

## **COMPARATIVE HISTOLOGICAL STUDIES OF DUEODENUM IN CATTLE SHEEP AND GOATS**

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**Abstract:** Dueodenum in cattle, sheep and goat comprised four types of layers tunica mucosa, tunica submucosa, tunica muscularis and tunica serosa. Tunica mucosa was innermost layer, which comprised lamina propria with number of glands. Intestinal glands were lined by number of goblet cells tall columnar cells and enterochromaffin cells. Lamina muscularis was with circular and longitudinal layers of smooth muscle fiber. Brunners glands were present in the tunica submucosa. Tunica muscularis was comprised of circular and longitudinal muscle fiber. Outermost layer was tunica serosa which was a loose connective tissue with blood vessels.

**Keywords:** Histology, Duodenum cattle Sheep Goat.

### **Introduction**

The Structure of duodenum is specialized in both its digestive and absorptive functions a very mearge information is available.

### **Materials and Methods**

For the present study the organ duodenum of cattle sheep and goat of non-discript breed were collected from eighteen animals. Each group comprised six animals. The duodenum was brought into the laboratory in the ice pack. The tissue samples approximately 5 mm thickness were collected and fixed into the following fixative 10% formaline, 10% neutral buffer formalinecorneys fluid and bouins fluid.

The tissue samples were processed through the gradedalcohol for dehydration. Cleared in the xylene and embedded in the paraffin of 50° to 60° melting point. The tissue comprising paraffin blocks were prepared with the help of the brass 'L' molds. The tissue sections were cut at 3 to 4  $\mu$  thickness with the help of manually operated rotary microtome machine. the sections were mounted on the glass slides by applying adhesive (Mukharjee 1990) these sections were stained by a Harris Haematoxyline and Eosin for general observations (Mukharjee 1990)., Silver impregnation stain for reticulin (Mukhajee 1990), Verhoeffs stain for collagen and elastic fibers (Mukhajee 1990), Crossmans modifications for

Mallarys triple stain for collagen elastic and muscle fiber (Singh and Sulochana 1978) masons Trichrome stain for collagen and muscle fiber (Mukhajejee 1990).

Micrometrical observations were recorded on ocular micrometer duly calibrating with stage micrometer. The micrometrical values were subjected to statistical analysis as per the standard procedures of Panse and Sukhatme (1967).

### **Result and Discussion**

The wall of the duodenum of cattle, sheep, and goat consisted tunica mucosa, tunica submucosa, tunica muscularis and tunica serosa. Tunica mucosa of duodenum of cattle, sheep and goat included the lining epithelium. Lamina propria with glands and a lamina muscularis throughout its length (Plate 1(3)) villi were mucosal projections into the lumen. The borders of villi were lined tall columnar epithelium and goblet cell with the microvilli. The villi of duodenum were somewhat uniform in shape and size. Shape and size of the villi were varied in duodenum of cattle, sheep and goat. Surfaces of the villi were lined by tall columnar epithelium cell Goblet cell and enterochrmoaffin cells. Villi were maximum length in duodenum and finger shaped. (Plate 1(3)). The height of the villi of duodenum in cattle, sheep and goat is given in (table No. 1)

The present observation of the tunica mucosa of the tall columnar absorbing cell, villi and goblet cells were in collaboration with the similar observation of Dellmonn and Brown (1987) and Bacha and Bacha (1990) in ruminants Morales Peregra (1979) in goat.

Duodenum was lined by a simple type of epithelium comprises numerous goblet cells interspersed among the columnar cells throughout the length of duodenum in cattle sheep and goat.

The columnar absorbing cells of cattle have oval nucli, situated near the cell base. Golet cells were dispersed among the columnar cells (Plate 2(4))

Epithelial lining of the villi of duodenum in cattle, sheep and goat consisted single layer of cells. Epithelial cells were tall simple columnar. Their apical border possesses a well marked striations composed of numerous microvilli. Nucleus was oval and placed close to the basement membrane.

Goblet cells were found in different stages of activities form great disk solen appearance all over the duodenum in cattle, sheep and goat (Plate 2/9).

The enterochromaffin cells were found in small number at the base of Crypts rather in frequently on the villi.

