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Research Article

Structure of the epididymis and ductus-deferens of Black Bengal buck (*Capra hircus*): a light microscope study

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ABSTRACT

Histological study of the epididymis in Black Bengal buck indicated a gradual decrease of epithelial height and an increase in tubular diameter from caput to caudal epididymal region. Spermatozoal distribution in the tubular lumen were found less in number in caput followed by gradual increase towards cauda.. Maximum number of basal cells was found in the corpus region. Ductus- deferens was characterized by long mucosal folds.

Key words: Epididymis, ductus-deferens.

The epididymis not only provides transit passage to the spermatozoa but also provides a special environment where sperm cells are concentrated, undergo maturation, and acquire motility and fertilizing capacity (Orgebin-Crist, 1969; Orgebin-Crist *et. al.*, 1975; Bedford, 1975).

Histology of the epididymis has been studied in various domesticated and laboratory animals like bull, buffalo, ram, dog, hamster and rat etc (Wrobel and Fallenbacher, 1974; Orgebin-Crist, 1969; Goyal and Dhingra, 1975) , however, there is paucity of information about the histological nature of the epididymis and ductus-deferens of the Black Bengal buck, a native breed only found in West Bengal, which prompted to take up the present investigation.

MATERIALS AND METHODS

Ten adult and healthy Black Bengal bucks were selected from the University goat breeding farm. Average age and body weight of the animals were 3 to 3 years and 12.5 to 14.5 Kg. respectively. All the animals were maintained on standard balanced feed and water was supplied *ad libitum.*

Testes were collected after castration and epididymes were dissected. Pieces of tissues were taken from three different epididymal parts and fixed in Bouin's fixative. Histological sections were cut and stained by Weigert's haematoxylene and Van-Gieson's stain (Cullin,1974).Leitz ocular micrometer was used to record the epithelial thickness and tubular diameter. All data were analyzed statistically (Snedecor and Cochran,1976).

RESULTS AND DISCUSSION

Duct of the epididymis and ductus-deferens had a cylindrical out line both inside and outside. Epididy was attached to the testis with the caput on its dorsal aspect and the cauda on the ventral aspect. The body i.e. corpus was lying along the posterolateral part of the testis. A layer of circularly arranged smooth muscle fibers was found to be surrounding the epididymis which had irregular arrangement in caput but definite regular arrangement was present in the corpus and cauda regions. Loose connective tissue was found outside

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muscular layer followed by presence of irregular dense tissue containing abundant blood vessels. Thickness of the intertubular connective tissue and muscular layer increased from caput to cauda epididymal regions. The lining epithelium of the entire epididymal tubules was found to be pseudostratified with tall columnar cells of two types, i. e. principal cells and basal cells. Lipid droplets were present in the cytoplasm of both cell types. Tall columnar cells contained pigment granules and lysosomes. The basal cells which were located near the basement mcmebrane of epididymal tubule, were less in number in caput (Fig. II) and more in corpus (Fig. III). Stereocilia were longest in the caput and were less prominent in other two regions. The epithelial height was found decreasing, whereas tubular diameter increased from caput to cauda epididymal regions (Table I).

The observations also revealed that epididymal free surface had a tough non motile stereocilia and spermatozoa were present in all the tubular regions but maximum concentration was found in the caudal region (Fig IV).

The epithelial lining of the ductus-deferens was pseudostratified and bore stereocilia which were composed of columnar and basal cells. The nuclei of the columnar cells were found lobated and located in the basal half of the cells. Moderate number of vacuoles were visible in the apical cytoplasm. The basal cells were found somewhat larger in this region than in the epididymis. Intraepithelial leukocytes were rarely seen. Basal lamina intervenes between the epithelium and a thin lamina propia, which was characterized by the presence of numerous elastic fibers. Beneath the lamina propia, there was ill-defined submucosa containing numerous blood vessels, which seperated the mucosa from the thick muscular coat and was found to be composed of three distinct layers of smooth muscles. The inner layer was thin and oriented longitudinally. The

Table 1: Epithelial Cell height and tubular diameter in different segments of the epididymis of adult Black Bengal buck

Segment	Epithelium height (µm)	Diameter of the tubule (µm)
Caput	47 ± 0.027	220 ± 0.011
Corpus	42 ± 0.036	228 ± 0.026
Cauda	22.5 ± 0.021	346 ± 0.019

Values expressed as Mean ±SE.

