**Histochemical Studies on the Stomach of Albino Rat (Rattus norvegicus)**

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**ABSTRACT**

A strong PAS positive reaction in the mucous cells and mild to moderate reaction in the other tunics of the glandular region of albino rats was observed. The reaction for proteins was very weak in all the regions of the stomach. In the non-glandular region, a faint reaction for lipids was observed in the superficial layers of epithelium. Fine isolated granules of lipids were observed in all the tunics except epithelium. A strong acid phosphatase, alkaline phosphatase and succinic dehydrogenase activity was reported in the epithelial cells of the non-glandular region. In the glandular mucosa, a strong reaction was observed in the parietal and mucous neck cells. Chief cells showed moderate activity.

**Key words:** Acid and Alkaline phosphatase, Lipid, Mucopolysaccharides, Protein, Stomach, Succinic dehydrogenase

Albino rat serves as a model for the analysis of a number of important biomedical traits i.e. it offers a number of unique advantages for modelling human diseases, developing new therapeutic agents etc. Rat stomach is used to study anti secretory, anti ulcerative and ulcerative properties of certain drugs. As the literature concerning detailed histochemistry of the stomach of commonly used laboratory animals was scanty, histochemical study of the stomach of albino rat was under taken.

**MATERIALS AND METHODS**

The present study was carried out on the stomach of ten normal adult male albino rats. The tissue pieces were obtained from the oesophageo-gastric junction, non-glandular region, limiting ridge, glandular region and the pyloric-duodenal junction of the stomach. For histochemistry of carbohydrates the tissue pieces collected were fixed in 10% neutral buffered formalin and were processed (Singh and Sulochana, 1996). Paraffin sections of 4-6 µ were obtained. For histochemistry of lipids and enzymes, frozen sections of 10-20 microns were cut using a Leica CM 1510 Cryostat Microtome and were subjected to various staining techniques.

**RESULTS AND DISCUSSION**

The epithelium was PAS negative in the non-glandular region of the stomach. However, the lamina propria, muscularis mucosae, walls of the blood vessels in the submucosa and the tunica muscularis showed a mild PAS positive reaction. The reaction was absent in the epithelium of the limiting ridge. In the glandular region, a strong PAS positive reaction was observed in the surface mucous cells and in the mucous neck cells. The lamina propria that extended between the gastric glands showed a moderate reaction. The muscularis mucosae and the walls of the blood vessels in the submucosa showed a moderate to mild reaction. The PAS positive reaction in all the tunics of non-glandular and glandular regions remained similar upon treatment with saliva except for the muscularis mucosae and tunica muscularis which appeared PAS negative indicating the presence of glycogen.

These findings were in agreement with the observations of Katsuyama and Spicer (1978) who reported that the most superficial epithelium of the corpus and pyloric parts in rat contained predominantly neutral mucosubstances. Similar findings have been observed by Greaves and Boiziau (1984) in rat stomach. Tatematsu et al. (1990) also reported that in the alimentary tract of...
rat class III mucins were observed in the mucous neck cells, pyloric gland cells whereas, class II mucins in surface mucous cells. In the present study, a deep blue reaction was observed in the surface mucous cells and mucous neck cells of the glandular mucosa which indicated the presence of acid mucopolysaccharides. On the contrary, Sheahan and Jervish (1976) reported that in the gastric mucosa of mice, traces of acidic or sulfated mucin were evident in the deep parts of the antral glands.

The reaction for proteins was very weak in all the regions of the stomach (Fig. 2). The reaction for lipids was absent in the different tunics except for a faint reaction in the superficial layers of the epithelium in the non-glandular region. In the glandular region, the reaction was observed in the tunica submucosa. However, fine isolated granules of lipids were also observed in the lamina propria, muscularis mucosa and tunica muscularis. Lipids were absent in the epithelium (Fig. 3). These findings were in contrast with the observation of Slomiany et al. (1981) who reported that glycerolipids were distributed in the mucous barrier of fundus, body and antrum in the glandular stomach of dog. A strong acid phosphatase activity was observed in the epithelial cells of the non-glandular region. It was absent in all the other regions of the non-glandular and the glandular stomach (Fig. 4).

The alkaline phosphatase activity was observed in the epithelium of the non-glandular and limiting ridge regions, with the latter showing a greater activity. In the glandular
mucosa, the activity in the parietal cells was strong. The serosa showed a moderate reaction. It was also observed in the vascular walls. The reaction was not observed in the other regions of the stomach (Fig. 5). On the contrary, Stoffels et al. (1966) reported that no activity was present in the mucosal cells of the stomach in rat.

A strong succinic dehydrogenase activity was observed in the mucosa of the non-glandular and glandular regions of the stomach. The activity in the non-glandular mucosa was reported in the basal layers of the epithelium. In the glandular mucosa adjacent to the limiting ridge a strong activity was observed in the cells of the lower half of the epithelium, whereas in the mucosa of the other regions, the reaction was observed throughout the length except at the apical portion. The chief cells showed moderate activity whereas, the parietal cells reacted significantly than all the other cell types. The activity in the mucous neck cells was strong whereas, in the surface mucous cells it was absent. No enzymatic activity was found in the walls of blood vessels, connective tissue and the muscle layers (Fig. 6). Similarly, Rutenberg et al. (1953) reported that the succinic dehydrogenase activity was present in the mucosa of the corpus in the stomach of rat and mouse and to a lesser extent in the dog. Niemi et al. (1960) also observed that the rat gastric glands showed an abundant succinic dehydrogenase activity, the parietal cells being the far most active. Stoffels et al. (1966) reported that in rats light staining was seen in the mucus neck cells, faint staining in the chief cells and very heavy staining in the parietal cells.

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**REFERENCES**


