Seasonal Variation in the Histomorphology and Histochemistry of the Bulbourethral Gland of Gaddi Goat and Gaddi Sheep

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ABSTRACT

Twenty four adult animals of each species (Gaddi goat and sheep) were utilized for recording seasonal variation in the histomorphology and histochemistry of bulbourethral glands. Bulbourethral glands were mixed (sero-mucous), tubulo-alveolar, consisting of mostly luminated and a few solid end-pieces, enclosed by a thick fibrous capsule. The gland was predominantly mucous in nature. A few serous end-pieces were also observed scattered either between mucous end-pieces or forming a separate lobule in the center of the gland. The mucous end-pieces were lined by columnar cells with basally placed oval or flat nuclei whereas, serous end-pieces were lined with cuboidal epithelium with rounded nuclei. The diameter of alveoli and tubules (both mucous and serous), solid end-pieces and epithelial height were largest during autumn and lowest during summer season in Gaddi goat and sheep. The secretory blebs and secretions were recorded more during autumn season and these secretions stained intensely for PAS-positive and diastase resistant material and also for cholesterol.

Key words: Histomorphology, Bulbourethral gland, Seasonal variation, Gaddi goat, Gaddi sheep

The secretions of bulbourethral glands flush the male urethra prior to ejaculation and lubricate it for the passage of seminal fluid (Breazile, 1971). The information regarding the seasonal variation in the microscopic structure of accessory glands of Gaddi goat and Gaddi sheep are scanty. This study was undertaken to record the seasonal variation in the histomorphology and histochemistry (glycogen and cholesterol secretion) of bulbourethral gland of Gaddi goat and sheep.

MATERIALS AND METHODS

The present study was conducted on 24 apparently healthy animals of each species (Gaddi goat and Gaddi sheep) of 2-2½ years of age. The period of study was divided into four seasons (spring, summer, autumn and winter). The whole pelvic urethrae of both species were collected and fixed in 10% neutral buffered formalin and 90% chilled alcohol. The tissues from bulbourethral glands were processed by alcohol-benzene schedule. The paraffin sections were stained with hematoxylin and eosin and utilized to study routine histomorphology. The architecture of the gland was studied by staining sections with Verhoeff’s counter stained with Van Gieson and Gomori’s reticulum stain (Luna, 1968). The alcohol fixed tissue sections were utilized for recording glycogen. The cryostat sections were stained by Schultz method to study the cholesterol in the gland.

RESULTS AND DISCUSSION

Bulbourethral glands were compound, mixed (sero-mucous, predominantly mucous), tubulo-alveolar glands, consisting of mostly luminated and a few solid end-pieces. A fibrous capsule ensheathed the gland composed of collagen and a few reticular fibres. From the capsule, thin septae descended into the gland dividing its parenchyma into distinct lobules. The overlying loose connective tissue contained fibroblasts, blood vessels, nerves and occasionally autonomic ganglia. The thickness of capsule and septae were minimum during autumn season and maximum during summer season in goat and sheep. The septae also showed moderate reaction for PAS reactive, diastase resistant material and cholesterol. The capsule,
septae and interlobular connective tissue did not show seasonal variation for PAS and cholesterol staining in both the species.

The glandular parenchyma was composed of alveoli, tubules and solid end-pieces. The alveoli and tubules were predominantly mucous in nature. A few serous end-pieces were also observed scattered between mucous end-pieces or formed a separate lobule in the center of the gland in both the species. Dellmann and Wrobel (1983) described the bulbourethral gland as compound tubular gland in goats.

The solid secretory end-pieces had round or oval nuclei. The diameter of solid end-pieces was maximum during autumn season followed by spring, winter and minimum during summer season. Their diameter varied significantly between seasons in both the species. These solid end-pieces also showed secretory activity and stained moderate to intense for diastase-resistant PAS and for cholesterol also. This showed that these solid end-pieces might become functional during autumn season under the influence of testosterone in adult animals (Thinbault and Levasseur, 1974).

The mucous end-pieces (alveoli and tubules) were lined with tall columnar or pyramidal cells having oval or flat nuclei in basal parts. They contained finely granular cytoplasm, which stained light basophilic. The cytoplasm was sometimes appeared foamy or vacuolated (Fig. 1) and remained unaffected with diastase treatment indicating absence of glycogen and presence of neutral mucins or weakly sulphated acidic mucopolysaccharides which might served as a source of energy for ejaculated spermatozoa (Banks, 1986). The diameter of alveoli and tubules was largest during autumn season followed by spring, winter and smallest during summer season. The diameter of tubules varied significantly in Gaddi sheep. A columnar epithelium lining the glandular end-pieces of the bulbourethral gland has been described in goat (Banks, 1986; Gupta, 1978; Kundu, 1980). The basal cells reported in the epithelium (Dellmann and Wrobel, 1983) were not recorded during the present study.

