

1-1-2004

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KHATOON, NASIRA; BILQEES, FATIMA MUJIB; JAFFERY, DURE SHAHWAR; and RIZWANA, A. G. (2004) "Histopathologic Alterations Associated with *Syphacia* sp. (Nematode) in the Intestine of *Nesokia indica*," *Turkish Journal of Zoology*. Vol. 28: No. 4, Article 10. Available at: <https://journals.tubitak.gov.tr/zoology/vol28/iss4/10>

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Histopathologic Alterations Associated with *Syphacia* sp. (Nematode) in the Intestine of *Nesokia indica*

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Received: 24.06.2003

Abstract: The present work was undertaken to study the histopathological changes in the intestine of male rat *Nesokia indica*. Histopathological sections of infected intestine were prepared by fixing small pieces of intestine in buffer formalin for 24 h. The fixed material was washed with 70% alcohol and dehydrated and cleared for paraffin block making by the usual procedure. Sections of 5 to 7 μ thickness were used for the present study. E & H stained serial sections were mounted permanently in DPX. Sections were examined in detail and photomicrographs of selected sections were taken by Nikon (Optiphot-2) photomicroscope using Fuji colour film. Histopathological study of selected portions of the intestine revealed that nematode parasites severely affected the whole thickness of the intestinal wall. Pronounced changes included atrophy of the villi and underlying tissue as a common finding. Granulomatous tissue masses and granulation lesions were also obvious. Hypertrophy and hyperplasia of the glandular region were seen. Pedunculate edema forming a condition like sessile villous adenoma was an important finding.

Key Words: *Syphacia* sp., Nematode, *Nesokia indica*, intestine, Histopathology.

Introduction

The vast majority of vertebrate pests are from amongst the classes of mammals and birds. Any animal within these 5 classes becomes a vertebrate pest if by reason of its food habits, population numbers or disease harbouring properties it adversely affects man's resources and well-being.

On a world scale the most serious vertebrate pests are rats and mice, especially those kinds adapted to live closely with man.

Some rodents live in close proximity with man; in fact they are attracted to his houses and food stores. Because these small mammals harbour many diseases which can be harmful to the human race, much research has gone into the understanding of what disease producing organisms are carried by rats and how they can be transmitted to man.

There are over 20 known diseases which are directly transmitted to man from rats – usually through the

agency of blood-sucking parasites such as fleas, ticks and mites which live in rats' fur, or through direct bites from rats or through their faecal and urine contamination of grain and other foods. In Pakistan Salmonella causes dysentery and comes from faecal contamination as well as through tapeworms. Regrettably such contamination has been observed in both large and small grain stores in studies conducted in Karachi. Scrub typhus is a dangerous and often fatal disease carried by Rickettsial mites which normally live on rodents.

Different species of nematodes are found in the intestine of the rodent. The eggs of the nematodes are transferred to human beings by their droppings in fields, godowns and food stuffs and thus are responsible for spreading zoonotic diseases.

Here an attempt is made to study the histopathological changes caused by *Syphacia* sp. in the intestine of *Nesokia indica*, which have not been reported previously.

Materials and Methods

Short-tailed Indian mole rats, *Nesokia indica*, were collected from crop fields of Gharu, Sindh, Pakistan. Heavily nematode infected intestine was selected for histopathology. For this purpose, selected portions of infected intestine were fixed in 10% formalin for 24 h, washed several times with 70% alcohol and dehydrated through graded series of alcohols, cleared in xylene, kept in a mixture of xylene and wax overnight and then transferred to pure wax for 8 h. Blocks were made in cavity blocks avoiding air bubbles using a hot needle. The cavity blocks were immersed in cold water for uniform cooling. These blocks were trimmed and fixed on microtome holders with a few drops of melted wax. Then 5-7 μ thick sections were prepared and parts of section ribbons were kept on slides with a few drops of water and stretched with slight heat from the burner. These slides already had a little egg albumin on their surfaces to avoid sections dropping off during dewaxing. They were stained with hematoxylin and eosin, dehydrated in a graded series of alcohols, cleared in clove oil, washed in xylene and mounted permanently in Canada balsam by the usual methods. Photographs were prepared with a Nikon (Optiphot-2) photomicroscopic camera using Fuji colour film.

