HISTOLOGICAL ALTERATIONS IN THE STOMACH OF MICE AGAINST ANCYLOSTOMIASIS

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ABSTRACT

Three different doses of Ancylostoma caninum larvae were given per OS to 3 varied groups (group A, 500 larvae; group B, 1000 larvae; group C, 2000 larvae) of male swiss albino mice. Histological changes in stomach of 3 groups of experimental mice were studied on day 1, 4, 9, 16 and 30 of infection comparing with uninfected controls (group D). A. caninum infection induced marked changes in the histology of stomach like destruction of gastric folds and glands, infiltration of cells and vacuolization from day 1 to 30 of infection.

Key words: Histology, stomach, mice, A caninum infection.

INTRODUCTION

Infection of intestinal nematodes is a global health problem and more than 25% of world’s population is suffering due to hookworm anemia (McCarthy and Moore, 2000; Maizels and Yazdanbakhsh, 2003; Elliot et al., 2007; Hewitsoh et al., 2011). Rural children infected with hookworm showed reduced level of RBC, Hb, MCH, MCHC and albumin (Avhad et al., 2013). Hookworms cause chronic pathogenesis in their host in relation to their invasion, colonization and toxicity (Periago and Bethony, 2012). The L3 larvae of A. caninum are highly infectious both to man and dog (Brooker et al., 2004). It is found that A. caninum larvae induce mastocytosis, eosinophilia, neutrophilia anaphylaxis in the small intestine of mice (Vardhani and Johri, 1979; Vardhani and Gowri., 1996; Nirmala Devi and Vardhani., 2007; Vardhani, 2002, 2005). However, no information is available on the histopathology of stomach during canine hookworm infection in mice. The present investigations are designed to understand the histologic reactions of stomach in mice infected with various single doses of infective A. caninum larvae.

MATERIALS AND METHODS

Infective larvae of A. caninum were obtained according to the method of Sen et al., (1965). Thirty male swiss albino mice (6 – 8 wks; 23 – 25 g) were divided into 3 groups and inoculated orally each with a single dose of 500 (group A), 1000 (group B) and 2000 (group C) larvae. Another group (D) of ten mice was kept as controls for comparison. Two mice from each infected and control groups were sacrificed on day 1, 4, 9, 16 and 30 of infection period and tissues of stomach were fixed, sectioned (5 um) and stained by H & E method for histopathological studies.

RESULTS AND DISCUSSION

The histological changes recorded in the stomach of mice exposed to various single doses
Figure-1. Showing the T.S of stomach from control (group a) and infected (500 dose/mouse) mice. All the panels are at 40 X magnification.

C : T.S. of stomach of normal mouse (group a); D1: Day 1 of infection; normal mucosa and slightly destructed gastric folds; D 4 : Day 4 of infection; slight destruction in glandular epithelium; D 9 : Day 9 of infection; gastric folds are covered by mucus and slight; destruction in glandular epithelium of gastric folds; D16 : Day 16 of infection showing the slightly destructed gastric folds; D 30 : Day 30 of infection; gastric folds are covered by mucus and showing destruction and hyperplasia.

Abbreviations: GF, gastric folds; SGF, slightly destructed gastric folds; SGE, slightly destructed glandular epithelium; DGF, destructed gastric folds; HP, hyperplasia.
Figure-2. Showing the T.S of stomach from infected (1000 dose/mouse) mice. All the panels are at 40 X magnification.

Plate 2

D1 : Day 1 of infection; note the gastric folds covered with excessive mucus; D 4 : Day 4 of infection; slight necrosis in gastric folds; D 9 : Day 9 of infection; slight infiltration of cells; D 16: Day 16 of infection; hyperplasia in gastric folds; D 30: Day 30 of infection; gastric folds are showing hyperplasia.

Abbreviations: MGF, mucus covered gastric folds; NGF, necrotized gastric folds; IF, infiltration; HP, hyperplasia
Figure-3. Showing the T.S of stomach from infected (2000 dose/mouse) mice. All the panels are at 40 X magnification.

