Macracanthorhynchus ingens infection in a dog

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Macracanthorhynchus ingens is typically a parasite of raccoons, wolves, badgers, foxes, skunks, and mink but is uncommon in dogs.

Transmission to dogs from wildlife may occur via ingestion of an infected millipede intermediate host.

Diagnosis may be made by examination of the parasite's unique morphologic features and spindle-shaped eggs.

A 4-month-old 17.0-kg (37.4-lb) sexually intact female Siberian Husky was brought to a veterinary hospital in Memphis, Tenn, for evaluation of a live flesh-colored helminth with annular wrinkles that covered the parasite's entire length; the owner had noticed the parasite in the dog's feces. The helminth was 8.0 cm in length and 0.6 cm at its widest point; the helminth was placed in neutral-buffered 10% formalin and submitted to a diagnostic laboratory. The dog had been housed outdoors in a suburban environment. The dog was owned by a breeder of Siberian Huskies and was from a litter of 9 puppies that had been born on the premises. All other littermates had been placed in new home environments; however, 6 other adult dogs resided in the home environment. None of the littermates or the other dogs in the home had similar parasites.

The owner reported a wide variety of wildlife species in the dog's suburban environment, including raccoons, opossums, squirrels, chipmunks, and mice. Millipedes were often observed in the backyard, especially during the evening hours and after periods of rainfall. Milbemycin oxime had been administered to all adult dogs at monthly intervals, whereas all puppies received ivermectin prior to departing their new homes.

The dog had diarrhea, but examination of a direct fecal smear and a fecal flotation sample did not reveal helminth ova or protozoan cysts. Examination of the dog's feces revealed the parasite Macracanthorhynchus ingens (thorny- or spiny-headed worms). The dog was treated empirically with a single dose of ivermectin' (250 µg/kg [114 µg/lb]); this treatment was repeated 14 days later. A final specimen of M ingens was observed 43 days after the first parasite had been observed; at this time, the dog was treated with ivermectin at 500 µg/kg (227 µg/lb) once daily for 5 days. This product was administered because it was the only product found to be effective against Macracanthorhynchus spp. The dosage regimen was repeated once 3 weeks later. Further parasites were not detected; the last 3 parasites detected were submitted in neutral-buffered 10% formalin to a diagnostic laboratory.

The first parasite was bisected longitudinally, processed routinely for microscopic examination, and stained with H&E. The parasite was pseudosegmented, had a cuticle and a thick hypodermis (felted layer), and lacked a digestive tract. Underlying the hypodermis was a thick layer of muscle fibers containing large lacunar channels oriented perpendicular to the long axis of the body. An outer circular layer and an inner longitudinal layer of somatic muscle lined the body cavity. In addition, a male gonad was evident.

Proboscides could not be identified among the other 3 specimens by use of a dissecting microscope; they were theorized to have retracted during formalin fixation. The body wall of the largest parasite was punctured to allow the eggs, which are contained within the body cavity, to flow into the liquid medium containing the parasite. The liquid medium was collected and subjected to centrifugal flotation in water (343.8 × g) and in Sheather solution (25.6 × g); eggs were examined by use of a compound microscope (Fig 2). The eggs had a multilayered shell; the second coat was dark brown and pitted. Mean length of 10 eggs was 91 µm (range, 90 to 95 µm), and mean width was 54 µm (range, 50 to 60 µm). Parasite identity was also confirmed at a third laboratory.

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Macracanthorhynchus hirudinaceus is a well-known parasite of pigs, and 2 species of acanthocephalans are parasites of canids in North America. *Oncicola canis*, a parasite commonly found in coyotes, has been recovered from a dog in Mexico City and from dogs in New York. *Macracanthorhynchus ingens* also has been reported in dogs in New Jersey, Kansas, and Tennessee. Typical definitive hosts for *M. ingens* are raccoons, wolves, badgers, foxes, skunks, opossums, mink, bears, and moles. *M. ingens* is not commonly found in domestic dogs, although pseudoparasitism with *M. hirudinaceus* has been reported.

To the authors’ knowledge, natural infection with *M. ingens* in a domestic dog in the United States has only been reported twice. Raccoons are the principal definitive hosts, and *M. ingens* has been recovered from Tennessee raccoons. Earlier reports also noted the presence of this acanthocephalan in dogs and raccoons from Kansas.

The life cycle of *M. ingens* is that of a typical acanthocephalan, using an arthropod intermediate host. Adult acanthocephalans are found within the small intestine of the definitive host and have unique histologic characteristics including absence of a digestive tract, a hypodermis that is thicker than the muscle layers, lacunar channels, and specialized structures such as lemnisci and a spiny proboscis. Eggs are ellipsoidal (90 to 106 X 53 to 59 μm) and dark brown. There are 3 types of eggs: eggs with a mottled brown middle coat, eggs with an incomplete middle coat at 1 end, and eggs with a lacy middle membrane with strands forming elongate fields oriented parallel to the long axis of the egg.

Millipede (*Narcus americanus, N. annularis*) intermediate hosts ingest the eggs, and the definitive host becomes infected by ingesting a millipede containing the infective cystacanth stage of the parasite or by ingesting a paratenic intermediate host, such as a rodent or a snake, containing encysted cystacanths. After ingestion, the cystacanth hatches in the small intestine of the host, attaches its retractable proboscis deep into the intestinal wall, and matures to the adult stage. Acanthocephalans lack a digestive tract and absorb nutrients through the integument.

The prepatent period for *M. ingens* infection in dogs is 5 to 7 weeks, and mean life span of the adult parasite is 23 days (range: 1 to 49 days). *Macracanthorhynchiasis* in dogs has been associated with periodic blood-tined diarrhea but does not cause measurable growth retardation. Experimental infection with *M. ingens* in dogs has been reported; the parasites cause circular mucosal ulcerations that are 1 mm in diameter and depth with edema, abscession, and eosinophilic inflammation but without small intestinal perforation.

Although treatment for *M. ingens* infection with anthelmintics has not been reported in dogs, ivermectin has been used against *M. hirudinaceus* in swine. At a concentration of 100 μg/kg (45.5 μg/lb) per day in medicated feed, efficacy was 100%. For the dog reported here, empirical treatment with ivermectin was attempted because of lack of data regarding efficacious anthelmintics for treatment of *M. ingens*; clinical signs resolved after treatment.

References