Observations

Observations are based on several serial sections of a portion of intestine from the short-tailed Indian mole rat *Nesokia indica* (Gray and Hardwicke) infected with the nematode *Syphacia* sp. The identification of the nematode is based on the diagnosis given (Yamaguti, 1961). Gross observations of the intestine before processing for histopathological studies revealed that the lumen of the intestine contained thick creamy mucous and worms were found free in the mucous while some of them were found to have penetrated the intestinal wall.

Histopathological observations indicated that severe damage occurred in the whole thickness of the intestinal wall (Figure 1). The intestinal mucosa was completely destroyed in the affected region, showing atrophy of the villi and underlying tissue. In some places it was observed that the lamina propria was infiltrated by numerous inflammatory cells with necrosis of the underlying tissue. In these regions a granulomatous lesion in the muscular layer was observed. The normal shape of

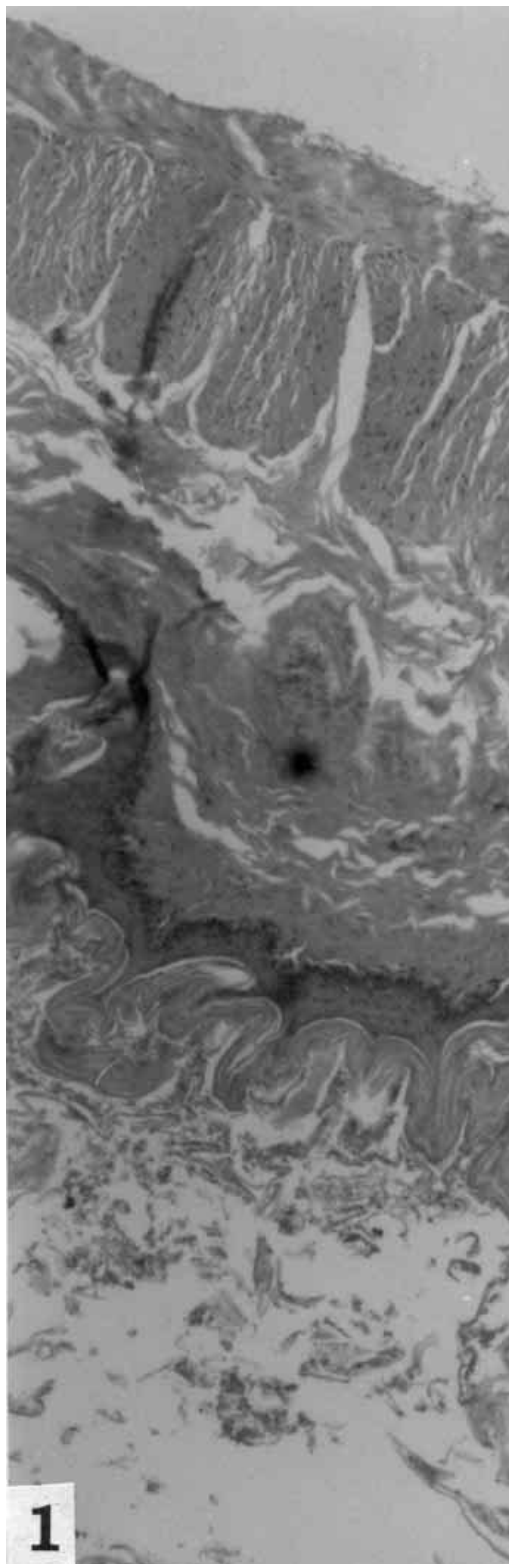


Figure 1. Section of intestine of *Nesokia indica* infected with *Syphacia* sp. showing damage to the whole thickness of the intestine. x25