Recorded histological findings of the goblet cells and enterochromaffin cells in the present study were similar to finding of Dellmann and Brown (1987) in ruminants and Mishra and Das (1990) in cattle.

The present observation of simple columnar epithelium of duodenum with numerous goblet cells interpreted among the columnar cells in ruminants was in close collaboration with the previous observation of Dellmann and Brown (1987) in ruminants.

Lamina propria of in cattle was formed by loose connective tissue that forms the core of the villi and surrounds the intestinal glands and blood vessels and lymphocyte (Plate 3(8)).

The present observation of lamina propria with loose connective tissue composed of collagen and elastic fibers in cattle, sheep and goat was in close collaboration with the previous findings of Dellmann and Brown (1987) and Bacha and Bacha (1990) in ruminants.

Intestinal glands were simple branched tubular and tortuous were seen in lamina propria lined by tall columnar cells, goblet cells and paneth cells. In cattle glands were straight, oval, tortuous, mucous secreting glands were present at the close vicinity of lamina muscularis in sheep mucus secreting glands were present at apical end of mucosa. Glands were lined by the simple columnar with basal nuclei (Plate 9).

Recorded histological findings of simple branched, tubular glands in the lamina propria lined by columnar cells, goblet cells and argentaffin cells in the present study were similar findings of Dellmon and Brown (1987) in ruminants.

In cattle, sheep and goat lamina muscularis was composed of circular layer of smooth muscle (Plate-8) similar observation were recorded by Dellmon and Brown (1987) in ruminants.

The present observations of tunica submucosa with collagen fiber bundles and with blood vessels was in close collaboration with the findings of Dellmon and Brown (1987)

Brunner's glands were found at the base of the villi and pushed into the corium of the villi. It was more predominant in the first part of the duodenum. The mucus alveoli of Brunner's gland presented a pyramidal shaped cells with a round to oval nuclei. Placed near to the basement membrane with irregular lumen in cattle, sheep and goat. Lining epithelium of the glands was simple (plate-9).

Brunners glands were small composed tubuloalveolous consisting of number of alveoli, with short columnar epithelium and surrounded by connective tissue in cattle, sheep and goat.

These glands were mucous type in cattle and seromucous in sheep and goat these glands were non luminated in cattle.

The lumen of gland was larger in good and large in the sheep. Brunner's gland cells had an acidophilic cytoplasm (Plate 7).

The present observations were in collaboration with observations of Bacha and Bacha (1990) in ruminants, Morales (1980) in cattle and Oomari et al (1980) in sheep. Micrometrical observations of Brunner's glands shown in table -1

In the duodenum of cattle, the tunica muscularis consists of an inner circular and an outer longitudinal smooth muscle layer. The outer muscle layer contains more elastic tissue than the inner layer. The external longitudinal smooth muscle layer was small. In between these two layers, the connective tissue and myenteric plexus were seen, which control gastrointestinal movement (Plate -3).

In sheep, only circular muscle fibers were present, but in goat, both outer longitudinal and inner circular muscle fibers were present.

The present observation of the tunica muscularis of the duodenum in cattle consisted of inner and outer longitudinal smooth muscle fibers, which was earlier reported by Bacha and Bacha (1990) in ruminants and Dellmann and Brown (1987) in ruminants.

The histological findings of the tunica muscularis of the duodenum in cattle, that the outer muscle layer contains more elastic tissue than the inner layer, were in close collaboration with the previous findings of Dellmann and Brown in ruminants (1987). Micrometrical observations are shown in table -1

The tunica serosa of the duodenum was the outermost layer, consisting of a highly vascular membrane with a loose framework of connective tissue fibers and mesothelium (Plate -2)

