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Original Research

Histochemical studies on the rectum of goat *(Capra hircus*)

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Abstract

The present investigation was carried out on 10 recti from obtained from abattoir derived adult goat. Rectum of goat was composed of four layers viz. tunica mucosa, tunica sub mucosa, tunica muscularis and tunica serosa or adventitia.The lining epithelium and lamina propria of rectum showed positive reaction for carbohydrates. Tunica muscularis showed positive reaction for muco-polysaccharide and negative reaction for glycogen. The lining epithelium showed positive reaction for sulphated muco-substances at pH 1.0. Lamina propria showed moderate positive at PAS Alcian Blue reaction at pH 0.4, pH 1.0 and pH 2.5 and lamina muscularis showed week positive reaction for pH 0.4 and moderate positive reaction for pH 2.5. Tunica sub mucosa showed moderate positive reaction for neutral muco-substances for PAS Alcian Blue at pH 1.0 and pH 2.5 whereas it showed moderate positive reaction for sulphated mucosubstances at pH 2.5 and for acidic sulphated mucosubstances at pH 0.4.Tunica muscularis showed strong positive reaction for sulphated muco-substances for PAS Alcian Blue reaction at pH 1.0 and pH 0.4 but showed mild to moderate positive reaction at pH 2.5. The tunica serosa layer showed moderate positive reaction for sulphated muco-substances for PAS Alcian Blue at pH 1.0 and pH 2.5 whereas showed strong positive reaction for acidic sulphated mucosubstances at pH 0.4. All layers of rectum showed negative reaction for Dane's method for prekeratin, keratin and mucin.

Keywords: Histochemical, Goat, Rectum.

Introduction

Goat population (148.34 million) in India accounts for 27.8% of total livestock population (535.78 million) with a 10.1 percent from the previous census [1] and there are 34 defined and non-descript breeds adapted to various agro-climatic conditions across the country [2]. However, the current goat population in Rajasthan is predicted to be 20.84 million, which decreased 3.81 percent from the 2012 census.

Goats are the main meat producing animals in India. Goat meat is a nutritious food that has an important role in human balance diet. Chevon (goat meat) contains comparatively higher proportion of iron, potassium and thiamine than other meats and is the most preferred and widely consumed meat in the country.

Goat milk is beneficial for preventing cardiovascular disease, cancer, allergies, as well as for boosting immunity. Goat milk is advised for infants, old and convalescent people [3]. Goat intestine is used to manufacture "catgut", a substance that is still utilized for internal surgical sutures. The detailed histological description of the rectum of goat is scanty. The present study evaluated the histological structure of goat rectum.

Materials and methods

The present research was carried out on the recti (n=10) of adult goat (*Capra hircus*) obtained from the local Municipal abattoir. Only recti from those samples were used that were free from any pathological condition of the digestive tract. Histochemical study on the research samples were conducted in the department of veterinary anatomy, veterinary college, Bikaner. Representative samples of rectum were collected from identical sites and fixed either in 10% formalin or Bouin's fluid for 48 h, and 18 h, respectively followed by washing overnight in running tap water, dehydration in ascending order of alcohol (50%, 70%, 90% and then absolute alcohol I, II and III), cleared in cedar wood oil and finally embedding in paraffin wax and then preparation of block, numbered and stored at 4^{o}C in refrigerator as described previously [4]. Five-to-six-micron thick sections were cut by using semi-automatic microtome then mounting of the section on albumenized slides and drying of section and then staining for general histomorphological observations.

Results and Discussion

Histochemical observations

Mcmanus's method for Glycogen (PAS)

The lining epithelium and lamina propria of rectum showed positive reaction for carbohydrates (Fig. 1). This was in uniformity with previous findings in bovine [5] and in cattle, sheep and goat [6]. Lamina muscularis and tunica sub-mucosa showed moderate positive reaction for glycogen (Fig.1, 2). Tunica muscularis showed positive reaction for glycogen (Fig. 2). The findings of present study were in accordance with previous findings in cattle, sheep and goat [5,6]. Tunica serosa showed negative reaction for glycogen.

Mcmanus's method with Saliva for Glycogen (PAS)

The lining epithelium, lamina propria and lamina muscularis layer showed PAS negative reaction for Mc Manus PAS with saliva stain and are in conformity with previous studies in sheep, goat and cattle [5.6]. After treatment with the saliva, lining epithelium, lamina propria and lamina muscularis layer showed negative reaction for carbohydrates in Mc Manus PAS with saliva stain because glycogen digested by saliva. The tunica sub-mucosa, tunica muscularis and tunica serosa also showed PAS negative reaction for carbohydrates in McManus PAS with saliva stain and are similar to a previous study [6] in sheep, goat and cattle. No difference was observed in PAS reaction at cranial, middle and caudal part of rectum.

