Pathological studies on helminth parasitic infection in mithun (*Bos frontalis*)

J. K. Chamuah¹ · B. Dutta² · D. Borkotoky¹

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Abstract A pathological study was carried out in different helminth parasite infection organs in 110 animals during the period from 2010 to 2016. Histopathological examination of hydatid cysts in the liver, showed extensive fibrous connective tissue proliferation with eosinophilic and lymphocytic infiltration, in lung, parenchyma showed severe emphysema with infiltration of alveolar macrophages and lymphocytes infiltration. In *Toxocara* infection, polymorphonuclear infiltration in the sub-mucosa with hyper activity of goblet cells leading to occlusion of the gland was noted in the tissue sections. In amphistomiasis, intestinal mucosa showed diffuse hyperemia, thickening and ulceration. Petechiae were observed in the anterior part of the duodenum and jejunum. Presence of parasites in the abomasum revealed petechial haemorrhages on the mucosa. In *Trichuris* infection, the rectum showed hypertrophy, hyperplasia and hyperactivity of the goblet cells. In some places there is focal aggregation of mononuclear cells.

Keywords Helminth parasite · Mithun · Pathological · Infection

Introduction

Mithun (*Bos frontalis*), pride animal of north eastern hilly region, plays an important role in the socio cultural life and economic status of the tribal population particularly for the states of Arunachal Pradesh, Nagaland, Manipur and Mizoram. This animal is susceptible to various parasitic diseases due to congenial atmosphere for propagation of parasitic life cycle. Reports of helminth parasites in mithun by faecal examination have been reported by different researchers from time to time (Tandon et al. 2005; Chamuah et al. 2009). The present study was designed to elucidate the pathological alterations of organs infested by different helminth parasites in mithun.

Materials and methods

In the present study materials were collected from the carcasses of (n = 110) that were slaughtered in various ritual festivals and marriage ceremonies of the tribal population in different areas of Arunachal Pradesh and Nagaland and also from the animals that died due to various disease conditions during the period from 2010 to 2016. At the time of post-mortem examination, visible gross lesions were recorded and representative tissue samples were collected in 10% formalin solution. The tissues were properly processed and embedded in paraffin wax. Paraffin sections were cut 4–5 µm thick and stained with haematoxylin and eosin (H&E) by method as described by Luna (1968). Histological alteration of all sections was examined using light microscope and photographed. The grossly visible parasites were collected from different organs and identified based on the morphological characteristics (Soulsby 1986).

✉ J. K. Chamuah
drjayantavet@gmail.com

¹ ICAR-National Research Centre on Mithun, Medziphema, Nagaland 797106, India

² College of Veterinary Science, Khanapara, Guwahati, Assam 781022, India

Results

The helminth parasites were recorded as *Fasciola gigantica* (8, 7.27%), *Paramphistomum epiclitum* (8, 7.27%), *Explanatum explanatum* (4, 3.63%) and *Calicophoron calicophorum* (2, 1.81%) *Setaria digitata* (9, 8.0%), *Mecistocirrus digitatus* (4, 3.63%), *Trichuris* spp. (4, 3.63%) and *Toxocara vitulorum* (8, 7.27%) during the present investigation. *Oesophagostomum* spp. infection with extensive nodule formation on the intestinal wall was present in 10 (9.09%) animals. Hydatid cyst was observed in 17 (15.4%) animals. The affected organs namely liver, lung and spleen showed thickening and pressure atrophy of the organs.

Histopathological examination of hydatid cysts in the liver showed formation of cystic cavity (Fig. 1) in the hepatic parenchyma. In some areas, the cystic spaces were filled with necrotic debris, numerous protoscolices and hooklets (Fig. 2), whereas in some areas, cavities were prominent without presence of any organism. There was extensive fibrous connective tissue proliferation with eosinophilic and lymphocytic infiltration (Fig. 3). Occasionally neutrophils were also prominent in some section. The lung parenchyma showed severe emphysema with presence of the cyst (Fig. 4) contained collapse hydatid membrane. Surrounding the cyst, there was presence of alveolar macrophages with lymphocytic infiltration. Spleen showed cystic cavity formation with accumulation of few necrotic debris and scolices (Fig. 5). In some areas there was depletion of lymphocytes from the lymphoidal follicle. Adherence of *Toxocara* parasite in mucosal surface of the intestine had been depicted. Polymorphonuclear infiltration in the sub-mucosa with hyper activity of goblet cells leading to occlusion of the gland was noted in the tissue sections (Fig. 6).

