, husbandry techniques, rope climbing structures, evaluation as enrichment devices, Switzerland, Zurich zoo, conference proceedings.

McGovern, I.M. (1998). **Bringing out the reclusive leopard: hand-rearing clouded leopards (*Neofelis nebulosa*).** *Animal Keepers' Forum* 25(7): 275-279. ISSN: 0164-9531.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, rearing techniques, young development, Florida, zoological park, hand rearing, case notes.

Volf, J. (1997). **Some remarks on rearing and breeding of clouded leopard, *Neofelis nebulosa* (griffith, 1821), at the Prague zoo**. *Zoologische Garten* 67(3): 153-163. ISSN: 0044-5169.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, rearing, breeding, animal care, captive, disease, life span, Prague zoo, reproduction, husbandry.
**Language of Text:** German.

Wielebnowski, N.C., N. Fletchall, K. Carlstead, J.M. Busso, and J.L. Brown (2002). **Noninvasive assessment of adrenal activity associated with husbandry and behavioral factors in the North American clouded leopard population.** *Zoo Biology* 21(1): 77-98. ISSN: 0733-3188.
**Abstract:** The North American clouded leopard (*Neofelis nebulosa*) population is far from self-sustaining. Breeding success is poor and behavioral problems (i.e., fur-plucking, tail-chewing, excessive hiding or pacing, and intersexual aggression that results in mate killing) are common. This study was undertaken to investigate whether some of these problems may be indicators of chronic stress (as reflected by persistently elevated glucocorticoid levels) and whether they are associated with specific management factors. A fecal corticoid metabolite assay was validated to monitor adrenal activity in clouded leopards. Adrenocorticotropic hormone (ACTH) challenges conducted in four clouded leopards established the biological relevance of the assay system. Fecal corticoid concentrations increased 14-fold above baseline within 24 hours after ACTH administration. Adrenal activity then was monitored in 72 (36 males; 36 females) clouded leopards (65% of the North American Species Survival Plan population) during a 6-week period and compared to husbandry and behavior data. There was a significant (P<0.01) gender difference in fecal corticoid concentrations, with females producing higher concentrations than males. Multiple regression analyses revealed negative associations (P<0.01) between enclosure height, number of hours keepers spent with each animal per week, and corticoid concentrations. A positive correlation (P<0.001) was found between the number of keepers caring for an individual and corticoid concentrations. Higher fecal corticoid concentrations (P[ltoreq]0.05) were measured in clouded leopards kept on public display or near potential predators compared to individuals maintained off exhibit or in

the absence of predators. Individuals that performed self-injuring behaviors also had elevated fecal corticoids (P<0.01). Spearman-rank correlation analysis of keeper ratings and hormone data revealed positive associations (P[ltoreq]0.05) between some behaviors (pace, sleep, hide, and fearful/tense) and fecal corticoid concentrations. Overall these results indicate that noninvasive fecal corticoid monitoring has enormous potential for investigating how management and behavioral problems are related to animal well-being. If conducted under carefully controlled experimental paradigms, this technique could allow researchers and managers to identify problem areas of captive management for clouded leopards (e.g., enclosure height, keeper time) and evaluate the efficacy of strategies designed to promote animal welfare and increased reproductive success.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, physiological techniques, adrenal activity, assessment, physiological condition, stress, adrenal activity, non-invasive assessment, association with husbandry, behavior, captivity, feces, adrenal gland, behaviour, abnormal behavior.

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### Clouded Leopard - Conditions and Diseases

Cai, J. and et al (1988). **Studies on viral enteritis in *Neofelis nebulosa*: identification of the virus.** *Chinese Journal of Veterinary Science and Technology* 1988(4): 6-8. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, viral enteritis, virus identification.
**Language of Text:** Chinese.

Citino, S.B. (1986). **Transient FeLV viremia in a clouded leopard.** *Journal of Zoo Animal Medicine* 17(1): 5-7. ISSN: 0093-4526.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, feline leukemia, transient viremia.

Cunningham, A.A. and A.P. Dhillon (1998). **Pleural malignant mesothelioma in a captive clouded leopard (*Neofelis nebulosa nebulosa*).** *Veterinary Record Journal of the British Veterinary Association* 143(1): 22-24. ISSN: 0042-4900.
**NAL Call Number:** 41.8 V641
**Descriptors:** clouded leopard, *Neofelis nebulosa*, mesothelioma, pleura, case studies, pathology, malignant course.

Okada, R., S. Imai, and T. Ishii (1983). **Clouded leopard, *Neofelis nebulosa*, new host for *Dirofilaria immitis*.** *Japanese Journal of Veterinary Science* 45(6): 849-852. ISSN: 0021-5295.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, *Dirofilaria immitis*, nematoda, general morphology, mammalian hosts, Panthera, new host record, Ueno zoo, Japan, Tokyo.
**Language of Text:** Japanese.

Patton, S. and A.R. Rabinowitz (1994). **Parasites of wild felidae in Thailand: a coprological survey**. *Journal of Wildlife Diseases* 30(3): 472-475. ISSN: 0090-3558.
**Descriptors:** Clouded leopard, *Neofelis nebulosa*, wild Felidae, parasites, coprological survey, leopards, tigers, leopard cats, Thailand.

Spencer, J.A., M.J. Higginbotham, and B.L. Blagburn (2003). **Seroprevalence of *Neospora caninum* and *Toxoplasma gondii* in captive and free-ranging nondomestic felids in the United States.** *Journal of Zoo and Wildlife Medicine* 34(3): 246-249. ISSN: 1042-7260.
**Descriptors:** nondomestic felids, captive, free ranging, seroprevalence, *Neospora caninum*, *Toxoplasma gondii*, indirect fluorescent antibody, pathogens.

Wada, Y., H. Kondo, G. Bando, M. Kosuge, Y. Ishikawa, and K. Kadota (1996). **Intestinal adenocarcinoma with neuroendocrine cells in a clouded leopard (*Neofelis nebulosa*).** *Journal of Comparative Pathology* 115(3): 305-310. ISSN: 0021-9975.
**NAL Call Number:** 41.8 J82
**Descriptors:** clouded leopard, *Neofelis nebulosa*, intestinal adenocarcinoma, neuroendocrine cells, small intestine, histopathology, case studies, goblet cells.

Wu, J. and et al (1988). **Investigations of hemorrhagic enteritis in *Panthera uncia* and *Neofelis nebulosa*.** *Chinese Journal of Veterinary Science and Technology* 1988(6): 22-23. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, snow leopard, *Panthera uncia*, felidae, viral diseases, hemorrhagic enteritis, investigations.
**Language of Text:** Chinese.

Yanai, T., T. Tomita, H. Sakai, K. Isowa, H. Takeda, Y. Yamamoto, H. Hori, and T. Masegi (1996). **Lung carcinoma in a clouded leopard (*Neofelis nebulosa*).** *Japanese Journal of Zoo and Wildlife Medicine* 1(1): 45-48. ISSN: 1342-6133.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, neoplastic diseases, lung carcinoma.
**Language of Text:** English and Japanese.

Zahedi, M., S. Vellayan, J. Jeffery, and M. Krishnasamy (1986). **A case of double infection with *Brugia pahangi* Buckley and Edeson 1956, and *Dirofilaria immitis* Leidy 1856, in a Malaysian clouded leopard, *Neofelis nebulosa*.** *Veterinary Parasitology* 21(2): 135-137. ISSN: 0304-4017.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, *Brugia pahangi*, *Dirofilaria immitis*, nematoda, mammalian hosts, panthera, new host record, Malaysia, Kuala Lumpur, zoological garden.

Zhang, Z. and et al (1988). **Studies on viral enteritis in *Neofelis nebulosa*: animal experimental infection.** *Chinese Journal of Veterinary Science and Technology* 1988(5): 18-20. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, enteritis, experimental infection.
**Language of Text:** Chinese.

Zhang, Z. and et al (1988). **Studies on viral enteritis in *Neofelis nebulosa*: properties of the disease.** *Chinese Journal of Veterinary Science and Technology* 1988(3): 3-5. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, enteritis, properties.
**Language of Text:** Chinese.

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### Clouded Leopard - Conservation

Austin, S.C. and M.E. Tewes (1999). **Ecology of the clouded leopard in Khao Yai National Park, Thailand.** *Cat News* 31: 17-18. ISSN: 1027-2992.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, felidae, activity patterns, home range, distribution within habitat, habitat preference, National Park, Khao Yai National Park,Thailand.

Austin, S.C., M.E. Tewes, L.I.J. Grassman, and N.J. Silvy (2007). **Ecology and conservation of the leopard cat *Prionailurus bengalensis* and clouded leopard *Neofelis nebulosa* in Khao Yai National Park, Thailand.** *Acta Zoologica Sinica* 53(1): 1-14. ISSN: 0001-7302.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Leopard cat, *Prionailurus bengalensis*, conservation, activity patterns, ecology, Khao Yai National Park, Biology, Conservation, Thailand.
**Language of Text:** Chinese and English.

Choudhury, A. (1997). **The clouded leopard in Manipur and Nagaland**. *Journal of the Bombay Natural History Society* 94(2): 389-391. ISSN: 0006-6982.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, wildlife management, conservation , biogeography, population studies, habitat loss, poaching , note.

Irven, P. (1993). **The clouded leopard (*Neofelis nebulosa*). A short review of the species' desperate situation at present.** *Ratel* 20(3): 93-98. ISSN: 0305-1218.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, breeding programmes, endangered status, species desperate situation, reduced populations, review.

Johnson, K. (2000). **The clouded leopard: the "littlest" big cat.** *Endangered Species Update* 17(2): 40-43. ISSN: 1081-3705.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, disturbance by humans, conservation measures, endangered status, threats, mammalian prey, distribution, biology, research, conservation, China, oriental region.

Kitchener, A.C., M.A. Beaumont, and D. Richardson (2006). **Geographical variation in the clouded leopard, *Neofelis nebulosa*, reveals two species**. *Current Biology* 16(23): 2377-2383. ISSN: 0960-9822.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, geographical variation, two species, morphological variation, genetic analysis, Sumatra, Borneo, southeast Asia.

Penny, G. (1984). **Rimau-dahan, tree tiger, clouded leopard.** *Zoonooz* 57(8): 11-13. ISSN: 0044-5282.
**Descriptors:** clouded leopard, Panthera, *Neofelis nebulosa*, Felidae, oriental region, distribution, natural history account.

Wildt, D., B. Pukazhenthi, J. Brown, S. Monfort, J. Howard, and T. Roth (1995). **Spermatology for understanding, managing and conserving rare species.** *Reproduction Fertility and Development* 7(4): 811-824. ISSN: 1031-3613.

**Descriptors:** mammalia, breeding programes, reproductive techniques, spermatology studies, endocrinology, reproduction, reproductive biology, conservation, review.

Wilting, A., F. Fischer, S. Abu Bakar, and K.E. Linsenmair (2006). **Clouded leopards, the secretive top-carnivore of south-east asian rainforests: their distribution, status and conservation needs in Sabah, Malaysia**. *BMC Ecology* 6 ISSN: 1472-6785.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, souteast Asian rainforests, distribution, status, conservation needs, Sahah Malaysia.

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### Clouded Leopard - Research

Christiansen, P. (2006). **Sabertooth characters in the clouded leopard (*Neofelis nebulosa* griffiths 1821)**. *Journal of Morphology* 267(10): 1186-1198. ISSN: 0362-2525.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, skeletal system, movement, support, dental and oral system, ingestion, assimilation, skull morphology, sabertooth characteristics.

Graham, L.H. and J.L. Brown (1997). **Non-invasive assessment of gonadal and adrenocortical function in felid species via faecal steroid analysis**. *Zeitschrift Fuer Saeugetierkunde* 62(suppl. 2): 78-82. ISSN: 0044-3468.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, non-invasive assessment, gonadal, adrenocortical function, felid species, fecal steroid analysis, radioimmunoassays.

Wielebnowski, N.C., N. Fletchall, K. Carlstead, J.M. Busso, and J.L. Brown (2002). **Noninvasive assessment of adrenal activity associated with husbandry and behavioral factors in the North American clouded leopard population.** *Zoo Biology* 21(1): 77-98. ISSN: 0733-3188.
**Abstract:** The North American clouded leopard (*Neofelis nebulosa*) population is far from self-sustaining. Breeding success is poor and behavioral problems (i.e., fur-plucking, tail-chewing, excessive hiding or pacing, and intersexual aggression that results in mate killing) are common. This study was undertaken to investigate whether some of these problems may be indicators of chronic stress (as reflected by persistently elevated glucocorticoid levels) and whether they are associated with specific management factors. A fecal corticoid metabolite assay was validated to monitor adrenal activity in clouded leopards. Adrenocorticotropic hormone (ACTH) challenges conducted in four clouded leopards established the biological relevance of the assay system. Fecal corticoid concentrations increased 14-fold above baseline within 24 hours after ACTH administration. Adrenal activity then was monitored in 72 (36 males; 36 females) clouded leopards (65% of the North American Species Survival Plan population) during a 6-week period and compared to husbandry and behavior data. There was a significant (P<0.01) gender difference in fecal corticoid concentrations, with females producing higher concentrations than males. Multiple regression analyses revealed negative associations (P<0.01) between enclosure height, number of hours keepers spent with each animal per week, and corticoid concentrations. A positive correlation (P<0.001) was found between the number of keepers caring for an individual and corticoid concentrations. Higher fecal corticoid concentrations (P[ltoreq]0.05) were measured in clouded leopards kept on public display or near potential predators compared to individuals maintained off exhibit or in the absence of predators. Individuals that performed self-injuring behaviors also had elevated fecal corticoids (P<0.01). Spearman-rank correlation analysis of keeper ratings and hormone data revealed positive associations (P[ltoreq]0.05) between some behaviors (pace, sleep, hide, and fearful/tense) and fecal corticoid concentrations. Overall these results indicate that noninvasive fecal corticoid monitoring has enormous potential for investigating how management and behavioral problems are related to animal well-being. If conducted under carefully controlled experimental paradigms, this technique could allow researchers and managers to identify problem areas of captive management for

clouded leopards (e.g., enclosure height, keeper time) and evaluate the efficacy of strategies designed to promote animal welfare and increased reproductive success.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, physiological techniques, adrenal activity, assessment, physiological condition, stress, adrenal activity, non-invasive assessment, association with husbandry, behavior, captivity, feces, adrenal gland, behaviour, abnormal behavior.

Wu, X., T. Zheng, and Z. Jiang (2007). **The mitochondrial genome structure of the clouded leopard (*Neofelis nebulosa*)**. *Genome* 50(2): 252-7. ISSN: (p) 0831-2796; online: 1480-3321.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, mitochondrial genome structure.

Yang, L. and J. Zhang (1993). **Studies on serum protein and ldh isoenzymes in *Panthera tigris amoyensis*, *Panthera pardus* and *Neofelis nebulosa***. *Acta Theriologica Sinica* 13(2): 151. ISSN: 1000-1050.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, tiger, *Panthera tigris amoyensis*, panther, *Panthera pardus*, studies, serum protein, 1dh isoenzymes.
**Language of Text:** Chinese.

Zhang, D., S. Chen, J. Li, R. Wu, G. Chen, and X. Hu (1993). **Determination of the erythrocytic C3b receptors of *Panthera tigris amurensis*, *Neofelis nebulosa* and *Felis temmincki*.** *Acta Theriologica Sinica* 13(4): 256-259. ISSN: 1000-1050.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, tiger, *Panthera tigris amurensis*, *Felis temmincki*, felidae, blood cells, erythrocytes, immune response, rosetting ratio, erythrocytic C3b receptors.
**Language of Text:** Chinese, Summaries in Chinese and English.

Zhang, K., X. Jin, X. Yang, W. Zeng, and H. Xu (1994). **Determination on electrocardiogram of cloudy leopard**. *Acta Theriologica Sinica* 14(1): 69-70. ISSN: 1000-1050.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, nervous system, neural coordination, systematics, taxonomy, electrocardiogram.
**Language of Text:** Chinese.

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### Clouded Leopard - Veterinary

Cooley, P.L. (2001). **Phacoemulsification in a clouded leopard (*Neofelis nebulosa*).** *Veterinary Ophthalmology* 4(2): 113-117. ISSN: 1463-5216.

**NAL Call Number:** SF891.V47
**Descriptors:** clouded leopard, *Neofelis nebulosa*, cataract, surgery, methodology, anesthesia, vision, case studies, inheritance, genetics, clinical examination, treatment.

Cunningham, A.A. and A.P. Dhillon (1998). **Pleural malignant mesothelioma in a captive clouded leopard (*Neofelis nebulosa nebulosa*).** *Veterinary Record Journal of the British Veterinary Association* 143(1): 22-24. ISSN: 0042-4900.
**NAL Call Number:** 41.8 V641
**Descriptors:** clouded leopard, *Neofelis nebulosa*, mesothelioma, pleura, case studies, pathology, malignant course.

Grassman, L.I.J., S.C. Austin, M.E. Tewes, and N.J. Silvy (2004). **Comparative immobilization of wild felids in Thailand**. *Journal of Wildlife Diseases* 40(3): 575-578. ISSN: 0090-3558.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, leopard cat, *Prionailurus bengalensis*, Asiatic golden cat, *Catopuma temminckii*, marbled cat, *Pardofelis marmorata*, immobilized, ketamine hydrochloride, xylazine hydrochloride, tiletamine hydrochloride, zolazepam hydrochloride, comparison, duration, induction time, recovery time.

Hildebrandt, T., R. Ippen, H.E. Kaiser, and R.J. Montali (1995). **Leiomyomas in the genital tract of captive exotic mammals**. *Anticancer Research* 15(5A): 1754. ISSN: 0250-7005.
**Descriptors:** captive exotic animals, leiomyomas, genital tract, reproductive system, reproduction, Asian elephant, Asian lion, cervical, lesser grison, uterine, vaginal tumors, meeting abstract.
**Notes:** Meeting Information: Fifth International Conference of Anticancer Research, Corfu, Greece; October 17-22, 1995.

Wada, Y., H. Kondo, G. Bando, M. Kosuge, Y. Ishikawa, and K. Kadota (1996). **Intestinal adenocarcinoma with neuroendocrine cells in a clouded leopard (*Neofelis nebulosa*).** *Journal of Comparative Pathology* 115(3): 305-310. ISSN: 0021-9975.
**NAL Call Number:** 41.8 J82
**Descriptors:** clouded leopard, *Neofelis nebulosa*, intestinal adenocarcinoma, neuroendocrine cells, small intestine, histopathology, case studies, goblet cells.

Zhang, K. (1993). **Study on electrocardiogram of clouded leopard.** *Chinese Wildlife* 3: 37-39. ISSN: 1000-0127.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, felidae, heart beat, ecg analysis, electocardiogram.
**Language of Text:** Chinese.

Zhang, K., X. Jin, X. Yang, W. Zeng, and H. Xu (1994). **Determination on electrocardiogram of cloudy leopard**. *Acta Theriologica Sinica* 14(1): 69-70. ISSN: 1000-1050.

**Descriptors:** clouded leopard, *Neofelis nebulosa*, nervous system, neural coordination, systematics, taxonomy, electrocardiogram.
**Language of Text:** Chinese.

Zhang, Z. and et al (1988). **Studies on viral enteritis in *Neofelis nebulosa*: animal experimental infection.** *Chinese Journal of Veterinary Science and Technology* 1988(5): 18-20. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, enteritis, experimental infection.
**Language of Text:** Chinese.

Zhang, Z. and et al (1988). **Studies on viral enteritis in *Neofelis nebulosa*: properties of the disease.** *Chinese Journal of Veterinary Science and Technology* 1988(3): 3-5. ISSN: 1000-6419.
**Descriptors:** clouded leopard, *Neofelis nebulosa*, Felidae, viral diseases, enteritis, properties.
**Language of Text:** Chinese.

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### Cougar


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### Cougar - General

Adams, R.B., J.C. Pitman, and L.A. Harveson (2006). **Texas tortoise (*Gopherus berlandier*i) consumed by a mountain lion (*Puma concolor*) in southern texas**. *Southwestern Naturalist* 51(4): 581-582. ISSN: 0038-4909.
**Descriptors:** cougar, montain lion, kitten, *Puma concolor*, Texas toroise, *Gopherus berlandier*i, consumed, prey variety, small prey, increase survival, predation skills.

Anderson, C.-R.J., F.G. Lindzey, and D.B. Mcdonald (2004). **Genetic structure of cougar populations across the wyoming basin: metapopulation or megapopulation**. *Journal of Mammalogy* 85(6): 1207-1214. ISSN: 0022-2372.

**Descriptors:** cougar population, *Puma concolor*, genetic structure, Wyoming basin, megapopulation, southwestern Colorado, population size, gene flow, U.S.

Benson, J.F., M.A. Lotz, and D. Jansen (2008). **Natal den selection by Florida panthers**. *Journal of Wildlife Management* 72(2): 405-410. ISSN: 0022-541X.
**Descriptors:** cougar, panther, *Puma concolor*, natal den selection, parturition, habitats used, kitten rearing, upland hardwood, pinelands, wet forests, Florida, U.S.

Biek, R., A.G. Rodrigo, D. Holley, A. Drummond, C.R.J. Anderson, H.A. Ross, and M. Poss (2003). **Epidemiology, genetic diversity, and evolution of endemic feline immunodeficiency virus in a population of wild cougars.** *Journal of Virology* 77(17): 9578-9589. ISSN: 0022-538X.
**Descriptors:** cougar, *Puma concolor*, epidemiology, genetic diversity, evolution, endemic feline immunodeficiency virus, retroviruses, natural host populations.

Biek, R., T.K. Ruth, K.M. Murphy, C.R.J. Anderson, M. Johnson, R. Desimone, R. Gray, M.G. Hornocker, C.M. Gillin, and M. Poss (2006). **Factors associated with pathogen seroprevalence and infection in Rocky Mountain cougars**. *Journal of Wildlife Diseases* 42(3): 606-615. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, infection, pathogen seroprevalence, associated factors, Rocky Mountain cougars, genetic material, feline herpes virus, *Yersinia pestis*, *U.S.*

Biek, R., T.K. Ruth, K.M. Murphy, C.R.J. Anderson, and M. Poss (2006). **Examining effects of persistent retroviral infection on fitness and pathogen susceptibility in a natural feline host**. *Canadian Journal of Zoology* 84(3): 365-373. ISSN: 0008-4301.
**Descriptors:** cougar, *Puma concolor*, persistent retroviral infection, effects, fitness, pathogen susceptibility, natural feline host, chronic infection, survival.

Blake, D.J., J. Graham, and M. Poss (2006). **Quantification of feline immunodeficiency virus (fivpco) in peripheral blood mononuclear cells, lymph nodes and plasma of naturally infected cougars**. *Journal of General Virology* 87(Part 4): 967-975. ISSN: 0022-1317.
**Descriptors:** cougar, *Puma concolor*, feline immunodeficiency virus, quantification, peripheral blood mononuclear cells, lymph nodes, plasma, naturally infected, domestic cats, lack of disease in cougars.

Bonier, F., H. Quigley, and S.N. Austad (2004). **A technique for non-invasively detecting stress response in cougars**. *Wildlife Society Bulletin* 32(3): 711-717. ISSN: 0091-7648.
**Descriptors:** cougar, *Puma concolor*, stress, detecting stress response, noninvasive technique, monitor stress hormone levels, assay of fecal corticoid metabolites.

Brown, M.A., M.W. Cunningham, A.L. Roca, J.L. Troyer, W.E. Johnson, and S.J. O'brien (2008). **Genetic characterization of feline leukemia virus from Florida panthers**. *Emerging Infectious Diseases* 14(2): 252-259. ISSN: 1080-6040.
**Descriptors:** cougar, *Puma concolor coryi*, feline leukemia virus, genetic characterization, clinical signs, co infection, feline immunodeficiency virus, Florida, U.S.

Burkala, E. and M. Poss (2007). **Evolution of feline immunodeficiency virus gag proteins**. *Virus Genes* 35(2): 251-264. ISSN: 0920-8569.
**Descriptors:** cougar, P*uma concolor*, feline immunodeficiency virus, FIV, gag proteins, evolution, domestic cat, cougar, lion, biocchemical properties, RNA.

Choate, D.M., M.L. Wolfe, and D.C. Stoner (2006). **Evaluation of cougar population estimators in Utah**. *Wildlife Society Bulletin* 34(3): 782-799. ISSN: 0091-7648.
**Descriptors:** cougar, *Puma concolor*, population estimators, radiotagging, management, evaluation, Monroe Mountain, Oquirrh Mountains, Utah, U.S.

Conroy, M.J., P. Beier, H. Quigley, and M.R. Vaughan (2006). **Improving the use of science in conservation: lessons from the Florida panther**. *Journal of Wildlife Management* 70(1): 1-7. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor coryi*, Florida panther, science in conservation, mehtodology, interpretation, management, working hypotheses, Florida U.S.

Cooley, H.S., H.S. Robinson, R.B. Wielgus, and C.S. Lambert (2008). **Cougar prey selection in a white-tailed deer and mule deer community**. *Journal of Wildlife Management* 72(1): 99-106. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, prey selection, white tailed deer, *Odocoilus virginianus*, *mule deer*, *Odocoilus hemionous*, northeast Washington state, U.S.

Dickson, B.G., J.S. Jenness, and P. Beier (2005). **Influence of vegetation, topography, and roads on cougar movement in Southern California**. *Journal of Wildlife Management* 69(1): 264-276. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, cougar movement, behavior, vegitation, roads, topography, influence, human altered landscapes, effects on cougar movements, Southern California U.S.

Dubey, J.R., T. Quirk, J.A. Pitt, N. Sundar, G.V. Velmurugan, O.C.H. Kwok, D. Leclair, R. Hill, and C. Su (2008). **Isolation and genetic characterization of *Toxoplasma gondii* from raccoons (*Procyon lotor*), cats (*Felis domesticus*), striped skunk (*Mephitis mephitis*), black bear (*Ursus americanus*), and cougar (*Puma concolor*) from Canada**. *Journal of Parasitology* 94(1): 42-45. ISSN: 0022-3395.
**Descriptors:** cougar, *Puma concolor*, *Toxoplasma gondii*, isolation, genetic characterization, bioassay, mice, feral cats, raccoons, skunk, black bear, genotyping, Canada.

Durden, L.A., M.W. Cunningham, R. Mcbride, and B. Ferree (2006). **Ectoparasites of free-ranging pumas and jaguars in the Paraguayan Chaco**. *Veterinary Parasitology* 137(1-2): 189-193. ISSN: 0304-4017.
**Descriptors:** cougar, *Puma concolor*, jaguar, *Panthera onca*, ectoparasites, infection, parasitology, free ranging, prevalence, Paraguayan Chaco.

Ernest, H.B., W.M. Boyce, V.C. Bleich, B. May, S.J. Stiver, and S.G. Torres (2003). **Genetic structure of mountain lion (*Puma concolor*) populations in California.** *Conservation Genetics* 4(3): 353-366. ISSN: 1566-0621.
**Descriptors:** cougar, *Puma concolor*, mountain lion, genetic structure, microsatellite analysis, genetic subdivisions, genetic variation, conservation efforts., California. U.S.

Fiorello, C.V., M.W. Cunningham, S.L. Cantwell, J.K. Levy, E.M. Neer, K. Conley, and P.M. Rist (2007). **Diagnosis and treatment of presumptive postobstructive pulmonary edema in a Florida panther (*Puma concolor coryi*)**. *Journal of Zoo and Wildlife Medicine* 38(2): 317-322. ISSN: 1042-7260.
**Descriptors:** cougar, *Puma concolor coryi*, postobstructive pulmonary edema, diagnosis, treatment, free ranging, airway obstruction, tracking collars, telemetry collar, immobilized, clinical signs.

Foster, G.W., M.W. Cunningham, J.M. Kinsella, G. Mclaughlin, and D.J. Forrester (2006). **Gastrointestinal helminths of free-ranging Florida panthers (*Puma concolor coryi*) and the efficacy of the current anthelmintic treatment protocol**. *Journal of Wildlife Diseases* 42(2): 402-406. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor coryi*, gastrointestinals parasites, free ranging, anthelmintic treatment protocol, efficacy, trematode, nematode, cestode.

Franklin, S.P., J.L. Troyer, J.A. Terwee, L.M. Lyren, W.M. Boyce, S.P.D. Riley, M.E. Roelke, K.R. Crooks, and S. Vandewoude (2007). **Frequent transmission of immunodeficiency viruses among bobcats and pumas**. *Journal of Virology* 81(20): 10961-10969. ISSN: 0022-538X.
**Descriptors:** cougar, *Puma concolor*, bobcats, *Lynx rufus*, pumas, infection, immunodeficiency viruses, frequent transmission, Lentiviridae, Southern California.

Franklin, S.P., J.L. Troyer, J.A. Terwee, L.M. Lyren, R.W. Kays, S.P.D. Riley, W.M. Boyce, K.R. Crooks, and S. Vandewoude (2007). **Variability in assays used for detection of lentiviral infection in bobcats (*Lynx rufus*), pumas (*Puma concolor*) and ocelots (*Leopardus pardalis*)**. *Journal of Wildlife Diseases* 43(4): 700-710. ISSN: 0090-3558.
**Descriptors:** cougar, pumas, *Puma concolor*, bob cats, *Lynx rufus*, ocelots, *Leopardus pardalis*, lentiviral infection, detection, assays, variability.

Galentine, S.P. and P.K. Swift (2007). **Intraspecific killing among mountain lions (*Leopardus pardalis*)**. *Southwestern Naturalist* 52(1): 161-164. ISSN: 0038-4909.
**Descriptors:** cougar, *Leopardus pardalis*, mountain lion, itraspecific killing, male, female, brain damage, hemorrhage, skull fracture, California.

Grigione, M.M., P. Beier, R.A. Hopkins, D. Neal, W.D. Padley, C.M. Schonewald, and M.L. Johnson (2002). **Ecological and allometric determinants of home-range size for mountain lions (*Puma concolor*).** *Animal Conservation* 5(4): 317-324. ISSN: 1367-9430.
**Descriptors:** cougars, *Puma concolor*, mountain lion, home range size, determinants, ecological, allometric, age, sex, reproductive status, California.U.S.

Guiao Leite, F.L. and T.A.R. Paula (2003). **Rendimento intrinseco da espermatogenese, o indice de celulas de sertoli e a producao espermatica diaria da onca parda (*Puma concolor*). [Intrinsec yield of spermatogenesis, sertoli cell index and daily sperm production in cougar (*Puma concolor*)].** *Revista Brasileira De Reproducao Animal* 27(1): 21-26. ISSN: 0102-0803.
**Descriptors:** cougar, *Puma concolor*, spermatogenesis, intrinsec yield, sertoli cell index, daily sperm production, testicular morphology, spermatzoa.
**Language of Text:** Portuguese.

Harrenstien, L.A., L. Munson, L.M. Chassy, I.K.M. Liu, and J.F. Kirkpatrick (2004). **Effects of porcine zona pellucida immunocontraceptives in zoo felids**. *Journal of Zoo and Wildlife Medicine* 35(3): 271-279. ISSN: 1042-7260.
**Descriptors:** zoo felids, contraception, methods, management, contraceptives, porcine zona pellucida, pZP, vaccine, African lion, *Panthera leo*, Asian leopard, *P. pardus*, jaguar, *P. onca*, tiger. (*P. tigris*, snow leopard, *P. uncia*, cougar, *Felis concolor*, Siberian lynx, *F. lynx*, Canada lynx, *F. canadensis*, serval, *F. serval*, bobcat, *F. rufus*.

Harvey, J.W., M.R. Dunbar, T.M. Norton, and M.J. Yabsley (2007). **Laboratory findings in acute *Cytauxzoon felis* infection in cougars (*Puma concolor couguar*) in Florida**. *Journal of Zoo and Wildlife Medicine* 38(2): 285-291. ISSN: 1042-7260.
**Descriptors:** cougar, *Puma concolor*, acute *Cytauxzoon felis* infection, laboratory findings, intraerythrocytic piroplasms, stained blood films, hematologic parameters, hemolytic anemia, liver inury.

Hawkey, C.M. and M.G. Hart (1986). **Haematological reference values for adult pumas, lions, tigers, leopards, jaguars and cheetahs.** *Research in Veterinary Science* 41(2): 268-269. ISSN: 0034-5288.
**Abstract:** Normal haematological values and fibrinogen levels were obtained from a number of healthy adult Felidae in the collection of the Zoological Society of London. The group comprised 29 pumas (*Felis concolor*), 32 lions (*Panthera leo*), 27 tigers (*P tigris*), 19 leopards (*P pardus*), 18 jaguars (*P onca*) and 22 cheetahs (*Acinonyx jubatus*). The values provided a basis for identifying abnormalities in the blood of sick individuals of these species and for undertaking interspecies comparisons.
**Descriptors:** cheetah, *Acinonyx jubata*, pumas, *Felis concolor*, lions, *Panthera leo*, tigers, *Panthera tigris*, leopards, *Panthera pardus*, jaguars, *Panthera onca*, adult, fibrinogen levels, blood, hematological reference values.

Hedberg, G.E., E.S. Dierenfeld, and Q.R. Rogers (2007). **Taurine and zoo felids: considerations of dietary and biological tissue concentrations**. *Zoo Biology* 26(6): 517-531. ISSN: 0733-3188.
**Descriptors:** zoo felids, taurine, dietary concentrations, biological concentrations, diets, essential amino acid, jarred baby foods, chunk meats, kitten milk replacer, plasma concentrations, measure of dietary impact, whole blood concentrations, reflect tissue storage.

Hoogesteijn, R. and A. Hoogesteijn (2008). **Conflicts between cattle ranching and large predators in Venezuela: could use of water buffalo facilitate felid conservation?** *Oryx* 42(1): 132-138. ISSN: 0030-6053.
**Descriptors:** cougar, *Puma concolor*, jaguar, *Panthera onca*, large predators, cattle ranching, *Bos indicus*, *B. taurus*, conflicts, water buffalo, *Bubalus bubalis*, mortality, defensive behavior.

Kortello, A.D., T.E. Hurd, and D.L. Murray (2007). **Interactions between cougars (*Puma concolor*) and gray wolves (*Canis lupus*) in Banff National Park, Alberta**. *Ecoscience* 14(2): 214-222. ISSN: 1195-6860.
**Descriptors:** cougars, *Puma concolor*, gray wolves, *Canis lupus*, predator, prey interactions, management, conservation, relationships.

Kurushima, J.D., J.A. Collins, J.A. Well, and H.B. Ernest (2006). **Development of 21 microsatellite loci for puma (*Puma concolor*) ecology and forensics**. *Molecular Ecology Notes* 6(4): 1260-1262. ISSN: 1471-8278.
**Descriptors:** cougar, *Puma concolor*, microsatellite loci, development, ecology, forensics, primers, dinucleoitide, tetranucleotide, genetic studies, parentage, kinship, popultion structure.

Lambert, C.M.S., R.B. Wielgus, H.S. Robinson, D.D. Katnik, H.S. Cruickshank, R. Clarke, and J. Almack (2006). **Cougar population dynamics and viability in the Pacific Northwest**. *Journal of Wildlife Management* 70(1): 246-254. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, population dynanics, viability, human cougar conflicts, densities, hunting, managing, Pacific Northwest.

Laundre, J.W. (2005). **Puma energetics: a recalculation**. *Journal of Wildlife Management* 69(2): 723-732. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, metabolism, energetics, population studies, radio telemetry, applied and field techniques, energetic requirement, prey requirement, daily energy demand, annual kill rate, impact on deer population.

Laundre, J.W. and L. Hernandez (2008). **The amount of time female pumas *Puma concolor* spend with their kittens**. *Wildlife Biology* 14(2): 221-227. ISSN: 0909-6396.
**Descriptors:** cougar, *Puma concolor*, amount of time females spend with kittens, ecology, telemetry data, age, wildlife management, conservation, applied and field techniques, spatial, temporal affinity, distance from kittens.

Laundre, J.W. and L. Hernandez (2007). **Do female pumas ( *Puma concolor*) exhibit a birth pulse?** *Journal of Mammalogy* 88(5): 1300-1304. ISSN: 0022-2372.
**Descriptors:** cougar, *Puma concolor*, population studies, birth pulse, young survival, birth all months of the year, season of birth, July-September, January-February.

Laundre, J.W. and L. Hernandez (2003). **Winter hunting habitat of pumas *Puma concolor* in northwestern Utah and southern Idaho, USA.** *Wildlife Biology* 9(2): 123-129. ISSN: 0909-6396.
**Descriptors:** cougar, *Puma concolor*, behavior, stalk prey, kill points, cache sites, winter hunting habitat, specific habitat characteristics, older larger trees, Utah, Idaho. U.S.

Leite, F.L.G., T.A.R. De Paula, S.L. Pinto Da Matta, C.C. Fonseca, M.T.D. Das Neves, and J.B. Goncalves De Barros (2006). **Cycle and duration of the seminiferous epithelium in puma (*Puma concolor*)**. *Animal Reproduction Science* 91(3-4): 307-316. ISSN: 0378-4320.
**Descriptors:** cougar, *Puma concolor*, seminiferous epithelium, cycle, duration, testis morphology, spermatogenic process, reproductive system, reproduction.

Long, E.S., D.M. Fecske, R.A. Sweitzer, J.A. Jenks, B.M. Pierce, and V.C. Bleich (2003). **Efficacy of photographic scent stations to detect mountain lions.** *Western North American Naturalist* 63(4): 529-532. ISSN: 1527-0904.
**Descriptors:** cougar, *Puma concolor*, photographic scent stations, efficacy, detection of mountain lions, population studies, ecology, wildlife management, conservation, automatic cameras, field equipment, population size estimates.

Mansfield, K.G. and E.D. Land (2002). **Cryptorchidism in Florida panthers: prevalence, features, and influence of genetic restoration.** *Journal of Wildlife Diseases* 38(4): 693-698. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, Florida panther, cryptorchidism, prevalence,

features, influence, genetic restoration, reproductive system, reproduction, veterinary medicine, wildlife management, conservation, congenital disease, endocrine disease, gonads, inbreeding, reproductive success, delayed testicular descent, genetic restoration, Florida.

Miller, D.L., S.K. Taylor, D.S. Rotsetin, M.B. Pough, M.C. Barr, C.A. Baldwin, M. Cunningham, M. Roelke, and D. Ingram (2006). **Feline immunodeficiency virus and puma lentivirus in Florida panthers (*Puma concolor coryi*): epidemiology and diagnostic issues**. *Veterinary Research Communications* 30(3): 307-317. ISSN: 0165-7380.
**Descriptors:** cougar, *Puma concolor coryi*, feline immunodeficiency virus, puma lentivirus, seroprevalence, Florida panthers, antibodies, enzyme linked immunosorbent assay, Western blot tests, Florida, U.S.

Newman, J., E. Zillioux, E. Rich, L. Liang, and C. Newman (2005). **Historical and other patterns of monomethyl and inorganic mercury in the Florida panther (*Puma concolor coryi*)**. *Archives of Environmental Contamination and Toxicology* 48(1): 75-80. ISSN: 0090-4341.
**Descriptors:** cougar, *Puma concolor coryi*, monomethyl, inorganic mercury, tissues, mercury contamination, historical patterns, hair analysis.

Pimm, S.L., L. Dollar, and O.L.J. Bass (2006). **The genetic rescue of the Florida panther**. *Animal Conservation* 9(2): 115-122. ISSN: 1367-9430.
**Descriptors:** cougar, *Puma concolor coryi*, Florida panther, isolated, inbred, introduced panthers from Texas, genetic damage, breeding, mortality, molecular genetics, wildlife management, conservation, reproduction.

Poss, M., H. Ross, A. Rodrigo, J. Terwee, S. Vandewoude, and R. Biek (2008). **The molecular biology and evolution of feline immunodeficiency viruses of cougars**. *Veterinary Immunology and Immunopathology* 123(1-2): 154-158. ISSN: 0165-2427.
**Descriptors:** cougar, *Puma concolor*, feline immunodeficiency virus, infection, veterinary medicine, molecular genetics, molecular biology, viral disease, lentivirus, pathology, mortality.

Quagliatto Santos, A.L., S. Fernandes Mano De Carvalho, F. Machado De Moraes, and J.R. Ferreira Alves Junior (2004). **Myocardial bridges in mountain lion (*Puma concolor*, Jardine-1834) (Felidae): a case report**. *Brazilian Journal of Morphological Sciences* 21(4): 221-223. ISSN: 0102-9010.
**Descriptors:** cougar, *Puma concolor*, myocardial bridges, cardiovascular system, transport, circulation, coronary arteries, epicardium, heart, ventricle.

Rau, J.R. and J.E. Jimenez (2002). **Diet of puma (*Puma concolor*, carnivora: felidae) in coastal and Andean ranges of southern Chile.** *Studies on Neotropical Fauna and Environment* 37(3): 201-205. ISSN: 0165-0521.
**Descriptors:** cougar, *Puma concolor*, puma, diet, prey species, feces, European hares, pudu deer, rodents, birds, marsupials, black neck swans, coypu, Andean ranges, Chile.

Ray, J.C. (2000). **Mesocarnivores of northeastern North America: status and conservation issues.** *WCS Working Paper*(15): 1-82. ISSN: 1530-4426.
**Descriptors:** cougar, *Puma concolor*, mesocarnivores, wildlife management, conservation, habitat degradation, habitat destruction, history, human induced disturbance, species population, status, conservation issues.

Riley, S.P.D., C. Bromley, R.H. Poppenga, F.A. Uzal, L. Whited, and R.M. Sauvajot (2007). **Anticoagulant exposure and notoedric mange in bobcats and mountain lions in urban southern California**. *Journal of Wildlife Management* 71(6): 1874-1884. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, notoedric mange, anticoagulant exposure, bob cats, mountain lions, rodenticides, ectoparasites, toxicity, California.

Rodzen, J.A., J.D. Banks, E.P. Meredith, and K.C. Jones (2007). **Characterization of 37 microsatellite loci in mountain lions (*Puma concolor*) for use in forensic and population applications**. *Conservation Genetics* 8(5): 1239-1241. ISSN: 1566-0621.
**Descriptors:** cougars, *Puma concolor*, mountain lions, microsatellits loci, characterization, forensic applicationa, population applications.

Roelke, M.E., J. Pecon Slattery, S. Taylor, S. Citino, E. Brown, C. Packer, S. Vandewoude, and S.J. O'brien (2006). **T-lymphocyte profiles in FIV-infected wild lions and pumas reveal CD4 depletion**. *Journal of Wildlife Diseases* 42(2): 234-248. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, feline innunodeficiency virus, lentivirus, FIV-infected wild lions, T-lymphocyte profiles, pumas, cd4 depletion, CD5+cells.

Rosas Rosas, O.C., R. Valdez, L.C. Bender, and D. Daniel (2003). **Food habits of pumas in northwestern Sonora, Mexico.** *Wildlife Society Bulletin* 31(2): 528-535. ISSN: 0091-7648.
**Descriptors:** cougar, *Puma concolor*, behavior, food habits, desert mule deer, *Odocoileus hemionus*, white tailed deer, *Odocoileus virginianus*, lagomorphs, bighorn sheep, *Ovis*

*canadensis*, fecal samples, Sonora Mexico.

Rossi Junior, J.L., M.A. Gioso, M.Q. Teles, and L.M. Domingues Falqueiro (2007). **Acompanhamento do crescimento dental em *Puma concolor* mantido em cativeiro. [Accompaniment of the dental growth in *Puma concolor* kept in captivity].** *Pesquisa Veterinaria Brasileira* 27(5): 205-208. ISSN: 0100-736X.
**Descriptors:** cougar, *Puma concolor*, captivity, dental growth, development, malocclusions, jaguars, *Panthera onca*, teeth, epidemiology, population studies, veterinary medicine, wildlife management, conservation, dental and oral disease, epidemiology, Brazil.
**Language of Text:** Portuguese.

Salkeld, D.J. and P. Stapp (2006). **Seroprevalence rates and transmission of plague (*Yersinia pestis*) in mammalian carnivores**. *Vector Borne and Zoonotic Diseases* 6(3): 231-239. ISSN: 1530-3667.
**Descriptors:** cougar, infection, *Yersinia pestis*, carnivores, plague, flea bites, transmission, seroprevalence, epidemiology, population studies, bacterial disease.

Sampaio Costa, D., T. Antonio Rego Paula, and S. Luiz Pinto Da Matta (2006). **Cat, cougar, and jaguar spermatogenesis: a comparative analysis**. *Brazilian Archives of Biology and Technology* 49(5): 725-731. ISSN: 1516-8913.
**Descriptors:** cougar, *Puma concolor*, reproductive system, reproduction, spermatogenesis, comparative analysis, cat, jaguar, spermatogenic process, Sertoli cell index.

Schulman, F.Y., A.E. Krafft, T. Janczewski, I. Mikaelian, J. Irwin, and K. Hassinger (2003). **Cutaneous fibropapilloma in a mountain lion (*Felis concolor*).** *Journal of Zoo and Wildlife Medicine* 34(2): 179-183. ISSN: 1042-7260.
**Descriptors:** cougar, mountain lion, *Felis concolor*, *Puma concolor*, cutaneous fibropapilloma, infection, tumor, integumentary system, tumor biology, veterinary medicine, neoplastic disease, diagnosis, clinical techniques, diagnostic techniques, histology polymerase chain reaction, surgical removal, case study.

Sims, C. (2001). **Morphological distinctions in skulls of five felids (*Puma concolor, Panthera onca, Panthera pardus, Uncia uncia, and Acinonyx jubatus*)**. *Journal of Morphology* 248(3): 285. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skull, morphological distinctions, skeletal system, cougar, jaguar, leopard, snow leopard, species comparison study.
**Notes:** Sixth International Congress of Vertebrate Morphology, Jena, Germany; July 21-26, 2001.

Swanson, B.J. and P.J. Rusz (2006). **Detection and classification of cougars in michigan using low copy DNA sources**. *American Midland Naturalist* 155(2): 363-372. ISSN: 0003-0031.
**Descriptors:** cougar, *Puma concolor*, detection, classification, low copy DNA, scats, genotype.

Sweanor, L.L., K.A. Logan, and M.G. Hornocker (2005). **Puma responses to close approaches by researchers**. *Wildlife Society Bulletin* 33(3): 905-913. ISSN: 0091-7648.
**Descriptors:** cougar, *Puma concolor*, behavior, researchers, close approaches, responses, wildlife management, conservation, threat behavior.

Thatcher, C.A., F.T. Van Manen, and J.D. Clark (2006). **Identifying suitable sites for Florida panther reintroduction**. *Journal of Wildlife Management* 70(3): 752-763. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor coryi*, reintroduction, suitable sites, identifying, models, simulations, wildlife management, conservation, populations, quantitative landscape assessment, mathematical and computer techniques, Florida, U.S.

Uzal, F.A., R.S. Houston, S.P.D. Riley, R. Poppenga, J. Odani, and W. Boyce (2007). **Notoedric mange in two free-ranging mountain lions *(Puma concolor*)**. *Journal of Wildlife Diseases* 43(2): 274-278. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, free ranging, notoedric mange, alopecia, skin crusts, *Notoedres cati*, anticoagulant rodenticide intoxication, death, mites, southern California, U.S.

Wolfe, L.L. and M.W. Miller (2005). **Suspected secondary thiafentanil intoxication in a captive mountain lion (*Puma concolor*)**. *Journal of Wildlife Diseases* 41(4): 829-833. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, thiafentanil intoxication, toxicology, captive, veterinary medicine, inadvertent ingestion, assimilation, myopathy, depression, behavioral and mental disorders, carcasses, sedation, potential intoxication, scavenging species.

Yabsley, M.J., S.M. Murphy, and M.W. Cunningham (2006). **Molecular detection and characterization of *Cytauxzoon felis* and a babesia species in cougars from**

**Florida**. *Journal of Wildlife Diseases* 42(2): 366-374. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor* coryi, *Cytauxzoon felis*, molecular detection, characterization, Babesia species, piroplasms, blood samples, 18SrRNA assay, Florida, U.S.

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### Cougar - Behavior

Benson, J.F., M.A. Lotz, and D. Jansen (2008). **Natal den selection by Florida panthers**. *Journal of Wildlife Management* 72(2): 405-410. ISSN: 0022-541X.
**Descriptors:** cougar, panther, *Puma concolor*, natal den selection, parturition, habitats used, kitten rearing, upland hardwood, pinelands, wet forests, Florida, U.S.

Cooley, H.S., H.S. Robinson, R.B. Wielgus, and C.S. Lambert (2008). **Cougar prey selection in a white-tailed deer and mule deer community**. *Journal of Wildlife Management* 72(1): 99-106. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, prey selection, white tailed deer, *Odocoilus virginianus*, *mule deer*, *Odocoilus hemionous*, northeast Washington state, U.S.

Dickson, B.G., J.S. Jenness, and P. Beier (2005). **Influence of vegetation, topography, and roads on cougar movement in Southern California**. *Journal of Wildlife Management* 69(1): 264-276. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, cougar movement, behavior, vegitation, roads, topography, influence, human altered landscapes, effects on cougar movements, Southern California U.S.

Galentine, S.P. and P.K. Swift (2007). **Intraspecific killing among mountain lions (*Leopardus pardalis*)**. *Southwestern Naturalist* 52(1): 161-164. ISSN: 0038-4909.
**Descriptors:** cougar, *Leopardus pardalis*, mountain lion, itraspecific killing, male, female, brain damage, hemorrhage, skull fracture, California.

Hoogesteijn, R. and A. Hoogesteijn (2008). **Conflicts between cattle ranching and large predators in Venezuela: could use of water buffalo facilitate felid conservation?** *Oryx* 42(1): 132-138. ISSN: 0030-6053.
**Descriptors:** cougar, *Puma concolor*, jaguar, *Panthera onca*, large predators, cattle ranching, *Bos indicus*, *B. taurus*, conflicts, water buffalo, *Bubalus bubalis*, mortality, defensive behavior.

Kortello, A.D., T.E. Hurd, and D.L. Murray (2007). **Interactions between cougars (*Puma concolor*) and gray wolves (*Canis lupus*) in Banff National Park, Alberta**. *Ecoscience* 14(2): 214-222. ISSN: 1195-6860.
**Descriptors:** cougars, *Puma concolor*, gray wolves, *Canis lupus*, predator, prey interactions, management, conservation, relationships.

Laundre, J.W. and L. Hernandez (2008). **The amount of time female pumas *Puma concolor* spend with their kittens**. *Wildlife Biology* 14(2): 221-227. ISSN: 0909-6396.
**Descriptors:** cougar, *Puma concolor*, amount of time females spend with kittens, ecology, telemetry data, age, wildlife management, conservation, applied and field techniques, spatial, temporal affinity, distance from kittens.

Laundre, J.W. and L. Hernandez (2003). **Winter hunting habitat of pumas *Puma concolor* in northwestern Utah and southern Idaho, USA.** *Wildlife Biology* 9(2): 123-129. ISSN: 0909-6396.

**Descriptors:** cougar, *Puma concolor*, behavior, stalk prey, kill points, cache sites, winter hunting habitat, specific habitat characteristics, older larger trees, Utah, Idaho. U.S.

Sweanor, L.L., K.A. Logan, and M.G. Hornocker (2005). **Puma responses to close approaches by researchers**. *Wildlife Society Bulletin* 33(3): 905-913. ISSN: 0091-7648.
**Descriptors:** cougar, *Puma concolor*, behavior, researchers, close approaches, responses, wildlife management, conservation, threat behavior.

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### Cougar - Breeding and Reproduction

Guiao Leite, F.L. and T.A.R. Paula (2003). **Rendimento intrinseco da espermatogenese, o indice de celulas de sertoli e a producao espermatica diaria da onca parda (*Puma concolor*). [Intrinsec yield of spermatogenesis, sertoli cell index and daily sperm production in cougar (*Puma concolor*)].** *Revista Brasileira De Reproducao Animal* 27(1): 21-26. ISSN: 0102-0803.
**Descriptors:** cougar, *Puma concolor*, spermatogenesis, intrinsec yield, sertoli cell index, daily sperm production, testicular morphology, spermatzoa.
**Language of Text:** Portuguese.

Harrenstien, L.A., L. Munson, L.M. Chassy, I.K.M. Liu, and J.F. Kirkpatrick (2004). **Effects of porcine zona pellucida immunocontraceptives in zoo felids**. *Journal of Zoo and Wildlife Medicine* 35(3): 271-279. ISSN: 1042-7260.
**Descriptors:** zoo felids, contraception, methods, management, contraceptives, porcine zona pellucida, pZP, vaccine, African lion, *Panthera leo*, Asian leopard, *P. pardus*, jaguar, *P. onca*, tiger. (*P. tigris*, snow leopard, *P. uncia*, cougar, *Felis concolor*, Siberian lynx, *F. lynx*, Canada lynx, *F. canadensis*, serval, *F. serval*, bobcat, *F. rufus*.

Laundre, J.W. and L. Hernandez (2007). **Do female pumas ( *Puma concolor*) exhibit a birth pulse?** *Journal of Mammalogy* 88(5): 1300-1304. ISSN: 0022-2372.
**Descriptors:** cougar, *Puma concolor*, population studies, birth pulse, young survival, birth all months of the year, season of birth, July-September, January-February.

Leite, F.L.G., T.A.R. De Paula, S.L. Pinto Da Matta, C.C. Fonseca, M.T.D. Das Neves, and J.B. Goncalves De Barros (2006). **Cycle and duration of the seminiferous epithelium in puma (*Puma concolor*)**. *Animal Reproduction Science* 91(3-4): 307-316. ISSN: 0378-4320.
**Descriptors:** cougar, *Puma concolor*, seminiferous epithelium, cycle, duration, testis morphology, spermatogenic process, reproductive system, reproduction.

Mansfield, K.G. and E.D. Land (2002). **Cryptorchidism in Florida panthers: prevalence, features, and influence of genetic restoration.** *Journal of Wildlife Diseases* 38(4): 693-698. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, Florida panther, cryptorchidism, prevalence, features, influence, genetic restoration, reproductive system, reproduction, veterinary medicine, wildlife management, conservation, congenital disease, endocrine disease, gonads, inbreeding, reproductive success, delayed testicular descent, genetic restoration, Florida.

Pimm, S.L., L. Dollar, and O.L.J. Bass (2006). **The genetic rescue of the Florida panther**. *Animal Conservation* 9(2): 115-122. ISSN: 1367-9430.
**Descriptors:** cougar, *Puma concolor coryi*, Florida panther, isolated, inbred, introduced panthers from Texas, genetic damage, breeding, mortality, molecular genetics, wildlife management, conservation, reproduction.

Sampaio Costa, D., T. Antonio Rego Paula, and S. Luiz Pinto Da Matta (2006). **Cat, cougar, and**

**jaguar spermatogenesis: a comparative analysis**. *Brazilian Archives of Biology and Technology* 49(5): 725-731. ISSN: 1516-8913.
**Descriptors:** cougar, *Puma concolor*, reproductive system, reproduction, spermatogenesis, comparative analysis, cat, jaguar, spermatogenic process, Sertoli cell index.

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### Cougar - Conditions and Diseases

Biek, R., A.G. Rodrigo, D. Holley, A. Drummond, C.R.J. Anderson, H.A. Ross, and M. Poss (2003). **Epidemiology, genetic diversity, and evolution of endemic feline immunodeficiency virus in a population of wild cougars.** *Journal of Virology* 77(17): 9578-9589. ISSN: 0022-538X.
**Descriptors:** cougar, *Puma concolor*, epidemiology, genetic diversity, evolution, endemic feline immunodeficiency virus, retroviruses, natural host populations.

Biek, R., T.K. Ruth, K.M. Murphy, C.R.J. Anderson, M. Johnson, R. Desimone, R. Gray, M.G. Hornocker, C.M. Gillin, and M. Poss (2006). **Factors associated with pathogen seroprevalence and infection in Rocky Mountain cougars**. *Journal of Wildlife Diseases* 42(3): 606-615. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, infection, pathogen seroprevalence, associated factors, Rocky Mountain cougars, genetic material, feline herpes virus, *Yersinia pestis*, *U.S*.

Biek, R., T.K. Ruth, K.M. Murphy, C.R.J. Anderson, and M. Poss (2006). **Examining effects of persistent retroviral infection on fitness and pathogen susceptibility in a natural feline host**. *Canadian Journal of Zoology* 84(3): 365-373. ISSN: 0008-4301.
**Descriptors:** cougar, *Puma concolor*, persistent retroviral infection, effects, fitness, pathogen susceptibility, natural feline host, chronic infection, survival.

