Occurrence and Pathology of Physalopterid Larvae Infections in Bobwhite Quail from Western Oklahoma

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Physalopterid larvae believed to be *Physaloptera* sp. were found in 5 of 64 bobwhite quail (*Colinus virginianus*) examined from northwestern Oklahoma. This is the first reported case of physalopterid infection in quail from Oklahoma. Embedded, yet unencapsulated, coiled larvae were recovered from the pectoral musculature and were associated with necrosis and a granulomatous reaction. The importance of gallinaceous birds in the transmission of this parasite is unknown. Controversy exists about identification of larvae and the role these birds play in the life history of physalopterid nematodes.

INTRODUCTION

Physalopterid nematodes are common stomach parasites of canids (1), felids (2), rodents (3, 4), skunks (*Mephitis mephitis*) (5), opossums (*Didelphis virginianus*) (6), raccoons (*Procyon lotor*) (7) and raptors (8) of the U.S.A. These nematodes apparently utilize orthopterans and beetles as intermediate hosts (9). Reports of infected passeriform and gallinaceous birds with *Physaloptera* sp. have been published (7, 10,11).

Controversy exists about the role of gallinaceous birds in the life cycle of *Physaloptera* sp. Cram (10) reported an encapsulated *Physaloptera* sp. larvae in the breast muscle of *C. virginianus* and suggested a requirement of two vertebrate hosts and an arthropod intermediate host. Campbell and Lee (12) found encapsulated *Physaloptera* sp. larvae in the breast muscle in 2/16 scaled quail *(Callipepla squamata pallida).* They suggested that the scaled quail is a paratenic host for a physalopterid having mammalian definitive hosts and ruled out the possibility that quail serve as a true intermediate host. Dixon and Roberson (7), reported encapsulated *Physaloptera* sp. in a *C.virginianus* and considered the infection aberrant. *Physaloptera* larvae infecting bobwhite quail have not been identified to species.

Although descriptions and keys are available for adult stages of these nematode species (13,14), comprehensive morphological descriptions of larval stages of all species in the family Physalopteridae are unavailable. Previous reports of *Physaloptera* sp. larvae in quail (7,10,12*)* were presumably made on the basis of distinguishing adult nematode characteristics, particularly adult cephalic morphology (13,14). In this study we report the occurrence of nematode larvae resembling *Physaloptera* sp. in a population of bobwhite quail from western Oklahoma.

MATERIALS AND METHODS

Necropsies were performed on 64 birds collected in Woods County, Oklahoma from early January to mid-July. Five adult (4 male, 1 female) birds (7.8% prevalence) contained white "rice grain" lesions (resembling those due to *Sarcocystis* sp.) embedded throughout the pectoral musculature. Coiled larvae *(n* = 36, range = 2-24) about 3.5 to 5.0 mm long were usually embedded no deeper than 1.0 mm in the musculature. Larvae were carefully removed from muscle tissue and mounted in lactophenol for microscopic examination. Specimens were prepared for electron microscopy by dehydrating formalin-fixed (10%) larvae in serial ethanol rinses, and critical-point dried by ethanol-CO_2 solvent exchange (Samdri Pvt 3 Critical Point Dryer, Tousimis Research Corp., Rockville, MD 20800, USA). Specimens were mounted on aluminum stubs and viewed at a 45º angle with a scanning electron microscope (JSM 35-U, Jeol Ltd., Tokyo, Japan). Representative samples were stored in 10% formalin solution and deposited in the U. S. National Parasite Collection, Beltsville, Maryland (Accession number 80611). Neutral formalin (10%) fixed tissue

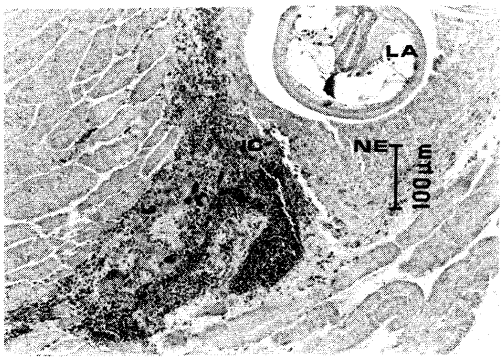

Fig. 1. Cross section of pectoral musculature of a bobwhite quail with embedded Physalopterid larva (LA). The larva is surrounded by necrotic muscle tissue (NE) which is bordered by inflammatory cells (IC).

