*Vol 17 No 1, p 103-106*

# ANATOMICAL AND HISTOCHEMICAL CHARACTERISTICS OF PROSTATE GLAND IN BACTRIAN CAMEL (*Camelus bactrianus*)

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## ABSTRACT

Anatomical and histochemical features of the corpus prostate in the bactrian camel were observed by anatomical, histological and histochemical methods, and also by transmission microscope. The corpus prostate is a tubuloalveolar gland containing many lobules. Each lobule composed of several secretory units and ducts, which was lined by a single line of epithelial cells with basal nucleus. Epithelial cells showed PAS-positive and Alcian Blue-negative, indicating that secretory granules contain neutral mucosubstances. The ultrastructure of epithelial cells varied in different shape of the cells. The columnar cells contained amount of golgi apparatus and mitochondria, while the pyramidal cells contained little organelles. These indicated that the ultrastructure of the cell depend on the different secretory cycle.

**Key words:** Anatomy, bactrian camel, histochemical feature, prostate, ultrastructure

The prostate gland is one of male accessory sex glands in mammals. The secretion can promote the formation of fertilised eggs, stimulate sperm motility, promote semen liquefaction and enhance sperm survival rate. Most studies of prostate glands mainly focused on human and laboratory animals and few on the camels (El-Jack, 1970; El-Wishy *et al,* 1972; Ali *et al,* 1976; Ali *et al,* 1978; Ningxia, 1983).

The purpose of this study is to describe the histological and ultrastructure features of corpus prostate in bactrian camel.

## Materials and Methods

Samples of prostate glands were collected from 5 adult bactrian camels in the rutting season (November). The samples were fixed in Bouin's fluid or 10% neutral formalin solution for one week, and processed for paraffin sections. These sections were stained using haematoxylin-eosin (H&E) for general observations, Mallory as a trichrome stain for collagenous and muscle fibres, toluidine blue for metachromatic substances, periodic acid-Schiff (PAS) for nuetral glyco-conjugates, alcian blue (AB) for acid glyco-conjugates, and a combined reaction of alcian blue and periodic acid-Schiff to show both acid and neutral mucosubstances (Badia, 2006).

The samples for electron microscope were fixed in 2.5% glutaraldehyde.

### *Quantitative measures*

The length, width and thickness of the corpus prostate were measured. All the data were obtained with slide calipers at the point of maximum dimension.

The diameter of the tubuloalveolar unit and the height of the epithelium were measured in 25 transverse sections under the light microscope. The values were expressed as the mean±SD (n=5).

## Result

### *Gross-anatomy*

The prostate is located on the dorsal aspect of the urethra and overhanging the neck of the urinary bladder. It is chestnut-shaped and greyish. The average size is 40.01±11.13 × 44.58±8.12 × 16.8±3.62 $mm^3$. The cranial $\frac{2}{3}^{rd}$ of the prostate is free and the caudal $\frac{1}{3}^{rd}$ is linked with the prostatic urethra.

There were 2 ejaculatory ducts on the left and right sides of prostate and these insert corpus prostate at the cranial prostate gland. A thin band coming from the internal aspect of the urethral muscle divided the prostate gland into 2 parts, the corpus prostate and the disseminate portion. The caudal disseminate portion became continuous with the glandular pelvic urethra. The colliculus seminalis was situated on the internal aspet of the dorsal urethral wall, and 7-15 prostatic ducts opened lateral to it.

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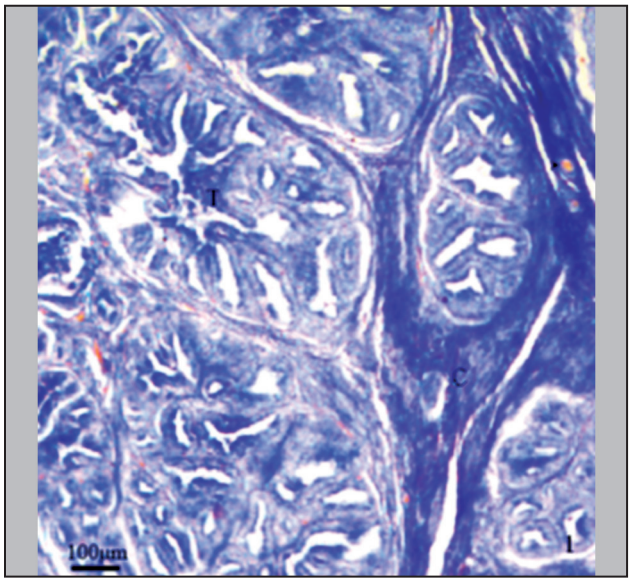


**Fig 1.** The gross-sectional view of the corpus prostate in bactrian camel with Mallory's trichrome stain. T, tubuloalveolar unit; C, connective tissue; Arrow (→) shows the capillary vessel in the interstitial tissue.