Blake, D.J., J. Graham, and M. Poss (2006). **Quantification of feline immunodeficiency virus (fivpco) in peripheral blood mononuclear cells, lymph nodes and plasma of naturally infected cougars**. *Journal of General Virology* 87(Part 4): 967-975. ISSN: 0022-1317.
**Descriptors:** cougar, *Puma concolor*, feline immunodeficiency virus, quantification, peripheral blood mononuclear cells, lymph nodes, plasma, naturally infected, domestic cats, lack of disease in cougars.

Brown, M.A., M.W. Cunningham, A.L. Roca, J.L. Troyer, W.E. Johnson, and S.J. O'brien (2008). **Genetic characterization of feline leukemia virus from Florida panthers**. *Emerging Infectious Diseases* 14(2): 252-259. ISSN: 1080-6040.
**Descriptors:** cougar, *Puma concolor coryi*, feline leukemia virus, genetic characterization, clinical signs, co infection, feline immunodeficiency virus, Florida, U.S.

Dubey, J.R., T. Quirk, J.A. Pitt, N. Sundar, G.V. Velmurugan, O.C.H. Kwok, D. Leclair, R. Hill, and C. Su (2008). **Isolation and genetic characterization of *Toxoplasma gondii* from raccoons (*Procyon lotor*), cats (*Felis domesticus*), striped skunk (*Mephitis mephitis*), black bear (*Ursus americanus*), and cougar (*Puma concolor*) from Canada**. *Journal of Parasitology* 94(1): 42-45. ISSN: 0022-3395.
**Descriptors:** cougar, *Puma concolor*, *Toxoplasma gondii*, isolation, genetic characterization, bioassay, mice, feral cats, raccoons, skunk, black bear, genotyping, Canada.

Durden, L.A., M.W. Cunningham, R. Mcbride, and B. Ferree (2006). **Ectoparasites of free-**

**ranging pumas and jaguars in the Paraguayan Chaco**. *Veterinary Parasitology* 137(1-2): 189-193. ISSN: 0304-4017.
**Descriptors:** cougar, *Puma concolor*, jaguar, *Panthera onca*, ectoparasites, infection, parasitology, free ranging, prevalence, Paraguayan Chaco.

Fiorello, C.V., M.W. Cunningham, S.L. Cantwell, J.K. Levy, E.M. Neer, K. Conley, and P.M. Rist (2007). **Diagnosis and treatment of presumptive postobstructive pulmonary edema in a Florida panther (*Puma concolor coryi*)**. *Journal of Zoo and Wildlife Medicine* 38(2): 317-322. ISSN: 1042-7260.
**Descriptors:** cougar, *Puma concolor coryi*, postobstructive pulmonary edema, diagnosis, treatment, free ranging, airway obstruction, tracking collars, telemetry collar, immobilized, clinical signs.

Foster, G.W., M.W. Cunningham, J.M. Kinsella, G. Mclaughlin, and D.J. Forrester (2006). **Gastrointestinal helminths of free-ranging Florida panthers (*Puma concolor coryi*) and the efficacy of the current anthelmintic treatment protocol**. *Journal of Wildlife Diseases* 42(2): 402-406. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor coryi*, gastrointestinals parasites, free ranging, anthelmintic treatment protocol, efficacy, trematode, nematode, cestode.

Franklin, S.P., J.L. Troyer, J.A. Terwee, L.M. Lyren, W.M. Boyce, S.P.D. Riley, M.E. Roelke, K.R. Crooks, and S. Vandewoude (2007). **Frequent transmission of immunodeficiency viruses among bobcats and pumas**. *Journal of Virology* 81(20): 10961-10969. ISSN: 0022-538X.
**Descriptors:** cougar, *Puma concolor*, bobcats, *Lynx rufus*, pumas, infection, immunodeficiency viruses, frequent transmission, Lentiviridae, Southern California.

Franklin, S.P., J.L. Troyer, J.A. Terwee, L.M. Lyren, R.W. Kays, S.P.D. Riley, W.M. Boyce, K.R. Crooks, and S. Vandewoude (2007). **Variability in assays used for detection of lentiviral infection in bobcats (*Lynx rufus*), pumas (*Puma concolor*) and ocelots (*Leopardus pardalis*)**. *Journal of Wildlife Diseases* 43(4): 700-710. ISSN: 0090-3558.
**Descriptors:** cougar, pumas, *Puma concolor*, bob cats, *Lynx rufus*, ocelots, *Leopardus pardalis*, lentiviral infection, detection, assays, variability.

Harvey, J.W., M.R. Dunbar, T.M. Norton, and M.J. Yabsley (2007). **Laboratory findings in acute *Cytauxzoon felis* infection in cougars (*Puma concolor couguar*) in Florida**. *Journal of Zoo and Wildlife Medicine* 38(2): 285-291. ISSN: 1042-7260.
**Descriptors:** cougar, *Puma concolor*, acute *Cytauxzoon felis* infection, laboratory findings, intraerythrocytic piroplasms, stained blood films, hematologic parameters, hemolytic anemia, liver inury.

Miller, D.L., S.K. Taylor, D.S. Rotsetin, M.B. Pough, M.C. Barr, C.A. Baldwin, M. Cunningham, M. Roelke, and D. Ingram (2006). **Feline immunodeficiency virus and puma lentivirus in Florida panthers (*Puma concolor coryi*): epidemiology and diagnostic issues**. *Veterinary Research Communications* 30(3): 307-317. ISSN: 0165-7380.
**Descriptors:** cougar, *Puma concolor coryi*, feline immunodeficiency virus, puma lentivirus, seroprevalence, Florida panthers, antibodies, enzyme linked immunosorbent assay, Western blot tests, Florida, U.S.

Newman, J., E. Zillioux, E. Rich, L. Liang, and C. Newman (2005). **Historical and other patterns of monomethyl and inorganic mercury in the Florida panther (*Puma concolor coryi*)**. *Archives of Environmental Contamination and Toxicology* 48(1): 75-80. ISSN: 0090-4341.
**Descriptors:** cougar, *Puma concolor coryi*, monomethyl, inorganic mercury, tissues, mercury contamination, historical patterns, hair analysis.

Poss, M., H. Ross, A. Rodrigo, J. Terwee, S. Vandewoude, and R. Biek (2008). **The molecular biology and evolution of feline immunodeficiency viruses of cougars**. *Veterinary Immunology and Immunopathology* 123(1-2): 154-158. ISSN: 0165-2427.
**Descriptors:** cougar, *Puma concolor*, feline immunodeficiency virus, infection, veterinary medicine, molecular genetics, molecular biology, viral disease, lentivirus, pathology, mortality.

Quagliatto Santos, A.L., S. Fernandes Mano De Carvalho, F. Machado De Moraes, and J.R. Ferreira Alves Junior (2004). **Myocardial bridges in mountain lion (*Puma concolor*, Jardine-1834) (Felidae): a case report**. *Brazilian Journal of Morphological Sciences* 21(4): 221-223. ISSN: 0102-9010.
**Descriptors:** cougar, *Puma concolor*, myocardial bridges, cardiovascular system, transport, circulation, coronary arteries, epicardium, heart, ventricle.

Riley, S.P.D., C. Bromley, R.H. Poppenga, F.A. Uzal, L. Whited, and R.M. Sauvajot (2007). **Anticoagulant exposure and notoedric mange in bobcats and mountain lions in urban southern California**. *Journal of Wildlife Management* 71(6): 1874-1884. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, notoedric mange, anticoagulant exposure, bob cats, mountain lions, rodenticides, ectoparasites, toxicity, California.

Roelke, M.E., J. Pecon Slattery, S. Taylor, S. Citino, E. Brown, C. Packer, S. Vandewoude, and S.J. O'brien (2006). **T-lymphocyte profiles in FIV-infected wild lions and pumas reveal CD4 depletion**. *Journal of Wildlife Diseases* 42(2): 234-248. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, feline innunodeficiency virus, lentivirus, FIV-infected wild lions, T-lymphocyte profiles, pumas, cd4 depletion, CD5+cells.

Salkeld, D.J. and P. Stapp (2006). **Seroprevalence rates and transmission of plague (*Yersinia pestis*) in mammalian carnivores**. *Vector Borne and Zoonotic Diseases* 6(3): 231-239. ISSN: 1530-3667.
**Descriptors:** cougar, infection, *Yersinia pestis*, carnivores, plague, flea bites, transmission, seroprevalence, epidemiology, population studies, bacterial disease.

Schulman, F.Y., A.E. Krafft, T. Janczewski, I. Mikaelian, J. Irwin, and K. Hassinger (2003). **Cutaneous fibropapilloma in a mountain lion (*Felis concolor*).** *Journal of Zoo and Wildlife Medicine* 34(2): 179-183. ISSN: 1042-7260.
**Descriptors:** cougar, mountain lion, *Felis concolor*, *Puma concolor*, cutaneous fibropapilloma, infection, tumor, integumentary system, tumor biology, veterinary medicine, neoplastic disease, diagnosis, clinical techniques, diagnostic techniques, histology polymerase chain reaction, surgical removal, case study.

Uzal, F.A., R.S. Houston, S.P.D. Riley, R. Poppenga, J. Odani, and W. Boyce (2007). **Notoedric mange in two free-ranging mountain lions *(Puma concolor)***. *Journal of Wildlife Diseases* 43(2): 274-278. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, free ranging, notoedric mange, alopecia, skin crusts, *Notoedres cati*, anticoagulant rodenticide intoxication, death, mites, southern California, U.S.

Wolfe, L.L. and M.W. Miller (2005). **Suspected secondary thiafentanil intoxication in a captive mountain lion (*Puma concolor*)**. *Journal of Wildlife Diseases* 41(4): 829-833. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, thiafentanil intoxication, toxicology, captive, veterinary medicine, inadvertent ingestion, assimilation, myopathy, depression, behavioral and mental disorders, carcasses, sedation, potential intoxication, scavenging species.

Yabsley, M.J., S.M. Murphy, and M.W. Cunningham (2006). **Molecular detection and characterization of *Cytauxzoon felis* and a babesia species in cougars from Florida**. *Journal of Wildlife Diseases* 42(2): 366-374. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor* coryi, *Cytauxzoon felis*, molecular detection, characterization, Babesia species, piroplasms, blood samples, 18SrRNA assay, Florida, U.S.

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### Cougar - Conservation

Choate, D.M., M.L. Wolfe, and D.C. Stoner (2006). **Evaluation of cougar population estimators in Utah**. *Wildlife Society Bulletin* 34(3): 782-799. ISSN: 0091-7648.
**Descriptors:** cougar, *Puma concolor*, population estimators, radiotagging, management, evaluation, Monroe Mountain, Oquirrh Mountains, Utah, U.S.

Conroy, M.J., P. Beier, H. Quigley, and M.R. Vaughan (2006). **Improving the use of science in conservation: lessons from the Florida panther**. *Journal of Wildlife Management* 70(1): 1-7. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor coryi*, Florida panther, science in conservation, mehtodology, interpretation, management, working hypotheses, Florida U.S.

Ernest, H.B., W.M. Boyce, V.C. Bleich, B. May, S.J. Stiver, and S.G. Torres (2003). **Genetic structure of mountain lion (*Puma concolor*) populations in California.** *Conservation Genetics* 4(3): 353-366. ISSN: 1566-0621.
**Descriptors:** cougar, *Puma concolor*, mountain lion, genetic structure, microsatellite analysis, genetic subdivisions, genetic variation, conservation efforts., California. U.S.

Grigione, M.M., P. Beier, R.A. Hopkins, D. Neal, W.D. Padley, C.M. Schonewald, and M.L. Johnson (2002). **Ecological and allometric determinants of home-range size for mountain lions (*Puma concolor*).** *Animal Conservation* 5(4): 317-324. ISSN: 1367-9430.
**Descriptors:** cougars, *Puma concolor*, mountain lion, home range size, determinants, ecological, allometric, age, sex, reproductive status, California.U.S.

Lambert, C.M.S., R.B. Wielgus, H.S. Robinson, D.D. Katnik, H.S. Cruickshank, R. Clarke, and J. Almack (2006). **Cougar population dynamics and viability in the Pacific Northwest**. *Journal of Wildlife Management* 70(1): 246-254. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, population dynanics, viability, human cougar conflicts, densities, hunting, managing, Pacific Northwest.

Long, E.S., D.M. Fecske, R.A. Sweitzer, J.A. Jenks, B.M. Pierce, and V.C. Bleich (2003). **Efficacy of photographic scent stations to detect mountain lions.** *Western North American Naturalist* 63(4): 529-532. ISSN: 1527-0904.
**Descriptors:** cougar, *Puma concolor*, photographic scent stations, efficacy, detection of mountain lions, population studies, ecology, wildlife management, conservation, automatic cameras, field equipment, population size estimates.

Newman, J., E. Zillioux, E. Rich, L. Liang, and C. Newman (2005). **Historical and other patterns of monomethyl and inorganic mercury in the Florida panther (*Puma concolor coryi*)**. *Archives of Environmental Contamination and Toxicology* 48(1): 75-80. ISSN: 0090-4341.
**Descriptors:** cougar, *Puma concolor coryi*, monomethyl, inorganic mercury, tissues, mercury contamination, historical patterns, hair analysis.

Pimm, S.L., L. Dollar, and O.L.J. Bass (2006). **The genetic rescue of the Florida panther**. *Animal Conservation* 9(2): 115-122. ISSN: 1367-9430.

**Descriptors:** cougar, *Puma concolor coryi*, Florida panther, isolated, inbred, introduced panthers from Texas, genetic damage, breeding, mortality, molecular genetics, wildlife management, conservation, reproduction.

Ray, J.C. (2000). **Mesocarnivores of northeastern North America: status and conservation issues.** *WCS Working Paper*(15): 1-82. ISSN: 1530-4426.
**Descriptors:** cougar, *Puma concolor*, mesocarnivores, wildlife management, conservation, habitat degradation, habitat destruction, history, human induced disturbance, species population, status, conservation issues.

Rodzen, J.A., J.D. Banks, E.P. Meredith, and K.C. Jones (2007). **Characterization of 37 microsatellite loci in mountain lions (*Puma concolor*) for use in forensic and population applications**. *Conservation Genetics* 8(5): 1239-1241. ISSN: 1566-0621.
**Descriptors:** cougars, *Puma concolor*, mountain lions, microsatellits loci, characterization, forensic applicationa, population applications.

Thatcher, C.A., F.T. Van Manen, and J.D. Clark (2006). **Identifying suitable sites for Florida panther reintroduction**. *Journal of Wildlife Management* 70(3): 752-763. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor coryi*, reintroduction, suitable sites, identifying, models, simulations, wildlife management, conservation, populations, quantitative landscape assessment, mathematical and computer techniques, Florida, U.S.

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### Cougar - Diet and Nutrition

Adams, R.B., J.C. Pitman, and L.A. Harveson (2006). **Texas tortoise (*Gopherus berlandier*i) consumed by a mountain lion (*Puma concolor*) in southern texas**. *Southwestern Naturalist* 51(4): 581-582. ISSN: 0038-4909.
**Descriptors:** cougar, montain lion, kitten, *Puma concolor*, Texas toroise, *Gopherus berlandier*i, consumed, prey variety, small prey, increase survival, predation skills.

Hedberg, G.E., E.S. Dierenfeld, and Q.R. Rogers (2007). **Taurine and zoo felids: considerations of dietary and biological tissue concentrations**. *Zoo Biology* 26(6): 517-531. ISSN: 0733-3188.
**Descriptors:** zoo felids, taurine, dietary concentrations, biological concentrations, diets, essential amino acid, jarred baby foods, chunk meats, kitten milk replacer, plasma concentrations, measure of dietary impact, whole blood concentrations, reflect tissue storage.

Rau, J.R. and J.E. Jimenez (2002). **Diet of puma (*Puma concolor*, carnivora: felidae) in coastal and Andean ranges of southern Chile.** *Studies on Neotropical Fauna and Environment* 37(3): 201-205. ISSN: 0165-0521.
**Descriptors:** cougar, *Puma concolor*, puma, diet, prey species, feces, European hares, pudu deer, rodents, birds, marsupials, black neck swans, coypu, Andean ranges, Chile.

Rosas Rosas, O.C., R. Valdez, L.C. Bender, and D. Daniel (2003). **Food habits of pumas in northwestern Sonora, Mexico.** *Wildlife Society Bulletin* 31(2): 528-535. ISSN: 0091-7648.
**Descriptors:** cougar, *Puma concolor*, behavior, food habits, desert mule deer, *Odocoileus hemionus*, white tailed deer, *Odocoileus virginianus*, lagomorphs, bighorn sheep, *Ovis canadensis*, fecal samples, Sonora Mexico.

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### Cougar - Research

Anderson, C.-R.J., F.G. Lindzey, and D.B. Mcdonald (2004). **Genetic structure of cougar populations across the wyoming basin: metapopulation or megapopulation**. *Journal of Mammalogy* 85(6): 1207-1214. ISSN: 0022-2372.

**Descriptors:** cougar population, *Puma concolor*, genetic structure, Wyoming basin, megapopulation, southwestern Colorado, population size, gene flow, U.S.

Bonier, F., H. Quigley, and S.N. Austad (2004). **A technique for non-invasively detecting stress response in cougars**. *Wildlife Society Bulletin* 32(3): 711-717. ISSN: 0091-7648.
**Descriptors:** cougar, *Puma concolor*, stress, detecting stress response, noninvasive technique, monitor stress hormone levels, assay of fecal corticoid metabolites.

Burkala, E. and M. Poss (2007). **Evolution of feline immunodeficiency virus gag proteins**. *Virus Genes* 35(2): 251-264. ISSN: 0920-8569.
**Descriptors:** cougar, P*uma concolor*, feline immunodeficiency virus, FIV, gag proteins, evolution, domestic cat, cougar, lion, biocchemical properties, RNA.

Ernest, H.B., W.M. Boyce, V.C. Bleich, B. May, S.J. Stiver, and S.G. Torres (2003). **Genetic structure of mountain lion (*Puma concolor*) populations in California.** *Conservation Genetics* 4(3): 353-366. ISSN: 1566-0621.
**Descriptors:** cougar, *Puma concolor*, mountain lion, genetic structure, microsatellite analysis, genetic subdivisions, genetic variation, conservation efforts., California. U.S.

Guiao Leite, F.L. and T.A.R. Paula (2003). **Rendimento intrinseco da espermatogenese, o indice de celulas de sertoli e a producao espermatica diaria da onca parda (*Puma concolor*). [Intrinsec yield of spermatogenesis, sertoli cell index and daily sperm production in cougar (*Puma concolor*)].** *Revista Brasileira De Reproducao Animal* 27(1): 21-26. ISSN: 0102-0803.
**Descriptors:** cougar, *Puma concolor*, spermatogenesis, intrinsec yield, sertoli cell index, daily sperm production, testicular morphology, spermatzoa.
**Language of Text:** Portuguese.

Kurushima, J.D., J.A. Collins, J.A. Well, and H.B. Ernest (2006). **Development of 21 microsatellite loci for puma (*Puma concolor*) ecology and forensics**. *Molecular Ecology Notes* 6(4): 1260-1262. ISSN: 1471-8278.
**Descriptors:** cougar, *Puma concolor*, microsatellite loci, development, ecology, forensics, primers, dinucleoitide, tetranucleotide, genetic studies, parentage, kinship, popultion structure.

Laundre, J.W. (2005). **Puma energetics: a recalculation**. *Journal of Wildlife Management* 69(2): 723-732. ISSN: 0022-541X.
**Descriptors:** cougar, *Puma concolor*, metabolism, energetics, population studies, radio telemetry, applied and field techniques, energetic requirement, prey requirement, daily energy demand, annual kill rate, impact on deer population.

Laundre, J.W. and L. Hernandez (2008). **The amount of time female pumas *Puma concolor* spend with their kittens**. *Wildlife Biology* 14(2): 221-227. ISSN: 0909-6396.
**Descriptors:** cougar, *Puma concolor*, amount of time females spend with kittens, ecology, telemetry data, age, wildlife management, conservation, applied and field techniques, spatial, temporal affinity, distance from kittens.

Rodzen, J.A., J.D. Banks, E.P. Meredith, and K.C. Jones (2007). **Characterization of 37 microsatellite loci in mountain lions (*Puma concolor*) for use in forensic and population applications**. *Conservation Genetics* 8(5): 1239-1241. ISSN: 1566-0621.
**Descriptors:** cougars, *Puma concolor*, mountain lions, microsatellits loci, characterization, forensic applicationa, population applications.

Sims, C. (2001). **Morphological distinctions in skulls of five felids (*Puma concolor, Panthera onca, Panthera pardus, Uncia uncia, and Acinonyx jubatus*)**. *Journal of Morphology* 248(3): 285. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skull, morphological distinctions, skeletal system, cougar, jaguar, leopard, snow leopard, species comparison study.
**Notes:** Sixth International Congress of Vertebrate Morphology, Jena, Germany; July 21-26, 2001.

Swanson, B.J. and P.J. Rusz (2006). **Detection and classification of cougars in michigan using low copy DNA sources**. *American Midland Naturalist* 155(2): 363-372. ISSN: 0003-0031.
**Descriptors:** cougar, *Puma concolor*, detection, classification, low copy DNA, scats, genotype.

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### Cougar - Veterinary

Biek, R., A.G. Rodrigo, D. Holley, A. Drummond, C.R.J. Anderson, H.A. Ross, and M. Poss (2003). **Epidemiology, genetic diversity, and evolution of endemic feline immunodeficiency virus in a population of wild cougars.** *Journal of Virology* 77(17): 9578-9589. ISSN: 0022-538X.
**Descriptors:** cougar, *Puma concolor*, epidemiology, genetic diversity, evolution, endemic feline immunodeficiency virus, retroviruses, natural host populations.

Biek, R., T.K. Ruth, K.M. Murphy, C.R.J. Anderson, M. Johnson, R. Desimone, R. Gray, M.G. Hornocker, C.M. Gillin, and M. Poss (2006). **Factors associated with pathogen seroprevalence and infection in Rocky Mountain cougars**. *Journal of Wildlife Diseases* 42(3): 606-615. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, infection, pathogen seroprevalence, associated factors, Rocky Mountain cougars, genetic material, feline herpes virus, *Yersinia pestis*, *U.S*.

Blake, D.J., J. Graham, and M. Poss (2006). **Quantification of feline immunodeficiency virus (fivpco) in peripheral blood mononuclear cells, lymph nodes and plasma of naturally infected cougars**. *Journal of General Virology* 87(Part 4): 967-975. ISSN: 0022-1317.
**Descriptors:** cougar, *Puma concolor*, feline immunodeficiency virus, quantification, peripheral blood mononuclear cells, lymph nodes, plasma, naturally infected, domestic cats, lack of disease in cougars.

Brown, M.A., M.W. Cunningham, A.L. Roca, J.L. Troyer, W.E. Johnson, and S.J. O'brien (2008). **Genetic characterization of feline leukemia virus from Florida panthers**. *Emerging Infectious Diseases* 14(2): 252-259. ISSN: 1080-6040.
**Descriptors:** cougar, *Puma concolor coryi*, feline leukemia virus, genetic characterization, clinical signs, co infection, feline immunodeficiency virus, Florida, U.S.

Durden, L.A., M.W. Cunningham, R. Mcbride, and B. Ferree (2006). **Ectoparasites of free-ranging pumas and jaguars in the Paraguayan Chaco**. *Veterinary Parasitology* 137(1-2): 189-193. ISSN: 0304-4017.
**Descriptors:** cougar, *Puma concolor*, jaguar, *Panthera onca*, ectoparasites, infection, parasitology, free ranging, prevalence, Paraguayan Chaco.

Fiorello, C.V., M.W. Cunningham, S.L. Cantwell, J.K. Levy, E.M. Neer, K. Conley, and P.M. Rist (2007). **Diagnosis and treatment of presumptive postobstructive pulmonary edema in a Florida panther (*Puma concolor coryi*)**. *Journal of Zoo and Wildlife Medicine* 38(2): 317-322. ISSN: 1042-7260.
**Descriptors:** cougar, *Puma concolor coryi*, postobstructive pulmonary edema, diagnosis, treatment, free ranging, airway obstruction, tracking collars, telemetry collar, immobilized, clinical signs.

Foster, G.W., M.W. Cunningham, J.M. Kinsella, G. Mclaughlin, and D.J. Forrester (2006). **Gastrointestinal helminths of free-ranging Florida panthers (*Puma concolor***

***coryi*) and the efficacy of the current anthelmintic treatment protocol**. *Journal of Wildlife Diseases* 42(2): 402-406. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor coryi*, gastrointestinals parasites, free ranging, anthelmintic treatment protocol, efficacy, trematode, nematode, cestode.

Franklin, S.P., J.L. Troyer, J.A. Terwee, L.M. Lyren, W.M. Boyce, S.P.D. Riley, M.E. Roelke, K.R. Crooks, and S. Vandewoude (2007). **Frequent transmission of immunodeficiency viruses among bobcats and pumas**. *Journal of Virology* 81(20): 10961-10969. ISSN: 0022-538X.
**Descriptors:** cougar, *Puma concolor*, bobcats, *Lynx rufus*, pumas, infection, immunodeficiency viruses, frequent transmission, Lentiviridae, Southern California.

Franklin, S.P., J.L. Troyer, J.A. Terwee, L.M. Lyren, R.W. Kays, S.P.D. Riley, W.M. Boyce, K.R. Crooks, and S. Vandewoude (2007). **Variability in assays used for detection of lentiviral infection in bobcats (*Lynx rufus*), pumas (*Puma concolor*) and ocelots (*Leopardus pardalis*)**. *Journal of Wildlife Diseases* 43(4): 700-710. ISSN: 0090-3558.
**Descriptors:** cougar, pumas, *Puma concolor*, bob cats, *Lynx rufus*, ocelots, *Leopardus pardalis*, lentiviral infection, detection, assays, variability.

Harrenstien, L.A., L. Munson, L.M. Chassy, I.K.M. Liu, and J.F. Kirkpatrick (2004). **Effects of porcine zona pellucida immunocontraceptives in zoo felids**. *Journal of Zoo and Wildlife Medicine* 35(3): 271-279. ISSN: 1042-7260.
**Descriptors:** zoo felids, contraception, methods, management, contraceptives, porcine zona pellucida, pZP, vaccine, African lion, *Panthera leo*, Asian leopard, *P. pardus*, jaguar, *P. onca*, tiger. (*P. tigris*, snow leopard, *P. uncia*, cougar, *Felis concolor*, Siberian lynx, *F. lynx*, Canada lynx, *F. canadensis*, serval, *F. serval*, bobcat, *F. rufus*.

Hawkey, C.M. and M.G. Hart (1986). **Haematological reference values for adult pumas, lions, tigers, leopards, jaguars and cheetahs.** *Research in Veterinary Science* 41(2): 268-269. ISSN: 0034-5288.
**Abstract:** Normal haematological values and fibrinogen levels were obtained from a number of healthy adult Felidae in the collection of the Zoological Society of London. The group comprised 29 pumas (*Felis concolor*), 32 lions (*Panthera leo*), 27 tigers (*P tigris*), 19 leopards (*P pardus*), 18 jaguars (*P onca*) and 22 cheetahs (*Acinonyx jubatus*). The values provided a basis for identifying abnormalities in the blood of sick individuals of these species and for undertaking interspecies comparisons.
**Descriptors:** cheetah, *Acinonyx jubata*, pumas, *Felis concolor*, lions, *Panthera leo*, tigers, *Panthera tigris*, leopards, *Panthera pardus*, jaguars, *Panthera onca*, adult, fibrinogen levels, blood, hematological reference values.

Miller, D.L., S.K. Taylor, D.S. Rotsetin, M.B. Pough, M.C. Barr, C.A. Baldwin, M. Cunningham, M. Roelke, and D. Ingram (2006). **Feline immunodeficiency virus and puma lentivirus in Florida panthers (*Puma concolor coryi*): epidemiology and diagnostic issues**. *Veterinary Research Communications* 30(3): 307-317. ISSN: 0165-7380.
**Descriptors:** cougar, *Puma concolor coryi*, feline immunodeficiency virus, puma lentivirus, seroprevalence, Florida panthers, antibodies, enzyme linked immunosorbent assay, Western blot tests, Florida, U.S.

Poss, M., H. Ross, A. Rodrigo, J. Terwee, S. Vandewoude, and R. Biek (2008). **The molecular biology and evolution of feline immunodeficiency viruses of cougars**. *Veterinary Immunology and Immunopathology* 123(1-2): 154-158. ISSN: 0165-2427.
**Descriptors:** cougar, *Puma concolor*, feline immunodeficiency virus, infection, veterinary medicine, molecular genetics, molecular biology, viral disease, lentivirus, pathology, mortality.

Roelke, M.E., J. Pecon Slattery, S. Taylor, S. Citino, E. Brown, C. Packer, S. Vandewoude, and S.J. O'brien (2006). **T-lymphocyte profiles in FIV-infected wild lions and pumas reveal CD4 depletion**. *Journal of Wildlife Diseases* 42(2): 234-248. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, feline innunodeficiency virus, lentivirus, FIV-infected wild lions, T-lymphocyte profiles, pumas, cd4 depletion, CD5+cells.

Wolfe, L.L. and M.W. Miller (2005). **Suspected secondary thiafentanil intoxication in a captive mountain lion (*Puma concolor*)**. *Journal of Wildlife Diseases* 41(4): 829-833. ISSN: 0090-3558.
**Descriptors:** cougar, *Puma concolor*, thiafentanil intoxication, toxicology, captive, veterinary medicine, inadvertent ingestion, assimilation, myopathy, depression, behavioral and mental disorders, carcasses, sedation, potential intoxication, scavenging species.

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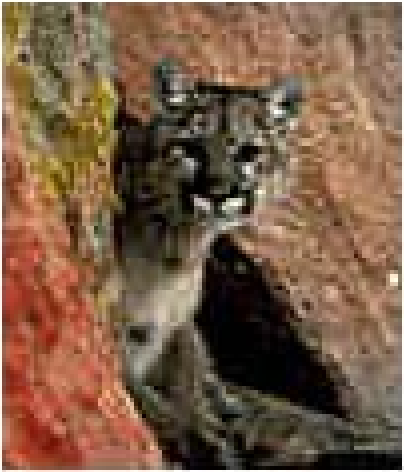

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### Jaguar - General

Abdulla, P.K., P.C. James, S. Sulochana, V. Jayaprakasan, and R.M. Pillai (1982). **Anthrax in a jaguar (*Panthera onca*)**. *Journal of Zoo Animal Medicine* 13(4): 151. ISSN: 0093-4526.
**Descriptors:** jaguar, *Panthera onca*, anthrax, bacterial diseases, case reports, zoo animals, *Bacillus anthracis*, Felidae.

Aguilar, R.F., A.M. Grooters, A. Camus, and M.M. Garner (2003). **Primary pulmonary pythiosis in a Central American jaguar (*Panthera onca*)**. *Proceedings of the Institute for Zoo and Wildlife Research, Berlin, No.5*: 319.
**Descriptors:** jaguar, *Panthera onca*, primary pulmonary pythiosis, case reports, clinical aspects, diagnosis, mycoses, respiratory diseases, zoo animals, *Pythium insidiosum*.
**Notes:** Meeting Information: Erkrankungen der Zootiere: Verhandlungsbericht des 41. Internationalen Symposiums uber die Erkrankungen der Zoo und Wildtiere, Rome, Italy, 28 May - 1 June, 2003.

Ahmed, A., M. Jahan, Z.H. Zaidi, and G. Braunitzer (1987). **The primary structure of the hemoglobins of the adult jaguar (*Panthera onca*, Carnivora).** *Biological Chemistry Hoppe Seyler* 368(10): 1385-1390. ISSN: 0177-3593; Discontinued. Continued as: Biological Chemistry: (P) 1431-6730; online: 1437-4315.
**Abstract:** The primary structure of the hemoglobins from Jaguar (*Panthera onca*) are presented. Electrophoretic separations without and with a dissociating agent revealed the presence of two hemoglobin components, alpha 2 beta I2 and alpha 2 beta II2. The separation of the hemoglobin components was achieved by ion-exchange chromatography. The globin chains were separated by ion-exchange chromatography and also by reversed phase HPLC. The amino-acid sequences of the native chains and peptides were determined by liquid-phase and gas-phase sequencing. N-Acetylserine was detected by FAB-mass spectroscopy as N-terminal group of the beta I chain. The sequences are compared with that of human hemoglobin (Hb A).
**Descriptors:** Jaguar, *Panthera onca*, adult, carnivora blood, hemoglobins, analysis, primary structure, amino acid sequence, chromatography, high pressure liquid, chromatography, ion exchange, oxidation reduction.

Altrichter, M., G. Boaglio, and P. Perovic (2006). **The decline of jaguars *Panthera onca* in the Argentine Chaco**. *Oryx* 40(3): 302-309. ISSN: 0030-6053.

**Abstract:** We assessed the distribution and status of jaguar *Panthera onca* in the Argentine Chaco, one of the least known areas within its range. Current jaguar distribution in the Chaco encompasses parts of central and western Formosa, western Chaco, eastern Salta and north-eastern Santiago del Estero Provinces. Jaguar range was reduced following colonization of the semiarid Chaco even though there has been little deforestation. Jaguars have not been observed over the last 15 years in areas where colonization occurred more than 35 years ago, probably reflecting hunting pressure. Livestock predation is lower now than when the area was first settled in the 1920s. This may indicate low jaguar densities as the livestock management system has not changed. Local people, however, continue to hunt jaguars with the intention of exterminating them. Education, enforcing jaguar hunting laws, increasing control of poaching in protected areas, and creating more protected areas may be the most efficient strategies to preserve the jaguar population of the Argentine Chaco. *Reproduced with permission of CAB Abstracts.*
**Descriptors:** jaguar, *Panthera onca*, decline, deforestation, habitat destruction, population decrease, density, distribution, predation, wild animals, wildlife conservation, wildlife management, Argentine Chaco.

Azevedo, M.H., T.A. Paula, M.K. Balarini, S.L. Matta, J.V. Peixoto, F.L. Guiao Leite, J.L.J. Rossi, and E.P. da Costa (2008). **Organization and quantification of the elements in the intertubular space in the adult jaguar testis (*Panthera onca*, LINNAEUS, 1758).** *Micron Oxford, England 1993* 39(8): 1166-70. ISSN: 0968-4328.
**Abstract:** The endocrine portion of mammal testicle is represented by Leydig cells which, together with connective cells, leukocytes, blood and lymphatic vessels, form the intertubular space. The arrangement and proportion of these components vary in the different species of mammals and form mechanisms that keep the testosterone level - the main product of the Leydig cell - two to three times higher in the interstitial fluid than in the testicular blood vessels and 40-250 times higher in these than in the peripheral blood. Marked differences are observed among animal species regarding the abundance of Leydig cells, loose connective tissue, development degree and location of the lymphatic vessels and their topographical relationship with seminiferous tubules. In the jaguar about 13% of the testicular parenchyma is occupied by Leydig cells, 8.3% by connective tissue and 0.3% by lymphatic vessels. Although included in standard II, as described in the literature, concerning the arrangement of the intertubular space, the jaguar has grouped lymphatic vessels in the intertubular space instead of isolated ones. In the jaguar the average volume of the Leydig cell was 2386mum3 and its average nuclear diameter was 7.7mum. A great quantity of 2.3mum diameter lipidic drops was observed in the Leydig cell cytoplasm of the jaguar. The Leydig cells in the jaguar occupy an average 0.0036% of the body weight and the average number per gram of testicle was within the range for most mammals: between 20 and 40million.
**Descriptors:** jguar, *Panthera onca*, testis, intertubular space, elements, organization, quantification, adult, Leydig cells, lymphatic vessels, blood vessels, leukocytes.

Azevedo, M.H.F.d., T.A.R.d. Paula, S.L.P.d. Matta, C.C. Fonseca, and M.T.D.d. Neves (2006). **Morfometria testicular e o tubulo seminifero da onca-pintada. [Testicular morphometry and the seminiferous tubule in adult Jaguars (*Panthera onca*)]**. *Revista Ceres* 53(307): 374-381. ISSN: 0034-737X.
**Abstract:** The composition of the testicular parenchyma and the relative size of the testicles can provide valuable information regarding the reproductive physiology and mating strategy of an animal. Five adult jaguars were investigated using testicular biopsy to determine the relationship between the morphometry of the testicles and seminiferous tubule with their corporal mass. The median corporal weight of the jaguars used in the study was 78.5 kg, of which about 0.034% corresponded to the testicular mass and 0.022% to the seminiferous tubules, which represented about 77.7% of the testicular parenchyma. The average diameter of the seminiferous tubules was 257 micro m and the average thickness was about 90 micro m. Jaguars have about 12.2 m of seminiferous tubules by testicular gram. *Reproduced with permission of CAB Abstracts.*
**Descriptors:** jaguar, *Panthera onca*, anatomy, morphology, morphometrics, seminiferous tubules, testes, testicular parenchyma, composition, reproductive physiology.
**Language of Text:** Portuguese, Summary in English.

Bossart, G.D. and G. Hubbell (1983). **Ovarian papillary cystadenocarcinoma in a jaguar (*Panthera onca*)**. *Journal of Zoo Animal Medicine* 14(2): 73-76. ISSN: 0093-4526.
**Descriptors:** jaguar, *Panthera onca*, neoplasms, zoo animals, cystadenocarcinoma, ovarian papillary.

Camus, A.C., A.M. Grooters, and R.E. Aquilar (2004). **Granulomatous pneumonia caused by *Pythium insidiosum* in a central American jaguar, *Panthera onca*.** *Journal of Veterinary Diagnostic Investigation* 16(6): 567-571. ISSN: 1040-6387.
**Abstract:** A 7-month-old, male jaguar presented with dyspnea and leukocytosis unresponsive to antibiotic therapy. Radiographs revealed unilateral pulmonary consolidation. An exploratory thoracotomy was performed, and the left lung, which contained a large multilobular mass with extensive fibrosis and numerous caseonecrotic foci, was removed. Microscopically, eosinophilic granulomatous inflammation surrounded

broad (4.4-8.3 microm) rarely septate hyphae. A diagnosis of *Pythium insidiosum* infection was confirmed by immunohistochemistry, immunoblot serology, culture, and polymerase chain reaction. Dyspnea recurred despite treatment, and the animal succumbed 3 weeks after surgery. Necropsy findings indicated that death resulted from occlusion of the right main stem bronchus by a fungal granuloma. The oomycete *P. insidiosum* typically causes granulomatous disease of the skin or gastrointestinal tract in animals and arteritis, keratitis, or cellulitis in humans. Infection is uncommon in felines, and pulmonary involvement is rare. This report details the first case of *P. insidiosum* infection in an exotic felid and provides the first description of primary pulmonary pythiosis in any species.
**Descriptors:** jaguar, *Panthera onca*, granulomatous pneumonia, *Pythium insidiosum*, dyspnea, leukocytosis, pulmonary consolidation, fibrosis, oomycete, pulmonary pythiosis.

Castro, M.B.d., K. Werther, G.S. Godoy, V.P. Borges, and A.C. Alessi (2003). **Visceral mast cell tumor in a captive black jaguar (*Panthera onca*)**. *Journal of Zoo and Wildlife Medicine* 34(1): 100-102. ISSN: 1042-7260.
**Abstract:** Little is known about neoplasia in the jaguar (*Panthera onca*), the largest American feline. A 26-year-old captive black jaguar from the county zoo in Ribeirao Preto, Sao Paulo, Brazil, was diagnosed at necropsy with a mastocytic form of visceral mast cell tumour (MCT) similar to that which occurs in domestic cats. This animal had no previous clinical disease and died during anaesthesia for a routine dental treatment. Histologically, the submucosa and muscular layers of the jejunum were diffusely infiltrated and expanded by massive numbers of monomorphic neoplastic mast cells arranged in cords or nests. The prognosis and criteria for the clinical diagnosis of MCT in the jaguar are unknown. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, visceral mast cell tumor, captive, case reports, clinical aspects, diagnosis, mast cells, neoplasms, zoo animals, Brazil.

Choi, J.H., H.S. Yoo, J.Y. Park, Y.K. Kim, E. Kim, and D.Y. Kim (2002). **Morganelliasis pneumonia in a captive jaguar.** *Journal of Wildlife Diseases* 38(1): 199-201. ISSN: 0090-3558.
**Abstract:** Suppurative bronchopneumonia was discovered in a 6-yr-old male jaguar (*Panthera onca onca*) that died after a 1 wk history of anorexia, depression, and respiratory difficulty. *Morganella morganii* was isolated as a pure culture from the lung, spleen, and heart blood. This is the first record of *M. morganii* induced pneumonia in a jaguar.
**Descriptors:** jaguar, *Panthera onca*, bronchopneumonia, Carnivora, infections, *Morganella morganii*, isolation, purification, bronchopneumonia, pathology, Enterobacteriaceae infections, microbiology, pathology, fatal outcome, pathogenicity.

Costa, G.M., H. Chiarini Garcia, R.G. Morato, R.L. Alvarenga, and L.R. Franca (2008). **Duration of spermatogenesis and daily sperm production in the jaguar (*Panthera onca*).** *Theriogenology* 70(7): 1136-46. ISSN: 0093-691X.
**Abstract:** The jaguar, like most wild felids, is an endangered species. Since there are few data regarding reproductive biology for this species, our main goal was to investigate basic aspects of the testis and spermatogenesis. Four adult male jaguars were utilized; to determine the duration of spermatogenesis, two animals received an intratesticular injection of H(3)-thymidine. Mean (+/-SEM) testis weight and the gonadosomatic index were 17.7+/-2.2g and 0.05+/-0.01%, respectively, whereas the seminiferous tubules and the Leydig cells volume density were 74.7+/-3.8 and 16.7+/-1.6%. Eight stages of spermatogenesis were characterized, according to the tubular morphology system and acrosome development. Each spermatogenic cycle and the entire spermatogenic process (based on 4.5 cycles) lasted approximately 12.8+/-0.01 and 57.7+/-0.07 d. The number of Sertoli and Leydig cells per gram of testis was 29+/-4 x 10(6) and 107+/-12 x 10(6). Based on the number of round spermatids per pachytene spermatocyte (2.8+/-0.3:1; meiotic index); significant cell loss (30%) occurred during the two meiotic divisions. There were approximately eight spermatids for each Sertoli cell (Sertoli cell efficiency), whereas the daily sperm production per gram of testis was 16.9+/-1.2 x 10(6). We expect that in the near future, the knowledge obtained in the present investigation will facilitate, utilizing germ cell transplantation, preservation of the germinal epithelium and the ability to generate sperm from jaguars in testes of domestic cats.
**Descriptors:** Jaguar, *Panthera onca*, spermatogenesis, duration, sperm production, reproductive biology, testis, seminiferous tubules, Leydig cells, sertoli cells.

Demar, M., D. Ajzenberg, B. Serrurier, M.L. Darde, and B. Carme (2008). **Atypical *Toxoplasma gondii* strain from a free-living jaguar (*Panthera onca*) in French Guiana**. *American Journal of Tropical Medicine and Hygiene* 78(2): 195-197. ISSN: 0002-9637.
**Abstract:** Like domestic cats, wild felids are involved in the complete infective cycle of *Toxoplasma gondii* because they can host in their gastrointestinal tract sexually mature parasites and shed infective oocysts in their faeces. We report, to our knowledge, the first isolation and molecular characterization of a *T. gondii* strain from the heart tissue of a free-living jaguar (*Panthera onca*) in Belizon, an eastern deep forest area in French Guiana. Sequencing at 6 polymorphic markers indicated that the jaguar isolate had an atypical genotype, including an allele at TgM-A previously found only in isolates from South America, and an allele at GRA6, which was previously reported only in Californian

sea otter isolates. These findings are consistent with the recent description of atypical *T. gondii* strains involved in severe toxoplasmosis in immunocompetent patients in French Guiana that seemed to be linked to a neotropical forest-based cycle involving wild cats and their prey. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, forests, genotypes, nucleotide sequences, strains, toxoplasmosis, wild animals, oocysts, feces, infective cycle, *Toxoplasma gondii*.

Eizirik, E., J.H. Kim, M. Menotti Raymond, P.G.J. Crawshaw, S.J. O'Brien, and W.E. Johnson (2001). **Phylogeography, population history and conservation genetics of jaguars (*Panthera onca*, Mammalia, Felidae).** *Molecular Ecology* 10(1): 65-79. ISSN: 0962-1083.
**Abstract:** The jaguar (*Panthera onca*), the largest felid in the American Continent, is currently threatened by habitat loss, fragmentation and human persecution. We have investigated the genetic diversity, population structure and demographic history of jaguars across their geographical range by analysing 715 base pairs of the mitochondrial DNA (mtDNA) control region and 29 microsatellite loci in approximately 40 individuals sampled from Mexico to southern Brazil. Jaguars display low to moderate levels of mtDNA diversity and medium to high levels of microsatellite size variation, and show evidence of a recent demographic expansion. We estimate that extant jaguar mtDNA lineages arose 280 000-510 000 years ago (95% CI 137 000-830 000 years ago), a younger date than suggested by available fossil data. No strong geographical structure was observed, in contrast to previously proposed subspecific partitions. However, major geographical barriers such as the Amazon river and the Darien straits between northern South America and Central America appear to have restricted historical gene flow in this species, producing measurable genetic differentiation. Jaguars could be divided into four incompletely isolated phylogeographic groups, and further sampling may reveal a finer pattern of subdivision or isolation by distance on a regional level. Operational conservation units for this species can be defined on a biome or ecosystem scale, but should take into account the historical barriers to dispersal identified here. Conservation strategies for jaguars should aim to maintain high levels of gene flow over broad geographical areas, possibly through active management of disconnected populations on a regional scale.
**Descriptors:** jaguar, *Panthera onca*, genetics, DNA, mitochondrial genetics, population genetics, microsatellite repeats, variation genetics, geography, haplotypes, phylogeny, polymerase chain reaction, South America, Central America, Mexico.

Frazier, K.S., M.E. Hines, C. Ruiz, A.J. Herron, and N.H. Altman (1994). **Immunohistochemical differentiation of multiple metastatic neoplasia in a jaguar (*Panthera onca*)**. *Journal of Zoo and Wildlife Medicine* 25(2): 286-293. ISSN: 1042-7260.
**Descriptors:** jaguar, *Panthera onca*, multiple metastatic neoplasia, immunohistochemical differentiation, case report, mammary gland diseases, metastasis, neoplasms, pathology, zoo animal.

Hawkey, C.M. and M.G. Hart (1986). **Haematological reference values for adult pumas, lions, tigers, leopards, jaguars and cheetahs.** *Research in Veterinary Science* 41(2): 268-269. ISSN: 0034-5288.
**Abstract:** Normal haematological values and fibrinogen levels were obtained from a number of healthy adult Felidae in the collection of the Zoological Society of London. The group comprised 29 pumas (*Felis concolor*), 32 lions (*Panthera leo*), 27 tigers (*P tigris*), 19 leopards (*P pardus*), 18 jaguars (*P onca*) and 22 cheetahs (*Acinonyx jubatus*). The values provided a basis for identifying abnormalities in the blood of sick individuals of these species and for undertaking interspecies comparisons.
**Descriptors:** cheetah, *Acinonyx jubata*, pumas, *Felis concolor*, lions, *Panthera leo*, tigers, *Panthera tigris*, leopards, *Panthera pardus*, jaguars, *Panthera onca*, adult, fibrinogen levels, blood, hematological reference values.

Hope, K. and S.L. Deem (2006). **Retrospective study of morbidity and mortality of captive jaguars (*Panthera onca*) in North America: 1982-2002**. *Zoo Biology* 25(6): 501-512. ISSN: 0733-3188.

**Abstract:** One hundred seventy-two medical records of captive jaguars (*Panthera onca*) were examined from 30 American Zoo and Aquarium Association (AZA) institutions housing jaguars between 1982-2002. The study determined common causes of morbidity and mortality, and the influence of age, gender, and melengestrol-acetate (MGA) exposure on these rates. The most common causes of morbidity in captive jaguars were found to be dental, gastrointestinal, integumentary, and musculoskeletal diseases. Prevalence of types of disease varied with age, with older animals experiencing a higher prevalence of multiple types of disease. Females developed reproductive disease more frequently than males, and the data suggest that MGA exposure increased the risk of developing female reproductive disease. The most common causes of mortality were reproductive diseases in females and musculoskeletal diseases in males. There was a high rate of neonate and pediatric mortality, primarily due to stillbirths or unexplained neonatal death, trauma, and pneumonia. Other diseases or clinical signs that seemed remarkable were a high prevalence of episodes of epistaxis among young, as well as old, jaguars. Based on these findings, management suggestions for the captive jaguar

population are presented. *Reproduced with permission of CAB*.
**Descriptors:** jaguars, *Panthera onca*, morbidity, mortality, retrospective study, captive jaguars, North America, age groups, animal health, digestive disorders, medical records, musculoskeletal anomalies, newborn animals, sex differences, trauma, zoo animals.

Junior, J.L.R., M.A. Gioso, and L.M. Domingues Falqueiro (2007). **Estudo comparative sobre prevalencia de doenca periodontal em *Panthera onca* mantida em cativeiro e em individuos de natureza. [A comparative study about the prevalence of periodontal disease in *Panthera onca*, living in captivity and in the wild].** *Pesquisa Veterinaria Brasileira* 27(5): 209-214. ISSN: 0100-736X.

**Abstract:** The aim was to survey the main oral lesions related with periodontal disease of jaguars, *Panthera onca*, living in captivity or in the wild, as conservation of threatened animals from extinction, as in case of the jaguar, and the preservation of such species in free life may be determined by environmental conditions which can influence oral health. Forty-two jaguars (*P. onca*) kept in captivity in 18 institutions in the state of Sao Paulo were studied. The animals to be examined were anesthetized by the Plan of Neotropical Handling of Felids. Additionally, 4 jaguars (*P. onca*) proceeding from wild life were captured for the study on Farm Sete, municipality of Miranda, Mato Grosso do Sul, in the southern Pantanal. All animals surveyed in captivity showed various degrees of oral lesions related to periodontal disease. The animals living in the wild did not present any clinical signs of oral lesions. *Reproduced with permission of CAB.*
**Descriptors:** jaguars, *Panthera onca*, periodontal disease, prevalence, dentistry, disease prevalence, disease surveys, lesions, tooth diseases, wild animals, captive zoo animals, oral lesions.
**Language of Text:** Portuguese, Summary in English.

Karesh, W.B. and G. Bottomley (1983). **Vaccine induced anaphylaxis in a Brazilian jaguar (*Panthera onca plaustrix*)**. *Journal of Zoo Animal Medicine* 14(4): 133-137. ISSN: 0093-4526.
**Descriptors:** jaguar, *Panthera onca plaustrix*, vaccine induced, adverse effects, anaphylaxis, complications, zoo animals, feline herpesvirus 1, feline calicivirus, feline panleukopenia virus.

Kim JeongRae, Kim BangHyun, Yoo HanSang, Lee DeogYong, Kim KiGeun, Jean KyungSun, Hwang WooSuk, Lee ByungChun, and Kim DaeYong (2001). **Concurrent infection with heartworm and *Pasteurella haemolytica*-induced pericarditis in a jaguar (*Panthera onca onca*)**. *Journal of Veterinary Clinics* 18(1): 85-87. ISSN: 1598-298X.
**Descriptors:** jaguar, *Panthera onca onca*, heartworm infection, clinical aspects, concurrent infections, diagnosis, heart, lungs, myocardium, pericarditis, pericardium, *Dirofilaria*, *Pasteurella haemolytica.*
**Language of Text:** Korean, Summary in English.

Kollias, G.V.J., M.B. Calderwood Mays, and B.G. Short (1984). **Diabetes mellitus and abdominal adenocarcinoma in a jaguar receiving megestrol acetate.** *Journal of the American Veterinary Medical Association* 185(11): 1383-1386. ISSN: 0003-1488.
**Descriptors:** jaguar, *Panthera onca*, abdominal neoplasms, adenocarcinoma, diabetes mellitus, megestrol acetate, derivatives, complications, complications, cat diseases chemically induced, cats, dog diseases, megestrol adverse effects, contraceptives, zoo animals.

Kumar, M.N. and M.V.A. Akbar (2001). **A case of uterine inertia in Jaguar (*Panthera onca*)**. *Zoos' Print Journal* 16(5): 502. ISSN: 0971-6378.
**Descriptors:** jaguars, *Panthera onca*, uterine inertia, case reports, dystocia, parturition.

Ladiges, W.C., J.W. Foster, and M.H. Jones (1981). **Malignant hemangioendothelioma in a jaguar (*Panthera onca*)**. *Journal of Zoo Animal Medicine* 12(2): 36-37. ISSN: 0093-4526.
**Descriptors:** jaguar, *Panthera onca*, malignant hemangioendothelioma, neoplasms, zoo animals, Felidae.

Liu, B. and X. Dong (2002). ***Lactobacillus pantheris* sp. nov., isolated from faeces of a jaguar.** *International Journal of Systematic and Evolutionary Microbiology* 52(Pt 5): 1745-8. ISSN: (p) 1466-5026; online: 1466-5034.
**Abstract:** Two novel *Lactobacillus* strains were isolated from the faeces of a jaguar in Beijing Zoo. They were gram-positive, non-spore-forming, non-motile, rod-shaped organisms that exhibited no catalase activity. The strains fermented cellobiose, D-fructose, galactose, D-glucose, lactose, maltose, D-mannose, salicin, trehalose, N-acetyl glucosamine, beta-gentiobiose and D-tagatose. D(-)-Lactic acid was the exclusive product from glucose fermentation. The G+C content of the DNA of strain A24-2-1T was 52.7 mol %. Phylogenetic analysis based on 16S rDNA sequence similarity indicated that the strains represented a novel member of the genus *Lactobacillus* and were most closely related to *Lactobacillus manihotivorans* LMG 18010T, with 16S rDNA sequence similarity of 95.2%. The DNA-DNA relatedness between them was 13%. The name *Lactobacillus pantheris* sp. nov. is proposed for the novel strains, with strain A24-2-1T as the type

strain (= AS 1.2826T = LMG 21017T).
**Descriptors:** jaguar, *Panthera onca*, *Lactobacillus pantheris* sp. nov, *Lactobacillus* classification, isolation, purification, feces, zoo microbiology, carnivora microbiology, China, DNA, bacterial chemistry, bacterial genetics, ribosomal genetics, *Lactobacillus* genetics, *Lactobacillus* metabolism, molecular sequence data, RNA.

Lohse, C.L. and Y.M. Baba (1982). **Comparative anatomy of intervertebral discs and related structures in the cat (*Felis catus*) and jaguar (*Panthera onca*)**. *Anatomia Histologia Embryologia* 11(4): 334-342. ISSN: 0340-2096.
**Abstract:** A female jaguar and 15 adult cats of both sexes were studied; of the cats, 12 were embalmed, and three perfused with heparinized saline only. All intervertebral disks cranial to the sacrum were examined, and the craniocaudal lengths of individual disks and vertebrae were recorded. The surface areas of nucleus pulposus and annulus fibrosus of disks sectioned transversely were measured in four cats and the jaguar. In the jaguar, the total disk length represented about 25% of the total vertebral column length (as it does in man) while the corresponding value for cats was 17.3-19.8%. The variations in area of the nucleus and annulus are also tabulated, and the relevance of the findings to the frequency of disk prolapse is discussed. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, cats, *Felis catus*, intervertebral discs, related structures, comparative anatomy, disks, vertebrae, vertebral column.
**Language of Text:** German, Spanish, and French.

McCain, E.B. and J.L. Childs (2008). **Evidence of resident jaguars (*Panthera onca*) in the southwestern United States and the implications for conservation**. *Journal of Mammalogy* 89(1): 1-10. ISSN: 0022-2372.

**Abstract:** Jaguars (*Panthera onca*) remain virtually unstudied in the desert environments at the northern extent of their range. Historic sightings from the United States indicate a declining population of resident jaguars from the late 1800s into the 1940s, after which only occasional jaguars were reported until the present. After 2 sightings of jaguars in 1996, we established a camera monitoring program in southeastern Arizona. From March 2001 to July 2007, we maintained 9-44 trail cameras and conducted opportunistic track surveys. We documented 2 adult males and a possible 3rd unidentified jaguar with 69 photographs and 28 sets of tracks. One jaguar, originally photographed in 1996, was resighted 64 times during 2004-2007. This >=13-year-old male used habitats from the Sonoran lowland desert at 877 m above sea level to pine-oak woodlands at 1,577 m, and covered 1,359 km2 in 2 mountain complexes. Despite speculation that recent sightings of jaguars in the United States represented dispersing transients on sporadic forays from Mexico, we documented jaguars in Arizona frequently, continuously, and year-round, and videotaped several scent-marking behaviors, indicating the residency of adult jaguars within Arizona. We outline the importance of maintaining cross-border connectivity for long-term survival of the wide-ranging and thinly distributed binational population of jaguars. We recommend further research and we stress the fragmentation consequences of the proposed United States-Mexico border fence to the northernmost jaguar population, and particularly to jaguars in the United States. Reproduced with permission of CAB.
**Descriptors:** jaguar, *Panthera onca*, resident jaguars, evidence, southwestern United States, camera monitoring, conservation.

