



Original Contribution

STUDY OF THE MAST CELL MORPHOLOGY IN THE DUODENUM OF THE CANARY-BIRD (SERINUS CANARIUS)

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ABSTRACT

The density, shape and dimensions of the mast cells are examined in the duodenum of ten sexually mature and clinically healthy canary - birds, aged 11 - 14 months. The material was fixed and embedded in paraffin and finally stained with toluidine blue at acidic pH. Light microscopy showed the highest density of mast cells in the propria of the intestinal villus of the duodenum, compared with the labile propria. Their number was small in the smooth muscle, where the study showed the mast cells being the longest in length. The form of the mast cells in the muscle was fusiform and in the propria - oval. We suggest that the mast cells in the connective tissue participate in the local homeostasis, and probably play a significant role in the motility and secretion of this intestinal part.

Key words: mast cells, duodenum, *Serinus canarius*

INTRODUCTION

The aim of many investigations on the mast cells of the intestinal mucosa is to explain the role of these cells in immune response, determined by the diet, parasitoses and other enteropathogenic factors (1).

The number of the intestinal mucosal mast cells increases in turkeys with haemorrhagica enteritis, an early indicator of this pathology (2).

The mast cells in the intestine are modulated by nerve impulses from the intestinal intraluminal contents, which induce mast cells' degranulation (3).

Other authors have examined immunohistochemically the mast cells in the oviduct of the birds, connected with the presence of histamine in different parts of these organs (4).

According to (5) there is no age-determined dependence on the distribution of mast cells in the stroma and hilus, compared with the ovarian follicles of the birds. The authors differentiated the investigated mast cells into two types: compact and degranulating ones (6).

There are mast cells in the stroma of the medulla and cortical parts of the domestic donkey's ovary. In the medullar stroma these cells are numerous in the layer under the germinative epithelium and follow its contours; because of this the role of the mast cells is discussed (7).

The distribution and ultrastructure of the mast cells are observed in many organs of the donkey, but their density is highest in the glandular stomach propria and in the perivascular regions. These cells showed metachromasia (8).

The age - determined changes of the mast cells' number are examined in the lymphoid organs of the birds that shows the dependence of their density on the physiological condition of the lymphoid tissues (9).

In the human, rat and mouse, the mast cells are localized in the connective tissue under the epithelial layer, near vascular, lymphoid vessels and peripheral nerves (10, 11, 12, 13).

In the domestic pig the mast cells have important role in the motility of the fibromuscle elements, regulation of the vascular tonus and microcirculation in the ureter (14).

The role of the intestinal mast cells has been examined in the human, in connection with the mucosal immunity in this part of the digestive organs (15). The authors determined

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that these cells take part in the epithelial secretion and permeability, in the neuroimmune connections and intestinal motility. The mast cells are key regulators of the integration and function of the gastrointestinal barrier.

The lack of data on the density, form, and dimensions of the mast cells in the intestines of the domestic canary and occasionally in the duodenum, compared with the other intestinal parts, motivated us to make this investigation.

The aim of this study was to determine the mast cells' role in the function of the duodenal intestinal mucosa.

MATERIAL AND METHODS

Duodenum of ten sexually mature, clinically healthy canaries, aged 11-14 months is examined. The birds were euthanised by intraperitoneal application of Pentobarbital (50 mg/kg b. w., i. p.). The material was fixed in Carnoi's fixative for 4 hours, put in 70° ethanol for 12 hours, dehydrated in an ascending alcohol series, cleared in xylene and embedded in paraffin.

The cross-sections (5-7 μm) were stained with 0.1% solution of toluidine blue in McIlvane's buffer, pH 3 (16).

The localization and the shape of mastocytes were determined via light microscopy and their density (in mm^2) and dimensions (in μm) were measured with an eyepiece micrometer (one element of the scale of the eyepiece is 18 μm , with magnification X 100).

The data were statistically processed (Date Analysis of the StatMost for Windows).

RESULTS AND DISCUSSION

The highest number of mast cells in mm^2 was observed in the propria - 310 and the least one in the smooth muscle - 25. The studied cells were longest in the smooth muscle's layer- 17,6 μm , and shortest in the propria- 6,8 μm , thinnest in the muscularity - 6,8 μm , and thickest in the propria- 10,2 μm .

Considerable density of mast cells was observed in the duodenal propria of the domestic canary via light microscopy (Figures 1, 2 and 3).

Higher number of mast cells was found in the duodenum, compared with the other parts of the small intestine (Fig. 4). The studies on the form and dimensions of the mast cells showed that they are longest (fusiform) in the smooth muscle layer and thicker in the propria (Figures 1, 2 and 3).

The localization of the mast cells in the duodenum is described comparatively with this study for the first time, their predominance was observed in the connective tissue (1, 3).

