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Prevalence and histopathology of *Trichuris ovis* infection in caecum of slaughtered sheep in West Bengal, India

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Abstract

The prevalence and histopathological lesions caused by *Trichuris ovis* was observed in caeca of slaughtered sheep of West Bengal in the present study. A total of three hundred sixty (360) caeca of slaughtered sheep were examined for the presence of *T. ovis*. Five uninfected and ten (10) infected caeca of slaughtered sheep were examined for histopathological lesions. The overall prevalence of *T. ovis* infection was 56.9% in sheep. Caeca of uninfected sheep appeared normal in histological specimen and caeca of five infected sheep showed only slight haemorrhage and cellular infiltration around the anterior end of the worm and rest five samples showed no marked cellular infiltration. The present study revealed that *T. ovis* is non-pathogenic to sheep and might also have adopted some immune evasion mechanism as indicated by the absence of cellular reaction around the anterior portion of the worm which remains deeply embedded in caecal mucosa.

Keywords: *Trichuris ovis*, prevalence, histopathology, sheep

Introduction

Trichuriasis caused by *Trichuris ovis* in ruminants is generally subclinical and most of the cases are asymptomatic in nature [1] and it is widely prevalent in India [2]. Generally, *Trichuris ovis* are localized in caecal mucosa of ruminants [3]. Infection with *Trichuris ovis* are common in small ruminants as reported by many authors from different parts of the world [4, 5] including India [6, 7] based on coprological screening. *Trichuris ovis* has a thin long anterior part and a thick short posterior part. The elongated thin anterior part of parasite remains embedded in mucosal epithelium whereas the short thicker part remains in intestinal lumen [3]. Alimentary tract is more prone to spontaneous pathological conditions due to parasitic infection than any other organ / system in the body. The anterior part of *Trichuris ovis* remains embedded in caecal mucosa in ruminant without showing any marked pathogenic effects in the infected ruminants though the mucosa and submucosa are the major sites for immune response against gastrointestinal pathogens [8]. Whereas *Trichuris trichuira* is pathogenic to man and dog showing some pathogenic effects.

Therefore, the present study was conducted to determine the prevalence of *Trichuris ovis* in slaughter sheep of West Bengal and also to observe the histopathological changes at the site of attachment in caecal mucosa of sheep.

Materials and Methods**Examination of caecum and colon of sheep for presence of *T. ovis***

Caeca and colons of slaughtered sheep (n = 360) were collected from the local abattoir at Kolkata and examined for the presence of *Trichuris ovis* for a period of 6 months from February to July, 2016. The caeca and colons were excised and the worms were collected with the help of a forceps in normal saline solution (NSS). Then the worms were washed for 4-5 times in distilled water. After washing *Trichuris* species were identified as *Trichuris ovis* on the basis of gross morphological characters. The numbers of worms collected from each caecum and colon were recorded accordingly to calculate the mean worm burden.

Histopathological examination of *Trichuris* infected and uninfected caecum of sheep

For histopathological studies, caeca of slaughtered sheep which were infected with

Trichuris ovis only without any pimply gut condition were collected and caeca of sheep showing no helminth infection as well as pimply gut condition were considered as uninfected caeca. For the histopathological studies five uninfected and ten infected caeca of sheep were examined. A portion of above caeca were cleaned properly with tap water and preserved in 10% neutral formalin solution. The specimens after fixation for 24 hours in 10% formalin were washed under a jet of running tap water for 12 hours. Then they were passed through ascending grade of alcohol (50%, 70%, 80%, 90% and absolute alcohol) for one hour each for dehydration. Thereafter the tissues were kept in equal volume of absolute alcohol and cedar wood oil for seven days until they become semi-transparent.

The tissues were taken out and kept in small crucible containing xylol and kept for ten minutes for removal of cedar wood oil. Then they were kept in equal volume of xylol and molten paraffin in a paraffin bath for an hour at a temperature of 58-68 °C [9]. The tissues were transferred to full molten paraffin in a paraffin bath for one hour with two changes. Afterwards tissue blocks were prepared in paraffin by standard procedure [10]. Thin sections (4-5µ) were cut with the help of rotary microtome and stained with Harris Haematoxylin and Eosin stain (H and E) following the standard method [11]. Then the infected as well as uninfected caecal tissues were examined microscopically both in low power and high power.

Results

Prevalence of *Trichuris ovis* in sheep

The present investigation revealed the prevalence of *Trichuris ovis* in sheep slaughtered at local abattoir in Kolkata. A total of three hundred sixty (360) caeca and colon of sheep were examined for the study and out of which two hundred five (205) were found positive for *Trichuris ovis* and thus the overall prevalence of *Trichuris ovis* infection was 56.9%. The percentage of sheep infected with *Trichuris ovis* in different months i.e. February- July were 25%, 36.6%, 65%, 55%, 73% and 86.6%, respectively. The highest *Trichuris ovis* infection (86.6%) was reported in July and lowest (25%) in February. The overall mean worm burden was 19 worms per caecum and colon of sheep. The highest worm burden was recorded in the month of July (32) and lowest burden was observed in the month of February (5).