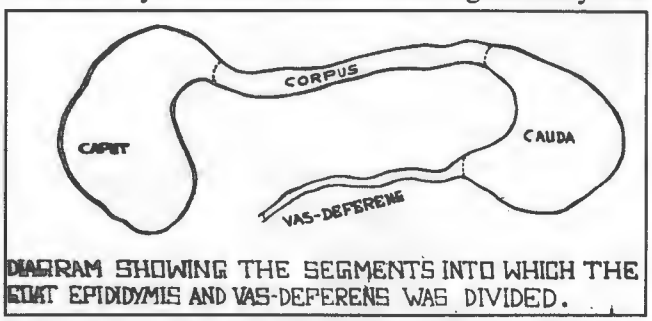

DIAGRAM SHOWING THE SEGMENTS INTO WHICH THE GOAT EPIDIDYMIS AND VAS-DEFERENS WAS DIVIDED.

Fig 1: Showing the diagrammatic presentation or caprine epididymis.

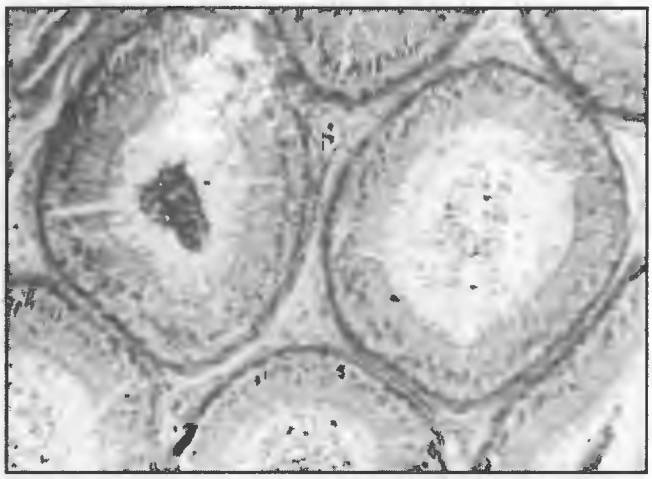

Fig 2: Micrograph of caput epididymis showing the thickest pseudostratified columnar epithelium. Smooth muscle fibers surrounding the duct are scare. (Haematoxylene-Eosin, x 200).

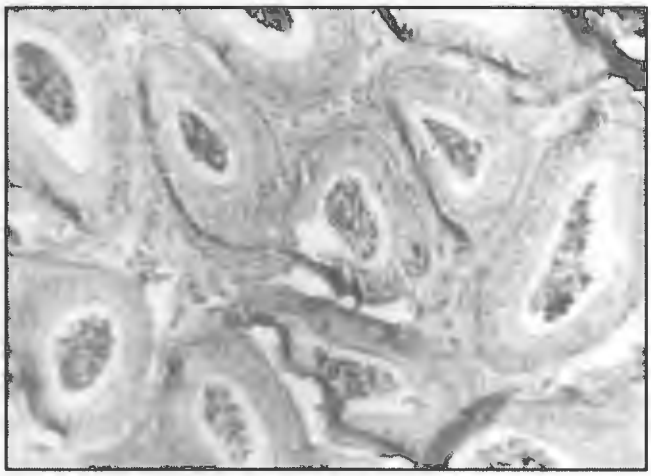

Fig 3: Micrograph of corpus epididymis showing more smooth muscle. Pseudostratified columnar epithelium is less thick. Presence of more basal cells. (Haematoxylene-Eosin, x 200).

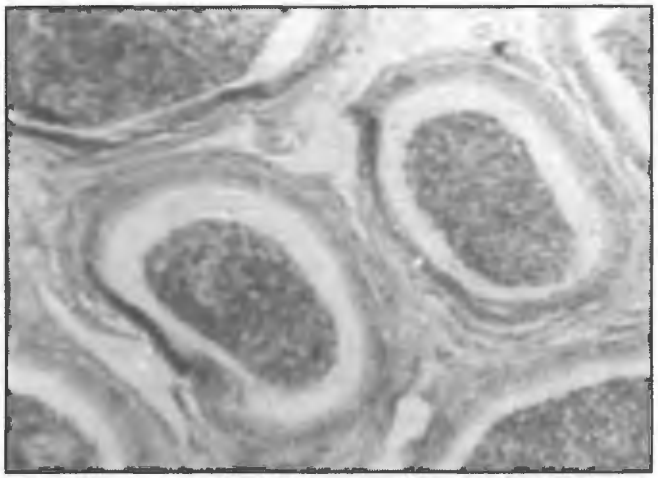

Fig 4: Micrograph of cauda epididymis showing thin Pseudostratified columnar epithelium and abundant circular smooth muscle. (Haematoxylene-Eosin, x 200).