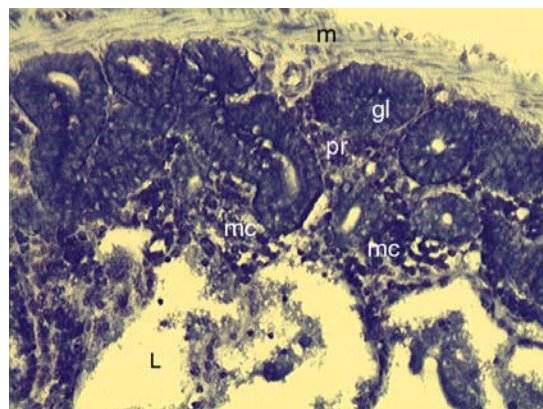


Figure 1. Mast cells (mc), localized in the duodenal propria (pr) and near the intestinal glands (gl), muscle layer (m). (magnification X 200)

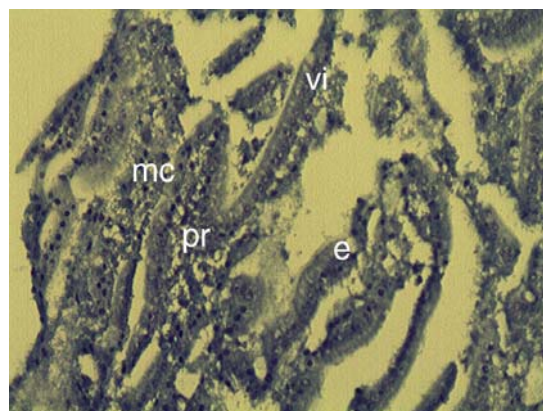


Figure 2. Mast cells (mc), localized in the propria (pr) of the intestinal villus (vi), epithelium (e). (magnification X 400)

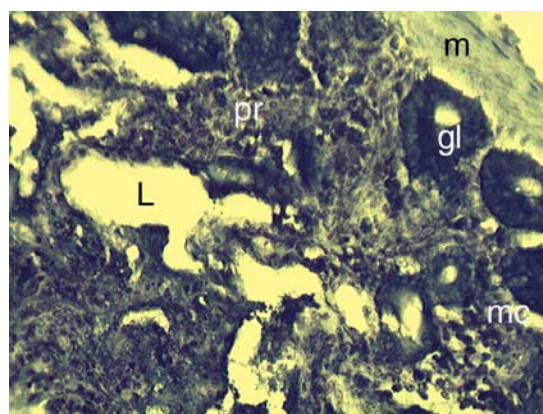


Figure 3. Mast cells (mc), localized in the duodenal propria (pr), glands (gl), lumen (L), muscle layer (m). (magnification X 400)

Our data have added some knowledge about the number of these cells in the intestine of some parenchyma and laminar organs of the

rat, mouse and human (10, 11, 12, 13).

Compared with the studies of (4, 5, 6) only one type of mast cells was observed - compact.

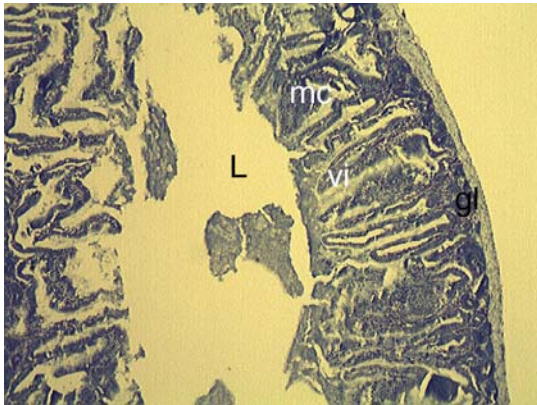


Figure 4. Distribution of the mast cells (mc) in the propria of the duodenal intestinal wall (pr), glands (gl), intestinal villus (vi). (magnification X 100)

In the intestinal propria the mast cells were mostly in the subepithelial layer and followed its contours that correspond with the investigations of (7); and we can conclude that these cells have important role in the function of the intestinal epithelium.

The localization of the mast cells in the connective tissue and around the vessels confirms the investigation of (8) but in the glandular stomach of the bird.

Our results motivate us to support the suggestion that the mast cells have predominant affinity to the fibroblastic elements of the duodenum (10).

The higher number of the mast cells we observed in the propria, compared with their density in the other parts of the intestine, is indicative of their importance in the motility of the fibromuscular elements, regulation of the vascular tonus and microcirculation in this region; this is similar to those already described by (14) in the ureter of the domestic pig.

The role of the duodenal mast cells in the domestic canary-bird is probably associated with the mucosal immunity in this part of the small intestine, which confirms the studies of (15, 9, 2) about the gastrointestinal and lymphoid organs of the birds.

According to us it is important that the mast cells in the smooth muscle layer were longest. That made us to suggest that the cellular length is due to the high peristaltic amplitude of the circular layer.

In conclusion, the results of the study showed that the higher number of the mast cells in the duodenal propria, compared with those in the smooth muscularity, is associated

with their active role in the connective tissue element of this intestinal part of the domestic canary-bird.

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