PAS- Alcian blue reaction for muco-polysaccharide substances

The lining epithelium showed negative reaction for PAS Alcian blue reaction at pH 0.4 and pH 2.5 but it showed positive reaction for sulphated muco-substances at pH 1.0 (Fig. 5-7). This finding was in conformity with findings in human [7], and in guinea pig and rabbit [8].

The epithelial glands of tunica mucosa showed strong positive reaction for acidic sulphated mucosubstances at PAS Alcian Blue reaction at pH 0.4, pH 1.0 and pH 2.5 whereas epithelial glands and goblet cells showed intense blue colour (Fig. 5-7). The findings of present study are in accordance with the findings in human [7]. The result was in partial harmony with the findings of Sheahan and Jervis [8] in guinea pig. In the distal colon, compact goblet cells containing neutral and sulfo-mucin were present only at the mouth of crypts, while the lower region showed increasing numbers of sulphated vacuolated cells, in some regions the entire crypts being lined by such cells. In the rabbit colon, acid muco-substances were more abundant than neutral mucin. Goblet cells containing only neutral mucin were seen mixed with those showing almost exclusively acid mucin. Lamina propria showed moderate positive at PAS Alcian Blue reaction at pH 0.4, pH 1.0 and pH 2.5 and lamina muscularis showed negative reaction for sulphated muco-substances at pH 1.0, week positive reaction for pH 0.4 and moderate positive reaction for pH 2.5 (Fig. 5-7). This was in uniformity with the findings of Sheahan and Jervis [8] in guinea pig, rabbit and cat.

Tunica sub-mucosa showed moderate positive reaction for neutral muco-substances for PAS Alcian Blue at pH 1.0 (Fig. 7) and pH 2.5 (Fig. 8) whereas, it showed moderate positive reaction for sulphated muco-substances at pH 2.5 (Fig. 9) and for acidic sulphated muco-substances at pH 0.4 (Fig. 6). The findings of the present study are in accordance with aprevious study in human [7]. Tunica muscularis showed strong positive reaction for sulphated muco-substances for PAS Alcian Blue reaction at pH 1.0 (Fig. 10) and pH 0.4 (Fig. 11) but showed mild to moderate positive reaction at pH 2.5 (Fig. 8, 9).

The tunica serosa layer showed moderate positive reaction for sulphated muco-substances for PAS Alcian Blue at pH 1.0 (Fig. 10) and pH 2.5 (Fig. 9) whereas showed strong positive reaction for acidic sulphated muco-substances at pH 0.4 (Fig. 11). These findings resembled to a few previous studies [7,8]

Dane's method for prekeratin, keratin and mucin

This stain was used for demonstration of prekeratin, keratin and mucin. Goblet cell showed strong positive reaction for mucin. But prekeratin and keratin were not found in the tunica mucosa, tunica sub-mucosa, tunica muscularis and tunica serosa. So, this test was negative for tunica mucosa, tunica sub mucosa, tunica muscularis and tunica serosa (Fig. 12, 13).

Table. 1 Histochemical reactions exhibited by the different layer of rectum of Goat

Particulars	McManus's method for Glycogen (PAS)	McManus's method with Saliva for Glycogen (PAS)	PAS-Alcian blue reaction at pH 1.0	PAS-Alcian blue reaction at pH 2.5	PAS-Alcian blue reaction at pH 0.4	Dane's method for prekeratin, keratin and mucin
Epithelium	+++	+++	+++	-	-	-
Lamina propria	+++	–	++	++	++	-
Lamina muscularis	++	++	-	+++	+	-
Tunica submucosa	++	+++	++	+++	+++	-
Tunica muscularis	+++	+++	++++	++	++++	-
Tunica serosa	-	–	+++	+++	++++	-

Note - ++++ = intense or strong, +++= positive ++ = moderate, + = weak and – = negative.

