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Pathogenesis of *Alloglossoides caridicola* (Trematoda) Infection in the Antennal Glands of the Crayfish *Procambarus acutus*

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The adult fluke *Alloglossoides caridicola* was described from the antennal glands (excretory organs) of crayfish, *Procambarus acutus*, in southern Louisiana (Corkum and Turner, 1977, Proc. Helminthol. Soc. Wash. 44: 176–178). No other definitive host has been reported for the parasite and its life cycle is unknown, but presumably involves only the crayfish and a molluscan intermediate host.

In proximal to distal arrangement, relative to urine flow, the crayfish antennal glands each consist of an end-sac and a cortical region, the labyrinth, which surrounds a medullary nephridial tubule. These three parts form a spongy-textured organ connected with a bladder, which in turn opens to the outside via an excretory pore (Maluf, 1939, Zool. Jahrb. Abt. Allg. Zool. Physiol. Tiere 59: 515–534).

The present study was undertaken to describe the pathogenesis of *A. caridicola* infection within the antennal glands.

Crayfish were collected in March 1984 from a roadside ditch near Rosedale in southcentral Louisiana. Antennal glands were removed from the body with forceps after breaking off the anterior cephalothorax at the base of the rostrum. Infected organs, including bladders, were fixed in Bouin's solution, prepared by routine histological procedures, serially sectioned at 7 μm, and stained with hematoxylin and eosin. Representative whole mount specimens of *A. caridicola* as well as two slides of sections from infected antennal glands have been deposited in the U.S. National Parasite Collection, Beltsville, Maryland 20705, USA (USNM Helm. Coll. No. 78574).

Specimens of *Alloglossoides caridicola* reside with most of their long slender bodies coiled, but unencysted, in a saccular dilatation of the nephridial tubule just medial to the labyrinth. The posteriors of small worms were often in the lumen of the labyrinth. The anteriors (oral sucker to genital pore) of worms were invariably

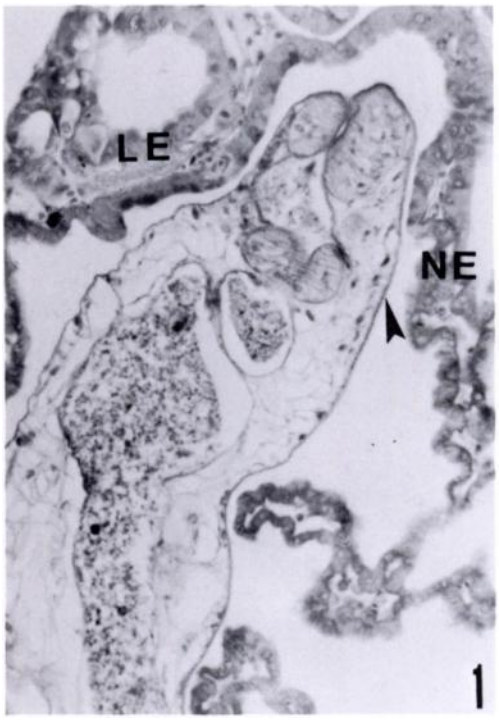

FIGURE 1. Sagittal section through anterior of a specimen of *Alloglossoides caridicola* in the nephridial tubule of a crayfish. Arrowhead indicates minute tegumental spines. LE, labyrinth epithelium; NE, nephridial tubule epithelium. H&E, ×125.

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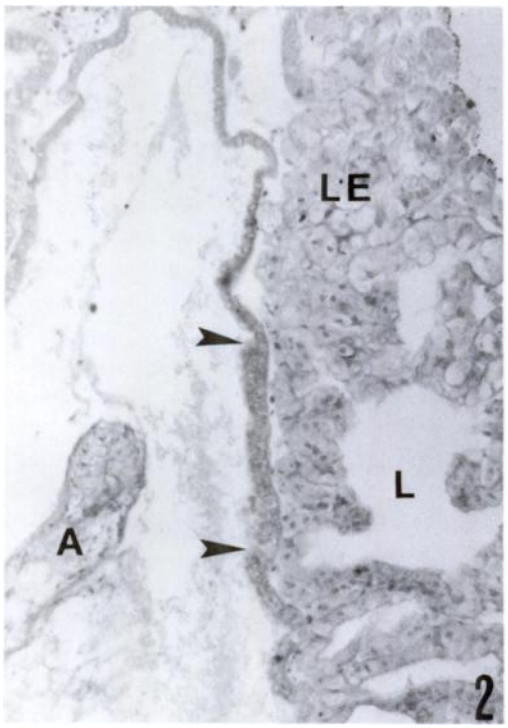

FIGURE 2. Section through anterior of small specimen of *Alloglossoides caridicola* (A) in nephridial tubule of a crayfish. Arrowheads indicate abrasion damage to tubule epithelium. L, lumen of labyrinth. H&E, ×125.

