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Research Article

REPORT ON GUT ASSOCIATED LYMPHOID TISSUE (GALT) IN FRESHWATER FISH *CHANNA PUNCTATUS* (BLOCH)

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ABSTRACT

The present study describes the presence of intraepithelial leucocytes (IEL) and interlaminal leucocytes (ILL) in the various gut regions of *Channa punctatus*. Routine histological techniques were adopted, section were stained with haematoxylin and eosin (H&E) and Giemsa. Apart from the IEL and ILL other cell types were observed along the entire gut regions, such as mucus cells, goblet cells, enterocytes, mast cells, granular cells and plasma cells. The presence of lymphoid cells in dispersed manner indicates the presence of gut associated lymphoid tissues and common mucosal immune responses.

Key Words: *IEL, ILL, GALT, Channa*.

INTRODUCTION

The mucosal immunology of vertebrates gained more attention in the past decades. The mucosal immune system is beneficial to fish because its lives in pathogenic rich aquatic environment (Rombout *et al.,* 2011). Still there is a lack of details about this system due to its diversity. It is well documented that teleost fish are able to mount humoral and cell mediated response (Fournier Betz *et al*., 2000).

In fish, mucus associated lymphoid tissue (MALT) is subdivided into several anatomical location of lymphoid tissue- Gut associated lymphoid tissue (GALT). The presence of mucosal immunoglobulin was first reported in Plaice *Pleuronectes platessa* (Fletcher and Grant, 1969). The mucosal immune system is more complex than its systemic counterpart both in terms of effectors and anatomy (Brandtzaeg, 2009). The MALT contains variety of leucocytes (T cells and B cells), plasma cells, macrophages, granulocytes and enterocytes (Salinas *et al*., 2011), but still considerable debate regarding which cells are the main antigen colleting cells in teleost gastro intestinal track. The adaptive immune system of several teleost has been reported by either histology or molecular analysis (Lin *et al.*, 2005).

Fish IELs represent a potential model system for comparative studies of immunology, which could assist in unravelling the complexities of the mammalian immune system (Frane Bozic, 1999). In view the above, the present study is aimed to deal with the GALT in relation to the frequency of intraepithelial leucocytes (IELs) in different region of gut in *Channa punctatus*.

MATERIALS AND METHODS

C. punctatus weighing about 150.0 ± 10.0 gm and length about 18-20 cm were collected from the local fish ponds situated in the vicinity of Annamalai Nagar. The fishes were brought to the laboratory, healthy and without sign of any disease were selected as a sample. The fishes were anesthetized with Tricane Methane Sulphonate (TMS) and the gut was dissected out. The gut was washed thoroughly in the saline to remove the gut content without any damage to the gut. The entire gut was cut into the different pieces and fixed in Bouin's fixatives or Neutral buffered formalin for 24 hours or more. The

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fixed tissue washed in tape water, dehydrated in graded series of ethyl alcohol, embedded in paraffin wax and the sections were cut at 6µ thickness in a Rotary microtome (Spencer). The sections were stained in delafieled haematoxylin and counter stain in eosin. Few sections were also stained with Giemsa stain.

The enumerations of intraepithelial leucocytes (IELs) were carried out by counting the number of IEL per 100 epithelial cells (Doggett, 1989).

RESULTS

The entire length of gut in *C. punctatus* was morphologically divided into five regions; oesophagus, anterior intestine (AI), middle intestine (MI), posterior intestine (PI) and rectum. Histomorphologically the gut of *C.punctatus* consisted of four strata as like in other teleost fish viz., serosa, muscularis, submucosa and mucosa. Serosa outermost layer consisted by loose connective tissues. Muscularis consisted of circular and longitudinal muscle layer and submucosa consisted of loose connective tissue as a mesh network. In mucosa region, the mucosal fold or villi made up of columnar epithelial cells (Figure 1). The mucosal folds were varied in their length and numbers in each region of the gut. The distinct strata in the gut of *C.punctatus* consisted of several cells such as, mucus cells, goblet cells, granular cells, mast cells, lymphoid cells-leucocytes and plasma cells were found along the entire gut region. Accumulation or aggregation of lymphoid cells or lymphocytes was not observed along the entire gut region of *C. punctatus.* The leucocytes were found dispersed along the entire gut as intraepithelial leucocytes (IELs) located along with the epithelial cells of the mucosa and intralaminal leucocytes were found in the lamina propria of mucosal fold (Figure 2 and 3). The relative percentage of IEL found entire gut region were given in Figure 4.

