

On the Gross and Microscopic Lesions Produced by the Adults and Larvae of *Dochmoides stenocephala* (Railliet, 1884) in the Dog

by H. C. Gibbs*

INTRODUCTION

The pathological lesions of the hookworms in the dog have been extensively studied by a number of workers. Notable among these are Wells (1), Sarles (2) and Landsberg (3) on *A. caninum*. Law (4) described the pathology of *D. stenocephala* adults in the small intestine of the silver fox. The present work serves to supplement that of the latter author and to furnish new information on the pathological lesions of the larvae of this species in the host.

Materials and Methods

Infective larvae were obtained according to the method of Baermann (5) from faecal cultures of the ova. After collection the larvae were washed several times in tap water and concentrated by gentle centrifugation.

Three-week old pups were used for infection. Percutaneous infection was effected by applying an estimated number of larvae in a few drops of water to the skin of the groin. The pup was restrained until the film had dried (about 20 minutes) and the area of application sponged off with soap and water.

Oral infection was effected by giving an estimated number of larvae in a gelatine capsule.

At specific intervals after infection the pups were killed and examined for evidence of gross and microscopic lesions.

RESULTS

1. Gross Lesions

The gross pathological changes produced by this worm are essentially the same as those seen with the other hook-

worms. The larvae in the skin elicited a marked response. About two days after percutaneous administration there was evidence of inflammation in the area of application, the skin was hyperaemic, thickened and small vesicles were present. In a few days the vesicles ruptured and the area of application became covered with small crusts of exudate. In the lungs the larvae produced small focal areas of inflammation on the pleural surface and in the tissue. There was never any great involvement of this organ. Few parasites appeared to reach the lungs from the skin.

When administered orally the infective third stage larvae produced no visible lesions in the gastric or duodenal mucosa. As the larvae became older and migrated out of the mucosal glands evidence of their presence became more pronounced. Areas where larvae were very numerous were denuded of epithelium and inflamed. When late fourth-stage larvae and adults were present the areas of attachment of individual worms were revealed by small petechial haemorrhages. There was never any evidence of frank blood being present in the lumen of the intestine.

2. Microscopic Lesions

a) Adults and late fourth-stage larvae in ileum.

The microscopic picture was one of a subacute to mild chronic enteritis with a patchy distribution. It was characterized by the presence of lymphocytes, plasma cells, macrophages and a few eosinophiles. A section through the buccal capsule of a feeding adult (Fig. 1) showed that the worms ingested plugs of mucosa which were then

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torn off with the aid of their cutting plates and digested by means of the esophageal gland secretions. At the immediate point of attachment of the

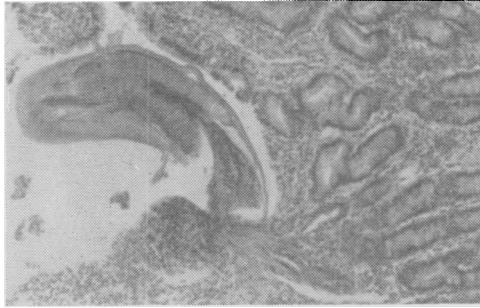


Fig. 1—Section through buccal capsule of feeding adult. x100.

worm there was some evidence of necrosis as shown by nuclear debris, pyknotic nuclei and indistinct outlines of the collagen network of the villi. More peripheral to the point of attachment the response was negligible. There was, in addition, some sloughing of the epithelial membrane at the point of attachment but the epithelium adjacent to

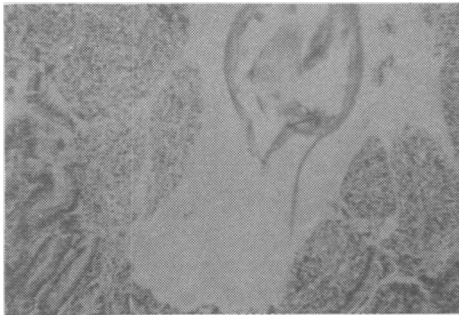


Fig. 2—Section through adult worm lying in a mucosal depression. x100.

this point was retained. There was also a definite puckering of the tissue at this point. There did not appear to be much haemorrhage at the point of attachment in the section studied. The body of the worm was seen to be lying in a trough-like depression (Fig. 2) which had probably been made in the mucosa as a result of feeding activities.

b) Parasitic third-stage larvae in the skin.

Penetration of the skin by the larvae elicited a marked inflammatory response (Fig. 3). In some areas there was ulceration of the epidermis involving mainly the *stratum corneum* but in some cases extending into the *stratum germinativum*. In addition to ulceration there was purulent material present.

In the region of the hair follicles the infection extended down to the dermis.

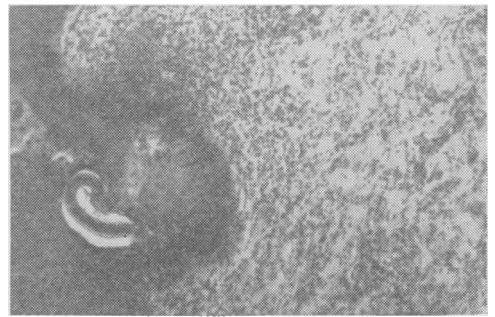


Fig. 3—Section through skin showing larvae. x100

There was often involvement of the hair follicles, resulting in their destruction, many being filled with pus. In some cases the inflammatory reaction extended down to the subcutaneous fat. Around the parasites there was an acute inflammatory reaction, the infiltrating cells being mainly polymor-



Fig. 4—Section through skin showing larva in sebaceous gland. x100

nuclear leucocytes. There was necrosis of the surrounding tissue and formation of considerable purulent material. There were also attempts to wall off

the parasite by proliferation of fibroblasts. One larva and considerable purulent material was seen in a sebaceous gland (Fig. 4).

c) Parasitic third-stage larvae in the lung.