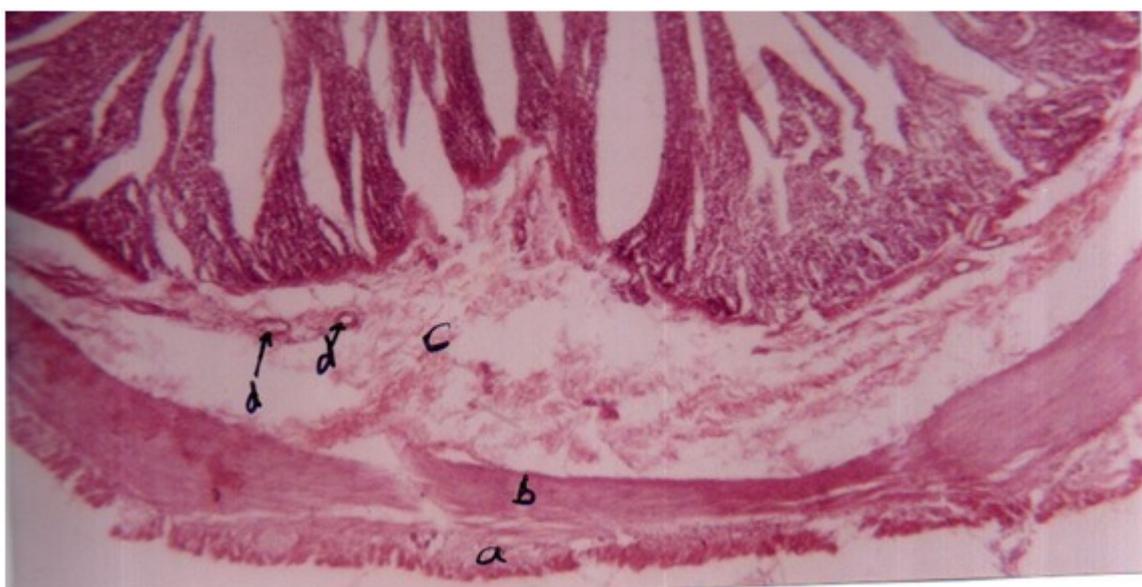
The arrangement of connective tissue fibers in the serosa was in full agreement with the similar observation of Dellmann and Brown (1987) in ruminants.

**Table-1 Micrometrical observations of duodenum ( $\mu\text{m}$ )**

Group		Thickness of Tunica Muscularis	Height of Villi	Thickness of tunica submucosa	Diameter of Brunner's gland	Diameter of intestinal glands
Cattle	Range	37.15-39.12	35.12-28.01	28.13-30.97	4.02-5.52	6.84-7.52
	Mean	38.724 $\pm$ 1.07	36.68 $\pm$ 1.02	29.14 $\pm$ 1.12	4.86 $\pm$ 0.21	7.35 $\pm$ 0.72
Sheep	Range	13.3-15.68	37.8-38.08	34.97-38.94	5.59-6.46	6.02-6.82
	Mean	14.03 $\pm$ 0.35	37.94 $\pm$ 0.97	36.82 $\pm$ 1.32	6.18 $\pm$ 0.17	6.42 $\pm$ 0.51
Goat	Range	13.72-18.34	68.76-74.92	21.29-25.04	3.33-4.16	5.63-6.11
	Mean	15.554 $\pm$ 0.83	72.52 $\pm$ 1.37	23.32 $\pm$ 0.79	3.78 $\pm$ 0.11	6.01 $\pm$ 0.95

