

13.6 Guideline - Veterinary and health management of lemurs in captivity

Contents

1. Purpose.....	1
2. Definitions	1
3. Summary of recommendations	2
4. Common health concerns	2
5. Health screening	3
6. Contraception	3
7. Anaesthesia	4
8. References and further reading.....	4
9. Approval	5
Appendix 1.....	Error! Bookmark not defined.

1. Purpose

- 1.1 Zoo and Aquarium Association institutions in Australasia currently hold two species of lemur¹:
- (a) ring-tailed lemur (*Lemur catta*)
 - (b) black and white ruffed lemur (*Varecia variegata*).
- 1.2 These guidelines summarise information on commonly encountered health issues in captive lemurs. They are intended to provide information and recommendations to Association member institutions holding lemur species.
- 1.3 These guidelines are to be read in conjunction with the following policies, procedures and guidelines of the Association:
- 13.7 Guideline - Dietary management of lemurs in captivity

2. Definitions

In these guidelines, unless the context requires otherwise: **Board** means the board of management of the Association.

Committee means a committee of the Board established in accordance with clause 33 of the Association's Constitution.

Member means a member of the Association, as defined in the Association's Membership Policy, and may include an employee, officer or agent of a Member of the Association.

Organisation means an unincorporated entity, or an entity incorporated under Commonwealth, State or Territory legislation.

Association means the Zoo and Aquarium Association Inc. (ABN 71 836 556 156).

3. Summary of recommendations

These guidelines should be read and utilised by animal managers and animal health staff at all Association organisations holding lemurs.

4. Common health concerns

Gastrointestinal parasitism is a common cause of diarrhoea in captive lemurs. Commonly identified organisms include *Entamoeba*, *Trichomonas*, *Giardia* and *Balantidium*. Nematode parasites including oxyurids, ascarids, *Trichuris* and *Capillaria* have been reported in captive lemurs.

A variety of bacterial pathogens have been associated with enteritis and colitis in prosimians including *Yersinia enterocolitica*, *Campylobacter fetus jejuni*, *Salmonella typhimurium*, enteropathogenic *Escherichia coli* and *Klebsiella pneumonia*. Reports of tuberculosis (TB) in prosimians are rare. However definitive diagnosis of the disease is difficult due to the lack of reliability of intradermal tuberculin testing (high frequency of false positive reactions) and poor sensitivity of thoracic radiography for TB diagnosis in lemurs. The gamma interferon test, Primagam® is also unsuitable for lemurs due to a lack of mitogen response and therefore a lack of positive control. Gastric and tracheal lavage are recommended for diagnosis in cases of suspected TB.

Bezoars (a compact mass of a fibre such as hair or plant material in the gastrointestinal tract) have been reported in captive lemurs, for which surgical intervention may be required. It is beneficial to avoid feeding browse items with long fibres to lemurs in order to prevent these. Regular administration of laxatives or lubricants can also help prevent occurrence.

Obesity may be a problem in captive lemurs; this generally occurs due to the selective consumption of preferred food items by more dominant individuals in the group or the feeding of cultivated fruits and vegetables which are high in sugar and low in fibre. Readers are referred to the ZAA Guidelines 13.7 "Dietary management of lemurs in captivity" for more specific dietary advice for lemurs.

Iron deposition in tissues (encompassing both haemosiderosis and haemochromatosis) has received a lot of attention in the literature pertaining to lemur nutrition but the condition's health implications and precise relationship to diet are still unclear. With improvements in management, recent work suggests that although iron deposition in tissues remains

commonplace, associated disease is rarely seen. A few cases of liver pathology associated with deposition have been reported in Australasian institutions. See the dietary management guidelines for further elaboration on this condition.

The following diseases have also been reported in captive lemurs: toxoplasmosis, age-related renal disease, diabetes, neoplasia, bacterial pneumonia (particularly when under stress or acclimating to a new environment), *Herpesvirus hominis* (virus of herpes simplex), fungal skin infections, hydatid disease, foreign body ingestion, infection with the larval stages of the rat lungworm *Angiostrongylus cantonensis*, encephalomyocarditis virus, cerebral nematodiasis due to *Baylisascaris larval migrans*, gastric pneumatosis and hairy nightshade poisoning.

