Wildlife Health Australia

Piroplasms (*Babesia* spp. and *Theileria* spp.) in Australian wildlife

Fact sheet

Introductory statement

Babesia spp. and *Theileria* spp. are protozoan haemoparasites which invade the erythrocytes of a wide range of mammals. Species of ticks are the usual vectors for these blood-borne parasites which mostly appear to be non-pathogenic to Australian wildlife. However, there are anecdotal reports of disease attributed to piroplasm-like organisms in Australian native wildlife. More work is required to assess the significance of these organisms to Australian wild animals and to identify any potential risk to production animals.

Aetiology

Piroplasmosis is caused by species of *Babesia* and *Theileria.*

Family (*Babesiidae*), genus (*Babesia*), Family (*Theileriidae*), genus (*Theileria*).

Natural hosts

Species of *Babesia* and *Theileria* are known to infect a wide range of native and non-native mammals. No tick species has yet been confirmed as a vector for any of the piroplasms in the native mammals so far described.

World distribution

Species of *Babesia* and *Theileria* have been recorded worldwide.

Occurrences in Australia

Uncertain distribution in Australia; there has been no systematic investigation of the piroplasms of native wildlife and most reports describe single cases.

Babesia vogeli (originally known as *Babesia canis*) has been reported from the dingo (*Canis lupus dingo*), *B. tachyglossi* from the short beaked echidna (*Tachyglossus aculeatus*), *B. thylacis* from the southern brown bandicoot (*Isoodon obesulus*) and unclassified *Babesia* spp. have been reported from the agile antechinus (*Antechinus agilis*), Proserpine rock wallaby (*Petrogale Persephone*), short-beaked echidna and brown antechinus (*Antechinus stuartii*) (O'Donoghue and Adlard 2000; Clark 2004).

Theileria ornithorhynchi has been reported in the platypus (*Ornithorhynchus anatinus*), *Th. tachyglossi* from the short-beaked echidna, *Th. perameles*, in the southern brown bandicoot, long-nosed bandicoot (*Perameles nasuta*) and long-nosed potoroo (*Potorous tridactylus*).

More recently *Th. gilberti* was reported in the Gilbert's Potoroo (*Potorous gilbertii*) (Lee et al. 2009), *Th. penicillata* from the woylie or brush-tailed bettong (*Bettongia penicillata*), *Th. brachyuri* from the quokka (*Setonix brachyurus*), and *Th. fuliginosa* from the western grey kangaroo (*Macropus fuliginosus*) (Clark and Spencer 2007). Unclassified *Theileria* spp. have been reported in the northern brown bandicoot, platypus, long-nosed bandicoot, and long-nosed potoroo (O'Donoghue and Adlard 2000; Clark 2004).

Epidemiology

Babesia spp and *Theileria* spp. are transmitted to the definitive host by a tick vector during a blood meal. *Babesia* spp. injected into the host bloodstream enter the erythrocytes and multiply through asexual division, while *Theileria* spp. also invade the lymphocytes where multiplication occurs. Eventually host cells are ruptured allowing the parasites to invade other erythrocytes and lymphocytes.

Piroplasmosis infecting Australian native fauna appears to be relatively non-pathogenic in most cases however immunosuppressed hosts may suffer clinical disease. Male mortality in the brown antechinus after mating has been associated with severe gastrointestinal trauma and high levels of *Babesia* sp.

Clinical signs

In other animals, clinical signs depend on the infecting species and susceptibility of the host. Symptoms can include fever, anorexia, depression and blood stained faeces (Mahoney 1977).

Observations of *Babesia* spp. and *Theileria* spp. within many apparently clinically normal Australian wildlife species suggest that these species of piroplasms are usually non-pathogenic. However, moderate anaemia associated with babesiosis has been observed in the brown antechinus (Cheal et al. 1979) and depression and anaemia has also been observed in an eastern grey kangaroo with significant parasitaemia (Ladds 2009).

Diagnosis

- Examination of peripheral blood smears stained with a Giemsa, Leishman's or Wrights stain. Species of *Babesia* and *Theileria* can be observed in the erythrocytes, while *Theileria* spp. may also be seen in the lymphocytes.
- Indirect fluorescent antibody (IFA) tests are useful for detecting low levels of parasitaemia.
- Due to similar morphology of the piroplasms it is extremely difficult to identify genus and species with basic techniques. PCR methods can be used for species identification.