Fig. 1 Photomicrograph showing hydatid cyst-cystic cavity (arrow) in liver. H&E $\times$ 100

Fig. 2 Photomicrograph showing cystic cavity with notable necrotic debris and protoscolices (arrow). H&E $\times$ 100

Fig. 3 Photomicrograph of liver affected with hydatid cyst showing eosinophilic and lymphocytic infiltration (small arrow) with connective tissue proliferation. H&E $\times$ 100

Fig. 4 Photomicrograph of lung affected with hydatid cyst showing emphysema with presence of collapsed hydatid membrane (arrow). H&E $\times$ 400

In amphistomiasis, the intestines were heavily studded with large numbers of immature amphistomes that embedded in the mucosal surface. The intestinal mucosa

Fig. 5 Photomicrograph of spleen showing cystic cavity with accumulation of few necrotic debris and scolices (arrow) and lymphocytic infiltration. H&E $\times$ 400

Fig. 6 Photomicrograph of rectum affected with *Trichuris* species showing hyperactivity of goblet cells (larger arrow) with polymorphonuclear infiltration (small arrow) in the intestinal submucosa. H&E $\times$ 100

showed diffuse hyperemia, thickening and ulceration. Petechiae were observed in the anterior part of the duodenum and jejunum. Presence of parasites in the abomasal mucosa revealed the presence of petechial haemorrhages. In *Trichuris* infestation, the rectum showed both hypertrophy and hyperplasia of the goblet cells with hyperactivity of goblet cells. In some places there was focal aggregation of mononuclear cells.

Discussion

When enquired about the source of the mithuns brought for slaughter, it was revealed that the animals were gathered from wild forest areas. Hence, there is every possibility that hydatidosis in these animals maintained a sylvatic cycle with wild carnivores animals like fox, jackal etc. The microscopic changes recorded in the present study were

thickening of cyst wall, pressure atrophy of hepatic lobule, marked fibrosis of liver and infiltration of mononuclear cells etc. are in agreement with the findings of earlier workers (Choudhury et al. 1987; Singh et al. 1992). Marked thickening of cyst wall and pressure atrophy of hepatic lobule was also noted by Chamuah (2005). Al Seadawy and Al Kaled (2012) recorded thickened fibrous layer and severe necrosis with infiltrations of eosinophils and extensive calcification in liver of cow. However, in the present study, protoscolices and scolices were not recorded in all the cysts. The pressure atrophy of surrounding alveolar structure as well as infiltration of capsule by a few polymorphs and large number of mononuclear cells, epithelioid cells and langhans type of giant cells with occasional presence of eosinophils were similar to the findings by Singh et al. (1992) in pigs.

The scattered brood capsules with hooklets along with the cyst wall having an outer cellular laminated layer and inner germinal layer in spleen infected with hydatid cyst in mice was observed by Rana et al. (2014). While Singh et al. (1992) recorded mild depletion of lymphoid cells and presence of large mononuclear and plasma cells in and around germinal center of cortical lymphoid follicles along with marked macrophage reaction was detected in the parafollicular areas in spleen of pigs, which is similar with present findings in mithun.

Nath et al. (2011) recorded slight catarrhal inflammation with petechial haemorrhages on the mucosa, infiltration of lymphocytes, eosinophils and macrophages on the caecum and colon and proliferation of goblet cells in *Trichuris ovis* infected black bengal goat. While, Chakraborty (1992) recorded pathological alteration of *T. ovis* infection in mithun where there was excessive mucus secretion in heavily infected animals with catarrhal typhlocolitis, hemorrhage and sloughing of mucosa, whereas in present finding, there was both hyperplasia and hypertrophy of goblet cells of the rectum.

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