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CASE REPORT

Diagnostic Exercise: Gastroenteritis and Pneumonia Due to *Mesocestoides* spp. and *Toxascaris leonina* in a Eurasian Lynx (*Lynx lynx*)

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ABSTRACT

Pathological and parasitological findings of a parasitic gastroenteritis due to *Mesocestoides* spp. and *Toxascaris leonina* in a two-year-old lynx (*Lynx lynx*) was identified. The lynx was injured due to an accident in the forest in İspir-Erzurum, Turkey. At necropsy, there was erosive and hemorrhagic tissue loss on different regions of the head, especially on the nose. Numerous parasites were found in the stomach and intestine. At histopathological examination, along with necrotic debris and gastric contents in the luminal surface of the stomach, various parasitic forms were identified. Similar parasitic forms were observed in the intestine. Fecal examination revealed *Toxascaris leonina* eggs. It was concluded that parasitic gastroenteritis and pneumonia due to *Mesocestoides* spp. and *Toxascaris leonina* were the causes of death in a wild lynx and this is the first reported from Turkey according to the current literature.

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INTRODUCTION

Endangered populations are markedly sensitive to diseases as a result of a variety of extrinsic and genetic factors (Munson *et al.,* 2005). Among these diseases, helminthiasis may play an important role in morbidity and mortality (Vicente *et al*., 2004). Certain species of virus, bacteria and parasites are the main cause of gastroenteritis and usually this disease occurs in all species of animals. Parasitic gastritis is generally of little significance in small animals (Vicente *et al*., 2004). Several intestinal helminthic species such as trematoda, cestoda and nematoda have been detected in fecal samples of the lynx (Torres *et al*., 1998; Acosta *et al*., 2011).

Adult *Mesocestoides* spp. and *Toxascaris leonina* are occasionally found in the intestines of cats, dogs and other wild carnivores. Animals infected by intestinal *Mesocestoides* may develop diarrhea. When 2nd stage larvae (tetrathridium) of Mesocestoides found in the abdominal cavity, it causes peritoneal effusion (parasitic ascites), perhaps with the development of pyogranulomatous peritonitis and adhesion in dogs and cats. *Toxascaris leonina* has a lifecycle which may be direct, although it can involve a paratenic host (Brown *et al*., 2007). There are very few records of the prevalence of these parasites in lynxes worldwide (Millán and Casanova, 2007; Acosta *et al*., 2011). In Turkey, to our knowledge, a report on *Mesocestoides* spp. and *Toxascaris leonina* in lynxes is lacking. The aim of this study was to evaluate the pathological and parasitological findings of a parasitic gastroenteritis case which is the first report in a wild lynx in Turkey according to the current literature.

Case history and methodology: A two-year-old male lynx (*Lynx lynx*) was referred for necropsy to the Pathology Department, Faculty of Veterinary Medicine, Ataturk University. The animal was injured due to an accident and found in agony in the forest in İspir-Erzurum. The animal was dead when referred to our laboratory. At necropsy, there was erosive and hemorrhagic tissue loss on different regions of the head, especially on the nose, limited hydroperitoneum and congestion in the liver. In gastrointestinal examination, mucosal surfaces of the stomach and intestine were hyperemic with watery contents. Numerous parasites were detected in the stomach and intestine. Intestinal contents and parasitic structures were submitted to the Parasitology laboratory with the suspicion of *Mesocestoides* spp. and *Toxascaris leonina*. The parasitic structures were more intense in the intestines. The cerebrum was hyperemic and swollen with an edematous appearance. For

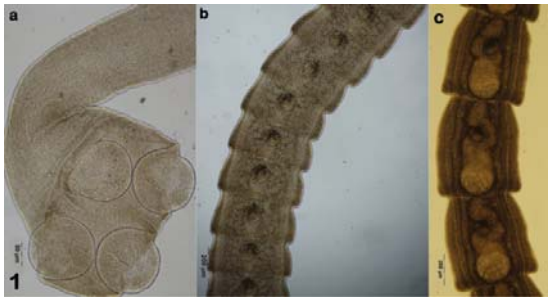

Fig. 1: Morphology of *Mesocestoides* spp. (a: scolex and b,c: proglotteds).