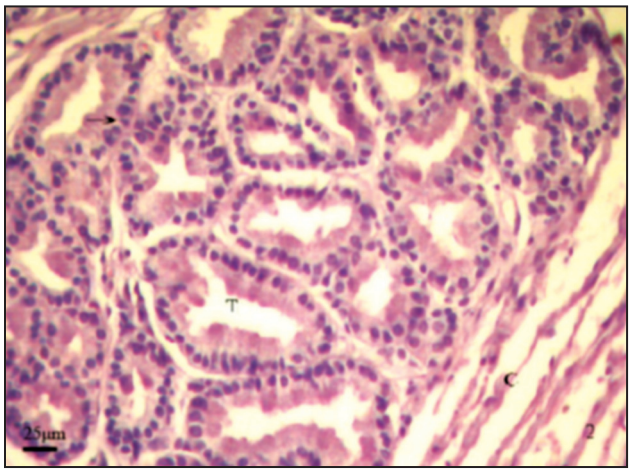


**Fig 2.** The tubuloalveolar units of corpus prostate in bactrian camel with H&E stain. T, tubuloalveolar unit; C, loose connective tissue between two lobules. Arrow (→) shows the basal cells.

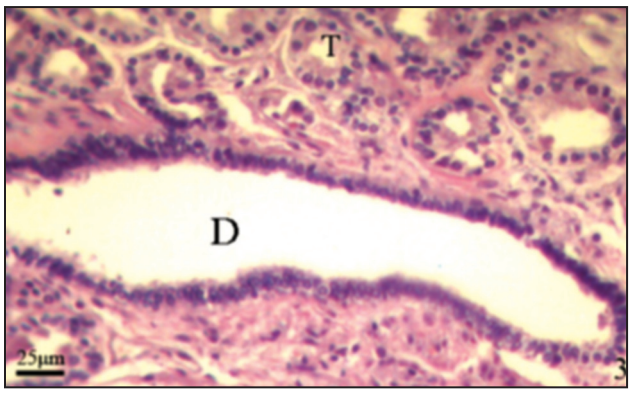


**Fig 3.** The duct of corpus prostate in the bactrian camel with H&E stain. D, duct; T, tubuloalveolar unit.

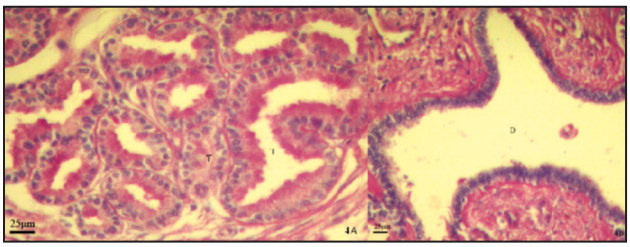


**Fig 4.** Corpus prostate of the bactrian camel with PAS stain. T, tubuloalveolar unit; D, duct.

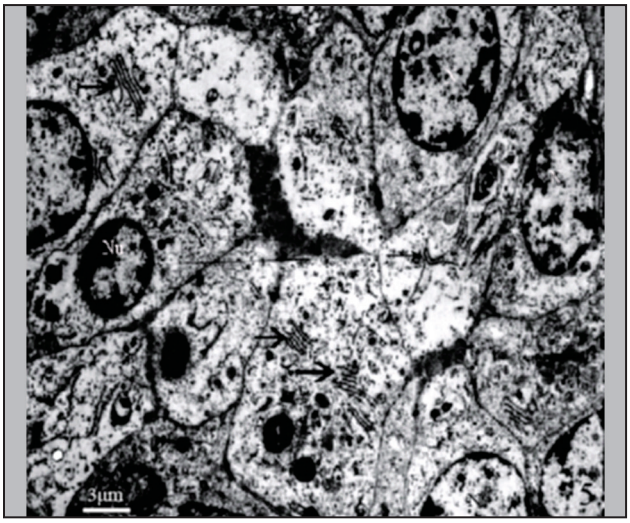


**Fig 5.** Ultrastructure view of corpus prostate in bactrian camel. N, nucleus; Nu, nucleolus; Arrow (→) shows Golgi apparatus.

The alveus utriculus was located on the *Colliculus seminalis*, and on each side, there was an orifice of ejaculatory duct.

### *Light microscopy*

#### Histology

It was observed from light microscope that the corpus prostate was covered by a thin fibromuscular capsule. The glandular parenchyma was lobulated and each lobule consisted of several tubuloalveolar secretory units. The interstitial connective tissue was rich in smooth muscle and collagen fibres. In the interstitial connective tissue, there were abundant capillaries and venules (Fig 1).

The secretory units of corpus prostate were almost oval, with an average size 21.12±3.99×14.28± 2.69μm$^2$, and had large lumens. The secretory units were lined by a single layer of cells, 6.31±1.28μm high, the shape of the cell was high columnar, cuboidal or pyramidal. The nuclei were spherical and located at the base cell. Occasionally, small cells wedged between the high columnar cell and basement membrane were seen in some units (Fig 2). There were a large number of granules in the supranuclear

cytoplasm, and were more close to the free surface stained deeper with H&E.