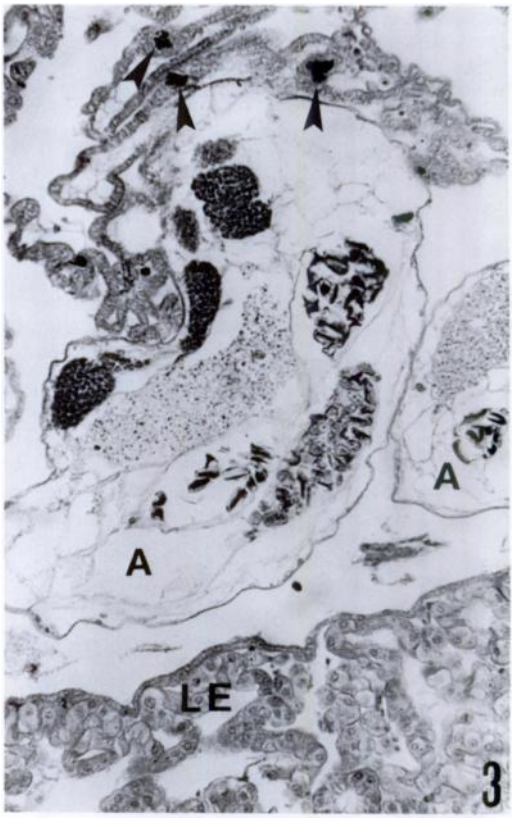

FIGURE 3. Sections through a specimen of *Alloglossoides caridicola* coiled in dilatation of nephridial tubule of a crayfish. Arrowheads indicate dark brown nodules beneath epithelium of tubule. H&E, ×125.

located in the lumen of the nephridial tubule (Fig. 1). There, worms used minute tegumental spines to abrade the tubule epithelium, thus causing lesions while feeding on the abraded tissue (Fig. 2). No host response was directed at the worms; however, small dark brown nodules (Fig. 3) of uniform size were occasionally found beneath the epithelium of the nephridial tubule. Nodules were associated only with infected crayfish and were absent from other regions of the organ. They appeared to form near sites of current abrasion and feeding where they were surrounded by hemocytes and were lighter in color than those nodules more distant from worm activity.

In a previous study, Turner (1984, Trans. Am. Microsc. Soc. 103: 434–437) described similar nodules in the antennal glands of *Procambarus clarkii* infected with the adult trematode *Allocorrigia filiformis*. Those nodules had clusters of trematode eggs in their centers, were more numerous, and tested positively for melanin, which was secreted by hemocytes. Although the nodules noted in the present study were not tested for melanin, they appeared identical in color, and hemocyte association with those reported from *P. clarkii*. While clusters of trematode eggs do not appear to serve as foci for these nodules, perhaps microorganisms that invaded through the damaged epithelium may be involved.

These infections result in a loss of tissue in the nephridial tubule. Each organ may harbor up to 10 worms, which have the effect of transforming it into a "hollow shell."

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Histopathology of Infections by *Learedius learedi* Price, 1934 and *Neospirorchis schistosomatoides* Price, 1934 (Digenea: Spirorchiidae) in Wild Green Turtles, *Chelonia mydas* L., from Bermuda

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Green turtles are known to harbor 10 species of spirorchid digeneans which parasitize the circulatory system (see review by Smith, 1972, Helminthol. Abstr. Ser. A41: 161–204). In this group from turtles, adults of three genera are known to release encapsulated embryos (eggs), which were first detected in 1861 (Smith, 1972, op. cit.) and which penetrate host tissues and elicit a focal inflammatory host response (Glazebrook et al., 1981, J. Comp. Pathol. 91: 361–368).

Although eggs of trematodes have been reported often in tissues of green turtles since 1861, there is apparently only one description of lesions associated with their presence in wild hosts, that of Glazebrook et al. (1981, op. cit.). Most reports are from either green turtles in aquaria (Smith and Coates, 1938, Zoologica 23: 93–98; Smith and Coates, 1939, Zoologica 24: 379–382) or mariculture facilities (Greiner et al., 1980, Proc. Helminthol. Soc. Wash. 47: 142–144).

Our study gives details of infections with the spirorchids *Learedius learedi,* and *Neospirorchis schistosomatoides* in wild green turtles from Bermuda and describes the histopathology of lesions caused by eggs of these parasites.

Between September and November 1981, five moribund green turtles were recovered from inshore Bermuda waters after storms. All were listless, weak and gulping vigorously. Copious viscous fluid was discharging from both mouth and nares. Respiration was rapid, but shallow. Both eyes were sunken into their sockets. Subcutaneous neck tissues were fluid-filled. We kept the turtles in aquaria for 24 hr after their capture, but as their health deteriorated they were killed and necropsied. Five other recently dead green turtles, collected from September to November 1980 and then frozen, and one killed by a boat and collected in a putrified condition in January 1983, were also examined. Mean carapace length and breadth for all the turtles was 43.2 ± 18 cm by 41.0 ± 17 cm, respectively.

The fatty layer underlying the plastron of the five turtles collected in 1981 was clear and jelly-like, a sign characteristic of mucoid degeneration (Wolke et al., 1982, J. Wildl. Dis. 18: 175–185). The lungs of two of these turtles had petechiae on the serosal surface and exuded a frothy fluid.

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