Histopathological changes due to *Trichuris ovis* infection in sheep

Caecum of uninfected animal

The histopathological studies of caecal tissue (Fig. 1) of uninfected sheep showed the various layers i.e. circular muscle layer (outer most), longitudinal muscle layer, sub-mucosa and mucosa. The sub-mucosa and mucosa layer were enriched with blood supply. The mucosa contained intact villi for absorption of food materials. All the layers of caecum appeared to the normal without any pathological changes.

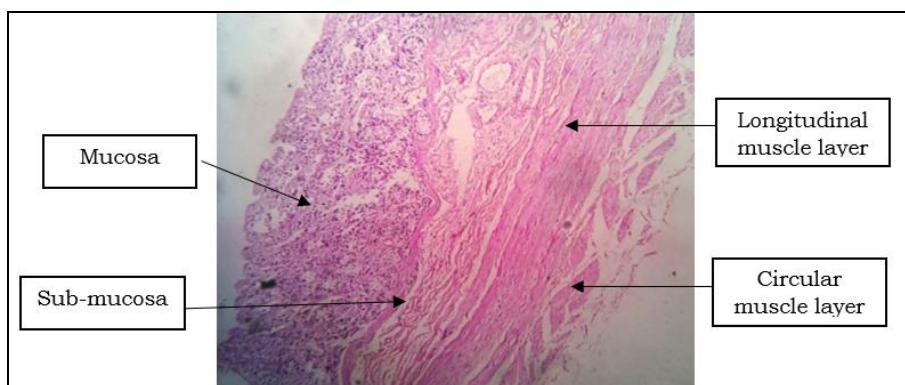


Fig 1: C. S. of caecum of uninfected sheep showing normal caecal tissue

Caecum of infected animal

The histopathological changes in the caeca of four sheep due to *T. ovis* infection were characterized by slight haemorrhage and cellular infiltration. A tunnel was formed up to sub-

mucosa due to piercing of anterior portion of *T. ovis* in caecal tissue of the sheep but around the tunnel there was no cellular reaction except the slight haemorrhage in the sub-mucosa as well as in the mucosa (Fig. 2).

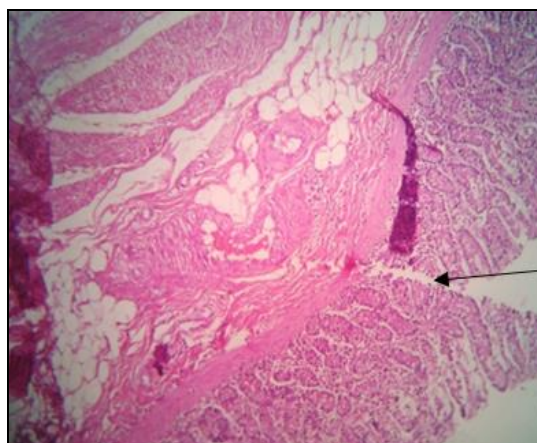


Fig 2: C. S. of caecum of infected sheep showing a tunnel in the mucosa and sub-mucosa layer

There was cellular infiltration of neutrophils, lymphocytes and eosinophils in the mucosa and sub-mucosa in caecum of another sheep infected with *T. ovis* (Fig. 3). Anterior portion of *T. ovis* was embedded within the mucosa only with slight cellular infiltration (Fig. 4) in the caeca of five sheep.

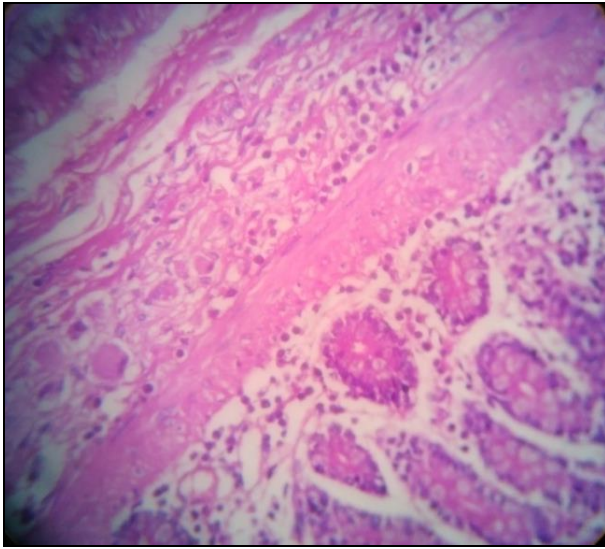


Fig 3: C. S. of caecum of infected sheep showing cellular infiltration around mucosa, sub-mucosa and muscle layer

