

Other 'non listed' diseases of particular interest and unusual mortalities in wildlife:

“Non-listed” diseases of particular interest

Free-ranging wildlife

- A syndrome referred to as “**Devil Facial Tumour Disease - DFTD**”, which affects Tasmanian Devils (*Sarcophilus harrisii*) is being investigated in Tasmania. The disease has been recorded over 65 per cent of the State and is almost certainly present in a larger area. There are now likely to be a third to about half the wild Devil numbers in the State compared to 10 years ago. Assessment for DFTD is hampered by a lack of a pre-clinical diagnostic test. Immunohistochemistry has shown that the most consistent tumour type is of neuroendocrine origin. Cytogenetics work has established the normal Tasmanian Devil karyotype and the chromosome rearrangements of the tumour. It appears that the tumour is an allograft that is passed directly from animal to animal by implantation of the cell line during fighting and biting (Pearse and Swift. 2006. Transmission of devil facial-tumour disease. Nature 439: 549). The role of environmental intoxicants in the aetiology of the condition is under investigation. A captive insurance population has been set up in Tasmania and in 2005 a workshop was held to identify gaps in understanding of the disease and prioritise work for the future (proceedings available at: <http://www.dpiwe.tas.gov.au/inter.nsf/WebPages/JCOK-65X2Y6?open>). A number of short and longer term priority projects were determined. Short term projects included: 1) challenge and transmission studies; 2) establishment of captive disease free populations; 3) analysis of existing data to establish R_0 and modelling key unknowns and possible outcomes. Longer term projects included: 1) studies of genetic resistance and susceptibility and genetic management; 2) studies of immunity; 3) development of a pre-clinical diagnostic test.
- **Mass mortality of red kangaroos** (*Macropus rufus*) in West Australia in February. Multiple remote locations centred in an ellipse around Meekatharra, West Australia. (Total length long axis North-South approximately 600 Km; East-West axis approximately 400 Km.) Reasonable intelligence suggests a confirmed minimum of 3 000 animals from a population estimated at 10 000 animals. Autopsies all showed changes that could be ascribed to being associated with **inanition** associated with prolonged drought.
- **Black swans** (*Cygnus atratus*) – wild, Lake Monger, WA (n = 8). Pallor, crusting and multifocal ulceration of the beak and face, conjunctivitis and uveitis, with inflamed sclera and iridiae, and bumblefoot. Investigators consider that the birds may have been exposed to a contact irritant, or **photosensitising agent**. Some of the birds had elevated serum concentrations of liver enzymes, which would be consistent with exposure to a photosensitising agent. Avian influenza and Newcastle disease excluded.

- Continued reports of **granulomatous meningitis** suggestive of *Angiostrongylus cantonensis* infection in **Tawny Frogmouths** (*Podargus strigoides*) from the Northern beaches area of Sydney (n = 3). These birds may be acting as an indicator species for the presence of *A. cantonensis* in the environment. This is significant because the parasite may infect humans (via ingestion of infected snails or larvae released in slime trails on improperly washed vegetables like lettuce) and cause neurological symptoms from severe headaches to disease (eosinophilic meningitis) and death. Risk of infection in humans is, however, low with potential sources of infection being small children ingesting infected molluscs.
- **Australian pelicans** (*Pelecanus conspicillatus*) (n = 6), **Black Swan** (*Cygnus atratus*) (n = 1) - Centennial Park, NSW - Birds found dead over a two day period in the same duck pond in the park. An additional three pelicans and a Pied Cormorant (*Phalacrocorax varius*) died within two weeks of the initial outbreak, at the same location, but these animals were too decomposed for examination. The birds examined had evidence of extensive subcutaneous haemorrhage, pericardial, epicardial and endocardial haemorrhage, and haemorrhagic/necrotising enteritis. An acute bacterial or enterotoxic event was suspected, but a variety of bacterial agents were identified within the gastrointestinal tracts of the birds. No bacteria were identified in the non-intestinal tissues of the birds that were best preserved (suggestive of **enterotoxaemia**). *Aeromonas sobrii*, *Clostridium bifermentans*, *E. coli* were identified in multiple tissues from several of the birds. *Clostridium sordellii* was identified in multiple tissues from only one bird. *E. coli* is the only organism found in all the birds that is capable of producing enterotoxins. Additional culture and serotyping is underway to determine if the *E. coli* isolated in the intestinal tracts was capable of producing enterotoxins. ELISA testing for C & D botulinum toxins was conducted on liver, serum, and intestinal content samples from each of the 7 birds and found to be negative. Avian influenza real-time PCR conducted on oral/tracheal, and cloacal swabs from the birds did not find any evidence of infection.
- **Grey-headed flying fox** (*Pteropus poliocephalus*). With 41°C heat on Christmas Eve, and 44°C heat on New Year's day, very large numbers of grey headed flying foxes were found dead. Most of the dead animals were neonates, but some aged animals were also found dead. Most of the mortalities were reported on New Year's Day, when temperatures were highest:
 - Melbourne colony - size approx 12,000, peak colony temp 43°C on New Year's eve, deaths approx 300-400 (110 carcasses found in one limited area)
 - Kurnell, NSW - colony size 3,260 adults, 400 dead young found on New Year's day
 - Townsville, Billabong Sanctuary, QLD - colony size approximately 5,000 animals, peak colony temperature 42°C with low humidity, approximately 500 dead neonatal, juvenile and adult animals
 - Wyoming, NSW, estimated 400 dead young animals
 - Wingham (Taree - Wildlife Arc), NSW, estimated 5,000 dead animals after a hail storm
 - Blackbutt Reserve, NSW (NATF - Audrey Koosman) - 2,500 animals dead (accurate number - census)
 - Bellingen, NSW (Wildlife Arc) - approximately 5,000 animals dead
 - Botanic Gardens, NSW - approximately 450 animals dead.

