Uncinaria hookworm in Australian sea lion pups

Fact Sheet

September 2025

Key points

- Hookworm infection caused by *Uncinaria sanguinis* causes significant disease and mortality in Australian sea lion pups.
- Pups acquire infection through larvae ingested via the mother's milk, soon after birth.
- In screened populations, there is 100% prevalence of infection in pups aged between 11 days and 2-3 months, with natural elimination of infection by around 3 months of age.
- Hookworm infection causes haemorrhagic diarrhoea, anaemia, reduced body condition and growth rates, with death in some pups.
- Hookworm infection increases susceptibility of pups to other causes of death, including trauma by conspecifics and starvation.

Aetiology

Hookworm infection in Australian sea lion pups (*Neophoca cinerea)* is caused by *Uncinaria sanguinis,* a species of blood-sucking roundworm in the Family *Ancylostomatidae* [1].

One Health implications

Wildlife and the environment: *Uncinaria sanguinis* causes clinical disease and sometimes death in Australian sea lion pups [2, 3] and there is evidence that this disease could contribute to limiting the growth of Australian sea lion populations [4].

Humans and domestic animals: there is evidence of a single human case of cutaneous larva migrans acquired through an existing skin lesion in a researcher [5]. There is no evidence of risk to domestic species.

Natural hosts

Uncinaria sanguinis is only reported in Australian sea lions. Evidence suggests that 100% of pups are infected soon after birth.

Hookworm infection by *Uncinaria* spp. is common in other pinniped species and causes disease of varying severity in pups.

World distribution

This species of hookworm only occurs in the habitat of the Australian sea lion which extends from the Abrolhos Islands in WA to The Pages Islands in SA [6].

Occurrences in Australia

Uncinaria sanguinis has been detected in faecal samples from Australian sea lion pups at 16/17 colonies sampled in SA [7]. It is expected that prevalence of infection is similar for all colonies.

Epidemiology

The life cycle of *U. sanguinis* [4] is similar to that for *Uncinaria* spp. in other sea lion and fur seal species. Infection is acquired through transfer of larvae in the milk soon after birth; eggs are shed in the pup's faeces from 11-14 days of infection (patent infection), and free-living hookworm stages (eggs and larvae) can survive in the environment for months to years under suitable conditions [4]. Free-living larvae are likely to be present in the colony substrate for at least six months during each 18-month Australian sea lion breeding cycle [4]. Individuals become infected when the free-living larvae invade through the skin [4] and migrate to the tissues of the ventral abdomen [8-10]. In adult females, these larvae migrate to the mammary tissues prior to birth, with larvae then transmitted to the pup via the milk [9]. Infection prevalence of 100% is reported in pups between 11-14 days and 2-3 months of age (patent infection) after which infection is naturally eliminated either through development of pup immunity against the parasite and/or worm death [4].

Infection through the faecal-oral route is not seen in Australian sea lion pups and pups do not become re-infected through the milk after the first transfer of larvae soon after birth [4].

Clinical disease is reported in all pups with hookworm infection; disease severity is dependent on numbers of adult hookworms in the small intestine. Both juvenile and adult hookworms can cause disease in pups [4, 11]. In addition to clinical disease, hookworm may cause death, with 16% of pup deaths at Seal Bay, Kangaroo Island due to hookworm disease [11]. Dead pups had a high intestinal burden of adult hookworms [4].

Hookworm infection is also an important factor for comorbidity. Pups with hookworm infection are 3 and 18 times more likely to die with conspecific trauma and starvation, respectively, compared to non-infected pups. Elimination of hookworm, through treatment early in the pup's life, significantly reduces the overall mortality from other causes [11].

Clinical signs

Common clinical signs of hookworm infestation observed in free-ranging Australian sea lion pups include:

- profuse haemorrhagic diarrhoea
- reduced growth (body length and weight)
- reduced body condition
- lethargy and depression, reduced activity.

Increased susceptibility to conspecific aggression and trauma is also seen in pups with clinical signs.

