Coccidiosis in Australian marsupials and monotremes

Fact Sheet

March 2025

Key points

- Coccidia are a group of protozoan parasites that naturally infect the intestinal tract of many animal species.
- The vast majority of coccidia are host species-specific, but some animal species may be parasitised by numerous coccidia species.
- Coccidiosis is the clinical disease associated with infection by coccidia.
- In Australian wildlife, coccidiosis is most frequently caused by *Eimeria* spp. infection in captive wild animals.
- On rare occasions, coccidiosis outbreaks have occurred in association with high mortality rates in free-ranging macropods.
- A range of environmental and host factors may influence the development and clinical outcome of coccidiosis.
- Faecal oocyst counts are recommended to monitor coccidia burdens in susceptible Australian wildlife in captivity.

Aetiology

Coccidia are obligate intracellular protozoan parasites. There are numerous coccidian genera, although only a small number are associated with clinical disease. Most coccidia isolated from Australian wildlife are *Eimeria* or *Isospora* spp. and, of these, only a small number of *Eimeria* spp. have been associated with coccidiosis (clinical disease associated with infection by coccidia) in Australian marsupials and monotremes.

One Health implications

Wildlife and the environment: in Australian wildlife, coccidiosis is an important disease of captive marsupials and monotremes, most frequently in macropods and juvenile animals. Coccidiosis is rare in free-ranging Australian wildlife, but occasional outbreaks have occurred in macropods [1].

Domestic animals: although coccidiosis is considered an important disease in domestic animals and can cause economic losses in livestock and poultry industries, there is no known potential for cross-infection between coccidia in domestic animals and wildlife.

Humans: there are no known zoonotic risks associated with coccidia infections in Australian wildlife.

Natural hosts

Coccidia can infect a wide range of taxa but are generally host species-specific. Some wildlife species may have multiple host-adapted coccidia species, meaning that co-infections are possible [2, 3].

Coccidia have been isolated from a large number of Australian marsupial and monotreme species, including macropods, platypus (*Ornithorhynchus anatinus*) [4], short-beaked echidna (*Tachyglossus aculeatus*) [5], bandicoots [6], antechinus [7], bettongs, potoroos [8], possums, wombats, and dingo [9]. Among macropods, over 40 *Eimeria* spp. have been isolated from several genera including kangaroos, wallaroos [10], wallabies [11] and quokka [12].

World distribution and occurrence in Australia

Coccidia and coccidiosis occur worldwide.

In Australia, coccidiosis has been reported in a large number of marsupial species, including: eastern grey kangaroos (*Macropus giganteus*), western grey kangaroos (*M. fuliginosus*), red kangaroos (*M. rufus*), black-striped wallabies (*M. dorsalis*), tammar wallabies (*M. eugenii*), whiptail wallabies (*M. parryi*), red-necked wallabies (*M. rufogriseus*), parma wallabies (*M. parma*) [13], short-beaked echidnas [3], common wombats (*Vombatus ursinus*) [14], southern hairy-nosed wombats (*Lasiorhinus latifrons*) [13], platypus [15] and southern brown bandicoots [16]. Coccidiosis has also been reported overseas in captive macropods [17, 18].

Importantly, although coccidia infections are common, only a small number of *Eimeria* spp. have been associated with coccidiosis in Australian wildlife [19], including *E. kogoni*, *E. cunnamullensis, E. maropodis, E. toganmainensis and E. prionotemni* in macropods, *E. arundeli* in wombats and potentially *E. tachyglossi* and *E. echidnae* in short-beaked echidna [13, 20].

Epidemiology

In general, coccidia complete their three-stage lifecycle within a single host. Completion of the involves oocysts (eggs) being shed in faeces and undergoing a short period of development in the environment to become infective [21]. Transmission occurs through the faecal-oral route, when material contaminated with infectious oocysts is consumed and the ingested parasites invade mucosal cells in the host's small intestine.

The prevalence of coccidia infections in Australian wildlife appears to vary widely between species, population and method of study (i.e., sampling protocols, diagnostic tools). For example, prevalence figures reported for *Eimeria* spp. range from 24% [10] to 92% [22] in various macropod species and 15% to 76% in other marsupials [2, 8]. Importantly, coccidian oocysts are frequently found in the faeces of apparently healthy free-ranging and captive wildlife. For example, in the absence of any clinical disease, a prevalence of 75% to 89% was found in faecal samples obtained from captive echidnas throughout a year [3].

Free-ranging wildlife are most likely exposed to coccidia as juveniles and thereafter develop immunity. This is probably why coccidiosis is rarely reported in free-ranging animals but frequently

occurs in juvenile captive wildlife [1]. Cross-protective immunity between coccidia species is not apparent, so exposure to an unfamiliar species of coccidia (which may occur when an animal is brought into captivity) may result in disease. When disease occurs in free-ranging wildlife, outbreaks have been associated with high mortality rates.

There are numerous host and environmental factors that can contribute to the development and clinical outcome of coccidiosis, and which likely influence the epidemiology of coccidiosis. There appear to be inter-species differences in susceptibility to coccidiosis, although the underlying mechanisms are unclear. For example, eastern grey kangaroos are the most severely and frequently affected macropod species, with high mortality rates reported in hand-reared juveniles [13, 23], while fatal disseminated coccidiosis is also common in captive short-beaked echidnas [3].

