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***Spiroxys contorta* (Nematoda: Spirurida) in Gastric Granulomas of *Apalone spinifera pallida* (Reptilia: Testudines)**

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ABSTRACT: Non-caseating granulomas containing larval spirurid nematodes (*Spiroxys contorta*) were observed in the gastric submucosa and muscularis externa of two pallid spiny softshells (*Apalone spinifera pallida*) from northcentral Texas (USA). In early granulomas, nematodes were not surrounded by a fibrous capsule but in older, mature granulomas, a fibrous capsule was present. Granulomas without nematodes also were present.

Key words: Nematoda, Spirurida, *Spiroxys contorta*, granuloma, pathology, pallid spiny softshell, Testudines, *Apalone spinifera pallida*.

Spirurid nematodes of the genus *Spiroxys* are common parasites of turtles of the world (Baker, 1987). Of the approximately 11 species known from turtles, five have been reported from softshell turtles (*Apalone* spp. and *Trionyx* spp.). The North American spiny softshell, *Apalone spinifera* has been reported to serve as host for three taxa, including *S. amydae* from Mississippi (USA) (Cobb, 1929; Hedrick, 1935a), *S. constricta* from Louisiana (USA) (Acholonu and Arny, 1970), and *S. contorta* (= *contortus*) from Michigan, Oklahoma, Ohio, Tennessee, and Texas (USA) (Harwood, 1932; Hedrick, 1935b; Rausch, 1947; McKnight, 1958; Limsuwan and Dunn, 1978). Hedrick (1935b) provided detailed information on larval *Spiroxys contorta* encapsulated in the stomach of the painted turtle (*Chrysemys picta*). Herein, we report on the histopathology of gastric granulomas associated with larval *Spiroxys contorta* in pallid spiny softshells (*A. spinifera pallida*).

Two subadult male *A. spinifera pallida* (carapace length = 160 to 180 mm) were collected by hand on 25 June 1989 from Georges Creek, Johnson County, Texas (32°19'N, 97°21'W). They were returned to the laboratory and killed with an intra-

peritoneal dose of 50 mg/kg sodium pentobarbital (Nembutal®, Abbott Laboratories, North Chicago, Illinois, USA). The entire gastrointestinal tract was removed and preserved in 10% formalin. White nodules in the stomach wall were grossly visible and representative tissues were excised and embedded in paraffin blocks. The paraffin blocks were sectioned at 5 µm, stained with hematoxylin and eosin, and mounted in Permount® (Fisher Scientific, Pittsburgh, Pennsylvania, USA).

Voucher specimens of turtles are deposited in the Arkansas State University Museum of Zoology, State University, Arkansas (USA) as ASUMZ 13386-13387. A representative slide of the parasite is on deposit in the United States National Parasite Collection, United States Department of Agriculture, Beltsville, Maryland (USA) as USNM Helm. Coll. No. 82606.

The nodules (Fig. 1) contained larval spirurid nematodes, *Spiroxys contorta*. Measurements and morphology of these larvae fit the description provided by Hedrick (1935b) for encysted larvae of *S. contorta* from the stomach of other turtles. Nematodes were surrounded by non-caseating granulomas in the gastric submucosa and muscularis externa. Newly formed granulomas consisted of macrophages, heterophils, occasional multinucleated giant cells, and cuffs of lymphoid cells. Larvae in these early granulomas were not surrounded by a fibrous capsule (Fig. 2). There were central areas of necrotic debris and eosinophilic coagulum.

In older, mature granulomas, *S. contorta* was surrounded by a fibrous capsule. Clusters of macrophages and heterophils were noted adjacent to the nematode cuticle. The bulk of each granuloma was



FIGURE 1. White nodules (granulomas) containing larval *Spiroxys contorta* (arrow) in stomach of *Apalone spinifer pallida*.

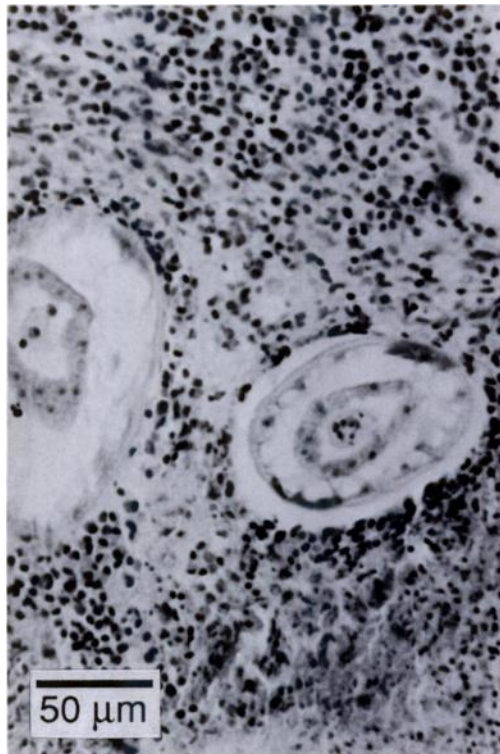


FIGURE 2. *Spiroxys contorta* larvae within newly formed granuloma in stomach of *Apalone spinifer pallida*. Nematodes are surrounded by a poorly organized population of macrophages, lymphoid cells, and heterophils. Note the adjacent area of necrosis and lack of fibrous capsule. H&E stain.

composed of concentric swirls of fibrous connective tissue and mononuclear cells, and was surrounded by dense cuffs of lymphocytes varying from approximately 5 to 50 cells (26 to 240 μm) in thickness. There were accumulations of necrotic debris and giant cells within the granulomas. The largest granulomas approximated 155 μm in diameter. We noted granulomas which lacked nematodes, but otherwise had the morphology typical of those granulomas containing nematodes.

Goldberg and Bursey (1989) reported that in the stomach of the sagebrush lizard (*Sceloporus graciosus*), *Ascarops* sp. were found in the submucosa within thin-walled granulomas which consisted of fibroblasts and macrophages. In addition, granulomas containing larval *Ascarops* sp. were found in the liver of the western fence lizard (*Sceloporus occidentalis*) by Goldberg and Bursey (1988). The structure of these granulomas was similar to those containing *S. contorta* in the present study.

Although the biology of *S. contorta* is well-known (Hedrick, 1935b), attempts to experimentally transmit *S. contorta* to turtles have not been successful (Anderson, 1992). Differences in host physiology have

been suggested as possible factors which make it difficult to experimentally infect turtles; also, the necessity to reside temporarily in a vertebrate paratenic host may be an essential part of the life cycle of *S. contorta* (Anderson, 1992).

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