**Introductory statement**

Besnoitia spp. are cyst forming coccidia that infect a wide range of vertebrates including mammals, reptiles and birds. There are several known species of Besnoitia which include those that cause the disease besnoitiosis in cattle (B. besnoiti), horses (B. bennetti) and goats (B. caprae). Besnoitiosis is not present in livestock in Australia, however B. wallacei has been reported in rats, and there is a report of a Besnoitia sp. causing pathology in a juvenile captive western grey kangaroo from Western Australia. Anecdotal reports suggest that the condition may be more widespread in Australia. Those reading this fact sheet who have more information are encourage to contact the Wildlife Health Network (below).

**Aetiology**

Besnoitiosis is caused by the cyst forming Besnoitia spp. which occurs in the tissues of the intermediate host.

*Family (Eimeriidae), genus (Besnoitia)*

**Natural hosts**

Besnoitia species have been found to infect a wide variety of vertebrate hosts including wild and domestic ungulates, rodents, opossums and lizards (Leighton and Gajadhar 2001). The definitive host for several species has been identified as the cat while others have yet to be determined.

**World distribution**

Occurs throughout the world.

**Occurrences in Australia**

In Australia, free living introduced rats (Rattus rattus) are the intermediate host for B. wallacei. The definitive host is the cat (Mason 1980, Adams et al., 2008).
There are reports of infection with a *Besnoitia* sp. in western grey kangaroos (*Macropus fuliginosus*) from Western Australia (Ladds 2009, DAFWA 2010 – eWHIS 2863) and anecdotal reports from Queensland (S. Besier pers comm.). The DAFWA (2010) report states that while little research has been undertaken on this parasite in kangaroos, it appears that the disease is widespread throughout the kangaroo population in Australia. These conclusions are based on previous reports, also from Western Australia (B. Richards pers. comm. to S. Besier 2011), and the anecdotal reports from Queensland. The fact that *R. rattus* and cats are widely distributed in Australia, often co-habiting areas where macropods occur, also supports this conclusion. The authors of the current fact sheet encourage submission of confirmed reports of the presence of this parasite in Australian wildlife to the National Wildlife Health Information System so that its distribution can be better documented.

**Epidemiology**

*Besnoitia* species have a two host cycle, the definitive host (carnivore) and intermediate host (herbivore). Besnoitiosis has only been recognised in the intermediate host with varying degrees of pathogenicity. The cat is a known definitive host for some species of *Besnoitia* however many are still unknown. Within the cat *Besnoitia* spp. oocysts are excreted in the faeces which, when ingested by the intermediate host, develop into cysts within the tissues and organs. Mechanical transfer by a biting arthropod has also been shown to occur between infected intermediate hosts (Bigalke 1968). Within Australia the lifecycle of *B. wallacei* involves the cat as the definitive host and the rat as the intermediate host (Manson 1980). It is not known if this species or others exists within Australian native fauna. The *Besnoitia* sp. reported by Ladds (2009) and DAFWA (2010) were not speciated.

**Clinical signs**

Epistaxis and rhinitis have been described (Ladds 2009).

**Diagnosis**

In the **definitive** host

- Oocysts resembling those of *Toxoplasma gondii* present in faecal samples.
- Direct microscopy examination of wet smears. Faecal flotation may also be used to separate oocysts from faecal debris.

In the **intermediate** host

- Large cysts containing bradyzoites will be present in tissue samples obtained during necropsy.
- Cysts or zoites may be visible on nasal smears from affected animals.

**Pathology**

On necropsy pale foci were noted in the nasal mucosa. Histological examination revealed massively enlarged epithelial cells containing bradyzoites within parasitiphous vacuoles (DAFWA 2010). In another case, cysts were present extending into deeper tissues (Ladds 2009).
Differential diagnoses

Rhinoploridium, Cryptococcus, other fungal and bacterial rhinitis. Trauma and haemorrhagic diatheses would also cause epistaxis.

Laboratory diagnostic specimens

- Fresh faecal samples for microscopy from suspected definitive host. Approximately 2-4 g is sufficient. Samples can be stored at 4°C for 2-3 days until delivery to the laboratory.
- Tissue samples fixed in 10% formalin for histology.
- Tissue samples fixed in 70% ethanol for molecular characterisation.

Treatment

No effective chemotherapy for besnoitiosis has been reported.

Prevention and control

Due to the limited knowledge of species distribution and competent vector(s) the impact of prevention and control programs would be negligible.

Surveillance and management

The findings of Besnoitia spp. in samples from wildlife in Australia are considered interesting and unusual and are logged in the National Wildlife Health Information System as part of Australia's National General Wildlife Surveillance System.

Statistics

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 single case in a captive western grey kangaroo cited above is listed in the National Database (eWHIS 2863).

Research

The lifecycle of many Besnoitia species is yet to be determined. Research is being conducted in an attempt to discover the definitive and intermediate hosts of each species and how transmission is completed. Molecular techniques are aiding this research (Ellis et al; 2000; Kiehl et al., 2010). It would be useful to speciate any organisms associated with pathology in Australian wildlife.
Human health implications

To date there are no Besnoitia species considered to be zoonotic.

Conclusions

The complete lifecycle for many Besnoitia spp. is still being unravelled. Little is known about transmission dynamics and the effect this parasite has on host populations. Besnoitia spp. have been known to cause severe disease in various intermediate hosts and is therefore an important pathogen in other parts of the world. To date only B. wallacei has been identified in Australia but it is possible that more species exist and have yet to be diagnosed. The significance of Besnoitia sp. in Australian native wildlife is not known.

References and other information


Acknowledgements

We are extremely grateful to those who have had input into this fact sheet. Without their ongoing support production of these fact sheets would not be possible.

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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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