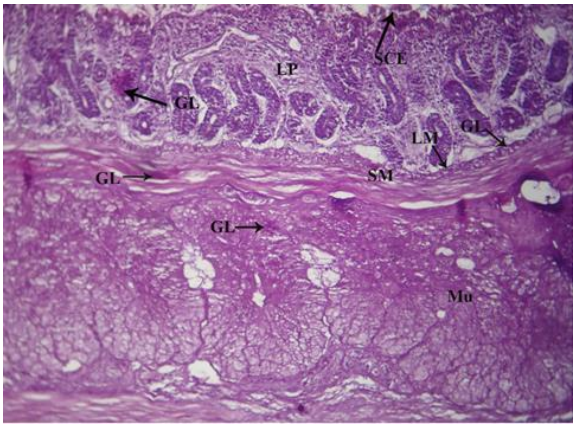

Fig. 1 Photomicrograph of rectum of goat showing PAS positive reaction. GL- Glycogen, LP- Lamina propria, SM- Tunica sub mucosa and Mu- Tunica muscularis

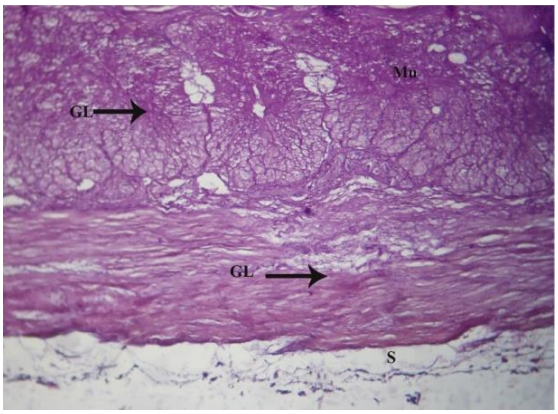

Fig. 2 Photomicrograph of rectum of goat showing PAS positive reaction GL- Glycogen, Mu- Tunica muscularis and S- Serosa

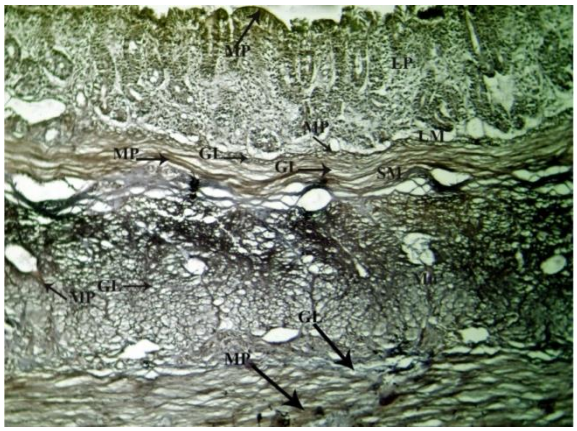

Fig.3 Photomicrograph of rectum of goat showing PAS positive Reaction GL- Glycogen, MP- Muco-polysaccharide, LP- Lamina propria, LM- Lamina muscularis, SM- Tunica sub mucosa and Mu- Tunica muscularis (PAS with saliva stain for muco-substance 100X)

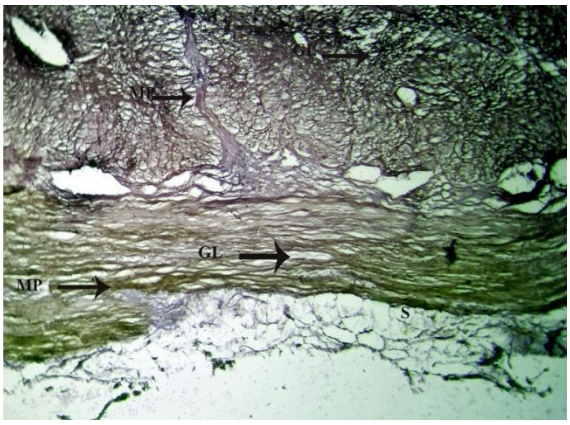

Fig.4 Photomicrograph of rectum of goat showing PAS positive reaction GL- Glycogen, MP- Muco-polysaccharide, Mu- Tunica muscularis and S- Serosa (PAS with saliva stain for muco-substance 100X)

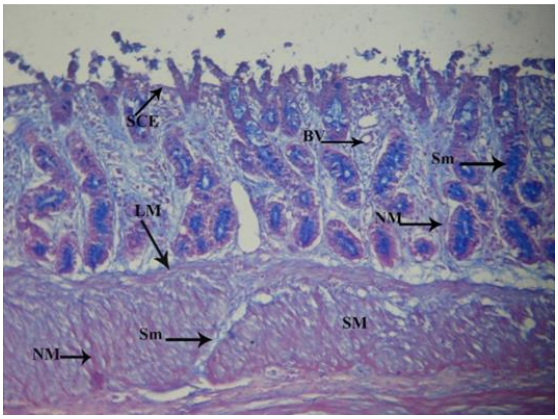

Fig.5 Photomicrograph of rectum of goat showing PAS positive reaction SCE- Epithelium, Sm- Sulphated muco-substance, NM-Neutral muco-substance, BV- Blood vessels, LM- Lamina muscularis and SM- Tunica sub-mucosa (PAS Alcian blue stain for muco-substance pH 2.5 100X)

