

Infectious agents of feral and wild Canids and Felids in Australia

Fact sheet

Introductory statement

Free-ranging species of Canidae and Felidae in Australia include the dingo (*Canis lupus dingo*) and dingo-dog hybrids (collectively referred to as wild dogs), feral dogs (*C. lupus familiaris*), red foxes (*Vulpes vulpes*) and feral cats (*Felis catus*).

The following list of infectious agents¹ (Table 1) have been reported in these species in Australia. These infectious agents are associated with diseases that fulfil one or more of the following criteria:

- zoonotic diseases
- OIE-listed animal diseases (www.oie.int/animal-health-in-the-world/oie-listed-diseases-2018/)
- diseases listed on the OIE worldwide monitoring system for wild animal diseases (referred to as “non OIE-listed diseases of wildlife” (www.oie.int/wahis_2/public/wahidwild.php/Diseaseinformation/popup/diseaselist))
- diseases of importance to agriculture
- diseases of importance to biodiversity
- diseases considered of significance to the health of the affected individuals (and therefore also to domestic populations).

Infectious agents, not detected to date in Australia in free-ranging canids and felids, but which are known occur in their domestic counterparts in Australia and are significant to OIE status, agriculture or as a zoonosis have also been included. There has been limited testing for infectious disease in feral Canidae and Felidae in Australia, thus a lack of a report of an infection may reflect an absence of disease testing information, rather than a true absence of the infectious agent.

¹ Infectious agents are organisms that live on or within a host and that survive at the expense of the host regardless of whether disease follows or not. This includes both microparasites (viruses, bacteria, fungi, protozoa) and macroparasites (worms and external parasites).

Table 1: Reports of infectious agents in feral cats, feral and wild dogs and foxes in Australia (*= serological evidence only)

| Infectious agent | Feral cat | Feral/ wild dog | Fox | Zoonosis | Agricultural importance | OIE status ² | References |
|---|-----------|-------------------|--------|-----------------|-------------------------|-------------------------|---|
| Viruses | | | | | | | |
| Canine distemper virus | | Report (domestic) | | | | Wild animal | Norris et al. (2006) |
| Canine parvovirus | Report | Report (domestic) | | | | Wild animal | Haynes and Holloway (2012); Zourkas et al. (2015) |
| Feline calicivirus | Report | | | | | | Coman et al. (1981b) |
| Feline herpesvirus | Report* | | | | | | Coman et al. (1981b) |
| Feline immunodeficiency virus | Report* | | | | | | Winkler et al. (1999); Norris et al. (2007) |
| Feline leukaemia virus | Report* | | | | | Wild animal | Westman et al. (2016) |
| Feline panleukopaenia virus (parvovirus) | Report | | | | | | Coman et al. (1981b); Haynes and Holloway (2012) |
| Bacteria | | | | | | | |
| Ampicillin resistant <i>E. coli</i> | | Report | | Yes (potential) | Yes (potential) | | Harriott (2018) |
| <i>Bartonella hensellae</i> | Report | | Report | Yes | | | Branley et al. (1996); Kaewmongkol et al. (2011) |

² “wild animal” = diseases listed on the OIE worldwide monitoring system for wild animal diseases (referred to as “non OIE-listed diseases of wildlife”); “OIE list” = OIE-listed animal diseases.