D1 : Day 1 of infection - the slight destruction in the gastric folds; D 4 : Day 4 of infection - slight separation of muscle layers; D 9 : Day 9 of infection - heavy infiltration of cells was seen; D 16: Day 16 of infection - heavy infiltration of cells; D 30 : Day 30 of infection - gastric folds showed hyperplasia and mucus covering.

Abbreviations: DGF, destruction of gastric folds; SML, separation of muscle layers; HIF, Heavy infiltration.
indicate that the infective larvae might have affected the normal histology of stomach. The transverse sections of the stomach (corpus) of control animals (group a) showed clear serosa, longitudinal muscle layer, circular muscle layer, sub mucosa, and gastric folds (glandular epithelium of mucosa) with gastric glands (Plate 1).

500 dose (group A):
The T.S. of stomach showed clear serosa, longitudinal muscle (LM) layer, circular muscle (CM) layer and sub mucosa on day 1, 4, 9, 16 and 30 of infection. The layers of stomach and gastric folds were found to be covered with mucus on all days of infection, slight damage was found in glandular epithelium of mucosa of gastric folds and glands on all days of infection.

1000 dose (group B):
Marked changes were found from day 1 to 30 of infection. The stomach walls and gastric folds were found to be coated with the mucus covering. Gastric folds were destructed at certain places on day 4 of infection. Heavy infiltration of cells and an increase of spaces in between gastric folds were found on day 9, 16 and 30 of infection.

2000 dose (group C):
Stomach exhibited a significant host-parasite infection when compared with controls. There was a slight destruction in gastric folds and gastric glands when comparison was made among the various days (1, 4, 9, 16 and 30) of infection period. The layers of stomach and gastric folds showed a thin layer of mucus covering and the lumen of the stomach is occupied by cell debris. Heavy infiltration of cells was found on day 4, 9 and 16 of infection.

A. caninum infection is known to cause weight loss and anemia in infected mice (Vardhani, 1986) and L3 larvae stay in gastrointestinal tract from day 1-9 (Bhopale and Johri, 1975), and in muscles by day 30 (Vardhani and Johri, 1981). Anemia and/or the adverse environment in the gastrointestinal tract might have brought significant changes in the stomach of experimental mice. Immune T cells produce different cytokines that induce many intestinal alterations like eosinophilia and mastocytosis during infections of Trichinella spiralis (Ruitenberg et al., 1979; Finkelman et al., 1997) and A. caninum (Vardhani and Johri, 1979; Vardhani, 2002). The allergic inflammation in the gut creates an unsuitable environment for the stay of the worms (Wakelin, 1993; Bell, 1998; Nirmala Devi and Vardhani, 2007) and IgG has been shown to mediate rapid expulsion of T. spiralis in rats (Appleton et al., 1988) and A. caninum in mice (Viveka Vardhani and Sakunthala, 2012). A. caninum induced eosinophilic enteritis infection as reported in dogs/humans (Croese et al., 1994; Khoshoo et al., 1994; Walker et al., 1995; McCarthy and Moore, 2000) might have occurred in this host (Vardhani and Gowri, 1996; Madhuri and Viveka Vardhani, 2013)) causing marked histological changes in stomach

Excessive secretion of mucus and destruction of mucosal cells are the marked changes observed in all the 3 singly infected groups (irrespective of the dose given). Similar findings like destruction, vacuolization and infiltration of cells and excessive mucus secretion in stomach were reported in the stomach of mice under the effect of Gene vac B vaccine by Sakunthala et al., (2014). Khogali et al., (2005) found high intensity of lymphocytic infiltration in stomach of mice treated with Dimethoate 40 EC.

ACKNOWLEDGEMENTS
The author (YTL) is thankful to Prof. V. Viveka Vardhani, the then Head of the Department of Zoology & Aquaculture for providing laboratory facilities and to UGC, New Delhi as a partial benefactor in the MRP for conducting this research.

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