The intestine plays an important role in the digestion and absorption of various nutrients. There is paucity of literature on light microscopic structure of the intestine of small ruminants except some work has been reported in goats (Ramakrishna and Tiwari, 1979). The present study was undertaken to study the histomorphology and histochemical components in duodenum of the sheep.

MATERIALS AND METHODS

The small intestine containing duodenum was collected from five adult sheep immediately after their sacrifice at local slaughter house. The tissues from abomaso-duodenal junction, descending, ascending, cranial, middle, caudal and duodeno-jejunal junction were collected and fixed in 10% neutral buffered formalin and processed for light microscopy. The paraffin sections of 5-6 µ were cut and stained with routine Harris’ hematoxylin and eosin stain, Mcmanus’ method for glycogen (PAS), PAS-Alcian blue method for mucosubstances (ph 2.5) and Alcian blue for acidic mucopolysaccharides (ph 2.5), Gomori’s method for reticular fibres, Weigert’s method for elastic fibres (Luna, 1968), and Crossman’s trichrome method for collagen fibres (Crossman, 1937) to demonstrate the different constituents of the tissues.

RESULTS AND DISCUSSION

The tunica mucosa of the duodenum was studded with villi of different shape and size which were lined by simple columnar epithelium with few goblet cells. The intestinal glands were simple branched tubular coiled type had predominance of acidic mucopolysaccharides. Lamina muscularis mucosa of varying thickness was interrupted because of infiltration of lymphoid tissue. The submucosa was consisted of submucosal having predominance of acidic mucopolysaccharides. Tunica muscularis had inner circular and outer longitudinal layers of smooth muscles. Histochemical studies presented that crypts of Lieberkühn had predominance of acidic mucopolysaccharides whereas Brunner’s glands were having predominance of neutral mucopolysaccharides.

Key words: Brunner’s gland, Crypts of Lieberkühn, Duodenum, Histochemistry, Small Intestine

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Histological Architecture and Histochemistry of Duodenum of the Sheep (*Ovis aries*)

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ABSTRACT

The duodenal tissue collected from five adult sheep. The duodenal tissues fixed in 10% neutral buffered formalin were processed for light microscopy. The pointed or blunt duodenal villi were lined by simple columnar epithelium with few goblet cells. The intestinal glands had predominance of acidic mucopolysaccharides. Lamina muscularis mucosa of varying thickness was interrupted because of infiltration of lymphoid tissue. The submucosa was consisted of submucosal having predominance of acidic mucopolysaccharides. Tunica muscularis had inner circular and outer longitudinal layers of smooth muscles. Histochemical studies presented that crypts of Lieberkühn had predominance of acidic mucopolysaccharides whereas Brunner’s glands were having predominance of neutral mucopolysaccharides.

Key words: Brunner’s gland, Crypts of Lieberkühn, Duodenum, Histochemistry, Small Intestine

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reaction for PAS (Fig. 2), Alcian blue (pH 2.5) and more acidic than neutral polysaccharides with PAS-AB stain (Figs. 3, 4). Whereas, the luminal border of columnar epithelium showed moderate reaction with PAS in duodenum of Gaddi goat (Andleeb et al., 2009) and presence of greater concentration of glycogen in epithelium in small intestine of goat foetii (Ramakrishna and Tiwari, 1979). The villi and the basement membrane of the epithelium showed moderate to weak reaction throughout the intestine of Gaddi goat with Alcian blue (Andleeb et al., 2009). In mammals, the striated border of columnar cells was PAS positive in small intestine (Sheahan and Jarvis, 1976) along with positive reaction towards Alcian blue. The columnar absorptive cells showed weak PAS and Alcian blue reaction in goat, sheep and cattle (Ohwada and Suzuki, 1992).

The lamina propria submucosa was having loose irregular connective tissue along with reticular, collagen and elastic fibers along with few lymphoid cells. In the caudal part of the duodenum, lymphoid aggregates were observed (Fig. 5). However, large number of lymphocytes had been reported in addition to above structures in buffalo (Barnwal and Yadava, 1975).

The intestinal glands or crypts of Lieberkühn were simple branched tubular coiled type lined with high cuboidal to simple columnar epithelium which were surrounded by small aggregates of lymphoid cells (Fig. 6) as observed in pig (Talukdar, 1999). The crypts of Lieberkühn were made up of undifferentiated columnar cells and goblet cells which may be fewer in number or absent in buffaloes (Barnwal and Yadava, 1975). Crypts of Lieberkühn showed PAS positive reaction due to presence of mixed i.e. acidic as well as neutral mucopolysaccharides whereas, Alcian blue showed strong reaction (Fig. 3) In Gaddi goat, the crypts showed moderate PAS reaction towards the supranuclear zone of the epithelium and a mild reaction with Alcian blue stain (pH 2.5) showing both sulphated and non-sulphated mucins (Andleeb et al., 2009).

The lamina muscularis mucosae varied in thickness at places and some times it was thinner and made up of smooth muscle fibres and at few places it was interrupted due to presence of large amount of lymphoid tissue and extension of crypts of Lieberkühn (Fig. 1). It was made
of continuous layer of smooth muscle fibres arranged in
two rows in buffaloes (Barnwal and Yadava, 1975). The
lamina muscularis mucosae formed a thin continuous inner
circular and outer longitudinal smooth muscle layer in
duodenum of pig (Sloss, 1954; Talukdar, 1999) and other
domestic animals (Tetkemeyer and Calhoun, 1955; Stinson
and Calhoun, 1993).

The submucosa was formed by loose irregular
connective tissue and connective tissue cells, fine blood
capillaries along with elastic, collagen and reticular fibres.
It was mainly occupied by submucosal or Brunner’s glands
(Fig. 1) as observed in pigs (Sloss, 1954 and Talukdar,
1999). The acini of the glands were of varying shapes
and dimensions and lined by simple columnar epithelium
except few places where high cuboidal epithelium was
observed (Fig. 6). The nuclei of these cells were mainly
elongated and pushed towards the base and strongly
basophilic. The cytoplasm was finely granular and
eosinophilic. The number of gland reduced towards the
caudal part of the descending duodenum. Brunners glands
showed strong PAS and Alcianophillic reaction which was
also observed in the Gaddi goat (Andleeb et al., 2009).
In contrast, a strong PAS reaction was observed in goat,
sheep and cattle (Ohwada and Suzuki, 1992)

Tunica muscularis was constituted by an inner
circular and an outer longitudinal layer of smooth muscles.
In between these layers, there were small blood capillaries,
small blood vessels, venous caverns, nerve bundles and
fatty tissue and at places myenteric plexus was also
observed. Tunica serosa formed by loose irregular
connective tissue had isolated collagen, elastic and reticular
fibres along with varying amount of fatty tissue and few
blood capillaries and flat mesothelial cell layer.

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