Canine Schistosomiasis in North America: An Underdiagnosed Disease With an Expanding Distribution

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Heterobilharzia americana, a digenean trematode in the family Schistosomatidae, is the etiologic agent of canine schistosomiasis in the southeastern United States.1 A few cases of canine schistosomiasis have been reported in Florida, Louisiana, North Carolina, Texas, and, recently, Kansas.1–6 The natural definitive host for the fluke is the raccoon; however, infections have been detected in nutrias, bobcats, mountain lions, opossums, white-tailed deer, swamp rabbits, armadillos, coyotes, red wolves, red wolf–coyote crosses, Brazilian tapirs, minks, and beavers.7

Geographic Distribution

The geographic distribution of H. americana is believed to be restricted to the south Atlantic and Gulf Coast states (Alabama, Florida, Louisiana, Georgia, North Carolina, South Carolina, Virginia, Mississippi, Texas) due to the environmental requirements of its intermediate host, the freshwater snail Lymnaea cubensis; however, H. americana infections have been reported in indigenous raccoons and three companion dogs in Kansas.3 These cases are likely due to introduction of the fluke with raccoons translocated from Florida before 1983 and transmission by a freshwater snail, Pseudosuccinea columella, experimentally shown to support development of H. americana.5,10 Both L. cubensis and P. columella are present in Oklahoma,11 although schistosomiasis in indigenous dogs or raccoons has not been reported there. P. columella, a North American lymnaeid, has spread worldwide through the trade and transport of aquatic plants.12 L. cubensis is known to be distributed in Florida, Georgia, Louisiana, Texas, Mexico, South America, and the West Indies; it has also been found in Oklahoma.11

A retrospective study conducted in Texas discovered a higher rate of H. americana infection in dogs than the previous literature seems to reflect, with a broader distribution than along the Gulf Coast.13 Within a 4-year consecutive period, 127 cases were confirmed in 25 of 254 counties in Texas. Distinct clusters of cases were found along the Gulf Coast and associated with major urban populations. These findings indicate that canine schistosomiasis is not a rare disease and that the distribution of the trematode in Texas has expanded. Another retrospective study of 22 naturally infected dogs in Texas found the infection in younger, larger-breed, indoor dogs that had occasional access to the outdoors. Often, multiple animals in a house-

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14 Cases have also recently been identified in Alabama, Georgia, North Carolina, and Tennessee. 

**Life Cycle**

Dogs and wildlife are exposed to *H. americana* while wading or swimming in freshwater areas such as marshes, mud flats, and canals. Cercariae discharged from infected snails penetrate the host’s skin. The immature schistosomes (schistosomula) first migrate through the body to the lungs, where they are associated with hemorrhage. They are then carried to the liver, where they develop into adult male and female flukes. The adults move into the mesenteric veins, mate, and deposit nonoperculated, spineless eggs. The eggs penetrate venules to enter the intestinal wall and are shed into the intestinal lumen. If the eggs reach fresh water, they rapidly hatch, releasing ciliated miracidia.

**Diagnosis and Treatment**

Eggs that have been hematogenously disseminated to visceral organs or the intestinal wall provoke a severe granulomatous reaction responsible for most of the clinical signs and pathology. Initially, a papular vesicular rash and coughing may be noted. Chronic diarrhea, characterized as mucoid to hemorrhagic, develops and progressively becomes more severe. Fever, anorexia, hypersalivation, lethargy, and weight loss may also be noted. Anemia, dehydration, hyperglobulinemia, hypoalbuminemia, hypercalcemia associated with elevated parathyroid hormone–related protein levels, and eosinophilia are common clinicopathologic findings in infected dogs. Elevated serum alkaline phosphatase, aspartate aminotransferase, and alanine aminotransferase activities may also be evident. Eggs are not likely to float with centrifugal flotation; examination of direct saline smears and sedimentation of feces facilitate the detection of *H. americana* eggs. A miracidia hatching technique that involves resuspending eggs sedimented in saline with deionized water can be employed to verify egg identification. An antigen capture ELISA for schistosome circulating anodic antigen and a

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*Personal communications: Byron Blagburn, MS, PhD, Auburn University; Dana Ambrose MS, University of Georgia; Anne Zajac, DVM, PhD, Virginia Tech; and Sharon Patton, MS, PhD, University of Tennessee; October 2009.*

*Available from North Carolina State University College of Veterinary Medicine by request.*

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**FIGURE 1**

*Heterobilharzia americana* egg (magnification: 400×).

**FIGURE 2**

Miracidium hatching from an egg in deionized water (magnification: 400×).

**FIGURE 3**

Gastroendoscopic photographs. (A) Healthy small intestine. (B) Small intestine of a dog infected with *H. americana*, demonstrating the thickened, corrugated appearance of the luminal surface of the intestinal wall.
polymerase chain reaction assay for *H. americana* are also available for diagnosis.\(^7\)

Infections in dogs have been treated with high-dose praziquantel (25 mg/kg PO bid or tid for 2 to 3 days) or fenbendazole (40 mg/kg PO sid for 10 days).\(^3\) Treatment may result in complete cure or resolution of clinical signs, or it may be ineffective. The protracted course of the disease, poor response to treatment, and diagnostic challenges often lead to euthanasia. Many of the clinical signs and the hypercalcemia associated with elevated parathyroid hormone–related protein levels detected in some cases of canine schistosomiasis are more commonly associated with tumors, endocrine disorders, and other infectious granulomatous diseases.\(^3\)

Some infections are secondary findings in animals with neoplasms.\(^14\) Expensive and invasive procedures may be required to rule out these conditions. Therefore, the definitive diagnosis of schistosomiasis is often delayed, as is initiation of appropriate therapy.

**Conclusion**

Increased awareness of canine schistosomiasis and implementation of appropriate diagnostic parasitology tests in dogs with chronic diarrhea, especially in the southeastern United States, should improve early detection of *H. americana* infections and could improve therapeutic outcomes. The limited number of reported cases in dogs is incongruent with the high prevalence reported in the natural host (raccoon) and the broad range of naturally infected hosts.\(^7\)

Geographic distribution of the snail intermediate hosts seems to be expanding.\(^11,12\) These factors suggest that canine infections with *H. americana* are often not detected because routine parasitologic examinations do not include the fecal sedimentation technique or because owners choose euthanasia after exhaustive diagnostic testing fails to determine the etiology of clinical disease.

**Key Points**

- Canine schistosomiasis is a debilitating and often fatal parasitic disease of dogs in the southeastern United States.
- Clinical signs and clinicopathologic findings are nonspecific and often mimic other diseases.
- Clinical signs may include anorexia, lethargy, weight loss, and chronic mucoid to hemorrhagic diarrhea.
- Clinicopathologic findings may include anemia, hyperglobulinemia, hypoalbuminemia, hypercalcemia, elevated serum parathyroid hormone–related protein levels, and elevated serum alkaline phosphatase, aspartate aminotransferase, and alanine aminotransferase activities.
- Abdominal radiography may detect enlargement of the liver, spleen, and lymph nodes and thickening of the intestinal wall.
- *Heterobilharzia americana* eggs do not float in standard fecal flotation solutions.
- Fecal sedimentation and direct saline smears are the tests of choice for detection of eggs.
- A polymerase chain reaction assay and an antigen capture ELISA are available for the diagnosis of canine schistosomiasis.

References


Available from Texas A&M University, College of Veterinary Medicine, Gastrointestinal Laboratory; www.cvm.tamu.edu/gilab/assays/Heterobilharzia%20americana.shtml.


