

MICROSCOPIC ANALYSIS OF THE LABIAL SALIVARY GLANDS OF THE SHEEP (OVIS ARIES)



Veterinary Science

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ABSTRACT

The present study was undertaken on ten healthy adult sheep of local mixed breed of either sex to study the histomorphological, histochemical and micrometrical studies on the labial salivary glands of sheep. The labial salivary glands were of branched tubuloacinar type having loose irregular connective tissue and surrounded by myoepithelial cells. The parenchyma was comprised of secretory units (adenomeres) and ductal system. The adenomeres were of seromucous type with predominance of mucous acini. Histochemically, the mucous cells contained mucosubstances, glycogen, mucopolysaccharides, mucin and lipids while serous cells were negative to all these histochemical reactions.

INTRODUCTION

The saliva, which is so important for digestion, is secreted from major and minor sets of salivary glands in case of domestic ruminants. Saliva plays a key role in keeping the ruminants healthy by facilitating mastication and deglutition, helping in restoration of normal ruminal pH and microbial protein synthesis to be used as dietary proteins. In general, the major salivary glands of the herbivores are better developed than those of the carnivores. The salivary glands may be classified on the basis of their secretions as serous, mucous, or seromucous (mixed) glands. The distribution of these types varies from species to species (Konig and Liebich, 2004). Saliva is secreted into the oral cavity via a series of ducts in the ductal system. The salivary glands also secrete IgA and potassium, and sodium (Aspinall and Reilly, 2004). The literature on histomorphology and histochemistry of sheep labial salivary glands was scanty. The present study was therefore undertaken with the aim to observe its detailed histology and histochemistry.

MATERIALS AND METHODS

The present study was conducted on ten healthy adult sheep of either sex of local mixed breed. The tissues from superior, inferior and commissural regions were collected and processed for paraffin and frozen sectioning techniques. The sections were stained with Harris' haematoxylin and eosin stain for histomorphological studies (Luna, 1968), Crossman's trichrome stain for collagen fibres (Crossman, 1937), Gomori's stain for reticular fibres, Weigert's method for elastic fibres, Alcian blue for mucosubstances (pH 2.5), PAS-Alcian blue method for mucosubstances (pH 2.5), Best's carmine method for glycogen, McManus' PAS method for glycogen, Diastase digestion method, Colloidal iron stain for acid mucopolysaccharide, Mayer's mucicarmine method for mucin, Sudan black B method for fats and Oil-red-O in propylene glycol method for fats (Luna, 1968). Micrometry was done with the help of ocular micrometer.

RESULTS AND DISCUSSION

The labial salivary glands in sheep were found mainly at the commissure of the lips even though some isolated lobes of the gland scattered in other parts of upper and lower lips. Similar distribution of labial salivary glands were reported in buffalo (Gupta et al., 1999). The authors observed that the labial salivary glands were more numerous towards the commissure of lips.

Whereas, Sloss (1954) made a reference that the labial salivary glands in pig were poorly developed and located at the commissural half of lower lip. The labial salivary glands of domestic animals were found to be aggregated in the propria submucosa of the lips (Young and Van Lennep, 1978) and (Stinson and Calhoun, 1993). The commissural labial salivary glands in sheep were found distributed around the commissure of the lips on either side. These were placed under the skin rostral to the insertion of the zygomaticus muscle embedded in the orbicularis oris muscle. These extended between the superior labial artery and inferior labial vein along the angle of mouth. The superior labial salivary glands were distributed in two zones viz; external and rostral (nasolabial). The labial salivary glands of external zone continued rostrally from the commissural labial salivary glands distributed under the skin and orbicularis oris muscle over the mucosa. The rostral zone of superior labial salivary gland was comprised of globular aggregations of the glandular lobes, which were wider at the philtrum but narrower towards the commissure. These constituted the nasolabial gland, which was lobulated and running parallel to denticulate papillae of the superior lip. Their duct traversed externally and opened into the skin under the nostril and above the rima oris. Internally, these were covered by mucosa and externally by orbicularis oris muscle. Labial nerve formed the external marginal of nasolabial salivary gland and their branches ramified into it. The inferior labial salivary gland in sheep was formed by the continuation of the commissural labial salivary gland into the inferior labium between the mucosa and orbicularis oris muscle internally and the skin externally.

Histologically, the labial salivary glands were of compound tubuloacinar type having loose irregular connective tissue being supported by bundles of striated muscle fibres, fine blood vessels and nerve bundles. These findings were similar in one-humped camel (Taib and Jarrar, 1987). The labial salivary glands were of seromucous type with predominance of mucous acini along with few serous acini. The view expressed by Dhingra et al. (1978) in buffalo that the labial salivary glands were lobulated and classified as compound tubuloacinar were in agreement with the present study. The secretory units were mainly mucous with few serous and seromucous (mixed) in nature which was in accordance with the observations of Gupta et al. (1999) in buffalo. The mucous acini were round to oval in shape of varying dimensions

having average acinar and luminal diameter $52.17 \pm 3.15 \mu\text{m}$ and $7.14 \pm 0.67 \mu\text{m}$ with a range value measuring $43.60 \mu\text{m}$ to $69.35 \mu\text{m}$ and $3.58 \mu\text{m}$ to $15.50 \mu\text{m}$ respectively.