histopathology, tissue samples from suspected organs were fixed in 10% neutral buffered formalin solution. After a routine histopathology process (alcohol-xylol procedure), tissue samples were embedded in paraffin wax and sectioned in 5 micron and routinely stained with Hematoxylin and Eosin (Presnell and Schreibman, 1997). All slides were examined under light microscopy. Collected parasites were fixed in 70% alcohol containing 5% glycerin for identification. Fecal samples were examined for helminthic eggs using saturated $NaCl_2$ flotation. Identifications for both helminthes and their eggs were performed based on the descriptions of Thienpont *et al*. (1986).

RESULTS

Two helminthic species were identified, including one cestoda species *Mesocestoides* spp. (2 adult) (Fig. 1) and one nematode species *Toxascaris leonina* (19 male, 25 female). In histopathologic examination, there were many parasitic forms with necrotic debris and gastric content on the luminal surfaces of the stomach. The gastric glands were dilated and the epithelial hyperplasia were detected (Fig. 2a and 2b). Similarly, parasitic forms were observed in the intestines (Fig. 3a). Fibrous proliferation and mononuclear cell infiltration in were detected the propria mucosa of the affected intestine (Fig. 3b). In addition to the stomach and intestinal parasitism, similar structures were observed in bronchial and

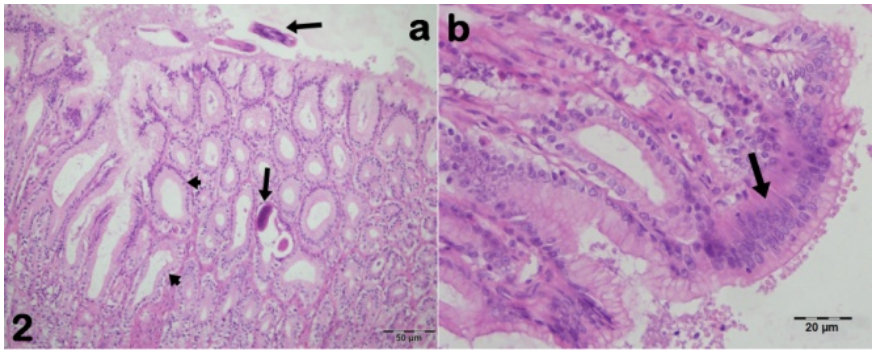

Fig. 2: a) Parasitic forms (long arrows), dilatation of gastric glandules (short arrows) and epithelial hyperplasia left top; b) Epithelial hyperplasia of gastric mucosa (arrow). H-E.

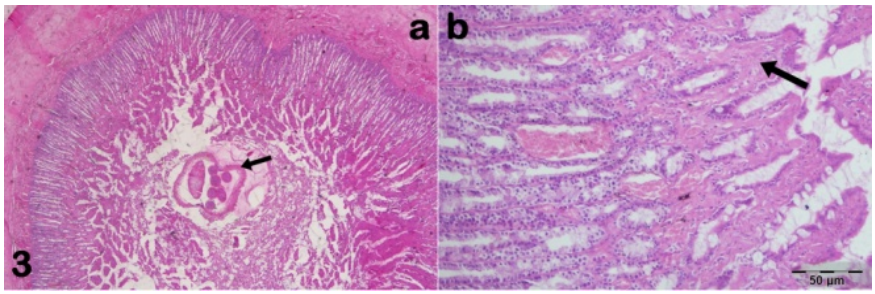

Fig. 3: a) Parasitic forms within the intestinal lumen (arrow); b) Hyperemic vessels and fibrous tissue proliferation (arrow) of propria mucosa of intestine. H-E.