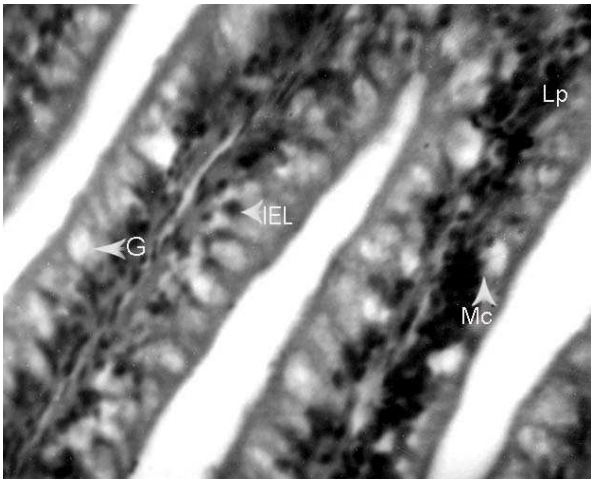

Figure 1. Showing mucosal region of gut in *C. punctatus.* (H&E× Ca 400) G- Goblet cells; IEL- Intera Epithelial Leucocytes; Lp- Lamina propria; Mc- Mucus cells.

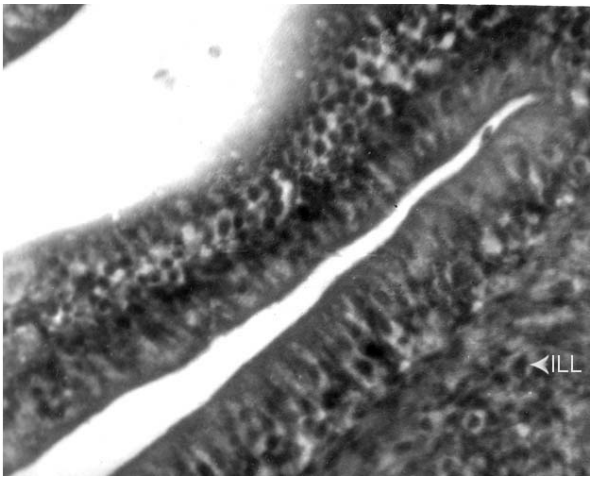

Figure 2. Showing the presence of ILL Intra laminal leucocytes in gut of *C. punctatus*. (H&E× Ca 400). ILL- Intera Laminal Leucocytes.

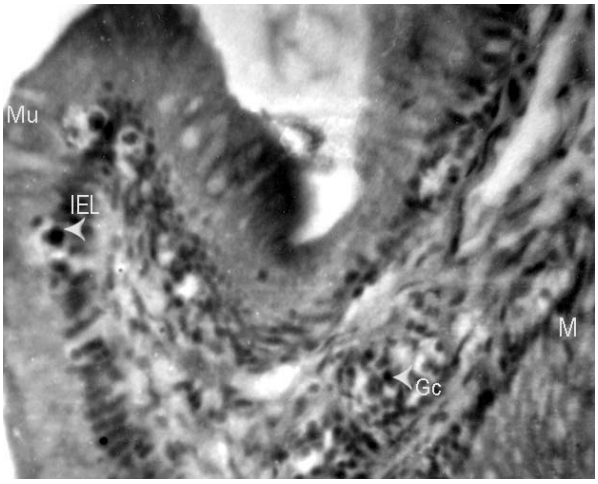

Figure 3. showing the presence of IEL and granular cells in the submucosa of gut in *C.punctatus* gut. (H&E× Ca 400). Mu- Mucosa; IEL- Inter Epithelial Leucocytes; M- Muscular; Gc- Granular cells.

