

MORPHOLOGICAL CHANGES IN THE INTESTINE
OF DOGS, EXPERIMENTALLY INFECTED WITH
TRICHURIS VULPIS

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Summary

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In 11 dogs, experimentally infected with *Trichuris vulpis*, the course of localization of larvae and sexually mature parasites during the different stages of their development in hosts as well as the induced histopathological changes in small and large intestine were monitored. It was found out that up to the 15th day after the infection, *T. vulpis* larvae developed into small intestinal mucosa and were localized over lamina muscularis mucosae. Afterwards, the larvae reached their sexual maturity in the caecum and the colon. A penetration of the anterior thin part of the parasite into caecal submucosa was observed only in a very heavy infection.

Histopathological changes were observed during all stages of parasite's development.

Key words: dogs, histological changes, *Trichuris vulpis*

INTRODUCTION

Trichurosis is a nematodosis on carnivores, caused by *Trichuris vulpis* Froelich (1789) belonging to the *Trichuridae* family. Generally, trichurae are localized in caecal mucosa (Miller, 1947; Kikuchi & Okuyama, 1964) but in severe infections, the parasites were observed all along from the ileum to the rectum (Kikuchi & Okuyama, 1964). The elongated thin part of parasites is located in mucosal epithelium whereas the short thicker part – in intestinal lumen.

T. vulpis is a geohelminth with a direct life cycle. The carnivores become infected only after ingestion of eggs containing infective larvae. The data about the development of *T. vulpis* in the host are contradictory. According to Miller (1947),

Rubin (1954), Kikuchi & Okuyama (1964) and Leib *et al.* (1991) the larvae, hatched in small intestine, penetrated the crypts of Lieberkühn for 2–10 days and afterwards passed in the caecum and the colon, where their anterior end became deeply embedded in mucosa and reached sexual maturity in 70–90 days. On the contrary, Opitz (1963) and Akbaev (1998) believe that the development of larvae occurs only in large intestine. Initially, larvae penetrate into the mucosa where they undergo moultings, then they fall into the lumen, become attached with their thinner end to the mucosa and reach sexual maturity in 30–107 days.

The pathogenic effect of *T. vulpis* upon the host is not sufficiently investi-

gated. In the opinion of Miller (1947) the mechanical injuries in intestines induced by larvae were insignificant.

The aim of the present study was to follow out the localization of *T. vulpis*, the gross pathological and histological changes in the intestines of experimentally infected dogs during the various stages of the development of parasites.

MATERIALS AND METHODS

The pathoanatomical and histological studies were performed on 11 dogs aged 6–12 months and weighing 3–5 kg. After a 10-day period of adaptation, the dogs were vaccinated and revaccinated with Novibac DHP (Intervet, Holland). They underwent also a double dehelminthization at an interval of 14 days with the combination praziquantel, pyrantel and febantel (Drontal plus, Bayer, Germany) at a dose of 1 tablet per 10 kg body weight and desinsection with permethrin and carbaryl (Tapilan B, Dorvet, Israel). The dogs were housed in individual cages (1 m²), previously cleansed and disinfected with warm 2% NaOH solution.

The dogs were infected orally with *T. vulpis* eggs at a dose of 20000 eggs/kg. After i. m. premedication with 1 mL xylazine and 1mL ketamine/10 kg, the dogs were euthanized with T61[®] (Intervet, Holland) at a dose of 3 mL/20 kg. i. v. at post infection days 3, 5, 10, 15, 20, 37, 42, 50, 67, 77 and 130. Material for investigation was sampled from small and large intestines. The specimens for histological studies were fixed in 10% buffered formalin (pH 7.0) and processed using the routine techniques. The cross sections (4 µm) were stained with haematoxylin-eosin (H/E).