| Infectious agent | Feral cat | Feral/ wild dog | Fox | Zoonosis | Agricultural importance | OIE status ² | References |
|------------------------------------|-----------|---------------------|--------|----------|-------------------------|-------------------------|---|
| <i>Brucella suis</i> | | Report (domestic) | | Yes | | OIE list | Mor et al. (2016) |
| <i>Campylobacter</i> spp. | Report | Report (stray dogs) | | Yes | | | Baker et al. (1999) |
| <i>Clostridium perfringens</i> | Report | | Report | | | | Cox et al. (2005) |
| <i>Coxiella burnetii</i> * | Report | Report | Report | Yes | Yes | OIE list | Cooper et al. (2012) |
| <i>Leptospira</i> sp. ³ | | Report (domestic) | | Yes | Yes | Wild animal | Zwijnenberg et al. (2008) |
| <i>Salmonella</i> spp. | | Report | | Yes | | Wild animal | Harriott (2018) |
| Protozoa | | | | | | | |
| <i>Cryptosporidium</i> sp. | Report | Report | Report | Yes | | | O'Callaghan et al. (2005); Ng et al. (2011) |
| <i>Giardia duodenalis</i> | Report | Report | Report | Yes | | | Milstein and Goldsmid (1997); Adams (2003); Cox et al. (2005); O'Callaghan et al. (2005); Ng et al. (2011) |
| <i>Neospora caninum</i> | | Report | | | Yes | | King et al. (2010); King et al. (2011) |
| <i>Sarcocystis</i> sp. | Report | | | | Yes | | Munday et al. (1978); O'Callaghan et al. (2005) |
| <i>Toxoplasma gondii</i> * | Report | Report | | Yes | Yes | Wild animal | Coman et al. (1981b); Johnson et al. (1990); Milstein and Goldsmid (1997); (Adams 2003); O'Callaghan et al. (2005); Adams et al. (2008) |

³ There is cross reactivity between sv Canicola, Broomi and Bindjei and serological testing alone cannot confirm the presence of sv Canicola. Only isolation of the agent confirms the presence of a particular serovar. In Australia, *Leptospira interrogans* sv Canicola has not been isolated in dogs (the only species recognised as the maintenance host for *L. interrogans* sv Canicola).

| Infectious agent | Feral cat | Feral/ wild dog | Fox | Zoonosis | Agricultural importance | OIE status ² | References |
|---|-----------|-----------------|--------|----------|-------------------------|-------------------------|--|
| Internal and external parasites (metazoan) | | | | | | | |
| <i>Ancylostoma spp.</i> | Report | Report | Report | Yes | | | Ryan (1976); Pavlov and Howell (1977); O'Callaghan and Beveridge (1996); Brown and Copeman (2003); O'Callaghan et al. (2005); Traub et al. (2007); Adams et al. (2008); Jenkins et al. (2008); Smout et al. (2013); Harriott (2018) |
| <i>Dipylidium caninum</i> | Report | Report | Report | Yes | | | Gregory and Munday (1976); Ryan (1976); Pavlov and Howell (1977); Coman et al. (1981a); Shaw et al. (1983); Brown and Copeman (2003); O'Callaghan et al. (2005); Dybing et al. (2013) |
| <i>Dirofilaria immitis</i> | Report | Report | Report | Yes | | | Kendall et al. (1991); (Marks and Bloomfield 1998); Brown and Copeman (2003); Smout et al. (2013) |
| <i>Echinococcus granulosus</i> | | Report | Report | Yes | Yes | OIE list | Baldock et al. (1985); Morrison et al. (1988); Jenkins and Morris (1991); Brown and Copeman (2003); Jenkins and Morris (2003); Jenkins et al. (2008); Harriott (2018) |
| <i>Linguatula serrata</i> | | Report | Report | Yes | Yes | | Shamsi et al. (2017) |
| <i>Sarcoptes scabiei</i> | | | Report | | | Wild animal | Gray (1937); McCarthy (1960) |
| <i>Spirometra sp.</i> | Report | Report | Report | Yes | | | Gregory and Munday (1976); Ryan (1976); Pavlov and Howell (1977); Coman et al. (1981a); Shaw et al. (1983); O'Callaghan and Beveridge (1996); Milstein and Goldsmid (1997); Brown and Copeman (2003); O'Callaghan et al. (2005); Dybing et al. (2013); Harriott (2018) |
| <i>Strongyloides sp</i> | Report | | | Yes | | | Adams et al. (2008) |
| <i>Taenia hydatigena</i> | | Report | Report | | Yes | | Coman and Ryan (1974); Jenkins et al. (2014) |
| <i>Taenia ovis</i> | | | Report | | Yes | | Jenkins et al. (2014) |
| <i>Toxocara canis</i> | | Report | Report | Yes | | | Coman (1972); Jenkins et al. (2008); Dybing et al. (2013); Harriott (2018) |