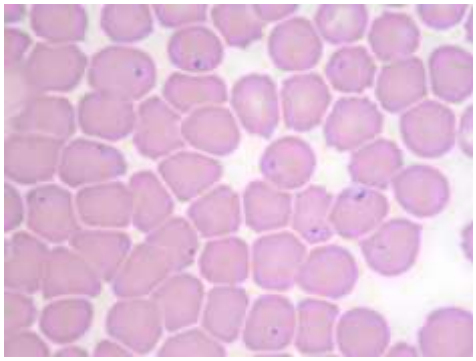

Figure 1. Giemsa stained blood smear from a Gilbert's potoroo. *Theileria gilberti* observed in erythrocytes.

Pathology

Anaemia associated with intravascular haemolysis.

Differential diagnoses

Differential diagnosis of haemolytic anaemia should be determined in clinically abnormal cases.

Laboratory diagnostic specimens

- Whole blood smears air dried and stained for microscopy analysis. If not staining immediately, allow slide to dry and then fix in 100% methanol or 70% ethanol for later staining.
- Whole blood stored in EDTA tubes and frozen can be used for later molecular characterisation. (Haematological evaluation must be done on fresh samples before freezing.)

Treatment

A wide range of antiprotozoal drugs are available for the treatment of babesiosis in domestic animals but these often have toxic side effects. There are no data available regarding the treatment of piroplasmosis in native mammals.

Prevention and control

Prevention and control can only be achieved by limiting exposure to the tick vector which is not feasible for wild populations.

Surveillance and management

Wildlife disease surveillance in Australia is coordinated by Wildlife Health Australia. The National Wildlife Health Information System (eWHIS) captures information from a variety of sources including Australian government agencies, zoo and wildlife parks, wildlife carers, universities and members of the public. Coordinators in each of Australia's States and Territories report monthly on significant wildlife cases identified in their jurisdictions. NOTE: access to information contained within the National Wildlife Health Information System dataset is by application. Please contact admin@wildlifehealthaustralia.com.au.

The findings of piroplasms in samples from wildlife in Australia is considered interesting and unusual and will be logged in the National Wildlife Health Information System (eWHIS) as part of national general wildlife surveillance activities.

Statistics

There are currently no cases of piroplasmosis listed in eWHIS.

Research

Current research is focused on the molecular identification and phylogeny of these parasites and the investigation of their vector tick species (Irwin P, pers. comm.).

A number of haemoparasites are known to affect Australian mammals (Mackerras 1959). In many cases the identity of these parasites has not been determined and their epidemiology and pathogenicity are not known. Haemolytic anaemia and sporadic outbreaks of mortality have been reported in Eastern Grey Kangaroos and some other species of macropod from northern and mid-north coast NSW (Coffs Harbour/ Lismore) since 1994 (Cook *et al.* 1996; Dooley 2004, K. Rose pers. comm. 2008). Cook *et al.* (1996) described the presence of many schizont-like forms within blood vessels and presumed the parasite to be an Apicomplexan. Other anecdotal reports suggest involvement of Babesia, Trypanosome-like or *Omnibacteria*-like organisms. More work is required on the significance and biology of haemoparasites in Australian native animals.

Human health implications

Piroplasms infecting native Australian fauna are not known to be zoonotic.

Conclusions

Little is known about the species diversity of piroplasms infecting Australian wildlife. Continued research is required to identify further species and to gain an understanding of the pathogenicity and any potential risks to livestock.

References and other information

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To provide feedback on this fact sheet

We are interested in hearing from anyone with information on this condition in Australia, including laboratory reports, historical datasets or survey results that could be added to the National Wildlife Health Information System. If you can help, please contact us at admin@wildlifehealthaustralia.com.au.

Wildlife Health Australia would be very grateful for any feedback on this fact sheet. Please provide detailed comments or suggestions to admin@wildlifehealthaustralia.com.au. We would also like to hear from you if you have a particular area of expertise and would like to produce a fact sheet (or sheets) for the network (or update current sheets). A small amount of funding is available to facilitate this.

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Wildlife Health Australia

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