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Alteration of Capute Epididymis of Bat, *Taphozous longimanus* During Reproductive Cycle: A Microscopic Study

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Abstract: During the Pre-Breeding Period, epididymal tubules are narrow and surrounded by moderate connective tissue stroma. The epithelial cell height is reduced. The epithelium consists of principal cells, apical cells and basal cells. The halo cells are not clearly observed. During the Breeding Period, epididymal tubules are compactly arranged and inter-tubular connective tissue stroma is less. Numerous spermatozoa are seen in the lumen. The rest of the characteristics of capute epididymis during breeding period are similar with that of pre-breeding period.

Key words: Caputew · Epididymis · Bat · Histology · *Taphozous* · Light Microscopy

INTRODUCTION

The epididymis of bat, *Taphozous longimanus* is divided into three regions i.e. the caput epididymis which form a cap at the anterior end of the testis, the corpus epididymis present on dorsomedial border of the testis, between caput and the cauda epididymis.The cauda epididymisis present at the caudal end of testis. Epididymis is an extragonadal site where the spermatozoa undergo morphological, physiological and biochemical changes. It thus plays a dynamic role in the development and maturation of spermatozoa.

Amongst bats, only regional histological differentiation of the epididymis has been reported [1]. In bat, *Rousettus leschenaulti*, during period of sexually active, the epididymis enlarges, the diameter of the epididymal tubules increases, the intertubular area decreases and the lamina become filled with spermatozoa. The tubules are lined with cuboidal or columnar cells with prominent nuclei. Large cilia project from the cells into the lumen.

The ciliated cells are found to help in forward movement of spermatozoa, while the basal cells are supposed to show holocrine secretary activity [2]. However, recent ultrastructure does not support this hypothesis [3]. The principal cells have been considered to be secretory [4 and 2] and an absorptive function [5]. All three regions of the head as well as the proximal body of the epididymis underwent a tremendous increase in epithelial height (160–230%), luminal diameter (49–155%) and tubular diameter (130– 190%) [6]. The epididymis depending upon its shape and position has been divided into anterior capute, middle corpus and posterior cauda epididymis [7].

The capute epididymis of present bat, *Taphozouslongimanus* shows following changes in structure and function during the reproductive cycle.

MATERIALS AND METHODS

For this study, preserved specimens of male bat, *Taphozous longimanus*is used. Epididymis is removed from scrotal sacs and quickly immersed in aqueous Bouin's fixative for light microscopy. After fixation, materialis washed in water, dehydrated with upgraded series of alcohol, cleared in xylene and embedded in paraffin wax. Blocks are prepared, trimmed and cut 5-6 µ sections with Leica 2417 microtome. The ribbon containing sections are spread with Mayer's albumen and used for hematoxylin-eosin staining.

These slides are dewaxed and hydrated by downgraded series of ethyl alcohol upto the water. Sections are stained with Ehrlich's hematoxylin and dehydrated by upgraded series of alcohol from 30% upto 70% ethyl alcohol. Now, slides are stained with eosin, washed in 90% alcohol and transferred in absolute

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alcohol. Then slides are cleared in xylene and mount in DPX. The desired stained slides are observed under light microscope and micro-photographed at different magnifications.

Observations: During the Pre-Breeding Period, the epididymal tubules are narrow and surrounded by moderate connective tissue stroma. In the connective tissue few blood vessels and capillaries are seen. These tubules are lined by pseudostratified columnar epithelium which lies on the basal lamina. The epithelial cell height is reduced. The epithelium consists of principal cells, apical cells and basal cells. The halo cells are not clearly observed. The principal cells are columnar and contain round to oval, darkly stained nuclei mostly situated at the basal region but some nuclei are present in the centre of cell, giving pseudostratified appearance to the epithelium. The nucleolus is single and centrally situated. Chromatin material is observed along the inner rim of nuclear membrane. Many long stereocilia are seen which project into the lumen. The cytoplasm is eosinophilic.