Fig 5: Micrograph of ductus-deferens showing, wall consisting of smooth muscle and forms an inner circular and an outer circular predominantly longitudinal layer with some randomly arranged cells. Presence of long mucosal folds. (Haematoxylene-Eosin, x 200).

middle or circular layer was markedly tough and beyond this a well developed layer of muscle fibers was found arranged longitudinally (Fig. V).

Present observations revealed that epididymis of Black Bengal buck were covered by vaginal tunic and a thin albuginea. Epididymal head (Caput) consisted of many coiled tubules which were grouped into lobules. The tubules of the lobes united to form a single tube and with the union of these single tubules the ducts of epididymis were formed which by its complex coils form the body (corpus) and tail (cauda) of the epididymis terminated in the ductus-deferens.

The decrease of epithelial thickness and increase of tubular diameter from caput to cauda epididymis (Table I) corroborated well with the findings of Wrobel and Fallenbacher (1974) and Dinakar *et al.*, (1977). Moreover, the variation in the height of the columnar cells at different levels of the duct in Black Bengal buck may be due to differences in luminal pressure (vitale-calpe and Aoki, 1971).

The initial segment (Caput) was characterized by high epithelium with long straight stereocilia that were found to obliterate the lumen, relatively small luminar diameter and tall pseudostratified columnar epithelium composed of columnar cells (i.e. principal cells), basal cells, apical cells and occassional presence of intraepithelial leukocytes were found as described in rat (Haffer *et al.*, 1973a), hamster (Nicander and Glover, 1973) and in other mammals (Hamilton, 1972). Stereocilia were observed to be most prominent in the caput but these did not occuled the tubular lumen as it was reported in horse (Glover and Nicander, 1971). The pseudostratified type of epithelium in Black Bengal buck showed resemblance to other domestic animals (Dellmann,1971; Pal, 1972; Wrobel and Fallenbacher, 1974; Goyal and Dhingra, 1975).

In the middle segment (Corpus) stereocilia were not so straight and the lumen of the duct was long. Maximum number of basal cells were present in this region, the smooth muscle was less and the epithelium was thinner.

The terminal segment (Cauda) bears comparatively thinnest pseudostratified epithelium. The surrounding smooth muscle were most abundant and the lumen was very wide. The stereocilia were found to be short in this region.

The epididymal epithelium is characterized by stereocilium and basal cells (constantinides, 1974). Stereocilium performs the function of secretion, phagocytosis and absorption (Glover, 1973) which seems to be diminished in the terminal segment, where only small micropinocytotic vesicles and a few multivesic

bodies are seen, whereas basal cells mature into preocilium. Large lipofuscin pigment granules are often seen in the basal cells. Suzuki and Glover (1973) suggested that basal cells might be able to absorb material passed to them from the columnar cells and in conditions of androgen deprivation, it seems that the product of autophagi in the columnar cells might be transferred in this region. Hess *et al.*, (1976) reported that the non-ciliated cells of epididymis also contribute to seminal plasma by apocrine secretion.

In the present investigation, tubular epithelium lining where three epididymal segments exhibited fully differentiated pseudostratified type of epithelium, indicated that experimental animals were in their puberty, and accumulation of spermatozoa in the tubular lumen was found to be increasing from caput to cauda epididymis as observed in other mammals (Glover and Nicander. 1971; Dinakar *et al.*, 1977). Moreover, appearance of intertubular connective tissue layer of circular smooth muscle fibers and connective tissue around the epididymis in Black Bengal buck as observed in the present study was also reported in other mammals (Dellmann, 1971; Pal, 1972; Kormano and Reijonen, 1976; Dinakar *et al.*, 1977).

Present study revealed that three epididymal parts including ductus-deferens in Black Bengal buck were distinctive in their cytological features of columnar cells along with changes in cell height and tubular diameter.

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