McLaughlin, R.J. and A. Kuzma (1991). **Surgical management of collapsed pelvis in a jaguar.** *Journal of the American Veterinary Medical Association* 198(10): 1789-91. ISSN: 0003-1488.
**Abstract:** An immature jaguar was surgically treated for severe constipation caused by a narrow pelvic canal. This narrowing was attributed to nutritional secondary hyperparathyroidism. The ventral floor of the pelvis was widened by placing a piece of high density polyethylene between the 2 sides of the pubis after symphysiotomy and stabilizing the implant with orthopedic wires. This procedure provided stable fixation and permanent enlargement of the pelvic canal. The technique was easy to perform and could be used to treat pelvic collapse in other species.
**Descriptors:** jaguar, *Panthers onca*, case study, surgery, constipation, femoral fractures, hyperparathyroidism, pelvic bones surgery, bone density, bone wires, pelvic bones injuries, surgical management.

Morato, R.G., M.G. Bueno, P. Malmheister, I.T. Verreschi, and R.C. Barnabe (2004). **Changes in the fecal concentrations of cortisol and androgen metabolites in captive male jaguars (*Panthera onca*) in response to stress.** *Brazilian Journal of Medical and Biological Research; Revista Brasileira De Pesquisas Medicas e Biologicas Sociedade Brasileira De Biofisica [Et Al.]* 37(12): 1903-7. ISSN: (p) 0100-879X; (E) 0034-7310.
**Abstract:** In the present study we determined the efficacy of the measurement of fecal cortisol and androgen metabolite concentrations to monitor adrenal and testicular activity in the jaguar (*Panthera onca*). Three captive male jaguars were chemically restrained and electroejaculated once or twice within a period of two months. Fecal samples were collected daily for 5 days before and 5 days after the procedure and stored at -20 degrees C until extraction. Variations in the concentrations of cortisol and androgen metabolites before and after the procedure were determined by solid phase cortisol and testosterone

radioimmunoassay and feces dry weight was determined by drying at 37 degrees C for 24 h under vacuum. On four occasions, fecal cortisol metabolite levels were elevated above baseline (307.8 +/- 17.5 ng/g dry feces) in the first fecal sample collected after the procedure (100 to 350% above baseline). On one occasion, we did not detect any variation. Mean (+/- SEM) fecal androgen concentration did not change after chemical restraint and electroejaculation (before: 131.1 +/- 26.7, after: 213.7 +/- 43.6 ng/g dry feces). These data show that determination of fecal cortisol and androgen metabolites can be very useful for a noninvasive assessment of animal well-being and as a complement to behavioral, physiological, and pathological studies. It can also be useful for the study of the relationship between adrenal activity and reproductive performance in the jaguar.
**Descriptors:** jaguars, *Panthera onca*, fecal cortisol, androgen metabolites, determination, noninvasive assessment, well-being, fecal concentrations, stress response, testicular activity, adrenal activity, changes.

Morato, R.G., V.A. Conforti, F.C. Azevedo, A.T. Jacomo, L. Silveira, D. Sana, A.L. Nunes, M.A. Guimaraes, and R.C. Barnabe (2001). **Comparative analyses of semen and endocrine characteristics of free-living versus captive jaguars (*Panthera onca*).** *Reproduction Cambridge, England* 122(5): 745-51. ISSN: 1470-1626.
**Abstract:** Semen and blood samples were obtained from free-living (n = 6) and captive (n = 8) jaguars (*Panthera onca*) to compare reproductive characteristics between the two populations. Semen samples were analysed for volume (ml), percentage of motile spermatozoa, rate of forward progression (0-5), concentration (10(6) ml(-1)), total sperm count (10(6)) and sperm morphology. Serum testosterone concentration was determined by radioimmunoassay. Although ejaculate volume was greater in captive jaguars (n = 47 samples) than in free-living jaguars (n = 7 samples) ($P < 0.05$), the free-living jaguars produced more total spermatozoa (59.3 +/- 12.8 versus 152.0 +/- 88.0 x 10(6), respectively; not significant) with better viability and forward progression (2.8 +/- 0.1 versus 3.5 +/- 0.2, respectively; $P < 0.05$) and more spermatozoa with normal morphology (73.5 +/- 3.9 versus 5.0 +/- 1.1%, respectively; $P < 0.05$). Serum testosterone concentrations were similar for captive and free-living male jaguars (3.1 +/- 0.7 and 2.1 +/- 0.8 ng ml(-1), respectively). In summary, the data showed that semen may be collected successfully from free-living jaguars and evaluated under field conditions to establish normative reproductive values in this species. The results also indicate that jaguars maintained in zoos show inferior seminal characteristics compared with free-living animals.
**Descriptors:** jaguars, *Panthera onca*, free living and captive animals, semen samples, endocrine characteristics, comparative analysis, blood samples, collection, field conditions, normal reproductive values, inferior seminal characteristics in zoo animals.

Morato, R.G., E. Crichton, R.C.R. Paz, R.M. Zuge, C.A. Moura, A.L.V. Nunes, R.H. Teixeira, M.A.B.V. Guimaraes, V.H. Barnabe, R.C. Barnabe, D. Armstrong, and N. Loskutoff (2002). **Superovulacao, recuperacao de oocitos e fecundacao in vitro em onca pintada (*Panthera onca*). [Ovarian stimulation, oocyte recovery and in vitro fertilization in the jaguar (*Panthera onca*)].** *Revista Brasileira De Reproducao Animal* 26(4): 317-324. ISSN: 0102-0803.
**Abstract:** This study was designed to examine the ovarian responsiveness to a gonadotropin regimen in the jaguar, to determine the best time of oocyte recovery, and to investigate the feasibility of using in vitro fertilization to produce jaguar embryos. Jaguars (n=3) were treated with 50 IU porcine FSH in a decreasing regimen over 3 days, followed 24 h later by a single dose of 25 IU porcine LH. Laparoscopy was performed 20-22 h or 24-26 h post-pLH, and ovaries were examined for the presence of follicles (>=2 mm in diameter). Oocyte recoveries were attempted from 165 follicles. Of the 91 COC recovered, 74 were classified as A quality (81%), 6 as B quality (7%), 4 as C quality (4%), and 7 as degenerated (8%). Oocyte recovery rate was high (75%; 86/114) when follicles were aspirated 20-22 h post-pLH. A total of 26 oocytes were co-incubated overnight with 1.0x106/ml fresh sperm. Presumptive zygotes were washed and transferred to culture medium and returned to incubator for 24 h at which time six 2- to 4-cell embryos were observed. The data indicated that jaguars respond to exogenous porcine gonadotropins by producing multiple antral ovarian follicles, laparoscopic retrieval was effectively performed 20-22 h than at 24-26 h post-pLH, and embryos could be produced by IVF. *Reproduced with permission of CAB.*
**Descriptors:** jaguars, *Panthera onca*, ovarian stimulation, oocyte recovery, in vitro fertilization, gonadotropin regimen, ovarian responsiveness, FSH, embryos.
**Language of Text:** Portuguese, Summary in English.

Morato, R.G., M.A.B.d.V. Guimaraes, F. Ferreira, I.T.d.N. Verreschi, and R.C. Barnabe (1999). **Reproductive characteristics of captive male jaguars (*Panthera onca*)**. *Brazilian Journal of Veterinary Research and Animal Science* 36(4/6): 262-266. ISSN: 1413-9596.
**Abstract:** Ejaculate traits, testicular volume and plasma testosterone levels were determined once every two months for one year in 4 adult male jaguars (*Panthera onca*) housed at the Sao Paulo Zoo, SP, Brazil. Semen samples was collected by electroejaculation and analyzed for pH, total volume, motility (0-100%), status (0-5), total spermatozoa count and morphology. Blood samples was obtained by cephalic venipuncture immediately before the onset of electroejaculation and stored at -20 degrees C until assay of testosterone by RIA. Using a calliper, the length and width of

each testis was measured and the values were combined to determine the testicular volume. Semen analyses demonstrated a high percentage of structurally abnormal sperm (mean=51%) and low rates of motility (50.6%) and status (2.2). No correlation was found between semen traits, plasma testosterone and testicular volume (Spearman's test). No season variation was detected throughout the year for semen traits, plasma testosterone and testicular volume ($p>0.05$, Friedman's test). The results of this study suggest that the captive jaguars in Brazil are not seasonal, and that semen collections can be performed throughout the year without a perturbation in overall ejaculate quality. However, underlying causes of high percentages of structurally abnormal sperm, found in captive jaguars, need to be investigated mainly to improve semen quality. *Reproduced with permission of CAB.*

**Descriptors:** jaguars, *Panthera onca*, captive, reproductive characteristics, abnormalities, blood chemistry, morphology, motility, pH, seasons, semen, ejaculation traits, testosterone levels.

**Language of Text:** Portuguese.

Morato, R.G., I.T. Verreschi, M.A. Guimaraes, K. Cassaro, C. Pessuti, and R.C. Barnabe (2004). **Seasonal variation in the endocrine-testicular function of captive jaguars (*Panthera onca*).** *Theriogenology* 61(7-8): 1273-81. ISSN: 0093-691X.

**Abstract:** Captive adult male jaguars (*Panthera onca*) from two locations in southeast Brazil were studied to evaluate the effects of season on endocrine and testicular function. For assessment of testicular steroidogenic activity, androgen metabolite concentrations were measured in fecal samples collected one to three times per week over 14 ( n=14 ), 9 ( n=1 ) or 7 months ( n=1 ). To assess seasonality, data were grouped by season (summer: December-February; autumn: March-May; winter: June-August; spring: September-November). Additionally, samples collected in the dry season (March-August) were compared with those collected in the wet season (September-February). There were no differences ( P>0.05 ) in fecal androgen concentrations in samples collected in spring, summer, autumn, and winter ( 480.8+/-50.4 ng/g, 486.4+/-42.0 ng/g, 335.4+/-37.7 ng/g, and 418.6+/-40.4 ng/g dry feces). However, there were differences ( P<0.05 ) in fecal androgen concentrations between the dry and wet seasons ( 380.5+/-28.0 ng/g versus 483.9+/-32.3 ng/g dry feces). Sperm samples, collected from all males twice (approximately 6 months apart) were similar; mean (+/-S.E.M.) motility, concentration and morphology were 57.0 %4.5%, 6.3+/-2.4 x 10(6) ml(-1), and 60.8+/-3.1 %, respectively. In conclusion, androgen metabolite concentrations in the captive male jaguar were not affected by season, but there was a difference between the wet and dry periods. Further research is needed to verify these results.

**Descriptors:** jaguars, *Panthera onca*, captive, seasonal variation, endocrine testicular function, androgen metabolite concentrations, wet periods, dry periods.

Paz, R.C.R.d., D.P. Leme, R.M. Zuge, C. Pessuti, E.F. Santos, and R.C. Barnabe (2003). **Citologia aspirativa por agulha fina (CAAF), em testiculo de onca pintada (*Panthera onca*), utilizada como ferramenta no diagnostico de infertilidade. [Testicular fine needle aspiration cytology as a diagnostic tool for jaguar (*Panthera onca*) infertility].** *Brazilian Journal of Veterinary Research and Animal Science* 40(1/6): 100-107. ISSN: 1413-9596.

**Abstract:** Several methods of testicular punch biopsy were proposed for obtaining materials for histological or cytological evaluation, but did not receive enough clinical acceptance because it was considered to be too traumatic. The fine needle aspiration technique (FNA) is considered a useful, simple and fast method to obtain samples from tissues. The FNA technique was evaluated in captive adult jaguar (*Panthera onca*) to determine the possible causes of infertility. Using a needle and disposable syringe, the testis were aspirated. The whole aspirate was smeared on a microscope slide and stained using the Diff-quick method. Semen samples were collected by electroejaculation and analysed for pH, total volume, motility, status, total spermatozoa count and morphology. Evaluation of sperm volume, pH, motility vigour and morphology were normal. Cytological examination revealed germinative cells in all testicles. Abnormal forms of double final spermatids were found. These anomalous forms of final spermatids have not yet been noticed in other literatures on FNA. It was concluded that FNA together with other techniques, provide a useful tool in male infertility diagnostics, mainly in endangered species. *Reproduced with permission of CAB.*

**Descriptors:** jaguar, *Panthera onca*, male infertility, diagnostic tool, testicular fine needle aspiration, cytology, FNA, captive adult, pH, total volume, motility.

**Language of Text:** Portuguese, Summary in English.

Paz, R.C.R.d., R.M. Zuge, and V.H. Barnabe (2007). **Frozen Jaguar (*Panthera onca*) sperm capacitation and ability to penetrate zona free hamster oocytes**. *Brazilian Journal of Veterinary Research and Animal Science* 44(5): 337-344. ISSN: 1413-9596.

**Abstract:** Assisted reproductive technologies in endangered species, such as artificial insemination, in vitro fertilization and embryo transfer, can be viewed as one potential approach for safeguarding species. Toward this aim, the objective of this study was to evaluate the fertility of frozen jaguar (*Panthera onca*) sperm and Tyrod's Talp PVA capacitation medium using the hamster zona free oocyte penetration assay. Ejaculates were collected from nine animals using electroejaculation and cryopreserved. Sperm capacitation was performed by swim-up technique using Tyrod's Talp PVA medium at

room temperature. Penetration was considered when the spermatozoa head decondensation was visualized within the oocyte. This assay showed 15.4% penetrations (350/2275 oocytes). Results of this study showed high sperm abnormalities, low sperm quality after cryopreservation, and low percentage of penetrations. However, the penetration results showed that the cryopreserved jaguar's semen can be used for artificial insemination, in vitro fertilization and intra cytoplasmatic sperm injection, supporting the semen bank creation for this specie. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, sperm capacitation, frozen sperm, ability to penetrate, zona free hamster oocytes, artificial insemination, cryopreservation, culture media, ejaculate volume, electroejaculation.
**Language of Text:** Portuguese.

Paz, R.C.R.d., R.M. Zuge, V.H. Barnabe, R.G. Morato, P.A.N. Felippe, and R.C. Barnabe (2000). **Avaliacao da capacidade de penetracao de semen congelado de onca pintada (*Panthera onca*) em oocitos heterologos. [Penetration assay of frozen jaguar (*Panthera onca*) sperm in heterologous oocytes].** *Brazilian Journal of Veterinary Research and Animal Science* 37(1/6): 462-466. ISSN: 1413-9596.
**Abstract:** Assisted reproductive technologies can be viewed as one potential approach for safeguarding wild species. In this study, the fertility of captivity male jaguars (*P. onca*) and different capacitation media using the golden hamster zona free oocyte penetration assay were evaluated. We used frozen/thawed semen from 3 animals housed at Bosque dos Jequitibas, Campinas, Sao Paulo, Brazil to test the Percoll gradient, Swim-up and Swim-up+1 h incubation (5% CO< sub>2</ sub>/38 degrees C), considering as penetration of spermatozoa head decondensation was visualized within the oocyte. It was shown that the results rate was greater for Percoll (26.5%) as compared to Swim-up (8.1%) (X< sub>2</ sub>=19.93; P<0.05). Penetration with Swim-up+1 h incubation (5% CO< sub>2</ sub>/38 degrees C) was not observed. In conclusion, Percoll and Swim-up are efficient methods to perform the golden hamster zona free oocyte penetration assay using frozen/thawed jaguar spermatozoa. The low rate of penetration could be related to the high rate of morphological abnormal spermatozoa observed in the samples examined. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, frozen sperm, penetration assay, heterologous oocytes, captive males, golden hamster, capacitation, oocyte penetration.
**Language of Text:** Portuguese, Summary in English.

Port, C.D., E.R. Maschgan, J. Pond, and D.G. Scarpelli (1981). **Multiple neoplasia in a jaguar (*Panthera onca*).** *Journal of Comparative Pathology* 91(1): 115-22. ISSN: 0021-9975.
**Descriptors:** jaguar, *Panthera onca*, multiple neoplasia, adrenal gland neoplasms, multiple myeloma, pathology, multiple primary pathology, pheochromocytoma.

Ramos Vara, J.A., M.A. Miller, and D. Preziosi (2000). **Glucagonoma in a jaguar (*Panthera onca*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 31(4): 563-5. ISSN: 1042-7260.
**Abstract:** An obese adult jaguar (*Panthera onca*) was euthanized because of progressive lameness. Two 3-cm-diameter pancreatic nodules were identified as islet cell tumors, which were positive with immunohistochemical stains for glucagon, neuron-specific enolase, chromogranin A, and synaptophysin. The jaguar did not present clinical evidence of hyperglucagonemia.
**Descriptors:** jaguar, *Panthera onca*, obese adult, glucagonoma, pancreatic neoplasms, progressive lameness, euthanasia, complications, islet cell tumors.

Ritscher, D. (1989). **Veterinarmedizinische Probleme bei der Haltung und Zucht von Pumas (*Puma concolor*) und Jaguaren (*Panthera onca*). [Veterinary problems associated with keeping and breeding pumas and jaguars].** In: *Erkrankungen der Zootiere Verhandlungsbericht des 31 Internationalen Symposiums uber die Erkrankungen der Zoo und Wildtiere, Dortmund 1989,*Berlin, German Democratic Republic: Akademie Verlag, p. 55-60. ISBN: 3055006518.
**Descriptors:** jaguar, *Panthera onca*, zoo animals, keeping, breeding, veterinary problems, helminthoses, Felidae, conference information.
**Language of Text:** German, Summaries in English, French and Russian.

Rossi Junior, J.L. (2003). **Estudo comparativo entre os achados clinicos de lesoes orais em onca-pintada (*Panthera onca*) e sucuarana (*Puma concolor*) mantidas em cativeiro no Estado de Sao Paulo e individuos de vida livre no Pantanal sul mato-grossense. [Comparative study between clinical findings of oral lesions in jaguars (*Panthera onca*) and pumas (*Puma concolor*) from captivity (State of Sao Paulo) and free-ranging individuals from the South Pantanal (State of Mato Grosso)].** *Arquivos De Ciencias Veterinarias e Zoologia Da UNIPAR* 6(1): 91-92. ISSN: 1415-8167.
**Descriptors:** jaguar, *Panthera onca*, cougar, *Puma concolor*, oral lesions, clinical findings, dental caries, mouth diseases, periodontal diseases, tooth diseases, wild animals, zoo animals, species comparative study.
**Language of Text:** Portuguese, Summary in English and Spanish.

Rossi Junior, J.L., M.A. Gioso, J.C.R.d. Silva, and M.F.V. Marvulo (2003). **Prevalencia de**

**maloclusao em *Panthera onca* e *Puma concolor* mantidas em cativeiro no Estado de Sao Paulo. [Prevalence of the maloclusion in *Panthera onca* and *Puma concolor* in captivity in the State of Sao Paulo].** *Brazilian Journal of Veterinary Research and Animal Science* 40(1/6): 155-160. ISSN: 1413-9596.

**Abstract:** Some international papers on wild animal dentistry deal with animals in captivity or free-ranging animals from diverse geographic distributions. So far, none has been published on the great neotropical felines like *Panthera onca* and *Puma concolor*. This study was conducted to determine the prevalence of malocclusion in neotropical felines kept in various institutions in Sao Paulo, Brazil. A total of 42 jaguars (*Panthera onca*) and 36 pumas (*Puma concolor*) kept in captivity in 18 institutions in Sao Paulo were included in the study (May 1999-October 2000). All animals were examined for malocclusion. The teeth were identified and examined using a dental explorer. Malocclusion was observed in 20 jaguars (47.61%) and 2 pumas (5.55%). The animals with malocclusion showed no signs of difficulty in apprehension or chewing, eventhough the condition was observed in the region of the teeth with more reduced interproximal space. The only sequela of this condition was the accumulation and difficult removal of dental plaques. *Reproduced with permission of CAB.*

**Descriptors:** jaguars, *Panthera onca*, cougar, *Puma concolor*, maloclusion, prevalence, dentistry, disease surveys, epidemiology, tooth diseases, zoo animals, captivity.

**Language of Text:** Portuguese, Summary in English.

Ruiz Garcia, M., E. Payan, A. Murillo, and D. Alvarez (2006). **DNA microsatellite characterization of the jaguar (*Panthera onca*) in Colombia.** *Genes and Genetic Systems* 81(2): 115-27. ISSN: 1341-7568.

**Abstract:** The Colombian jaguar population is thought to contain two different subspecies, *Panthera onca centralis* and *Panthera onca onca*. The genetic structure of this population was evaluated using 12 microsatellite loci (n = 62 samples). In addition, 22 jaguar DNA samples from Guatemala, Paraguay, Peru, Bolivia, Venezuela and Brazil were analyzed for these microsatellite loci (n = 84 samples). The results of this study indicate six primary themes. First, the levels of gene diversity were very high. Second, the majority of the loci analyzed showed an absence of Hardy-Weinberg equilibrium, probably due to the Wahlund effect (= population subdivision). Third, several microsatellite loci showed significant heterogeneity between the two supposed subspecies in the country. Nevertheless, gene flow was present between them, and heterogeneity was relatively low, although the assignment analyses showed good classification of the jaguars studied into their respective subspecies. Fourth, the long-term historical effective population sizes were calculated through a maximum likelihood procedure for single and multi-step mutation models. Fifth, seven out of twelve DNA microsatellites studied significantly deviated from a single-step mutation model. However, the overall mean multi-step mutation percentage for these 12 DNA microsatellites was only 6%. Therefore, 94% of mutations were uni-step. Sixth, no bottleneck events were detected in the Colombian jaguar population overall.

**Descriptors:** jaguar, *Panthera onca*, DNA microsatellite characterization, population genetic structure, subspecies, heterogeneity, gene flow, Guatemala, Paraguay, Peru, Bolivia, Venezuela, Brazil, Columbia.

Sellinger, R.L. and J.C. Ha (2005). **The effects of visitor density and intensity on the behavior of two captive jaguars (*Panthera onca*).** *Journal of Applied Animal Welfare Science JAAWS* 8(4): 233-44. ISSN: 1088-8705.

**Abstract:** Several researchers have reported significant effects of visitor density and intensity on captive animal behavior. This study determined whether this was the case for 2 captive jaguars housed at the Woodland Park Zoo, Seattle, WA. Subjects were monitored for changes in behavior as a function of visitor density and intensity. The jaguars were observed for 8 hr per week for 29 weeks--March 31 until October 11, 1998--for a total of 230 hr. Continuous frequency sampling was used, and visitor density and intensity were recorded every minute. Parametric statistics were used to test for correlations between behavior and density, intensity, or a combination of the two. Both density and intensity were significant for time spent non-visible for both cats, and intensity showed a significant effect on the female's pacing behavior. In addition, the male cat exhibited a trend for increased aggression based on both visitor density and intensity and a trend of intensity affecting his social behavior. In conclusion, both density and intensity had a significant effect on behavior, with intensity showing a larger effect.

**Descriptors:** jaguar, *Panthera onca*, animal welfare, behavior, visitor density, visitor intensity, effects, behavior, captive, zoo animals, housing, aggression, population density, time factors, pacing behavior, social behavior, Woodland Park Zoo, Seattle, WA. U.S.

Selvam, N.P., B.S. Bonal, and R.K. Sharma (2005). **Successful breeding and hand rearing of jaguar cub *Panthera onca* in the National Zoological Park, New Delhi**. *Zoos' Print* 20(11): 23-25. ISSN: 0971-6378.

**Descriptors:** jaguar, *Panthera onca*, cub, hand rearing, successful breeding, artificial rearing, zoological gardens, National Zoological Park.,New Delhi, India.

Senthilkumar, K., M.G. Jayathangaraj, S. Ramesh, K. Devaki, and P.N. Khan (2006). **Therapeutic approach in fungal infection in a Jaguar *Panthera onca*.** *Zoos' Print Journal* 21(10): 2440-2441. ISSN: 0971-6378.

**Abstract:** An incidence of dermatomycosis is reported in a black jaguar (*P. onca*). Frequent pawing of the cheek regions was reported by an animal keeper of the Arignar Arna Zoological Park (Tamil Nadu, India) in this animal for 2 days. Closer examination of the felid revealed rubbing of both cheek regions on the fence of the enclosure along with intermittent pawing and hair loss. The jaguar was physically restrained in the squeeze cage and direct skin scrapings and faecal samples were obtained and examined. A detailed examination of the felid further revealed presence of wounds near the cheek region and the animal was treated with an injection of 500 mg of ampicillin and cloxacillin intramuscularly in the morning and orally in the evening which was continued daily for 7 days, along with local application of povidone iodine solution sprayed from a 20 ml syringe externally, from a distance, over the discoloured alopecic patch in the cheek region. Ten grams of griseofulvin was administered orally with meat, daily for 2 weeks. The animal's condition dramatically improved over this period and no pruritus or pawing was reported by the animal keeper. The skin scrapings examined revealed evidence of fungal infections and based on both macroscopic and microscopic appearance of growth in Saboraud's medium, *Microsporum* sp. infection was identified. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, fungal infection, therapeutic approach, ampicillin, animal diseases, antifungal agents, cloxacillin, dermatomycoses, drug therapy, griseofulvin, zoo animals, *Microsporum*.

Silver, S.C., L.E.T. Ostro, L.K. Marsh, L. Maffei, A.J. Noss, M.J. Kelly, R.B. Wallace, H. Gomez, and G. Ayala (2004). **The use of camera traps for estimating jaguar *Panthera onca* abundance and density using capture/recapture analysis**. *Oryx* 38(2): 148-154. ISSN: 0030-6053.

**Abstract:** Across their range jaguars *Panthera onca* are important conservation icons for several reasons: their important role in ecosystems as top carnivores, their cultural and economic value, and their potential conflicts with livestock. However, jaguars have historically been difficult to monitor. This paper outlines the first application of a systematic camera trapping methodology for abundance estimation of jaguars. The methodology was initially developed to estimate tiger abundance in India. We used a grid of camera traps deployed for 2 months, identified individual animals from their pelage patterns, and estimated population abundance using capture-recapture statistical models. We applied this methodology in a total of five study sites in the Mayan rain forest of Belize, the Chaco dry forest of Bolivia, and the Amazonian rain forest of Bolivia. Densities were 2.4-8.8 adult individuals per 100 km2, based on 7-11 observed animals, 16-37 combined 'captures' and 'recaptures', 486-2,280 trap nights, and sample areas of 107-458 km2. The sampling technique will be used to continue long-term monitoring of jaguar populations at the same sites, to compare with further sites, and to develop population models. This method is currently the only systematic population survey technique for jaguars, and has the potential to be applied to other species with individually recognizable markings. *Reproduced with permission of CAB.*
**Descriptors:** jaguars, *Panthera onca*, camera traps, use, analysis, estimating, abundance, density, population monitoring, identify individuals, conservation.

Sims, C. (2001). **Morphological distinctions in skulls of five felids (*Puma concolor, Panthera onca, Panthera pardus, Uncia uncia, and Acinonyx jubatus*)**. *Journal of Morphology* 248(3): 285. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skull, morphological distinctions, skeletal system, cougar, jaguar, leopard, snow leopard, species comparison study.
**Notes:** Sixth International Congress of Vertebrate Morphology, Jena, Germany; July 21-26, 2001.

Timm, R.M. and R.D. Price (1994). **A new species of *Felicola* (*Phthiraptera*: Trichodectidae) from a Costa Rican jaguar, *Panthera onca* (Carnivora: Felidae)**. *Proceedings of the Biological Society of Washington* 107(1): 114-118. ISSN: 0006-324X.
**Abstract:** A new species of chewing louse, *Felicola (Lorisicola) oncae* sp. nov. is described from a jaguar, *Panthera onca* taken in Costa Rica. Although this louse is based only on a single male specimen, its morphological distinctiveness and occurrence on a big cat of the genus *Panthera* make its discovery and description of special significance. The genus *Felicola* now contains 55 species, which can be grouped into 4 subgenera: *Felicola, Lorisicola, Paradoxuroecus* and *Suricatoecus*. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, ectoparasites, new species, chewing louse, *Felicola (Lorisicola) oncae*, taxonomy, wild animals, carnivores, Felidae, Mallophaga, mammals, Phthiraptera, Trichodectidae, Costa Rica.
**Language of Text:** Spanish.

Toniollo, G.H., D.d. Faria Junior, E. Lega, C.M. Batista, and N. Nunes (2000). **Piometra na especie felina - relato de um caso em. [Pyometra in feline species - report of a case in *Panthera onca*.]**. *Brazilian Journal of Veterinary Research and Animal Science* 37(1/6): 166-168. ISSN: 1413-9596.
**Descriptors:** jaguar, *Panthera onca*, pyometra, case report, medical treatment, surgery.
**Language of Text:** Portuguese, Summary in English.

Ulehlova, L., H. Burda, and L. Voldrich (1984). **Involution of the auditory neuro-epithelium in a tiger (*Panthera tigris*) and a jaguar (*Panthera onca*).** *Journal of Comparative Pathology* 94(1): 153-7. ISSN: 0021-9975.

**Abstract:** Numerical atrophy of the hair cells of the organ of Corti of the inner ear in a 14-year-old tiger and a 17-year-old jaguar is described. The decrease in number of sensory hair cells is considered to represent physiological atrophy caused by the process of ageing. The findings are compared with previous observations on man, guinea-pigs, shrews, and bats. The development of the physiological involution of the hearing neuro-epithelium is discussed.

**Descriptors:** jaguar, *Panthera onca*, tiger, *Panthera tigris*, carnivora anatomy, histology, organ of Corti, hair cells, inner ear, auditory neuro epithelium, aging, atrophy, cell survival, man, guinea pigs, shrew, bats, atrophy.

Viau, P., E.C.G. Felippe, and C.A.d. Oliveira (2005). **Quantificacao de esteroides fecais de femeas de onca-pintada (*Panthera onca*) mantidas em cativeiro: validacao da tecnica. [Fecal steroid and quantification in captive jaguars (*Panthera onca*): validation of a method].** *Brazilian Journal of Veterinary Research and Animal Science* 42(4): 262-270. ISSN: 1413-9596.

**Abstract:** The ovarian function of captive jaguars (2 adults and 3 prepubertals) was assessed by extraction and quantification of faecal oestrogens and progestins. Faecal samples were obtained from the jaguars 2-7 times per week for 16-18 months. The validation of the solid phase radioimmunoassay for progesterone and 17 beta -estradiol was performed using the faecal extracts. The mean concentrations of faecal oestrogen (ng/g of dry faeces) in prepubertal and adult jaguars were 10.97 (ranged from 0.28 to 59.16) and 68.99 (ranged from 3.50 to 609.37), respectively. The faecal progestins ( micro g/g of dry faeces) had mean concentrations of 0.26 (ranged from 0.02 to 4.44) and 0.85 (ranged from 0.08 to 6.51) in prepubertal and adult jaguars, respectively. *Reproduced with permission of CAB.*

**Descriptors:** jaguar, *Panthera onca*, ovarian function, fecal steroid, quantification, method, validation, fecal estrogens, progesterones, concentration, captive.

**Language of Text:** Portuguese, Summary in English.

Villoldo, A. (2007). **Jaguar Medicine.** *Alternative Therapies in Health and Medicine* 13(5): 14-6. ISSN: 1078-6791.

**Descriptors:** jaguar, *Panthera onca*, medicine, veterinary care, treatment, therapies, diesease, injury, health.

Waelbers, T., T. Bosmans, M. Risselada, P. Verleyen, and I. Polis (2007). **Inhalation anesthesia with isoflurane in a black jaguar (*Panthera onca*) for surgical repair of a fractured mandible**. *Vlaams Diergeneeskundig Tijdschrift* 76(2): 138-145. ISSN: 0303-9021.

**Abstract:** A black jaguar (*Panthera onca*) was anesthetized with a combination of medetomidine, ketamine and isoflurane in oxygen for radiological examination and surgical repair of a fractured mandible. Since a non-domesticated cat is potentially dangerous, induction of anesthesia was performed by intramuscular injection using a mechanical squeeze cage. The cardiopulmonary parameters during anesthesia remained within normal ranges; only a small increase in the respiration rate was recorded 75 minutes after intubation. This hyperventilation was treated with buprenorphine (for additional analgesia) and an increased inspiratory fraction of isoflurane. Recovery was rather slow after 165 minutes of general anesthesia, so atipamezole was administered. Ten minutes after the intramuscular injection of atipamezole, the animal started to recover. Meloxicam and buprenorphine were used for post-operative analgesia. *Reproduced with permission of CAB.*

**Descriptors:** jaguar, *Panthera onca*, fractured mandible, surgical repair, anesthesia, anesthetics, bone fractures, clinical aspects, diagnosis, fracture fixation, inhaled anesthetics, isoflurane, ketamine, mandible, medetomidine, pharmacodynamics, respiration rate.

**Language of Text:** Dutch.

Weckel, M., W. Giuliano, and S. Silver (2006). **Jaguar (*Panthera onca*) feeding ecology: distribution of predator and prey through time and space**. *Journal of Zoology* 270(1): 25-30. ISSN: 0952-8369.

**Abstract:** Jaguars *Panthera onca* inhabiting tropical or subtropical evergreen moist forest have often been classified as opportunistic predators because they consume prey relative to its availability. However, these studies failed to address simultaneously the distribution of predator and prey through time and space, which may lead to an incomplete or erroneous understanding of jaguar foraging strategies. In this study, we reconstructed jaguar diet from scat, and used camera traps to investigate jaguar prey availability and the distribution of jaguar and its prey through space and time. The study was conducted in the northeast region of the Cockscomb Basin Wildlife Sanctuary, Belize, from 1 June to 24 November 2002. We focused our examination of predator-prey temporal and spatial relations on forest infrastructure comprising man-made paths, small mammal trails, tapir *Tapirus bairdi* trail and trail-less, forested areas as they represent distinct habitats for prey selection. Overall, we observed high overlap between the prey used and available,

suggestive of opportunistic foraging. However, jaguars exhibited selective tendencies in discriminating between larger prey. Jaguars used collared peccary *Tayassu tajacu* greater than its availability, while preying upon the equally abundant and similarly distributed white-lipped peccary *Tayassu pecari* and tapir less than predicted based upon availability. Armadillo *Dasypus novemcinctus* and paca *Agouti paca*, 56.6% of total consumption, were consumed relative to availability but exhibited low spatial overlap with jaguar. Armadillo and paca used trail-less, forested areas and small mammal trails not used by jaguar and were photographed more frequently at greater distances from man-made paths, major thoroughfares for jaguars. This study suggests that although forest jaguars use prey relative to its abundance, jaguars may rely on foraging strategies other than chance encounters for exploiting prey. *Reproduced with permission of CAB.*

**Descriptors:** jaguar, *Panthera onca*, behaviour, diet, feeding behaviour, foraging strategies, predators, prey, small mammals, spatial distribution, tropical rain forests, Agouti, *Dasypus novemcinctus*, *Tayassu tajacu*, Cockscomb Basin Wildlife Sanctuary, Belize.

Weissengruber, G.E., G. Forstenpointner, G. Peters, A. Kubber Heiss, and W.T. Fitch (2002). **Hyoid apparatus and pharynx in the lion (*Panthera leo*), jaguar (*Panthera onca*), tiger (*Panthera tigris*), cheetah (*Acinonyx jubatus*) and domestic cat (*Felis silvestris f. catus*).** *Journal of Anatomy* 201(3): 195-209. ISSN: 0021-8782.

**Abstract:** Structures of the hyoid apparatus, the pharynx and their topographical positions in the lion, tiger, jaguar, cheetah and domestic cat were described in order to determine morphological differences between species or subfamilies of the Felidae. In the lion, tiger and jaguar (species of the subfamily Pantherinae) the Epihyoideum is an elastic ligament lying between the lateral pharyngeal muscles and the Musculus (M.) thyroglossus rather than a bony element like in the cheetah or the domestic cat. The M. thyroglossus was only present in the species of the Pantherinae studied. In the lion and the jaguar the Thyrohyoideum and the thyroid cartilage are connected by an elastic ligament, whereas in the tiger there is a synovial articulation. In adult individuals of the lion, tiger and jaguar the ventral end of the tympanohyal cartilage is rotated and therefore the ventral end of the attached Stylohyoideum lies caudal to the Tympanohyoideum and the cranial base. In newborn jaguars the Apparatus hyoideus shows a similar topographical position as in adult cheetahs or domestic cats. In adult Pantherinae, the Basihyoideum and the attached larynx occupy a descended position: they are situated near the cranial thoracic aperture, the pharyngeal wall and the soft palate are caudally elongated accordingly. In the Pantherinae examined the caudal end of the soft palate lies dorsal to the glottis. Differences in these morphological features between the subfamilies of the Felidae have an influence on specific structural characters of their vocalizations.

**Descriptors:** cheetah, *Acinonyx jubatus*, lion, *Panthera leo*, jaguar, *Panthera onca*, tiger, *Panthera tigris*, domestic cat, *Felis silvestris f. catus*, anatomy, histology, hyoid apparatus, pharynx, anatomy, histology, hyoid bone growth, development, pharyngeal muscles anatomy, histology, pharyngeal muscles growth, development, pharynx, growth, development.

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### Jaguar - Anatomy

Azevedo, M.H., T.A. Paula, M.K. Balarini, S.L. Matta, J.V. Peixoto, F.L. Guiao Leite, J.L.J. Rossi, and E.P. da Costa (2008). **Organization and quantification of the elements in the intertubular space in the adult jaguar testis (*Panthera onca*, LINNAEUS, 1758).** *Micron Oxford, England 1993* 39(8): 1166-70. ISSN: 0968-4328.

**Abstract:** The endocrine portion of mammal testicle is represented by Leydig cells which, together with connective cells, leukocytes, blood and lymphatic vessels, form the intertubular space. The arrangement and proportion of these components vary in the different species of mammals and form mechanisms that keep the testosterone level - the main product of the Leydig cell - two to three times higher in the interstitial fluid than in the testicular blood vessels and 40-250 times higher in these than in the peripheral blood. Marked differences are observed among animal species regarding the abundance of Leydig cells, loose connective tissue, development degree and location of the lymphatic vessels and their topographical relationship with seminiferous tubules. In the jaguar about 13% of the testicular parenchyma is occupied by Leydig cells, 8.3% by connective tissue and 0.3% by lymphatic vessels. Although included in standard II, as described in the literature, concerning the arrangement of the intertubular space, the jaguar has grouped lymphatic vessels in the intertubular space instead of isolated ones. In the jaguar the average volume of the Leydig cell was 2386mum3 and its average nuclear diameter was 7.7mum. A great quantity of 2.3mum diameter lipidic drops was observed in the Leydig cell cytoplasm of the jaguar. The Leydig cells in the jaguar occupy an average 0.0036% of the body weight and the average number per gram of testicle was within the range for most mammals: between 20 and 40million.

**Descriptors:** jguar, *Panthera onca*, testis, intertubular space, elements, organization, quantification, adult, Leydig cells, lymphatic vessels, blood vessels, leukocytes.

Lohse, C.L. and Y.M. Baba (1982). **Comparative anatomy of intervertebral discs and related structures in the cat (*Felis catus*) and jaguar (*Panthera onca*)**. *Anatomia Histologia Embryologia* 11(4): 334-342. ISSN: 0340-2096.

**Abstract:** A female jaguar and 15 adult cats of both sexes were studied; of the cats, 12 were embalmed, and three perfused with heparinized saline only. All intervertebral disks cranial to the sacrum were examined, and the craniocaudal lengths of individual disks and vertebrae were recorded. The surface areas of nucleus pulposus and annulus fibrosus of disks sectioned transversely were measured in four cats and the jaguar. In the jaguar, the total disk length represented about 25% of the total vertebral column length (as it does in man) while the corresponding value for cats was 17.3-19.8%. The variations in area of the nucleus and annulus are also tabulated, and the relevance of the findings to the frequency of disk prolapse is discussed. *Reproduced with permission of CAB.*

**Descriptors:** jaguar, *Panthera onca*, cats, *Felis catus*, intervertebral discs, related structures, comparative anatomy, disks, vertebrae, vertebral column.

**Language of Text:** German, Spanish, and French.

Sims, C. (2001). **Morphological distinctions in skulls of five felids (*Puma concolor, Panthera onca, Panthera pardus, Uncia uncia, and Acinonyx jubatus*)**. *Journal of Morphology* 248(3): 285. ISSN: 0362-2525.

**Descriptors:** cheetah, *Acinonyx jubatus*, skull, morphological distinctions, skeletal system, cougar, jaguar, leopard, snow leopard, species comparison study.
**Notes:** Sixth International Congress of Vertebrate Morphology, Jena, Germany; July 21-26, 2001.

Weissengruber, G.E., G. Forstenpointner, G. Peters, A. Kubber Heiss, and W.T. Fitch (2002). **Hyoid apparatus and pharynx in the lion (*Panthera leo*), jaguar (*Panthera onca*), tiger (*Panthera tigris*), cheetah (*Acinonyx jubatus*) and domestic cat (*Felis silvestris f. catus*).** *Journal of Anatomy* 201(3): 195-209. ISSN: 0021-8782.
**Abstract:** Structures of the hyoid apparatus, the pharynx and their topographical positions in the lion, tiger, jaguar, cheetah and domestic cat were described in order to determine morphological differences between species or subfamilies of the Felidae. In the lion, tiger and jaguar (species of the subfamily Pantherinae) the Epihyoideum is an elastic ligament lying between the lateral pharyngeal muscles and the Musculus (M.) thyroglossus rather than a bony element like in the cheetah or the domestic cat. The M. thyroglossus was only present in the species of the Pantherinae studied. In the lion and the jaguar the Thyrohyoideum and the thyroid cartilage are connected by an elastic ligament, whereas in the tiger there is a synovial articulation. In adult individuals of the lion, tiger and jaguar the ventral end of the tympanohyal cartilage is rotated and therefore the ventral end of the attached Stylohyoideum lies caudal to the Tympanohyoideum and the cranial base. In newborn jaguars the Apparatus hyoideus shows a similar topographical position as in adult cheetahs or domestic cats. In adult Pantherinae, the Basihyoideum and the attached larynx occupy a descended position: they are situated near the cranial thoracic aperture, the pharyngeal wall and the soft palate are caudally elongated accordingly. In the Pantherinae examined the caudal end of the soft palate lies dorsal to the glottis. Differences in these morphological features between the subfamilies of the Felidae have an influence on specific structural characters of their vocalizations.
**Descriptors:** cheetah, *Acinonyx jubatus*, lion, *Panthera leo*, jaguar, *Panthera onca*, tiger, *Panthera tigris*, domestic cat, *Felis silvestris f. catus*, anatomy, histology, hyoid apparatus, pharynx, anatomy, histology, hyoid bone growth, development, pharyngeal muscles anatomy, histology, pharyngeal muscles growth, development, pharynx, growth, development.

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### Jaguar - Behavior

Sellinger, R.L. and J.C. Ha (2005). **The effects of visitor density and intensity on the behavior of two captive jaguars (*Panthera onca*).** *Journal of Applied Animal Welfare Science JAAWS* 8(4): 233-44. ISSN: 1088-8705.

**Abstract:** Several researchers have reported significant effects of visitor density and intensity on captive animal behavior. This study determined whether this was the case for 2 captive jaguars housed at the Woodland Park Zoo, Seattle, WA. Subjects were monitored for changes in behavior as a function of visitor density and intensity. The jaguars were observed for 8 hr per week for 29 weeks--March 31 until October 11, 1998--for a total of 230 hr. Continuous frequency sampling was used, and visitor density and intensity were recorded every minute. Parametric statistics were used to test for correlations between behavior and density, intensity, or a combination of the two. Both density and intensity were significant for time spent non-visible for both cats, and intensity showed a significant effect on the female's pacing behavior. In addition, the male cat exhibited a trend for increased aggression based on both visitor density and intensity and a trend of intensity affecting his social behavior. In conclusion, both density and intensity had a significant effect on behavior, with intensity showing a larger effect.

**Descriptors:** jaguar, *Panthera onca*, animal welfare, behavior, visitor density, visitor intensity, effects, behavior, captive, zoo animals, housing, aggression, population density, time factors, pacing behavior, social behavior, Woodland Park Zoo, Seattle, WA. U.S.

Weckel, M., W. Giuliano, and S. Silver (2006). **Jaguar (*Panthera onca*) feeding ecology: distribution of predator and prey through time and space**. *Journal of Zoology* 270(1): 25-30. ISSN: 0952-8369.

**Abstract:** Jaguars *Panthera onca* inhabiting tropical or subtropical evergreen moist forest have often been classified as opportunistic predators because they consume prey relative to its availability. However, these studies failed to address simultaneously the distribution of predator and prey through time and space, which may lead to an incomplete or erroneous understanding of jaguar foraging strategies. In this study, we reconstructed jaguar diet from scat, and used camera traps to investigate jaguar prey availability and the distribution of jaguar and its prey through space and time. The study was conducted in the northeast region of the Cockscomb Basin Wildlife Sanctuary, Belize, from 1 June to 24 November 2002. We focused our examination of predator-prey temporal and spatial relations on forest infrastructure comprising man-made paths, small mammal trails, tapir *Tapirus bairdi* trail and trail-less, forested areas as they represent distinct habitats for prey selection. Overall, we observed high overlap between the prey used and available, suggestive of opportunistic foraging. However, jaguars exhibited selective tendencies in discriminating between larger prey. Jaguars used collared peccary *Tayassu tajacu* greater than its availability, while preying upon the equally abundant and similarly distributed white-lipped peccary *Tayassu pecari* and tapir less than predicted based upon availability. Armadillo *Dasypus novemcinctus* and paca *Agouti paca*, 56.6% of total consumption, were consumed relative to availability but exhibited low spatial overlap with jaguar. Armadillo and paca used trail-less, forested areas and small mammal trails not used by jaguar and were photographed more frequently at greater distances from man-made

paths, major thoroughfares for jaguars. This study suggests that although forest jaguars use prey relative to its abundance, jaguars may rely on foraging strategies other than chance encounters for exploiting prey. *Reproduced with permission of CAB.*

**Descriptors:** jaguar, *Panthera onca*, behaviour, diet, feeding behaviour, foraging strategies, predators, prey, small mammals, spatial distribution, tropical rain forests, Agouti, *Dasypus novemcinctus*, *Tayassu tajacu*, Cockscomb Basin Wildlife Sanctuary, Belize.

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### Jaguar - Breeding and Reproduction

Azevedo, M.H., T.A. Paula, M.K. Balarini, S.L. Matta, J.V. Peixoto, F.L. Guiao Leite, J.L.J. Rossi, and E.P. da Costa (2008). **Organization and quantification of the elements in the intertubular space in the adult jaguar testis (*Panthera onca*, LINNAEUS, 1758).** *Micron Oxford, England 1993* 39(8): 1166-70. ISSN: 0968-4328.

**Abstract:** The endocrine portion of mammal testicle is represented by Leydig cells which, together with connective cells, leukocytes, blood and lymphatic vessels, form the intertubular space. The arrangement and proportion of these components vary in the different species of mammals and form mechanisms that keep the testosterone level - the main product of the Leydig cell - two to three times higher in the interstitial fluid than in the testicular blood vessels and 40-250 times higher in these than in the peripheral blood. Marked differences are observed among animal species regarding the abundance of Leydig cells, loose connective tissue, development degree and location of the lymphatic vessels and their topographical relationship with seminiferous tubules. In the jaguar about 13% of the testicular parenchyma is occupied by Leydig cells, 8.3% by connective tissue and 0.3% by lymphatic vessels. Although included in standard II, as described in the literature, concerning the arrangement of the intertubular space, the jaguar has grouped lymphatic vessels in the intertubular space instead of isolated ones. In the jaguar the average volume of the Leydig cell was 2386mum3 and its average nuclear diameter was 7.7mum. A great quantity of 2.3mum diameter lipidic drops was observed in the Leydig cell cytoplasm of the jaguar. The Leydig cells in the jaguar occupy an average 0.0036% of the body weight and the average number per gram of testicle was within the range for most mammals: between 20 and 40million.

**Descriptors:** jguar, *Panthera onca*, testis, intertubular space, elements, organization, quantification, adult, Leydig cells, lymphatic vessels, blood vessels, leukocytes.

Azevedo, M.H.F.d., T.A.R.d. Paula, S.L.P.d. Matta, C.C. Fonseca, and M.T.D.d. Neves (2006). **Morfometria testicular e o tubulo seminifero da onca-pintada. [Testicular morphometry and the seminiferous tubule in adult Jaguars (*Panthera onca*)].** *Revista Ceres* 53(307): 374-381. ISSN: 0034-737X.

**Abstract:** The composition of the testicular parenchyma and the relative size of the testicles can provide valuable information regarding the reproductive physiology and mating strategy of an animal. Five adult jaguars were investigated using testicular biopsy to determine the relationship between the morphometry of the testicles and seminiferous tubule with their corporal mass. The median corporal weight of the jaguars used in the study was 78.5 kg, of which about 0.034% corresponded to the testicular mass and 0.022% to the seminiferous tubules, which represented about 77.7% of the testicular parenchyma. The average diameter of the seminiferous tubules was 257 micro m and the average thickness was about 90 micro m. Jaguars have about 12.2 m of seminiferous tubules by testicular gram. *Reproduced with permission of CAB Abstracts.*

**Descriptors:** jaguar, *Panthera onca*, anatomy, morphology, morphometrics, seminiferous tubules, testes, testicular parenchyma, composition, reproductive physiology.

**Language of Text:** Portuguese, Summary in English.

Costa, G.M., H. Chiarini Garcia, R.G. Morato, R.L. Alvarenga, and L.R. Franca (2008). **Duration of**

**spermatogenesis and daily sperm production in the jaguar (*Panthera onca*).** *Theriogenology* 70(7): 1136-46. ISSN: 0093-691X.

**Abstract:** The jaguar, like most wild felids, is an endangered species. Since there are few data regarding reproductive biology for this species, our main goal was to investigate basic aspects of the testis and spermatogenesis. Four adult male jaguars were utilized; to determine the duration of spermatogenesis, two animals received an intratesticular injection of H(3)-thymidine. Mean (+/-SEM) testis weight and the gonadosomatic index were 17.7+/-2.2g and 0.05+/-0.01%, respectively, whereas the seminiferous tubules and the Leydig cells volume density were 74.7+/-3.8 and 16.7+/-1.6%. Eight stages of spermatogenesis were characterized, according to the tubular morphology system and acrosome development. Each spermatogenic cycle and the entire spermatogenic process (based on 4.5 cycles) lasted approximately 12.8+/-0.01 and 57.7+/-0.07 d. The number of Sertoli and Leydig cells per gram of testis was 29+/-4 x 10(6) and 107+/-12 x 10(6). Based on the number of round spermatids per pachytene spermatocyte (2.8+/-0.3:1; meiotic index); significant cell loss (30%) occurred during the two meiotic divisions. There were approximately eight spermatids for each Sertoli cell (Sertoli cell efficiency), whereas the daily sperm production per gram of testis was 16.9+/-1.2 x 10(6). We expect that in the near future, the knowledge obtained in the present investigation will facilitate, utilizing germ cell transplantation, preservation of the germinal epithelium and the ability to generate sperm from jaguars in testes of domestic cats.

**Descriptors:** Jaguar, *Panthera onca*, spermatogenesis, duration, sperm production, reproductive biology, testis, seminiferous tubules, Leydig cells, sertoli cells.

Morato, R.G., V.A. Conforti, F.C. Azevedo, A.T. Jacomo, L. Silveira, D. Sana, A.L. Nunes, M.A. Guimaraes, and R.C. Barnabe (2001). **Comparative analyses of semen and endocrine characteristics of free-living versus captive jaguars (*Panthera onca*).** *Reproduction Cambridge, England* 122(5): 745-51. ISSN: 1470-1626.

**Abstract:** Semen and blood samples were obtained from free-living (n = 6) and captive (n = 8) jaguars (*Panthera onca*) to compare reproductive characteristics between the two populations. Semen samples were analysed for volume (ml), percentage of motile spermatozoa, rate of forward progression (0-5), concentration (10(6) ml(-1)), total sperm count (10(6)) and sperm morphology. Serum testosterone concentration was determined by radioimmunoassay. Although ejaculate volume was greater in captive jaguars (n = 47 samples) than in free-living jaguars (n = 7 samples) ($P < 0.05$), the free-living jaguars produced more total spermatozoa (59.3 +/- 12.8 versus 152.0 +/- 88.0 x 10(6), respectively; not significant) with better viability and forward progression (2.8 +/- 0.1 versus 3.5 +/- 0.2, respectively; $P < 0.05$) and more spermatozoa with normal morphology (73.5 +/- 3.9 versus 5.0 +/- 1.1%, respectively; $P < 0.05$). Serum testosterone concentrations were similar for captive and free-living male jaguars (3.1 +/- 0.7 and 2.1 +/- 0.8 ng ml(-1), respectively). In summary, the data showed that semen may be collected successfully from free-living jaguars and evaluated under field conditions to establish normative reproductive values in this species. The results also indicate that jaguars maintained in zoos show inferior seminal characteristics compared with free-living animals.

**Descriptors:** jaguars, *Panthera onca*, free living and captive animals, semen samples, endocrine characteristics, comparative analysis, blood samples, collection, field conditions, normal reproductive values, inferior seminal characteristics in zoo animals.

Morato, R.G., E. Crichton, R.C.R. Paz, R.M. Zuge, C.A. Moura, A.L.V. Nunes, R.H. Teixeira, M.A.B.V. Guimaraes, V.H. Barnabe, R.C. Barnabe, D. Armstrong, and N. Loskutoff (2002). **Superovulacao, recuperacao de oocitos e fecundacao in vitro em onca pintada (*Panthera onca*). [Ovarian stimulation, oocyte recovery and in vitro fertilization in the jaguar (*Panthera onca*)].** *Revista Brasileira De Reproducao Animal* 26(4): 317-324. ISSN: 0102-0803.

**Abstract:** This study was designed to examine the ovarian responsiveness to a gonadotropin regimen in the jaguar, to determine the best time of oocyte recovery, and to investigate the feasibility of using in vitro fertilization to produce jaguar embryos. Jaguars (n=3) were treated with 50 IU porcine FSH in a decreasing regimen over 3 days, followed 24 h later by a single dose of 25 IU porcine LH. Laparoscopy was performed 20-22 h or 24-26 h post-pLH, and ovaries were examined for the presence of follicles (>=2 mm in diameter). Oocyte recoveries were attempted from 165 follicles. Of the 91 COC recovered, 74 were classified as A quality (81%), 6 as B quality (7%), 4 as C quality (4%), and 7 as degenerated (8%). Oocyte recovery rate was high (75%; 86/114) when follicles were aspirated 20-22 h post-pLH. A total of 26 oocytes were co-incubated overnight with 1.0x106/ml fresh sperm. Presumptive zygotes were washed and transferred to culture medium and returned to incubator for 24 h at which time six 2- to 4-cell embryos were observed. The data indicated that jaguars respond to exogenous porcine gonadotropins by producing multiple antral ovarian follicles, laparoscopic retrieval was effectively performed 20-22 h than at 24-26 h post-pLH, and embryos could be produced by IVF. *Reproduced with permission of CAB.*

**Descriptors:** jaguars, *Panthera onca*, ovarian stimulation, oocyte recovery, in vitro fertilization, gonadotropin regimen, ovarian responsiveness, FSH, embryos.

**Language of Text:** Portuguese, Summary in English.

Morato, R.G., M.A.B.d.V. Guimaraes, F. Ferreira, I.T.d.N. Verreschi, and R.C. Barnabe (1999).

**Reproductive characteristics of captive male jaguars (*Panthera onca*)**. *Brazilian Journal of Veterinary Research and Animal Science* 36(4/6): 262-266. ISSN: 1413-9596.
**Abstract:** Ejaculate traits, testicular volume and plasma testosterone levels were determined once every two months for one year in 4 adult male jaguars (*Panthera onca*) housed at the Sao Paulo Zoo, SP, Brazil. Semen samples was collected by electroejaculation and analyzed for pH, total volume, motility (0-100%), status (0-5), total spermatozoa count and morphology. Blood samples was obtained by cephalic venipuncture immediately before the onset of electroejaculation and stored at -20 degrees C until assay of testosterone by RIA. Using a calliper, the length and width of each testis was measured and the values were combined to determine the testicular volume. Semen analyses demonstrated a high percentage of structurally abnormal sperm (mean=51%) and low rates of motility (50.6%) and status (2.2). No correlation was found between semen traits, plasma testosterone and testicular volume (Spearman's test). No season variation was detected throughout the year for semen traits, plasma testosterone and testicular volume ($p>0.05$, Friedman's test). The results of this study suggest that the captive jaguars in Brazil are not seasonal, and that semen collections can be performed throughout the year without a perturbation in overall ejaculate quality. However, underlying causes of high percentages of structurally abnormal sperm, found in captive jaguars, need to be investigated mainly to improve semen quality. *Reproduced with permission of CAB.*
**Descriptors:** jaguars, *Panthera onca*, captive, reproductive characteristics, abnormalities, blood chemistry, morphology, motility, pH, seasons, semen, ejaculation traits, testosterone levels.
**Language of Text:** Portuguese.