RESULTS

The gross examination of dogs euthanized 3 and 5 days after the infection, revealed signs of moderate to high hyperaemia of mucosa all along the small intestine. In the dog euthanized 10 days after the infection, there were massive haemorrhagic spot-like and band-like lesions, most extensive into the middle third of the jejunum (Fig. 1). The intestinal content was watery.

Apart the band-like hemorrhages in jejunal and ilea mucosa (Fig. 2), on post infection days 15, 20 and 37, hyperaemia and petechial hemorrhages in caecal mucosa were also observed macroscopically, especially in the region of the ileocaecal valve.

On the 42nd, 50th and 67th days after the infection, there were no macroscopically visible changes in small intestine mucosa. In the dog euthanized on the 77th day, the caecal and colonic mucosa was nodular, thickened and looked like scattered with sawdust (Fig. 3).

The large intestine content in the dog euthanized 130 days after the infection consisted of mucus mixed with blood. Sexually mature trichuræ were found out in the distal end of the ileum, in the caecum and the colon. The anterior thin part of the parasite was located in the mu-



Fig. 1. Haemorrhages on jejunal mucosa in a dog, 10 days after infection with *T. vulpis*. Bar = 1.5 cm.



Fig. 2. Haemorrhages on ileal mucosa in a dog, 20 days after infection with *T. vulpis*. Bar = 1 cm.

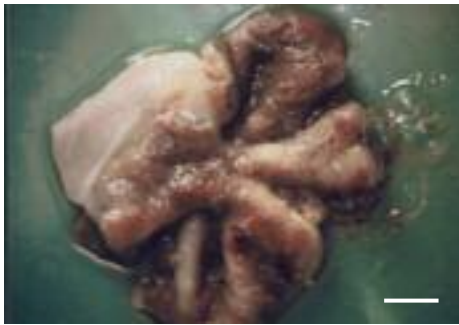


Fig. 3. Nodular thickening of caecal mucosa in a dog, 77 days after infection with *T. vulpis*. Bar = 0.5 cm.



Fig. 4. Haemorrhages at the sites of trichuræ fixation on large intestine mucosa in a dog, 130 days after infection with *T. vulpis*. Bar = 0.3 cm.

cosa and the posterior thicker part – in intestinal lumen. The highest number of

parasites were detected on the caecal top and the region of the ileocaecal valve. The mucosa was oedematous, and haemorrhages were present at the sites where the organisms were fixed to (Fig. 4).

Histologically, the dog euthanized 3 days after the infection exhibited a moderate hyperaemia in duodenal and jejunal mucosa whereas that sacrificed by day 5 – desquamation of the epithelium covering the intestinal villi and an early stage of mucoid dystrophy. The larvae were localized over lamina muscularis mucosae and were slightly coiled.

By post infection day 10, the histopathological changes consisted in a marked mucous dystrophy, hyperaemia, epithelial desquamation and clusters of eosinophilic leukocytes around the larvae, that were localized over lamina muscularis mucosae of small intestine and were coiled (Fig. 5).

Apart the jejunum, 15 days after the infection, larvae were found out also in superficial and deep layers of the caecal and colonic mucosae. In small intestine, a profuse cellular infiltration of histiocytes, lymphocytes and eosinophils was observed between the glands.

By days 20, 37, 42, 50, 67 and 77 after the infection, larvae of trichuræ were detected only in superficial and deep layers of caecal and colonic mucosa. Desquamation of the epithelium, mucoid dystrophy, vascular hyperaemia in the mucosa and the submucosa, diffuse lymphohistiocytic infiltration and oedema of the submucosa (Fig. 6) were observed. Penetration of the anterior thin part of larvae into the caecal submucosa was present only in the dog, euthanized 77 days after the infection.