5. Health screening

Health screening and preventative health care of captive lemurs should consider and include, where appropriate:

- regular faecal parasite screening
- regular vaccination against tetanus using tetanus toxoid
- regular physical examination (including dental examination, haematology and serum biochemistry) under anaesthesia
- regular TB screening (consideration should be given to difficulties with interpretation of results as discussed above).

6. Contraception

Several methods of contraception have been used in lemurs. Refer to the AZA Wildlife Contraception Center website

(<http://www.stlzoo.org/animals/scienceresearch/contraceptioncenter>) for generic information on contraceptive options for prosimians, including contraindications, advantages and disadvantages of various methods.

Options for contraception include:

- Depo-Provera[®] injection (females)
- GnRH agonists (females or males) - include Suprelorin[®] (deslorelin) implant or Lupron[®] depot injection
- Permanent methods: ovariectomy, castration and vasectomy. Note: as there are ASMP Programs for both ring-tailed lemur and black and white ruffed lemurs, any decision for permanent contraception requires ASMP Committee approval, in the first instance please discuss with the Species Co-ordinator and refer to ZAA ASMP Policy 5.5 “Modifying or Annexing Program Specimens” for further information.
- Group management e.g. separation of sexes, noting that separation of sexes may provide future challenges when introducing animals (i.e. it may be more appropriate to maintain a cohesive social structure).

7. Anaesthesia

- Netting and hand delivery of injectable anaesthetic agents is recommended for adult animals. Other options include oral administration and squeeze cages.
- Mask induction with isoflurane is preferred for juvenile animals or conditioned adults that can be safely restrained.
- Many drugs and combinations have been used safely and successfully for intramuscular induction. Commonly used drugs and drug combinations include medetomidine/butorphanol/midazolam, alfaxalone, ketamine, ketamine/medetomidine, tiletamine/zolazepam and butorphanol/medetomidine/ketamine. Reversal of medetomidine with atipamazole, (and zolazepam with flumazenil at veterinary discretion) is recommended and promotes quicker recoveries. The reader is referred to the chapter on Prosimians in Fowler's Zoo and Wildlife Medicine 8th ed. for more specific information on doses.
- Intubation and the delivery of gaseous isoflurane is recommended for maintenance of anaesthesia. Sevoflurane may also be used.

8. References and further reading

1. ASMP Regional Census and Plan, Mammals (2014) Zoo and Aquarium Association. <http://www.zaamembers.org.au/ASMP-Publications/default.aspx>
2. Brockman KD, Willis MS and Karesh WB. 1988. Management and husbandry of ruffed lemurs, *Varecia variegata*, at the San Diego Zoo. 3. Medical considerations and population management. *Zoo Biology*. 7:253-262.
3. Campbell GA, Hoover JP, Russell WC and Breazile JE. 1997. Naturally occurring cerebral nematodiasis due to *Baylisascaris* larval migration in two black-and-white ruffed lemurs (*Varecia variegata variegata*) and suspected cases in three emus (*Dromaius novaehollandiae*). *Journal of Zoo and Wildlife Medicine*. 28(2):204-207.
4. Drew ML and Fowler ME. 1991. Poisoning of black and white ruffed lemurs (*Varecia variegata variegata*) by hairy nightshade (*Solanum sarrachoides*). 22(4):494-496.
5. Niederwerder MC, Stalis IH, Campbell GA and Backues KA. 2013. Gastric pneumatosis with associated eosinophilic gastritis in four black and white ruffed lemurs (*Varecia variegata variegata*). *Journal of Zoo and Wildlife Medicine*. 44 (1):79-86.
6. Tyler, M. (2008). Captive diet nutritional review of the Black and White Ruffed Lemurs *Varecia variegata variegata* and Ring-tailed Lemurs *Lemur catta* held at Perth Zoo.
7. Wells SK, Gutter AE, Soike KF and Baskin GB. 1989. Encephalomyocarditis virus: epizootic in a zoological collection. *Journal of Zoo and Wildlife Medicine*. 20(3):291-296.
8. Williams CV. 2015. Prosimians. In: Fowler's Zoo and Wildlife Medicine 8th ed (RE Miller and ME Fowler, Eds), pp. 291-301.

9. Approval

These guidelines were approved by the Executive Director of the Association on 22/01/2016.

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