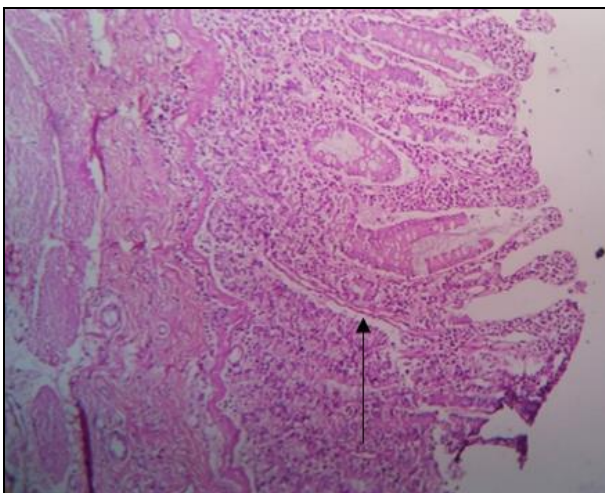


Fig 4: C. S. of caecum of infected sheep showing anterior portion of *Trichuris ovis* embedded into the mucosa

Discussions

Prevalence of *Trichuris ovis* in sheep

Gastrointestinal parasitism is a common occurrence in small ruminants of the world [4, 5] including India [6, 12]. The overall prevalence of *Trichuris* infection was 56.9%. The prevailing agro – climatic conditions of West Bengal such as monthly average temperature, rainfall and relative humidity are optimum for all round the year for survival and translation of free-living stages of g. i. parasites (AINP on GIP, Annual Report, 2016 – 2017) and favour the high prevalence of gastrointestinal parasites in livestock. In West Bengal the rural farmers rear the sheep by semi-intensive system which is also accountable for higher occurrence of g.i. parasites [6] including *T. ovis* in sheep. The higher prevalence of *Trichuris* sp. in sheep of West Bengal as observed in the present study is therefore quite reasonable. Higher prevalence of *Trichuris* sp. in small ruminants has been recorded earlier from different parts of world [13, 14] and India [15, 16].

The high prevalence of *Trichuris* in sheep in the present study is in contrast to earlier records [4, 7, 12, 17, 18]. This discrepancy might be due to the fact that the above studies was carried out by the screening the faecal samples and by this process only animals having infection with the adult parasite are identified but infection due to immature parasites are not detected. Also, the above studies conducted for a longer duration than the present study and number faecal samples was higher the number of caecum and colon of slaughtered sheep as used in the present study.

Histopathological changes due to *Trichuris ovis* infection in sheep

Present study showed the histopathological changes in caecum of sheep infected with *T. ovis* and there was slight haemorrhage, cellular infiltration and the anterior portion of worm was embedded in the mucosa. Similar type of observations was also found by Wani *et al.* [19]. Sparse infiltration of mononuclear cells may be due to response of tissue to the invading parasite. Haemorrhage in the mucosa as observed in the present study was also recorded earlier by Sharma *et al.* [20]. A tunnel was formed up to sub-mucosa due to piercing of anterior portion of *T. ovis* in caecal tissue of the sheep but around the tunnel there was no cellular reaction except the slight haemorrhage in the sub-mucosa as well as in the mucosa. This is in contrast to the earlier finding by Mohanta *et al.* [21] who reported *T. ovis* embedded in the mucosa of black Bengal goat with slight catarrhal inflammation. Petechial haemorrhages on the mucosa, cellular infiltration such as infiltration of lymphocytes, eosinophils and macrophages on the caecum and colon and proliferation of goblet cells were noticed. Destruction and desquamation of lining epithelium of intestine were detected.

Absence of any severe inflammatory / immunopathological lesion in caecum of infected sheep as observed in the present might be due the presence of shared immunopeptides between the *Trichuris ovis* and host caecal mucosal protein [22]. There was cellular infiltration of neutrophils, lymphocytes and eosinophils in the mucosa and sub-mucosa in caecum of another sheep infected with *T. Ovis*. The cellular infiltration might be due the presence of non-shared immunopeptides in the CSAG and ESAG of *Trichuris ovis*. This is in agreement with the finding of Solanki *et al.* [23] who reported that due to *Trichuris* sp. infection in camel large intestinal mucosa showed a few dilated glands and hyperemia with moderate increase in inflammatory cells composed of lymphocytes and eosinophils.

Conclusion

Trichuris ovis is prevalent in small ruminants of West Bengal, India. The results of the present study revealed that *T. ovis* is non-pathogenic to sheep and might also has evolved some immune evasion mechanism as indicated by the no cellular reaction around the anterior portion of the worm which remains deeply embedded in caecal mucosa.

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