| Infectious agent | Feral cat | Feral/ wild dog | Fox | Zoonosis | Agricultural importance | OIE status ² | References |
|-------------------------------|-----------|-----------------|--------|----------|-------------------------|-------------------------|--|
| <i>Toxocara cati</i> | Report | | | Yes | | | Gregory and Munday (1976); Ryan (1976); Pavlov and Howell (1977); Coman et al. (1981a); Shaw et al. (1983); O'Callaghan and Beveridge (1996); Milstein and Goldsmid (1997); O'Callaghan et al. (2005); Adams et al. (2008) |
| <i>Uncinaria stenocephala</i> | | Report | Report | Yes | | | Coman (1972); Gregory and Munday (1976); Ryan (1976); Dybing et al. (2013); Mackenstedt et al. (2015); Harriott (2018) |

Conclusion

A wide range of infectious agents including viruses, bacteria and protozoal and metazoan parasites occur in free-ranging Canidae and Felidae species in Australia. Many of the associated diseases are zoonotic, are important to agriculture and may also have an impact on biodiversity. A number of these infectious agents are included on the OIE List of Notifiable diseases while others are not listed but are recognised as important by the OIE.

Additional information may be found in the WHA Fact Sheet “Disease agents reported in feral animals in Australia”, with information in that sheet drawn from the work of the Invasive Animal CRC.

References

- Adams P (2003) Parasites of feral cats and native fauna from Western Australia: the application of molecular techniques for the study of parasitic infections in Australian wildlife. PhD thesis, Murdoch University.
- Adams P, Elliot A, Algar D, Brazell R (2008) Gastrointestinal parasites of feral cats from Christmas Island. *Australian Veterinary Journal* **86**, 60-63.
- Baker J, Barton MD, Lanser J (1999) *Campylobacter* species in cats and dogs in South Australia. *Australian Veterinary Journal* **77**, 662-666.
- Baldock F, Thompson R, Kumaratilake L, Shield J (1985) *Echinococcus granulosus* in farm dogs and dingoes in south eastern Queensland. *Australian Veterinary Journal* **62**, 335-337.
- Branley J, Wolfson C, Waters P, Gottlieb T, Bradbury R (1996) Prevalence of *Bartonella henselae* bacteremia, the causative agent of cat scratch disease, in an Australian cat population. *Pathology* **28**, 262-265.
- Brown B, Copeman D (2003) Zoonotic importance of parasites in wild dogs caught in the vicinity of Townsville. *Australia Veterinary Journal* **81**, 700-702.
- Coman B (1972) Helminth parasites of the dingo and feral dog in Victoria with some notes on the diet of the host. *Australian Veterinary Journal* **48**, 456-461.
- Coman B, Jones E, Driesen M (1981a) Helminth parasites and arthropods of feral cats. *Australia Veterinary Journal* **57**, 324-327.
- Coman B, Jones E, Westbury H (1981b) Protozoan and viral infections of feral cats. *Australia Veterinary Journal* **57**, 319-323.
- Coman B, Ryan G (1974) The role of the fox as a host for *Taenia ovis* and *Taenia hydatigena* in Australia. *Australia Veterinary Journal* **50**, 577-578.
- Cooper A, Goullet M, Mitchell J, Ketheesan N, Govan B (2012) Serological evidence of *Coxiella burnetii* exposure in native marsupials and introduced animals in Queensland, Australia. *Epidemiology & Infection* **140**, 1304-1308.
- Cox P, Griffith M, Angles M, Deere D, Ferguson C (2005) Concentrations of pathogens and indicators in animal feces in the Sydney watershed. *Applied and Environmental Microbiology* **71**, 5929-5934.
- Dybing NA, Fleming PA, Adams PJ (2013) Environmental conditions predict helminth prevalence in red foxes in Western Australia. *International Journal for Parasitology: Parasites and Wildlife* **2**, 165-172.