Morato, R.G., I.T. Verreschi, M.A. Guimaraes, K. Cassaro, C. Pessuti, and R.C. Barnabe (2004). **Seasonal variation in the endocrine-testicular function of captive jaguars (*Panthera onca*).** *Theriogenology* 61(7-8): 1273-81. ISSN: 0093-691X.
**Abstract:** Captive adult male jaguars (*Panthera onca*) from two locations in southeast Brazil were studied to evaluate the effects of season on endocrine and testicular function. For assessment of testicular steroidogenic activity, androgen metabolite concentrations were measured in fecal samples collected one to three times per week over 14 ( n=14 ), 9 ( n=1 ) or 7 months ( n=1 ). To assess seasonality, data were grouped by season (summer: December-February; autumn: March-May; winter: June-August; spring: September-November). Additionally, samples collected in the dry season (March-August) were compared with those collected in the wet season (September-February). There were no differences ( $P>0.05$ ) in fecal androgen concentrations in samples collected in spring, summer, autumn, and winter ( 480.8+/-50.4 ng/g, 486.4+/-42.0 ng/g, 335.4+/-37.7 ng/g, and 418.6+/-40.4 ng/g dry feces). However, there were differences ( $P<0.05$ ) in fecal androgen concentrations between the dry and wet seasons ( 380.5+/-28.0 ng/g versus 483.9+/-32.3 ng/g dry feces). Sperm samples, collected from all males twice (approximately 6 months apart) were similar; mean (+/-S.E.M.) motility, concentration and morphology were 57.0 %4.5%, 6.3+/-2.4 x 10(6) ml(-1), and 60.8+/-3.1 %, respectively. In conclusion, androgen metabolite concentrations in the captive male jaguar were not affected by season, but there was a difference between the wet and dry periods. Further research is needed to verify these results.
**Descriptors:** jaguars, *Panthera onca*, captive, seasonal variation, endocrine testicular function, androgen metabolite concentrations, wet periods, dry periods.

Paz, R.C.R.d., D.P. Leme, R.M. Zuge, C. Pessuti, E.F. Santos, and R.C. Barnabe (2003). **Citologia aspirativa por agulha fina (CAAF), em testiculo de onca pintada (*Panthera onca*), utilizada como ferramenta no diagnostico de infertilidade. [Testicular fine needle aspiration cytology as a diagnostic tool for jaguar (*Panthera onca*) infertility].** *Brazilian Journal of Veterinary Research and Animal Science* 40(1/6): 100-107. ISSN: 1413-9596.
**Abstract:** Several methods of testicular punch biopsy were proposed for obtaining materials for histological or cytological evaluation, but did not receive enough clinical acceptance because it was considered to be too traumatic. The fine needle aspiration technique (FNA) is considered a useful, simple and fast method to obtain samples from tissues. The FNA technique was evaluated in captive adult jaguar (*Panthera onca*) to determine the possible causes of infertility. Using a needle and disposable syringe, the testis were aspirated. The whole aspirate was smeared on a microscope slide and stained using the Diff-quick method. Semen samples were collected by electroejaculation and analysed for pH, total volume, motility, status, total spermatozoa count and morphology. Evaluation of sperm volume, pH, motility vigour and morphology were normal. Cytological examination revealed germinative cells in all testicles. Abnormal forms of double final spermatids were found. These anomalous forms of final spermatids have not yet been noticed in other literatures on FNA. It was concluded that FNA together with other techniques, provide a useful tool in male infertility diagnostics, mainly in endangered species. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, male infertility, diagnostic tool, testicular fine needle aspiration, cytology, FNA, captive adult, pH, total volume, motility.
**Language of Text:** Portuguese, Summary in English.

Paz, R.C.R.d., R.M. Zuge, and V.H. Barnabe (2007). **Frozen Jaguar (*Panthera onca*) sperm**

**capacitation and ability to penetrate zona free hamster oocytes**. *Brazilian Journal of Veterinary Research and Animal Science* 44(5): 337-344. ISSN: 1413-9596.
**Abstract:** Assisted reproductive technologies in endangered species, such as artificial insemination, in vitro fertilization and embryo transfer, can be viewed as one potential approach for safeguarding species. Toward this aim, the objective of this study was to evaluate the fertility of frozen jaguar (*Panthera onca*) sperm and Tyrod's Talp PVA capacitation medium using the hamster zona free oocyte penetration assay. Ejaculates were collected from nine animals using electroejaculation and cryopreserved. Sperm capacitation was performed by swim-up technique using Tyrod's Talp PVA medium at room temperature. Penetration was considered when the spermatozoa head decondensation was visualized within the oocyte. This assay showed 15.4% penetrations (350/2275 oocytes). Results of this study showed high sperm abnormalities, low sperm quality after cryopreservation, and low percentage of penetrations. However, the penetration results showed that the cryopreserved jaguar's semen can be used for artificial insemination, in vitro fertilization and intra cytoplasmatic sperm injection, supporting the semen bank creation for this specie. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, sperm capacitation, frozen sperm, ability to penetrate, zona free hamster oocytes, artificial insemination, cryopreservation, culture media, ejaculate volume, electroejaculation.
**Language of Text:** Portuguese.

Paz, R.C.R.d., R.M. Zuge, V.H. Barnabe, R.G. Morato, P.A.N. Felippe, and R.C. Barnabe (2000). **Avaliacao da capacidade de penetracao de semen congelado de onca pintada (*Panthera onca*) em oocitos heterologos. [Penetration assay of frozen jaguar (*Panthera onca*) sperm in heterologous oocytes].** *Brazilian Journal of Veterinary Research and Animal Science* 37(1/6): 462-466. ISSN: 1413-9596.
**Abstract:** Assisted reproductive technologies can be viewed as one potential approach for safeguarding wild species. In this study, the fertility of captivity male jaguars (*P. onca*) and different capacitation media using the golden hamster zona free oocyte penetration assay were evaluated. We used frozen/thawed semen from 3 animals housed at Bosque dos Jequitibas, Campinas, Sao Paulo, Brazil to test the Percoll gradient, Swim-up and Swim-up+1 h incubation (5% CO< sub>2</ sub>/38 degrees C), considering as penetration of spermatozoa head decondensation was visualized within the oocyte. It was shown that the results rate was greater for Percoll (26.5%) as compared to Swim-up (8.1%) (X< sub>2</ sub>=19.93; P<0.05). Penetration with Swim-up+1 h incubation (5% CO< sub>2</ sub>/38 degrees C) was not observed. In conclusion, Percoll and Swim-up are efficient methods to perform the golden hamster zona free oocyte penetration assay using frozen/thawed jaguar spermatozoa. The low rate of penetration could be related to the high rate of morphological abnormal spermatozoa observed in the samples examined. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, frozen sperm, penetration assay, heterologous oocytes, captive males, golden hamster, capacitation, oocyte penetration.
**Language of Text:** Portuguese, Summary in English.

Selvam, N.P., B.S. Bonal, and R.K. Sharma (2005). **Successful breeding and hand rearing of jaguar cub *Panthera onca* in the National Zoological Park, New Delhi**. *Zoos' Print* 20(11): 23-25. ISSN: 0971-6378.
**Descriptors:** jaguar, *Panthera onca*, cub, hand rearing, successful breeding, artificial rearing, zoological gardens, National Zoological Park.,New Delhi, India.

Viau, P., E.C.G. Felippe, and C.A.d. Oliveira (2005). **Quantificacao de esteroides fecais de femeas de onca-pintada (*Panthera onca*) mantidas em cativeiro: validacao da tecnica. [Fecal steroid and quantification in captive jaguars (*Panthera onca*): validation of a method].** *Brazilian Journal of Veterinary Research and Animal Science* 42(4): 262-270. ISSN: 1413-9596.
**Abstract:** The ovarian function of captive jaguars (2 adults and 3 prepubertals) was assessed by extraction and quantification of faecal oestrogens and progestins. Faecal samples were obtained from the jaguars 2-7 times per week for 16-18 months. The validation of the solid phase radioimmunoassay for progesterone and 17 beta -estradiol was performed using the faecal extracts. The mean concentrations of faecal oestrogen (ng/g of dry faeces) in prepubertal and adult jaguars were 10.97 (ranged from 0.28 to 59.16) and 68.99 (ranged from 3.50 to 609.37), respectively. The faecal progestins ( micro g/g of dry faeces) had mean concentrations of 0.26 (ranged from 0.02 to 4.44) and 0.85 (ranged from 0.08 to 6.51) in prepubertal and adult jaguars, respectively. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, ovarian function, fecal steroid, quantification, method, validation, fecal estrogens, progesterones, concentration, captive.
**Language of Text:** Portuguese, Summary in English.

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### Jaguar - Conservation

Altrichter, M., G. Boaglio, and P. Perovic (2006). **The decline of jaguars *Panthera onca* in the Argentine Chaco**. *Oryx* 40(3): 302-309. ISSN: 0030-6053.

**Abstract:** We assessed the distribution and status of jaguar *Panthera onca* in the Argentine Chaco, one of the least known areas within its range. Current jaguar distribution in the Chaco encompasses parts of central and western Formosa, western Chaco, eastern Salta and north-eastern Santiago del Estero Provinces. Jaguar range was reduced following colonization of the semiarid Chaco even though there has been little deforestation. Jaguars have not been observed over the last 15 years in areas where colonization occurred more than 35 years ago, probably reflecting hunting pressure. Livestock predation is lower now than when the area was first settled in the 1920s. This may indicate low jaguar densities as the livestock management system has not changed. Local people, however, continue to hunt jaguars with the intention of exterminating them. Education, enforcing jaguar hunting laws, increasing control of poaching in protected areas, and creating more protected areas may be the most efficient strategies to preserve the jaguar population of the Argentine Chaco. *Reproduced with permission of CAB Abstracts.*

**Descriptors:** jaguar, *Panthera onca*, decline, deforestation, habitat destruction, population decrease, density, distribution, predation, wild animals, wildlife conservation, wildlife management, Argentine Chaco.

Eizirik, E., J.H. Kim, M. Menotti Raymond, P.G.J. Crawshaw, S.J. O'Brien, and W.E. Johnson (2001). **Phylogeography, population history and conservation genetics of jaguars (*Panthera onca*, Mammalia, Felidae).** *Molecular Ecology* 10(1): 65-79. ISSN: 0962-1083.

**Abstract:** The jaguar (*Panthera onca*), the largest felid in the American Continent, is currently threatened by habitat loss, fragmentation and human persecution. We have investigated the genetic diversity, population structure and demographic history of jaguars across their geographical range by analysing 715 base pairs of the mitochondrial DNA (mtDNA) control region and 29 microsatellite loci in approximately 40 individuals sampled from Mexico to southern Brazil. Jaguars display low to moderate levels of mtDNA diversity and medium to high levels of microsatellite size variation, and show evidence of a recent demographic expansion. We estimate that extant jaguar mtDNA lineages arose 280 000-510 000 years ago (95% CI 137 000-830 000 years ago), a younger date than suggested by available fossil data. No strong geographical structure was observed, in contrast to previously proposed subspecific partitions. However, major geographical barriers such as the Amazon river and the Darien straits between northern South America and Central America appear to have restricted historical gene flow in this species, producing measurable genetic differentiation. Jaguars could be divided into four incompletely isolated phylogeographic groups, and further sampling may reveal a finer pattern of subdivision or isolation by distance on a regional level. Operational conservation units for this species can be defined on a biome or ecosystem scale, but should take into account the historical barriers to dispersal identified here. Conservation strategies for jaguars should aim to maintain high levels of gene flow over broad

geographical areas, possibly through active management of disconnected populations on a regional scale.
**Descriptors:** jaguar, *Panthera onca*, genetics, DNA, mitochondrial genetics, population genetics, microsatellite repeats, variation genetics, geography, haplotypes, phylogeny, polymerase chain reaction, South America, Central America, Mexico.

McCain, E.B. and J.L. Childs (2008). **Evidence of resident jaguars (*Panthera onca*) in the southwestern United States and the implications for conservation**. *Journal of Mammalogy* 89(1): 1-10. ISSN: 0022-2372.

**Abstract:** Jaguars (*Panthera onca*) remain virtually unstudied in the desert environments at the northern extent of their range. Historic sightings from the United States indicate a declining population of resident jaguars from the late 1800s into the 1940s, after which only occasional jaguars were reported until the present. After 2 sightings of jaguars in 1996, we established a camera monitoring program in southeastern Arizona. From March 2001 to July 2007, we maintained 9-44 trail cameras and conducted opportunistic track surveys. We documented 2 adult males and a possible 3rd unidentified jaguar with 69 photographs and 28 sets of tracks. One jaguar, originally photographed in 1996, was resighted 64 times during 2004-2007. This >=13-year-old male used habitats from the Sonoran lowland desert at 877 m above sea level to pine-oak woodlands at 1,577 m, and covered 1,359 km2 in 2 mountain complexes. Despite speculation that recent sightings of jaguars in the United States represented dispersing transients on sporadic forays from Mexico, we documented jaguars in Arizona frequently, continuously, and year-round, and videotaped several scent-marking behaviors, indicating the residency of adult jaguars within Arizona. We outline the importance of maintaining cross-border connectivity for long-term survival of the wide-ranging and thinly distributed binational population of jaguars. We recommend further research and we stress the fragmentation consequences of the proposed United States-Mexico border fence to the northernmost jaguar population, and particularly to jaguars in the United States. Reproduced with permission of CAB.
**Descriptors:** jaguar, *Panthera onca*, resident jaguars, evidence, southwestern United States, camera monitoring, conservation.

Ruiz Garcia, M., E. Payan, A. Murillo, and D. Alvarez (2006). **DNA microsatellite characterization of the jaguar (*Panthera onca*) in Colombia.** *Genes and Genetic Systems* 81(2): 115-27. ISSN: 1341-7568.
**Abstract:** The Colombian jaguar population is thought to contain two different subspecies, *Panthera onca centralis* and *Panthera onca onca*. The genetic structure of this population was evaluated using 12 microsatellite loci (n = 62 samples). In addition, 22 jaguar DNA samples from Guatemala, Paraguay, Peru, Bolivia, Venezuela and Brazil were analyzed for these microsatellite loci (n = 84 samples). The results of this study indicate six primary themes. First, the levels of gene diversity were very high. Second, the majority of the loci analyzed showed an absence of Hardy-Weinberg equilibrium, probably due to the Wahlund effect (= population subdivision). Third, several microsatellite loci showed significant heterogeneity between the two supposed subspecies in the country. Nevertheless, gene flow was present between them, and heterogeneity was relatively low, although the assignment analyses showed good classification of the jaguars studied into their respective subspecies. Fourth, the long-term historical effective population sizes were calculated through a maximum likelihood procedure for single and multi-step mutation models. Fifth, seven out of twelve DNA microsatellites studied significantly deviated from a single-step mutation model. However, the overall mean multi-step mutation percentage for these 12 DNA microsatellites was only 6%. Therefore, 94% of mutations were uni-step. Sixth, no bottleneck events were detected in the Colombian jaguar population overall.
**Descriptors:** jaguar, *Panthera onca*, DNA microsatellite characterization, population genetic structure, subspecies, heterogeneity, gene flow, Guatemala, Paraguay, Peru, Bolivia, Venezuela, Brazil, Columbia.

Silver, S.C., L.E.T. Ostro, L.K. Marsh, L. Maffei, A.J. Noss, M.J. Kelly, R.B. Wallace, H. Gomez, and G. Ayala (2004). **The use of camera traps for estimating jaguar *Panthera onca* abundance and density using capture/recapture analysis**. *Oryx* 38(2): 148-154. ISSN: 0030-6053.

**Abstract:** Across their range jaguars *Panthera onca* are important conservation icons for several reasons: their important role in ecosystems as top carnivores, their cultural and economic value, and their potential conflicts with livestock. However, jaguars have historically been difficult to monitor. This paper outlines the first application of a systematic camera trapping methodology for abundance estimation of jaguars. The methodology was initially developed to estimate tiger abundance in India. We used a grid of camera traps deployed for 2 months, identified individual animals from their pelage patterns, and estimated population abundance using capture-recapture statistical models. We applied this methodology in a total of five study sites in the Mayan rain forest of Belize, the Chaco dry forest of Bolivia, and the Amazonian rain forest of Bolivia. Densities were 2.4-8.8 adult individuals per 100 km2, based on 7-11 observed animals, 16-37 combined 'captures' and 'recaptures', 486-2,280 trap nights, and sample areas of 107-

458 km2. The sampling technique will be used to continue long-term monitoring of jaguar populations at the same sites, to compare with further sites, and to develop population models. This method is currently the only systematic population survey technique for jaguars, and has the potential to be applied to other species with individually recognizable markings. *Reproduced with permission of CAB.*

**Descriptors:** jaguars, *Panthera onca*, camera traps, use, analysis, estimating, abundance, density, population monitoring, identify individuals, conservation.

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### Jaguar - Research

Ahmed, A., M. Jahan, Z.H. Zaidi, and G. Braunitzer (1987). **The primary structure of the hemoglobins of the adult jaguar (*Panthera onca*, Carnivora).** *Biological Chemistry Hoppe Seyler* 368(10): 1385-1390. ISSN: 0177-3593; Discontinued. Continued as: Biological Chemistry: (P) 1431-6730; online: 1437-4315.

**Abstract:** The primary structure of the hemoglobins from Jaguar (*Panthera onca*) are presented. Electrophoretic separations without and with a dissociating agent revealed the presence of two hemoglobin components, alpha 2 beta I2 and alpha 2 beta II2. The separation of the hemoglobin components was achieved by ion-exchange chromatography. The globin chains were separated by ion-exchange chromatography and also by reversed phase HPLC. The amino-acid sequences of the native chains and peptides were determined by liquid-phase and gas-phase sequencing. N-Acetylserine was detected by FAB-mass spectroscopy as N-terminal group of the beta I chain. The sequences are compared with that of human hemoglobin (Hb A).

**Descriptors:** Jaguar, *Panthera onca*, adult, carnivora blood, hemoglobins, analysis, primary structure, amino acid sequence, chromatography, high pressure liquid, chromatography, ion exchange, oxidation reduction.

Eizirik, E., J.H. Kim, M. Menotti Raymond, P.G.J. Crawshaw, S.J. O'Brien, and W.E. Johnson (2001). **Phylogeography, population history and conservation genetics of jaguars (*Panthera onca*, Mammalia, Felidae).** *Molecular Ecology* 10(1): 65-79. ISSN: 0962-1083.

**Abstract:** The jaguar (*Panthera onca*), the largest felid in the American Continent, is currently threatened by habitat loss, fragmentation and human persecution. We have investigated the genetic diversity, population structure and demographic history of jaguars across their geographical range by analysing 715 base pairs of the mitochondrial DNA (mtDNA) control region and 29 microsatellite loci in approximately 40 individuals sampled from Mexico to southern Brazil. Jaguars display low to moderate levels of mtDNA diversity and medium to high levels of microsatellite size variation, and show evidence of a recent demographic expansion. We estimate that extant jaguar mtDNA lineages arose 280 000-510 000 years ago (95% CI 137 000-830 000 years ago), a younger date than suggested by available fossil data. No strong geographical structure was observed, in contrast to previously proposed subspecific partitions. However, major geographical barriers such as the Amazon river and the Darien straits between northern South America and Central America appear to have restricted historical gene flow in this species, producing measurable genetic differentiation. Jaguars could be divided into four incompletely isolated phylogeographic groups, and further sampling may reveal a finer pattern of subdivision or isolation by distance on a regional level. Operational conservation units for this species can be defined on a biome or ecosystem scale, but should take into account the historical barriers to dispersal identified here. Conservation strategies for jaguars should aim to maintain high levels of gene flow over broad geographical areas, possibly through active management of disconnected populations on a regional scale.

**Descriptors:** jaguar, *Panthera onca*, genetics, DNA, mitochondrial genetics, population genetics, microsatellite repeats, variation genetics, geography, haplotypes, phylogeny,

polymerase chain reaction, South America, Central America, Mexico.

Hope, K. and S.L. Deem (2006). **Retrospective study of morbidity and mortality of captive jaguars (*Panthera onca*) in North America: 1982-2002**. *Zoo Biology* 25(6): 501-512. ISSN: 0733-3188.

**Abstract:** One hundred seventy-two medical records of captive jaguars (*Panthera onca*) were examined from 30 American Zoo and Aquarium Association (AZA) institutions housing jaguars between 1982-2002. The study determined common causes of morbidity and mortality, and the influence of age, gender, and melengestrol-acetate (MGA) exposure on these rates. The most common causes of morbidity in captive jaguars were found to be dental, gastrointestinal, integumentary, and musculoskeletal diseases. Prevalence of types of disease varied with age, with older animals experiencing a higher prevalence of multiple types of disease. Females developed reproductive disease more frequently than males, and the data suggest that MGA exposure increased the risk of developing female reproductive disease. The most common causes of mortality were reproductive diseases in females and musculoskeletal diseases in males. There was a high rate of neonate and pediatric mortality, primarily due to stillbirths or unexplained neonatal death, trauma, and pneumonia. Other diseases or clinical signs that seemed remarkable were a high prevalence of episodes of epistaxis among young, as well as old, jaguars. Based on these findings, management suggestions for the captive jaguar population are presented. *Reproduced with permission of CAB*.
**Descriptors:** jaguars, *Panthera onca*, morbidity, mortality, retrospective study, captive jaguars, North America, age groups, animal health, digestive disorders, medical records, musculoskeletal anomalies, newborn animals, sex differences, trauma, zoo animals.

Junior, J.L.R., M.A. Gioso, and L.M. Domingues Falqueiro (2007). **Estudo comparative sobre prevalencia de doenca periodontal em *Panthera onca* mantida em cativeiro e em individuos de natureza. [A comparative study about the prevalence of periodontal disease in *Panthera onca*, living in captivity and in the wild].** *Pesquisa Veterinaria Brasileira* 27(5): 209-214. ISSN: 0100-736X.

**Abstract:** The aim was to survey the main oral lesions related with periodontal disease of jaguars, *Panthera onca*, living in captivity or in the wild, as conservation of threatened animals from extinction, as in case of the jaguar, and the preservation of such species in free life may be determined by environmental conditions which can influence oral health. Forty-two jaguars (*P. onca*) kept in captivity in 18 institutions in the state of Sao Paulo were studied. The animals to be examined were anesthetized by the Plan of Neotropical Handling of Felids. Additionally, 4 jaguars (*P. onca*) proceeding from wild life were captured for the study on Farm Sete, municipality of Miranda, Mato Grosso do Sul, in the southern Pantanal. All animals surveyed in captivity showed various degrees of oral lesions related to periodontal disease. The animals living in the wild did not present any clinical signs of oral lesions. *Reproduced with permission of CAB.*
**Descriptors:** jaguars, *Panthera onca*, periodontal disease, prevalence, dentistry, disease prevalence, disease surveys, lesions, tooth diseases, wild animals, captive zoo animals, oral lesions.
**Language of Text:** Portuguese, Summary in English.

Liu, B. and X. Dong (2002). ***Lactobacillus pantheris* sp. nov., isolated from faeces of a jaguar.** *International Journal of Systematic and Evolutionary Microbiology* 52(Pt 5): 1745-8. ISSN: (p) 1466-5026; online: 1466-5034.

**Abstract:** Two novel *Lactobacillus* strains were isolated from the faeces of a jaguar in Beijing Zoo. They were gram-positive, non-spore-forming, non-motile, rod-shaped organisms that exhibited no catalase activity. The strains fermented cellobiose, D-fructose, galactose, D-glucose, lactose, maltose, D-mannose, salicin, trehalose, N-acetyl glucosamine, beta-gentiobiose and D-tagatose. D(-)-Lactic acid was the exclusive product from glucose fermentation. The G+C content of the DNA of strain A24-2-1T was 52.7 mol %. Phylogenetic analysis based on 16S rDNA sequence similarity indicated that the strains represented a novel member of the genus *Lactobacillus* and were most closely related to *Lactobacillus manihotivorans* LMG 18010T, with 16S rDNA sequence similarity of 95.2%. The DNA-DNA relatedness between them was 13%. The name *Lactobacillus pantheris* sp. nov. is proposed for the novel strains, with strain A24-2-1T as the type strain (= AS 1.2826T = LMG 21017T).
**Descriptors:** jaguar, *Panthera onca*, *Lactobacillus pantheris* sp. nov, *Lactobacillus* classification, isolation, purification, feces, zoo microbiology, carnivora microbiology, China, DNA, bacterial chemistry, bacterial genetics, ribosomal genetics, *Lactobacillus* genetics, *Lactobacillus* metabolism, molecular sequence data, RNA.

Morato, R.G., M.G. Bueno, P. Malmheister, I.T. Verreschi, and R.C. Barnabe (2004). **Changes in the fecal concentrations of cortisol and androgen metabolites in captive male jaguars (*Panthera onca*) in response to stress.** *Brazilian Journal of Medical and Biological Research; Revista Brasileira De Pesquisas Medicas e Biologicas Sociedade Brasileira De Biofisica [Et Al.]* 37(12): 1903-7. ISSN: (p) 0100-879X; (E) 0034-7310.

**Abstract:** In the present study we determined the efficacy of the measurement of fecal cortisol and androgen metabolite concentrations to monitor adrenal and testicular activity in the jaguar (*Panthera onca*). Three captive male jaguars were chemically restrained and

electroejaculated once or twice within a period of two months. Fecal samples were collected daily for 5 days before and 5 days after the procedure and stored at -20 degrees C until extraction. Variations in the concentrations of cortisol and androgen metabolites before and after the procedure were determined by solid phase cortisol and testosterone radioimmunoassay and feces dry weight was determined by drying at 37 degrees C for 24 h under vacuum. On four occasions, fecal cortisol metabolite levels were elevated above baseline (307.8 +/- 17.5 ng/g dry feces) in the first fecal sample collected after the procedure (100 to 350% above baseline). On one occasion, we did not detect any variation. Mean (+/- SEM) fecal androgen concentration did not change after chemical restraint and electroejaculation (before: 131.1 +/- 26.7, after: 213.7 +/- 43.6 ng/g dry feces). These data show that determination of fecal cortisol and androgen metabolites can be very useful for a noninvasive assessment of animal well-being and as a complement to behavioral, physiological, and pathological studies. It can also be useful for the study of the relationship between adrenal activity and reproductive performance in the jaguar.
**Descriptors:** jaguars, *Panthera onca*, fecal cortisol, androgen metabolites, determination, noninvasive assessment, well-being, fecal concentrations, stress response, testicular activity, adrenal activity, changes.

Morato, R.G., V.A. Conforti, F.C. Azevedo, A.T. Jacomo, L. Silveira, D. Sana, A.L. Nunes, M.A. Guimaraes, and R.C. Barnabe (2001). **Comparative analyses of semen and endocrine characteristics of free-living versus captive jaguars (*Panthera onca*).** *Reproduction Cambridge, England* 122(5): 745-51. ISSN: 1470-1626.
**Abstract:** Semen and blood samples were obtained from free-living (n = 6) and captive (n = 8) jaguars (*Panthera onca*) to compare reproductive characteristics between the two populations. Semen samples were analysed for volume (ml), percentage of motile spermatozoa, rate of forward progression (0-5), concentration (10(6) ml(-1)), total sperm count (10(6)) and sperm morphology. Serum testosterone concentration was determined by radioimmunoassay. Although ejaculate volume was greater in captive jaguars (n = 47 samples) than in free-living jaguars (n = 7 samples) ($P < 0.05$), the free-living jaguars produced more total spermatozoa (59.3 +/- 12.8 versus 152.0 +/- 88.0 x 10(6), respectively; not significant) with better viability and forward progression (2.8 +/- 0.1 versus 3.5 +/- 0.2, respectively; $P < 0.05$) and more spermatozoa with normal morphology (73.5 +/- 3.9 versus 5.0 +/- 1.1%, respectively; $P < 0.05$). Serum testosterone concentrations were similar for captive and free-living male jaguars (3.1 +/- 0.7 and 2.1 +/- 0.8 ng ml(-1), respectively). In summary, the data showed that semen may be collected successfully from free-living jaguars and evaluated under field conditions to establish normative reproductive values in this species. The results also indicate that jaguars maintained in zoos show inferior seminal characteristics compared with free-living animals.
**Descriptors:** jaguars, *Panthera onca*, free living and captive animals, semen samples, endocrine characteristics, comparative analysis, blood samples, collection, field conditions, normal reproductive values, inferior seminal characteristics in zoo animals.

Morato, R.G., I.T. Verreschi, M.A. Guimaraes, K. Cassaro, C. Pessuti, and R.C. Barnabe (2004). **Seasonal variation in the endocrine-testicular function of captive jaguars (*Panthera onca*).** *Theriogenology* 61(7-8): 1273-81. ISSN: 0093-691X.
**Abstract:** Captive adult male jaguars (*Panthera onca*) from two locations in southeast Brazil were studied to evaluate the effects of season on endocrine and testicular function. For assessment of testicular steroidogenic activity, androgen metabolite concentrations were measured in fecal samples collected one to three times per week over 14 ( n=14 ), 9 ( n=1 ) or 7 months ( n=1 ). To assess seasonality, data were grouped by season (summer: December-February; autumn: March-May; winter: June-August; spring: September-November). Additionally, samples collected in the dry season (March-August) were compared with those collected in the wet season (September-February). There were no differences ( $P>0.05$ ) in fecal androgen concentrations in samples collected in spring, summer, autumn, and winter ( 480.8+/-50.4 ng/g, 486.4+/-42.0 ng/g, 335.4+/-37.7 ng/g, and 418.6+/-40.4 ng/g dry feces). However, there were differences ( $P<0.05$ ) in fecal androgen concentrations between the dry and wet seasons ( 380.5+/-28.0 ng/g versus 483.9+/-32.3 ng/g dry feces). Sperm samples, collected from all males twice (approximately 6 months apart) were similar; mean (+/-S.E.M.) motility, concentration and morphology were 57.0 %4.5%, 6.3+/-2.4 x 10(6) ml(-1), and 60.8+/-3.1 %, respectively. In conclusion, androgen metabolite concentrations in the captive male jaguar were not affected by season, but there was a difference between the wet and dry periods. Further research is needed to verify these results.
**Descriptors:** jaguars, *Panthera onca*, captive, seasonal variation, endocrine testicular function, androgen metabolite concentrations, wet periods, dry periods.

Ruiz Garcia, M., E. Payan, A. Murillo, and D. Alvarez (2006). **DNA microsatellite characterization of the jaguar (*Panthera onca*) in Colombia.** *Genes and Genetic Systems* 81(2): 115-27. ISSN: 1341-7568.
**Abstract:** The Colombian jaguar population is thought to contain two different subspecies, *Panthera onca centralis* and *Panthera onca onca*. The genetic structure of this population was evaluated using 12 microsatellite loci (n = 62 samples). In addition, 22 jaguar DNA samples from Guatemala, Paraguay, Peru, Bolivia, Venezuela and Brazil were analyzed for these microsatellite loci (n = 84 samples). The results of this study indicate six primary

themes. First, the levels of gene diversity were very high. Second, the majority of the loci analyzed showed an absence of Hardy-Weinberg equilibrium, probably due to the Wahlund effect (= population subdivision). Third, several microsatellite loci showed significant heterogeneity between the two supposed subspecies in the country. Nevertheless, gene flow was present between them, and heterogeneity was relatively low, although the assignment analyses showed good classification of the jaguars studied into their respective subspecies. Fourth, the long-term historical effective population sizes were calculated through a maximum likelihood procedure for single and multi-step mutation models. Fifth, seven out of twelve DNA microsatellites studied significantly deviated from a single-step mutation model. However, the overall mean multi-step mutation percentage for these 12 DNA microsatellites was only 6%. Therefore, 94% of mutations were uni-step. Sixth, no bottleneck events were detected in the Colombian jaguar population overall.

**Descriptors:** jaguar, *Panthera onca*, DNA microsatellite characterization, population genetic structure, subspecies, heterogeneity, gene flow, Guatemala, Paraguay, Peru, Bolivia, Venezuela, Brazil, Columbia.

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### Jaguar - Veterinary

Abdulla, P.K., P.C. James, S. Sulochana, V. Jayaprakasan, and R.M. Pillai (1982). **Anthrax in a jaguar (*Panthera onca*)**. *Journal of Zoo Animal Medicine* 13(4): 151. ISSN: 0093-4526.
**Descriptors:** jaguar, *Panthera onca*, anthrax, bacterial diseases, case reports, zoo animals, *Bacillus anthracis*, Felidae.

Aguilar, R.F., A.M. Grooters, A. Camus, and M.M. Garner (2003). **Primary pulmonary pythiosis in a Central American jaguar (*Panthera onca*)**. *Proceedings of the Institute for Zoo and Wildlife Research, Berlin, No.5*: 319.
**Descriptors:** jaguar, *Panthera onca*, primary pulmonary pythiosis, case reports, clinical aspects, diagnosis, mycoses, respiratory diseases, zoo animals, *Pythium insidiosum*.
**Notes:** Meeting Information: Erkrankungen der Zootiere: Verhandlungsbericht des 41. Internationalen Symposiums uber die Erkrankungen der Zoo und Wildtiere, Rome, Italy, 28 May - 1 June, 2003.

Ahmed, A., M. Jahan, Z.H. Zaidi, and G. Braunitzer (1987). **The primary structure of the hemoglobins of the adult jaguar (*Panthera onca*, Carnivora).** *Biological Chemistry Hoppe Seyler* 368(10): 1385-1390. ISSN: 0177-3593; Discontinued. Continued as: Biological Chemistry: (P) 1431-6730; online: 1437-4315.
**Abstract:** The primary structure of the hemoglobins from Jaguar (*Panthera onca*) are presented. Electrophoretic separations without and with a dissociating agent revealed the presence of two hemoglobin components, alpha 2 beta I2 and alpha 2 beta II2. The separation of the hemoglobin components was achieved by ion-exchange chromatography. The globin chains were separated by ion-exchange chromatography and also by reversed phase HPLC. The amino-acid sequences of the native chains and peptides were determined by liquid-phase and gas-phase sequencing. N-Acetylserine was detected by FAB-mass spectroscopy as N-terminal group of the beta I chain. The sequences are compared with that of human hemoglobin (Hb A).
**Descriptors:** Jaguar, *Panthera onca*, adult, carnivora blood, hemoglobins, analysis, primary structure, amino acid sequence, chromatography, high pressure liquid, chromatography, ion exchange, oxidation reduction.

Bossart, G.D. and G. Hubbell (1983). **Ovarian papillary cystadenocarcinoma in a jaguar (*Panthera onca*)**. *Journal of Zoo Animal Medicine* 14(2): 73-76. ISSN: 0093-4526.
**Descriptors:** jaguar, *Panthera onca*, neoplasms, zoo animals, cystadenocarcinoma, ovarian papillary.

Camus, A.C., A.M. Grooters, and R.E. Aquilar (2004). **Granulomatous pneumonia caused by *Pythium insidiosum* in a central American jaguar, *Panthera onca*.** *Journal of Veterinary Diagnostic Investigation* 16(6): 567-571. ISSN: 1040-6387.
**Abstract:** A 7-month-old, male jaguar presented with dyspnea and leukocytosis unresponsive to antibiotic therapy. Radiographs revealed unilateral pulmonary consolidation. An exploratory thoracotomy was performed, and the left lung, which contained a large multilobular mass with extensive fibrosis and numerous caseonecrotic foci, was removed. Microscopically, eosinophilic granulomatous inflammation surrounded broad (4.4-8.3 microm) rarely septate hyphae. A diagnosis of *Pythium insidiosum*

infection was confirmed by immunohistochemistry, immunoblot serology, culture, and polymerase chain reaction. Dyspnea recurred despite treatment, and the animal succumbed 3 weeks after surgery. Necropsy findings indicated that death resulted from occlusion of the right main stem bronchus by a fungal granuloma. The oomycete *P. insidiosum* typically causes granulomatous disease of the skin or gastrointestinal tract in animals and arteritis, keratitis, or cellulitis in humans. Infection is uncommon in felines, and pulmonary involvement is rare. This report details the first case of *P. insidiosum* infection in an exotic felid and provides the first description of primary pulmonary pythiosis in any species.
**Descriptors:** jaguar, *Panthera onca*, granulomatous pneumonia, *Pythium insidiosum*, dyspnea, leukocytosis, pulmonary consolidation, fibrosis, oomycete, pulmonary pythiosis.

Castro, M.B.d., K. Werther, G.S. Godoy, V.P. Borges, and A.C. Alessi (2003). **Visceral mast cell tumor in a captive black jaguar (*Panthera onca*)**. *Journal of Zoo and Wildlife Medicine* 34(1): 100-102. ISSN: 1042-7260.
**Abstract:** Little is known about neoplasia in the jaguar (*Panthera onca*), the largest American feline. A 26-year-old captive black jaguar from the county zoo in Ribeirao Preto, Sao Paulo, Brazil, was diagnosed at necropsy with a mastocytic form of visceral mast cell tumour (MCT) similar to that which occurs in domestic cats. This animal had no previous clinical disease and died during anaesthesia for a routine dental treatment. Histologically, the submucosa and muscular layers of the jejunum were diffusely infiltrated and expanded by massive numbers of monomorphic neoplastic mast cells arranged in cords or nests. The prognosis and criteria for the clinical diagnosis of MCT in the jaguar are unknown. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, visceral mast cell tumor, captive, case reports, clinical aspects, diagnosis, mast cells, neoplasms, zoo animals, Brazil.

Choi, J.H., H.S. Yoo, J.Y. Park, Y.K. Kim, E. Kim, and D.Y. Kim (2002). **Morganelliasis pneumonia in a captive jaguar.** *Journal of Wildlife Diseases* 38(1): 199-201. ISSN: 0090-3558.
**Abstract:** Suppurative bronchopneumonia was discovered in a 6-yr-old male jaguar (*Panthera onca onca*) that died after a 1 wk history of anorexia, depression, and respiratory difficulty. *Morganella morganii* was isolated as a pure culture from the lung, spleen, and heart blood. This is the first record of *M. morganii* induced pneumonia in a jaguar.
**Descriptors:** jaguar, *Panthera onca*, bronchopneumonia, Carnivora, infections, *Morganella morganii*, isolation, purification, bronchopneumonia, pathology, Enterobacteriaceae infections, microbiology, pathology, fatal outcome, pathogenicity.

Demar, M., D. Ajzenberg, B. Serrurier, M.L. Darde, and B. Carme (2008). **Atypical *Toxoplasma gondii* strain from a free-living jaguar (*Panthera onca*) in French Guiana**. *American Journal of Tropical Medicine and Hygiene* 78(2): 195-197. ISSN: 0002-9637.
**Abstract:** Like domestic cats, wild felids are involved in the complete infective cycle of *Toxoplasma gondii* because they can host in their gastrointestinal tract sexually mature parasites and shed infective oocysts in their faeces. We report, to our knowledge, the first isolation and molecular characterization of a *T. gondii* strain from the heart tissue of a free-living jaguar (*Panthera onca*) in Belizon, an eastern deep forest area in French Guiana. Sequencing at 6 polymorphic markers indicated that the jaguar isolate had an atypical genotype, including an allele at TgM-A previously found only in isolates from South America, and an allele at GRA6, which was previously reported only in Californian sea otter isolates. These findings are consistent with the recent description of atypical *T. gondii* strains involved in severe toxoplasmosis in immunocompetent patients in French Guiana that seemed to be linked to a neotropical forest-based cycle involving wild cats and their prey. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, forests, genotypes, nucleotide sequences, strains, toxoplasmosis, wild animals, oocysts, feces, infective cycle, *Toxoplasma gondii*.

Frazier, K.S., M.E. Hines, C. Ruiz, A.J. Herron, and N.H. Altman (1994). **Immunohistochemical differentiation of multiple metastatic neoplasia in a jaguar (*Panthera onca*)**. *Journal of Zoo and Wildlife Medicine* 25(2): 286-293. ISSN: 1042-7260.
**Descriptors:** jaguar, *Panthera onca*, multiple metastatic neoplasia, immunohistochemical differentiation, case report, mammary gland diseases, metastasis, neoplasms, pathology, zoo animal.

Hawkey, C.M. and M.G. Hart (1986). **Haematological reference values for adult pumas, lions, tigers, leopards, jaguars and cheetahs.** *Research in Veterinary Science* 41(2): 268-269. ISSN: 0034-5288.
**Abstract:** Normal haematological values and fibrinogen levels were obtained from a number of healthy adult Felidae in the collection of the Zoological Society of London. The group comprised 29 pumas (*Felis concolor*), 32 lions (*Panthera leo*), 27 tigers (*P tigris*), 19 leopards (*P pardus*), 18 jaguars (*P onca*) and 22 cheetahs (*Acinonyx jubatus*). The values provided a basis for identifying abnormalities in the blood of sick individuals of these species and for undertaking interspecies comparisons.
**Descriptors:** cheetah, *Acinonyx jubata*, pumas, *Felis concolor*, lions, *Panthera leo*, tigers, *Panthera tigris*, leopards, *Panthera pardus*, jaguars, *Panthera onca*, adult, fibrinogen

levels, blood, hematological reference values.

Junior, J.L.R., M.A. Gioso, and L.M. Domingues Falqueiro (2007). **Estudo comparative sobre prevalencia de doenca periodontal em *Panthera onca* mantida em cativeiro e em individuos de natureza. [A comparative study about the prevalence of periodontal disease in *Panthera onca*, living in captivity and in the wild].** *Pesquisa Veterinaria Brasileira* 27(5): 209-214. ISSN: 0100-736X.

**Abstract:** The aim was to survey the main oral lesions related with periodontal disease of jaguars, *Panthera onca*, living in captivity or in the wild, as conservation of threatened animals from extinction, as in case of the jaguar, and the preservation of such species in free life may be determined by environmental conditions which can influence oral health. Forty-two jaguars (*P. onca*) kept in captivity in 18 institutions in the state of Sao Paulo were studied. The animals to be examined were anesthetized by the Plan of Neotropical Handling of Felids. Additionally, 4 jaguars (*P. onca*) proceeding from wild life were captured for the study on Farm Sete, municipality of Miranda, Mato Grosso do Sul, in the southern Pantanal. All animals surveyed in captivity showed various degrees of oral lesions related to periodontal disease. The animals living in the wild did not present any clinical signs of oral lesions. *Reproduced with permission of CAB.*
**Descriptors:** jaguars, *Panthera onca*, periodontal disease, prevalence, dentistry, disease prevalence, disease surveys, lesions, tooth diseases, wild animals, captive zoo animals, oral lesions.
**Language of Text:** Portuguese, Summary in English.

Karesh, W.B. and G. Bottomley (1983). **Vaccine induced anaphylaxis in a Brazilian jaguar (*Panthera onca plaustrix*)**. *Journal of Zoo Animal Medicine* 14(4): 133-137. ISSN: 0093-4526.
**Descriptors:** jaguar, *Panthera onca plaustrix*, vaccine induced, adverse effects, anaphylaxis, complications, zoo animals, feline herpesvirus 1, feline calicivirus, feline panleukopenia virus.

Kim JeongRae, Kim BangHyun, Yoo HanSang, Lee DeogYong, Kim KiGeun, Jean KyungSun, Hwang WooSuk, Lee ByungChun, and Kim DaeYong (2001). **Concurrent infection with heartworm and *Pasteurella haemolytica*-induced pericarditis in a jaguar (*Panthera onca onca*)**. *Journal of Veterinary Clinics* 18(1): 85-87. ISSN: 1598-298X.
**Descriptors:** jaguar, *Panthera onca onca*, heartworm infection, clinical aspects, concurrent infections, diagnosis, heart, lungs, myocardium, pericarditis, pericardium, *Dirofilaria*, *Pasteurella haemolytica.*
**Language of Text:** Korean, Summary in English.

Kollias, G.V.J., M.B. Calderwood Mays, and B.G. Short (1984). **Diabetes mellitus and abdominal adenocarcinoma in a jaguar receiving megestrol acetate.** *Journal of the American Veterinary Medical Association* 185(11): 1383-1386. ISSN: 0003-1488.
**Descriptors:** jaguar, *Panthera onca*, abdominal neoplasms, adenocarcinoma, diabetes mellitus, megestrol acetate, derivatives, complications, complications, cat diseases chemically induced, cats, dog diseases, megestrol adverse effects, contraceptives, zoo animals.

Kumar, M.N. and M.V.A. Akbar (2001). **A case of uterine inertia in Jaguar (*Panthera onca*)**. *Zoos' Print Journal* 16(5): 502. ISSN: 0971-6378.
**Descriptors:** jaguars, *Panthera onca*, uterine inertia, case reports, dystocia, parturition.

Ladiges, W.C., J.W. Foster, and M.H. Jones (1981). **Malignant hemangioendothelioma in a jaguar (*Panthera onca*)**. *Journal of Zoo Animal Medicine* 12(2): 36-37. ISSN: 0093-4526.
**Descriptors:** jaguar, *Panthera onca*, malignant hemangioendothelioma, neoplasms, zoo animals, Felidae.

McLaughlin, R.J. and A. Kuzma (1991). **Surgical management of collapsed pelvis in a jaguar.** *Journal of the American Veterinary Medical Association* 198(10): 1789-91. ISSN: 0003-1488.
**Abstract:** An immature jaguar was surgically treated for severe constipation caused by a narrow pelvic canal. This narrowing was attributed to nutritional secondary hyperparathyroidism. The ventral floor of the pelvis was widened by placing a piece of high density polyethylene between the 2 sides of the pubis after symphysiotomy and stabilizing the implant with orthopedic wires. This procedure provided stable fixation and permanent enlargement of the pelvic canal. The technique was easy to perform and could be used to treat pelvic collapse in other species.
**Descriptors:** jaguar, *Panthers onca*, case study, surgery, constipation, femoral fractures, hyperparathyroidism, pelvic bones surgery, bone density, bone wires, pelvic bones injuries, surgical management.

Port, C.D., E.R. Maschgan, J. Pond, and D.G. Scarpelli (1981). **Multiple neoplasia in a jaguar (*Panthera onca*).** *Journal of Comparative Pathology* 91(1): 115-22. ISSN: 0021-9975.
**Descriptors:** jaguar, *Panthera onca*, multiple neoplasia, adrenal gland neoplasms, multiple myeloma, pathology, multiple primary pathology, pheochromocytoma.

Ramos Vara, J.A., M.A. Miller, and D. Preziosi (2000). **Glucagonoma in a jaguar (*Panthera onca*).** *Journal of Zoo and Wildlife Medicine Official Publication of the American Association of Zoo Veterinarians* 31(4): 563-5. ISSN: 1042-7260.

**Abstract:** An obese adult jaguar (*Panthera onca*) was euthanized because of progressive lameness. Two 3-cm-diameter pancreatic nodules were identified as islet cell tumors, which were positive with immunohistochemical stains for glucagon, neuron-specific enolase, chromogranin A, and synaptophysin. The jaguar did not present clinical evidence of hyperglucagonemia.

**Descriptors:** jaguar, *Panthera onca*, obese adult, glucagonoma, pancreatic neoplasms, progressive lameness, euthanasia, complications, islet cell tumors.

Ritscher, D. (1989). **Veterinarmedizinische Probleme bei der Haltung und Zucht von Pumas (*Puma concolor*) und Jaguaren (*Panthera onca*). [Veterinary problems associated with keeping and breeding pumas and jaguars].** In: *Erkrankungen der Zootiere Verhandlungsbericht des 31 Internationalen Symposiums uber die Erkrankungen der Zoo und Wildtiere, Dortmund 1989,*Berlin, German Democratic Republic: Akademie Verlag, p. 55-60. ISBN: 3055006518.

**Descriptors:** jaguar, *Panthera onca*, zoo animals, keeping, breeding, veterinary problems, helminthoses, Felidae, conference information.

**Language of Text:** German, Summaries in English, French and Russian.

Rossi Junior, J.L. (2003). **Estudo comparativo entre os achados clinicos de lesoes orais em onca-pintada (*Panthera onca*) e sucuarana (*Puma concolor*) mantidas em cativeiro no Estado de Sao Paulo e individuos de vida livre no Pantanal sul mato-grossense. [Comparative study between clinical findings of oral lesions in jaguars (*Panthera onca*) and pumas (*Puma concolor*) from captivity (State of Sao Paulo) and free-ranging individuals from the South Pantanal (State of Mato Grosso)].** *Arquivos De Ciencias Veterinarias e Zoologia Da UNIPAR* 6(1): 91-92. ISSN: 1415-8167.

**Descriptors:** jaguar, *Panthera onca*, cougar, *Puma concolor*, oral lesions, clinical findings, dental caries, mouth diseases, periodontal diseases, tooth diseases, wild animals, zoo animals, species comparative study.

**Language of Text:** Portuguese, Summary in English and Spanish.

Rossi Junior, J.L., M.A. Gioso, J.C.R.d. Silva, and M.F.V. Marvulo (2003). **Prevalencia de maloclusao em *Panthera onca* e *Puma concolor* mantidas em cativeiro no Estado de Sao Paulo. [Prevalence of the maloclusion in *Panthera onca* and *Puma concolor* in captivity in the State of Sao Paulo].** *Brazilian Journal of Veterinary Research and Animal Science* 40(1/6): 155-160. ISSN: 1413-9596.

**Abstract:** Some international papers on wild animal dentistry deal with animals in captivity or free-ranging animals from diverse geographic distributions. So far, none has been published on the great neotropical felines like *Panthera onca* and *Puma concolor*. This study was conducted to determine the prevalence of malocclusion in neotropical felines kept in various institutions in Sao Paulo, Brazil. A total of 42 jaguars (*Panthera onca*) and 36 pumas (*Puma concolor*) kept in captivity in 18 institutions in Sao Paulo were included in the study (May 1999-October 2000). All animals were examined for malocclusion. The teeth were identified and examined using a dental explorer. Malocclusion was observed in 20 jaguars (47.61%) and 2 pumas (5.55%). The animals with malocclusion showed no signs of difficulty in apprehension or chewing, eventhough the condition was observed in the region of the teeth with more reduced interproximal space. The only sequela of this condition was the accumulation and difficult removal of dental plaques. *Reproduced with permission of CAB.*

**Descriptors:** jaguars, *Panthera onca*, cougar, *Puma concolor*, maloclusion, prevalence, dentistry, disease surveys, epidemiology, tooth diseases, zoo animals, captivity.

**Language of Text:** Portuguese, Summary in English.

Senthilkumar, K., M.G. Jayathangaraj, S. Ramesh, K. Devaki, and P.N. Khan (2006). **Therapeutic approach in fungal infection in a Jaguar *Panthera onca.*** *Zoos' Print Journal* 21(10): 2440-2441. ISSN: 0971-6378.

**Abstract:** An incidence of dermatomycosis is reported in a black jaguar (*P. onca*). Frequent pawing of the cheek regions was reported by an animal keeper of the Arignar Arna Zoological Park (Tamil Nadu, India) in this animal for 2 days. Closer examination of the felid revealed rubbing of both cheek regions on the fence of the enclosure along with intermittent pawing and hair loss. The jaguar was physically restrained in the squeeze cage and direct skin scrapings and faecal samples were obtained and examined. A detailed examination of the felid further revealed presence of wounds near the cheek region and the animal was treated with an injection of 500 mg of ampicillin and cloxacillin intramuscularly in the morning and orally in the evening which was continued daily for 7 days, along with local application of povidone iodine solution sprayed from a 20 ml syringe externally, from a distance, over the discoloured alopecic patch in the cheek region. Ten grams of griseofulvin was administered orally with meat, daily for 2 weeks. The animal's condition dramatically improved over this period and no pruritus or pawing was reported by the animal keeper. The skin scrapings examined revealed evidence of fungal infections and based on both macroscopic and microscopic appearance of growth in

Saboraud's medium, *Microsporum* sp. infection was identified. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, fungal infection, therapeutic approach, ampicillin, animal diseases, antifungal agents, cloxacillin, dermatomycoses, drug therapy, griseofulvin, zoo animals, *Microsporum*.

Timm, R.M. and R.D. Price (1994). **A new species of *Felicola* (*Phthiraptera*: Trichodectidae) from a Costa Rican jaguar, *Panthera onca* (Carnivora: Felidae)**. *Proceedings of the Biological Society of Washington* 107(1): 114-118. ISSN: 0006-324X.
**Abstract:** A new species of chewing louse, *Felicola (Lorisicola) oncae* sp. nov. is described from a jaguar, *Panthera onca* taken in Costa Rica. Although this louse is based only on a single male specimen, its morphological distinctiveness and occurrence on a big cat of the genus *Panthera* make its discovery and description of special significance. The genus *Felicola* now contains 55 species, which can be grouped into 4 subgenera: *Felicola, Lorisicola, Paradoxuroecus* and *Suricatoecus*. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, ectoparasites, new species, chewing louse, *Felicola (Lorisicola) oncae*, taxonomy, wild animals, carnivores, Felidae, Mallophaga, mammals, Phthiraptera, Trichodectidae, Costa Rica.
**Language of Text:** Spanish.

Toniollo, G.H., D.d. Faria Junior, E. Lega, C.M. Batista, and N. Nunes (2000). **Piometra na especie felina - relato de um caso em. [Pyometra in feline species - report of a case in *Panthera onca*.]**. *Brazilian Journal of Veterinary Research and Animal Science* 37(1/6): 166-168. ISSN: 1413-9596.
**Descriptors:** jaguar, *Panthera onca*, pyometra, case report, medical treatment, surgery.
**Language of Text:** Portuguese, Summary in English.

Ulehlova, L., H. Burda, and L. Voldrich (1984). **Involution of the auditory neuro-epithelium in a tiger (*Panthera tigris*) and a jaguar (*Panthera onca*).** *Journal of Comparative Pathology* 94(1): 153-7. ISSN: 0021-9975.
**Abstract:** Numerical atrophy of the hair cells of the organ of Corti of the inner ear in a 14-year-old tiger and a 17-year-old jaguar is described. The decrease in number of sensory hair cells is considered to represent physiological atrophy caused by the process of ageing. The findings are compared with previous observations on man, guinea-pigs, shrews, and bats. The development of the physiological involution of the hearing neuro-epithelium is discussed.
**Descriptors:** jaguar, *Panthera onca*, tiger, *Panthera tigris*, carnivora anatomy, histology, organ of Corti, hair cells, inner ear, auditory neuro epithelium, aging, atrophy, cell survival, man, guinea pigs, shrew, bats, atrophy.

Villoldo, A. (2007). **Jaguar Medicine.** *Alternative Therapies in Health and Medicine* 13(5): 14-6. ISSN: 1078-6791.
**Descriptors:** jaguar, *Panthera onca*, medicine, veterinary care, treatment, therapies, diesease, injury, health.

Waelbers, T., T. Bosmans, M. Risselada, P. Verleyen, and I. Polis (2007). **Inhalation anesthesia with isoflurane in a black jaguar (*Panthera onca*) for surgical repair of a fractured mandible**. *Vlaams Diergeneeskundig Tijdschrift* 76(2): 138-145. ISSN: 0303-9021.
http://vdt.ugent.be/code/showupload.php?id=289
**Abstract:** A black jaguar (*Panthera onca*) was anesthetized with a combination of medetomidine, ketamine and isoflurane in oxygen for radiological examination and surgical repair of a fractured mandible. Since a non-domesticated cat is potentially dangerous, induction of anesthesia was performed by intramuscular injection using a mechanical squeeze cage. The cardiopulmonary parameters during anesthesia remained within normal ranges; only a small increase in the respiration rate was recorded 75 minutes after intubation. This hyperventilation was treated with buprenorphine (for additional analgesia) and an increased inspiratory fraction of isoflurane. Recovery was rather slow after 165 minutes of general anesthesia, so atipamezole was administered. Ten minutes after the intramuscular injection of atipamezole, the animal started to recover. Meloxicam and buprenorphine were used for post-operative analgesia. *Reproduced with permission of CAB.*
**Descriptors:** jaguar, *Panthera onca*, fractured mandible, surgical repair, anesthesia, anesthetics, bone fractures, clinical aspects, diagnosis, fracture fixation, inhaled anesthetics, isoflurane, ketamine, mandible, medetomidine, pharmacodynamics, respiration rate.
**Language of Text:** Dutch.