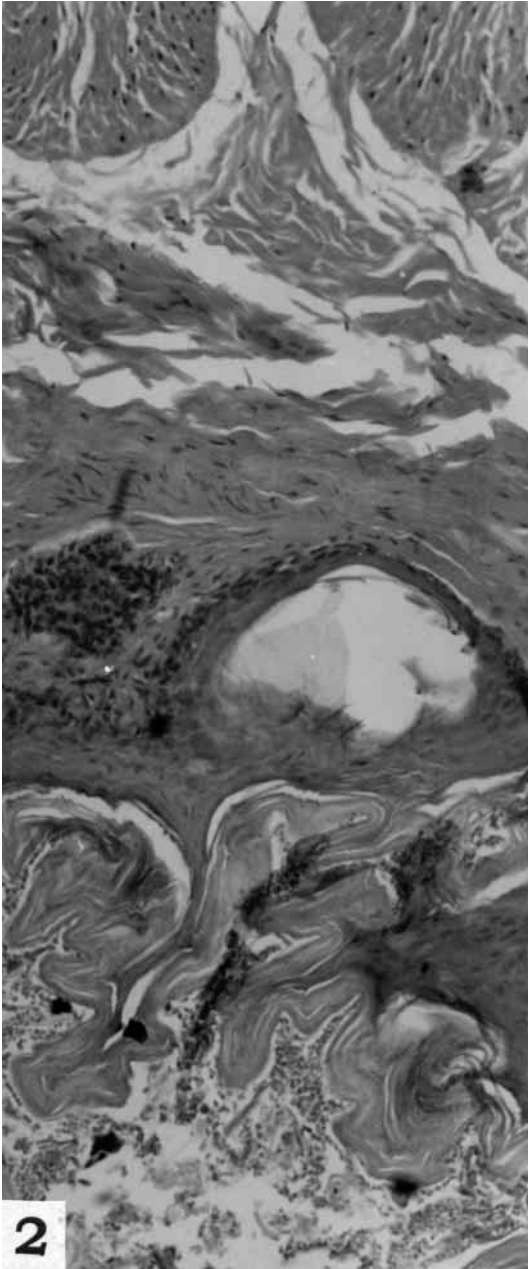


Figure 2. Section showing dislocation of epithelial cells, which appear as granulomatous masses. Shrinkage of muscles and a granulomatous lesion are obvious. x50

intestinal mucosa was destroyed and a condition like atrophic intestinalis was obvious (Figures 2 and 4) along with dislocation of epithelial cells, which appear as granulomatous masses.

In some regions the mucosa appeared markedly diminished. The surface mucosal epithelium was necrotic

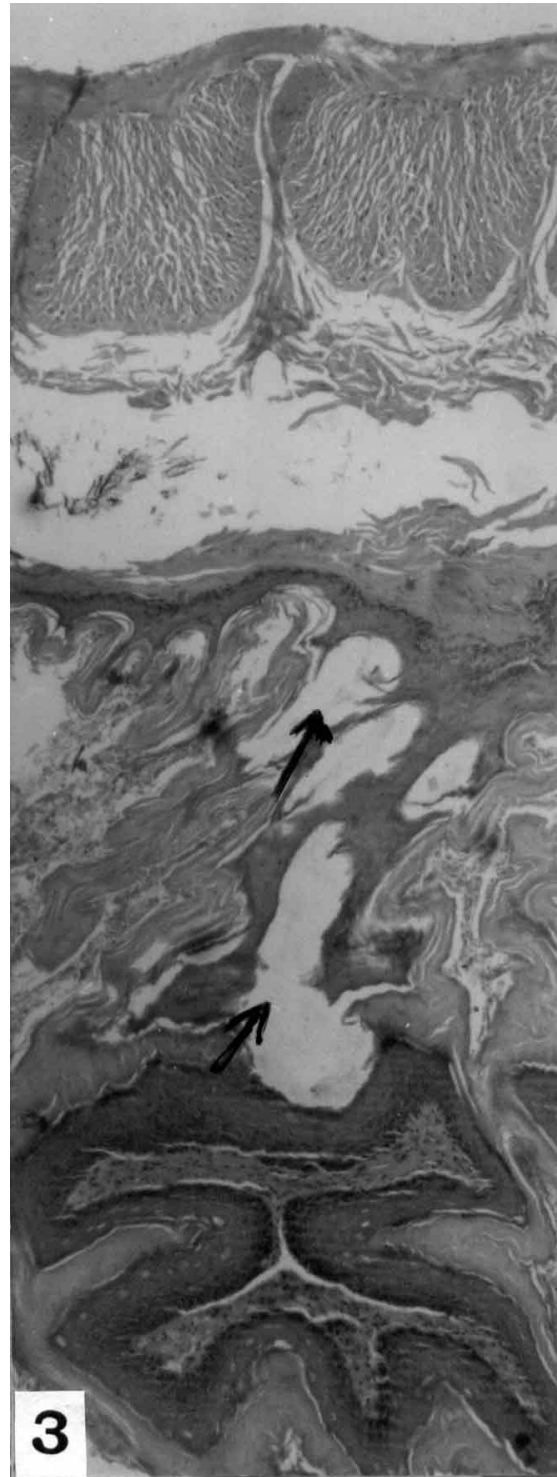


Figure 3. Section of infected intestine showing hyperplasia of the glandular region. Dissolution of masses leaving empty spaces (arrow). x25

