Leishmaniasis in Australian wildlife

Fact Sheet

July 2025

Key points

- Leishmaniasis describes a variety of disease syndromes caused by the protozoan parasite *Leishmania*.
- Australia was considered to be free of leishmaniasis until 2003, when the first case of locally acquired disease, caused by *Leishmania (Mundinia) macropodum*, was diagnosed in a group of captive red kangaroos (*Osphranter rufus*) in the NT.
- Day-feeding midges may play a role in transmission of the parasite in the Australian context, in contrast to *Leishmania* transmission in other areas of the world, where sand flies are the major vector.
- Other aspects of the epidemiology of *Leishmania* in Australia, including the mammalian reservoir hosts, remain unclear.
- Infection with *Leishmania* spp. is a nationally notifiable disease; you must notify animal health authorities if you suspect an animal has *Leishmania* (see *Surveillance and management* below).

Aetiology

Leishmaniasis is caused by intracellular protozoan parasites belonging to the family *Trypanosomatidae*, genus *Leishmania* [1]. There are around 30 *Leishmania* species, with at least 20 species pathogenic to humans [2]. The novel and distinct strain that causes skin disease (cutaneous macropod leishmaniasis) in macropods in Australia is *L. macropodum*, a member of the *Mundinia* subgenus [3].

One Health implications

Wildlife and the environment: to date, macropods are the only wildlife species confirmed to acquire leishmaniasis in Australia and disease reports are rare. Wider ecological impacts of *L. macropodum* are unlikely [4].

Domestic animals: overseas, most clinical *Leishmania* cases have been reported in dogs, with occasional reports of illnesses in other domestic animals. Leishmaniasis is not a significant disease in livestock [2]. In Australia, only a small number of imported dogs have been diagnosed with leishmaniasis [5]. *Leishmania macropodum* is not known to infect domestic animals, livestock or humans in Australia.

Humans: there have been no reports of locally acquired leishmaniasis in humans in Australia. Overseas, leishmaniasis is one of the world's most significant parasitic diseases, with approximately

two million new cases occurring in humans around the world each year**.** Parasitism in humans can cause a chronic spectrum of disease including cutaneous, muco-cutaneous (involves both skin and mucous membrane) and visceral (spreads to organs) leishmaniasis which may lead to death if left untreated. *Leishmania macropodum* antibodies have been detected among human blood donors in the *L. macropodum* endemic region of Australia, however this test may lack accuracy and the human health significance of this finding remains unclear [6].

Natural hosts

There may be one or more mammalian reservoir hosts for each species of *Leishmania*. A few *Leishmania* species are maintained primarily in humans, but most circulate in animals [2]. In other parts of the world, rodents, small mammals and canids are common reservoirs of *Leishmania* infection in endemic countries. Domestic dogs also play a significant role in transmission in the urban environment [7]. There is evidence to suggest that marsupials (opossums) may be a significant natural host in the Americas [2, 8] as may the red fox (*Vulpes vulpes*) in Europe [9, 10].

It has been suggested that one or more native macropod species may be natural reservoirs of *L. macropodum* in the NT [11] (see below). Visceral leishmaniasis caused by *L. infantum* was reported in a captive red-necked wallaby in Spain [12].

World distribution

Leishmania spp. have been found on every continent except Antarctica, and are most prevalent in tropical and sub-tropical regions [2]. Human leishmaniasis is endemic in 88 countries around the world [1, 13] and particularly in developing countries of Africa, Asia and South America [14, 15].

Leishmania macropodum isolated from macropods and midges in Australia has not been described elsewhere in the world [16].

Occurrences in Australia

Until recently, leishmaniasis in macropods had only been reported from a limited geographical area of northern Australia [4]. *Leishmania macropodum* has been isolated from skin lesions of captive red kangaroos, northern wallaroos (*O. robustus*), black wallaroo (*O. bernardus*) and agile wallabies (*Notamacropus agilis*) in the NT. Lesions have primarily been reported in captive facilities, more than 20 km apart, with only one case being reported in a free-living agile wallaby in the same area [11, 17, 18].

Leishmania macropodum was recently detected for the first time in captive quokkas (*Setonix brachyurus*) in Qld, where captive agile wallabies were also housed [19].

Epidemiology

The epidemiology of *Leishmania* in Australian wildlife remains largely unknown, although it is considered likely that it is endemic to the tropical region of the NT [11]. Studies in the NT to determine the vector for Australian *Leishmania* found no evidence that phlebotomine sand flies acted in this role. Rather, an unnamed species of day-feeding midge from the subgenus *Forcipomyia* (*Lasiohelea)*, family *Ceratopogonidae* and possibly a similar species, *F. (L.) peregrinator*, show

compelling evidence as vectors for Australian leishmaniasis. Australian *Leishmania* transmission appears unique, as globally *Leishmania* are transmitted between mammalian hosts by phlebotomine sand fly vectors.

Previous risk assessments regarding incursions of exotic *Leishmania* into Australia were based on the premise that no suitable sand fly species existed in Australia to act as vectors. *Forcipomyia* (*Lasiohelea)* species are known to bite humans, and these insects are considered to have the potential to act as vectors for other species of *Leishmania*, raising the possibility that imported pathogenic *Leishmania* could become endemic in Australia [20].

Cutaneous leishmaniasis was first described in captive red kangaroos in greater Darwin area of the NT and has since been reported in other captive adult and juvenile macropods from the same region and in captive quokkas in Qld [11, 19]. One case has been reported in a free-living agile wallaby, living in close proximity to the fence of the wildlife park where captive cases were seen [18]. Anecdotal reports suggest clinical disease has also been seen antilopine wallaroos (*O. antilopinus*).