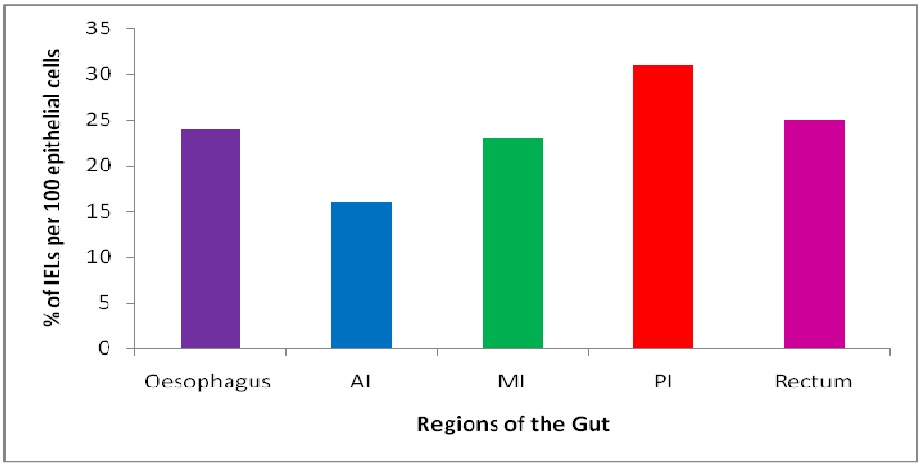

Figure 4. showing the relative proportation of the intraepithelial leucocytes (IELs) in the various region of gut in *C. punctatus*.

DISCUSSION

In the present report, the histological features of the gut of *C.punctatus* showed distinct strata viz., serosa muscularis, submucosa and mucosa were similar with the other teleost fishes and also with mammalian species reported earlier (Suresh and Ranganathan, 2003; Domeneghini *et al.*, 2005; Raji and Norouzi, 2010; Lokka *et al.*, 2013).

The different types of cells such as mucus cells, goblet cells, plasma cells, granular cells and mast cells in the different strata of the gut along the entire length were consistent with earlier studies on other fish species (Gargiulo *et al.*, 1998; Cao *et al.*, 2011; Lokka *et al.*, 2013). The presence of mucus cells indicates secretion of mucus for the protective role against the microorganism (Diaz *et al.*, 2003).

In the present study, no visible accumulation of leucocytes or lymphocytes was found in the entire gut of *C.punctatus*. Suresh and Ranganathan, (2005) reported that no such aggregation of leucocytes in the gut of *Catla catla*. In contradict to the above, accumulation of leucocytes found in the gut of *Oreochromis mossambicus* and *Acanthopagrus latus* (Doggett, and Harris, 1991; Salamat *et al.*, 2011). The presence of IEL and intralaminal leucocytes in the gut of *C. punctatus* were consistent with the other reports (Suresh and Ranganathan, 2005; Salamat *et al.*, 2011).

The numbers of teleost fishes have exists a diffused distribution of leucocytes, lymphocytes, plasma cells, granulocytes and macrophages (Petrie and Ellis, 2006). Similar observations were made in *A.latus* (Salamat *et al.,* 2011) and Atlantic halibut *Hippoglossus hippoglossus* (Grove *et al.,* 2006).

Fish lack the organised GALT like organ like other vertebrates such as Peyer's patches or mesenteric lymph node. But in fishes lymphoid cells are present in scattered along the alimentary canal (Salinas *et al.,* 2011; Rombout *et al.,* 2011). The presence of lymphocytes and IEL in the gut especially in lamina propria indicates the presence of GALT and involved in mucosal immune response (Fournier-Betz *et al.,* 2000).

CONCLUSION

In present study the gut of *C. punctatus* consisted of four distinct layers were observed and the cells important for local immune response such as IELs and ILL, goblet cells, mucus cells present.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest associated with this article.

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