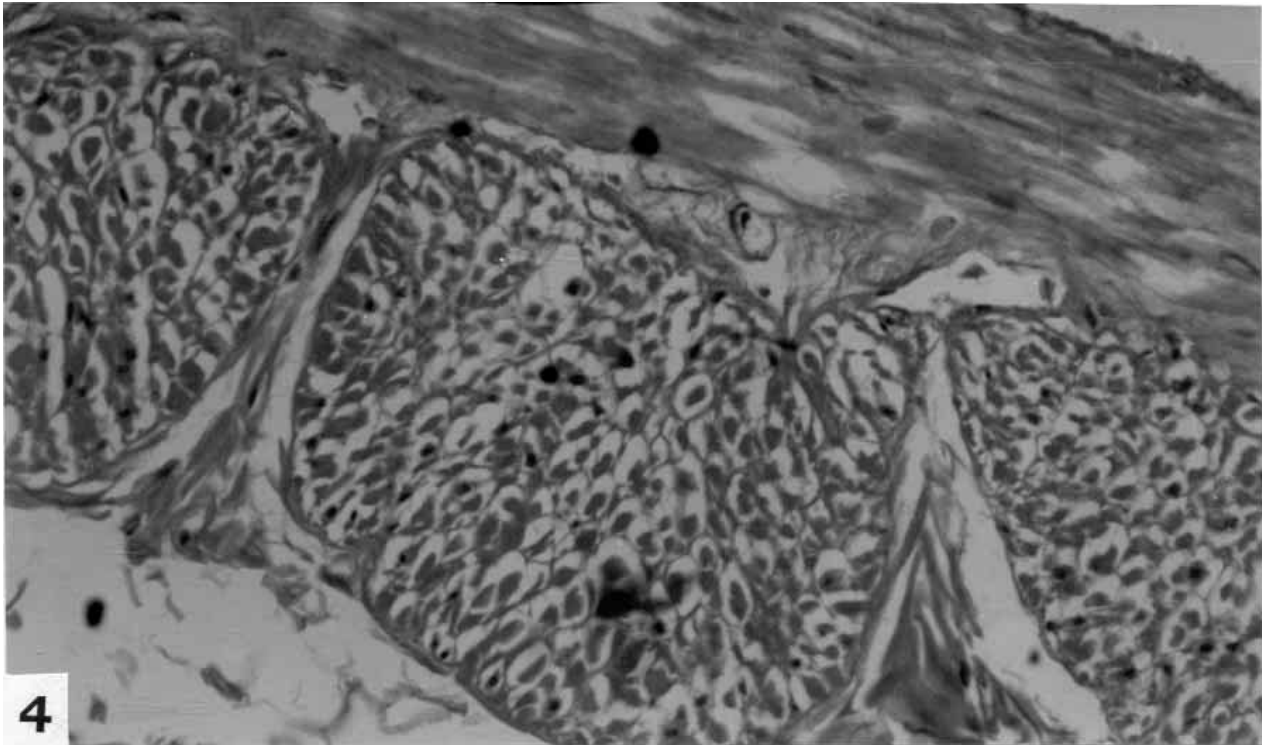


Figure 4. Section of muscles of muscular layer showing shrinkage and atrophy, dislocating individual cells from their membrane producing numerous empty spaces. x100

and atrophied, and underlying cells were replaced by empty spaces (Figures 4 and 5). Hyperplasia of the glandular region was also obvious (Figure 3). It was also noted that in some places the villi were greatly reduced, forming a condition like sessile villous adenoma, and appeared hyperplastic in other places, causing a condition like pedunculate adenomas (Figure 6). In some sections dissolution of the epithelial cell of villi appeared as granular masses. Here destruction of muscle cells and villi were seen, leading to proliferative dysplasia, which is responsible for carcinoma of the intestine (Figures 7-10). The muscular layers were totally damaged, and appeared atrophied and necrotic. The submucosa and adjacent areas appeared abnormal, proceeding to hyperplasia, while atrophy of the muscles was prominent.

Discussion

Nesokia indica is an important pest of human dwellings. It is not only harmful by itself but also causes a health hazard to human beings due to its parasitic fauna. Histopathological studies of the intestine of the rat

associated with nematode parasites are described here. Information on rat pathology in general and tissue damage caused by helminths and other parasites with reference to Pakistan has not been reported previously, although the parasitology of the rat is better known (Cram, 1943; Chen, 1952; Gafurov et al., 1971; Eaton, 1972). Nematodes, the round worms, are injurious to their rat host both as larvae and as adults (Geller, 1946). The nematode is identified in the present rat as *Syphacia* sp.