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### Leopard - General

A.l Johany, A.M.H. (2007). **Distribution and conservation of the Arabian Leopard *Panthera pardus nimr* in Saudi Arabia.** *Journal of Arid Environments* 68(1): 20-30. ISSN: 0140-1963.

**NAL Call Number:** QH541.5.D4J6
**Descriptors:** *Panthera pardus*, wildlife management, population distribution, predation , wildlife habitats, mortality , animal ecology, Saudi Arabia.

Acharjyo L N and Patnaik S K (1985). **Observations on some aspects of reproduction among the panthers *Panthera-pardus* on Nandankanan Biological Park Orissa India**. *Indian Journal of Forestry* 8(1): 8-14. ISSN: 0250-524X.
**Descriptors:** leopard, *Panthera pardus*, reproductive system, reproduction, estrus, sex ratio, matings, observations, age, litter size, receptivity, gestation.

Ahmed A, Jahan M, Braunitzer G, and Goeltenboth R (1988). **Carnivora the primary structure of the major and minor hemoglobin components of adult north Persian leopard *Panthera pardus sexicolor***. *Zeitschrift Fuer Naturforschung Section B Chemical Sciences* 43(10): 1341-1346. ISSN: 0932-0776.
**Descriptors:** leopard, *Panthera pardus sexicolor*, primary structure, major and minor hemoglobin components, north Persian leopard, Hb-I, HbII, polypeptide chains, amino acid sequences.

Akhtar, N. and M.L. Narang (1998). **Earthworm in the diet of leopard *Panthera pardus***. *Journal of the Bombay Natural History Society* 95(1): 110. ISSN: 0006-6982.
**Descriptors:** leopard, *Panthera pardus*, diet, nutrition, earthworm, food, India.

Archana, D.N. Sharma, R. Rajput, R.S. Kishtwaria, R.L. Bhardwaj, and L.S. Sudhakar (2006). **Anatomy of north western himalayan leopard**. *Indian Journal of Animal Sciences* 76(8): 616-617. ISSN: 0367-8318.
**Descriptors:** leopard, north western Himalayan, anatomy, biogeography, population studies.

Babu, N.G.R., A.J. Bragitha, M.M. Babu, C.R. Prasad, and T. Gopal (1993). **Incidence of salmonellosis in leopards (*Panthera pardus*)**. *Indian Veterinary Journal* 70(3): 289-290. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, salmonellosis, incidence, infection, veterinary medicine, diagnosis, infection source, mortality.

Balme, G., L. Hunter, and R. Slotow (2007). **Feeding habitat selection by hunting leopards *Panthera pardus* in a woodland savanna: prey catchability versus abundance**. *Animal Behaviour* 74(Part 3): 589-98. ISSN: 0003-3472.
**Descriptors:** leopards, *Panthera pardus*, hunting behavior, feeding habit selection, prey catchability, woodland savanna, diet.

Berger, M., P. Schawalder, H. Stich, and A. Lussi (1995). **"Neck Lesion" bei Grosskatzen: Untersuchungen beim Leoparden (*Panthera pardus*). ["Neck lesion" in big cats. Examinations in the leopard (*Panthera pardus*)]**. *Kleintierpraxis* 40(7): 537-549. ISSN: 0023-2076.
**Descriptors:** leopards, *Panthera pardus*, tooth diseases, teeth, veterinary medicine, dental caries, radiography, microscopy, diagnosis, analytical methods, Carnivora, mouth.
**Language of Text:** German, Summaries in German, English and French.

Bodendorfer, T., B. Hoppe Dominik, F. Fischer, and K.E. Linsenmair (2006). **Predation par le leopard (*Panthera pardus*) et le lion (*Panthera leo*) dans les parcs nationaux de la comoe et de la marahoue en cote d'Ivoire (Afrique de l'ouest) [Prey of the leopard (*Panthera pardus*) and the lion (*Panthera leo*) in the Comoe and Marahoue National Parks, cote d'Ivoire, West Africa].** *Mammalia* 70(3-4): 231-246. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, lion, *Panthera leo*, prey, population studies, scat analysis, applied and field techniques, Comoe and Marahoue National Parks, Ivory Coast, West Africa.
**Language of Text:** French.

Brown J L, Goodrowe K L, Simmons L G, Armstrong D L, and Wildt D E (1988). **Evaluation of the pituitary-gonadal response to gnrh and adrenal status in the leopard *Panthera pardus japonensis* and tiger *Panthera tigris***. *Journal of Reproduction and Fertility* 82(1): 227-236. ISSN: 0022-4251.
**Descriptors:** leopard, *Panthera pardus japonensis*, pituitary gonadal response, GnRH, evaluation, adrenal status, reproductive system, reproduction, sex differences, species differences, gonadotropin releasing hormone, cortisol luteinizing hormone, fsh testosterone.

Brown J L, Wildt D E, Phillips L G, Seidensticker J, Fernando S B U, Miththapala S, and Goodrowe K L (1989). **Adrenal-pituitary-gonadal relationships and ejaculate characteristics in captive leopards *Panthera pardus kotiya* isolated on the island of Sri Lanka**. *Journal of Reproduction and Fertility* 85(2): 605-614. ISSN: 0022-4251.
**Descriptors:** captive leopard, *Panthera pardus kotiya*, physiology, reproductive system, reproduction, adrenal pituitary gonadal relationships, ejaculate characteristics, captive, wildlife management, conservation, testosterone, FSH, ACTH, luteinizing hormone, gonadotropin releasing hormone, electroejaculation, sperm abnormality, Sri Lanka.

Chambers M R, Santiapillai C, and Ishwaran N (1984). **Tourist activity and behavior of the leopard *Panthera pardus fusca* in the Ruhuna National Park Sri Lanka**. *Journal of the Bombay Natural History Society* 81(1): 42-48. ISSN: 0006-6982.
**Descriptors:** leopard, *Panthera pardus fusca*, behavior, tourist activity, wildlife management, conservation, stress, Ruhuna National Park, Sri Lanka.

Chandranaik, B.M., S. Murthy, D. Das, G.S. Mamatha, C. Renukaprasad, and G. Krishnappa (2005). **Helminthiasis in leopards (*Panthera pardus*) at Bannerghatta Biological Park**. *Zoos Print Journal* 20(7): 1934. ISSN: 0971-6378.
**Descriptors:** leopards, infection, helminthiasis, veterinary medicine, animal care, parasitic disease, drug therapy, prevention, control, complications, gastroenteritis, digestive system disease, symptomss, anorexia nervosa, behavioral and mental disorders, deworming.

Chelomina, G.N., L.N. Spiridonova, M.M. Kozyrenko, E.V. Artyukova, Y.V. Chelomin, and Y.U.N. Zhuravlev (1999). **Estimation of genetic polymorphism and subspecies diagnostics in the far-eastern leopard *Panthera pardus orientalis* by means of rapd-PCR analysis of cellular DNA**. *Genetika* 35(5): 681-687. ISSN: 0016-6758.
**Descriptors:** leopard, *Panthera pardus orientalis*, genetic polymorphism, estimation, subspecies diagnostics, rapid-PCR analysis, DNA, wild living, captivity, breeding lines, genetic diversity.
**Language of Text:** Russian.

Clifford, D.H. (1958). **Observations on effect of preanesthetic medication with meperidine and promazine on barbiturate anesthesia in an ocelot and a leopard.** *Journal of the American Veterinary Medical Association* 133(9): 459-63. ISSN: 0003-1488.
**Descriptors:** leopard, *Panthera pardus*, ocelot, anesthesia, analgesia, barbiturates,

meperidine, pre-anesthetic medication, observations, promazine, effect.

Cunningham, P. and C. Gross (2000). **Reproduction and development of the Arabian leopard, *Panthera pardus nimr*, in captivity**. *Zoology in the Middle East* 20: 9-14. ISSN: 0939-7140.
**Descriptors:** Arabian leopard, *Panthera pardus nimr*, wildlife management, conservation, development, reproduction, captive breeding, captivity, cub number, gestation period, inter estrus period, estrus period.

de Haas van Dorsser, F.J., D.I. Green, W.V. Holt, and A.R. Pickard (2007). **Ovarian activity in Arabian leopards (*Panthera pardus nimr*): Sexual behaviour and faecal steroid monitoring during the follicular cycle, mating and pregnancy.** *Reproduction, Fertility, and Development* 19(7): 822-830. ISSN: 1031-3613.
**Abstract:** The Arabian leopard is a critically endangered subspecies endemic to the Arabian Peninsula. A fundamental understanding of the ovarian activity of the leopard is important to enhance the success with which it breeds in captivity. The objective of the present study was to characterise the endocrinology of the follicular cycle, ovulation and pregnancy in captive females using faecal steroid hormone analyses and observations of sexual behaviour. The follicular cycle of the leopard was shown to last 18-23 days based on the interval between consecutive peaks of faecal oestrogen conjugates, and the occurrence of silent heats was high. Puberty had commenced at 2 years of age, but faecal steroid profiles did not match those of the adult female until 3 years of age. No seasonal change in ovarian steroid excretion was observed, although behavioural oestrus was suppressed in summer. Significant rises in faecal progestagen concentrations were only recorded in mated leopards, indicating that these females were strictly induced ovulators. However, only 60% of these mating periods were ovulatory. Progestagen concentrations during pregnancy were significantly higher than those of the non-pregnant luteal phase. The average duration of the non-pregnant and pregnant luteal phases was 39 and 97 days, respectively. The basic features of the reproductive cycle of the Arabian leopard described here form an important foundation for further study into its reproduction.
**Descriptors:** leopard, *Panthera pardus nimr*, ovarian activity, sexual behavior, fecal steroid monitoring, follicular cycle, mating, pregnancy.

de Haas van Dorsser, F.J. and J.A. Strick (2005). **Semen characteristics and sperm morphology in the Arabian leopard (*Panthera pardus nimr*) and how these vary with age and season.** *Reproduction, Fertility, and Development* 17(7): 675-82. ISSN: 1031-3613.
**Abstract:** The Arabian leopard is a critically endangered species. Since there are only an estimated 200 animals remaining in the wild, careful management of the captive population is necessary to minimise inbreeding. The objective of this study was to characterise sperm morphology and ejaculate quality in captive males. Semen was collected by electroejaculation from 8 adult captive male leopards (aged 2-16 years) during the summer and winter months, and semen parameters, including sperm morphology, were assessed. Two-year-old leopards showed lower total sperm counts per ejaculate than older animals and these counts declined at > 8 years. Ejaculates collected during the hot summer showed significantly lower sperm concentrations, total sperm counts, sperm motility and viability and percentage of spermatozoa showing normal morphology than ejaculates collected in the cooler winter. The results showed that the male leopard attains sexual maturity between 2 and 3 years of age and exhibits good semen quality until 8 years. Collection of semen for artificial breeding or banking would best be carried out in the cooler winter months.
**Descriptors:** Arabian leopard, *Panthera pardus nimr*, captive mates, semen characteristics, sperm morphology, vary, age, seasonal effects, sperm.

De Simoi, A. (2006). **Complications of mandibular brachygnathism in a North African leopard.** *Journal of Veterinary Dentistry* 23(2): 89-95. ISSN: 0898-7564.
**Abstract:** A 9-year-old, male North African leopard (*Panthera pardus*) presented with mandibular brachygnathism and lingually displaced mandibular canine teeth causing a large left oronasal fistula, rhinitis and nasal discharge, and a right orocutaneous fistula. Surgical closure of the left oronasal defect, bilateral mandibular canine tooth crown reduction, and root canal therapy resulted in a positive clinical outcome. A small recurrent left oronasal fistula and the right orocutaneous fistula healed spontaneously after alleviating the occlusal contact with the mandibular canine teeth. At 12-months postoperatively, clinical signs of oral and dental disease had resolved.
**Descriptors:** leopard, *Panhtera pardus*, mandibular brachygnathism, malocclusion, mandibular canine teeth diseases, oroantral fistula, diagnosis, complications, surgery, complications, treatment successful.

Dong H, Chen S, Zhao Q, Yu H, and Hao Y (1988). **The fine structure of the spermatozoa of the *Panthera pardus***. *Acta Zoologica Sinica* 34(4): 384. ISSN: 0001-7302.
**Descriptors:** leopard, *Panthera pardus*, spermatazoa, fine structure, morphology, reproductive system, reproduction, oogonia follicle, oocyte lipid, yolk, ovulation.
**Language of Text:** Chinese.

Edgaonkar, A. and R. Chellam (2002). **Food habit of the leopard, *Panthera pardus*, in the**

**Sanjay Gandhi National Park, Maharashtra, India.** *Mammalia* 66(3): 353-360. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, domestic dog, primates, cervids, pigs, birds, buffaloes, domestic animals, food habit, scat analysis, India.

Gavashelishvili, A. and V. Lukarevskiy (2008). **Modelling the habitat requirements of leopard *Panthera pardus* in west and central Asia.** *Journal of Applied Ecology* 45(2): 579-588. ISSN: 0021-8901.

**NAL Call Number:** 410 J828
**Abstract:** 1. Top predators are seen as keystone species of ecosystems. Knowledge of their habitat requirements is important for their conservation and the stability of the wildlife communities that depend on them. The goal of our study was to model the habitat of leopard *Panthera pardus* in west and central Asia, where it is endangered, and analyse the connectivity between different known populations in the Caucasus to enable more effective conservation management strategies to be implemented. 2. Presence and absence data for the species were evaluated from the Caucasus, Middle East and central Asia. Habitat variables related to climate, terrain, land cover and human disturbance were used to construct a predictive model of leopard habitat selection by employing a geographic information system (GIS) and logistic regression. 3. Our model suggested that leopards in west and central Asia avoid deserts, areas with long-duration snow cover and areas that are near urban development. Our research also provides an algorithm for sample data management, which could be used in modelling habitats for similar species. 4. Synthesis and applications. This model provides a tool to improve search effectiveness for leopard in the Caucasus, Middle East and central Asia as well as for the conservation and management of the species. The model can predict the probable distribution of leopards and the corridors between various known populations. Connectivity patterns can be used to facilitate corridor planning for leopard conservation, especially in the Caucasus, where the leopard is a top priority conservation species. Also, as top predators are often associated with high biodiversity, the leopard habitat model could help to identify biodiversity hotspots. The protection of biodiversity hotspots is seen as the most effective way to conserve biodiversity globally.
**Descriptors:** leopard, *Panthera pardus*, habitat requirements, modelling, ecosystems, conservation management, climate, terrain, land cover, human disturbances, Asia.

Grassman, L.I. (1999). **Ecology and behavior of the indochinese leopard in Kaeng Krachan National Park, Thailand**. *Natural History Bulletin of the Siam Society* 47(1): 77-93. ISSN: 0080-9462.
**Descriptors:** leopard, *Panthera pardus delacouri*, ecology, berhavior, radio collared, feces, scat, badger, barking deer, wild pig, seasonal changes, environmental stress, fire, floods, Thailand.

Hao Yifeng (1993). **Morphological observations and functional analysis of semen of leopard (*Panthera pardus*).** *Chinese Wildlife (China)*(no. 1): 40-42. ISSN: 1000-0127.
**Descriptors:** leopards, *Panthera pardus*, semen, morphological observations, functional analysis, carnivora, Felidae, male genital system, urogenital system.
**Language of Text:** Chinese.

Hart, J.A., M. Katembo, and K. Punga (1996). **Diet, prey selection and ecological relations of leopard and golden cat in the Ituri forest, Zaire**. *African Journal of Ecology* 34(4): 364-379. ISSN: 0141-6707.
**Descriptors:** leopard, *Panthera pardus*, diet, prey selection, ecological relations, behavior, nutrition, feeding behavior, Ituri forest, predator.

Hartley, A., F. Goeritz, T. Arzhanova, S. Christie, P. Kertesz, J. Lewis, G. Maksudov, and K. Jewgenow (2000). **Semen collection and reproductive health assessment of pure bred amur leopards (*Panthera pardus orientalis*) within the eep breeding programme**. *Advances in Ethology*(35): 88. ISSN: 0931-4202.
**Descriptors:** leopard, *Panthera pardus orientalis*, conservation, reproductive system, reproduction, genetic analysis, semen collection, health assessment, DNA technology, genome banking, preservation method, eep breeding program, ssp breeding program, Berlin Tierpark, Moscow zoo, Prague zoo.
**Notes:** Meeting Information: 3rd International Symposium on Physiology and Ethology of Wild and Zoo Animals, Berlin, Germany; October 04-07, 2000.

Hawkey, C.M. and M.G. Hart (1986). **Haematological reference values for adult pumas, lions, tigers, leopards, jaguars and cheetahs.** *Research in Veterinary Science* 41(2): 268-269. ISSN: 0034-5288.
**Abstract:** Normal haematological values and fibrinogen levels were obtained from a number of healthy adult Felidae in the collection of the Zoological Society of London. The group comprised 29 pumas (*Felis concolor*), 32 lions (*Panthera leo*), 27 tigers (*P tigris*), 19 leopards (*P pardus*), 18 jaguars (*P onca*) and 22 cheetahs (*Acinonyx jubatus*). The values provided a basis for identifying abnormalities in the blood of sick individuals of these species and for undertaking interspecies comparisons.
**Descriptors:** cheetah, *Acinonyx jubata*, pumas, *Felis concolor*, lions, *Panthera leo*, tigers,

*Panthera tigris*, leopards, *Panthera pardus*, jaguars, *Panthera onca*, adult, fibrinogen levels, blood, hematological reference values.

Hayward, M.W., P. Henschel, J. O'brien, M. Hofmeyr, G. Balme, and G.I.H. Kerley (2006). **Prey preferences of the leopard (*Panthera pardus*)**. *Journal of Zoology (London)* 270(2): 298-313. ISSN: 0952-8369.
**Descriptors:** leopard, *Panthera pardus*, behavior, prey preferences, impala, bushbuck, common duiker, weight range, open vegetation, body mass.

Hayward, M.W., J. Adendorff, L. Moolman, G.J. Hayward, and G.I.H. Kerley (2007). **The successful reintroduction of leopard *Panthera pardus* to the Addo Elephant National Park.** *African Journal of Ecology* 45(1): 103-104. ISSN: 0141-6707.

**NAL Call Number:** 409.6 Ea7
**Descriptors:** leopard, *Panthera pardus*, successful reintroduction, Addo Elephant National Park, conservation, South Africa.

Henschel, P., K.A. Abernethy, and L.J.T. White (2005). **Leopard food habits in the Lope National Park, Gabon, central Africa**. *African Journal of Ecology* 43(1): 21-28. ISSN: 0141-6707.
**Abstract:** To determine leopard *Panthera pardus* (Linnaeus) food habits in the Lope National Park in Gabon, Central Africa, 196 leopard scats were collected and analysed. Prey items were determined using undigested matter isolated from the scats, and a reference collection of hairs and bones from potential prey species. A minimum of 30 different prey species were identified, 27 of which were mammalian. Leopards preyed mainly on ungulates, which made up 59%, of the biomass consumed. Diurnal primates (18%) and large rodents (17%) were also heavily preyed upon. The mean prey weight estimated from scats was 29.2 kg. The most important single prey species was found to be red river hog *Potamochoerus porcus* (Linnaeus), making up 20% of the biomass consumed, followed by forest buffalo *Syncerus caffer nanus* (Boddaert) and cane rat *Thryonomys swinderianus* (Temminck), each comprising 13% of biomass consumed.
**Descriptors:** leopard, *Panthera pardus*, food habits, scats, prey, ungulates, primates, large rodents, prey weight, red river hog, buffalo, cane rat, Africa, Loops National Park.

Hoppe Dominik B (1984). **Prey frequency of the leopard *Panthera pardus* in the Tai National Park of the Ivory Coast**. *Mammalia* 48(4): 477-488. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, diet, nutrition, prey frequency, monkey, bovid, rodent, feces, scat hair, opportunist, Ivory Coast. Africa.
**Language of Text:** French.

Jani, R.G., D.R. Patil, and P.R. Patel (2003). **A case study of epilepsy in a captive leopard (*Panthera pardus*).** *Indian Veterinary Journal* 80(5): 464. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, nervous system condition, epilepsy, case study, neural coordination, pharmacology, nervous system disease, seizures, Sayajibaug zoo, India.

Jayakumar S R, Babu M M, Gopal T, and Keshavamurthy B S (1989). **Rabies in a wild leopard *Felis pardus***. *Indian Veterinary Journal* 66(11): 1076-1077. ISSN: 0019-6479.
**Descriptors:** wild leopard, rabies, *Felis pardus*, infection, nervous system, neural coordination, wildlife management, conservation, India.

Jayaprakash, D., S.B. Patil, M.N. Kumar, K.C. Majumdar, and S. Shivaji (2000). **Semen characteristics of the captive indian leopard, *Panthera pardus***. *Biology of Reproduction* 62(Supplement 1): 147-148. ISSN: 0006-3363.
**Descriptors:** leopard, *Panthera pardus*, semen characteristics, reproductive system, reproduction, computer aided semen analysis, cryopreservation, methods, preservation, captive breeding programs, meeting abstract.
**Notes:** Thirty-Third Annual Meeting of the Society for the Study of Reproduction, Madison, Wisconsin, USA; July 15-18, 2000.

Jayaprakash, D., S.B. Patil, M.N. Kumar, K.C. Majumdar, and S. Shivaji (2001). **Semen characteristics of the captive Indian leopard, *Panthera pardus***. *Journal of Andrology* 22(1): 25-33. ISSN: 0196-3635.
**Descriptors:** captive leopard, *Panthera pardus*, semen characteristics, sperm motility, density, spermatazoa, motile, morphological normal, cryopreservation, hamester oocyte, penetrated, breeding programs.

Jenny, D. (1996). **Spatial organization of leopards *Panthera pardus* in Tai National Park, Ivory Coast: is rainforest habitat a 'tropical haven'?.** *Journal of Zoology (United Kingdom)* 240(3): 427-440. ISSN: 0952-8369.
**Descriptors:** leopards, *Panthera pardus*, spatial organization, rainforest habitat, Tia National Park, Ivory Coast.

Johnson, K.G., W. Wei, and D.G. Reid (1993). **Food habits of Asiatic leopards (*Panthera pardus fusea*) in Wolong Reserve, Sichuan, China**. *Journal of Mammalogy* 74(3): 646-50. ISSN: 0022-2372.

**Abstract:** Analysis of feces showed Asiatic leopards (*Panthera pardus fusea*) to consume a varied diet over a 7-year period. Tufted deer (*Elaphodus cephalophus*) was replaced as the most frequent prey by bamboo rats (*Rhizomys sinense*). Fifteen species of large and medium-sized mammals composed the majority of the diet with pheasants, livestock, grass, and soil being eaten occasionally. Reasons for dietary shifts were unclear and may reflect leopards hunting for any readily captured prey by opportunistic encounter and perhaps by changes in hunting behavior, prey availability, or prey vulnerability associated with a bamboo die-off. Reprinted by permission of the American Society of Mammalogists, 1993.
**Descriptors:** leopard, *Panthera pardus fusea*, food habits, Asiatic leopards, feces analysis, varied diet, tufted deer, bamboo rats, pheasants, livestock, hunting behavior, prey selection, China.

Kalita, A., M. Sarma, P. Roychoudhury, and G. Baishya (2001). **Comparative anatomy of the skull of adult domestic cat and Indian leopard**. *Indian Journal of Animal Sciences* 71(11): 1014-1015. ISSN: 0367-8318.
**Descriptors:** leopard, *Panthera pardus*, comparative skull anatomy, adult domestic cat, morphology, gross anatomical comparisons.

Kalita, A., M. Sarma, and K.K. Sarma (2001). **Anatomy of the mandible of Indian leopard**. *Indian Veterinary Journal* 78(12): 1138-1140. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, mandible, dental and oral system, ingestion, assimilation, ramus, body, condyles, coronoid process, anatomy.

Kalita, A., M. Sarma, K.K. Sarma, and R.N. Gowsami (2002). **Craniometrical study in leopard**. *Indian Veterinary Journal* 79(5): 477-480. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, craniometrical study, skull, cephalic index, length, width, morphology, skeletal system, movement, support, cranial capacity.

Karanth, K.U. and M.E. Sunquist (1995). **Prey selection by tiger, leopard and dhole in tropical forests**. *The Journal of Animal Ecology* 64(4): 439-50. ISSN: 0021-8790.
**Descriptors:** leopard, *Panthera pardus*, tiger, *Panthera tigris*, dhole, *Cuon alpinus*, prey selection, tropical forest, India.

Karanth, K.U. and M.E. Sunquist (2000). **Behavioural correlates of predation by tiger (*Panthera tigris*), leopard (*Panthera pardus*) and dhole (*Cuon alpinus*) in Nagarahole, India**. *Journal of Zoology* 250(2): 255-265. ISSN: 0952-8369.
**Descriptors:** leopard, *Panthera pardus*, tiger, *Panthera tigris*, dhole, *Cuon alpinus*, predation, behavioral correlates, predator scats, predators, habitat specificity, prey size, cover, behavioral factors, Nagarahole, India.

Kearns, K.S., M.P. Jones, R.M. Bright, R. Toal, R. Denovo, and S. Orosz (2000). **Hiatal hernia and diaphragmatic eventration in a leopard (*Panthera pardus*)**. *Journal of Zoo and Wildlife Medicine* 31(3): 379-382. ISSN: 1042-7260.
**Descriptors:** leopard, *Panthera pardus*, hiatal hernia, ultrasonography, diaphragmatic eventration, intermittent anorexia, emaciation, exporatory laparotomy, surgical repair.

Khorozyan, I.G., A. Cazon, A.G. Malkhasyan, and A.V. Abramov (2007). **Using thin-layer chromatography of fecal bile acids to study the leopard (*Panthera pardus ciscaucasica*) population**. *Biology Bulletin* 34(4): 361-366. ISSN: 1062-3590.
**Descriptors:** leopard, *Panthera pardus ciscaucasica*, chromatography, fecal bile acids, populations, study, wildlife management, conservation, visual identification, Armenia.

Khorozyan, I. (2003). **Habitat preferences by the persian leopard (*Panthera pardus saxicolor pocock*, 1927) in Armenia.** *Zoology in the Middle East* 30: 25-36. ISSN: 0939-7140.
**Descriptors:** leopard, *Panthera pardus saxicolor*, *habitat preferences*, Armenia, human activities, forest, pastures, conservation, livestock grazing, spatial distribution.

Khorozyan, I.G. and A.V. Abrarnov (2007). **The leopard, *Panthera pardus*, (Carnivora : Felidae) and its resilience to human pressure in the Caucasus**. *Zoology in the Middle East* 41: 11-24. ISSN: 0939-7140.
**Descriptors:** leopard, *Panthera pardus*, human pressure, population, resilience, habitats, conservation, Caucasus.

Laman, T.G. and C.D. Knott (1997). **An observation of leopard ( *Panthera pardus linnaeus*) mating behaviour in Serengeti National Park, Tanzania**. *African Journal of Ecology* 35(2): 165-167. ISSN: 0141-6707.
**Descriptors:** leopard, *Panthera pardus linnaeus*, behavior, reproductive system, reproduction, copulation, mating behavior, Serengeti National Park, Tanzania.

Leonard, A., D. Tonkyn, and A. Shoemaker (1996). **Measuring the full costs of inbreeding to captive, endangered leopards *Panthera pardus***. *Bulletin of the Ecological Society of America* 77(3 Suppl. Part 2): 260. ISSN: 0012-9623.
**Descriptors:** leopard, *Panthera pardus*, captive, inbreeding, conservation , reproductive system, reproduction, measuring full costs, systematics, taxonomy, wildlife management,

conservation, adult mortality, meeting abstract, reintroduction.
**Notes:** 1996 Annual Combined Meeting of the Ecological Society of America on Ecologists/Biologists as Problem Solvers, Providence, Rhode Island, USA; August 10-14, 1996.

Mallapur, A. and R. Chellam (2002). **Environmental influences on stereotypy and the activity budget of Indian leopards (*Panthera pardus*) in four zoos in southern India.** *Zoo Biology* 21(6): 585-595. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6
**Descriptors:** leopard, *Panthera pardus*, zoo animals, stereotyped behavior, environmental enrichment, animal behavior, cage size, animal housing, animal technicians, visitors, physical activity, animal feeding, enclosure size, resting, feeding time, India.

Mallapur, A., Q. Qureshi, and R. Chellam (2002). **Enclosure design and space utilization by Indian leopards (*Panthera pardus*) in four zoos in southern India.** *Journal of Applied Animal Welfare Science JAAWS* 5(2): 111-124. ISSN: 1088-8705.
**NAL Call Number:** HV4701.J68
**Descriptors:** leopards, *Panthera pardus*, zoo animals, cages, animal behavior, abnormal behavior, physical activity, animal welfare, stereotyped behavior, animal use refinement, enrichment, enclosure design, space utilization, India.

Marker, L.L. and A.J. Dickman (2005). **Factors affecting leopard (*Panthera pardus*) spatial ecology, with particular reference to Namibian farmlands**. *South African Journal of Wildlife Research* 35(2): 105-115. ISSN: 0379-4369.
**Descriptors:** leopard, *Panthera pardus*, spatial ecology, wildlife management, terrestrial ecology, conservation, habitat degradation, farmland, home range size, prey biomass, long term viability.

Markowitz, H., C. Aday, and A. Gavazzi (1995). **Effectiveness of acoustic "prey": environmental enrichment for a captive African leopard (*Panthera pardus*).** *Zoo Biology* 14(4): 371-379. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** leopard, *Panthera pardus*, environmental enrichment, zoos, feeding behavior, acoustic prey, effectiveness, predation, predator prey relationships, behavior, stimulation, behavior patterns, audiovisual aids, California.

Mehta, P. (1997). **Leopard (*Panthera pardus*) attempting to prey on Indian giant squirrel (*Ratufa indica centralis*)**. *Journal of the Bombay Natural History Society* 94(3): 555-556. ISSN: 0006-6982.
**Descriptors:** leopard, *Panthera pardus*, behavior, predation, Indian giant squirrel, *Ratufa indica centralis*, diet, food, India.

Meijaard, E. (2004). **Biogeographic history of the Javan leopard *Panthera pardus* Based on a craniometric Analysis**. *Journal of Mammalogy* P.: 302-10. ISSN: 0022-2372.
**Descriptors:** Javan leopard, *Panthera pardus*, biogeographic history, Craniometric analysis.

Miththapala, S., J. Seidensticker, and L.G. Phillips (1989). **Identification of individual leopards (*Panthera pardus kotiya*) using spot pattern variation**. *Journal of Zoology* 218(4): 527-36. ISSN: 0952-8369.
**Descriptors:** leopard, spot pattern variation, visual identification method, individual leopards, *Panthera pardus kotiya*.

Miththapala, S., J. Seidensticker, and S.J. O'brien (1996). **Phylogeographic subspecies recognition in leopards (*Panthera pardus*): Molecular genetic variation**. *Conservation Biology* 10(4): 1115-1132. ISSN: 0888-8892.
**Descriptors:** leopard, *Panthera pardus*, phylogeographic subspecies recognition, molecular genetic variation, wildlife, endangered species, taxonomy, genetic divergence.

Mizutani, F. and P.A. Jewell (1998). **Home-range and movements of leopards (*Panthera pardus*) on a livestock ranch in Kenya.** *Journal of Zoology (United Kingdom)* 244(2): 269-286. ISSN: 0952-8369.
**Descriptors:** leopards, *Panthera pardus*, home range, movements, livestock ranch, Kenya, conservation.

Mohanty, J., L.N. Acharya, and A.K. Mohanty (1985). **Obstipation in a Leopard (*Panthera pardus*).** *Indian Veterinary Journal (India)* 62(10): 899-902. ISSN: 0019-6479.
**Abstract:** A female leopard suffered from obstipation due to faecal concretion in the region of colon. There was no response to medicinal treatment. Enterotomy was performed after 15 days of obstruction. Satisfactory recovery occurred in 17 days.
**Descriptors:** leopards, *Panthera pardus*, obstipation, female, fecal concretion, colon, enterotomy, medicinal treatment, recovery, veterinary care, India.
**Language of Text:** Summary in English.

Mukherjee, S., S.P. Goyal, and R. Chellam (1994). **Standardisation of scat analysis**

**techniques for leopard (*Panthera pardus*) in Gir National Park, western India**. *Mammalia* 58(1): 139-143. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, digestive system, ingestion, assimilation, scat analysis, nutrition, diet analysis, hair, technique standardization.

Nagata, J., V.V. Aramilev, A. Belozor, T. Sugimoto, and D.R. McCullough (2005). **Fecal genetic analysis using PCR RFLP of cytochrome b to identify sympatric carnivores, the tiger *Panthera tigris* and the leopard *Panthera pardus*, in far eastern Russia.** *Conservation Genetics* 6(5): 863-866. ISSN: 1566-0621.

**NAL Call Number:** QH75.A1 C56
**Descriptors:** leopard, *Panthera pardus*, tiger, *Panthera tigris*, fecal genetic analysis, PCR RFLP, cytochrome B, sympatric carnivores, mtDNA, Russia.

Nath, I., T.K. Pattanaik, N. Sahoo, V.S.C. Bose, H.K. Mohapatra, and P.K. Roy (2006). **A case of histiocytoma in a leopard *Panthera pardus***. *Zoos Print Journal* 21(6): 2302. ISSN: (p) 0973-2535 - (E) 0973-2551.
**Descriptors:** leopard, *Panthera pardus*, histiocytoma, pharmacology, tumor biology, respiratory system, respiratory distress, drug therapy, neoplastic disease.

Neiffer, D.L. (2001). ***Clostridium perfringens* enterotoxicosis in two Amur leopards (*Panthera pardus orientalis*).** *Journal of Zoo and Wildlife Medicine* 32(1): 134-135. ISSN: 1042-7260.
**Abstract:** Two 6-yr-old male sibling Amur leopards (*Panthera pardus orientalis*) housed together at the Pittsburgh Zoo presented for acute onset of diarrhea with no changes in appetite or behavior. Heat-fixed modified Wright-stained and Gram-stained fecal smears revealed a mixed bacterial population with a large number of gram-positive *Clostridium perfringens*-like spores (>20 per high-power oil immersion field). In addition, *C. perfringens* enterotoxin was isolated from one leopard at 1:256, confirming the presence of *C. perfringens* enterotoxicosis. Treatment with oral metronidazole, tylosin tartrate, and psyllium fiber was prescribed, with return of more normal stool by the third day of treatment. Fecal consistency steadily improved and was considered normal by the time all prescribed treatments were complete. Diarrhea has not recurred. Partially thawed meat in the leopards' diet may have precipitated the production of an endogenous clostridial enterotoxicosis by disrupting digestive tract flora with resultant clostridial overgrowth and sporulation.
**Descriptors:** leopard, *Panthera pardus orientalis*, enterotoxicosis, *Clostridium perfringens*, zoo, diarrhea, fecal smears, treatment.

Ott, T., G.I.H. Kerley, and A.F. Boshoff (2007). **Preliminary observations on the diet of leopards (*Panthera pardus*) from a conservation area and adjacent rangelands in the Baviaanskloof region, South Africa**. *African Zoology* 42(1): 31-37. ISSN: 1562-7020.
**Descriptors:** leopard, *Panthera pardus*, diet, observations, wildlife management, conservation, ingestion, assimilation, scats, ungulates, rodents, birds, felid, mountain buck, vlei rat, bushbuck, rock hyrax, grysbok, conservation area, prey category, South Africa.

Penzhorn, B.L., E. Stylianides, M. Van Vuuren, K.M.D.G.A. Alexander, and N. Mukarati (2002). **Seroprevalence of *Toxoplasma gondii* in free-ranging lion and leopard populations in southern Africa.** *South African Journal of Wildlife Research* 32(2): 163-165. ISSN: 0379-4369.
**Descriptors:** leopard, *Panthera pardus*, *Toxoplasma gondii*, seroprevalence, free ranging, lion, leopard, population studies, parasitology, toxoplasmosis, infectious disease, parasitic disease, antibodies.

Perez, I., E. Geffen, and O. Mokady (2006). **Critically endangered Arabian leopards *Panthera pardus nimr* in Israel: estimating population parameters using molecular scatology**. *Oryx* 40(3): 295-301. ISSN: 0030-6053.
**Descriptors:** leopard, *Panthera pardus nimr*, population studies, wildlife management, conservation, survey, critically endangered, population parameters, molecular scatology, laboratory techniques, Israel.

Poddar Sarkar, M. and R.L. Brahmachary (2004). **Putative chemical signals of leopard**. *Animal Biology (Leiden)* 54(3): 255-259. ISSN: (p) 1570-7555; (E) 1570-7563.
**Descriptors:** leopard, *Panthera pardus*, behavior, putative chemical signals, biochemistry, marking fluid, communication, molecular biophysics, chemical analysis, laboratory techniques, marking behavior, scent marking.

Pythal, C., K.M. Pillai, C.G. Varghese, and T. Surendranathan (1993). **Death of a wild Indian leopard *Panthera pardus fusca* (meyer) due to parasitism with the lung fluke *Paragonimus westermanii* (Kerbert, 1878) and the hookworm *Galoncus perniciosus* (Linstow, 1885)**. *Journal of Veterinary and Animal Sciences* 24(1): 44-46. ISSN: 0971-0701.
**Descriptors:** leopard, *Panthera pardus fusca*, parasitism, lung fluke, *Paragonimus westermanii*, hookworm, *Galoncus perniciosus*, death, free living, reservoir host.

Rameshkumar B, Ramasamy V, and Gopal M S (1989). **Use of ketamine hydrochloride as general anesthetic in combination with triflupromazine hydrochloride in a black panther *Panthera pardus*.** *Indian Veterinary Journal* 66(7): 667-668. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, general anesthetic drug, tail amputation, drug interactions, ketamine hydrochloride, triflupromazine, combination of drugs.

Ranganath, L., B.N. Ranganath, C.L. Srinivas, R. Nagaraja, and S.M. Jayadevappa (1997). **Treatment of fracture of tibia and fibula in a male panther (*Panthera pardus*)**. *Indian Veterinary Journal* 74(9): 783-784. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, fracture, tibia, fibula, fracture treatment, movement support, injury, cerclage wire, Steinman pin, anesthesia, ketamine, xylazine, halothane.

Rao, M.R.K.M., Ch. Choudhary, and S. Ali (1984). **Case of sudden death in a panther (*Panthera pardus*) with choke.** *Indian Veterinary Journal (India)* 61(7): 618. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, sudden death, choke.
**Language of Text:** Summary in English.

Ray, S., G.K. Dutta, and M. Ray (1997). **Anatomy of the mandible of leopard (*Panthera pardus*)**. *Indian Veterinary Journal* 74(9): 765-767. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, skeletal system, mandible, movement, support, teeth, mental foramina, mandibular foramina, coronoid process, mandibular notch.

Ray, S., M. Ray, S.C. Mandal, and G.K. Dutta (1997). **Anatomy of the humerus of leopard (*Panthera pardus*)**. *Indian Journal of Animal Sciences* 67(2): 131. ISSN: 0367-8318.
**Descriptors:** leopard, *Panthera pardus*, humerus, anatomy, skeletal system, movement, leg support, gross anatomy.

Ray, S., M. Ray, S.C. Mandal, G.K. Dutta, and K. Das (1996). **Anatomical study of the femur (os femoris) of leopard (*Panthera pardus*)**. *Indian Journal of Animal Sciences* 66(2): 147-148. ISSN: 0367-8318.
**Descriptors:** leopard, *Panthera pardus*, femur, os femoris, anatomy, skeletal system, movement, support, caudal surface, cranial surface, length.

Roedel, H.G., W.W.A. Scholze, and A. Paulsch (2004). **Notes on the feeding habits of the leopard in the alpine zone of Mount Kenya**. *Mammalia* 68(1): 61-63. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, behavior, feeding habits, digestive system, ingestion, assimilation, alpine zone, diet, feeding habits, prey, scat analysis, alpine zone of Mount Kenya.

Rosen, S., I. Horowitz, Y. Braverman, M.J.R. Hall, and N.P. Wyatt (1998). **Dual infestation of a leopard by *Wohlfahrtia magnifica* and *Lipoptena chalcomelaena*.** *Medical and Veterinary Entomology* 12(3): 313-314. ISSN: 0269-283X.
**NAL Call Number:** RA639.M44
**Descriptors:** leopard, *Panthera pardus*, *Lipoptena chalcomelaena*, myiasis, new host records, case studies, infestation, *Wohlfahrtia magnifica*, duel infestation.

Roychoudhury A K and Acharjyo L N (1984). **Genetics of coat color in the leopard *Panthera pardus***. *Indian Journal of Experimental Biology* 22(6): 308-311. ISSN: 0019-5189.
**Descriptors:** leopard, *Panthera pardus*, coat color, genetics, autosomal alleles, pair, black recessive genes, spotted normal coat, genealogical data, analysis.

Sabapara, R.H. (1995). **Chemical restraint and sedation of leopards (*Panthera pardus*)**. *Indian Veterinary Journal* 72(6): 655-657. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, chemical restraint, sedation, nervous system, pharmacology , veterinary medicine, wildlife management, conservation, handling technique.

Sabapara, R.H., R.G. Jani, and P.R. Patel (2003). **Squamous cell carcinoma of lungs in an Indian leopard *Panthera pardus*.** *Zoos' Print Journal* 18(3): 1056. ISSN: (p) 0973-2535; (E) 0973-2551.
**Descriptors:** leopard, *Panthera pardus*, squamous cell carcinoma, lungs, respiratory system, respiration, tumor biology, lung neoplasms, neoplastic disease, mortality, symptoms.

Sankar, K. and A.J.T. Johnsingh (2002). **Food habits of tiger (*Panthera tigris*) and leopard (*Panthera pardus*) in Sariska Tiger Reserve, Rajasthan, India, as shown by scat analysis**. *Mammalia* 66(2): 285-289. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, behavior, food habits, prey selection, scat analysis, microscopy, examination method, body weight, food consumption, fruits, predation, prey biomass, Sariska Tiger Reserve, Rajasthan, India.

Santiapillai, C., M.R.1. Chambers, and N.O. Ishwaran (1982). **The leopard (Meyer 1794) in the Ruhuna National Park, Sri Lanka, and observations relevant to its conservation endangered species.** *Biological Conservation* 23(1): 5-14. ISSN: 0006-3207.
**NAL Call Number:** S900.B5
**Descriptors:** leopard, *Panthera pardus fusca*, observations, conservation, endangerd species, Ruhuna National Park, Sri Lanka.

Santiapillai, C. and W.S. Ramono (1992). **Status of the leopard (*Panthera pardus*) in Java, Indonesia.** *Tigerpaper (FAO)* 19(2): 1-5. ISSN: 1014-2789.
**Descriptors:** leopard, *Panthera pardus*, status, conservation, endangerd species, Java, Indonesia.

Sarma, K., M.M.S. Zama, S. Surp, and A. Kalita (2004). **Macromorphological study on the kidney of leopard (*Panthara pardus*)**. *Indian Journal of Animal Sciences* 74(11): 1137-1138. ISSN: 0367-8318.
**Descriptors:** leopard, *Panthara pardus*, kidney, macromorphological study, urinary system, chemical coordination, homeostasis, India.

Schmidt A M, Hess D L, Schmidt M J, Smith R C, and Lewis C R (1988). **Serum concentrations of estradiol and progesterone and sexual behavior during the normal estrous cycle in the leopard *Panthera pardus***. *Journal of Reproduction and Fertility* 82(1): 43-50. ISSN: 0022-4251.
**Descriptors:** leopard, *Panthera pardus*, normal estrous cycle, sexual behavior, estradiol, serum concentrations, progesterone, reproductive behavior.

Shang Jian Ke, Chen Yu Qin, Shang Zhi Feng, Yu Shi Yuan, Han Guo Juan, Jia Zong Ping, Zhang Jing, Zhang Hu Lin, and Xie Ming Ren (2008). **Renal histology and microvasculature in the *Panthera pardus***. *Chinese Journal of Zoology* 43(1): 155-158. ISSN: 0250-3263.
**Descriptors:** leopard, *Panthera pardus*, renal histology, microvasculature, urinary system, light microscopy, laboratory techniques, imaging and microscopy techniques, scanning electron microscopy, microvascular casting technique.
**Language of Text:** Chinese.

Shoemaker and A H (1985). **1983 studbook for rare leopards *Panthera pardus* ssp**. *Zoo Biology* 4(2): 169-196. ISSN: 0733-3188.
**Descriptors:** rare leopards, *Panthera pardus* ssp, studbook, reproductive system, reproduction, taxonomy, veterinary medicine, wildlife management, conservation, *Panthera pardus saxicolor*, *Panthera pardus kotiya*, *Panthera pardus japonensis*, *Panthera pardus orientalis*.

Shrivastav, A.B., A.K. Katiyar, and P.K. Malik (1999). **Ascending duodenal invagination in a leopard.** *Veterinary Record.* 144(26): 736. ISSN: 0042-4900.
**Descriptors:** leopard, ascending duodenal invagination, intussusception, pathology, duodenal pathology, edema.

Shukla, B.B., R. Kumar, A.K. Upadhyay, S.K. Shukla, V.P. Dixit, and M. Kumar (2003). **Relationship of age with body weight in orphaned leopard cubs.** *Zoos' Print Journal* 18(3): 1058. ISSN: (p) 0971-6378; online: 0973-2543.
**Descriptors:** leopard, *Panthera pardus*, orphaned newborn cubs, animal care, nutrition, age body weight relationship, diet, feeding frequency.

Siegal Willott, J.L., T. Henrikson, J.W. Carpenter, and G.A. Andrews (2005). **Chronic obstipation in a leopard (*Panthera pardus*) caused by intrapelvic uterine leiomyoma compression of the distal colon**. *Journal of Zoo and Wildlife Medicine* 36(3): 534-537. ISSN: 1042-7260.
**Descriptors:** leopard, *Panthera pardus*, chronic obstipation, intrapelvic uterine leiomyoma, compression, distal colon, constipation, imaging modalities, diagnostic.

Sims, C. (2001). **Morphological distinctions in skulls of five felids (*Puma concolor, Panthera onca, Panthera pardus, Uncia uncia, and Acinonyx jubatus*)**. *Journal of Morphology* 248(3): 285. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skull, morphological distinctions, skeletal system, cougar, jaguar, leopard, snow leopard, species comparison study.
**Notes:** Sixth International Congress of Vertebrate Morphology, Jena, Germany; July 21-26, 2001.

Singh, B., P.N. Dhingra, N. Singh, and M. Chandra (1983). **Infectious feline enteritis in panther cubs (*Panthera pardus*).** *Indian Journal of Animal Sciences* 53(8): 921-924. ISSN: 0367-8318.
**Descriptors:** leopards, *Panthera pardus*, cubs, infectious feline enteritis, India.

Singh, H.S. (2005). **Status of leopard (*Panthera pardus fusca*) in India**. *Indian Forester* 131(10): 1353-1362. ISSN: 0019-4816.
**Descriptors:** leopard, *Panthera pardus fusca*, population studies, wildlife management, conservation, habitat fragmentation, species extinction, India.

Singh, L.A.K. and D. Swain (2005). **The implications of increase in leopard numbers**. *Indian Forester* 131(10): 1383-1385. ISSN: 0019-4816.
**Descriptors:** leopard, *Panthera pardus*, population studies, terrestrial ecology, environmental sciences, wildlife management, conservation, India.

Somvanshi, R., G.L. Koul, and J.C. Biswas (1987). **Sarcocystis in a leopard (*Panthera pardus*).** *Indian Veterinary Medical Journal* 11(3): 174-175. ISSN: 0250-5266.
**NAL Call Number:** SF601.I45
**Descriptors:** leopards, sarcocystis, myocardium, postmortem-examinations, India.

Sugimoto, T., J. Nagata, V.V. Aramilev, A. Belozor, S. Higashi, and D.R. Mccullough (2006). **Species and sex identification from faecal samples of sympatric carnivores, Amur leopard and Siberian tiger, in the Russian far east**. *Conservation Genetics* 7(5): 799-802. ISSN: 1566-0621.
**Descriptors:** leopard, carnivors, amur leopard, Siberian tiger, *Panthera*, molecular genetics, fecal samples, species identification, sex identification, Russian far east.

Tehsin, R.H. (1996). **Panther, *Panthera pardus* (Linnaeus) with guinea worm infection**. *Journal of the Bombay Natural History Society* 93(1): 79-80. ISSN: 0006-6982.
**Descriptors:** leopard, *Panthera pardus*, guina worm infection, parasitology, physiology, note .

Tripathy S B and Acharjyo L N (1985). **Parotitis in captive *Panthera pardus* and *Panthera leo persica***. *Indian Journal of Veterinary Medicine* 5(1): 59. ISSN: 0970-051X.
**Descriptors:** leopard, *Panthera pardus*, lion, *Panthera leo persica*, captive, parotid glands, parotitis, dental system, oral system, ingestion, infection, pathology, pharmacology, veterinary medicine, tetracycline, pheniramine maleate, vitamin c, anti-infective drug.

Tripathy, S.B., L.N. Acharjyo, A.T. Rao, and B.C. Nayak (1980). **Hemorrhagic cystitis in a captive black panther [*Panthera pardus*] India/ Short communication.** *Indian Veterinary Journal* 57(3): 252-253. ISSN: 0019-6479.
**Descriptors:** leopards, *Panthera pardus*, black panther, captive, hemorrhagic cyctitis, India.

Uphyrkina, O., D. Miquelle, and H. Quigley (2002). **Conservation genetics of the Far Eastern leopard (*Panthera pardus orientalis*)**. *The Journal of Heredity* 93(5): 303-11. ISSN: 0022-1503.
**Abstract:** The Far Eastern or Amur leopard (*Panthera pardus orientalis)* survives today as a tiny relict population of 25-40 individuals in the Russian Far East. The population descends from a 19th-century northeastern Asian subspecies whose range extended over southeastern Russia, the Korean peninsula, and northeastern China. A molecular genetic survey of nuclear microsatellite and mitochondrial DNA (mtDNA) sequence variation validates subspecies distinctiveness but also reveals a markedly reduced level of genetic variation. The amount of genetic diversity measured is the lowest among leopard subspecies and is comparable to the genetically depleted Florida panther and Asiatic lion populations. When considered in the context of nonphysiological perils that threaten small populations (e.g., chance mortality, poaching, climatic extremes, and infectious disease), the genetic and demographic data indicate a critically diminished wild population under severe threat of extinction. An established captive population of *P. p. orientalis* displays much higher diversity than the wild population sample, but nearly all captive individuals are derived from a history of genetic admixture with the adjacent Chinese subspecies, *P. p. japonensis*. The conservation management implications of potential restoration/augmentation of the wild population with immigrants from the captive population are discussed. Reprinted by permission of the publisher.
**Descriptors:** leopard, *Panthera pardus orientalis*, conservation genetics, Amur leopard, genetic survey, mitochondral DNA, consevation management.

Uphyrkina, O., W.E. Johnson, H. Quigley, D. Miquelle, L. Marker, M. Bush, and S.J. O'brien (2001). **Phylogenetics, genome diversity and origin of modern leopard, *Panthera pardus***. *Molecular Ecology* 10(11): 2617-2633. ISSN: 0962-1083.
**Descriptors:** origins of the modern leopard, *Panthera pardus*, phylogenetics, genome diversity, origin, evolution, adaptation, population genetics, population studies, systematics, taxonomy.

Uphyrkina, O. and S.J. O'brien (2003). **Applying molecular genetic tools to the conservation and action plan for the critically endangered far eastern leopard (*Panthera pardus orientalis*).** *Comptes Rendus Biologies* 326(Supplement 1): S93-S97. ISSN: 1631-0691.
**Descriptors:** Amur leopard, *Panthera pardus orientalis*, endangered, conservation, applying molecular genetic tools, genetic analysis, management, far eastern leopard.

Zhang Zhihe, Lu Wenqi, Wang Xingliang, Wang Chengdong, Hou Rong, Song Yunfang, and He Guangxin (1999). **The captive breeding of Chinese leopard (*Panthera pardus*)**. *Acta Theriologica Sinica* 19(3): 233-236. ISSN: 1000-1050.
**Descriptors:** leopard, *Panthera pardus*, captive breeding, behavior, wildlife management, conservation, reproduction, conservation, estrus, gestation, litter size, mating.

**Language of Text:** Chinese.

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### Leopard - Anatomy

Archana, D.N. Sharma, R. Rajput, R.S. Kishtwaria, R.L. Bhardwaj, and L.S. Sudhakar (2006). **Anatomy of north western himalayan leopard**. *Indian Journal of Animal Sciences* 76(8): 616-617. ISSN: 0367-8318.
**Descriptors:** leopard, north western Himalayan, anatomy, biogeography, population studies.

Kalita, A., M. Sarma, P. Roychoudhury, and G. Baishya (2001). **Comparative anatomy of the skull of adult domestic cat and Indian leopard**. *Indian Journal of Animal Sciences* 71(11): 1014-1015. ISSN: 0367-8318.
**Descriptors:** leopard, *Panthera pardus*, comparative skull anatomy, adult domestic cat, morphology, gross anatomical comparisons.

Kalita, A., M. Sarma, and K.K. Sarma (2001). **Anatomy of the mandible of Indian leopard**. *Indian Veterinary Journal* 78(12): 1138-1140. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, mandible, dental and oral system, ingestion, assimilation, ramus, body, condyles, coronoid process, anatomy.

Kalita, A., M. Sarma, K.K. Sarma, and R.N. Gowsami (2002). **Craniometrical study in leopard**. *Indian Veterinary Journal* 79(5): 477-480. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, craniometrical study, skull, cephalic index, length, width, morphology, skeletal system, movement, support, cranial capacity.

Ray, S., G.K. Dutta, and M. Ray (1997). **Anatomy of the mandible of leopard (*Panthera pardus*)**. *Indian Veterinary Journal* 74(9): 765-767. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, skeletal system, mandible, movement, support, teeth, mental foramina, mandibular foramina, coronoid process, mandibular notch.

Ray, S., M. Ray, S.C. Mandal, and G.K. Dutta (1997). **Anatomy of the humerus of leopard (*Panthera pardus*)**. *Indian Journal of Animal Sciences* 67(2): 131. ISSN: 0367-8318.
**Descriptors:** leopard, *Panthera pardus*, humerus, anatomy, skeletal system, movement, leg support, gross anatomy.

Ray, S., M. Ray, S.C. Mandal, G.K. Dutta, and K. Das (1996). **Anatomical study of the femur (os femoris) of leopard (*Panthera pardus*)**. *Indian Journal of Animal Sciences* 66(2): 147-148. ISSN: 0367-8318.
**Descriptors:** leopard, *Panthera pardus*, femur, os femoris, anatomy, skeletal system, movement, support, caudal surface, cranial surface, length.

Sarma, K., M.M.S. Zama, S. Surp, and A. Kalita (2004). **Macromorphological study on the kidney of leopard (*Panthara pardus*)**. *Indian Journal of Animal Sciences* 74(11): 1137-1138. ISSN: 0367-8318.
**Descriptors:** leopard, *Panthara pardus*, kidney, macromorphological study, urinary system, chemical coordination, homeostasis, India.

Shang Jian Ke, Chen Yu Qin, Shang Zhi Feng, Yu Shi Yuan, Han Guo Juan, Jia Zong Ping, Zhang

Jing, Zhang Hu Lin, and Xie Ming Ren (2008). **Renal histology and microvasculature in the *Panthera pardus***. *Chinese Journal of Zoology* 43(1): 155-158. ISSN: 0250-3263.
**Descriptors:** leopard, *Panthera pardus*, renal histology, microvasculature, urinary system, light microscopy, laboratory techniques, imaging and microscopy techniques, scanning electron microscopy, microvascular casting technique.
**Language of Text:** Chinese.

Sims, C. (2001). **Morphological distinctions in skulls of five felids (*Puma concolor, Panthera onca, Panthera pardus, Uncia uncia, and Acinonyx jubatus*)**. *Journal of Morphology* 248(3): 285. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skull, morphological distinctions, skeletal system, cougar, jaguar, leopard, snow leopard, species comparison study.
**Notes:** Sixth International Congress of Vertebrate Morphology, Jena, Germany; July 21-26, 2001.

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### Leopard - Breeding and Reproduction

Acharjyo L N and Patnaik S K (1985). **Observations on some aspects of reproduction among the panthers *Panthera-pardus* on Nandankanan Biological Park Orissa India**. *Indian Journal of Forestry* 8(1): 8-14. ISSN: 0250-524X.
**Descriptors:** leopard, *Panthera pardus*, reproductive system, reproduction, estrus, sex ratio, matings, observations, age, litter size, receptivity, gestation.

