Physocephalus sexalatus (Nematoda: Spirurida: Spirocercidae) in Three Species of Rattlesnakes, Crotalus atrox, Crotalus lepidus, and Crotalus scutulatus, from Southwestern Texas

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ABSTRACT: Third-stage larval spirurid nematodes, Physocephalus sexalatus, were found to be infecting three species of rattlesnakes, Crotalus spp., from southwestern Texas. These roundworms were encysted in granulomas of the stomach of a western diamondback rattlesnake, C. atrox, a mottled rock rattlesnake, C. lepidus lepidus, and a Mojave rattlesnake, C. scutulatus. We report detailed histopathological information on the infection in C. l. lepidus. This is the first time P. sexalatus has been reported from C. l. lepidus and C. scutulatus. In addition, an oligacanthorhynchid acanthocephalan infected C. l. lepidus.

KEY WORDS: rattlesnakes, Crotalus spp., Acanthocephala, granulomas, nematoda, Physocephalus sexalatus.

INTRODUCTION


Larval nematodes were found encysted in granulomas of three species of rattlesnakes (Crotalus) from Texas. The hosts included a western diamondback rattlesnake, Crotalus atrox, a mottled rock rattlesnake, Crotalus lepidus lepidus, and a Mojave rattlesnake, Crotalus scutulatus collected in May 2001 from a site 8.0 km west of Alpine, Brewster County, Texas (29°38'N, 103°30'W). The snake that experienced the most severe infection (C. l. lepidus) had been previously donated to the Kentucky Reptile Zoo on 5 February 2002 and dewormed with 10 mg/kg Panacur® (Fenbendazole, Hoechst Aktiengesellschaft, Hamburg, Germany) intra-peritoneally and left anterolateral body walls had dorsoventral lip-like projections running along the length of the larva. Microscopically, the cyst wall was made up of five to ten layers of loosely woven fibrocytes mixed with occasional histiocytes. The center of each granuloma contained an average of four to five transverse and longitudinal cross sections from a single larva surrounded by blue mucoid-like substances. Larval cross sections were 67 μm (range 50 – 80 μm) in diameter. The right and left anterolateral body walls had dorsoventral lip-like projections running along the length of the larva. Multifocal areas of submucosa were replaced by larger granulomas with central areas of necrosis. These granulomas also contained abundant inflammatory cell debris, gram positive and negative bacteria, and areas of mineralization, and larval fragments. A morphologic diagnosis of severe, multifocal granulomatous gastritis caused by the thick stomach worm, Physocephalus sexalatus (Molin, 1860) was made. Interestingly, the histopathology of gastric infection in these snakes was very similar to that caused by larval...
Figure 1. Third-stage larvae of Physocephalus sexalatus infecting C. l. lepidus. Larva showing characteristic knoblike process (arrow) which supports 14 - 20 digitiform processes. Scale bar = 40 μm.

Figure 2. Series of granulomas within gastric mucosa. Scale bar = 400 μm.

Figure 3. Closer view of granulomatous cyst in the stomach containing numerous larvae. Scale bar = 200 μm.

Figure 4. Higher magnification of granulomatous cyst showing concentric layers of connective tissue. Scale bar = 50 μm.

Physocephalus sp. in blue spiny lizards, Sceloporus serrifer, from southern Texas (Goldberg, et al., 1994) and physalopterid larvae in elapid snakes and lizards from Western Australia (Jones, 1995).

Physocephalus sexalatus is a cosmopolitan species and common parasite of wild and domestic pigs that is occasionally found in other mammals, including tapirs, equines, bovines, and lagomorphs (Anderson, 2000). Infective larvae have been recovered from tissues of 20 different genera of beetles and encapsulated larvae have been found in the tissues of amphibians, reptiles, birds and mammals, which typically ingest beetles (Anderson, 2000). Larvae hatch in the midgut of the beetle intermediate host and by 13 to 15 d after infection first-stage larvae are enclosed in spherical, thin-walled cysts located in the wall of the Malpighian tubules; two molts occur and cysts containing infective third-stage larvae are usually found free in the abdominal cavity (Olsen, 1974). Subsequent development of the larvae is dependent upon reaching a definitive host. However, numerous animals from all classes of vertebrates can serve as reservoir hosts; in these instances, upon digestion of the cyst wall freed third stage larvae migrate through the gut wall and re-encyst in various tissues, including heart, liver, spleen, and gonads (Olsen, 1974). Third-stage larvae are characterized by a digitiform knob at the tip of the tail (Figure 1) (Alicata, 1935).

The main food item of Crotalus lepidus are insectivorous lizards (Beaupre, 1995, Werler and Dixon, 2000). However, arthropod remains once considered secondary prey items that were first eaten by lizards, are now known to be normal prey items of the species but may not be regularly eaten (Kaufield, 1943). Unlike adult Crotalus atrox and Crotalus scutulatus, who have been reported to feed almost exclusively on small mammals (Beavers, 1976, Reynolds and Scott, 1982), lizards too are occasionally eaten by juvenile and smaller Crotalus spp. (Werler and Dixon, 2000).

This represents the first report of P. sexalatus from Crotalus l. lepidus and Crotalus scutulatus. Previous reports of this parasite from other snakes include the smooth snake, Coronella austrica, grass snake, Natrix natrix, and common viper, Vipera berus from Belarus (Shimalov and Shimalov, 2000), Dahl’s whipsnake, Coluber najadum and Aesculapian snake, Elaphe longissima from Bulgaria (Biserkov, 1995), and desert massasauga, Sistrurus catenatus edwardsii and C. atrox from New Mexico (Goldberg, et al., 2001, 2002b).

In addition to the nematode infection, an oligacanthorhychid acanthocephalan (USNPC 92421) was observed in tissues of C. l. lepidus. This is the second report of these parasites as oligacanthorhychid acanthocephalans have been previously reported from Crotalus atrox in Texas (Bolette, 1997a) and New Mexico (Goldberg, et al., 2002b), Crotalus lepidus in Arizona (Goldberg and Bursey, 1999a), and Crotalus scutulatus in Arizona (Bolette, 1997b).
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