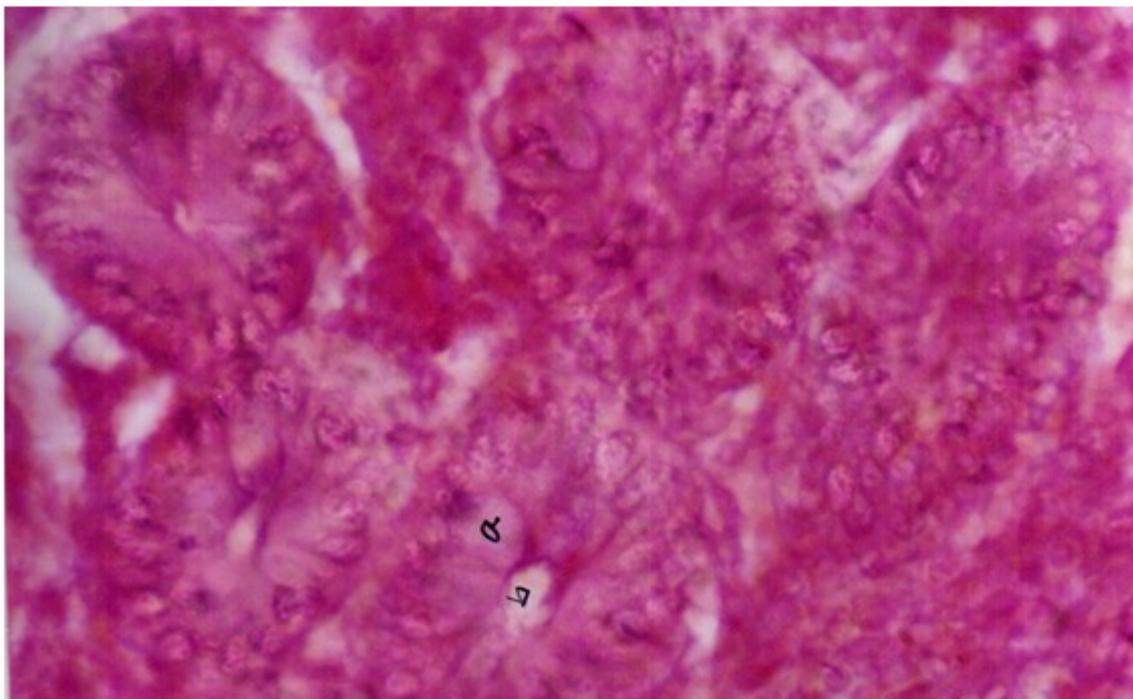
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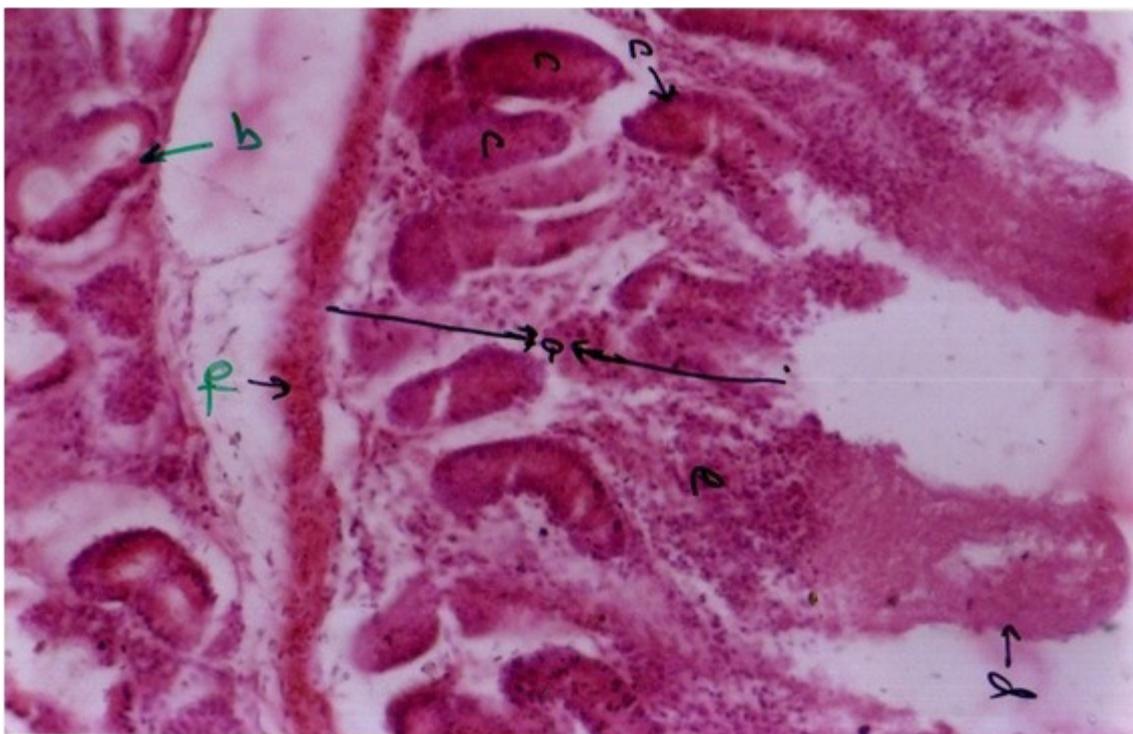
**Plate 1.** Microphotograph showing histological structure of duodenum in Goat.