Brown J L, Goodrowe K L, Simmons L G, Armstrong D L, and Wildt D E (1988). **Evaluation of the pituitary-gonadal response to gnrh and adrenal status in the leopard *Panthera pardus japonensis* and tiger *Panthera tigris***. *Journal of Reproduction and Fertility* 82(1): 227-236. ISSN: 0022-4251.
**Descriptors:** leopard, *Panthera pardus japonensis*, pituitary gonadal response, GnRH, evaluation, adrenal status, reproductive system, reproduction, sex differences, species differences, gonadotropin releasing hormone, cortisol luteinizing hormone, fsh testosterone.

Brown J L, Wildt D E, Phillips L G, Seidensticker J, Fernando S B U, Miththapala S, and Goodrowe K L (1989). **Adrenal-pituitary-gonadal relationships and ejaculate characteristics in captive leopards *Panthera pardus kotiya* isolated on the island of Sri Lanka**. *Journal of Reproduction and Fertility* 85(2): 605-614. ISSN: 0022-4251.
**Descriptors:** captive leopard, *Panthera pardus kotiya*, physiology, reproductive system, reproduction, adrenal pituitary gonadal relationships, ejaculate characteristics, captive, wildlife management, conservation, testosterone, FSH, ACTH, luteinizing hormone, gonadotropin releasing hormone, electroejaculation, sperm abnormality, Sri Lanka.

Cunningham, P. and C. Gross (2000). **Reproduction and development of the Arabian leopard, *Panthera pardus nimr*, in captivity**. *Zoology in the Middle East* 20: 9-14. ISSN: 0939-7140.
**Descriptors:** Arabian leopard, *Panthera pardus nimr*, wildlife management, conservation, development, reproduction, captive breeding, captivity, cub number, gestation period, inter estrus period, estrus period.

de Haas van Dorsser, F.J., D.I. Green, W.V. Holt, and A.R. Pickard (2007). **Ovarian activity in Arabian leopards (*Panthera pardus nimr*): Sexual behaviour and faecal steroid monitoring during the follicular cycle, mating and pregnancy.** *Reproduction, Fertility, and Development* 19(7): 822-830. ISSN: 1031-3613.
**Abstract:** The Arabian leopard is a critically endangered subspecies endemic to the Arabian Peninsula. A fundamental understanding of the ovarian activity of the leopard is important to enhance the success with which it breeds in captivity. The objective of the present study was to characterise the endocrinology of the follicular cycle, ovulation and pregnancy in captive females using faecal steroid hormone analyses and observations of sexual behaviour. The follicular cycle of the leopard was shown to last 18-23 days based on the interval between consecutive peaks of faecal oestrogen conjugates, and the occurrence of silent heats was high. Puberty had commenced at 2 years of age, but faecal steroid profiles did not match those of the adult female until 3 years of age. No seasonal change in ovarian steroid excretion was observed, although behavioural oestrus was

suppressed in summer. Significant rises in faecal progestagen concentrations were only recorded in mated leopards, indicating that these females were strictly induced ovulators. However, only 60% of these mating periods were ovulatory. Progestagen concentrations during pregnancy were significantly higher than those of the non-pregnant luteal phase. The average duration of the non-pregnant and pregnant luteal phases was 39 and 97 days, respectively. The basic features of the reproductive cycle of the Arabian leopard described here form an important foundation for further study into its reproduction.
**Descriptors:** leopard, *Panthera pardus nimr*, ovarian activity, sexual behavior, fecal steroid monitoring, follicular cycle, mating, pregnancy.

de Haas van Dorsser, F.J. and J.A. Strick (2005). **Semen characteristics and sperm morphology in the Arabian leopard (*Panthera pardus nimr*) and how these vary with age and season.** *Reproduction, Fertility, and Development* 17(7): 675-82. ISSN: 1031-3613.
**Abstract:** The Arabian leopard is a critically endangered species. Since there are only an estimated 200 animals remaining in the wild, careful management of the captive population is necessary to minimise inbreeding. The objective of this study was to characterise sperm morphology and ejaculate quality in captive males. Semen was collected by electroejaculation from 8 adult captive male leopards (aged 2-16 years) during the summer and winter months, and semen parameters, including sperm morphology, were assessed. Two-year-old leopards showed lower total sperm counts per ejaculate than older animals and these counts declined at > 8 years. Ejaculates collected during the hot summer showed significantly lower sperm concentrations, total sperm counts, sperm motility and viability and percentage of spermatozoa showing normal morphology than ejaculates collected in the cooler winter. The results showed that the male leopard attains sexual maturity between 2 and 3 years of age and exhibits good semen quality until 8 years. Collection of semen for artificial breeding or banking would best be carried out in the cooler winter months.
**Descriptors:** Arabian leopard, *Panthera pardus nimr*, captive mates, semen characteristics, sperm morphology, vary, age, seasonal effects, sperm.

Hao Yifeng (1993). **Morphological observations and functional analysis of semen of leopard (*Panthera pardus*).** *Chinese Wildlife (China)*(no. 1): 40-42. ISSN: 1000-0127.
**Descriptors:** leopards, *Panthera pardus*, semen, morphological observations, functional analysis, carnivora, Felidae, male genital system, urogenital system.
**Language of Text:** Chinese.

Hartley, A., F. Goeritz, T. Arzhanova, S. Christie, P. Kertesz, J. Lewis, G. Maksudov, and K. Jewgenow (2000). **Semen collection and reproductive health assessment of pure bred amur leopards (*Panthera pardus orientalis*) within the eep breeding programme**. *Advances in Ethology*(35): 88. ISSN: 0931-4202.
**Descriptors:** leopard, *Panthera pardus orientalis*, conservation, reproductive system, reproduction, genetic analysis, semen collection, health assessment, DNA technology, genome banking, preservation method, eep breeding program, ssp breeding program, Berlin Tierpark, Moscow zoo, Prague zoo.
**Notes:** Meeting Information: 3rd International Symposium on Physiology and Ethology of Wild and Zoo Animals, Berlin, Germany; October 04-07, 2000.

Jayaprakash, D., S.B. Patil, M.N. Kumar, K.C. Majumdar, and S. Shivaji (2000). **Semen characteristics of the captive indian leopard, *Panthera pardus***. *Biology of Reproduction* 62(Supplement 1): 147-148. ISSN: 0006-3363.
**Descriptors:** leopard, *Panthera pardus*, semen characteristics, reproductive system, reproduction, computer aided semen analysis, cryopreservation, methods, preservation, captive breeding programs, meeting abstract.
**Notes:** Thirty-Third Annual Meeting of the Society for the Study of Reproduction, Madison, Wisconsin, USA; July 15-18, 2000.

Jayaprakash, D., S.B. Patil, M.N. Kumar, K.C. Majumdar, and S. Shivaji (2001). **Semen characteristics of the captive Indian leopard, *Panthera pardus***. *Journal of Andrology* 22(1): 25-33. ISSN: 0196-3635.
**Descriptors:** captive leopard, *Panthera pardus*, semen characteristics, sperm motility, density, spermatazoa, motile, morphological normal, cryopreservation, hamester oocyte, penetrated, breeding programs.

Laman, T.G. and C.D. Knott (1997). **An observation of leopard ( *Panthera pardus linnaeus*) mating behaviour in Serengeti National Park, Tanzania**. *African Journal of Ecology* 35(2): 165-167. ISSN: 0141-6707.
**Descriptors:** leopard, *Panthera pardus linnaeus*, behavior, reproductive system, reproduction, copulation, mating behavior, Serengeti National Park, Tanzania.

Schmidt A M, Hess D L, Schmidt M J, Smith R C, and Lewis C R (1988). **Serum concentrations of estradiol and progesterone and sexual behavior during the normal estrous cycle in the leopard *Panthera pardus***. *Journal of Reproduction and Fertility* 82(1): 43-50. ISSN: 0022-4251.
**Descriptors:** leopard, *Panthera pardus*, normal estrous cycle, sexual behavior, estradiol,

serum concentrations, progesterone, reproductive behavior.

Zhang Zhihe, Lu Wenqi, Wang Xingliang, Wang Chengdong, Hou Rong, Song Yunfang, and He Guangxin (1999). **The captive breeding of Chinese leopard (*Panthera pardus*)**. *Acta Theriologica Sinica* 19(3): 233-236. ISSN: 1000-1050.
**Descriptors:** leopard, *Panthera pardus*, captive breeding, behavior, wildlife management, conservation, reproduction, conservation, estrus, gestation, litter size, mating.
**Language of Text:** Chinese.

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### Leopard - Care and Husbandry

Mallapur, A. and R. Chellam (2002). **Environmental influences on stereotypy and the activity budget of Indian leopards (*Panthera pardus*) in four zoos in southern India.** *Zoo Biology* 21(6): 585-595. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6
**Descriptors:** leopard, *Panthera pardus*, zoo animals, stereotyped behavior, environmental enrichment, animal behavior, cage size, animal housing, animal technicians, visitors, physical activity, animal feeding, enclosure size, resting, feeding time, India.

Mallapur, A., Q. Qureshi, and R. Chellam (2002). **Enclosure design and space utilization by Indian leopards (*Panthera pardus*) in four zoos in southern India.** *Journal of Applied Animal Welfare Science JAAWS* 5(2): 111-124. ISSN: 1088-8705.
**NAL Call Number:** HV4701.J68
**Descriptors:** leopards, *Panthera pardus*, zoo animals, cages, animal behavior, abnormal behavior, physical activity, animal welfare, stereotyped behavior, animal use refinement, enrichment, enclosure design, space utilization, India.

Markowitz, H., C. Aday, and A. Gavazzi (1995). **Effectiveness of acoustic "prey": environmental enrichment for a captive African leopard (*Panthera pardus*).** *Zoo Biology* 14(4): 371-379. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** leopard, *Panthera pardus*, environmental enrichment, zoos, feeding behavior, acoustic prey, effectiveness, predation, predator prey relationships, behavior, stimulation, behavior patterns, audiovisual aids, California.

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### Leopard - Conservation

A.l Johany, A.M.H. (2007). **Distribution and conservation of the Arabian Leopard *Panthera pardus nimr* in Saudi Arabia.** *Journal of Arid Environments* 68(1): 20-30. ISSN: 0140-1963.

**NAL Call Number:** QH541.5.D4J6
**Descriptors:** *Panthera pardus*, wildlife management, population distribution, predation , wildlife habitats, mortality , animal ecology, Saudi Arabia.

Chambers M R, Santiapillai C, and Ishwaran N (1984). **Tourist activity and behavior of the leopard *Panthera pardus fusca* in the Ruhuna National Park Sri Lanka**. *Journal of the Bombay Natural History Society* 81(1): 42-48. ISSN: 0006-6982.
**Descriptors:** leopard, *Panthera pardus fusca*, behavior, tourist activity, wildlife management, conservation, stress, Ruhuna National Park, Sri Lanka.

Gavashelishvili, A. and V. Lukarevskiy (2008). **Modelling the habitat requirements of leopard *Panthera pardus* in west and central Asia.** *Journal of Applied Ecology* 45(2): 579-588. ISSN: 0021-8901.

**NAL Call Number:** 410 J828
**Abstract:** 1. Top predators are seen as keystone species of ecosystems. Knowledge of their habitat requirements is important for their conservation and the stability of the wildlife communities that depend on them. The goal of our study was to model the habitat of leopard *Panthera pardus* in west and central Asia, where it is endangered, and analyse the connectivity between different known populations in the Caucasus to enable more effective conservation management strategies to be implemented. 2. Presence and absence data for the species were evaluated from the Caucasus, Middle East and central Asia. Habitat variables related to climate, terrain, land cover and human disturbance were used to construct a predictive model of leopard habitat selection by employing a geographic information system (GIS) and logistic regression. 3. Our model suggested that leopards in west and central Asia avoid deserts, areas with long-duration snow cover and areas that are near urban development. Our research also provides an algorithm for sample data management, which could be used in modelling habitats for similar species. 4. Synthesis and applications. This model provides a tool to improve search effectiveness for leopard in the Caucasus, Middle East and central Asia as well as for the conservation and management of the species. The model can predict the probable distribution of leopards and the corridors between various known populations. Connectivity patterns can be used to facilitate corridor planning for leopard conservation, especially in the Caucasus, where the leopard is a top priority conservation species. Also, as top predators are often associated with high biodiversity, the leopard habitat model could help to identify biodiversity hotspots. The protection of biodiversity hotspots is seen as the most effective way to conserve biodiversity globally.
**Descriptors:** leopard, *Panthera pardus*, habitat requirements, modelling, ecosystems, conservation management, climate, terrain, land cover, human disturbances, Asia.

Grassman, L.I. (1999). **Ecology and behavior of the indochinese leopard in Kaeng Krachan National Park, Thailand**. *Natural History Bulletin of the Siam Society* 47(1): 77-93. ISSN: 0080-9462.
**Descriptors:** leopard, *Panthera pardus delacouri*, ecology, berhavior, radio collared, feces, scat, badger, barking deer, wild pig, seasonal changes, environmental stress, fire, floods, Thailand.

Hayward, M.W., J. Adendorff, L. Moolman, G.J. Hayward, and G.I.H. Kerley (2007). **The successful reintroduction of leopard *Panthera pardus* to the Addo Elephant National Park.** *African Journal of Ecology* 45(1): 103-104. ISSN: 0141-6707.

**NAL Call Number:** 409.6 Ea7
**Descriptors:** leopard, *Panthera pardus*, successful reintroduction, Addo Elephant National Park, conservation, South Africa.

Jenny, D. (1996). **Spatial organization of leopards *Panthera pardus* in Tai National Park, Ivory Coast: is rainforest habitat a 'tropical haven'?.** *Journal of Zoology (United Kingdom)* 240(3): 427-440. ISSN: 0952-8369.
**Descriptors:** leopards, *Panthera pardus*, spatial organization, rainforest habitat, Tia National Park, Ivory Coast.

Khorozyan, I. (2003). **Habitat preferences by the persian leopard (*Panthera pardus saxicolor pocock*, 1927) in Armenia.** *Zoology in the Middle East* 30: 25-36. ISSN: 0939-7140.
**Descriptors:** leopard, *Panthera pardus saxicolor*, *habitat preferences*, Armenia, human activities, forest, pastures, conservation, livestock grazing, spatial distribution.

Khorozyan, I.G. and A.V. Abrarnov (2007). **The leopard, *Panthera pardus*, (Carnivora : Felidae) and its resilience to human pressure in the Caucasus**. *Zoology in the Middle East* 41: 11-24. ISSN: 0939-7140.
**Descriptors:** leopard, *Panthera pardus*, human pressure, population, resilience, habitats, conservation, Caucasus.

Leonard, A., D. Tonkyn, and A. Shoemaker (1996). **Measuring the full costs of inbreeding to captive, endangered leopards *Panthera pardus***. *Bulletin of the Ecological Society of America* 77(3 Suppl. Part 2): 260. ISSN: 0012-9623.
**Descriptors:** leopard, *Panthera pardus*, captive, inbreeding, conservation , reproductive system, reproduction, measuring full costs, systematics, taxonomy, wildlife management, conservation, adult mortality, meeting abstract, reintroduction.
**Notes:** 1996 Annual Combined Meeting of the Ecological Society of America on Ecologists/Biologists as Problem Solvers, Providence, Rhode Island, USA; August 10-14, 1996.

Marker, L.L. and A.J. Dickman (2005). **Factors affecting leopard (*Panthera pardus*) spatial ecology, with particular reference to Namibian farmlands**. *South African Journal of Wildlife Research* 35(2): 105-115. ISSN: 0379-4369.
**Descriptors:** leopard, *Panthera pardus*, spatial ecology, wildlife management, terrestrial ecology, conservation, habitat degradation, farmland, home range size, prey biomass, long term viability.

Miththapala, S., J. Seidensticker, and S.J. O'brien (1996). **Phylogeographic subspecies recognition in leopards (*Panthera pardus*): Molecular genetic variation**. *Conservation Biology* 10(4): 1115-1132. ISSN: 0888-8892.
**Descriptors:** leopard, *Panthera pardus*, phylogeographic subspecies recognition, molecular genetic variation, wildlife, endangered species, taxonomy, genetic divergence.

Mizutani, F. and P.A. Jewell (1998). **Home-range and movements of leopards (*Panthera pardus*) on a livestock ranch in Kenya.** *Journal of Zoology (United Kingdom)* 244(2): 269-286. ISSN: 0952-8369.
**Descriptors:** leopards, *Panthera pardus*, home range, movements, livestock ranch, Kenya, conservation.

Perez, I., E. Geffen, and O. Mokady (2006). **Critically endangered Arabian leopards *Panthera pardus nimr* in Israel: estimating population parameters using molecular scatology**. *Oryx* 40(3): 295-301. ISSN: 0030-6053.
**Descriptors:** leopard, *Panthera pardus nimr*, population studies, wildlife management, conservation, survey, critically endangered, population parameters, molecular scatology, laboratory techniques, Israel.

Santiapillai, C., M.R.1. Chambers, and N.O. Ishwaran (1982). **The leopard (Meyer 1794) in the Ruhuna National Park, Sri Lanka, and observations relevant to its conservation endangered species.** *Biological Conservation* 23(1): 5-14. ISSN: 0006-3207.
**NAL Call Number:** S900.B5
**Descriptors:** leopard, *Panthera pardus fusca*, observations, conservation, endangerd species, Ruhuna National Park, Sri Lanka.

Santiapillai, C. and W.S. Ramono (1992). **Status of the leopard (*Panthera pardus*) in Java, Indonesia.** *Tigerpaper (FAO)* 19(2): 1-5. ISSN: 1014-2789.
**Descriptors:** leopard, *Panthera pardus*, status, conservation, endangerd species, Java, Indonesia.

Shoemaker and A H (1985). **1983 studbook for rare leopards *Panthera pardus* ssp**. *Zoo Biology* 4(2): 169-196. ISSN: 0733-3188.
**Descriptors:** rare leopards, *Panthera pardus* ssp, studbook, reproductive system, reproduction, taxonomy, veterinary medicine, wildlife management, conservation, *Panthera pardus saxicolor*, *Panthera pardus kotiya*, *Panthera pardus japonensis*, *Panthera pardus orientalis*.

Singh, H.S. (2005). **Status of leopard (*Panthera pardus fusca*) in India**. *Indian Forester* 131(10): 1353-1362. ISSN: 0019-4816.
**Descriptors:** leopard, *Panthera pardus fusca*, population studies, wildlife management, conservation, habitat fragmentation, species extinction, India.

Singh, L.A.K. and D. Swain (2005). **The implications of increase in leopard numbers**. *Indian Forester* 131(10): 1383-1385. ISSN: 0019-4816.
**Descriptors:** leopard, *Panthera pardus*, population studies, terrestrial ecology, environmental sciences, wildlife management, conservation, India.

Sugimoto, T., J. Nagata, V.V. Aramilev, A. Belozor, S. Higashi, and D.R. Mccullough (2006). **Species and sex identification from faecal samples of sympatric carnivores, Amur leopard and Siberian tiger, in the Russian far east**. *Conservation Genetics* 7(5): 799-802. ISSN: 1566-0621.
**Descriptors:** leopard, carnivors, amur leopard, Siberian tiger, *Panthera*, molecular genetics, fecal samples, species identification, sex identification, Russian far east.

Uphyrkina, O., D. Miquelle, and H. Quigley (2002). **Conservation genetics of the Far Eastern leopard (*Panthera pardus orientalis*)**. *The Journal of Heredity* 93(5): 303-11. ISSN: 0022-1503.
**Abstract:** The Far Eastern or Amur leopard (*Panthera pardus orientalis)* survives today as a tiny relict population of 25-40 individuals in the Russian Far East. The population descends from a 19th-century northeastern Asian subspecies whose range extended over southeastern Russia, the Korean peninsula, and northeastern China. A molecular genetic survey of nuclear microsatellite and mitochondrial DNA (mtDNA) sequence variation validates subspecies distinctiveness but also reveals a markedly reduced level of genetic variation. The amount of genetic diversity measured is the lowest among leopard subspecies and is comparable to the genetically depleted Florida panther and Asiatic lion populations. When considered in the context of nonphysiological perils that threaten small populations (e.g., chance mortality, poaching, climatic extremes, and infectious disease), the genetic and demographic data indicate a critically diminished wild population under severe threat of extinction. An established captive population of *P. p. orientalis* displays much higher diversity than the wild population sample, but nearly all captive individuals are derived from a history of genetic admixture with the adjacent Chinese subspecies, *P. p. japonensis*. The conservation management implications of potential restoration/augmentation of the wild population with immigrants from the captive population are discussed. Reprinted by permission of the publisher.
**Descriptors:** leopard, *Panthera pardus orientalis*, conservation genetics, Amur leopard, genetic survey, mitochondral DNA, consevation management.

Uphyrkina, O., W.E. Johnson, H. Quigley, D. Miquelle, L. Marker, M. Bush, and S.J. O'brien (2001). **Phylogenetics, genome diversity and origin of modern leopard, *Panthera pardus***. *Molecular Ecology* 10(11): 2617-2633. ISSN: 0962-1083.
**Descriptors:** origins of the modern leopard, *Panthera pardus*, phylogenetics, genome diversity, origin, evolution, adaptation, population genetics, population studies, systematics, taxonomy.

Uphyrkina, O. and S.J. O'brien (2003). **Applying molecular genetic tools to the conservation and action plan for the critically endangered far eastern leopard (*Panthera pardus orientalis*).** *Comptes Rendus Biologies* 326(Supplement 1): S93-S97. ISSN: 1631-0691.
**Descriptors:** Amur leopard, *Panthera pardus orientalis*, endangered, conservation, applying molecular genetic tools, genetic analysis, management, far eastern leopard.

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### Leopard - Diet and Nutrition

Akhtar, N. and M.L. Narang (1998). **Earthworm in the diet of leopard *Panthera pardus***. *Journal of the Bombay Natural History Society* 95(1): 110. ISSN: 0006-6982.
**Descriptors:** leopard, *Panthera pardus*, diet, nutrition, earthworm, food, India.

Bodendorfer, T., B. Hoppe Dominik, F. Fischer, and K.E. Linsenmair (2006). **Predation par le leopard (*Panthera pardus*) et le lion (*Panthera leo*) dans les parcs nationaux de la comoe et de la marahoue en cote d'Ivoire (Afrique de l'ouest) [Prey of the leopard (*Panthera pardus*) and the lion (*Panthera leo*) in the Comoe and Marahoue National Parks, cote d'Ivoire, West Africa].** *Mammalia* 70(3-4): 231-246. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, lion, *Panthera leo*, prey, population studies, scat analysis, applied and field techniques, Comoe and Marahoue National Parks, Ivory Coast, West Africa.
**Language of Text:** French.

Edgaonkar, A. and R. Chellam (2002). **Food habit of the leopard, *Panthera pardus*, in the Sanjay Gandhi National Park, Maharashtra, India.** *Mammalia* 66(3): 353-360. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, domestic dog, primates, cervids, pigs, birds, buffaloes, domestic animals, food habit, scat analysis, India.

Hart, J.A., M. Katembo, and K. Punga (1996). **Diet, prey selection and ecological relations of leopard and golden cat in the Ituri forest, Zaire**. *African Journal of Ecology* 34(4): 364-379. ISSN: 0141-6707.
**Descriptors:** leopard, *Panthera pardus*, diet, prey selection, ecological relations, behavior, nutrition, feeding behavior, Ituri forest, predator.

Hayward, M.W., P. Henschel, J. O'brien, M. Hofmeyr, G. Balme, and G.I.H. Kerley (2006). **Prey preferences of the leopard (*Panthera pardus*)**. *Journal of Zoology (London)* 270(2): 298-313. ISSN: 0952-8369.
**Descriptors:** leopard, *Panthera pardus*, behavior, prey preferences, impala, bushbuck, common duiker, weight range, open vegetation, body mass.

Henschel, P., K.A. Abernethy, and L.J.T. White (2005). **Leopard food habits in the Lope National Park, Gabon, central Africa**. *African Journal of Ecology* 43(1): 21-28. ISSN: 0141-6707.
**Abstract:** To determine leopard *Panthera pardus* (Linnaeus) food habits in the Lope National Park in Gabon, Central Africa, 196 leopard scats were collected and analysed. Prey items were determined using undigested matter isolated from the scats, and a reference collection of hairs and bones from potential prey species. A minimum of 30 different prey species were identified, 27 of which were mammalian. Leopards preyed mainly on ungulates, which made up 59%, of the biomass consumed. Diurnal primates (18%) and large rodents (17%) were also heavily preyed upon. The mean prey weight estimated from scats was 29.2 kg. The most important single prey species was found to be red river hog *Potamochoerus porcus* (Linnaeus), making up 20% of the biomass

consumed, followed by forest buffalo *Syncerus caffer nanus* (Boddaert) and cane rat *Thryonomys swinderianus* (Temminck), each comprising 13% of biomass consumed.
**Descriptors:** leopard, *Panthera pardus*, food habits, scats, prey, ungulates, primates, large rodents, prey weight, red river hog, buffalo, cane rat, Africa, Loops National Park.

Hoppe Dominik B (1984). **Prey frequency of the leopard *Panthera pardus* in the Tai National Park of the Ivory Coast**. *Mammalia* 48(4): 477-488. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, diet, nutrition, prey frequency, monkey, bovid, rodent, feces, scat hair, opportunist, Ivory Coast. Africa.
**Language of Text:** French.

Johnson, K.G., W. Wei, and D.G. Reid (1993). **Food habits of Asiatic leopards (*Panthera pardus fusea*) in Wolong Reserve, Sichuan, China**. *Journal of Mammalogy* 74(3): 646-50. ISSN: 0022-2372.
**Abstract:** Analysis of feces showed Asiatic leopards (*Panthera pardus fusea*) to consume a varied diet over a 7-year period. Tufted deer (*Elaphodus cephalophus*) was replaced as the most frequent prey by bamboo rats (*Rhizomys sinense*). Fifteen species of large and medium-sized mammals composed the majority of the diet with pheasants, livestock, grass, and soil being eaten occasionally. Reasons for dietary shifts were unclear and may reflect leopards hunting for any readily captured prey by opportunistic encounter and perhaps by changes in hunting behavior, prey availability, or prey vulnerability associated with a bamboo die-off. Reprinted by permission of the American Society of Mammalogists, 1993.
**Descriptors:** leopard, *Panthera pardus fusea*, food habits, Asiatic leopards, feces analysis, varied diet, tufted deer, bamboo rats, pheasants, livestock, hunting behavior, prey selection, China.

Karanth, K.U. and M.E. Sunquist (1995). **Prey selection by tiger, leopard and dhole in tropical forests**. *The Journal of Animal Ecology* 64(4): 439-50. ISSN: 0021-8790.
**Descriptors:** leopard, *Panthera pardus*, tiger, *Panthera tigris*, dhole, *Cuon alpinus*, prey selection, tropical forest, India.

Karanth, K.U. and M.E. Sunquist (2000). **Behavioural correlates of predation by tiger (*Panthera tigris*), leopard (*Panthera pardus*) and dhole (*Cuon alpinus*) in Nagarahole, India**. *Journal of Zoology* 250(2): 255-265. ISSN: 0952-8369.
**Descriptors:** leopard, *Panthera pardus*, tiger, *Panthera tigris*, dhole, *Cuon alpinus*, predation, behavioral correlates, predator scats, predators, habitat specificity, prey size, cover, behavioral factors, Nagarahole, India.

Mehta, P. (1997). **Leopard (*Panthera pardus*) attempting to prey on Indian giant squirrel (*Ratufa indica centralis*)**. *Journal of the Bombay Natural History Society* 94(3): 555-556. ISSN: 0006-6982.
**Descriptors:** leopard, *Panthera pardus*, behavior, predation, Indian giant squirrel, *Ratufa indica centralis*, diet, food, India.

Mukherjee, S., S.P. Goyal, and R. Chellam (1994). **Standardisation of scat analysis techniques for leopard (*Panthera pardus*) in Gir National Park, western India**. *Mammalia* 58(1): 139-143. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, digestive system, ingestion, assimilation, scat analysis, nutrition, diet analysis, hair, technique standardization.

Ott, T., G.I.H. Kerley, and A.F. Boshoff (2007). **Preliminary observations on the diet of leopards (*Panthera pardus*) from a conservation area and adjacent rangelands in the Baviaanskloof region, South Africa**. *African Zoology* 42(1): 31-37. ISSN: 1562-7020.
**Descriptors:** leopard, *Panthera pardus*, diet, observations, wildlife management, conservation, ingestion, assimilation, scats, ungulates, rodents, birds, felid, mountain buck, vlei rat, bushbuck, rock hyrax, grysbok, conservation area, prey category, South Africa.

Roedel, H.G., W.W.A. Scholze, and A. Paulsch (2004). **Notes on the feeding habits of the leopard in the alpine zone of Mount Kenya**. *Mammalia* 68(1): 61-63. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, behavior, feeding habits, digestive system, ingestion, assimilation, alpine zone, diet, feeding habits, prey, scat analysis, alpine zone of Mount Kenya.

Sankar, K. and A.J.T. Johnsingh (2002). **Food habits of tiger (*Panthera tigris*) and leopard (*Panthera pardus*) in Sariska Tiger Reserve, Rajasthan, India, as shown by scat analysis**. *Mammalia* 66(2): 285-289. ISSN: 0025-1461.
**Descriptors:** leopard, *Panthera pardus*, behavior, food habits, prey selection, scat analysis, microscopy, examination method, body weight, food consumption, fruits, predation, prey biomass, Sariska Tiger Reserve, Rajasthan, India.

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### Leopard - Research

Ahmed A, Jahan M, Braunitzer G, and Goeltenboth R (1988). **Carnivora the primary structure of the major and minor hemoglobin components of adult north Persian leopard *Panthera pardus sexicolor***. *Zeitschrift Fuer Naturforschung Section B Chemical Sciences* 43(10): 1341-1346. ISSN: 0932-0776.
**Descriptors:** leopard, *Panthera pardus sexicolor*, primary structure, major and minor hemoglobin components, north Persian leopard, Hb-I, HbII, polypeptide chains, amino acid sequences.

Chelomina, G.N., L.N. Spiridonova, M.M. Kozyrenko, E.V. Artyukova, Y.V. Chelomin, and Y.U.N. Zhuravlev (1999). **Estimation of genetic polymorphism and subspecies diagnostics in the far-eastern leopard *Panthera pardus orientalis* by means of rapd-PCR analysis of cellular DNA**. *Genetika* 35(5): 681-687. ISSN: 0016-6758.
**Descriptors:** leopard, *Panthera pardus orientalis*, genetic polymorphism, estimation, subspecies diagnostics, rapid-PCR analysis, DNA, wild living, captivity, breeding lines, genetic diversity.
**Language of Text:** Russian.

Dong H, Chen S, Zhao Q, Yu H, and Hao Y (1988). **The fine structure of the spermatozoa of the *Panthera pardus***. *Acta Zoologica Sinica* 34(4): 384. ISSN: 0001-7302.
**Descriptors:** leopard, *Panthera pardus*, spermatazoa, fine structure, morphology, reproductive system, reproduction, oogonia follicle, oocyte lipid, yolk, ovulation.
**Language of Text:** Chinese.

Khorozyan, I.G., A. Cazon, A.G. Malkhasyan, and A.V. Abramov (2007). **Using thin-layer chromatography of fecal bile acids to study the leopard (*Panthera pardus ciscaucasica*) population**. *Biology Bulletin* 34(4): 361-366. ISSN: 1062-3590.
**Descriptors:** leopard, *Panthera pardus ciscaucasica*, chromatography, fecal bile acids, populations, study, wildlife management, conservation, visual identification, Armenia.

Meijaard, E. (2004). **Biogeographic history of the Javan leopard *Panthera pardus* Based on a craniometric Analysis**. *Journal of Mammalogy* P.: 302-10. ISSN: 0022-2372.
**Descriptors:** Javan leopard, *Panthera pardus*, biogeographic history, Craniometric analysis.

Miththapala, S., J. Seidensticker, and L.G. Phillips (1989). **Identification of individual leopards (*Panthera pardus kotiya*) using spot pattern variation**. *Journal of Zoology* 218(4): 527-36. ISSN: 0952-8369.
**Descriptors:** leopard, spot pattern variation, visual identification method, individual leopards, *Panthera pardus kotiya*.

Nagata, J., V.V. Aramilev, A. Belozor, T. Sugimoto, and D.R. McCullough (2005). **Fecal genetic analysis using PCR RFLP of cytochrome b to identify sympatric carnivores, the tiger *Panthera tigris* and the leopard *Panthera pardus*, in far eastern Russia.** *Conservation Genetics* 6(5): 863-866. ISSN: 1566-0621.

**NAL Call Number:** QH75.A1 C56
**Descriptors:** leopard, *Panthera pardus*, tiger, *Panthera tigris*, fecal genetic analysis, PCR RFLP, cytochrome B, sympatric carnivores, mtDNA, Russia.

Poddar Sarkar, M. and R.L. Brahmachary (2004). **Putative chemical signals of leopard**. *Animal Biology (Leiden)* 54(3): 255-259. ISSN: (p) 1570-7555; (E) 1570-7563.
**Descriptors:** leopard, *Panthera pardus*, behavior, putative chemical signals, biochemistry, marking fluid, communication, molecular biophysics, chemical analysis, laboratory techniques, marking behavior, scent marking.

Roychoudhury A K and Acharjyo L N (1984). **Genetics of coat color in the leopard *Panthera pardus***. *Indian Journal of Experimental Biology* 22(6): 308-311. ISSN: 0019-5189.
**Descriptors:** leopard, *Panthera pardus*, coat color, genetics, autosomal alleles, pair, black recessive genes, spotted normal coat, genealogical data, analysis.

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### Leopard - Veterinary

Babu, N.G.R., A.J. Bragitha, M.M. Babu, C.R. Prasad, and T. Gopal (1993). **Incidence of salmonellosis in leopards (*Panthera pardus*)**. *Indian Veterinary Journal* 70(3): 289-290. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, salmonellosis, incidence, infection, veterinary medicine, diagnosis, infection source, mortality.

Berger, M., P. Schawalder, H. Stich, and A. Lussi (1995). **"Neck Lesion" bei Grosskatzen: Untersuchungen beim Leoparden (*Panthera pardus*). ["Neck lesion" in big cats. Examinations in the leopard (*Panthera pardus*)]**. *Kleintierpraxis* 40(7): 537-549. ISSN: 0023-2076.
**Descriptors:** leopards, *Panthera pardus*, tooth diseases, teeth, veterinary medicine, dental caries, radiography, microscopy, diagnosis, analytical methods, Carnivora, mouth.
**Language of Text:** German, Summaries in German, English and French.

Chandranaik, B.M., S. Murthy, D. Das, G.S. Mamatha, C. Renukaprasad, and G. Krishnappa (2005). **Helminthiasis in leopards (*Panthera pardus*) at Bannerghatta Biological Park**. *Zoos Print Journal* 20(7): 1934. ISSN: 0971-6378.
**Descriptors:** leopards, infection, helminthiasis, veterinary medicine, animal care, parasitic disease, drug therapy, prevention, control, complications, gastroenteritis, digestive system disease, symptomss, anorexia nervosa, behavioral and mental disorders, deworming.

Clifford, D.H. (1958). **Observations on effect of preanesthetic medication with meperidine and promazine on barbiturate anesthesia in an ocelot and a leopard.** *Journal of the American Veterinary Medical Association* 133(9): 459-63. ISSN: 0003-1488.
**Descriptors:** leopard, *Panthera pardus*, ocelot, anesthesia, analgesia, barbiturates, meperidine, pre-anesthetic medication, observations, promazine, effect.

Hawkey, C.M. and M.G. Hart (1986). **Haematological reference values for adult pumas, lions, tigers, leopards, jaguars and cheetahs.** *Research in Veterinary Science* 41(2): 268-269. ISSN: 0034-5288.
**Abstract:** Normal haematological values and fibrinogen levels were obtained from a number of healthy adult Felidae in the collection of the Zoological Society of London. The group comprised 29 pumas (*Felis concolor*), 32 lions (*Panthera leo*), 27 tigers (*P tigris*), 19 leopards (*P pardus*), 18 jaguars (*P onca*) and 22 cheetahs (*Acinonyx jubatus*). The values provided a basis for identifying abnormalities in the blood of sick individuals of these species and for undertaking interspecies comparisons.
**Descriptors:** cheetah, *Acinonyx jubata*, pumas, *Felis concolor*, lions, *Panthera leo*, tigers, *Panthera tigris*, leopards, *Panthera pardus*, jaguars, *Panthera onca*, adult, fibrinogen levels, blood, hematological reference values.

Jayakumar S R, Babu M M, Gopal T, and Keshavamurthy B S (1989). **Rabies in a wild leopard *Felis pardus***. *Indian Veterinary Journal* 66(11): 1076-1077. ISSN: 0019-6479.
**Descriptors:** wild leopard, rabies, *Felis pardus*, infection, nervous system, neural coordination, wildlife management, conservation, India.

Mohanty, J., L.N. Acharya, and A.K. Mohanty (1985). **Obstipation in a Leopard (*Panthera pardus*).** *Indian Veterinary Journal (India)* 62(10): 899-902. ISSN: 0019-6479.
**Abstract:** A female leopard suffered from obstipation due to faecal concretion in the region of colon. There was no response to medicinal treatment. Enterotomy was performed after 15 days of obstruction. Satisfactory recovery occurred in 17 days.
**Descriptors:** leopards, *Panthera pardus*, obstipation, female, fecal concretion, colon, enterotomy, medicinal treatment, recovery, veterinary care, India.
**Language of Text:** Summary in English.

Nath, I., T.K. Pattanaik, N. Sahoo, V.S.C. Bose, H.K. Mohapatra, and P.K. Roy (2006). **A case of histiocytoma in a leopard *Panthera pardus***. *Zoos Print Journal* 21(6): 2302. ISSN: (p) 0973-2535 - (E) 0973-2551.
**Descriptors:** leopard, *Panthera pardus*, histiocytoma, pharmacology, tumor biology, respiratory system, respiratory distress, drug therapy, neoplastic disease.

Neiffer, D.L. (2001). ***Clostridium perfringens* enterotoxicosis in two Amur leopards (*Panthera pardus orientalis*).** *Journal of Zoo and Wildlife Medicine* 32(1): 134-135. ISSN: 1042-7260.
**Abstract:** Two 6-yr-old male sibling Amur leopards (*Panthera pardus orientalis*) housed together at the Pittsburgh Zoo presented for acute onset of diarrhea with no changes in appetite or behavior. Heat-fixed modified Wright-stained and Gram-stained fecal smears revealed a mixed bacterial population with a large number of gram-positive *Clostridium perfringens*-like spores (>20 per high-power oil immersion field). In addition, *C. perfringens* enterotoxin was isolated from one leopard at 1:256, confirming the presence of *C. perfringens* enterotoxicosis. Treatment with oral metronidazole, tylosin tartrate, and psyllium fiber was prescribed, with return of more normal stool by the third day of treatment. Fecal consistency steadily improved and was considered normal by the time all prescribed treatments were complete. Diarrhea has not recurred. Partially thawed meat in the leopards' diet may have precipitated the production of an endogenous clostridial enterotoxicosis by disrupting digestive tract flora with resultant clostridial overgrowth and sporulation.
**Descriptors:** leopard, *Panthera pardus orientalis*, enterotoxicosis, *Clostridium perfringens*, zoo, diarrhea, fecal smears, treatment.

Penzhorn, B.L., E. Stylianides, M. Van Vuuren, K.M.D.G.A. Alexander, and N. Mukarati (2002). **Seroprevalence of *Toxoplasma gondii* in free-ranging lion and leopard populations in southern Africa.** *South African Journal of Wildlife Research* 32(2): 163-165. ISSN: 0379-4369.
**Descriptors:** leopard, *Panthera pardus*, *Toxoplasma gondii*, seroprevalence, free ranging, lion, leopard, population studies, parasitology, toxoplasmosis, infectious disease, parasitic disease, antibodies.

Pythal, C., K.M. Pillai, C.G. Varghese, and T. Surendranathan (1993). **Death of a wild Indian leopard *Panthera pardus fusca* (meyer) due to parasitism with the lung fluke *Paragonimus westermanii* (Kerbert, 1878) and the hookworm *Galoncus perniciosus* (Linstow, 1885)**. *Journal of Veterinary and Animal Sciences* 24(1): 44-46. ISSN: 0971-0701.
**Descriptors:** leopard, *Panthera pardus fusca*, parasitism, lung fluke, *Paragonimus westermanii*, hookworm, *Galoncus perniciosus*, death, free living, reservoir host.

Rameshkumar B, Ramasamy V, and Gopal M S (1989). **Use of ketamine hydrochloride as general anesthetic in combination with triflupromazine hydrochloride in a black panther *Panthera pardus*.** *Indian Veterinary Journal* 66(7): 667-668. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, general anesthetic drug, tail amputation, drug interactions, ketamine hydrochloride, triflupromazine, combination of drugs.

Rao, M.R.K.M., Ch. Choudhary, and S. Ali (1984). **Case of sudden death in a panther (*Panthera pardus*) with choke.** *Indian Veterinary Journal (India)* 61(7): 618. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, sudden death, choke.
**Language of Text:** Summary in English.

Rosen, S., I. Horowitz, Y. Braverman, M.J.R. Hall, and N.P. Wyatt (1998). **Dual infestation of a leopard by *Wohlfahrtia magnifica* and *Lipoptena chalcomelaena*.** *Medical and Veterinary Entomology* 12(3): 313-314. ISSN: 0269-283X.
**NAL Call Number:** RA639.M44
**Descriptors:** leopard, *Panthera pardus*, *Lipoptena chalcomelaena*, myiasis, new host records, case studies, infestation, *Wohlfahrtia magnifica*, duel infestation.

Sabapara, R.H. (1995). **Chemical restraint and sedation of leopards (*Panthera pardus*)**. *Indian Veterinary Journal* 72(6): 655-657. ISSN: 0019-6479.
**Descriptors:** leopard, *Panthera pardus*, chemical restraint, sedation, nervous system, pharmacology , veterinary medicine, wildlife management, conservation, handling technique.

Sabapara, R.H., R.G. Jani, and P.R. Patel (2003). **Squamous cell carcinoma of lungs in an Indian leopard *Panthera pardus*.** *Zoos' Print Journal* 18(3): 1056. ISSN: (p) 0973-2535; (E) 0973-2551.
**Descriptors:** leopard, *Panthera pardus*, squamous cell carcinoma, lungs, respiratory system, respiration, tumor biology, lung neoplasms, neoplastic disease, mortality, symptoms.

Shukla, B.B., R. Kumar, A.K. Upadhyay, S.K. Shukla, V.P. Dixit, and M. Kumar (2003). **Relationship of age with body weight in orphaned leopard cubs.** *Zoos' Print Journal* 18(3): 1058. ISSN: (p) 0971-6378; online: 0973-2543.
**Descriptors:** leopard, *Panthera pardus*, orphaned newborn cubs, animal care, nutrition, age body weight relationship, diet, feeding frequency.

Siegal Willott, J.L., T. Henrikson, J.W. Carpenter, and G.A. Andrews (2005). **Chronic obstipation in a leopard (*Panthera pardus*) caused by intrapelvic uterine leiomyoma compression of the distal colon**. *Journal of Zoo and Wildlife Medicine* 36(3): 534-537. ISSN: 1042-7260.
**Descriptors:** leopard, *Panthera pardus*, chronic obstipation, intrapelvic uterine leiomyoma, compression, distal colon, constipation, imaging modalities, diagnostic.

Singh, B., P.N. Dhingra, N. Singh, and M. Chandra (1983). **Infectious feline enteritis in panther cubs (*Panthera pardus*).** *Indian Journal of Animal Sciences* 53(8): 921-924. ISSN: 0367-8318.
**Descriptors:** leopards, *Panthera pardus*, cubs, infectious feline enteritis, India.

Somvanshi, R., G.L. Koul, and J.C. Biswas (1987). **Sarcocystis in a leopard (*Panthera pardus*).** *Indian Veterinary Medical Journal* 11(3): 174-175. ISSN: 0250-5266.
**NAL Call Number:** SF601.I45
**Descriptors:** leopards, sarcocystis, myocardium, postmortem-examinations, India.

Tehsin, R.H. (1996). **Panther, *Panthera pardus* (Linnaeus) with guinea worm infection**. *Journal of the Bombay Natural History Society* 93(1): 79-80. ISSN: 0006-6982.
**Descriptors:** leopard, *Panthera pardus*, guina worm infection, parasitology, physiology, note .

Tripathy S B and Acharjyo L N (1985). **Parotitis in captive *Panthera pardus* and *Panthera leo persica***. *Indian Journal of Veterinary Medicine* 5(1): 59. ISSN: 0970-051X.
**Descriptors:** leopard, *Panthera pardus*, lion, *Panthera leo persica*, captive, parotid glands, parotitis, dental system, oral system, ingestion, infection, pathology, pharmacology, veterinary medicine, tetracycline, pheniramine maleate, vitamin c, anti-infective drug.

Tripathy, S.B., L.N. Acharjyo, A.T. Rao, and B.C. Nayak (1980). **Hemorrhagic cystitis in a captive black panther [*Panthera pardus*] India/ Short communication.** *Indian Veterinary Journal* 57(3): 252-253. ISSN: 0019-6479.
**Descriptors:** leopards, *Panthera pardus*, black panther, captive, hemorrhagic cyctitis, India.

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### Lions


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### Lions - General

Abuzaid, S.M., M.R. Gad, and Y.R. Wally (1994). **Renal venous system of the lion (*Panthera leo*) a gross anatomical description.** *Veterinary Medical Journal, Cairo Univ.* 41(1): 131-135. ISSN: None.
**NAL Call Number:** 41.9 C125
**Descriptors:** lion, *Panthera leo*, renal venous system, gross anatomical description, kidneys, venous anatomy.
**Language of Text:** Summary in English.

Abuzeid, S.M., S.M.M. El Nahla, A.K. Osman, and A.M. Erasha (1991). **Some gross anatomical studies on the morphology and arterial segmentation of the spleen of the lion (*Panthera leo*) in Giza zoological garden [Egypt].** *Assiut Veterinary Medical Journal* 22(43): 8-12. ISSN: 1012-5973.
**NAL Call Number:** SF604 A77
**Abstract:** The present work was conducted on five lion spleens collected from Giza zoological Garden. The morphology of the spleen was thoroughly investigated with special references to its parameters. The study of the intrasplenic distribution of arterial system in the spleen of lion as well as the corrosion cast revealed the presence of two splenic segments, proximal and distal.
**Descriptors:** lion, *Panthera leo*, spleen, gross anatomical studies, morphology, arterial segmentation, arterial system, corrosion cast, spleenic segments.
**Language of Text:** Summaries in Arabic and English.

Battisti, A., G. Panfili, G.d. Guardo, and M. Principato (1997). ***Gasterophilus pecorum* larvae in an aged lion.** *Veterinary Record (United Kingdom)* 140(25): 664. ISSN: 0042-4900.
**Descriptors:** lion, *Panthera leo*, case studies, *Gasterophilus pecorum*, Felidae, zoo animals, pathogenesis, parasites, myiasis, Carnivora, Diptera, Insecta, parasitoses, ectoparasites, Italy, Europe GB.
**Notes:** Correspondence.

Bengis, R.G. (2000). **Chemical capture of free-ranging lions (*Panthera leo*).** *Proceedings of the North American Veterinary Conference* 14(14): 1029-1031. ISSN: 0003-1488.
**NAL Call Number:** SF605.N672
**Descriptors:** capture of animals, anesthesia, immobilization, darting, sedation, chemical capture.
**Notes:** Meeting held on January 15-19, 2000, Orlando, Florida.

Boag, B. and J.A. Mlotkiewicz (1994). **Effect of odor derived from lion faeces on behavior of wild rabbits.** *Journal of Chemical Ecology* 20(3): 631-637. ISSN: 0098-0331.
**NAL Call Number:** QD415.A1J6
**Abstract:** A synthetic repellent derived from lion feces was tested in both pen and field bioassay trials. The chemical suppressed the feeding of rabbits on carrots for approximately one month. The application of the chemical to rabbit burrows under field conditions showed that it decreased rabbit numbers in the treated warrens and that this effect could still be detected after five months. It is suggested that this chemical could be a timely environmentally acceptable addition to the armamentarium of control measures required to reduce the recent increase in rabbit numbers occurring in Britain.
**Descriptors:** lion, *Panthera leo*, rabbits, vertebrate pests, pest control, feces, predators, odors, field tests, lions, rodent repellents, Britian.

Brennan, G., M.D. Podell, R. Wack, S. Kraft, J.L. Troyer, H. Bielefeldt Ohmann, and S. VandeWoude (2006). **Neurologic disease in captive lions (*Panthera leo*) with low titer lion lentivirus infection.** *Journal of Clinical Microbiology J.C.M* 44(12): 4345-4352. ISSN: 0095-1137.
**NAL Call Number:** QR46 .J6
**Abstract:** Lion lentivirus (LLV; also known as feline immunodeficiency virus of lion, *Panthera leo* [FIVPle]) is present in free-ranging and captive lion populations at a seroprevalence of up to 100%; however, clinical signs are rarely reported. LLV displays up to 25% interclade sequence diversity, suggesting that it has been in the lion population for some time and may be significantly host adapted. Three captive lions diagnosed with LLV infection displayed lymphocyte subset alterations and progressive behavioral, locomotor, and neuroanatomic abnormalities. No evidence of infection with other potential neuropathogens was found. Antemortem electrodiagnostics and radiologic imaging indicated a diagnosis consistent with lentiviral neuropathy. PCR was used to determine a partial lentiviral genomic sequence and to quantify the proviral burden in eight postmortem tissue specimens. Phylogenetic analysis demonstrated that the virus was consistent with the LLV detected in other captive and free-ranging lions. Despite progressive neurologic signs, the proviral load in tissues, including several regions of the brain, was low; furthermore, gross and histopathologic changes in the brain were minimal. These findings suggest that the symptoms in these animals resulted from nonspecific encephalopathy, similar to human immunodeficiency virus, FIV, and simian immunodeficiency virus (SIV) neuropathies, rather than a direct effect of active viral replication. The association of neuropathy and lymphocyte subset alterations with chronic LLV infection suggests that long-term LLV infection can have detrimental effects for the host, including death. This is similar to reports of aged sootey mangabeys dying from diseases typically associated with end-stage SIV infection and indicates areas for further research of lentiviral infections of seemingly adapted natural hosts, including mechanisms of host control and viral adaptation.
**Descriptors:** lion, *Panthera leo*, captive, neurologic diseases, low titer, lentivirus infection, feline immunodeficiency virus, free ranging, seroprevalence.

Briggs, M.B. (1996). **Veterinary considerations of caring for the lion.** *American Zoo and Aquarium Association Annual Conference Proceedings*: 60-66.
**NAL Call Number:** QL76.5.U6A472
**Descriptors:** lion, *Panthera leo*, zoo animals, animal health, animal diseases, veterinary medicine, caring, health.
**Notes:** Paper presented at the American Zoo and Aquarium Association Annual Conference, September 17-21, 1996, Honolulu, Hawaii.

Bull, M.E., D.G. Gebhard, W.A.F. Tompkins, and S. Kennedy Stoskopf (2002). **Polymorphic expression in the CD8alpha chain surface receptor of African lions (*Panthera leo*).** *Veterinary Immunology and Immunopathology* 84(3-4): 181-189. ISSN: 0165-2427.
**NAL Call Number:** SF757.2.V38
**Abstract:** Free-ranging African lion (*Panthera leo*) peripheral blood mononuclear cells (PBMC) were examined using flow cytometry and antibodies developed for use in the domestic cat to determine if phenotypic changes occurred in lion lymphocytes as a result of feline immunodeficiency virus (FIV) infection. The percentage of CD8 cells from lion peripheral blood was considerably lower than in the domestic cat. Lions with elevated levels of CD8+ cells were typically infected with FIV, similar to observations in the domestic cat. Antibodies against the alpha chain of the CD8 receptor (monoclonal antibody (mAb) 3.357) did not react consistently in all lions examined. Flow cytometric analysis determined that approximately 82 and 80% of the animals from Kruger and Hluhluwe-Umfolozi National Parks in South Africa reacted with the monoclonal antibody against the a chain of CD8 receptor, while only 17% of the lions in Etosha National Park in Namibia cross-reacted with the CD8alpha chain. There was no apparent correlation between FIV status and CD8alpha chain reactivity. The relative isolation of Etosha from the other two parks could explain the marked difference in CD8alpha chain expression and suggests that lions similar to other mammalian species demonstrate polymorphic expression of the CD8alpha chain (197).
**Descriptors:** lion, *Panthera leo*, antigens, receptors, gene expression, monocytes,

antibodies, lymphocytes, feline immunodeficiency virus, infections.

Bull, M.E., S. Kennedy Stoskopf, J.F. Levine, M. Loomis, D.G. Gebhard, and W.A.F. Tompkins (2003). **Evaluation of T lymphocytes in captive African lions (*Panthera leo*) infected with feline immunodeficiency virus.** *American Journal of Veterinary Research* 64(10): 1293-1300. ISSN: 0002-9645.
**NAL Call Number:** 41.8 Am3A
**Descriptors:** lion, *Panthera leo*, zoo animals, CD4 positive T lymphocytes, feline immunodeficiency virus, feline acquired immunodeficiency syndrome, host pathogen relationships, lymphocyte count, flow cytometry, CD8 positive T lymphocytes, wasting syndrome, symptoms.

Bwangamoi, O., D. Rottcher, and C. Wekesa (1990). **Rabies, microbesnoitosis and sarcocystosis in a lion. [Correspondence].** *Veterinary Record (United Kingdom)* 127(16): 411. ISSN: 0042-4900.
**Descriptors:** lion, *Panthera leo*, sarcocystosis, microbesnoitosis, protozoal infections, rabies, parasitoses, protozoa, viral diseases, zoonoses, Kenya, Africa.

de Barros, J.B.G., T.A.R. de Paula, S.L.P. daMatta, C.C. Fonseca, F.L.G. Leite, J.L. Rossi, P.C. de Oliveira, and E.P. daCosta (2007). **Sertoli cell index and spermatic reserves in adult captive African lions (*Panthera leo*, Linnaeus, 1758).** *Animal Reproduction Science* 102(3-4): 350-356. ISSN: 0378-4320.

**NAL Call Number:** QP251.A5
**Descriptors:** lions, *Panthera leo*, Sertoli cells, spermatozoa, adult animals, captive animals, males, spermatogenesis, testes, animal reproduction.

de la Fe, C., J.M. Rodraiguez, G.A. Ramairez, J. Hervaas, J. Gil, and J.B. Poveda (2006). **Sudden Death Associated with *Clostridium sordellii* in Captive Lions (*Panthera leo*).** *Veterinary Pathology* 43(3): 370-374. ISSN: 0300-9858.
**NAL Call Number:** 41.8 P27
**Abstract:** In the spring of 2003, a series of sudden deaths in a group of adult lions (*Panthera leo*) with a previous history of depression, inanition, and lethargy, was investigated. Five animals died within 24 to 36 hours after onset of signs of disease. Serologic screening for viral disease detection was negative, evidence of parasites was not detected, and results of a complete blood count and serum biochemical analysis were within reference intervals in all lions. The most relevant lesions observed were multiple areas of necrosis and hemorrhage in the intestinal outer muscular layer, and cellulitis with an intense bloody edema in the mesenteric and the pericardial fat tissue. On the basis of the fulminant course of the disease, the gross and histologic findings, and the isolation and identification of Clostridium sordellii, a diagnosis of infectious myositis and cellulitis associated with acute clostridiosis was made. To the authors' knowledge, this is the first report of sudden death associated with *C. sordellii* in felines.
**Descriptors:** lion, *Panthera leo*, zoo animals, disease outbreaks, acute course, *Clostridium sordellii*, cellulitis, myositis, bacterial enteritis, sudden death.

Diniz, L.S.M., M.P. Holzchuh, V. Barnabe, C.A. Oliveira, and E.O. Costa (1996). **Controle da reproducao de leoas (*Panthera leo*) em cativeiro: implante de contraceptivos de longa duracao. [Control of reproduction of captive lionesses (*Panthera leo*): long-term implanted contraceptive].** *Hora Veterinaria (Brazil)* 16(94): 60-64. ISSN: 0101-9163.
**Descriptors:** lion, *Panthera leo*, females, captivity, contraceptives, control of reproduction, oestrous cycle, oestrus synchronization, biological rhythms, reproduction, control of reproduction, long term inplanted contraceptive.
**Language of Text:** Portuguese, Summaries in English and Spanish.

Diop, P.E.H. (1986). **Note clinique a propos d' une caudectomie d' un lion. [Clinical note about caudectomy on lion].** *Revue De Medecine Veterinaire* 137(12): 831-833. ISSN: 0035-1555.
**Descriptors:** lions, *Panthera leo*, caudectomy, surgical operations, tail, lesions, anatomy, body regions, injurious factors, vertebrates.
**Language of Text:** French, Summaries in French, English, German and Spanish).