The present study indicates the total destruction and necrosis of all layers of the intestinal wall. In some regions, severe destruction occurs only in the mucosa and sub-mucosa. Such types of changes were also observed in fishes parasitized by *Anisakis* larvae (Bilqees and Parveen, 1996). Destruction of the epithelium at the point of attachment was observed by some workers and large numbers of detached cells of epithelial and connective tissue origin in the paramucosal lumen were also reported (Chaicharn and Bullock, 1967). Similar abnormalities were observed in the present study but here the mucosal

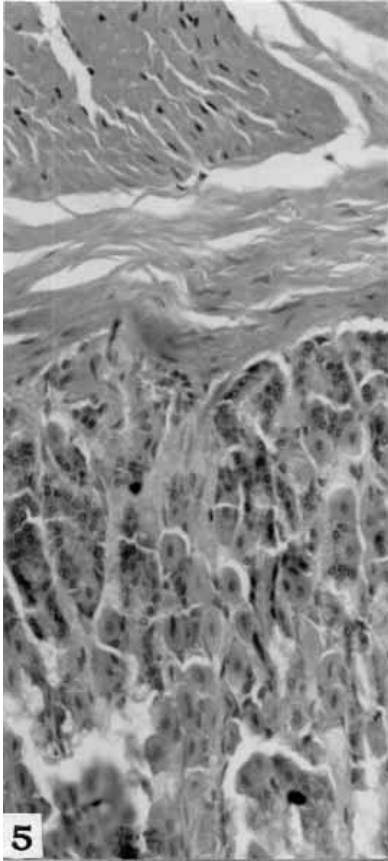


Figure 5. Section showing hypertrophy of individual cell, and hyperplasia of the glandular region. Note the dislocation of the muscular layer and atrophy of muscle cells. x100



Figure 7. Portion of a section showing dissolution of the epithelial cells of villi, which appear as granular masses (arrow). Destruction of muscle cells and villi are obvious. Note the pedunculate adenoma (double arrow). x10

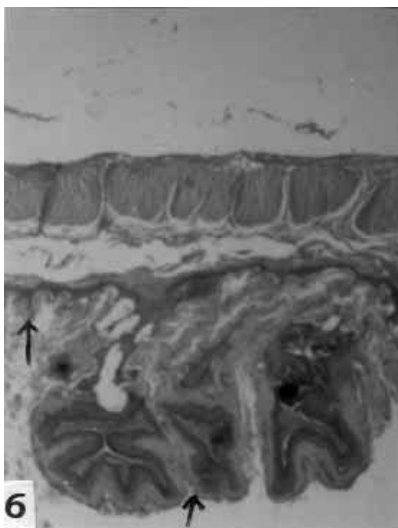


Figure 6. Note the damage to all the layers of the intestine, especially the villi which have been atrophied and reduced in some places (arrow), forming a condition like sessile villous adenoma, and hyperplastic in other places (small arrow) pedunculate adenomas. x10

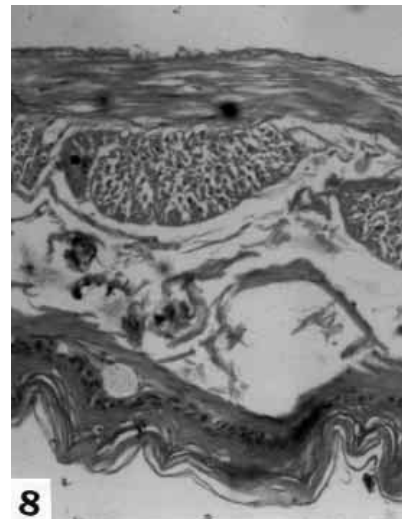


Figure 8. Section showing membranous villi with wavy outline; cellular structures are indistinguishable, muscular layers are totally damaged. x50