The larvae in the lung (Fig. 5) evoked a marked localized inflammatory reaction. The predominant cells were polymorphonuclear leucocytes and in addition there appeared to be some proliferation of the septal cells. There were localized areas of acute pneumonia and some sloughing of the pleura adjacent to the area of inflammation.

d) Parasitic third-stage larvae in the gastric mucosa.

The larvae did not appear to penetrate the mucosa but came to lie coiled in the crypts of the gastric glands

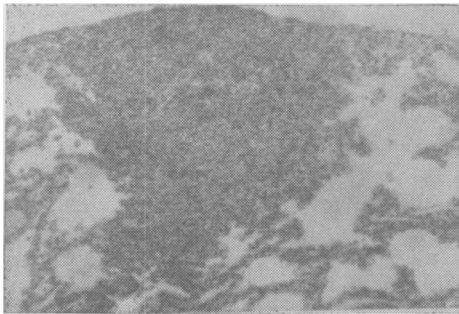


Fig. 5—Section through portion of lung containing larvae. x100

(Fig. 6). This evoked a very mild tissue response. The surrounding cells were distorted and flattened by the presence of the parasite. A few well segmented eosinophiles were present in the area adjacent to the parasite.

e) Parasitic third-stage larvae in the duodenal mucosa.

In the duodenal mucosa the reaction was similar to that seen in the gastric mucosa (Fig. 7). The larvae were coiled in the crypts of the duodenal glands. The eosinophilic response was not as marked in the section studied as was seen in the stomach.

DISCUSSION

Law (4) points out that the adult

worms appear to graze the tops of the villi rather than penetrate deeply into the mucosa. The present studies are in agreement with this. This worm does not appear to be as effective a blood-sucker as *A. caninum*. Of particular interest was the very marked inflamma-

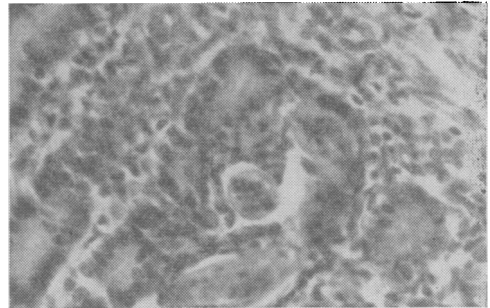


Fig. 6—Section showing larva in gastric mucosa. x440

tory response evoked by the larvae in the skin and in the lungs. It is felt that this marked inflammatory response rather than being a direct result of the presence of the parasite is in large measure due to the fact that they introduce secondary bacterial invaders on their bodies, as the inflammatory response was mainly neutrophilic rather than eosinophilic. Goodey (6) has reported that the infective larvae of this worm will penetrate mouse skin in an

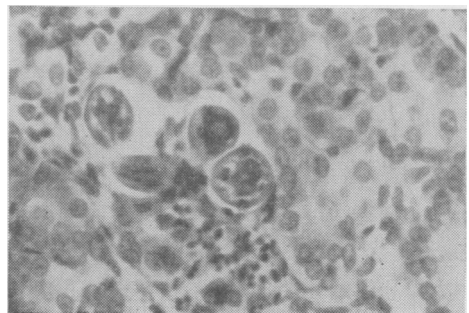


Fig. 7—Section showing larva in duodenal mucosa. x440

unshathed condition. This was not verified in these experiments but, if it is the case, it would certainly increase the chances of introducing secondary bacterial invaders on the unshed skin. Very poor results were obtained dur-

ing this series of experiments in obtaining satisfactory infections percutaneously. It is easy to visualize how larvae could be immobilized and even destroyed by such an active tissue response in this host.

SUMMARY

The gross and microscopic lesions of the larvae and adults of *D. stenocephala* in the skin, lungs, stomach and intestine of the dog are described. The effects were seen to be very similar to those described for other hookworms. A marked tissue response to the invasion of larvae in the skin and lungs was reported and its possible effect on the establishment of infection discussed.

RESUME

Chez le chien, les lésions intestinales (microscopiques et macroscopiques) dé-

terminées par les larves et les formes adultes de *Dochmoides stenocephala* (Raillet, 1884), ressemblent à celles observées dans les autres ankylostomes des carnivores. La présence de larves infectieuses dans la peau et les poumons provoque une vive réaction inflammatoire. On croit que c'est à cette réaction que sont dues les difficultés que l'on rencontre dans les essais d'infection par la voie cutanée.

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This report covers the results of treatment of 100 consecutive cases of injury to bovine teats. Lacerations caused by barbed wire, congenital and traumatic obstructions and inflammations of the teat, both traumatic and bacterial, are thoroughly reviewed. Excellent illustrations accompany the section dealing with treatment.

Priouzeau, M. Chronic neuritis of the spinal nerves supplying the dorso-lumbar region in cattle.

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J. Amer. vet. med. ass. 129:417-521, 1956.

Symptoms, necropsy findings, histopathology and bacteriology are discussed. In all probability, a septicaemia existed in many of the animals, indicated by infarcts in kidneys and heart. Infectious rhinotracheitic and bronchopneumonia were the most frequent primary infections.

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This paper deals with the work done by the New York State Mastitis Research and Control Program, and presents all aspects of the mastitis problem — diagnosis, culture methods, control, etiology, proper use of milking machines, and advice to clients on breeding programs.