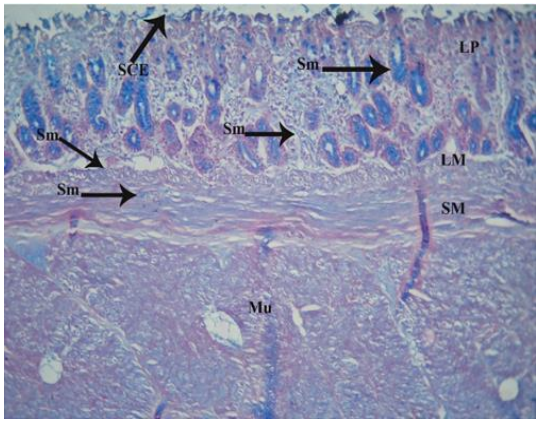

Fig. 6 Photomicrograph of rectum of goat showing SCE- Epithelium, LP- Lamina propria, Sm- Sulphated muco-substance, LM- Lamina muscularis, SM- Tunica Sub-mucosa and Mu- Tunica muscularis (PAS Alcian blue stain for muco-substance pH 0.4 (100X)

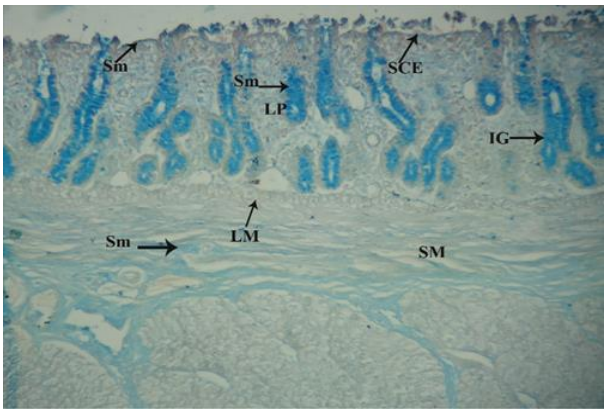

Fig.7 Photomicrograph of rectum of goat showing PAS positive reaction SCE- Epithelium, Sm- Sulphated muco-substance, LP- Lamina propria, IG- Intestinal glands, LM- Lamina muscularis and SM- Tunica sub-mucosa (PAS Alcian blue stain for muco-substance pH 1.0 100X)

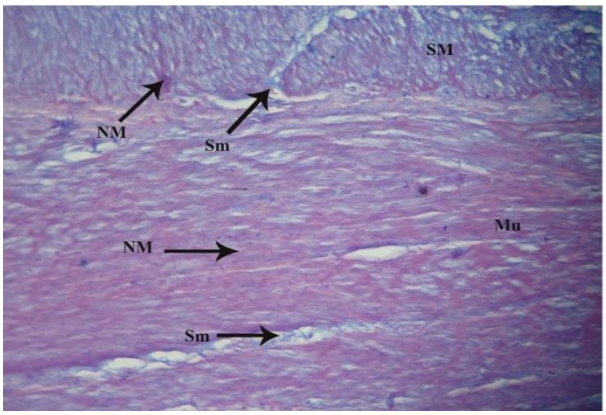

Fig.8 Photomicrograph of rectum of goat showing PAS positive reaction SM- Sub-mucosa, Sm- Sulphated muco-substance, NM- Neutral muco-substance and Mu- Tunica muscularis (PAS Alcian blue stain for muco-substance pH 2.5 100X)

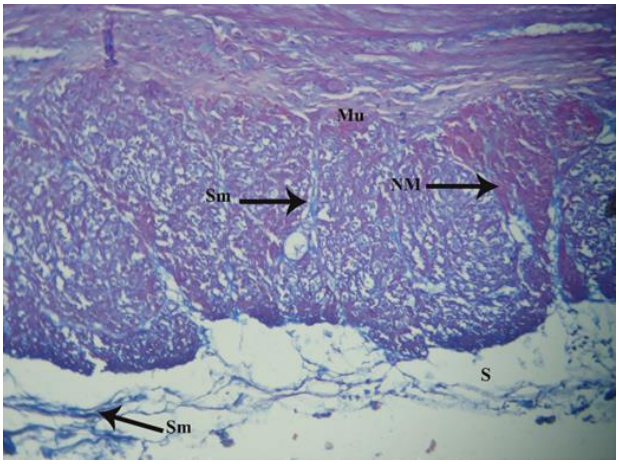

Fig.9 Photomicrograph of rectum of goat showing PAS positive reaction Sm- Sulphated muco-substance, NM- Neutral muco-substance, Mu- Tunica muscularis and S- Serosa (PAS Alcian blue stain for muco-substance pH 2.5 100X)