The ducts in the lobules were lined by a single layer of cells. The morphological characteristic of these cells were similar to those of the secretory units, but aligned closer (Fig 3). The main ducts were lined with transitional epithelium.

**Histochemistry**

The high columnar cells in the secretory units were stained intensely with PAS and were more close to the free surface. The cuboidal and pyramidal cells can also be stained with PAS, but much weaker than high columnar cells (Fig 4A). All the epithelial cells of secretory units were AB-negative and toluidine blue-negative. The epithelium of ducts were PAS-negative (Fig 4B), AB-negative and toluidine blue-negative.

***Transmission electron microscopy***

The epithelial cells of secretory units consisted of columnar or pyramidal cells and extended from the basal membrane to the luminal surface. The nuclei are oval in shape, and most of them have a prominent nucleolus. The chromatin was homogeneously and condensed close to the nuclear membrane. In the columnar cells, there are amount of golgi complex and rough endoplasmic reticulum in the supranuclear region. Mitochondria can be observed near the nucleus (Fig 5).

## Discussion

The corpus prostate is located on the dorsal aspect of the urethral, and the pars disseminata occupies the prostatic urethra, which is in agreement with the reports in dromedaries (Ali *et al,* 1978) and Alpacas (Hai-Dong Wang *et al,* 2007). The large part of the glandular zone is considered to be the zone of urethral glands, which is much different from the well developed pars disseminata in bull (Kainer *et al,* 1969), ram (Aitken, 1959) and boar (Aitken, 1960).

It can be observed by the light microscope that the prostate of bactrian camel belongs to tubuloalveolar gland, not the tubular gland that reported in other studies (Ningxia, 1983). Hitochemistry revealed, the epithelial cells of secretory units to be PAS-positive, but AB-negative. Histochemical analysis showed the neutral glycoconjugates were PAS-positive, and AB-negative, while the acid glyco-conjugates showed the AB-positive but PAS-negative (Pcarso, 1980), the secretory granules of the epithelia in prostate contained the amount of neutral mucosubstances. This result is consistent with the reports on Alpacas (Hai-Dong Wang *et al,* 2007). Besides, the cytoplasm had no reaction with toluidine blue and indicated that there is no acid mucosubstances existed.

The different shape of epithelial cells in the prostate showed the different intensity when these were stained with PAS. The high columnar cells were stained more intensely than cuboidal and pyramidal cells. This study suggested that the secretion of high columnar cells is much thriver than other 2 types of cells and the secretory units of prostate were not in the same stages of secretory cycle. Meanwhile, the weak reaction to PAS in the epithelia of ducts indicated that these cells have almost no secretory functions.

Transmission electron microscopy, revealed that the organelles in pyramidal cells are much less than those in columar cells. Histochemical by the secretory units of prostate gland showed 2 different types of epithelial cells with different activities. The secretory action of tall columnar cells was much more vivace than the other type of epithelia.

In summary, secretions of prostate in bactrian camel mainly consisted of neutral mucopolysaccharides. The mucopolysaccharides can either carry some signal or provide energy by decomposing themselves. While, the bactrian camel is a kind of ovulation inducing animal, the fertilisation process required a number of kinds of signals to start up, and also need lots of energy. Thus, the mucopolysaccharides may play an important role in this process.

## Acknowledgement

This study received financial support from the Key Project Fund of State Key Laboratory for Agrobiotechnology of China in 2008 (2008SKLAB06-05), National Science Fund for Talent Training in Basic Science of China (J0630644), and Startup Fund of Collaboration Scientific Research Item of Chunhui Project of MOE in China (z-2007-1-62012).

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(See Rule 8)


| | | |
|---|---|---|
| 1. Place of Publication | : | Camel Publishing House, 67, Gandhi Nagar West, Near Lalgarh Palace, Bikaner 334001, India. |
| 2. Periodicity of its publication | : | Biannual |
| 3. Printer's Name | : | Smt. Leela Devi |
| (Whether citizen of India) | : | Yes |
| Address | : | Gahlot Kutir, Nagani Road, Bikaner (Raj.) |
| 4. Publisher's Name | : | Smt. Leela Devi |
| (Whether citizen of India) | : | Yes |
| Address | : | Gahlot Kutir, Nagani Road, Bikaner (Raj.) |
| 5. Editor's Name | : | Dr. T.K. Gahlot |
| (Whether citizen of India) | : | Yes |
| Address | : | Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Bikaner 334001 (India). |
| 6. Names and address of individual who own the newspaper and partners or share holders holding more than one per cent of total capital. | : | Dr. T.K. Gahlot 67, Gandhi Nagar West, Near Lalgarh Palace, Bikaner 334001 (India). |

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