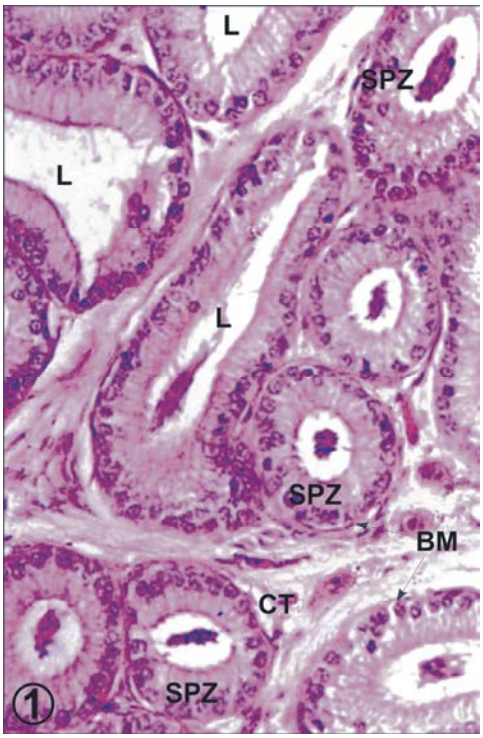

Fig. 1: Structure of low magnified part of caput epididymis during the pre-breeding condition showing numerous epididymal tubules covered by basement membrane (BM), separated by moderate connective tissue (CT). Narrow lumen of epididymal tubules shows few spermatozoa. X400

Few apical cells with spherical nucleus are noticed near the apical region of epithelium. Few basal cells are seen at the basal region of the epithelium and located between the principal cells. These cells are attached to the basal lamina. The nucleus of basal cell is oval and darkly stained. The cytoplasm is eosinophilic. Lumina are filled with homogeneous secretion containing spermatozoa (Figs. 1 and 2).

During the Breeding Period, epididymal tubules are compactly arranged and lie on the basal lamina. The inter-tubular connective tissue stroma is very less. Epithelium consists of numerous principal cells, few apical and basal cells. The halo cells are not demarcated. The principal cells are tall columnar. The nucleus is prominent, darkly stained and oval in shape. The chromatin material is dispersed in nucleoplasm. Cytoplasm is basophilic. Stereocilia are short and projected into the lumen.Numerous spermatozoa are seenin the lumen (Figs. 3 and 4). The rest of the characteristics are similar with that of capute epididymis during pre-breeding period.

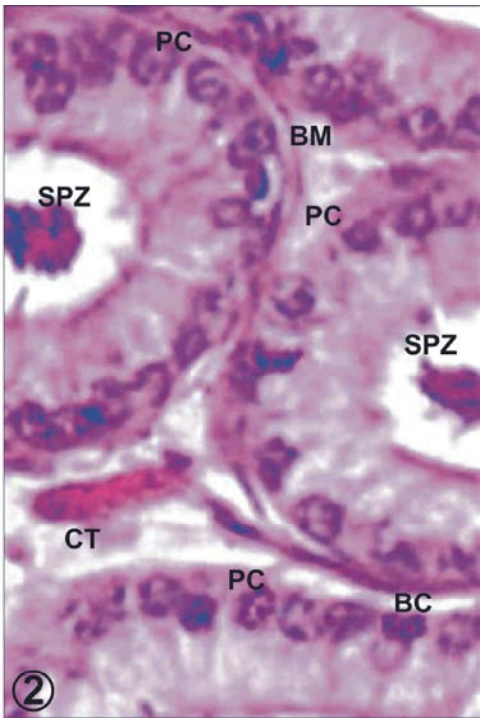

Fig. 2: Structure of high magnified region of epididymal tubules of caput epididymis during the pre-breeding condition shows tubules on basement membrane (BM). Epithelium consists of columnar principal cells (PC), few apical cells and basal cells (BC). Epididymal tubules separated by connective tissue (CT) containing blood capillaries. Narrow lumen contains few spermatozoa. X1200

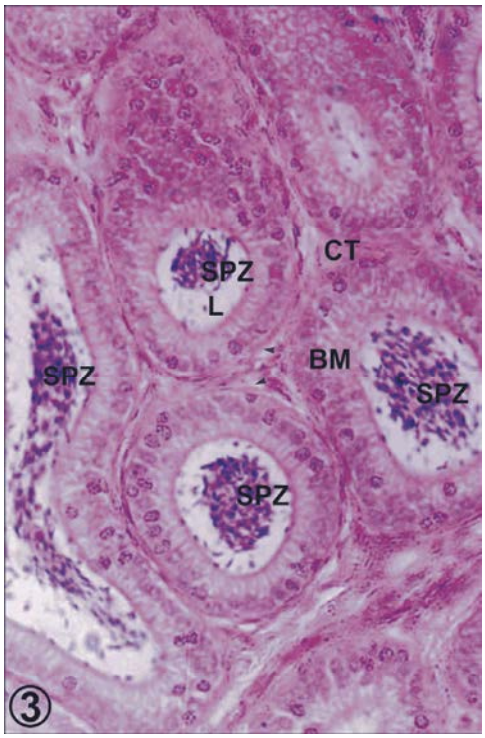

Fig. 3: Microphotograph of caput epididymis during the breeding period shows large epididymal tubules on basement membrane (BM), tall columnar epithelial cells and thin connective tissue (CT). Lumina (L) are filled with spermatozoa (SPZ). X400