These events are very interesting and deserve further study, particularly more accurate census data, given the potential impact of global warming on the population status of this threatened species. A questionnaire is being prepared to send to wildlife rehabilitators to

obtain additional information from this event and future events by the Australian registry of Wildlife Health.

- **Red fox** (*Vulpes vulpes*) – wild, Western Sydney. The fox was euthanased due to signs of central nervous system dysfunction. The fox had respiratory lesions consistent with canine distemper virus infection, and cytoplasmic inclusion bodies present in adrenal gland and bronchial epithelium. Fixed tissues were forwarded to Australian Animal Health Laboratories for Lyssavirus exclusion. No Lyssavirus antigen was detected.

Captive Australian native wildlife

- **Ophidian paramyxovirus** – OPMV. The first presumptive diagnoses of OPMV based on clinical history and histological grounds were made in several captive collections in Queensland, New South Wales and South Australia in 2004. Attempts to isolate OPMV from three live cases were unsuccessful and OPMV like viruses were not seen on electron microscopy of selected tissues from the affected snakes. However, a panel of 25 sera from snakes in various collections in New South Wales was assembled and sent to VLA Weybridge UK where they were examined in two separate haemagglutination inhibition tests. One test used an avian paramyxovirus antigen and the other test an OPMV isolate. The results showed that 9 of 25 snakes were positive for antibodies to OPMV-1 and 7 of 25 to OPMV-7. Seven snakes were positive in both tests. Positive snakes originated from two separate collections in NSW where there have been clinical and pathological findings consistent with OPMV. The significance of individual titres and differences between species is unclear. Species involved included: Death Adders (*Acanthophis* sp.), Taipans (*Oxyuranus* sp.), Tiger (*Notechis scutatus*) and King Brown Snakes (*Pseudechis* sp.), some non-venomous pythons (*Morelia* sp.) and corn snakes (*Elaphe guttata*). The extent and significance of infection is unknown. A retrospective sero-survey was commenced last year but is taking longer than first estimated due to the need to send samples overseas to confirm the diagnosis.

Other unusual mortalities

- On 10/8/05 a group of school children in Mt Evelyn, Victoria found an **Australian Raven** (*Corvus coronoides*) on the ground. The bird was bright but thin and extremely ataxic, being unable to stand or fly. Its condition deteriorated and it was euthanased on 17/8/05. There were no gross abnormalities. Histopathology revealed a **non-suppurative meningoencephalitis**. Tests for West Nile virus, Newcastle Disease and Avian Influenza were all negative. The cause of the encephalitis is unknown. No further cases have presented.
- West Nile virus infection was excluded as a cause of death in four avian mortality events. All involved **crow** species (**Corvus** sp.) three of which were from Queensland (George Town, Normanton and Mackay) and one from Victoria (Mt Evelyn).
- Avian influenza virus and Newcastle disease virus were excluded as the cause of death in 6 mortality events involving a variety of wild bird species from Queensland (n = 5) and Victoria (n = 1). Species included: Pied Currawong (*Strepera graculina*), Crows (*Corvus*

sp., in three events), Friarbird (*Phileman* sp.), and a falcon (Acciptridae). Samples were received from: Carmilla, Mackay, Atherton, Cairns and George Town (QLD); and Mt. Evelyn in Victoria.

(These exclusions were part of Australia's dead, wild bird surveillance system, which targets West Nile virus, Avian influenza and paramyxoviruses.)