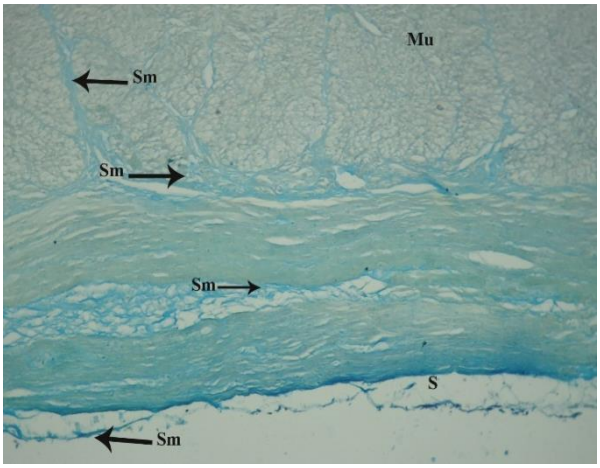

Fig.10 Photomicrograph of rectum of goat showing PAS positive reaction Sm- Sulphated muco-substance, Mu- Tunica muscularis and S- Serosa PAS Alcian blue stain for muco-substance pH 1.0 100X)

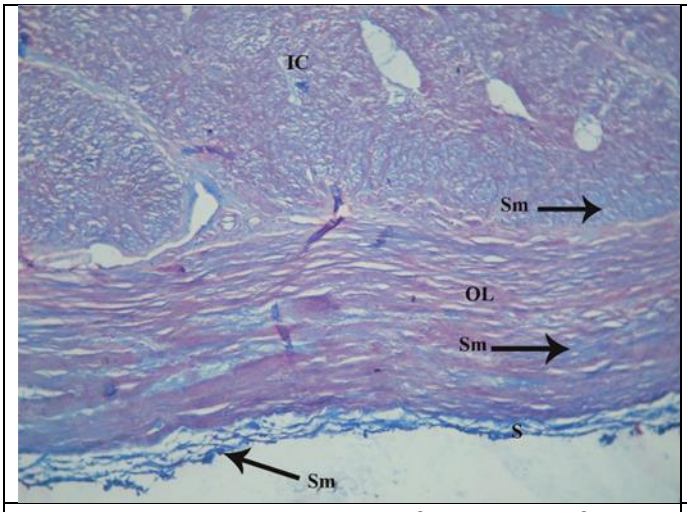

Fig. 11 Photomicrograph of rectum of goat showing IC- Inner circular and OL- Outer longitudinal layers of tunica muscularis, S- Serosa and Sm- Sulphated muco-substance (PAS Alcian blue stain for muco-substance, pH 0.4 100X)

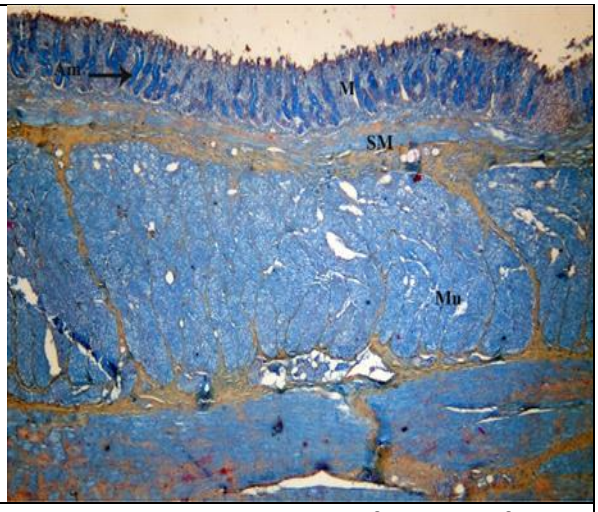

Fig. 12 Photomicrograph of rectum of goat showing, Am- Acid Muco-polysaccharide, M- Tunica mucosa, SM- Tunica Sub-mucosa And Mu- Tunica muscularis (Dane's Stain for Prekeratin, Keratin and Mucin 40X)

Fig. 13 Photomicrograph of rectum of goat showing Mu- Tunica muscularis and S- Serosa (Dane's Stain for Prekeratin, Keratin and Mucin 40X).

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