Gray D (1937) Sarcoptic mange affecting wild fauna in New South Wales. *Australian Veterinary Journal* **13**, 154-155.

Gregory G, Munday B (1976) Internal parasites of feral cats from the Tasmanian Midlands and King Island. *Australia Veterinary Journal* **52**, 317-320.

Harriott LC (2018) Prevalence, risk factors, and geographical distribution of zoonotic pathogens carried by peri-urban wild dogs. PhD thesis, University of Queensland.

Haynes S, Holloway S (2012) Identification of parvovirus in the bone marrow of eight cats. *Australia Veterinary Journal* **90**, 136-139.

Jenkins D, Allen L, Goulet M (2008) Encroachment of *Echinococcus granulosus* into urban areas in eastern Queensland, Australia. *Australia Veterinary Journal* **86**, 294-300.

Jenkins D, Morris B (1991) Unusually heavy infections of *Echinococcus granulosus* in wild dogs in south-eastern Australia. *Australian Veterinary Journal* **68**, 36-37.

Jenkins D, Morris B (2003) *Echinococcus granulosus* in wildlife in and around the Kosciuszko National Park, south-eastern Australia. *Australian Veterinary Journal* **81**, 81-85.

Jenkins D, Urwin NA, Williams TM, Mitchell KL, Lievaart JJ, Armua-Fernandez MT (2014) Red foxes (*Vulpes vulpes*) and wild dogs (dingoes (*Canis lupus dingo*) and dingo/domestic dog hybrids), as sylvatic hosts for Australian *Taenia hydatigena* and *Taenia ovis*. *International Journal for Parasitology: Parasites and Wildlife* **3**, 75-80.

Johnson AM, Phillips P, Jenkins D (1990) Prevalence of *Toxoplasma gondii* antibodies in dingoes. *Journal of Wildlife Diseases* **26**, 383-386.

Kaewmongkol G, Kaewmongkol S, Fleming PA, Adams PJ, Ryan U, Irwin PJ, Fenwick SG (2011) Zoonotic *Bartonella* species in fleas and blood from red foxes in Australia. *Vector-Borne and Zoonotic Diseases* **11**, 1549-1553.

Kendall K, Collins G, Pope S (1991) *Dirofilaria immitis* in cats from inner Sydney. *Australia Veterinary Journal* **68**, 356-357.

King JS, Jenkins DJ, Ellis JT, Fleming P, Windsor PA, Šlapeta J (2011) Implications of wild dog ecology on the sylvatic and domestic life cycle of *Neospora caninum* in Australia. *The Veterinary Journal* **188**, 24-33.

King JS, Šlapeta J, Jenkins DJ, Al-Qassab SE, Ellis JT, Windsor PA (2010) Australian dingoes are definitive hosts of *Neospora caninum*. *International Journal for Parasitology* **40**, 945-950.

Mackenstedt U, Jenkins D, Romig T (2015) The role of wildlife in the transmission of parasitic zoonoses in peri-urban and urban areas. *International Journal for Parasitology: Parasites and Wildlife* **4**, 71-79.

Marks C, Bloomfield T (1998) Canine heartworm (*Dirofilaria immitis*) detected in red foxes (*Vulpes vulpes*) in urban Melbourne. *Veterinary Parasitology* **78**, 147-154.

McCarthy P (1960) The presence of sarcoptic mange in the wild fox (*Vulpes vulpes*) in Central Queensland. *Australian Veterinary Journal* **36**, 359-360.