The histopathological study in the dog sacrificed by post infection day 130 showed active hyperaemia and haemorrhages in the mucosa. Blood and haemosiderin deposits were present (Fig. 7). A

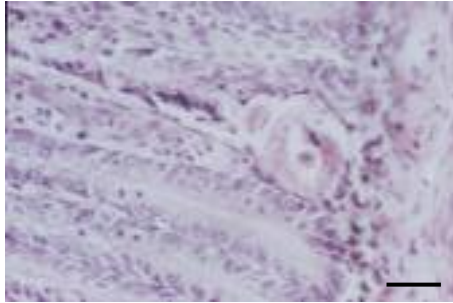


Fig. 5. 10-days old coiled *T. vulpis* larva in small intestine mucosa. Bar = 20 μ m.

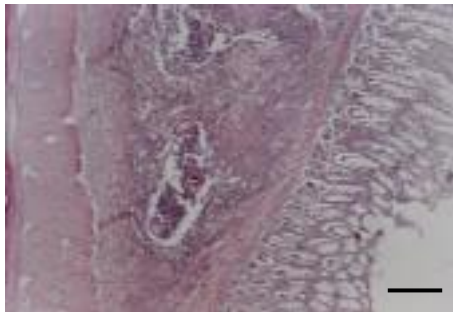


Fig. 6. Oedema and lymphohistiocytic proliferation of large intestine's submucosa in a dog, 77 days after the infection with *T. vulpis*. Bar = 100 μ m.

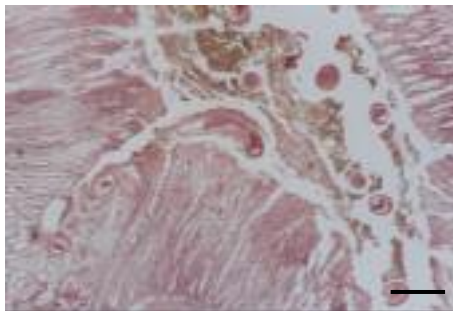


Fig. 7. Bloody content of large intestine in a dog, 130 days after the infection with *T. vulpis*. Bar = 200 μ m.

diffuse lymphohistiocytic proliferation in both mucosa and submucosa were determined.

DISCUSSION

Our data evidenced that after hatching from eggs, the larvae penetrated into small intestine's mucosa and they stayed for about 15 days. This penetration of larvae provoked desquamation of the epithelium, hyperaemia, mucoid dystrophy, eosinophilic infiltration around larvae. In a study on the early stages of *T. vulpis* development, Miller (1947) observed an insignificant destruction of host cells even in dogs infected with 300 000 eggs. This fact is explained by the author with the localization of larvae into the mucosa and their weak activity up to the moment of migration into large intestine.

After the 15th day, the larvae colonized the caecum and large intestine where they reached sexual maturity. The hemorrhages in the mucosa and the lymphohistiocytic infiltration of both mucosa and submucosa, observed by us, have been described by Hung (1926), Kikuchi & Okuyama (1964), Rubin (1954) and Widmer & van Kruiningen (1974) only after penetration of trichuræ in the submucosa. The occurring histopathological changes were attributed by these authors to mechanical and toxic damage provoked by larvae and sexually mature trichuræ. According to Kikuchi & Okuyama (1964) and Burrows & Lillis (1964), trichuræ secrete enzymes with cytolytic and haemolytic activity, so the parasites are determined as histophages and haemophages. The presence of a stylet in the mouth of the parasite is specified by Burrows & Lillis (1964), Miller (1947) and Rubin (1954) as one of the causes for mechanical damage. Burrows & Lillis (1964) considered that due to the permanent fencing-like movement of the anterior part of the organism and the similar movement of its mouth stylet, the parasite could perforate, cut or tear tissue and blood vessels. The ob-

served hemorrhages, dystrophic changes and profuse cellular infiltration of mucosa and submucosa allowed us to assume, that the mechanical factor is one of the causes of observed morphological changes.

The results of our studies showed that larvae and sexually mature trichuræ induce a mechanical damage of small and large intestines' mucosa and provoke an extensive local inflammation and haemorrhages.

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