- a) Tunica muscularis longitudinal layer
  - b) Tunica muscularis circular layer
  - c) Loose connective tissue
  - d) Blood vessels
  - f) Lacteal duct
- (Haematoxyline and Eosin stain, 100 x)



**Plate 2.** Microphotograph showing Brunner's gland of duodenum in cattle

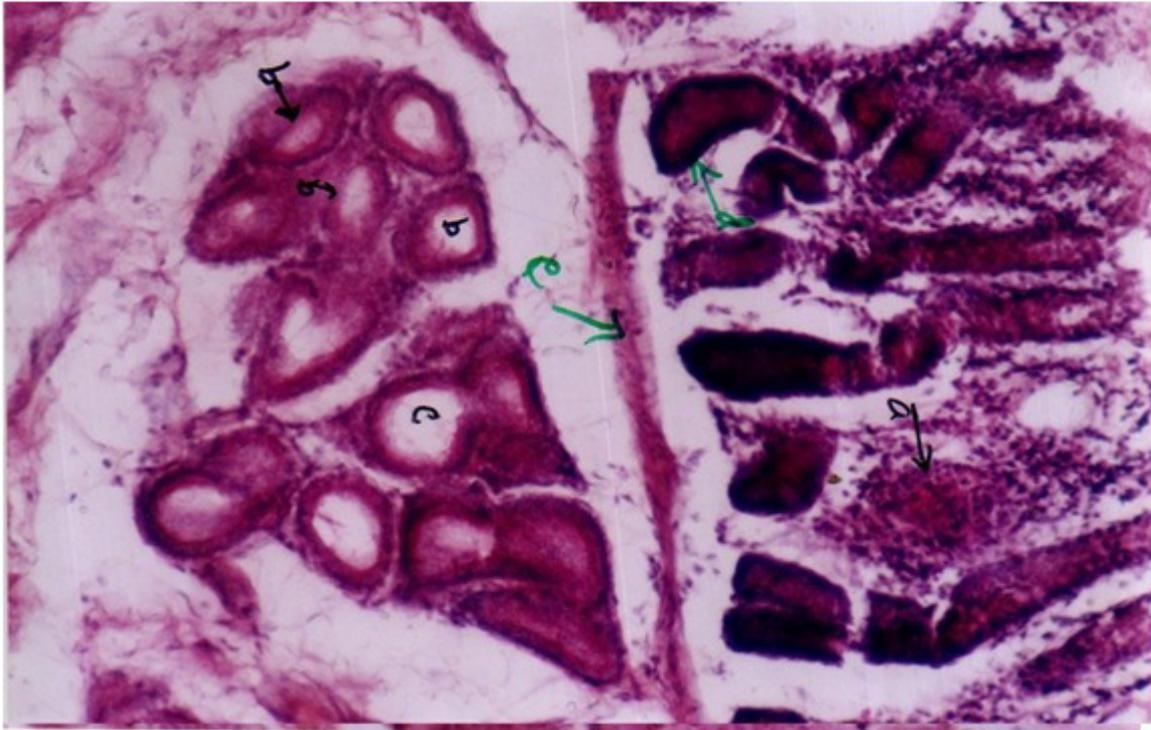
- a) Goblet cells
- b) Lumen  
(Haematoxyline and Eosin stain, 100 x)



**Plate 3.** Microphotograph showing histological structure of duodenum in Sheep

- a) Lamina Propria

- b) Brunner's gland
- c) Crypts of Lieberkuhn
- d) Intestinal villi
- e) Lamina Muscularis  
(Haematoxyline and Eosin stain, 100 x)



**Plate 4.** Microphotograph showing histological structure of duodenum in Sheep

Showing carbohydrate +ve reaction

- a) Goblet cells
- b) Brunner's gland
- c) Luman of the brunner's gland
- d) Crypts of lieberkuhn
- e) Lamina muscularis  
(Periodic acid schiff's stain, 100 X)