The mammalian reservoir host(s) for Australian *Leishmania* are yet to be identified, although it has been suggested that one or more species of macropod native to the Darwin area (including the most numerous species, the agile wallaby) are likely to serve as natural reservoirs [11]. There is serological evidence of exposure in agile wallabies and antilopine wallaroos across the Darwin rural area of the NT [21].

It has been suggested that certain species of captive macropods may be incidental hosts, such as red kangaroos, black wallaroos and northern wallaroos, in which clinical disease may manifest due to a naivety to infection and subclinical stress [22]. In juvenile agile wallabies, lesions were less severe and resolved more quickly, suggesting this species may have a lower susceptibility to clinical disease [11]. Lesions were noted to be severe in the one case reported in a wild, adult agile wallaby [18]. In general, clinical severity is noted to increase in the tropical wet season [17].

Morbidity rates in macropods have not been reported. Mortality related to Australian *Leishmania* has not been reported. The significance of locally acquired leishmaniasis in macropods in Australia is not known.

Given that marsupials and canids play a significant role in the transmission of *Leishmania* in endemic countries, it is possible that native marsupials, foxes, dingoes and domestic dogs may play a similarly important role in Australia. Experimental infection of both the common brushtail possum (*Trichosurus vulpecula*) and common ringtail possum (*Pseudocheirus peregrinus*) with *L. donovani* demonstrate the potential for these species to become reservoir hosts [23].

Clinical signs

In macropods in Australia, clinical signs have been limited to skin lesions (cutaneous leishmaniasis). Affected animals typically exhibit areas of thickened skin or raised pale nodules, with variable degrees of crusting and ulceration. Lesions may be itchy. Lesions may be restricted to the nose, ears, tail, limbs and occasionally the cloaca. While chronic in nature, lesions sometimes self-resolve [11, 17].

Outside Australia, most mammalian reservoirs of *Leishmania* are well adapted to infection, remaining asymptomatic or exhibiting only mild skin lesions that may persist for years, but cause little harm [7]. Dogs are an exception, as they develop visceral leishmaniasis and eventually die if left untreated. There have been no reports of visceral leishmaniasis in Australian wildlife.

Diagnosis

Confirmation of leishmaniasis requires demonstration of the parasite. Culture of the parasite from aseptically collected biopsies and fine needle aspirates using an appropriate blood agar-based medium, such as Novy, McNeil and Nicolle (NNN) medium, is the diagnostic gold standard, however this specialised testing is generally limited to research laboratories [17, 24].

Leishmania organisms may be visualised by histological examination of stained smears from skin scrapes, tissue biopsies and fine needle aspirates of the margins of suspect lesions. Polymerase chain reaction (PCR) is used to detect parasite DNA within infected tissue or in the blood. A generic *Leishmania* spp. PCR may detect the organism, with speciation as *L. macropodum* performed through sequencing of the PCR product. Alternatively, a PCR specific to *L. macropodum* has been developed [11]. PCR can be undertaken on fresh, frozen or ethanol fixed tissue biopsies and fine needle aspirates.

Serology can also be used to detect anti-leishmanial antibodies [17]. The indirect fluorescent antigen test and enzyme-linked immunosorbent assay (ELISA) are most commonly used for this purpose [24]. However, false positive results to serological tests detecting antibodies to *Leishmania* spp. are a recognised limitation (6).

Detailed information on diagnostic laboratory procedures can be obtained through the *Manual of diagnostic tests and vaccines for terrestrial animals* [24].

Pathology

Histopathology reveals a variable range of host inflammatory responses ranging from lympho-plasmacytic to granulomatous cellular infiltrates within the dermis. Other observations include epidermal hyperplasia, coagulation necrosis, ulceration and associated suppurative inflammation. Biopsies reveal infiltration of the superficial and/or dermis with clustering of macrophages, containing single celled organisms, confirmed to be *Leishmania* amastigotes [11, 17].

Differential diagnoses

Differential diagnoses of leishmaniasis in Australian wildlife are likely to include other causes of nodular, hairless skin lesions such as sarcoptic mange, ringworm and dermatitis.

Treatment, prevention and control

Treatment is available for leishmaniasis in humans and dogs. Safety and efficacy of treatments for Australian leishmaniasis in macropods is not known. In juvenile agile wallabies, the lesions were self-resolving and did not require treatment [4].

Prevention focuses on avoidance of bites from insect vectors in known *Leishmania* localities. Global methods of control are largely limited to treatment or destruction of animal reservoirs, treatment of infected humans and management of sand fly populations. Development of an effective vaccine against leishmaniasis has been largely unsuccessful.

Research

Research questions include:

- What is the confirmed vector and identified reservoir species for Australian *Leishmania*?
- What is the ability of the midge *Lasiohelea* spp. to act as vectors for other species of *Leishmania*?
- What is the potential for an introduction of an exotic species of *Leishmania*, given the presence of an apparently novel vector in the NT?
- What is the potential for zoonotic transmission of *Leishmania* in Australia? [16].
- What is the natural host range, and geographic extent of *Leishmania* infection in Australian wildlife?

Surveillance and management

Leishmania is a WOAH listed disease [25, 26]. Infection with *Leishmania* spp. is a nationally notifiable disease (see www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/notifiable). By law you must notify animal health authorities in your jurisdiction if you know or suspect that an animal has a notifiable pest or disease. Refer to advice in your jurisdiction (www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/state-notifiable) and on outbreak.gov.au on how to report.

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.

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. Negative data are also valuable. If you can help, 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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