Seasonal histopathological alterations caused by *Adenoscolex oreini* in *Schizothorax niger* of Kashmir valley

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Received: 28-07-2016 Accepted: 06-01-2017 DOI: 10.18805/ijar.v0iOF.7815

ABSTRACT

Fishes infected with *Adenoscolex oreini* appeared anemic and the abdomen and the abdominal fluid was tinged red. On opening the intestine necrotic debris was present on the surface and numerous parasites were present. The histopathological alterations observed in the intestine of fish were (severe degenerative and necrotic changes in the intestinal mucosa as well as edema between submucosa and mucosa). In parasitized *Schizothorax niger*, hyperplasia of intestinal mucous cells and enhanced mucus secretion were also noticed. Cestode bodies were covered with an adherent mucus blanket. The analysis of the seasonal variation on the histological parameters leads to the conclusion that the distribution or the severity of the lesions observed in these organs were not related to the seasons. Such information confirms that histopathological alterations are good biomarkers for field assessment, in particular in tropical areas that are naturally subject to a multiplicity of environmental variations. It must be emphasized that histopathology is able to evaluate the early effects and the responses to acute exposure to parasitic infections and chemical stressors.

Key words: Cestodes, Histopathological, Necrotic, Parasites.

INTRODUCTION

Since parasites are sensitive to environmental change, others are more resistant than their hosts and tend to increase in numbers in polluted conditions (Sures, 2004); they are now regarded as a useful indicator of aquatic health. The relationship between environmental pollution and parasitism in aquatic organisms and the potential role of endoparasites as water quality indicators has received increasing attention during the past two decades (Sures, 2003, 2004). The ability of endoparasites to detect even lowest metal concentration due to their enormous accumulation capacity has made them suitable water pollution biomonitors than their fish hosts (Elijah et al., 2010). Recently Sures (2007) indicated that parasites can also act as metal sinks for its fish host. It is apparent that any changes to metal concentration in the fish tissues are likely to alter metal bioavailability and toxicity. Study of histopathology is of prime importance in the diagnosis, etiology and prevention of disease. Data on tropical fish and effects on different fish tissues are still scarce (Mela et al., 2007). The present study was aimed to evaluate the histopathological effects of heavy metals on intestines and liver *S. niger* and to enhance the knowledge of tissue damage after exposure to heavy metals.

MATERIALS AND METHODS

**Gross pathology:** Fishes were systematically subjected to detailed macroscopic examination with special emphasis on liver, intestine and the lesions were recorded.

**Histopathology:** Representative tissue samples from the liver, intestine affected by parasites were collected in 10% formalin. The tissue samples were processed for routine paraffin embedding technique and 5 μm thin section were stained with Haris haematoxylin and Eosin (Bernet et al., 1999).

**Histochemistry:** Sister tissue section selected on the basis of histopathological examination were stained for following histochemical observations.

1. Determination of acid and neutral mucin by combined alcian blue Periodic-acid Schiff (PAS) stain (Bancroft and Gamble, 2002).
2. Determination of mast cells by toluidine blue staining protocol (Gandalfo et al., 2006)

RESULTS AND DISCUSSION

**Histopathology of Adenoscolex oreini infection of Schizothorax niger.** The fishes infected with *Adenoscolex oreini* were anemic and the abdomen appeared slightly pot bellied. Viscera appeared red on opening the abdomen.
and the abdominal fluid was tinged red. On opening the intestine necrotic debris was present on the surface and numerous parasites were present. During spring (Fig. 1) enteritis characterized by inflammatory cells in the lamina propria and lamina epithelialis of intestine was seen. Epithelial desquamation was evident and hyperplasia of lymphoid nodules seen. Villi towards the luminal side were completely devoid of epithelial cells and were only survived by connective core. Eosinophils granule cells were seen in lamina propria. Goblet cells hyperplasia was seen with positivity for acid mucopolysaccharide. Liver cells were swollen showing vacuolar degeneration and Kupffer cell hyperplasia. During summer severe chronic enteritis was seen with infiltration of lymphocytes and fibroblasts in the lamina propria. Mast cells were occasionally seen. Liver cells showed moderate degenerative changes with cellular swelling and distortion. During Autumn (Fig. 2) Enteritis was comparatively less severe in intestines. Lamina propria was infiltrated with mononuclear and eosinophilic granule cells. Necrosis of some villi was seen represented by fibrillar networks.

Alcian blue Periodic-acid Schiff staining revealed goblet cells hyperplasia with presence of acid mucopolysaccharide. During winter (Fig. 3) enteritis seen in intestine was characterized by infiltration of inflammatory cells in lamina propria and lamina epithelial along with necrosis of mucosal epithelial cells. Intestinal villi had become thickened and crypts were obliterated. Eosinophiles granules were seen in lamina propria. Goblet cell hyperplasia was clearly seen having acid mucopolysaccharide. Mast cells were evident. Liver cells revealed vascular degeneration and cellular disorganization (Fig. 4). Mast cell infiltration was evident with scattered metachromatic granules.

The histopathological alterations observed in the intestine of fish (severe degenerative and necrotic changes in the intestinal mucosa as well as edema between submucosa and mucosa) might be the result of *Adenoscolex oreini*, and has previously been attributed also to the uptake of toxic metals (Hanna *et al.*, 2005). In the present findings, we observed severe degenerative changes in villi structure. In parasitized *Schizothorax*...
niger, hyperplasia of intestinal mucous cells and enhanced mucus secretion were documented. Cestode bodies were often covered with an adherent mucus blanket. Our data are in agreement with the suggestion that the mucus gel layer protects the underlying epithelium as a physical barrier against pathogens and their toxins (Schroers et al., 2009). Mast cells were occasionally seen in our study. It has been reported that mast cells are major effector cells in the immune response to helminth infection (Dezfuli et al., 2008) and suggested that mast cells or their products are pivotal in mediating leukocyte recruitment to inflammatory sites (Mekorì, 2004). Mast cells have been associated with defense against bacteria (Wedemeyer et al., 2000). Degeneration and necrosis of the hepatocytes might be due to the cumulative effect of metals and the increase in their concentrations in the liver. These results agreed with Authman and Abbas (2007) who stated that the liver has an important detoxical role of endogenous waste products as well as externally derived toxins as heavy metals. The cellular degeneration in the liver might also be due to oxygen deficiency as a result of gill degeneration and/or to the vascular dilation and intravascular haemolysis observed in the blood vessels with subsequent stasis of blood (Mohamed, 2001). Presence of mainly glycogen in the vacuoles of the hepatocytes shown by Periodic-acid Schiff method in the present study, however, suggested that, the vacuolization need not be related to a degenerative process. The liver parenchyma of the fish showed signs of degeneration (cytoplasmic and nuclear degeneration, and nuclear vacuolation). These alterations are more severe and have been associated with the exposure of the fishes to contamination by metals, such as copper (Paris-Palacios et al., 2000). The histological changes observed in the intestines and liver of the S. niger in the present study indicated that the fish were responding to the direct effects of the contaminants as much as to the secondary effects caused by stress.

REFERENCES