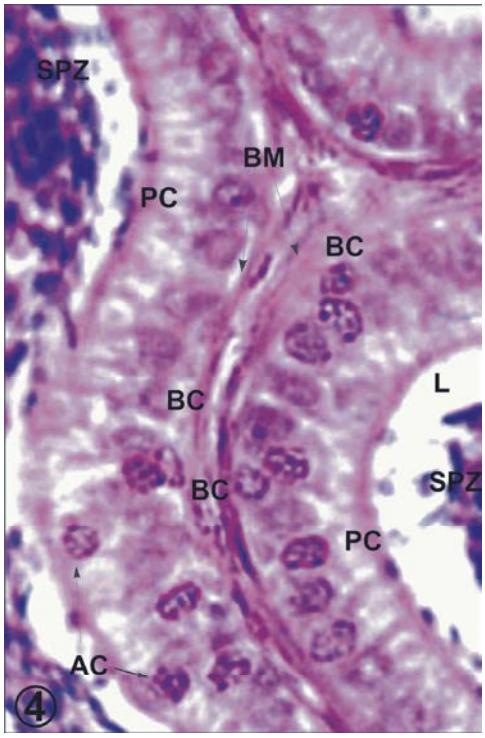

Fig. 4: Microphotograph of magnified region of caput epididymis during the breeding period shows thin connective tissue stroma (CT) in between epididymal tubules. These tubules are covered by basement membrane (BM). Epithelial layer consists of tall columnar principal cells (PC) shows stereocilia, few apical cells and basal cells (BC). Numerous spermatozoa (SPZ) are observed in the lumen (L). X1200

DISCUSSION

Grossly, the epididymis in most of the species of mammals can be divided into three regions-head, body and tail [7] although further subdivisions have been described in virtually all species [8, 9 and 10]. The epididymis of bat, *Vesperugo savi* and *Vesperugo piccolo* is divided into three regions: head, body and tail [11]. As in the other bats, the epididymis of *Taphozous longimanus* is also divided into three regions i.e. caput (Head), corpus (Middle) and cauda (Tail).

Histologically, caput epididymis during the pre-breeding and breeding period of bat, *Taphozous longimanus* show, compact tubules with less inter-tubular stroma and epididymal epithelium. A epithelium is pseudostratified and composed of mainly three type of cells: principal cells, basal cells, apical cells and rarely intraepithelial lymphocytes (Halo cells) as reported in epididymis of other bats, *Vesperugo savi* and *Vesperugo piccolo* [11], cat [12], monkey [13], goat [6], dog [15], Mexican rodent [16] and viscacha [17].

In the capute epididymis of present bat also reported three different types of cells. But the epididymal epithelium of other mammals contains five [10, 18 and 19] to six [20] different types of cells.

Principal cells are more in number than apical and basal cells. These are pseudo-stratified columnar to low columnar cells, studded with apical stereocilia, contain round to oval, dark, basally situated nucleus and central nucleolus. Apical cells are few, situated near luminal region with apical, spherical nucleus. Basal cells are few, spherical to oval shape with dark and oval shape nucleus. These cells are attached to the basal lamina and never reach to the lumen. Halo cells are not clearly demarcated. The lumina are filled with homogeneous secretion and numerous spermatozoa during the breeding period. Similar morphological features of epididymal epithelium are previously reported in the caput epididymis of bats [11, 21 and 22], rabbit [23 and 24], rat [5, 10, 20 and 25],

Mexican rodent [16], hamster [4], guinea pig [26], pig [27, 28], buffalo [29], goat [14] and other mammals [30] with function of spermatozoa storage.

But during the breeding period tubular diameter and epithelial cell height of caput epididymis is larger than that of the pre-breeding period respectively. The above observation is confirmed [1 and 21] in which tubules of epididymis show variation in the diameter, height of the epithelium, cell types and number of spermatozoa during the reproductive cycle.

CONCLUSION

During the breeding period, the epididymal tubule diameter and epithelial cell height are more than that of epididymal tubule diameter and cell height of caput epididymis during the pre-breeding period. Numerous spermatozoa are noticed in the lumen than that of pre-breeding period.

Abbrrevation: L- Lumen; SPZ- Spermatozoa; CT- Cunnective tissue; BM- Basement membrane; PC- Principle cell; BC- Basal Cell; AC- Apical Cell.

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