Milstein T, Goldsmid J (1997) Parasites of feral cats from southern Tasmania and their potential significance. *Australian Veterinary Journal* **75**, 218-219.

Mor SM, Wiethoelter AK, Lee A, Moloney B, James DR, Malik R (2016) Emergence of *Brucella suis* in dogs in New South Wales, Australia: clinical findings and implications for zoonotic transmission. *BMC Veterinary Research* **12**, 199.

Morrison P, Stanton R, Pilatti E (1988) *Echinococcus granulosus* infection in wild dogs in south-eastern New South Wales. *Australia Veterinary Journal* **65**, 97-98.

Munday B, Mason R, Hartley W, Presidente P, Obendorf D (1978) *Sarcocystis* and related organisms in Australian wildlife: I. Survey findings in mammals. *Journal of Wildlife Diseases* **14**, 417-433.

Ng J, Yang R, Whiffin V, Cox P, Ryan U (2011) Identification of zoonotic *Cryptosporidium* and *Giardia* genotypes infecting animals in Sydney's water catchments. *Experimental Parasitology* **128**, 138-144.

Norris J, Bell ET, Hales L, Toribio J-AL, White JD, Wigney DI, Baral RM, Malik R (2007) Prevalence of feline immunodeficiency virus infection in domesticated and feral cats in eastern Australia. *Journal of Feline Medicine & Surgery* **9**, 300-308.

Norris J, Krockenberger M, Baird A, Knudsen G (2006) Canine distemper: re-emergence of an old enemy. *Australian Veterinary Journal* **84**, 362-363.

O'Callaghan M, Beveridge I (1996) Gastro-intestinal parasites of feral cats in the Northern Territory. *Transactions of the Royal Society of South Australia* **120**, 175-176.

O'Callaghan M, Reddin J, Dehmann D (2005) Helminth and protozoan parasites of feral cats from Kangaroo Island. *Transactions of the Royal Society of South Australia* **129**, 81-83.

Pavlov P, Howell M (1977) Helminth parasites of Canberra cats. *Australian Veterinary Journal* **53**, 599-600.

Ryan G (1976) Gastro-intestinal parasites of feral cats in New South Wales. *Australia Veterinary Journal* **52**, 224-227.

Shaw J, Dunsmore J, Jakob-Hoff R (1983) Prevalence of some gastrointestinal parasites in cats in the Perth area. *Australia Veterinary Journal* **60**, 151-152.

Smout FA, Thompson RA, Skerratt LF (2013) First report of *Ancylostoma ceylanicum* in wild canids. *International Journal for Parasitology: Parasites and Wildlife* **2**, 173-177.

Traub RJ, Hobbs R, Adams P, Behnke JM, Harris PD, Thompson R (2007) A case of mistaken identity—reappraisal of the species of canid and felid hookworms (*Ancylostoma*) present in Australia and India. *Parasitology* **134**, 113-119.

Westman ME, Paul A, Malik R, McDonagh P, Ward MP, Hall E, Norris JM (2016) Seroprevalence of feline immunodeficiency virus and feline leukaemia virus in Australia: risk factors for infection and geographical influences (2011–2013). *Journal of Feline Medicine and Surgery Open Reports* **2**, 2055116916646388.

Winkler I, Löchelt M, Flower R (1999) Epidemiology of feline foamy virus and feline immunodeficiency virus infections in domestic and feral cats: a seroepidemiological study. *Journal of Clinical Microbiology* **37**, 2848-2851.

Zourkas E, Ward MP, Kelman M (2015) Canine parvovirus in Australia: A comparative study of reported rural and urban cases. *Veterinary Microbiology* **181**, 198-203.

Zwijnenberg R, Smythe L, Symonds M, Dohnt M, Toribio JA (2008) Cross-sectional study of canine leptospirosis in animal shelter populations in mainland Australia. *Australia Veterinary Journal* **86**, 317-323.

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