The epithelial height of the cells measured from $11.50 \mu\text{m}$ to $21.70 \mu\text{m}$ with an average of $16.45 \pm 1.17 \mu\text{m}$. The nuclei were elongated and located towards the basement membrane. Nuclei appeared dark because of densely stained chromatin which were homogeneous distributed throughout the nucleoplast and masks the appearance of nucleoli. Cytoplasm was finely granular and eosinophilic. These acini were surrounded by myoepithelial cells, collagen, elastic and reticular fibres. These findings were in total agreement with the reports of Jabbar (2010) in buffalo. The serous acini were round to oval in shape and very small in size having average acinar and luminal diameter $20.3 \pm 1.15 \mu\text{m}$ and $4.91 \pm 0.41 \mu\text{m}$ with a range value measuring $13.52 \mu\text{m}$ to $27.49 \mu\text{m}$ and $2.80 \mu\text{m}$ to $9.15 \mu\text{m}$ respectively. These acini were also lined by pyramidal shaped cells. The epithelial height of the cells measured from $4.16 \mu\text{m}$ to $14.26 \mu\text{m}$ with an average of $8.71 \pm 0.63 \mu\text{m}$. The cytoplasm was finely granular and strongly eosinophilic in nature. Seromucogenic granules were present in apical portion. A few mixed acini having distribution of both serous and mucous cells were also observed. The glandular parenchyma was devoid of elastic fibres. Fine reticular fibres were present in capsule and trabeculae. These reticular fibres surrounded the each acini and forming the basement membrane.

Histochemically, the mucous acini were very strongly (++++) PAS positive for glycogen (Figure. 1). The serous acini and their ducts were devoid of PAS activity. The mucous acini were strongly (+++) positive for acidic mucopolysaccharides and very less concentration of neutral mucopolysaccharides were observed towards the periphery of acini by PAS-AB method (Figure. 2). The ducts were devoid of PAS activity.

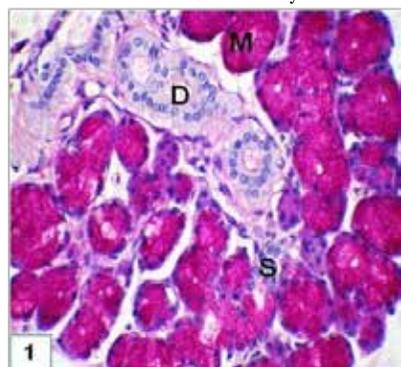


Figure 1: Representative photograph showing very strong PAS positive material in mucous acini (M) which was absent in serous acini (S) intralobular (D) duct (McManus' Method x 400).

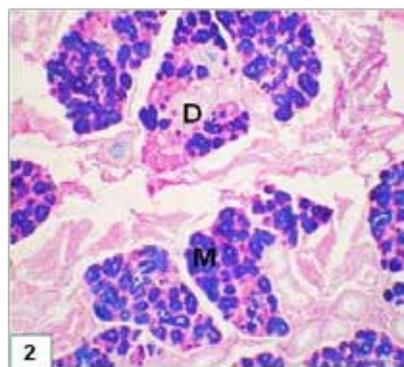


Figure 2: Photomicrograph of labial salivary gland showing strong PAS-AB positive reaction in mucous acini (M).

Intralobular duct (D) shows negative reaction (PAS-Alcian Blue Method x 100).

Secretions of intralobular and interlobular ducts were positive for acidic mucopolysaccharides. The mucous acini showed strong (+++) positive reaction for mucin and serous acini showed negative reaction by Mayer mucicarmin method. The mucous acini were strongly (+++) positive for acidic mucopolysaccharides by Colloidal iron method (Figure. 3).

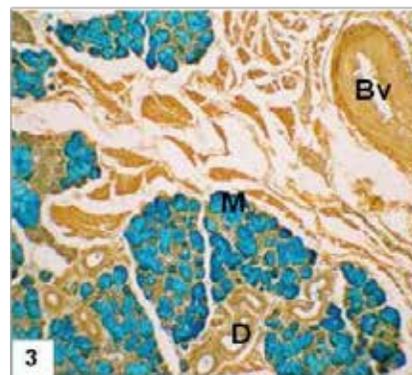


Figure 3: Representative photograph showing strong positive reaction for colloidal iron in mucous acini (M) which was negative in duct (D). Blood vessel (Bv) can also be seen (Colloidal Iron Method x 100).

Strong PAS and Colloidal iron positive reaction confirmed the presence of neutral mucopolysaccharide and acidic carboxylated mucosubstances, respectively (Thompson and Hunt, 1966) and (Pearse, 1968). The mucous acini showed strong (+++) alciphilic reaction and ducts showed negative reaction. The fatty material was unevenly distributed in the cytoplasm and showed negative (-) reaction with Sudan black-B. Nile blue sulphate and Oil-red-O showed weak (\pm) reactions for lipids. The serous acini exhibited negative reaction to all histochemical staining techniques carried out during the present investigation indicating the absence of mucopolysaccharides, mucin, glycogen and lipids included in this study.

CONCLUSIONS

On the basis of above observations, it can be concluded that the labial salivary glands were of compound tubuloacinar type. The adenomeres were of seromucous type with predominance of mucous acini. The acinar and luminal diameters of adenomeres of labial salivary glands were less as compared to buccal glands. The epithelial height was also slightly less than that of buccal glands. The histochemical studies revealed that the mucous cells contained mucosubstances, glycogen, mucopolysaccharides, mucin and lipids while serous cells were negative to all these histochemical reactions.

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