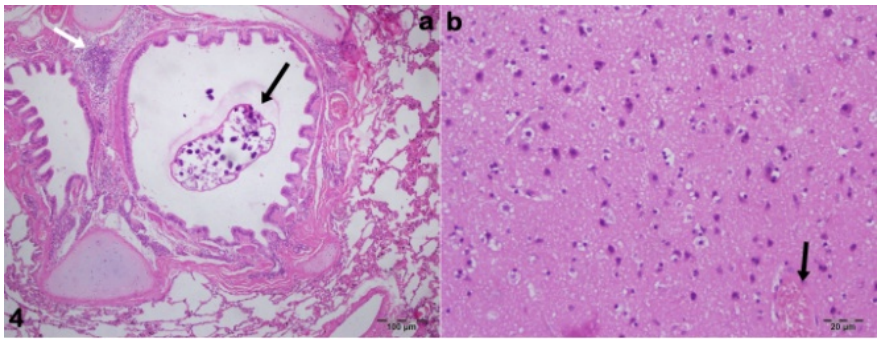

Fig. 4: a) Parasitic forms within the bronchial lumina (arrow); b) Hyperemia (arrow) and gliosis in cerebral tissue. H-E.

bronchiolar lumina (Fig. 4a). There were interstitial pneumonia characterized by interalveolar tissue thickening and peribronchiolar lymphoid hyperplasia in these lung sections. In the liver, central veins and sinusoids were hyperemic and limited mononuclear cell infiltration was detected. Cerebral meninges were hyperemic (Fig. 4b). There was neuronal degeneration, necrosis and neuronophagy. Besides, the perineural and perivascular spaces were expanded in cerebral sections.

DISCUSSION

According to Brown *et al*. (2007), the diagnosis of gastrointestinal diseases due to helminthes must be made with knowledge of their pathogenic potential and the mechanisms by which it is expressed. Parasites are much more common than the diseases they cause, and helminthiasis, which is the state of infection, must be differentiated clearly from helminthiasis, which is the state of the disease. The principal differential diagnoses for gastroenteritis in carnivores include canine parvovirus, bacterial infections or parasitic infestations. Gastrointestinal nematodes and cestodes are major agents in animal health, welfare and alimentary tract diseases (Rodriguez and Carbonell, 1998; Torres *et al*., 1998; Brown *et al*., 2007). According to the published reports, *Mesocestoides lineatus* and *Toxascaris leonina* were detected in very high percentages in the lynx (Rodriguez and Carbonell, 1998; Torres *et al*., 1998; Acosta *et al*., 2011) and other carnivores (Gicik *et al*., 2009). In the present case, parasitic gastroenteritis was seen in a two-year-old lynx (Lynx lynx) and *Mesocestoides* spp. with *Toxascaris leonina* were identified with parasitological and molecular methods. In previous studies, the percentage of *Mesocestoides* was reported as between 37.5 and 40% (Torres *et al*., 1998). Besides, the percentage of *Toxascaris leonina* was reported as 3.1% and 62.5% (Torres *et al*., 1998; Acosta *et al*., 2011) in a larger range in the lynx. In another study about Red Foxes (*Vulpesvulpes*) in Turkey, *Mesocestoides lineatus* was reported in the percentage of 60% and *Toxascaris leonina* in the percentage of 65% were reported (Gicik *et al*., 2009).

Nematode infestations primarily cause blood loss, anemia, hypoproteinemia, diarrhea and death. Also, there may be some findings of dehydration, weakness and watery intestine content (Brown *et al*., 2007). In this diagnostic exercise, there were similar findings with literature such as limited hydroperitoneum and watery gastrointestinal tract content. Mucosal surfaces of the stomach and intestine were hyperemic and many parasites were grossly observable in microscopy. Parasitic forms with necrotic debris and hyperemia were in histo-pathological examination of the stomach and intestine and fibrous proliferation and mononuclear cell infiltration of propria mucosa of affected intestine were similar to a previous report (Brown *et al*., 2007). According to the parasitological result these parasites were identified as *Mesocestoides* spp. and *Toxascaris leonina.*

Traumatic changes and injuries and continued coma were thought to be responsible for the cerebral changes observed in the present study. The people who found the lynx reported that they had found the animal in a coma. It is thought that there may be a lack of resistance depending on intensive parasitic infection and accordingly, the lynx may have been injured in a fight.

Conclusion: This parasitic gastroenteritis case, which is the first report in of wild lynx in Erzurum, Turkey, according to the current literature, was pathologically described and named as having *Mesocestoides* spp. and *Toxascaris leonina*.

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