Diagnosis

Faecal samples (up to 1 g) can be collected using a sterile lubricated swab, from the rectum of live or dead pups, or from the colony substrate. Samples should be stored at 4°C or -20°C. A direct faecal smear is used to detect the presence of hookworm eggs [3, 4] and faecal flotation can count the number of eggs per gram of faeces (EPG) [4]. However, the number of adult worms in the intestine cannot be estimated from the faecal egg count [4].

In dead pups, diagnosis can also be made by observing adult hookworms in the small intestine during necropsy, with or without evidence of gross pathology, which will be dependent on adult hookworm burden.

Clinical pathology

Hookworm infection in Australian sea lion pups results in regenerative anaemia, due to blood loss from the small intestine [2, 3]. Non-regenerative anaemia has also been seen [12]. Both low [2] and high [3, 13] total protein concentrations have been seen in infected pups, likely reflecting age differences and the host inflammatory response [3, 13]. The inflammatory response to hookworm infection is characterised by lymphocytosis and eosinophilia [2, 3].

Pathology

Gross necropsy findings in hookworm disease include moderate to severe adult hookworm burden in the small intestine (mainly jejunum) and intestinal haemorrhage seen as either haemorrhagic intestinal contents or multifocal petechiae and ecchymoses of the intestinal serosa [11]. Prominent lymphoid tissue (Peyer's patches) is also noted [14]. Other necropsy findings include enlargement of abdominal lymph nodes (mesenteric, ileocolic and colic nodes), and reduced or emaciated body condition. Intestinal perforation with peritonitis has been reported in a small number of pups [11].

Microscopically, moderate to marked enteritis with erosion and ulceration of the mucosa, eosinophilic, lymphocytic and neutrophilic inflammation, and haemorrhage of varying severity is reported in the small intestine with the majority of the changes in the jejunum [11]. Additionally, multifocal hookworm feeding tracts with associated inflammation and haemorrhage extend from the lamina propria into the submucosa and in some cases, to the muscular tunics [11]. Extension of these feeding tracts to the serosa is seen in cases of intestinal perforation [11].

Differential diagnoses

Differential diagnoses for anaemia in Australian sea lions include haemorrhage secondary to conspecific trauma [11], and infestation with the sucking louse, *Antarctophthirus microchir*. However, lice infestation has only a minor role in the development of neonatal anaemia in hookworm-infected pups [2].

Treatment

Any intervention must weigh the benefits to the individual (improved health, survival and welfare) against the potential risks, including the impact of researcher presence on colonies, development of parasite resistance to treatment, the environment and changes to the host-pathogen relationship [15].

Subcutaneous injection and topical (pour on) administration of ivermectin [2, 3, 13] have been used in free-ranging Australian sea lions in SA. Both were equally and highly effective in clearing infection and there were no adverse reactions to treatment [13]. Similar treatment has been undertaken in captive individuals.

Prevention and control

Due to the long-term survival of the tissue and free-living parasite stages, elimination of infection in free-ranging populations is not feasible, although there is the potential to reduce the numbers of free-living stages in the colony substrate by eliminating early infection in pups [16]. This would require a prolonged and systematic treatment program which has not been implemented to date.

Research

Current research aims to:

- determine the prevalence of hookworm infection across the species' geographical range to address knowledge gaps of hookworm presence
- monitor the long-term survival of individuals treated for hookworm as pups
- evaluate the feasibility and effectiveness of eliminating hookworm in pups at remote colony sites
- monitor the contribution of hookworm infection to clinical disease and death in Australian sea lion pups across the geographical range
- evaluate the impact of anthropogenic toxicants on the immune response to hookworm infection.

Surveillance and management

Ongoing surveillance work, for prevalence of infection and disease impacts, and treatment trials are being undertaken by university-based researchers in SA and WA Australian sea lion colonies.

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.

Acknowledgements

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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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Email: **admin@wildlifehealthaustralia.com.au**

Or call +61 2 9960 6333