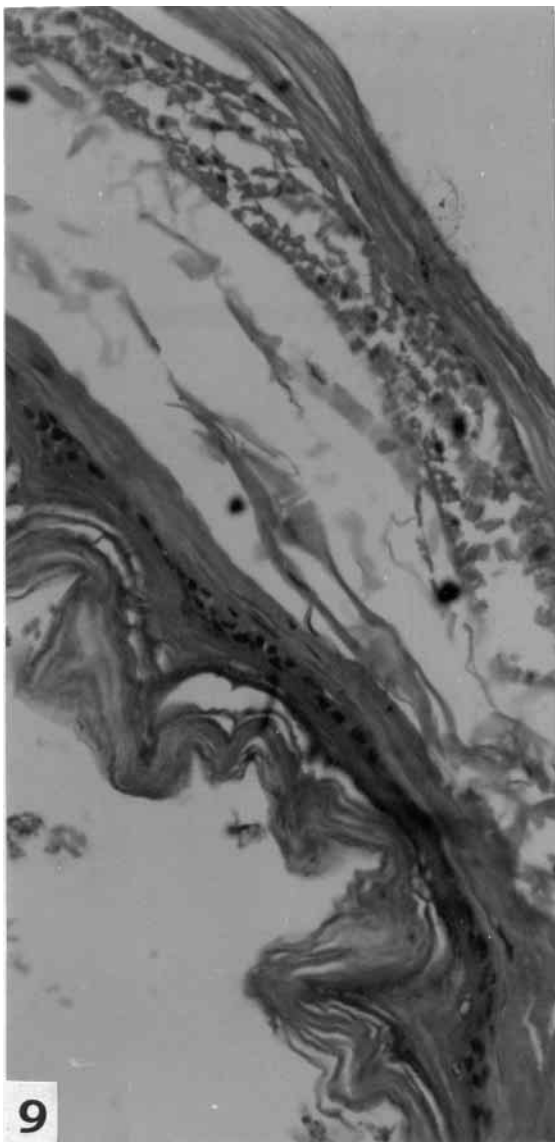


Figure 9. Enlarge portion of a section in Figure 8 showing membranous villi. Hypertrophied sub-mucosal cells are obvious. Destruction of both layers of muscles. x100

layer disintegrated to form granular masses. The damage was severe, resulting in a condition like sessile adenoma, and in some places the mucosal region was thickened, producing a condition like pedunculate adenoma. Some of the infected intestinal sections represent a collapsed

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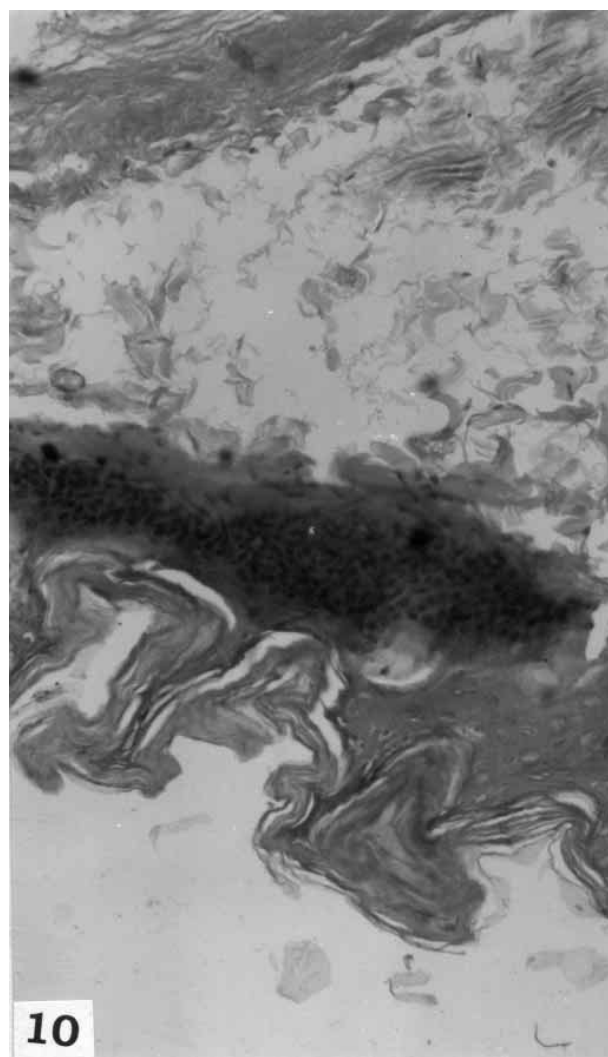


Figure 10. Showing hyperplasia of submucosa and adenomatous villi and atrophy of muscles. x50

mucosal layer; a similar condition has also been reported in other animals (Bilqees and Fatima, 1995).

Granulomatous lesions were also observed involving muscularis mucosa. This may be due to the parasite moving deeper into the host tissue, resulting in severe tissue damage. Such types of lesions were also reported (Bilqees, 1995).

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