The epithelial height of alveoli and tubules was recorded highest during autumn season and minimum during summer season. In Gaddi goat, tubular epithelial height showed significant variation between seasons (P<0.05), whereas in Gaddi sheep alveolar epithelial height was significantly higher during autumn season. In both the species, epithelial cells were seen to discharge secretions which were more during autumn season and very less during summer season, as most of alveolar lumina and ducts were filled during autumn season (Figs. 1, 2, 3). These secretions were PAS positive and a strong activity of cholesterol was observed at periphery. These changes might be due to increased level of testosterone during the breeding season (Donald, 2005). The cytoplasm of mucous epithelial cells was intensely PAS positive during autumn season and weak activity was observed during summer season (Fig. 4).

The apical and basal borders of lining epithelium showed variable cholesterol activity during different seasons (highest during autumn season) in both the species. During autumn season, intensely positive cholesterol droplets were seen at infranuclear region. Some secretory end-pieces showing mixed mucin in their cytoplasm might indicated that the mucins secreted (Fig. 5) by the cells were not released into the lumen and hence, accumulated in their cytoplasm (Sudhakar, 1982). Moderate cholesterol reaction was observed only at periphery of the secretion and mild in the center during all seasons of the year in Gaddi goat and sheep (Fig. 6).

Fine cholesterol granules were uniformly observed in the cytoplasm. Singh (1967) in buffalo and Gupta (1978) in goat did not observe fat in the bulbourethral gland. Chandra Pal (1976) found more lipid droplets in the serous secretory cells than in the mucous cells. Bhosle et al. (2006) observed large number of lipid granules in the cell cytoplasm in cattle.

The ducts of mucous lobules (both inter and intralobular) and lumina of alveoli and tubules were lined with epithelium similar to that of alveoli. These ducts were completely filled with basophilic secretions during autumn season (Fig. 3) whereas appeared empty during summer season in both the species. In Gaddi goat, dark eosinophilic granules were observed scattered uniformly in the
Fig. 1. Bulbourethral gland of Gaddi sheep showing foamy cytoplasm of columnar epithelium of alveoli and tubules during autumn season. H. & E. × 400

Fig. 2. Bulbourethral gland of Gaddi goat showing mucous alveoli (A) and collecting duct (C) filled with light eosinophilic secretion with dark pink globules. H. & E. × 400

Fig. 3. Bulbourethral gland of Gaddi goat showing basophilic secretion in the lumen of alveoli, tubules and collecting duct during autumn season. H. & E. × 200

Fig. 4. Bulbourethral gland of Gaddi sheep showing mildly stained foamy cytoplasm during summer season. PAS with diastase × 400

Fig. 5. Bulbourethral gland of Gaddi goat showing intensely PAS-positive diastase resistant carbohydrates in mucous end-pieces (M). Secretion stained moderately (S) during autumn season. PAS with diastase × 400

Fig. 6. Bulbourethral gland of Gaddi sheep showing strong cholesterol reactivity at periphery of secretion (arrow), moderate in the center of secretion and in interlobular connective tissue during autumn season. Schultz method × 200
secretions. These secretions were moderately PAS positive and remained unaffected with diastase treatment. Strong cholesterol reaction was observed only at periphery and moderate in the center of secretion in Gaddi goat (Fig. 6). These secretions showed moderate cholesterol during spring season. Based on different staining pattern of secretions, it was presumed that all the secretory components were not in the same phase of activity.

The serous end-pieces were few and were present either under the capsule or in the centre of the gland between mucous lobules singly or in groups forming separate lobules. The serous alveoli and tubules were lined with cuboidal epithelium with rounded nuclei. The alveolar and tubular diameter was recorded maximum during autumn season and minimum during summer season in both the species. The height of alveolar and tubular epithelia was maximum during autumn season. The ducts were also lined by epithelium similar to that of alveoli and tubules. A few of them contained eosinophilic, PAS-reactive, diastase-resistant colloid in their lumen. The cytoplasm of the serous end-pieces and ducts showed strongly PAS-reactive, diastase-resistant fine granules only at supranuclear zone of cytoplasm. Cholesterol reaction of serous epithelium was similar to the mucous end-pieces. Apical and basal borders also showed mild to moderate reaction for cholesterol. The intensity of reaction was maximum during autumn season.

REFERENCES