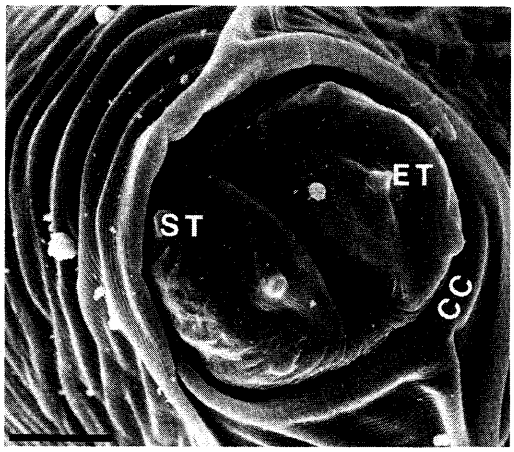

Fig. 3. Scanning electron micrograph (SEM) of embedded Physalopterid larvae recovered from a bobwhite quail in western Oklahoma. Key to plate: Submedian Teeth (ST); Externo-lateral Tooth (ET); Cephalic Collarette (CC). Scale bar = 25 μm.

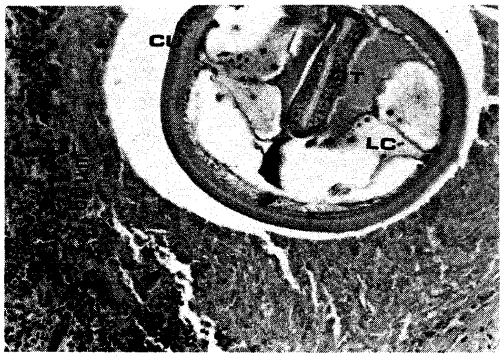

Fig. 2. Cross section of a Physalopterid larva in the pectoral musculature of a bobwhite quail showing the distinct thick cuticle (CU), lateral cords (LC), and digestive tract (DT).

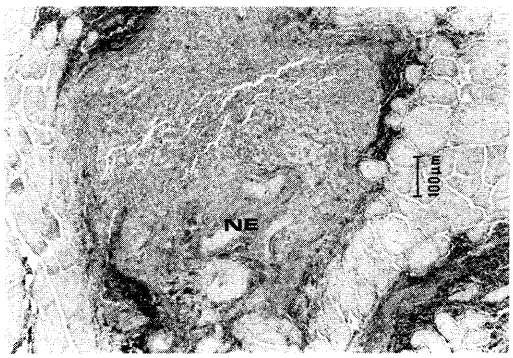

Fig. 4. Cross section of a larval migran in the pectoral musculature of a bobwhite quail. Note the large area of necrosis (NE) irregularly bordered by inflammatory cells (IC).

sections (6 μm thick) were stained with hematoxylin and eosin for histopathology.

RESULTS AND DISCUSSION

Larvae had a thick smooth cuticle, coelomyarian musculature, and well developed lateral cords which were usually narrow at the base and expanded into the body cavity (Figs. 1 and 2). The intestinal tracts of the larvae were lined with columnar epithelial cells with a microvillus border. These features are characteristic of *Physaloptera* sp. and consistent with descriptions given by Chitwood and Lichtenfels (15). Cephalic morphology of larvae in this study (Fig. 3) resembled that of *Physaloptera* sp. as described by Yamagouti (14), but differed from Physalopterid genera *(Skrjabinoptera* sp., *Abbreviatta* sp., *Paraleptus* sp., *Heliconema* sp., *Pseudabbreviatta* sp., *Bulbocephalus* sp., and *Thubunaea* sp.) as described by Chabaud (13).

Lesions associated with nematode larvae consisted of multifocal areas of granulomatous inflammation. The larvae were surrounded by an irregular, lightly eosinophilic granular zone of necrotic debris and degenerate inflammatory cells. The outer zone of granulomatous reaction was characterized by an inflammatory infiltrate composed of macrophages, lymphocytes, eosinophils, and multinucleate giant cells. Granulomatous foci, without identifiable larvae, contained necrotic muscle tissue, cellular debris, and the above listed inflammatory infiltrate (Fig. 4). Pathologic changes resulting from these infections were primarily associated with larval migrans. No fibrous capsules were found associated with these larvae. The

granulomatous reaction and necrosis of the infected host is consistent with previous description of *Physaloptera*-associated lesions (7,16); however, contrary to other studies, no fibrous capsule was associated with the larvae recovered from this study. Infections too recent to elicit host encapsulation could be responsible for this discrepancy.

CONCLUSION

It is still unclear how important bobwhite quail are in the transmission of this parasite. This and previous studies suggest that the occurrence of Physalopterid infections in quail may be more prevalent than previously thought. Life history research including experimental infections with known definitive and intermediate hosts will be necessary to permit accurate identification of larval stages and determine the exact role of quail in the transmission of Physalopterid larvae.

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