Environmental factors associated with outbreaks in both captive and wild marsupials and monotremes include stressors such as weaning, sudden changes to diet, transportation, malnutrition and co-morbidities, and overcrowding and damp conditions that enhance oocyst accumulation and survival [3, 23-25].

Clinical signs

The main clinical sign associated with coccidiosis is mucoid or haemorrhagic diarrhoea. Additional signs include depression, lethargy, abdominal discomfort, anorexia, inappetence and dehydration [9, 25]. In acute cases, death may occur prior to the onset of clinical signs, while chronic coccidiosis can cause ongoing weight loss or failure to thrive [26].

Unlike other Australian species, short-beaked echidnas can develop either enteric or disseminated coccidiosis (affecting multiple organs) [5]. The enteric form is associated with signs as described above and the signs associated with disseminated coccidiosis vary depending on the organs affected and may include neurological or respiratory signs [3].

Diagnosis

Faecal microscopy is most commonly used to diagnose coccidia infections. This involves examination of either wet preparations or samples following faecal floatation at 400x magnification [1, 12] . Large numbers of faecal oocysts in combination with clinical signs are usually considered significant [3].

In short-beaked echidnas, an ante-mortem diagnosis of disseminated coccidiosis is supported by marked (>30%) *Eimeria* burdens within monocytes, identifiable on microscopy of buffy coat preparations from blood samples [3].

Histology, in combination with immunohistochemistry, can also be used to diagnose coccidia infection in tissues (e.g., small intestine) and determine clinical significance. However, this method requires tissue biopsies and is therefore mostly applicable to investigating coccidiosis post-mortem.

Characterisation of coccidia species is most-often achieved through molecular methods, including PCR and subsequent DNA sequencing. Though PCR is potentially a sensitive and specific diagnostic tool, the limited availability of DNA sequences for coccidia species in Australian wildlife hinders the

usefulness of this technique at present [12]. Importantly, as the presence of coccidia is not always associated with disease, positive PCR results must be interpreted in combination with clinical signs or other clinical indicators.

Pathology

Clinical coccidiosis is associated with haemorrhagic and necrotising enteritis [13]. Other gross lesions may include intestinal wall oedema, nodular lesions or discoloured foci on the intestinal mucosa, ascites and nodular lesions in the liver [13].

In echidnas, microscopic lesions associated with disseminated coccidiosis can be observed in various organs, including stomach, spleen, pancreas, liver, brain, kidney, heart and lung [3, 13]. These include mononuclear and neutrophilic infiltrates, necrosis and scattered granulomas associated with the protozoa [13].

Differential diagnoses

Differential diagnoses include other causes of enteritis, including infectious (i.e., fungal, bacterial, viral, parasitic) and non-infectious (i.e., nutritional, stress) causes [26].

Treatment

Treatment with medications such as toltrazuril or trimethoprim–sulfonamide combinations are used in concert with supportive and antibiotic treatment [25]. While toltrazuril is considered highly effective for treating coccidiosis in macropods, results in echidnas are variable [3]. In severe cases or in young animals of all species, early treatment with aggressive supportive care is considered necessary.

Prevention and control

Coccidia are ubiquitous in the environment and naturally infect marsupials and monotremes. As such, prevention of infection in free-ranging animals is neither necessary nor feasible. Aside from humane euthanasia, treatment of free-ranging animals affected by (rare) coccidiosis outbreaks is similarly not considered a viable option (though in some cases affected animals may be taken into captivity for treatment).

Coccidia can survive in the environment for several months under favourable conditions and traditional disinfectants have little effect on oocysts [24]. In captive animals, preventative measures should focus on limiting coccidia burdens through appropriate husbandry practices. These include housing animals at low densities, regularly removing faeces and using well-draining substrates to reduce oocyst build-up in enclosures; and reducing other risk factors, such as through provision of species and age-appropriate nutrition and minimising stressors [3].

Routine faecal screening at appropriate time intervals is recommended to monitor coccidia burdens in marsupials in wildlife hospitals and rehabilitation facilities. Prophylactic treatment may be required in the presence of large oocyst burdens or other risk factors [1, 3].

Research

Further work is recommended to:

- ascertain the pathogenicity of individual species of *Eimeria* in different species of marsupial
- confirm the host specificity of coccidian species
- describe unknown coccidian species in marsupials

Surveillance and management

Wildlife Health Australia administers Australia's general wildlife health surveillance system, in partnership with government and non-government agencies. Wildlife health data is collected into a national database, the electronic Wildlife Health Information System (eWHIS). Information is reported by a variety of sources including government agencies, zoo-based wildlife hospitals, sentinel veterinary clinics, universities, wildlife rehabilitators, and a range of other organisations and individuals. Targeted surveillance data is also collected by WHA. See the WHA website for more information https://wildlifehealthaustralia.com.au/Our-Work/Surveillance and https://wildlifehealthaustralia.com.au/Our-Work/Surveillance/eWHIS-Wildlife-Health-Information-System.

There are currently no targeted surveillance programs for coccidiosis in marsupials. We encourage those with laboratory confirmed cases of this condition in native Australian or feral animals to submit this information to the national system for consideration for inclusion in the national database. Please contact us at admin@wildlifehealthaustralia.com.au.

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Wildlife Health Australia recognises the Traditional Custodians of Country throughout Australia. We respectfully acknowledge Aboriginal and Torres Strait Islander peoples' continuing connection to land, sea, wildlife and community. We pay our respects to them and their cultures, and to their Elders past and present.

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