Dorso, L., E. Risi, S. Triau, S. Labrut, F. Nguyen, L. Guigand, M. Wyers, and J. Abadie (2008). **High grade mucoepidermoid carcinoma of the mandibular salivary gland in a lion (*Panthera leo*).** *Veterinary Pathology* 45(1): 104-108. ISSN: 0300-9858.
**NAL Call Number:** 41.8 P27
**Abstract:** A 13-year-old neutered male lion was presented with a primary neoplasm arising from the left mandibular salivary gland associated with metastases to regional lymph nodes, thoracic viscera (lungs, heart, esophagus, and diaphragm), and kidney. Histologic and immunohistochemical investigations led to a diagnosis of a high-grade mucoepidermoid carcinoma of the mandibular salivary gland. In this case report, we point out the importance of the immunohistochemical characterization for differential diagnosis between various types of carcinomas of the salivary gland.
**Descriptors:** lion, *Panthera leo*, mandibular salivary gland, mucoepidermoid carcinoma,

high grade, metastases, regional lymph modes, thoracid viscera, kidney, case report.

Epstein, A., R. White, I.H. Horowtiz, P.H. Kass, and R. Ofri (2002). **Effects of propofol as an anaesthetic agent in adult lions (*Panthera leo*): a comparison with two established protocols.** *Research in Veterinary Science* 72(2): 137-140. ISSN: 0034-5288.
**NAL Call Number:** 41.8 R312
**Abstract:** The aims of this study were to evaluate the effects of a ketamine/propofol anaesthetic protocol in lions (*Panthera leo*), and to compare it to two commonly used anaesthetic protocols. Seventeen adult lions were anaesthetised using three different protocols. Group XK (n=6) was anaesthetised with intramuscular (i.m.) injections of xylazine and ketamine. Group KD (n=5) was anaesthetised with an i.m. injection of ketamine, followed by an intravenous (i.v.) injection of ketamine and diazepam. Group KP (n=6) was anaesthetised with an i.m. injection of ketamine followed by an i.v. injection of propofol. There was a significant difference in heart rate ($P < 0.0002$), which was lowest in group XK and highest in KD. Jaw tone was significantly lower in Group XK ($P < 0.05$). No undesirable effects were noted following injection of the propofol. Propofol was a suitable and safe drug for maintenance of anaesthesia in adult lions.
**Descriptors:** lion, *Panthera leo*, ketamine, intramuscular injection, intravenous injection, xylazine, diazepam, heart rate, jaws, adverse effects, human health and safety, respiration rate, propofol, jaw tone.

Fahlman, A., A. Loveridge, C. Wenham, C. Foggin, J.M. Arnemo, and G. Nyman (2005). **Reversible anaesthesia of free-ranging lions (*Panthera leo*) in Zimbabwe.** *Journal of the South African Veterinary Association* 76(4): 187-192. ISSN: 0038-2809.
**Descriptors:** lions, *Panthera leo*, free ranging, anaesthesia, reversable, Carnivora, Felidae, Zimbabwe Africa.

Frackowiak, H. (1989). **Das Rete mirabile der Arteria maxillaris des Loewen (*Panthera leo*, L. 1758). [The rete mirabile of the maxillary artery of the lion (*Panthera leo*, L. 1758)].** *Journal of Veterinary Medicine, Series C* 18(4): 342-348. ISSN: 0340-2096.
**Descriptors:** lions, *Panthera leo*, blood vessels, maxillary artery, anatomy, rete mirabile, body parts, body regions, cardiovascular system.
**Language of Text:** German, Summaries in German, English, Spanish and French.

George, P.O., J.V. Cheeran, A.M. Jalaluddin, K. Rajankutty, and C.A. Varkey (1986). **Treatment of wounds on the forelimb of a lion (*Panthera leo*) under general anaesthesia.** *Indian Veterinary Journal (India)* 63(11): 952-953. ISSN: 0019-6479.
**Descriptors:** lions, *Panthera leo*, wounds, forelimb, treatment, therapy, anaesthesia, anatomy, body regions, veterinary care, India.

Hartley, M.P., R.M. Kirberger, M. Haagenson, and L. Sweers (2005). **Diagnosis of suspected hypovitaminosis A using magnetic resonance imaging in African lions (*Panthera leo*).** *Journal of the South African Veterinary Association* 76(3): 132-137. ISSN: 0038-2809.
**Descriptors:** lions, *Panthera leo*, suspected hypovitaminosis A, vitamin deficiencies, retinol, diagnosis, magnetic resonance imaging, south Africa, nutrient deficiencies.

Hashizaki, F., N. Kohno, E. Narushima, K. Tashiro, M. Inoue, T. Komine, K. Yamakawa, A. Takagi, and M. Saitoh (1981). **Contraception of vasectomy procedure for male lions, *Panthera leo*, at Tama Zoological Park [Japan].** *Journal of Japanese Association of Zoological Gardens and Aquariums* 22(4): 100-103. ISSN: 0386-7498.
**Descriptors:** lion, *Panthera leo*, contraception, vasectomy procedure, male, Tama Zoological Park, Japan.
**Language of Text:** Japanese, Summary in English.

Hawkey, C.M. and M.G. Hart (1986). **Haematological reference values for adult pumas, lions, tigers, leopards, jaguars and cheetahs.** *Research in Veterinary Science* 41(2): 268-269. ISSN: 0034-5288.
**Abstract:** Normal haematological values and fibrinogen levels were obtained from a number of healthy adult Felidae in the collection of the Zoological Society of London. The group comprised 29 pumas (*Felis concolor*), 32 lions (*Panthera leo*), 27 tigers (*P tigris*), 19 leopards (*P pardus*), 18 jaguars (*P onca*) and 22 cheetahs (*Acinonyx jubatus*). The values provided a basis for identifying abnormalities in the blood of sick individuals of these species and for undertaking interspecies comparisons.
**Descriptors:** cheetah, *Acinonyx jubata*, pumas, *Felis concolor*, lions, *Panthera leo*, tigers, *Panthera tigris*, leopards, *Panthera pardus*, jaguars, *Panthera onca*, adult, fibrinogen levels, blood, hematological reference values.

Hayward, M.W. and G.J. Hayward (2007). **Activity patterns of reintroduced lion *Panthera leo* and spotted hyaena *Crocuta crocuta* in the Addo Elephant National Park, South Africa.** *African Journal of Ecology* 45(2): 135-141. ISSN: 0141-6707.
**NAL Call Number:** 409.6 Ea7
**Abstract:** Africa's large predator guild competes for a limited food resource base. To minimize the degree of competition, we hypothesized that the two largest members of this guild and its fiercest competitors, the lion and the spotted hyaena, would partition

their activity patterns to avoid interacting. We used 96-h continuous follows of focal animal(s) to determine when the six radio-collared lions and eight radio-collared spotted hyaenas, reintroduced into Addo Elephant National Park in 2003/2004, were active using a binomial measure of activity which was defined as movements >100 m during each hourly period. Contrary to our predictions, lions and hyaenas did not partition their activity times, probably because of their current low population densities. Both species exhibited a crepuscular activity pattern although hyaenas were far less active during daylight. A sub-adult lioness minimized competitive interactions by becoming diurnal. This is likely to be a common strategy for lions that have been expelled from their natal pride to become nomadic, as it allows them to minimize kleptoparasitic and agonistic interactions from competitively dominant conspecifics and competitors. The increase in testosterone that occurs in males upon reaching sexual maturity, darkens their pelage and causes them to be more directly impacted by the heat, and thereby affords females an opportunity to escape from males during hot temperatures. Similarly, the longer pelage of young hyaenas restricts their activity to the cooler night-time.
**Descriptors:** lions, *Panthera leo*, behavior, Carnivora, interspecific competition, intraspecific competition, competition avoidance, crepuscular, nocturnal, nomadism, temperature inhibition, spotted hyaena, *Crocuta crocuta*.

Hcottner, M., M. Nakao, T. Wassermann, L. Siefert, J.D.F. Boomker, A. Dinkel, Y. Sako, U. Mackenstedt, T. Romig, and A. Ito (2008). **Genetic characterization and phylogenetic position of *Echinococcus felidis* (Cestoda: Taeniidae) from the African lion.** *International Journal for Parasitology* 38(7): 861-868. ISSN: 0020-7519.

**NAL Call Number:** QH547.I55
**Abstract:** *Echinococcus felidis* had been described in 1937 from African lions, but was later included in *Echinococcus granulosus* as a subspecies or a strain. In the absence of any genetic characterization, most previous records of this taxon from a variety of large African mammals remained unconfirmed due to the lack of diagnostic criteria and the possible confusion with the sympatric *E. granulosus sensu stricto*, *Echinococcus ortleppi* and *Echinococcus canadensis*. In this study, we obtained taeniid eggs from lion feces in Uganda and amplified DNA from individual eggs. Mitochondrial and nuclear DNA sequences showed similarities with those of other *Echinococcus* spp., but high values of percentage divergence of mitochondrial genes indicated the presence of a distinct species. In a second step, we compared this material with the preserved specimens of adult *E. granulosus felidis*, which had been identified morphologically approximately 40years ago in South Africa. All DNA fragments (<200bp) that could be amplified from the adults showed 100% similarity with the Ugandan material. In the phylogenetic tree of *Echinococcus* which was constructed from the mitochondrial genes, *E. felidis* is positioned as a sister taxon of *E. granulosus sensu stricto*. The data obtained will facilitate the development of diagnostic tools necessary to study the epidemiology of this enigmatic parasite.
**Descriptors:** African lion, *Pantherea leo*, parasites, Cestoda, *Echinococcus felidis*, eggs, DNA, epidemiology.

Herz, V. and R.M. Kirberger (2004). **Nutritional secondary hyperparathyroidism in a white lion cub (*Panthera leo*), with concomitant radiographic double corticle line.** *Journal of the South African Veterinary Association* 75(1): 49-53. ISSN: 0038-2809.
**Descriptors:** lion, *Panthera leo*, nutritional secondary hyperparathyroidism, white lion cub, radiographic double corticle line, concomitant, nutrition, diagnosis.

Kiffner, C., M. Waltert, B. Meyer, and M. Mcohlenberg (2008). **Response of lions (*Panthera leo* Linnaeus 1758) and spotted hyaenas (*Crocuta crocuta* Erxleben 1777) to sound playbacks.** *African Journal of Ecology* 46(2): 223-226. ISSN: 0141-6707.

**NAL Call Number:** 409.6 Ea7
**Descriptors:** lion, *Panthera leo*, spotted hyaenas, *Crocuta crocuta*, sound playbacks, response, behavior.

Kirberger, R.M., D.F. Keet, and W.M. Wagner (2006). **Radiologic abnormalities of the appendicular skeleton of the lion (*Panthera Leo*): Incidental findings and *Mycobacterium bovis*-induced changes.** *Veterinary Radiologyand Ultrasound the Official Journal of the American College of Veterinary Radiology and the International Veterinary Radiology Association* 47(2): 145-152. ISSN: 1058-8183.

**NAL Call Number:** SF757.8.A4
**Descriptors:** lion, *Panthera leo*, musculoskeletal system, limb bones, bone fractures, mycobacterial diseases, *Mycobacterium bovis*, tuberculosis, animal injuries, joint diseases, lesions, diagnostic techniques, radiography, animal age.

Lewis, J.C.M. (1991). **Malattia di Osgood-Schlatter in un leone africano. [The Osgood-Schlatter disease in an African lion].** *Selezione Veterinaria (Italy)* 32(5): 943-944. ISSN: 0037-1521.
**Descriptors:** lions, *Panthera leo*, Osgood Schlatter disease, African lion, movement disorders, fractures, diagnosis, food enrichment, healing, veterinary care, food, functional

disorders, lesions.
**Language of Text:** Italian.

Lewis, J.C.M. (1989). **Osgood Schlatter disease in an African lion in the Middle East.** *British Veterinary Journal (UK)* 145(5): 494-495. ISSN: 0007-1935.
**Descriptors:** lions, *Panthera leo*, osgood schlatter disease, radiography, anaesthesia, nutritional disorders, fractures, bone diseases, metabolic disorders, Middle East.

Maj, A., G.M. Spellman, and S.K. Sarver (2008). **The Complete CDS of the Prion Protein (PRNP) Gene of African Lion (*Panthera leo*).** *Virus Genes* 36(2): 433-434. ISSN: 0920-8569.

**NAL Call Number:** QH434 .V57
**Abstract:** We provide the complete PRNP CDS sequence for the African lion, which is different from the previously published sequence and more similar to other carnivore sequences. The newly obtained prion protein sequence differs from the domestic cat sequence at three amino acid positions and contains only four octapeptide repeats. We recommend that this sequence be used as the reference sequence for future studies of the PRNP gene for this species.
**Descriptors:** lion, *Panthera leo*, prion protein, PRNP, complete CDS, gene, sequence, amino acid positions, reference sequence.

Maratea, K., S.B. Hooser, and J.A. Ramos Vara (2006). **Degenerative myelopathy and vitamin A deficiency in a young black-maned lion (*Panthera leo*).** *Journal of Veterinary Diagnostic Investigation* 18(6): 608-611. ISSN: 1040-6387.
**NAL Call Number:** SF774.J68
**Descriptors:** lion, *Panthera leo*, females, zoo animals, vitamin A, nutrient deficiencies, deficiency diseases, nervous system diseases, spinal cord, disease diagnosis, myelin sheath, cell nucleus, pathogenesis , cerebrospinal fluid, degenerative myelopathy.

Muller Graf, C.D.M., M.E.J. Woolhouse, and C. Packer (1999). **Epidemiology of an intestinal parasite (Spirometra spp.) in two populations of African lions (*Panthera leo*).** *Parasitology (United Kingdom)* 118(4): 407-415. ISSN: 0301-1820.
**Descriptors:** lion, *Panthera leo*, intestinal parasite, epidemiology, diphyllobothriidae, Spirometa spp., ova, helminths, feces, cestoda, platyhelminthes, wildlife.

Munao Diniz, L.S., H.E. Belluomini, L.P. Travassos Filho, and M.B. da Rocha (1987). **Presence of the ear mite *Otobius megnini* in the external ear canal of lions (*Panthera leo*).** *Journal of Zoo Animal Medicine* 18(4): 154-155. ISSN: 0093-4526.
**NAL Call Number:** SF601.J6
**Descriptors:** lion, *Panthera leo*, ears, Acari, ear mites, larvae, *Otobius megnini*, disease vectors, Brazil.

Munson, L., J.L. Brown, M. Bush, C. Packer, D. Janssen, S.M. Reiziss, and D.E. Wildt (1996). **Genetic diversity affects testicular morphology in free-ranging lions (*Panthera leo*) of the Serengeti Plains and Ngorongoro Crater.** *Journal of Reproduction and Fertility (United Kingdom)* 108(1): 11-15. ISSN: 0022-4251.
**Descriptors:** lion, *Panthera leo*, free ranging, genetic diversity, affects, testicular mophology, Serengeti Plains, Nngorongoro Crater.

Murali Manohar, B., A.V. Korandi, S. Vairamuthu, M.G. Jayathangaraj, and R. Vijayakumar (2003). **Cutaneous capillary haemangioma in a lion.** *Indian Veteinary Journal (India).* 80(8): 826-827. ISSN: 0019-6479.
**Abstract:** The Reports on cutaneous neoplasms in the captive wild mammals are very sparse. A case of cutaneous squamous cell carcinoma was reported. Considering rarity of occurance and paucity of information on skin tumours in wild mammals, a case of cutaneous capillary haemangioma in a lion is recorded.
**Descriptors:** lion, *Panthera leo*, hemangioma, cutaneous capillary, neoplasms, captive, squamous cell carcinoma, tumors, case report, India.

Natoli, E. (1990). **Mating strategies in cats: a comparison of the role and importance of infanticide in domestic cats, *Felis catus* L., and lions, *Panthera leo* L.** *Animal Behaviour* 40(1): 183-186. ISSN: 0003-3472.
**NAL Call Number:** 410 B77
**Descriptors:** lions, *Panthera leo*, domestic cats, *Felis catus*, mating behavior, infant mortality, reproduction , infanticide, species comparison.

Ocholi, R.A., J.O. Kalejaiye, and P.A. Okewole (1989). **Acute disseminated toxoplasmosis in two captive lions (*Panthera leo*) in Nigeria.** *Veterinary Record (UK)* 124(19): 515-516. ISSN: 0042-4900.
**Descriptors:** lion, *Panthera leo*, acute disseminated toxoplasmosis, toxoplasma, captive, disease symptoms, diarrhea, postmortem examination, coccidia, diagnosis, digestive disorders, diseases, parasitoses, protozoa, protozoal infections, sporozoa, symptoms, *Toxoplasma gondii*, Nigeria Africa.

Ofri, R., I.H. Horowitz, S. Jacobson, and P.H. Kass (1997). **Tear production in lions (*Panthera***

***leo*): the effect of two anesthetic protocols.** *Veterinary and Comparative Ophthalmology* 7(3): 173-175. ISSN: 1076-4607.
**NAL Call Number:** SF891.P78
**Descriptors:** lion, *Panthera leo*, tears, anesthesia, xylazine, atropine, ketamine, diazepam, tear production.

Ofri, R., L.S. Shore, P.H. Kass, and I.H. Horowitz (1999). **The effect of elevated progesterone levels on intraocular pressure in lions (*Panthera leo*).** *Research in Veterinary Science* 67(2): 121-123. ISSN: 0034-5288.
**NAL Call Number:** 41.8 R312
**Abstract:** Recently, we reported that intraocular pressure (IOP) in juvenile male lions (*Panthera leo)* is significantly higher than in juvenile lionesses. Whilst we could not ascertain the basis for this gender-related difference, we suspected that they were the result of fluctuations in levels of sex hormones. Because 19 of the 22 lions described in our previous report had to be re-anaesthetized, we repeated tonometry in these animals, to try and correlate between IOP and the levels of progesterone, oestrogen and/or testosterone. Based on elevated (>5 ng ml-1) levels of progesterone, lionesses were divided into a luteal (n=8) and a non-luteal (n=13) group. In the luteal group, mean IOP was 27.07 +/- 2.15 mm Hg, significantly (P=0.001) higher than in the non-luteal group (21.61 +/- 2.70 mm Hg). Oestrogen, testosterone, anesthesia and age had no significant effect on IOP. It is suggested that elevated progesterone levels associated with the luteal phase in lionesses cause increased resistance to aqueous humor outflow, leading to IOP elevation. Similar ocular hypertension has been observed in rabbits following exogenous progesterone application, but this is the first report on the hypertensive effect of endogenous progesterone on top.
**Descriptors:** lion, *Panthera leo*, progesterone, eyes, gender differences, estrogens, testosterone, intraocular pressure, elevated progesterone levels, sex hormones, levels.

Ogungbade, S.G. and A.F. Ogunrinade (1984). **[Tapeworm infection (*Taenia hydatigena*) in lion (*Panthera leo*) in captivity. A case report].** *Revue D'Elevage Et De Medecine Veterinaire Des Pays Tropicaux* 37(1): 30-31. ISSN: 0035-1865.
**Descriptors:** lion, *Panthera leo*, tapeworm infection, *Tainia hydatigena*, captivity, case report, Nigeria.
**Language of Text:** French, Summaries in French, English and Spanish.

Port, C.D., E.R. Maschgan, J. Pond, B. Kirschner, S. Poticha, and D.G. Scarpelli (1981). **Chronic exocrine pancreatic insufficiency in 2 Indian lions (*Panthera leo persica*).** *Journal of Comparative Pathology (UK)* 91(4): 483-491. ISSN: 9921-9975.
**Descriptors:** lion, *Panthera leo persica*, chronic exocrine pancreatic insufficiency, disease, pathology.

Powell, D.M. (1995). **Preliminary evaluation of environmental enrichment techniques for African lions (*Panthera leo*).** *Animal Welfare (United Kingdom)* 4(4): 361-370. ISSN: 0962-7286.
**Descriptors:** lion, *Panthera leo persica*, zoo animals, behavior, animal housing, environmental enrichment techniques, preliminary evaluation.

Power, R.J. (2002). **Prey selection of lions *Panthera leo* in a small, enclosed reserve.** *Koedoe (South Africa)* 45(2): 67-75. ISSN: 0075-6458.
**Descriptors:** lions, *Panthera leo*, prey selection, small enclosed reserve, predation, mammals, resource conservation, resource management, South Africa.

Rashid, M.A. (1982). **The GIR lion sanctuary project , conservation, India.** *Wildlife in India, PSA Journal*
**NAL Call Number:** QL84.5.I4S2
**Descriptors:** Persian lion, *Panthera leo persica*, conservation efforts, GIR lion sanctuary, India.

Roelke Parker, M.E., L. Munson, C. Packer, R. Kock, S. Cleaveland, M. Carpenter, S.J. O' Brien, A. Pospischil, R. Hofmann Lehmann, and H. Lutz (1996). **A canine distemper virus epidemic in Serengeti lions (*Panthera leo*).** *Nature* 379(6564): 441-445. ISSN: 0028-0836.
**NAL Call Number:** 472 N21
**Abstract:** Canine distemper virus (CDV) is thought to have caused several fatal epidemics in canids within the Serengeti-Mara ecosystem of East Africa, affecting silver-backed jackals (*Canis mesomelas*) and bat-eared foxes (*Otocyon megalotis*) in 1978, and African wild dogs (*Lycaon pictus*) in 1991. The large, closely monitored Serengeti lion population was not affected in these epidemics. However, an epidemic caused by a morbillivirus closely related to CDV emerged abruptly in the lion population of the Serengeti National Park, Tanzania, in early 1994, resulting in fatal neurological disease characterized by grand mal seizures and myoclonus; the lions that died had encephalitis and pneumonia. Here we report the identification of CDV from these lions, and the close phylogenetic relationship between CDV isolates from lions and domestic dogs. By August 1994, 85% of the Serengeti lion population had anti-CDV antibodies, and the epidemic spread north to lions in the Massai Mara National reserve, Kenya, and uncounted hyaenas, bat-eared

foxes, and leopards were also affected.
**Descriptors:** lion, *Panthera leo*, endangered species, disease outbreaks, mortality, symptoms, wildlife management, dogs as disease vectors and resivors, vaccination, domestic animals, fatal-infections, distemper virus, lions, grand mal seizures, species extinction, Tanzania, Kenya.

Ruiz de Ybanez, M.R., C. Martinez Carrasco, J.J. Martinez, J.M. Ortiz, T. Attout, and O. Bain (2006). ***Dirofilaria immitis* in an African lion (*Panthera leo*).** *Veterinary Record Journal of the British Veterinary Association* 158(7): 240-242. ISSN: 0042-4900.
**NAL Call Number:** 41.8 V641
**Descriptors:** lion, *Panthera leo*, *Dirofilaria immitis*, disease.

Schramm, R.D., M.B. Briggs, and J.J. Reeves (1994). **Spontaneous and induced ovulation in the lion (*Panthera leo*).** *Zoo Biology* 13(4): 301-307. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** lion, *Panthera leo*, induced, spontaneous, ovulation, copulation, progesterone, blood, estrus, interestrous interval.

Sharma, M., R.C. Katoch, V.K. Gupta, and M.K. Batta (2003). ***Yersinia pseudotuberculosis* infection in lion (*Panthera leo*) cubs.** *Indian Journal of Animal Sciences* 73(2): 163. ISSN: 0367-8318.
**Descriptors:** lion, *Panthera leo*, cubs, *Yersinia pseudotuberculosis*, septicemia, infection, histopathology, wildlife, bacteria, bacterioses, enterobacteriaceae, India.

Shi Zhukui (1993). **Diagnosis and treatment of intestinal obstruction and anemia in African lion.** *Chinese Journal of Veterinary Science and Technology* 23(7): 31-32. ISSN: 1000-6419.
**Descriptors:** lions, *Panthera leo*, intestinal obstruction, anemia, diagnosis, treatment, digestive disorders, laboratory diagnosis, disease control, blood disorders.
**Language of Text:** Chinese.

Singh, M., P.P. Raval, N. Dharaiya, and V.C. Soni (1999). **Feeding niche of Asiatic lion (*Panthera leo persica*) and leopard (*Panthera pardus*) in the Gir Protected Area.** *Tigerpaper (FAO)* 26(3): 12-15. ISSN: 1014-2789.
**Descriptors:** lions, *Panthera leo persica*, leopard, *Panthera pardus*, feeding habits, predation, behavior, carnivora, felidae, protected area.

Siqueira, V.J., W.O. Bernis, C.H.R.d.A. Silva, T.M.P. Soares, P.A.d.S. Ferreira, and R.G.d.M. Campos (2001). **Correcao cirurgica de fratura de tibia e fibula em um leao (*Panthera leo*), por meio de pinos intramedulares de Steinmann. [Surgical correction of tibia e fibula in a lion (*Panthera leo*), using Steinmann intramedullary pins. A case report].** *Veterinaria Noticias* 7(1): 107-112. ISSN: 0104-3463.
**NAL Call Number:** CENAGRI, CP 02432, 70.043-900 Brasilia,DF - Brasil.
**Descriptors:** lions, *Panthera leo*, limb bones, fractures, surgical operations, fibula, tibia, bones, felidae, Steinmann pins, anesthesia, radiografs, case report.
**Language of Text:** Portuguese, Summaries in English and Portuguese.

Steinmetz, A., K. Eulenberger, J. Thielebein, S. Buschatz, A. Bernhard, A. Wilsdorf, and R. Ofri (2006). **Lens anomalies and other ophthalmic findings in a group of closely related Angola lions (*Panthera leo bleyenberghi*).** *Zoo Biology* 25(5): 433-439. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6
**Descriptors:** lion, *Panthera leo*, eye lens, cataracts, clinical examination, histopathology, adult animals, young animals, progeny, endangered species, Katanga lion, lenticular abnormalities, ophthalmic examination, lion cubs.

Stolte, M. and M. Welle (1995). **Cutaneous mast cell tumours in a lion (*Panthera leo*): a light and transmission electron microscopical study.** *Journal of Comparative Pathology* 113(3): 291-294. ISSN: 0021-9975.
**NAL Call Number:** 41.8 J82
**Descriptors:** lion, *Panthera leo*, neoplasms, cutaneous mast cells, skin, histopathology, electron microscopical study, cell ultrastructure.

Sundeep Chandra, A.M., R.E. Papendick, J. Schumacher, B.L. Homer, and P. Wollenman (1999). **Cerebellar herniation in captive lions (*Panthera leo*).** *Journal of Veterinary Diagnostic Investigation Official Publication of the American Association of Veterinary Laboratory Diagnosticians Inc* 11(5): 465-468. ISSN: 1040-6387.
**NAL Call Number:** SF774.J68
**Descriptors:** lion, *Panthera leo*, cerebellar herniation, spinal cord, etiology, skull, case studies, malformations, vitamin A deficiency, Florida.

Tanwar, R.K., L.M. Mittal, S.M. Sharma, J.S. Yadav, and P.D. Mathur (1984). **Parasitic gastritis in an Asian lion- a case report.** *Indian Journal of Veterinary Medicine (India)* 4(1): 48-49. ISSN: 0970-051X.

**Descriptors:** lion, *Panthera leo*, parsitic gastritis, disease, parasites, case report.

Tefera, M. (2003). **Phenotypic and reproductive characteristics of lions (*Panthera leo*) at Addis Ababa Zoo.** *Biodiversity and Conservation* 12(8): 1629-1639. ISSN: 0960-3115.
**NAL Call Number:** QH75.A1 B562
**Descriptors:** lion, *Panthera leo*, animal breeding, reproductive characteristics, zoo animals, sexual reproduction, phenotypic characteristics, wildlife management, Ethiopia, captive breeding.

Trinkel, M., N. Ferguson, A. Reid, C. Reid, M. Somers, L. Turelli, J. Graf, M. Szykman, D. Cooper, P. Haverman, G. Kastberger, C. Packer, and R. Slotow (2008). **Translocating lions into an inbred lion population in the Hluhluwe iMfolozi Park, South Africa.** *Animal Conservation* 11(2): 138-143. ISSN: 1367-9430.

**NAL Call Number:** QH75.A1 A54
**Abstract:** A fundamental problem in conservation biology is the risk of inbreeding in fragmented and declining populations. In the Hluhluwe-iMfolozi Park (HiP), a small, enclosed reserve in South Africa, a large lion *Panthera leo* population arose from a founder group of five individuals in the 1960s. The HiP lion population went through a persistent decline and showed indications of inbreeding depression. To restore the genetic variation of the inbred HiP lion population, new lions were translocated into the existing population. Translocated females formed stable associations and established enduring pride areas with other translocated lionesses, but did not bond into native female prides. The translocated male coalition was more successful in gaining and maintaining residence in a pride than the translocated lone male that split off on his own from the male coalition. Litter size and cub survival was about twice as high for pairings involving at least one translocated parent than for pairings of two native lions. It is therefore possible to infuse new genes rapidly and successfully into a small, isolated lion population. Such translocations may become an important adaptive management tool as lion populations become increasingly fragmented.
**Descriptors:** lion, *Panthera leo*, inbreeding, population dynamics, translocation, inbred population, translocated lions, litter size, cub survival.

Umapathy, G., S.D. Sontakke, K. Srinivasu, T. Kiran, S.D. Kholkute, and S. Shivaji (2007). **Estrus behavior and fecal steroid profiles in the Asiatic lion (*Panthera leo persica*) during natural and gonadotropin induced estrus.** *Animal Reproduction Science* 101(3-4): 313-325. ISSN: 0378-4320.

**NAL Call Number:** QP251.A5
**Descriptors:** lion, *Panthera leo*, endangered species, zoo animals, female reproductive system, estrous cycle, ovulation, hormone secretion, estradiol, progesterone, feces, normal values, hormonal regulation, human chorionic gonadotropin, mating behavior, vocalization , India.

VandeWoude, S., S.J. O' Brien, and E.A. Hoover (1997). **Infectivity of lion and puma lentiviruses for domestic cats.** *Journal of General Virology* 78(4): 795-800. ISSN: 0022-1317.
**NAL Call Number:** QR360.A1J6
**Abstract:** Infection of domestic cats with feline immunodeficiency virus (FIV) causes progressive immunological deterioration similar to that caused by human immunodeficiency virus (HIV). Lentiviruses related to but phylogenetically distinct from FIV have been detected in several non-domestic feline species. Serological cross-reactivity of these viruses raises the question as to whether inter-species transmission may occur. To address this issue, we asked whether lion lentivirus (FIV-Ple) or two strains of puma lentivirus (FIV-Pco) could replicate or cause disease in domestic cats. We found that domestic cats inoculated with FIV-Ple developed persistent cell-associated viraemia, transient cell-free viraemia and antiviral antibody. Clinical disease was not detected throughout a 6 month observation period. Two of four cats inoculated with FIV-Pco developed cell-associated viraemia, seroconverted and exhibited transient lymphadenopathy. No changes in white blood cell parameters or other haematological abnormalities were detected in any of the infected cats. Virus-specific RNA was detected in cocultivated lymphocytes of all infected cats by RT-PCR. These findings reveal that non-domestic cat lentiviruses are infectious for domestic cats and can establish persistent infection in the absence of disease.
**Descriptors:** lion, puma, domestic cats, lentiviruses, infectivity, immunideficiency virus, FIV, infectious.

VandeWoude, S., S.J. O'Brien, K. Langelier, W.D. Hardy, J.P. Slattery, E.E. Zuckerman, and E.A. Hoover (1997). **Growth of lion and puma lentiviruses in domestic cat cells and comparisons with FIV.** *Virology (USA)* 233(1): 185-192. ISSN: 0042-6822.
**NAL Call Number:** 448.8 V81
**Abstract:** Feline immunodeficiency virus (FIV-Fca) is a lentivirus that causes gradual immunological deterioration in domestic cats. Lentiviruses related to FIV have been detected in several nondomestic feline species; the biologic significance of these viruses remains to be defined. To examine the in vitro cell tropism of these nondomestic cat

lentiviruses, prototypical puma and lion lentiviruses (FIV-Pco and FIV-Ple) were cultured in a variety of feline cell cultures. A domestic cat T lymphoma cell line, 3201, best supported the replication of both FIV-Pco and FIV-Ple. Moreover, FlV-Ple was lytic for these cells. RT-PCR amplification of a conserved pol gene region demonstrated species-specific primer homology. Sequence and phylogenetic analyses of this amplification product confirmed the identity of the replicating viruses and classified two previously uncharacterized viruses within predictable lion and puma clades. Sequence analysis of a conserved pol region demonstrated homology with previously characterized FIV-Ple and FIV-Pco. Western blot analysis using domestic cat anti-FIV-Fca sera showed that both FIV-Pco and FIV-Ple were antigenically related, to differing degrees, to three serotypes of FIV-Fca. These studies demonstrate that though nondomestic cat lentiviruses differ significantly from FIV-Fca and that a viral-specific protocol may be necessary for sensitive viral detection, these viruses can replicate in cells of domestic cats, suggesting the potential for cross-species transmission.
**Descriptors:** lion, *Panthera leo*, puma, *Puma concolor*, lentivirus, growth, domestic cat cells, comparison with FIV, viruses, feline immunodeficiency virus.

Weissengruber, G.E., G. Forstenpointner, G. Peters, A. Kubber Heiss, and W.T. Fitch (2002). **Hyoid apparatus and pharynx in the lion (*Panthera leo*), jaguar (*Panthera onca*), tiger (*Panthera tigris*), cheetah (*Acinonyx jubatus*) and domestic cat (*Felis silvestris f. catus*).** *Journal of Anatomy* 201(3): 195-209. ISSN: 0021-8782.
**Abstract:** Structures of the hyoid apparatus, the pharynx and their topographical positions in the lion, tiger, jaguar, cheetah and domestic cat were described in order to determine morphological differences between species or subfamilies of the Felidae. In the lion, tiger and jaguar (species of the subfamily Pantherinae) the Epihyoideum is an elastic ligament lying between the lateral pharyngeal muscles and the Musculus (M.) thyroglossus rather than a bony element like in the cheetah or the domestic cat. The M. thyroglossus was only present in the species of the Pantherinae studied. In the lion and the jaguar the Thyrohyoideum and the thyroid cartilage are connected by an elastic ligament, whereas in the tiger there is a synovial articulation. In adult individuals of the lion, tiger and jaguar the ventral end of the tympanohyal cartilage is rotated and therefore the ventral end of the attached Stylohyoideum lies caudal to the Tympanohyoideum and the cranial base. In newborn jaguars the Apparatus hyoideus shows a similar topographical position as in adult cheetahs or domestic cats. In adult Pantherinae, the Basihyoideum and the attached larynx occupy a descended position: they are situated near the cranial thoracic aperture, the pharyngeal wall and the soft palate are caudally elongated accordingly. In the Pantherinae examined the caudal end of the soft palate lies dorsal to the glottis. Differences in these morphological features between the subfamilies of the Felidae have an influence on specific structural characters of their vocalizations.
**Descriptors:** cheetah, *Acinonyx jubatus*, lion, *Panthera leo*, jaguar, *Panthera onca*, tiger, *Panthera tigris*, domestic cat, *Felis silvestris f. catus*, anatomy, histology, hyoid apparatus, pharynx, anatomy, histology, hyoid bone growth, development, pharyngeal muscles anatomy, histology, pharyngeal muscles growth, development, pharynx, growth, development.

Williams, J.H., E. Van Wilpe, and M. Momberg (2005). **Renal medullary AA amyloidosis, hepatocyte dissociation and multinucleated hepatocyte in a 14 year old free ranging lioness (*Panthera leo*).** *Journal of the South African Veterinary Association* 76(2): 90-98. ISSN: 0038-2809.
**Descriptors:** lioness, *Panthera leo*, free ranging, 14 year old, renal medullary AA amyloidosis, hepatocyte dissociation, multinucleated hepatocyte, veterinary care.

Yu, C.H., K.T. Kim, D.N. Hwang, J.Y. Yhee, C.T. Moon, T.Y. Hur, and J.H. Sur (2007). **Peribiliary cysts associated with severe liver disease: a previously unrecognized tumor in a lion (*Panthera leo*).** *Journal of Veterinary Diagnostic Investigation* 19(6): 709-712. ISSN: 1040-6387.
**NAL Call Number:** SF774.J68
**Descriptors:** lion, *Panthera leo*, zoo animals, liver, liver diseases, signs, symptoms, animals and humans, mortality, cysts, neoplasms, animal diseases, diagnosis, histopathology, histology.

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### Lion - Behavior

Boag, B. and J.A. Mlotkiewicz (1994). **Effect of odor derived from lion faeces on behavior of wild rabbits.** *Journal of Chemical Ecology* 20(3): 631-637. ISSN: 0098-0331.
**NAL Call Number:** QD415.A1J6
**Abstract:** A synthetic repellent derived from lion feces was tested in both pen and field bioassay trials. The chemical suppressed the feeding of rabbits on carrots for approximately one month. The application of the chemical to rabbit burrows under field conditions showed that it decreased rabbit numbers in the treated warrens and that this effect could still be detected after five months. It is suggested that this chemical could be a timely environmentally acceptable addition to the armamentarium of control measures required to reduce the recent increase in rabbit numbers occurring in Britain.
**Descriptors:** lion, *Panthera leo*, rabbits, vertebrate pests, pest control, feces, predators, odors, field tests, lions, rodent repellents, Britian.

Hayward, M.W. and G.J. Hayward (2007). **Activity patterns of reintroduced lion *Panthera leo* and spotted hyaena *Crocuta crocuta* in the Addo Elephant National Park, South Africa.** *African Journal of Ecology* 45(2): 135-141. ISSN: 0141-6707.
**NAL Call Number:** 409.6 Ea7
**Abstract:** Africa's large predator guild competes for a limited food resource base. To minimize the degree of competition, we hypothesized that the two largest members of this guild and its fiercest competitors, the lion and the spotted hyaena, would partition their activity patterns to avoid interacting. We used 96-h continuous follows of focal animal(s) to determine when the six radio-collared lions and eight radio-collared spotted hyaenas, reintroduced into Addo Elephant National Park in 2003/2004, were active using a binomial measure of activity which was defined as movements >100 m during each hourly period. Contrary to our predictions, lions and hyaenas did not partition their activity times, probably because of their current low population densities. Both species exhibited a crepuscular activity pattern although hyaenas were far less active during daylight. A sub-adult lioness minimized competitive interactions by becoming diurnal. This is likely to be a common strategy for lions that have been expelled from their natal pride to become nomadic, as it allows them to minimize kleptoparasitic and agonistic interactions from competitively dominant conspecifics and competitors. The increase in testosterone that occurs in males upon reaching sexual maturity, darkens their pelage and causes them to be more directly impacted by the heat, and thereby affords females an opportunity to escape from males during hot temperatures. Similarly, the longer pelage of young hyaenas restricts their activity to the cooler night-time.
**Descriptors:** lions, *Panthera leo*, behavior, Carnivora, interspecific competition, intraspecific competition, competition avoidance, crepuscular, nocturnal, nomadism, temperature inhibition, spotted hyaena, *Crocuta crocuta*.

Kiffner, C., M. Waltert, B. Meyer, and M. Mcohlenberg (2008). **Response of lions (*Panthera leo* Linnaeus 1758) and spotted hyaenas (*Crocuta crocuta* Erxleben 1777) to sound playbacks.** *African Journal of Ecology* 46(2): 223-226. ISSN: 0141-6707.
**NAL Call Number:** 409.6 Ea7

**Descriptors:** lion, *Panthera leo*, spotted hyaenas, *Crocuta crocuta*, sound playbacks, response, behavior.

Powell, D.M. (1995). **Preliminary evaluation of environmental enrichment techniques for African lions (*Panthera leo*).** *Animal Welfare (United Kingdom)* 4(4): 361-370. ISSN: 0962-7286.
**Descriptors:** lion, *Panthera leo persica*, zoo animals, behavior, animal housing, environmental enrichment techniques, preliminary evaluation.

Power, R.J. (2002). **Prey selection of lions *Panthera leo* in a small, enclosed reserve.** *Koedoe (South Africa)* 45(2): 67-75. ISSN: 0075-6458.
**Descriptors:** lions, *Panthera leo*, prey selection, small enclosed reserve, predation, mammals, resource conservation, resource management, South Africa.

Singh, M., P.P. Raval, N. Dharaiya, and V.C. Soni (1999). **Feeding niche of Asiatic lion (*Panthera leo persica*) and leopard (*Panthera pardus*) in the Gir Protected Area.** *Tigerpaper (FAO)* 26(3): 12-15. ISSN: 1014-2789.
**Descriptors:** lions, *Panthera leo persica*, leopard, *Panthera pardus*, feeding habits, predation, behavior, carnivora, felidae, protected area.

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### Lion - Breeding and Reproduction

de Barros, J.B.G., T.A.R. de Paula, S.L.P. daMatta, C.C. Fonseca, F.L.G. Leite, J.L. Rossi, P.C. de Oliveira, and E.P. daCosta (2007). **Sertoli cell index and spermatic reserves in adult captive African lions (*Panthera leo*, Linnaeus, 1758).** *Animal Reproduction Science* 102(3-4): 350-356. ISSN: 0378-4320.

**NAL Call Number:** QP251.A5
**Descriptors:** lions, *Panthera leo*, Sertoli cells, spermatozoa, adult animals, captive animals, males, spermatogenesis, testes, animal reproduction.

Diniz, L.S.M., M.P. Holzchuh, V. Barnabe, C.A. Oliveira, and E.O. Costa (1996). **Controle da reproducao de leoas (*Panthera leo*) em cativeiro: implante de contraceptivos de longa duracao. [Control of reproduction of captive lionesses (*Panthera leo*): long-term implanted contraceptive].** *Hora Veterinaria (Brazil)* 16(94): 60-64. ISSN: 0101-9163.
**Descriptors:** lion, *Panthera leo*, females, captivity, contraceptives, control of reproduction, oestrous cycle, oestrus synchronization, biological rhythms, reproduction, control of reproduction, long term inplanted contraceptive.
**Language of Text:** Portuguese, Summaries in English and Spanish.

Hashizaki, F., N. Kohno, E. Narushima, K. Tashiro, M. Inoue, T. Komine, K. Yamakawa, A. Takagi, and M. Saitoh (1981). **Contraception of vasectomy procedure for male lions, *Panthera leo*, at Tama Zoological Park [Japan].** *Journal of Japanese Association of Zoological Gardens and Aquariums* 22(4): 100-103. ISSN: 0386-7498.
**Descriptors:** lion, *Panthera leo*, contraception, vasectomy procedure, male, Tama Zoological Park, Japan.
**Language of Text:** Japanese, Summary in English.

Munson, L., J.L. Brown, M. Bush, C. Packer, D. Janssen, S.M. Reiziss, and D.E. Wildt (1996). **Genetic diversity affects testicular morphology in free-ranging lions (*Panthera leo*) of the Serengeti Plains and Ngorongoro Crater.** *Journal of Reproduction and Fertility (United Kingdom)* 108(1): 11-15. ISSN: 0022-4251.
**Descriptors:** lion, *Panthera leo*, free ranging, genetic diversity, affects, testicular mophology, Serengeti Plains, Nngorongoro Crater.

Natoli, E. (1990). **Mating strategies in cats: a comparison of the role and importance of infanticide in domestic cats, *Felis catus* L., and lions, *Panthera leo* L.** *Animal Behaviour* 40(1): 183-186. ISSN: 0003-3472.
**NAL Call Number:** 410 B77
**Descriptors:** lions, *Panthera leo*, domestic cats, *Felis catus*, mating behavior, infant mortality, reproduction , infanticide, species comparison.

Ofri, R., L.S. Shore, P.H. Kass, and I.H. Horowitz (1999). **The effect of elevated progesterone levels on intraocular pressure in lions (*Panthera leo*).** *Research in Veterinary Science* 67(2): 121-123. ISSN: 0034-5288.
**NAL Call Number:** 41.8 R312

**Abstract:** Recently, we reported that intraocular pressure (IOP) in juvenile male lions (*Panthera leo)* is significantly higher than in juvenile lionesses. Whilst we could not ascertain the basis for this gender-related difference, we suspected that they were the result of fluctuations in levels of sex hormones. Because 19 of the 22 lions described in our previous report had to be re-anaesthetized, we repeated tonometry in these animals, to try and correlate between IOP and the levels of progesterone, oestrogen and/or testosterone. Based on elevated (>5 ng ml-1) levels of progesterone, lionesses were divided into a luteal (n=8) and a non-luteal (n=13) group. In the luteal group, mean IOP was 27.07 +/- 2.15 mm Hg, significantly (P=0.001) higher than in the non-luteal group (21.61 +/- 2.70 mm Hg). Oestrogen, testosterone, anesthesia and age had no significant effect on IOP. It is suggested that elevated progesterone levels associated with the luteal phase in lionesses cause increased resistance to aqueous humor outflow, leading to IOP elevation. Similar ocular hypertension has been observed in rabbits following exogenous progesterone application, but this is the first report on the hypertensive effect of endogenous progesterone on top.
**Descriptors:** lion, *Panthera leo*, progesterone, eyes, gender differences, estrogens, testosterone, intraocular pressure, elevated progesterone levels, sex hormones, levels.

Schramm, R.D., M.B. Briggs, and J.J. Reeves (1994). **Spontaneous and induced ovulation in the lion (*Panthera leo*).** *Zoo Biology* 13(4): 301-307. ISSN: 0733-3188.
**NAL Call Number:** QL77.5.Z6
**Descriptors:** lion, *Panthera leo*, induced, spontaneous, ovulation, copulation, progesterone, blood, estrus, interestrous interval.

Tefera, M. (2003). **Phenotypic and reproductive characteristics of lions (*Panthera leo*) at Addis Ababa Zoo.** *Biodiversity and Conservation* 12(8): 1629-1639. ISSN: 0960-3115.
**NAL Call Number:** QH75.A1 B562
**Descriptors:** lion, *Panthera leo*, animal breeding, reproductive characteristics, zoo animals, sexual reproduction, phenotypic characteristics, wildlife management, Ethiopia, captive breeding.

Trinkel, M., N. Ferguson, A. Reid, C. Reid, M. Somers, L. Turelli, J. Graf, M. Szykman, D. Cooper, P. Haverman, G. Kastberger, C. Packer, and R. Slotow (2008). **Translocating lions into an inbred lion population in the Hluhluwe iMfolozi Park, South Africa.** *Animal Conservation* 11(2): 138-143. ISSN: 1367-9430.

**NAL Call Number:** QH75.A1 A54
**Abstract:** A fundamental problem in conservation biology is the risk of inbreeding in fragmented and declining populations. In the Hluhluwe-iMfolozi Park (HiP), a small, enclosed reserve in South Africa, a large lion *Panthera leo* population arose from a founder group of five individuals in the 1960s. The HiP lion population went through a persistent decline and showed indications of inbreeding depression. To restore the genetic variation of the inbred HiP lion population, new lions were translocated into the existing population. Translocated females formed stable associations and established enduring pride areas with other translocated lionesses, but did not bond into native female prides. The translocated male coalition was more successful in gaining and maintaining residence in a pride than the translocated lone male that split off on his own from the male coalition. Litter size and cub survival was about twice as high for pairings involving at least one translocated parent than for pairings of two native lions. It is therefore possible to infuse new genes rapidly and successfully into a small, isolated lion population. Such translocations may become an important adaptive management tool as lion populations become increasingly fragmented.
**Descriptors:** lion, *Panthera leo*, inbreeding, population dynamics, translocation, inbred population, translocated lions, litter size, cub survival.

Umapathy, G., S.D. Sontakke, K. Srinivasu, T. Kiran, S.D. Kholkute, and S. Shivaji (2007). **Estrus behavior and fecal steroid profiles in the Asiatic lion (*Panthera leo persica*) during natural and gonadotropin induced estrus.** *Animal Reproduction Science* 101(3-4): 313-325. ISSN: 0378-4320.

**NAL Call Number:** QP251.A5
**Descriptors:** lion, *Panthera leo*, endangered species, zoo animals, female reproductive system, estrous cycle, ovulation, hormone secretion, estradiol, progesterone, feces, normal values, hormonal regulation, human chorionic gonadotropin, mating behavior, vocalization , India.

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### Lion - Research

Abuzaid, S.M., M.R. Gad, and Y.R. Wally (1994). **Renal venous system of the lion (*Panthera leo*) a gross anatomical description.** *Veterinary Medical Journal, Cairo Univ.* 41(1): 131-135. ISSN: None.
**NAL Call Number:** 41.9 C125
**Descriptors:** lion, *Panthera leo*, renal venous system, gross anatomical description, kidneys, venous anatomy.
**Language of Text:** Summary in English.

Abuzeid, S.M., S.M.M. El Nahla, A.K. Osman, and A.M. Erasha (1991). **Some gross anatomical studies on the morphology and arterial segmentation of the spleen of the lion (*Panthera leo*) in Giza zoological garden [Egypt].** *Assiut Veterinary Medical Journal* 22(43): 8-12. ISSN: 1012-5973.
**NAL Call Number:** SF604 A77
**Abstract:** The present work was conducted on five lion spleens collected from Giza zoological Garden. The morphology of the spleen was thoroughly investigated with special references to its parameters. The study of the intrasplenic distribution of arterial system in the spleen of lion as well as the corrosion cast revealed the presence of two splenic segments, proximal and distal.
**Descriptors:** lion, *Panthera leo*, spleen, gross anatomical studies, morphology, arterial segmentation, arterial system, corrosion cast, spleenic segments.
**Language of Text:** Summaries in Arabic and English.

Bull, M.E., D.G. Gebhard, W.A.F. Tompkins, and S. Kennedy Stoskopf (2002). **Polymorphic expression in the CD8alpha chain surface receptor of African lions (*Panthera leo*).** *Veterinary Immunology and Immunopathology* 84(3-4): 181-189. ISSN: 0165-2427.
**NAL Call Number:** SF757.2.V38
**Abstract:** Free-ranging African lion (*Panthera leo*) peripheral blood mononuclear cells (PBMC) were examined using flow cytometry and antibodies developed for use in the domestic cat to determine if phenotypic changes occurred in lion lymphocytes as a result of feline immunodeficiency virus (FIV) infection. The percentage of CD8 cells from lion peripheral blood was considerably lower than in the domestic cat. Lions with elevated levels of CD8+ cells were typically infected with FIV, similar to observations in the domestic cat. Antibodies against the alpha chain of the CD8 receptor (monoclonal antibody (mAb) 3.357) did not react consistently in all lions examined. Flow cytometric analysis determined that approximately 82 and 80% of the animals from Kruger and Hluhluwe-Umfolozi National Parks in South Africa reacted with the monoclonal antibody against the a chain of CD8 receptor, while only 17% of the lions in Etosha National Park in Namibia cross-reacted with the CD8alpha chain. There was no apparent correlation between FIV status and CD8alpha chain reactivity. The relative isolation of Etosha from the other two parks could explain the marked difference in CD8alpha chain expression and suggests that lions similar to other mammalian species demonstrate polymorphic expression of the CD8alpha chain (197).
**Descriptors:** lion, *Panthera leo*, antigens, receptors, gene expression, monocytes,

antibodies, lymphocytes, feline immunodeficiency virus, infections.

Bull, M.E., S. Kennedy Stoskopf, J.F. Levine, M. Loomis, D.G. Gebhard, and W.A.F. Tompkins (2003). **Evaluation of T lymphocytes in captive African lions (*Panthera leo*) infected with feline immunodeficiency virus.** *American Journal of Veterinary Research* 64(10): 1293-1300. ISSN: 0002-9645.
**NAL Call Number:** 41.8 Am3A
**Descriptors:** lion, *Panthera leo*, zoo animals, CD4 positive T lymphocytes, feline immunodeficiency virus, feline acquired immunodeficiency syndrome, host pathogen relationships, lymphocyte count, flow cytometry, CD8 positive T lymphocytes, wasting syndrome, symptoms.

Frackowiak, H. (1989). **Das Rete mirabile der Arteria maxillaris des Loewen (*Panthera leo*, L. 1758). [The rete mirabile of the maxillary artery of the lion (*Panthera leo*, L. 1758)].** *Journal of Veterinary Medicine, Series C* 18(4): 342-348. ISSN: 0340-2096.
**Descriptors:** lions, *Panthera leo*, blood vessels, maxillary artery, anatomy, rete mirabile, body parts, body regions, cardiovascular system.
**Language of Text:** German, Summaries in German, English, Spanish and French.

Kirberger, R.M., D.F. Keet, and W.M. Wagner (2006). **Radiologic abnormalities of the appendicular skeleton of the lion (*Panthera Leo*): Incidental findings and *Mycobacterium bovis*-induced changes.** *Veterinary Radiologyand Ultrasound the Official Journal of the American College of Veterinary Radiology and the International Veterinary Radiology Association* 47(2): 145-152. ISSN: 1058-8183.

**NAL Call Number:** SF757.8.A4
**Descriptors:** lion, *Panthera leo*, musculoskeletal system, limb bones, bone fractures, mycobacterial diseases, *Mycobacterium bovis*, tuberculosis, animal injuries, joint diseases, lesions, diagnostic techniques, radiography, animal age.

Maj, A., G.M. Spellman, and S.K. Sarver (2008). **The Complete CDS of the Prion Protein (PRNP) Gene of African Lion (*Panthera leo*).** *Virus Genes* 36(2): 433-434. ISSN: 0920-8569.

**NAL Call Number:** QH434 .V57
**Abstract:** We provide the complete PRNP CDS sequence for the African lion, which is different from the previously published sequence and more similar to other carnivore sequences. The newly obtained prion protein sequence differs from the domestic cat sequence at three amino acid positions and contains only four octapeptide repeats. We recommend that this sequence be used as the reference sequence for future studies of the PRNP gene for this species.
**Descriptors:** lion, *Panthera leo*, prion protein, PRNP, complete CDS, gene, sequence, amino acid positions, reference sequence.

Ofri, R., I.H. Horowitz, S. Jacobson, and P.H. Kass (1997). **Tear production in lions (*Panthera leo*): the effect of two anesthetic protocols.** *Veterinary and Comparative Ophthalmology* 7(3): 173-175. ISSN: 1076-4607.
**NAL Call Number:** SF891.P78
**Descriptors:** lion, *Panthera leo*, tears, anesthesia, xylazine, atropine, ketamine, diazepam, tear production.

Ofri, R., L.S. Shore, P.H. Kass, and I.H. Horowitz (1999). **The effect of elevated progesterone levels on intraocular pressure in lions (*Panthera leo*).** *Research in Veterinary Science* 67(2): 121-123. ISSN: 0034-5288.
**NAL Call Number:** 41.8 R312
**Abstract:** Recently, we reported that intraocular pressure (IOP) in juvenile male lions (*Panthera leo)* is significantly higher than in juvenile lionesses. Whilst we could not ascertain the basis for this gender-related difference, we suspected that they were the result of fluctuations in levels of sex hormones. Because 19 of the 22 lions described in our previous report had to be re-anaesthetized, we repeated tonometry in these animals, to try and correlate between IOP and the levels of progesterone, oestrogen and/or testosterone. Based on elevated (>5 ng ml-1) levels of progesterone, lionesses were divided into a luteal (n=8) and a non-luteal (n=13) group. In the luteal group, mean IOP was 27.07 +/- 2.15 mm Hg, significantly (P=0.001) higher than in the non-luteal group (21.61 +/- 2.70 mm Hg). Oestrogen, testosterone, anesthesia and age had no significant effect on IOP. It is suggested that elevated progesterone levels associated with the luteal phase in lionesses cause increased resistance to aqueous humor outflow, leading to IOP elevation. Similar ocular hypertension has been observed in rabbits following exogenous progesterone application, but this is the first report on the hypertensive effect of endogenous progesterone on top.
**Descriptors:** lion, *Panthera leo*, progesterone, eyes, gender differences, estrogens, testosterone, intraocular pressure, elevated progesterone levels, sex hormones, levels.

Weissengruber, G.E., G. Forstenpointner, G. Peters, A. Kubber Heiss, and W.T. Fitch (2002). **Hyoid apparatus and pharynx in the lion (*Panthera leo*), jaguar (*Panthera onca*),**

**tiger (*Panthera tigris*), cheetah (*Acinonyx jubatus*) and domestic cat (*Felis silvestris f. catus*).** *Journal of Anatomy* 201(3): 195-209. ISSN: 0021-8782.