- In early September, two cases of *Mycobacterium ulcerans* were reported in **Mountain Brushtail Possums** (*Trichosurus caninus*) from Orbost in Victoria. Both cases were found in the same area where a case in a long-footed potoroo (*Potorous longipes*) was previously diagnosed. *M. ulcerans* is a recognised zoonosis, which causes the Buruli or Bairnsdale ulcer in humans. Previous cases have been reported in koalas, ringtail possums, and an alpaca but these have all been in the same coastal areas where human cases occur. We have very little information about this condition in wildlife and humans. The transmission vectors are not known. Although isolated from one species of mosquito in Victoria and aquatic insects in Africa, these have not been shown to actually transmit the disease to humans.

Prominent management issues

- **Australian Wildlife Health Network update**

The Australian Wildlife Health Network (The Network; AWHN) was formed in 2002. Functions of the AWHN include wildlife disease surveillance, development a national database of diagnostic and surveillance information, coordination of information in an emergency, advancing education and training, and prioritising and promoting survey and research activities. Core funding comes from the Wildlife and Exotic Diseases Program (WEDPP, Australian Department of Agriculture, Fisheries and Forestry - DAFF).

The AWHN has a general wildlife surveillance system in place including:

- 1) A system of State and Territory coordinators.
- 2) Reporting of wildlife disease in six dedicated categories.
- 3) A rapid alert system ("First alert system") e.g. used for Avian influenza.
- 4) Weekly electronic digests of wildlife health information of relevance to the Region.
- 5) Website and databases (eWHIS and WHIS) in place (and alignment with other government systems).

- **Australian bat Lyssavirus group update**

The Australian bat Lyssavirus focus group acts as a focus for identifying areas for research and further work, as well as acting as a link and catalyst to improve collaboration, communication and coordination of Australian bat Lyssavirus issues for the region. Priorities for 2005 have been in:

- 1) reviewing post exposure management of humans and animals;
- 2) review of AUSVETPLAN for Australian bat Lyssavirus; and
- 3) design and facilitation of Australian bat Lyssavirus vaccine efficacy studies.

- **Australian Biosecurity (Cooperative Research Centre) CRC update**

In 2005 the AB-CRC held a number of workshops to identify priorities for wildlife disease work in Australia. Priorities included: development of technologies to enhance detection; ecology of emerging diseases; advanced surveillance systems. Further information is available on-line (at www1.abcrc.org.au).

- **Australasian Invasive Animal Cooperative Research Centre update**

The AIA-CRC focuses on solving invasive animal pest problems through the development of a partnership that brings together national and international skills in science, management, commerce and industry. Many outcomes of the CRC have implications for improved management of diseases with wildlife as part of their ecology. (For more information see: www.pestanimal.crc.org.au/hot.htm.)

- **Australian Registry of Wildlife Health update**

The Australian Registry of Wildlife Health wildlife health investigation manual has now been published (Rose, K. 2005. Wildlife Health Investigation Manual. Zoological Parks Board of New South Wales, Sydney, Australia). It includes procedures and guidelines for collection of specimens to enable wildlife diagnoses to be made and has been distributed widely across Australia (it is available from: www.arwh.org.)

Serological surveys/ disease investigations and surveys

- **Avian influenza surveillance in wild birds**

Year	AI subtype	Classification (type)	Prevalence [1] (%)
2005	nil	ducks, migratory birds (shorebirds, other)	0/1287* (0%)

* 586 samples also screened by nested polymerase chain reaction

Virology in 2005 has not resulted in any viral isolations. However serology does reveal influenza A antibodies in wild birds, with prevalence varying widely from survey to survey. This suggests that AI viruses are circulating endemically in wild birds in Australia.

- **Bat disease research and surveys:** Current henipavirus surveillance is concentrated in northern Australia in two projects – an international collaboration funded by the US National Institutes of Health Risk factors for the emergence of henipaviruses (project officer Raina Plowright, University of California, Davis) and the Australian Biosecurity CRC funded Assessment of the risk of introduction of Nipah virus to Australia by flying foxes (project officer Andrew Breed, University of Queensland). The former incorporates disease and landscape ecology data to develop and test alternative models for the maintenance of Hendra virus infection in flying foxes, and thus predictive models for spillover events. This study follows modelling (Field, 2005) that suggests infection may not be endemic in all flying fox populations continuously, but rather maintain in a dynamic spatial and temporal mosaic in sub-populations within the greater

metapopulation. The second project incorporates serologic, virologic, genetic and satellite telemetry studies to quantify contact between flying foxes pre- and post-border, and thus assess the risk of introduction of Nipah virus to Australia by flying foxes. Preliminary satellite telemetry shows seasonal movement of black flying foxes between Cape York and New Guinea.

Surveillance to monitor flying foxes for novel and zoonotic viruses, including Nipah, Hendra and Australian bat lyssavirus, is carried out throughout the year in the Kimberley region. Surveillance involves opportunistic sampling of flying foxes under the care of wildlife carers and clinical cases submitted from the Western Australian Department of Land Management. There is no evidence to suggest Nipah virus is present in Australia.

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