**Abstract:** Structures of the hyoid apparatus, the pharynx and their topographical positions in the lion, tiger, jaguar, cheetah and domestic cat were described in order to determine morphological differences between species or subfamilies of the Felidae. In the lion, tiger and jaguar (species of the subfamily Pantherinae) the Epihyoideum is an elastic ligament lying between the lateral pharyngeal muscles and the Musculus (M.) thyroglossus rather than a bony element like in the cheetah or the domestic cat. The M. thyroglossus was only present in the species of the Pantherinae studied. In the lion and the jaguar the Thyrohyoideum and the thyroid cartilage are connected by an elastic ligament, whereas in the tiger there is a synovial articulation. In adult individuals of the lion, tiger and jaguar the ventral end of the tympanohyal cartilage is rotated and therefore the ventral end of the attached Stylohyoideum lies caudal to the Tympanohyoideum and the cranial base. In newborn jaguars the Apparatus hyoideus shows a similar topographical position as in adult cheetahs or domestic cats. In adult Pantherinae, the Basihyoideum and the attached larynx occupy a descended position: they are situated near the cranial thoracic aperture, the pharyngeal wall and the soft palate are caudally elongated accordingly. In the Pantherinae examined the caudal end of the soft palate lies dorsal to the glottis. Differences in these morphological features between the subfamilies of the Felidae have an influence on specific structural characters of their vocalizations.

**Descriptors:** cheetah, *Acinonyx jubatus*, lion, *Panthera leo*, jaguar, *Panthera onca*, tiger, *Panthera tigris*, domestic cat, *Felis silvestris f. catus*, anatomy, histology, hyoid apparatus, pharynx, anatomy, histology, hyoid bone growth, development, pharyngeal muscles anatomy, histology, pharyngeal muscles growth, development, pharynx, growth, development.

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### Lion - Veterinary

Battisti, A., G. Panfili, G.d. Guardo, and M. Principato (1997). ***Gasterophilus pecorum* larvae in an aged lion.** *Veterinary Record (United Kingdom)* 140(25): 664. ISSN: 0042-4900.
**Descriptors:** lion, *Panthera leo*, case studies, *Gasterophilus pecorum*, Felidae, zoo animals, pathogenesis, parasites, myiasis, Carnivora, Diptera, Insecta, parasitoses, ectoparasites, Italy, Europe GB.
**Notes:** Correspondence.

Bengis, R.G. (2000). **Chemical capture of free-ranging lions (*Panthera leo*).** *Proceedings of the North American Veterinary Conference* 14(14): 1029-1031. ISSN: 0003-1488.
**NAL Call Number:** SF605.N672
**Descriptors:** capture of animals, anesthesia, immobilization, darting, sedation, chemical capture.
**Notes:** Meeting held on January 15-19, 2000, Orlando, Florida.

Brennan, G., M.D. Podell, R. Wack, S. Kraft, J.L. Troyer, H. Bielefeldt Ohmann, and S. VandeWoude (2006). **Neurologic disease in captive lions (*Panthera leo*) with low titer lion lentivirus infection.** *Journal of Clinical Microbiology J.C.M* 44(12): 4345-4352. ISSN: 0095-1137.
**NAL Call Number:** QR46 .J6
**Abstract:** Lion lentivirus (LLV; also known as feline immunodeficiency virus of lion, *Panthera leo* [FIVPle]) is present in free-ranging and captive lion populations at a seroprevalence of up to 100%; however, clinical signs are rarely reported. LLV displays up to 25% interclade sequence diversity, suggesting that it has been in the lion population for some time and may be significantly host adapted. Three captive lions diagnosed with LLV infection displayed lymphocyte subset alterations and progressive behavioral, locomotor, and neuroanatomic abnormalities. No evidence of infection with other potential neuropathogens was found. Antemortem electrodiagnostics and radiologic imaging indicated a diagnosis consistent with lentiviral neuropathy. PCR was used to determine a partial lentiviral genomic sequence and to quantify the proviral burden in eight postmortem tissue specimens. Phylogenetic analysis demonstrated that the virus was consistent with the LLV detected in other captive and free-ranging lions. Despite progressive neurologic signs, the proviral load in tissues, including several regions of the brain, was low; furthermore, gross and histopathologic changes in the brain were minimal. These findings suggest that the symptoms in these animals resulted from nonspecific encephalopathy, similar to human immunodeficiency virus, FIV, and simian immunodeficiency virus (SIV) neuropathies, rather than a direct effect of active viral replication. The association of neuropathy and lymphocyte subset alterations with chronic LLV infection suggests that long-term LLV infection can have detrimental effects for the host, including death. This is similar to reports of aged sootey mangabeys dying from diseases typically associated with end-stage SIV infection and indicates areas for further research of lentiviral infections of seemingly adapted natural hosts, including mechanisms of host control and viral adaptation.
**Descriptors:** lion, *Panthera leo*, captive, neurologic diseases, low titer, lentivirus infection, feline immunodeficiency virus, free ranging, seroprevalence.

Briggs, M.B. (1996). **Veterinary considerations of caring for the lion.** *American Zoo and Aquarium Association Annual Conference Proceedings*: 60-66.
**NAL Call Number:** QL76.5.U6A472
**Descriptors:** lion, *Panthera leo*, zoo animals, animal health, animal diseases, veterinary medicine, caring, health.
**Notes:** Paper presented at the American Zoo and Aquarium Association Annual Conference, September 17-21, 1996, Honolulu, Hawaii.

Bwangamoi, O., D. Rottcher, and C. Wekesa (1990). **Rabies, microbesnoitosis and sarcocystosis in a lion. [Correspondence].** *Veterinary Record (United Kingdom)* 127(16): 411. ISSN: 0042-4900.
**Descriptors:** lion, *Panthera leo*, sarcocystosis, microbesnoitosis, protozoal infections, rabies, parasitoses, protozoa, viral diseases, zoonoses, Kenya, Africa.

de la Fe, C., J.M. Rodraiguez, G.A. Ramairez, J. Hervaas, J. Gil, and J.B. Poveda (2006). **Sudden Death Associated with *Clostridium sordellii* in Captive Lions (*Panthera leo*).** *Veterinary Pathology* 43(3): 370-374. ISSN: 0300-9858.
**NAL Call Number:** 41.8 P27
**Abstract:** In the spring of 2003, a series of sudden deaths in a group of adult lions (*Panthera leo*) with a previous history of depression, inanition, and lethargy, was investigated. Five animals died within 24 to 36 hours after onset of signs of disease. Serologic screening for viral disease detection was negative, evidence of parasites was not detected, and results of a complete blood count and serum biochemical analysis were within reference intervals in all lions. The most relevant lesions observed were multiple areas of necrosis and hemorrhage in the intestinal outer muscular layer, and cellulitis with an intense bloody edema in the mesenteric and the pericardial fat tissue. On the basis of the fulminant course of the disease, the gross and histologic findings, and the isolation and identification of Clostridium sordellii, a diagnosis of infectious myositis and cellulitis associated with acute clostridiosis was made. To the authors' knowledge, this is the first report of sudden death associated with *C. sordellii* in felines.
**Descriptors:** lion, *Panthera leo*, zoo animals, disease outbreaks, acute course, *Clostridium sordellii*, cellulitis, myositis, bacterial enteritis, sudden death.

Diop, P.E.H. (1986). **Note clinique a propos d' une caudectomie d' un lion. [Clinical note about caudectomy on lion].** *Revue De Medecine Veterinaire* 137(12): 831-833. ISSN: 0035-1555.
**Descriptors:** lions, *Panthera leo*, caudectomy, surgical operations, tail, lesions, anatomy, body regions, injurious factors, vertebrates.
**Language of Text:** French, Summaries in French, English, German and Spanish).

Dorso, L., E. Risi, S. Triau, S. Labrut, F. Nguyen, L. Guigand, M. Wyers, and J. Abadie (2008). **High grade mucoepidermoid carcinoma of the mandibular salivary gland in a lion (*Panthera leo*).** *Veterinary Pathology* 45(1): 104-108. ISSN: 0300-9858.
**NAL Call Number:** 41.8 P27
**Abstract:** A 13-year-old neutered male lion was presented with a primary neoplasm arising from the left mandibular salivary gland associated with metastases to regional lymph nodes, thoracic viscera (lungs, heart, esophagus, and diaphragm), and kidney. Histologic and immunohistochemical investigations led to a diagnosis of a high-grade mucoepidermoid carcinoma of the mandibular salivary gland. In this case report, we point out the importance of the immunohistochemical characterization for differential diagnosis between various types of carcinomas of the salivary gland.
**Descriptors:** lion, *Panthera leo*, mandibular salivary gland, mucoepidermoid carcinoma, high grade, metastases, regional lymph modes, thoracid viscera, kidney, case report.

Epstein, A., R. White, I.H. Horowtiz, P.H. Kass, and R. Ofri (2002). **Effects of propofol as an anaesthetic agent in adult lions (*Panthera leo*): a comparison with two established protocols.** *Research in Veterinary Science* 72(2): 137-140. ISSN: 0034-5288.
**NAL Call Number:** 41.8 R312
**Abstract:** The aims of this study were to evaluate the effects of a ketamine/propofol anaesthetic protocol in lions (*Panthera leo*), and to compare it to two commonly used anaesthetic protocols. Seventeen adult lions were anaesthetised using three different protocols. Group XK (n=6) was anaesthetised with intramuscular (i.m.) injections of xylazine and ketamine. Group KD (n=5) was anaesthetised with an i.m. injection of ketamine, followed by an intravenous (i.v.) injection of ketamine and diazepam. Group KP (n=6) was anaesthetised with an i.m. injection of ketamine followed by an i.v. injection of propofol. There was a significant difference in heart rate ($P < 0.0002$), which was lowest in group XK and highest in KD. Jaw tone was significantly lower in Group XK ($P < 0.05$). No undesirable effects were noted following injection of the propofol. Propofol was a suitable and safe drug for maintenance of anaesthesia in adult lions.
**Descriptors:** lion, *Panthera leo*, ketamine, intramuscular injection, intravenous injection, xylazine, diazepam, heart rate, jaws, adverse effects, human health and safety, respiration rate, propofol, jaw tone.

Fahlman, A., A. Loveridge, C. Wenham, C. Foggin, J.M. Arnemo, and G. Nyman (2005).

**Reversible anaesthesia of free-ranging lions (*Panthera leo*) in Zimbabwe.** *Journal of the South African Veterinary Association* 76(4): 187-192. ISSN: 0038-2809.
**Descriptors:** lions, *Panthera leo*, free ranging, anaesthesia, reversable, Carnivora, Felidae, Zimbabwe Africa.

George, P.O., J.V. Cheeran, A.M. Jalaluddin, K. Rajankutty, and C.A. Varkey (1986). **Treatment of wounds on the forelimb of a lion (*Panthera leo*) under general anaesthesia.** *Indian Veterinary Journal (India)* 63(11): 952-953. ISSN: 0019-6479.
**Descriptors:** lions, *Panthera leo*, wounds, forelimb, treatment, therapy, anaesthesia, anatomy, body regions, veterinary care, India.

Hartley, M.P., R.M. Kirberger, M. Haagenson, and L. Sweers (2005). **Diagnosis of suspected hypovitaminosis A using magnetic resonance imaging in African lions (*Panthera leo*).** *Journal of the South African Veterinary Association* 76(3): 132-137. ISSN: 0038-2809.
**Descriptors:** lions, *Panthera leo*, suspected hypovitaminosis A, vitamin deficiencies, retinol, diagnosis, magnetic resonance imaging, south Africa, nutrient deficiencies.

Hashizaki, F., N. Kohno, E. Narushima, K. Tashiro, M. Inoue, T. Komine, K. Yamakawa, A. Takagi, and M. Saitoh (1981). **Contraception of vasectomy procedure for male lions, *Panthera leo*, at Tama Zoological Park [Japan].** *Journal of Japanese Association of Zoological Gardens and Aquariums* 22(4): 100-103. ISSN: 0386-7498.
**Descriptors:** lion, *Panthera leo*, contraception, vasectomy procedure, male, Tama Zoological Park, Japan.
**Language of Text:** Japanese, Summary in English.

Hawkey, C.M. and M.G. Hart (1986). **Haematological reference values for adult pumas, lions, tigers, leopards, jaguars and cheetahs.** *Research in Veterinary Science* 41(2): 268-269. ISSN: 0034-5288.
**Abstract:** Normal haematological values and fibrinogen levels were obtained from a number of healthy adult Felidae in the collection of the Zoological Society of London. The group comprised 29 pumas (*Felis concolor*), 32 lions (*Panthera leo*), 27 tigers (*P tigris*), 19 leopards (*P pardus*), 18 jaguars (*P onca*) and 22 cheetahs (*Acinonyx jubatus*). The values provided a basis for identifying abnormalities in the blood of sick individuals of these species and for undertaking interspecies comparisons.
**Descriptors:** cheetah, *Acinonyx jubata*, pumas, *Felis concolor*, lions, *Panthera leo*, tigers, *Panthera tigris*, leopards, *Panthera pardus*, jaguars, *Panthera onca*, adult, fibrinogen levels, blood, hematological reference values.

Hcottner, M., M. Nakao, T. Wassermann, L. Siefert, J.D.F. Boomker, A. Dinkel, Y. Sako, U. Mackenstedt, T. Romig, and A. Ito (2008). **Genetic characterization and phylogenetic position of *Echinococcus felidis* (Cestoda: Taeniidae) from the African lion.** *International Journal for Parasitology* 38(7): 861-868. ISSN: 0020-7519.

**NAL Call Number:** QH547.I55
**Abstract:** *Echinococcus felidis* had been described in 1937 from African lions, but was later included in *Echinococcus granulosus* as a subspecies or a strain. In the absence of any genetic characterization, most previous records of this taxon from a variety of large African mammals remained unconfirmed due to the lack of diagnostic criteria and the possible confusion with the sympatric *E. granulosus sensu stricto*, *Echinococcus ortleppi* and *Echinococcus canadensis*. In this study, we obtained taeniid eggs from lion feces in Uganda and amplified DNA from individual eggs. Mitochondrial and nuclear DNA sequences showed similarities with those of other *Echinococcus* spp., but high values of percentage divergence of mitochondrial genes indicated the presence of a distinct species. In a second step, we compared this material with the preserved specimens of adult *E. granulosus felidis*, which had been identified morphologically approximately 40years ago in South Africa. All DNA fragments (<200bp) that could be amplified from the adults showed 100% similarity with the Ugandan material. In the phylogenetic tree of *Echinococcus* which was constructed from the mitochondrial genes, *E. felidis* is positioned as a sister taxon of *E. granulosus sensu stricto*. The data obtained will facilitate the development of diagnostic tools necessary to study the epidemiology of this enigmatic parasite.
**Descriptors:** African lion, *Pantherea leo*, parasites, Cestoda, *Echinococcus felidis*, eggs, DNA, epidemiology.

Herz, V. and R.M. Kirberger (2004). **Nutritional secondary hyperparathyroidism in a white lion cub (*Panthera leo*), with concomitant radiographic double corticle line.** *Journal of the South African Veterinary Association* 75(1): 49-53. ISSN: 0038-2809.
**Descriptors:** lion, *Panthera leo*, nutritional secondary hyperparathyroidism, white lion cub, radiographic double corticle line, concomitant, nutrition, diagnosis.

Lewis, J.C.M. (1991). **Malattia di Osgood-Schlatter in un leone africano. [The Osgood-Schlatter disease in an African lion].** *Selezione Veterinaria (Italy)* 32(5): 943-944. ISSN: 0037-1521.
**Descriptors:** lions, *Panthera leo*, Osgood Schlatter disease, African lion, movement

disorders, fractures, diagnosis, food enrichment, healing, veterinary care, food, functional disorders, lesions.
**Language of Text:** Italian.

Lewis, J.C.M. (1989). **Osgood Schlatter disease in an African lion in the Middle East.** *British Veterinary Journal (UK)* 145(5): 494-495. ISSN: 0007-1935.
**Descriptors:** lions, *Panthera leo*, osgood schlatter disease, radiography, anaesthesia, nutritional disorders, fractures, bone diseases, metabolic disorders, Middle East.

Maratea, K., S.B. Hooser, and J.A. Ramos Vara (2006). **Degenerative myelopathy and vitamin A deficiency in a young black-maned lion (*Panthera leo*).** *Journal of Veterinary Diagnostic Investigation* 18(6): 608-611. ISSN: 1040-6387.
**NAL Call Number:** SF774.J68
**Descriptors:** lion, *Panthera leo*, females, zoo animals, vitamin A, nutrient deficiencies, deficiency diseases, nervous system diseases, spinal cord, disease diagnosis, myelin sheath, cell nucleus, pathogenesis , cerebrospinal fluid, degenerative myelopathy.

Muller Graf, C.D.M., M.E.J. Woolhouse, and C. Packer (1999). **Epidemiology of an intestinal parasite (Spirometra spp.) in two populations of African lions (*Panthera leo*).** *Parasitology (United Kingdom)* 118(4): 407-415. ISSN: 0301-1820.
**Descriptors:** lion, *Panthera leo*, intestinal parasite, epidemiology, diphyllobothriidae, Spirometa spp., ova, helminths, feces, cestoda, platyhelminthes, wildlife.

Munao Diniz, L.S., H.E. Belluomini, L.P. Travassos Filho, and M.B. da Rocha (1987). **Presence of the ear mite *Otobius megnini* in the external ear canal of lions (*Panthera leo*).** *Journal of Zoo Animal Medicine* 18(4): 154-155. ISSN: 0093-4526.
**NAL Call Number:** SF601.J6
**Descriptors:** lion, *Panthera leo*, ears, Acari, ear mites, larvae, *Otobius megnini*, disease vectors, Brazil.

Murali Manohar, B., A.V. Korandi, S. Vairamuthu, M.G. Jayathangaraj, and R. Vijayakumar (2003). **Cutaneous capillary haemangioma in a lion.** *Indian Veteinary Journal (India).* 80(8): 826-827. ISSN: 0019-6479.
**Abstract:** The Reports on cutaneous neoplasms in the captive wild mammals are very sparse. A case of cutaneous squamous cell carcinoma was reported. Considering rarity of occurance and paucity of information on skin tumours in wild mammals, a case of cutaneous capillary haemangioma in a lion is recorded.
**Descriptors:** lion, *Panthera leo*, hemangioma, cutaneous capillary, neoplasms, captive, squamous cell carcinoma, tumors, case report, India.

Ocholi, R.A., J.O. Kalejaiye, and P.A. Okewole (1989). **Acute disseminated toxoplasmosis in two captive lions (*Panthera leo*) in Nigeria.** *Veterinary Record (UK)* 124(19): 515-516. ISSN: 0042-4900.
**Descriptors:** lion, *Panthera leo*, acute disseminated toxoplasmosis, toxoplasma, captive, disease symptoms, diarrhea, postmortem examination, coccidia, diagnosis, digestive disorders, diseases, parasitoses, protozoa, protozoal infections, sporozoa, symptoms, *Toxoplasma gondii*, Nigeria Africa.

Ofri, R., I.H. Horowitz, S. Jacobson, and P.H. Kass (1997). **Tear production in lions (*Panthera leo*): the effect of two anesthetic protocols.** *Veterinary and Comparative Ophthalmology* 7(3): 173-175. ISSN: 1076-4607.
**NAL Call Number:** SF891.P78
**Descriptors:** lion, *Panthera leo*, tears, anesthesia, xylazine, atropine, ketamine, diazepam, tear production.

Ogungbade, S.G. and A.F. Ogunrinade (1984). **[Tapeworm infection (*Taenia hydatigena*) in lion (*Panthera leo*) in captivity. A case report].** *Revue D'Elevage Et De Medecine Veterinaire Des Pays Tropicaux* 37(1): 30-31. ISSN: 0035-1865.
**Descriptors:** lion, *Panthera leo*, tapeworm infection, *Tainia hydatigena*, captivity, case report, Nigeria.
**Language of Text:** French, Summaries in French, English and Spanish.

Port, C.D., E.R. Maschgan, J. Pond, B. Kirschner, S. Poticha, and D.G. Scarpelli (1981). **Chronic exocrine pancreatic insufficiency in 2 Indian lions (*Panthera leo persica*).** *Journal of Comparative Pathology (UK)* 91(4): 483-491. ISSN: 9921-9975.
**Descriptors:** lion, *Panthera leo persica*, chronic exocrine pancreatic insufficiency, disease, pathology.

Roelke Parker, M.E., L. Munson, C. Packer, R. Kock, S. Cleaveland, M. Carpenter, S.J. O' Brien, A. Pospischil, R. Hofmann Lehmann, and H. Lutz (1996). **A canine distemper virus epidemic in Serengeti lions (*Panthera leo*).** *Nature* 379(6564): 441-445. ISSN: 0028-0836.
**NAL Call Number:** 472 N21
**Abstract:** Canine distemper virus (CDV) is thought to have caused several fatal epidemics in canids within the Serengeti-Mara ecosystem of East Africa, affecting silver-backed jackals (*Canis mesomelas*) and bat-eared foxes (*Otocyon megalotis*) in 1978, and African

wild dogs (*Lycaon pictus*) in 1991. The large, closely monitored Serengeti lion population was not affected in these epidemics. However, an epidemic caused by a morbillivirus closely related to CDV emerged abruptly in the lion population of the Serengeti National Park, Tanzania, in early 1994, resulting in fatal neurological disease characterized by grand mal seizures and myoclonus; the lions that died had encephalitis and pneumonia. Here we report the identification of CDV from these lions, and the close phylogenetic relationship between CDV isolates from lions and domestic dogs. By August 1994, 85% of the Serengeti lion population had anti-CDV antibodies, and the epidemic spread north to lions in the Massai Mara National reserve, Kenya, and uncounted hyaenas, bat-eared foxes, and leopards were also affected.
**Descriptors:** lion, *Panthera leo*, endangered species, disease outbreaks, mortality, symptoms, wildlife management, dogs as disease vectors and resivors, vaccination, domestic animals, fatal-infections, distemper virus, lions, grand mal seizures, species extinction, Tanzania, Kenya.

Ruiz de Ybanez, M.R., C. Martinez Carrasco, J.J. Martinez, J.M. Ortiz, T. Attout, and O. Bain (2006). ***Dirofilaria immitis* in an African lion (*Panthera leo*).** *Veterinary Record Journal of the British Veterinary Association* 158(7): 240-242. ISSN: 0042-4900.
**NAL Call Number:** 41.8 V641
**Descriptors:** lion, *Panthera leo*, *Dirofilaria immitis*, disease.

Sharma, M., R.C. Katoch, V.K. Gupta, and M.K. Batta (2003). ***Yersinia pseudotuberculosis* infection in lion (*Panthera leo*) cubs.** *Indian Journal of Animal Sciences* 73(2): 163. ISSN: 0367-8318.
**Descriptors:** lion, *Panthera leo*, cubs, *Yersinia pseudotuberculosis*, septicemia, infection, histopathology, wildlife, bacteria, bacterioses, enterobacteriaceae, India.

Shi Zhukui (1993). **Diagnosis and treatment of intestinal obstruction and anemia in African lion.** *Chinese Journal of Veterinary Science and Technology* 23(7): 31-32. ISSN: 1000-6419.
**Descriptors:** lions, *Panthera leo*, intestinal obstruction, anemia, diagnosis, treatment, digestive disorders, laboratory diagnosis, disease control, blood disorders.
**Language of Text:** Chinese.

Siqueira, V.J., W.O. Bernis, C.H.R.d.A. Silva, T.M.P. Soares, P.A.d.S. Ferreira, and R.G.d.M. Campos (2001). **Correcao cirurgica de fratura de tibia e fibula em um leao (*Panthera leo*), por meio de pinos intramedulares de Steinmann. [Surgical correction of tibia e fibula in a lion (*Panthera leo*), using Steinmann intramedullary pins. A case report].** *Veterinaria Noticias* 7(1): 107-112. ISSN: 0104-3463.
**NAL Call Number:** CENAGRI, CP 02432, 70.043-900 Brasilia,DF - Brasil.
**Descriptors:** lions, *Panthera leo*, limb bones, fractures, surgical operations, fibula, tibia, bones, felidae, Steinmann pins, anesthesia, radiografs, case report.
**Language of Text:** Portuguese, Summaries in English and Portuguese.

Steinmetz, A., K. Eulenberger, J. Thielebein, S. Buschatz, A. Bernhard, A. Wilsdorf, and R. Ofri (2006). **Lens anomalies and other ophthalmic findings in a group of closely related Angola lions (*Panthera leo bleyenberghi*).** *Zoo Biology* 25(5): 433-439. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6
**Descriptors:** lion, *Panthera leo*, eye lens, cataracts, clinical examination, histopathology, adult animals, young animals, progeny, endangered species, Katanga lion, lenticular abnormalities, ophthalmic examination, lion cubs.

Stolte, M. and M. Welle (1995). **Cutaneous mast cell tumours in a lion (*Panthera leo*): a light and transmission electron microscopical study.** *Journal of Comparative Pathology* 113(3): 291-294. ISSN: 0021-9975.
**NAL Call Number:** 41.8 J82
**Descriptors:** lion, *Panthera leo*, neoplasms, cutaneous mast cells, skin, histopathology, electron microscopical study, cell ultrastructure.

Sundeep Chandra, A.M., R.E. Papendick, J. Schumacher, B.L. Homer, and P. Wollenman (1999). **Cerebellar herniation in captive lions (*Panthera leo*).** *Journal of Veterinary Diagnostic Investigation Official Publication of the American Association of Veterinary Laboratory Diagnosticians Inc* 11(5): 465-468. ISSN: 1040-6387.
**NAL Call Number:** SF774.J68
**Descriptors:** lion, *Panthera leo*, cerebellar herniation, spinal cord, etiology, skull, case studies, malformations, vitamin A deficiency, Florida.

Tanwar, R.K., L.M. Mittal, S.M. Sharma, J.S. Yadav, and P.D. Mathur (1984). **Parasitic gastritis in an Asian lion- a case report.** *Indian Journal of Veterinary Medicine (India)* 4(1): 48-49. ISSN: 0970-051X.
**Descriptors:** lion, *Panthera leo*, parsitic gastritis, disease, parasites, case report.

VandeWoude, S., S.J. O' Brien, and E.A. Hoover (1997). **Infectivity of lion and puma**

**lentiviruses for domestic cats.** *Journal of General Virology* 78(4): 795-800. ISSN: 0022-1317.
**NAL Call Number:** QR360.A1J6
**Abstract:** Infection of domestic cats with feline immunodeficiency virus (FIV) causes progressive immunological deterioration similar to that caused by human immunodeficiency virus (HIV). Lentiviruses related to but phylogenetically distinct from FIV have been detected in several non-domestic feline species. Serological cross-reactivity of these viruses raises the question as to whether inter-species transmission may occur. To address this issue, we asked whether lion lentivirus (FIV-Ple) or two strains of puma lentivirus (FIV-Pco) could replicate or cause disease in domestic cats. We found that domestic cats inoculated with FIV-Ple developed persistent cell-associated viraemia, transient cell-free viraemia and antiviral antibody. Clinical disease was not detected throughout a 6 month observation period. Two of four cats inoculated with FIV-Pco developed cell-associated viraemia, seroconverted and exhibited transient lymphadenopathy. No changes in white blood cell parameters or other haematological abnormalities were detected in any of the infected cats. Virus-specific RNA was detected in cocultivated lymphocytes of all infected cats by RT-PCR. These findings reveal that non-domestic cat lentiviruses are infectious for domestic cats and can establish persistent infection in the absence of disease.
**Descriptors:** lion, puma, domestic cats, lentiviruses, infectivity, immunideficiency virus, FIV, infectious.

VandeWoude, S., S.J. O'Brien, K. Langelier, W.D. Hardy, J.P. Slattery, E.E. Zuckerman, and E.A. Hoover (1997). **Growth of lion and puma lentiviruses in domestic cat cells and comparisons with FIV.** *Virology (USA)* 233(1): 185-192. ISSN: 0042-6822.
**NAL Call Number:** 448.8 V81
**Abstract:** Feline immunodeficiency virus (FIV-Fca) is a lentivirus that causes gradual immunological deterioration in domestic cats. Lentiviruses related to FIV have been detected in several nondomestic feline species; the biologic significance of these viruses remains to be defined. To examine the in vitro cell tropism of these nondomestic cat lentiviruses, prototypical puma and lion lentiviruses (FIV-Pco and FIV-Ple) were cultured in a variety of feline cell cultures. A domestic cat T lymphoma cell line, 3201, best supported the replication of both FIV-Pco and FIV-Ple. Moreover, FIV-Ple was lytic for these cells. RT-PCR amplification of a conserved pol gene region demonstrated species-specific primer homology. Sequence and phylogenetic analyses of this amplification product confirmed the identity of the replicating viruses and classified two previously uncharacterized viruses within predictable lion and puma clades. Sequence analysis of a conserved pol region demonstrated homology with previously characterized FIV-Ple and FIV-Pco. Western blot analysis using domestic cat anti-FIV-Fca sera showed that both FIV-Pco and FIV-Ple were antigenically related, to differing degrees, to three serotypes of FIV-Fca. These studies demonstrate that though nondomestic cat lentiviruses differ significantly from FIV-Fca and that a viral-specific protocol may be necessary for sensitive viral detection, these viruses can replicate in cells of domestic cats, suggesting the potential for cross-species transmission.
**Descriptors:** lion, *Panthera leo*, puma, *Puma concolor*, lentivirus, growth, domestic cat cells, comparison with FIV, viruses, feline immunodeficiency virus.

Williams, J.H., E. Van Wilpe, and M. Momberg (2005). **Renal medullary AA amyloidosis, hepatocyte dissociation and multinucleated hepatocyte in a 14 year old free ranging lioness (*Panthera leo*).** *Journal of the South African Veterinary Association* 76(2): 90-98. ISSN: 0038-2809.
**Descriptors:** lioness, *Panthera leo*, free ranging, 14 year old, renal medullary AA amyloidosis, hepatocyte dissociation, multinucleated hepatocyte, veterinary care.

Yu, C.H., K.T. Kim, D.N. Hwang, J.Y. Yhee, C.T. Moon, T.Y. Hur, and J.H. Sur (2007). **Peribiliary cysts associated with severe liver disease: a previously unrecognized tumor in a lion (*Panthera leo*).** *Journal of Veterinary Diagnostic Investigation* 19(6): 709-712. ISSN: 1040-6387.
**NAL Call Number:** SF774.J68
**Descriptors:** lion, *Panthera leo*, zoo animals, liver, liver diseases, signs, symptoms, animals and humans, mortality, cysts, neoplasms, animal diseases, diagnosis, histopathology, histology.

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# Publications

## Information Resources on Big Cats

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### Snow Leopard

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### Snow Leopard - General

Ale, S.B., P. Yonzon, and Kamal Thapa (2007). **Recovery of snow leopard *Uncia uncia* in Sagarmatha (Mount Everest) National Park, Nepal**. *Oryx* 41(1): 89-92. ISSN: 0030-6053.

**Abstract:** From September to November 2004 we conducted surveys of snow leopard (*Uncia uncia*) signs in three major valleys in Sagarmatha (Mount Everest) National Park in Nepal using the Snow Leopard Information Management System, a standardized survey technique for snow leopard research. We walked 24 transects covering c. 14 km and located 33 sites with 56 snow leopard signs, and 17 signs incidentally in other areas. Snow leopards appear to have re-inhabited the Park, following their disappearance c. 40 years ago, apparently following the recovery of Himalayan tahr *Hemitragus jemlahicus* and musk deer *Moschus chrysogaster* populations. Taken together the locations of all 73 recent snow leopard signs indicate that the species is using predominantly grazing land and shrubland/open forest at elevations of 3,000-5,000 m, habitat types that are also used by domestic and wild ungulates. Sagarmatha is the homeland of c. 3,500 Buddhist Sherpas with >3,000 livestock. Along with tourism and associated developments in Sagarmatha, traditional land use practices could be used to ensure coexistence of livestock and wildlife, including the recovering snow leopards, and ensure the wellbeing of the Sherpas. *Reproduced with permission of CAB. Abstracts.*
**Descriptors:** snow leopard, *Uncia uncia*, recovery, habitats, national parks, tourism, Mount Everest, Sagarmatha, *Panthera uncia.*

Barnett, K.C. and J.C.M. Lewis (2002). **Multiple ocular colobomas in the snow leopard (*Uncia uncia*).** *Veterinary Ophthalmology* 5(3): 197-199. ISSN: 1463-5216.
**NAL Call Number:** SF891.V47
**Descriptors:** snow leopard, *Uncia uncia*, eye diseases, symptoms, eyelid diseases,

multiple ocular colobomas, etiology, congenital abnormalities, case studies, diagnosis, *Panthera uncia*.
**Notes:** In the special issue: Exotic and laboratory animal / edited by T.J. Kern.

Blomqvist, L. (1980). **Distribution and status of the snow leopard (*Panthera uncia*) [in Central Asia].** *Tigerpaper (FAO-RAPA).* 7(4): 15-20. ISSN: 1014-2789.
**Descriptors:** snow leopard, *Panthera uncia*, *Uncia uncia*, distribution, status, Central Asia.

Broder, J.M., A.J. MacFadden, L.M. Cosens, D.S. Rosenstein, and T.M. Harrison (2008). **Use of positive reinforcement conditioning to monitor pregnancy in an unanesthetized snow leopard (*Uncia uncia*) via transabdominal ultrasound.** *Zoo Biology* 27(1): 78-85. ISSN: 0733-3188.

**NAL Call Number:** QL77.5.Z6
**Abstract:** Closely monitoring snow leopard (*Uncia uncia*) fetal developments via transabdominal ultrasound, with minimal stress to the animal, was the goal of this project. The staff at Potter Park Zoo has used the principles of habituation, desensitization, and positive reinforcement to train a female snow leopard (*U. uncia*). Ultrasound examinations were preformed on an unanesthetized feline at 63 and 84 days. The animal remained calm and compliant throughout both procedures. Fetuses were observed and measured on both occasions. The absence of anesthesia eliminated components of psychologic and physiologic stress associated with sedation. This was the first recorded instance of transabdominal ultrasound being carried out on an unanesthetized snow leopard. It documents the feasibility of detecting pregnancy and monitoring fetal development via ultrasound.
**Descriptors:** snow leopard, *Uncia uncia*, positive reinforcement, conditioning, ultrasound, monitor, pregnancy, transabdominal ultrasound, stress.

Burgener, N., M. Gusset, and H. Schmid (2008). **Frustrated appetitive foraging behavior, stereotypic pacing, and fecal glucocorticoid levels in snow leopards (*Uncia uncia*) in the Zurich Zoo**. *Journal of Applied Animal Welfare Science* 11(1): 74-83. ISSN: 1088-8705.
**Abstract:** This study hypothesized that permanently frustrated, appetitive-foraging behavior caused the stereotypic pacing regularly observed in captive carnivores. Using 2 adult female snow leopards (*Uncia uncia*), solitarily housed in the Zurich Zoo, the study tested this hypothesis experimentally with a novel feeding method: electronically controlled, time-regulated feeding boxes. The expected result of employing this active foraging device as a successful coping strategy was reduced behavioral and physiological measures of stress, compared with a control-feeding regime without feeding boxes. The study assessed this through behavioral observations and by evaluating glucocorticoid levels noninvasively from feces. Results indicated that the 2 snow leopards did not perform successful coping behavior through exercising active foraging behavior or through displaying the stereotypic pacing. The data support a possible explanation: The box-feeding method did not provide the 2 snow leopards with the external stimuli to satisfy their appetitive behavioral needs. Moreover, numerous other factors not necessarily or exclusively related to appetitive behavior could have caused and influenced the stereotypic pacing. *Reproduced with permission of CAB Abstracts.*
**Descriptors:** snow leopard, *Uncia uncia*, abnormal behavior, animal behaviour, animal welfare, feces, foraging, glucocorticoids, stress, zoo animals, leopards, *Panthera uncia*, Switzerland.

Chaudhuri, S., S.K. Mukherjee, A. Chatterjee, and J.L. Ganguli (1992). **Isolation of *P. multocida* F-3,4 from a stillborn snow leopard.** *Veterinary Record Journal of the British Veterinary Association* 130(2): 36. ISSN: 0042-4900.
**NAL Call Number:** 41.8 V641
**Descriptors:** snow leopard, *Uncia uncia*, *Pasteurella multocida*, stillborn, isolated, case studies, *Panthera uncia*, India.

Doster, A.R., D.L. Armstrong, and T.W. Bargar (1989). **Seminoma and parathyroid adenoma in a snow leopard (*Panthera uncia*).** *Journal of Comparative Pathology (UK)* 100(4): 475-480. ISSN: 0021-9975.
**Descriptors:** snow leopard, *Panthera uncia*, *Uncia uncia*, seminoma, parathyroid adenoma, neoplasms, zoo animal collections, carnivores, diseases.

Espinosa Aviles, D., M. Lucia Taylor, M. Del Rocio Reyes Montes, and A. Perez Torrez (2008). **Molecular findings of disseminated histoplasmosis in two captive snow leopards (*Uncia uncia*)**. *Journal of Zoo and Wildlife Medicine* 39(3): 450-454. ISSN: 1042-7260.
**Descriptors:** snow leopard, *Unica unica*, disseminated histoplasmosis, molecular findings, captive, diagnosis, histopathology, immunohistochemistry, transmission.

Green, M.J.B. (1993). **Protecting the mountains of Central Asia and their snow leopard populations.** *Tigerpaper (FAO)* 20(2): 1-14. ISSN: 1014-2789.
**Descriptors:** snow leopard, *Uncia uncia*, mountains, management, planning, surveys, nature conservation., resource management, Afghanistan, central Asia, nature reserves, Bhutan, China, India, Nepal, Pakistan.

Green, M.J.B. (1987). **Protected areas and snow leopards: their distribution and status. Paper presented at the fifth International Snow Leopard Symposium held in Srinagar from 13-15 October 1986.** *Tigerpaper (FAO)* 14(4): 1-10. ISSN: 1014-2789.
**Descriptors:** snow leopard, *Unica unica*, endangered species, natural distribution, wilderness areas, protected areas, distribution, conservation, Felidae, symposium.

Ikeda, N. (2004). **Economic impacts of livestock depredation by snow leopard *Uncia uncia* in the Kanchenjunga Conservation Area, Nepal Himalaya**. *Environmental Conservation* 31(4): 322-330. ISSN: 0376-8929.

**Abstract:** It is necessary to fully understand the economic conditions of local herders in

order to find solutions to the conflicts between wildlife conservation and livestock rearing in remote areas of low-income countries. In the Kanchenjunga Conservation Area (KCA), Nepal, livestock depredation by snow leopards impacts on yak herders' livelihoods. Retaliatory killings of snow leopard by the herders have been reported and the concerned authorities recently initiated snow leopard conservation programmes. In 2001, interviews with the yak herders who used the pastures in the Ghunsa valley in the preceding year collected data on the incidence of livestock death caused by snow leopards. The annual net cash income of the yak herders was estimated by obtaining baseline values of sales and expenditure per livestock head through field measurement of dairy products and interviews with a sample of herders. As yet, the average annual damage does not appear to have adversely affected fundamental livelihoods in households with an average herd size (36.6 head). However, in the worst scenario of livestock depredation, households with medium or small-sized herds (<40 head) might risk their living conditions becoming unsustainable or having to withdraw from yak pastoralism. A supplementary interview showed that the majority of the herders, except those who took completely neutral attitudes towards the regional conservation and development programme, had negative views of the snow leopard conservation policy. For the snow leopard conservation programme in the KCA to be a success, there must be a system to compensate the herders' households for livestock damage. *Reproduced with permission of CAB.*
**Descriptors:** snow leopard, *Uncia uncia*, damage, economic impact, income, livestock farming, losses, predation, wild animals, wildlife conservation, *Panthera uncia*, yaks.

Isenbuegel, E. and P. Weilenmann (1985). **Lidcolobome bei Schneeleoparden (*Uncia uncia*, Schreber 1775) im Zoo Zuerich. [Colobomes of the eyelid in an snow leopard (*Uncia uncia*, Schreber 1775) in the Zurich zoological garden].** *Praktische Tierarzt* 66(1): 61-62. ISSN: 0032-681X.
**Descriptors:** snow leopard, *Uncia uncia*, eye diseases, diagnosis, Felidae, injurious factors, eyelid diseases.
**Language of Text:** German.

Janovsky, M., A. Grone, D. Ciardo, J. Vollm, A. Burnens, R. Fatzer, and L.N. Bacciarini (2006). **Phaeohyphomycosis in a snow leopard (*Uncia uncia*) due to *Cladophialophora bantiana***. *Journal of Comparative Pathology* 134(2/3): 245-248. ISSN: 0021-9975.
**Abstract:** Phaeohyphomycosis caused by *Cladophialophora bantiana* was diagnosed in a 5-month-old snow leopard with spastic paralysis of the hind legs and inability to defaecate or urinate. At post-mortem examination, a greenish soft mass resembling an abscess was found on one side of the epidural space at the fourth lumbar vertebral body. Histological examination revealed a purulent meningitis with myelomalacia. Dematiaceous fungal hyphae, present within the inflammatory infiltrate, were identified as *C. bantiana* by culture and sequence analysis of the 18S ribosomal RNA gene. This neurotropic fungus rarely affects organs other than the brain in human beings and cats, and has been reported only occasionally in Europe. The case described suggests that phaeohyphomycosis due to *C. bantiana* infection may be recognized more frequently in the future and the possible involvement of organs other than the brain should be borne in mind. *Reproduced with permission of CAB.*
**Descriptors:** snow leopard, young animal, *Uncia uncia*, phaeohyphomycosis, case reports, clinical aspects, diagnosis, histopathology, meningitis, mycoses, paralysis, postmortem examinations, ribosomal RNA, *Cladophialophora bantiana*.

Jiang Zhi Gang and Xu Ai Chun (2006). **Snow leopard (*Uncia uncia*)**. *Chinese Journal of Zoology* 41(4): 128. ISSN: 0250-3263.
**Descriptors:** snow leopard, *Uncia uncia*, conservation, terrestrial ecology, environmental sciences.
**Language of Text:** Chinese.

Liao Y, Luo H, Liou D, Xu S, and Yuan B (1986). **A preliminary study on the rearing and breeding of snow leopard *Panthera uncia***. *Acta Theriologica Sinica* 6(2): 93-100. ISSN: 1000-1050.
**Descriptors:** snow leopard, *Panthera uncia*, rearing, breeding, preliminary study, oestrus, parturition, behavior, growth, pregnancy, feeding, mating.
**Language of Text:** Chinese.

Lukarevsky, V.S. and A.D. Poyarkov (2008). **The current state of the snow leopard (*Uncia uncia*, Carnivora) population in Russia**. *Zoologicheskii Zhurnal* 87(1): 114-121. ISSN: 0044-5134.
**Abstract:** Based on the analysis of the field materials and literature data on the distribution of *Uncia uncia* Shreber 1775, the most part of its range in Russia was investigated. The current distribution of this species in southern Siberia was studied. The marking activity of the animal was used for the assessment of the density and number of its population. The main groups of snow leopard were revealed, and their size was determined. The most preferential habitats of the animal are areas, where small open plateau, gentle slopes and narrow valleys alternate with rocky gorges, taluses and mountains with dissected gorges, as well as slopes without snow cover. The pathways and preferential biotopes for the movements of the animal, as well as the main regularities of the leopard distribution were revealed. The higher the altitude of

mountains, the higher the altitude this predator prefers. The range of snow leopard is fragmentary, probably, due to the mosaic pattern of its habitats. Problems of conservation and the main reasons for the reduction of the range and number of snow leopard in Russia are discussed. Such a reduction appears to relate to the application of toxic substances against wolves and wide use of loop traps for legal and illegal hunting for musk deer. *Reproduced with permission of CAB.*
**Descriptors:** snow leopard, *Uncia uncia*, animal welfare, habitat selection, hunting, population distribution, toxicology, *Panthera uncia*.
**Language of Text:** Russian, Summary in English.

Murata, K., T. Yanai, T. Agatsuma, and S. Uni (2003). ***Dirofilaria immitis* infection of a snow leopard (*Uncia uncia*) in a Japanese zoo with mitochondrial DNA analysis**. *Journal of Veterinary Medical Science* 65(8): 945-947. ISSN: 0916-7250.

**Abstract:** Three dog heartworms (*Dirofilaria immitis*) were detected in the lumen of the right cardiac ventriculus and of the pulmonary artery of a captive female snow leopard (*Uncia uncia*) that died of pancreatic carcinoma at a zoo in Japan. Neither clinical respiratory nor circulatory symptoms caused by the heartworm infection were observed. The filarial worms were identified as *D. immitis* from the morphologic characteristics of the esophagus, the presence of faint longitudinal ridges on the cuticular surface, the situation of vulva posterior to the esophagus, and the measurements of the body. The heartworms from the snow leopard were identical to that of *D. immitis* from dogs in the sequence of the cytochrome oxidase I region in the mitochondrial DNA. This host record is the first of *D. immitis* in *U. uncia. Reproduced with permission of CAB.*
**Descriptors:** snow leopard, *Uncia uncia*, *Dirofilaria immitis*, heart worms, case reports, cytochrome c oxidase, hosts, mitochondrial DNA, new host records, zoo animals, *Panthera uncia*.

Pfeil, A. (2004). **Leiomyom in der Blase bei einem weiblichen Schneeleoparden (*Uncia uncia*, Schreber, 1776). [Leiomyoma in the urinary bladder of a female snow leopard (*Uncia uncia*, Schreber, 1776)].** *Tierarztliche Praxis Ausgabe K, Kleintiere/Heimtiere* 32(1): 40-44. ISSN: 1434-1239.
**Abstract:** A leiomyoma of the urinary bladder in a 14-year-old female snow leopard exhibiting bloody vaginal discharge was removed by partial cystectomy [Germany, date not given]. Gravel (struvite) was found in the urine of the inflammatory bladder. Moreover, ovariohysterectomy was performed. Histological findings showed a glandular-cystic hyperplasia. Tumours of the bladder were very rare in cats. The benign tumours of the bladder often had no clinical relevance and rarely resulted in bladder dysfunction. Therefore, they might remain undiagnosed in many cases, particularly since the diagnostic procedure in big cats was very extensive. Leiomyoma of the bladder in snow leopards had not been described. The present paper described the surgery performed, succeeding therapy and struvite prophylaxis. Moreover, the aetiology of the leiomyoma's origin was discussed based on current literature. *Reproduced with permission of CAB.*
**Descriptors:** snow leopard, *Uncia uncia*, leiomyoma, urinary bladder, case reports, clinical aspects, diagnosis, diagnostic techniques, gravel, histopathology, neoplasms, surgery, urine, *Panthera uncia*.
**Language of Text:** German, Summary in English.

Reed Smith, J. and M. Kumpf (1998). **Snow leopards (*Uncia uncia*): Family group management alternatives.** *Animal Keepers' Forum* 25(10): 386-391. ISSN: 0164-9531.
**Descriptors:** snow leopard, *Uncia uncia*, care in captivity, creation and management, family groups, case reports and recommendations.

Roth, T.L., D.L. Armstrong, M.T. Barrie, D.M. Garell, and D.E. Wildt (1996). **Seasonal effects on ovarian responsiveness to exogenous gonadotropins and successful artificial insemination in the snow leopard (*Panthera unica*)**. *Annual Conference of the International Embryo Transfer Society.,Salt Lake City, Utah, USA,* Theriogenology, Vol. 45, p. 246.
**Descriptors:** snow leopard, *Panthera pardus*, successful artificial insemination, exogenous gonadotropins, ovarian responsiveness, seasonal effects, conference information.

Roth, T.L., D.L. Armstrong, M.T. Barrie, and D.E. Wildt (1997). **Seasonal effects on ovarian responsiveness to exogenous gonadotrophins and successful artificial insemination in the snow leopard (*Uncia uncia*).** *Reproduction, Fertility, and Development* 9(3): 285-295. ISSN: 1031-3613.
**NAL Call Number:** QP251.R47
**Abstract:** Ovaries of the seasonally-breeding snow leopard (*Uncia uncia*) were examined to determine whether they were responsive to exogenous gonadotrophins throughout the year. The potential of laparoscopic artificial insemination (AI) also was assessed for producing offspring. During the non-breeding, pre-breeding, breeding and post-breeding seasons, females (n = 20) were treated with a standardized, dual-hormone regimen given intramuscularly (600 I.U. of equine chorionic gonadotrophin followed 80-84 h later with 300 I.U. of human chorionic gonadotrophin (hCG)). Laparoscopy was performed 45-50 h after administration of hCG, and all ovarian structures were described. Females with fresh corpora lutea (CL) were inseminated, and anovulatory females were subjected to follicular

aspiration to examine oocyte quality. Snow leopards responded to exogenous gonadotrophins throughout the year. Mean number of total ovarian structures (distinct follicles mature in appearance plus CL) did not differ (P > or = 0.05) with season, but the proportion of CL: total ovarian structures was greater (P < 0.01) for the breeding season compared with all other seasons. The proportion of females ovulating was greater (P < 0.05) during the breeding and post-breeding seasons than during the pre-breeding and non-breeding seasons respectively. No Grade-1 quality oocytes were recovered from follicles of anovulatory females. Serum concentrations of oestradiol-17 beta appeared elevated in all females, and neither oestradiol-17 beta concentrations nor progesterone concentrations differed (P > or = 0.05) among seasons. Of 15 females artificially inseminated, the only one that was inseminated in the non-breeding season became pregnant and delivered a single cub. This is the first successful pregnancy resulting from AI in this endangered species.
**Descriptors:** snow leopard, *Unica unica*, ovarian responsiveness, exogenous gonadotrophins, seasonal effects, successful artificial insemination.

Schaeffer, E., H. Wiesner, and G. von Hegel (1988). **Multiple okulare Kolobome (MOC) mit persistierender Pupillarmembran beim Schneeleopard (*Panthera unica*). [Multiple ocular colobomata (MOC) with persistent pupillary membranes in the snow leopard (*Panthera unica*)].** *Tieraerztliche Praxis* 16(1): 87-91. ISSN: 0303-6286.
**Descriptors:** snow leopard, *Uncia uncia*, ocular colobomata, multiple, histology, persistant pupillary membranes, *Panthera unica*.
**Language of Text:** German, Summaries in English and German.

Sharma, D. (2007). **Ketamine xylazine anaesthesia in snow leopard (*Uncia uncia*)**. *Zoos Print Journal* 22(11): 2895. ISSN: 0973-2535 (print); 0973-2551 (electronic).
**Descriptors:** snow leopard, *Uncia uncia*, anesthesia, ketamine, xylazine.

Sims, C. (2001). **Morphological distinctions in skulls of five felids (*Puma concolor, Panthera onca, Panthera pardus, Uncia uncia, and Acinonyx jubatus*)**. *Journal of Morphology* 248(3): 285. ISSN: 0362-2525.
**Descriptors:** cheetah, *Acinonyx jubatus*, skull, morphological distinctions, skeletal system, cougar, jaguar, leopard, snow leopard, species comparison study.
**Notes:** Sixth International Congress of Vertebrate Morphology, Jena, Germany; July 21-26, 2001.

Stidworthy, M.R., J.C.M. Lewis, J. Penderis, and A.C. Palmer (2008). **Progressive encephalomyelopathy and cerebellar degeneration in a captive-bred snow leopard (*Uncia uncia*)**. *Veterinary Record* 162(16): 522-524. ISSN: 0042-4900.
**Abstract:** A 6-week-old snow leopard (*Uncia uncia*) from a zoological park in eastern England was initially presented with progressive signs of incoordination and ataxia [date not given]. By three months of age, the animal showed increasing coordination of the hindlimbs, and two weeks later it was unable to support its weight on its hindlimbs or control their movement. Radiographic examination revealed no abnormalities of the vertebral column. The animal was euthanized by intravenous injection of pentobarbitone sodium. Postmortem examination revealed no other macroscopic abnormalities except for pulmonary congestion and oedema. Histopathological abnormalities were confined to the central nervous system. In the spinal cord, Wallerian-type degeneration occurred in the white matter tracts in all funiculi except for the dorsal columns. Axonal degeneration was of typical Wallerian type, characterized by the presence of numerous widely dilated myelin sheaths, many of which contained myelophages, and gliosis. These changes were most prominent in the ventral columns and in the dorsal spinocerebellar tracts. In the cerebellum, changes were most pronounced in the cortical layers of the vermis. In conclusion, this case may be part of a spectrum of spinal cord degenerative disease in captive snow leopards described previously. The distinctive histological features suggest that it may be more appropriately classified as an example of the progressive encephalomyelopathy with cerebellar degeneration previously reported in captive cheetahs and domestic cats. At present, the cause remains unknown. *Reproduced with permission of CAB.*
**Descriptors:** snow leopard, *Uncia uncia*, brain diseases, progressive encephalomyelopathy, case reports, cerebellar degeneration, clinical aspects, diagnosis, histopathology, lesions, myeloencephalopathy, nervous system diseases, postmortem examinations, zoo animals, *Panthera uncia*.

Sulser, C.E., B.L. Steck, and B. Baur (2008). **Effects of construction noise on behaviour of and exhibit use by Snow leopards *Uncia uncia* at Basel zoo.** *International Zoo Yearbook* 42(1): 199-205. ISSN: 0074-9664.

**NAL Call Number:** QL76.I5
**Abstract:** Noise caused by human activities can cause stress in animals. We examined whether noise from construction sites affects the behaviour of and exhibit use by three Snow leopards *Uncia uncia* at Basel zoo. The behaviour and location of the animals were recorded at 1 minute intervals, using the instantaneous scan sampling method over a period of 216 hours (104 hours on noisy days and 112 hours on quiet days). The animals

differed individually in their responses to the construction noise. On noisy days, the Snow leopards generally spent less time in locomotion and more time resting, but even on quiet days, resting was the predominant behaviour performed. Under noisy conditions, they increased social resting and decreased resting alone. Walking and social walking were also reduced on noisy days. Furthermore, the Snow leopards spent considerably more time in the remote off-exhibit enclosure under noisy conditions. Independent of background noise, they stayed more than half of the time in the caves and the forecourts of the outdoor enclosure. On quiet days, the Snow leopards used more sectors of their exhibit than on noisy days. The results indicate that the Snow leopards responded to construction noise by increasing the amount of time spent resting and by withdrawing to the remote parts of their exhibit.
**Descriptors:** snow leopard, *Uncia uncia*, construction noise, effects, behavior, exhibit use, resting, noise, stress, locomotion, resting, walking.

Taylor D J, Meuli L E, and Thau R B (1984). **Comparison of urinary steroids in the siberian tiger and the snow leopard during estrus and pregnancy**. *17TH Annual Meeting of the Society for the Study of Reproduction.,Laramie, Wyo., USA,* Biology of Reproduction, Vol. 30, p. 66.
**Descriptors:** snow leopard, *Unica unica*, Siberian tiger, *Panther tigris*, estrus, pregnancy, urinary steroids, comparison, conference information.

W.W.F Nepal Program. (2000). ***Snow Leopard Manual.***, Kathmandu: WWF Nepal Program, [2000].: 70 p.: ill. (chiefly col.), col. map; 25 cm. p.
**NAL Call Number:** QL737.C23.S58 2000
**Descriptors:** snow leopard, *Uncia uncia*, manual, Nepal, World Wildlife Fund, book.

Wharton, D. and S.A. Mainka (1997). **Management and husbandry of the snow leopard *Uncia uncia***. *International Zoo Yearbook* 35(0): 139-147. ISSN: 0074-9664.
**Descriptors:** snow leopard, *Uncia uncia*, management, husbandry, animal care, breeding, captive management, diet, enclosures, housing, nutrition, veterinary care.

Xu Feng, Ma Ming, Yin Shou Jing, and B. Munkhtsog (2006). **Autumn habitat selection by snow leopard (*Uncia uncia*) in beita mountain, Xinjiang, China**. *Zoological Research* 27(2): 221-224. ISSN: 0254-5853.
**Descriptors:** snow leopard, *Uncia uncia*, behavior, autumn habitat selection, population studies, terrestrial ecology, topography, vegetation type, shrub, cliff base, hillside.
**Language of Text:** Chinese.

Zhang, F., Z. Jiang, Y. Zeng, and T. McCarthy (2007). **Development of primers to characterize the mitochondrial control region of the snow leopard (*Uncia uncia*).** *Molecular Ecology Notes* 7(6): 1196-1198. ISSN: 1471-8278.

**NAL Call Number:** QH541.15 .M632
**Abstract:** The snow leopard (*Uncia uncia*) is a rare carnivore living above the snow line in central Asia. Using universal primers for the mitochondrial genome control region hypervariable region 1 (HVR1), we isolated a 411-bp fragment of HVR1 and then designed specific primers near each end of this sequence in the conserved regions. These primers were shown to yield good polymerase chain reaction products and to be species specific. Of the 12 snow leopards studied, there were 11 segregating sites and six haplotypes. An identification case of snow leopard carcass (confiscated by the police) proved the primers to be a useful tool for forensic diagnosis in field and population genetics studies.
**Descriptors:** snow leopard, *Uncia uncia*, mitochondrial DNA, control region, primers, species specific primers.

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