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Dept. of Anatomy and Histology
Fac. Vet. Med., Tanta University Kafr EL- Sheikh, Egypt

ULTRASTRUCTURAL STUDIES ON THE POLL GLANDS OF THE ONE HUMPED CAMEL (CAMELLIAS DROMEDARIUS) DURING RUTTING AND NON RUTTING SEASONS

(With 15 Figures)

By
M.H. FAYED and M. KASSAB

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التركيب الوصفي الدقيق للغدد القفوية النشطة في الجمل وحيد السنام

مسعود حسن فايد ، محمد محمد كساب

أجريت هذه الدراسة على عشرة عينات من الغدد القفوية لذكور الجمال وحيدة السنام . ولقد تم تجميع العينات المستخدمة في هذه الدراسة في موسمي التزاوج والكمون. وأظهرت النتائج أن هذه الغدد تنشط في موسم التزاوج فتكون وحداتها الإفرازية مبطنة بخلايا مكعبة الشكل. وبفحص هذه الخلايا بالمجهر الإلكتروني تبين أنها تحتوي على العديد من الميتوكوندريا والشبكة الأندوبلازمية بنوعيها الملساء والخشن. وكان أهم مايميز هذه الخلية هو وجود الحويصلات المفرزة الخارجة من أجسام جولجي محاطة بالميتوكوندريا والشبكة الإندوبلازمية الملساء. ويمكن إستنتاج أن هذه الخلايا تعتمد في نشاطها على الهرمون الذكري أكثر من أن تكون مفرزة له.

SUMMARY

The ultrastructure of poll glands of the one humped camel was examined in ten specimens collected in both rutting and non rutting seasons. The active acini were lined by cuboidal cells in different secretory phases. In the resting phase of the active gland the apical parts of the cells were healed together with the junctional complex and apart from each others forming secretory canaliculi in the secretory phase. The secretory cell is characterized by the presence of spherical nucleus, mitochondria, Golgi complex and smooth and rough endoplasmic reticula but the prominent feature was the presence of large vacuole in the vicinity of Golgi apparatus. The interpretations of the current results suggested that the

gland may be steroid-dependent organ captured the androgen from the general circulation rather than it is steroid synthesized organ.

Key words: *Poll glands, humped camel.*

INTRODUCTION

There are conflicting reports with regard to the existing, morphology and function of the poll gland in both sexes. Singh and Bharadwaji (1978) and Taha and Abdalla (1980) reported the presence of the poll gland in the male camel at birth and absence of any visible gland at any age in she camel. Wilson, (1984) emphasized the existing of the poll glands in both sexes but show a sexual dimorphism in their development; they much more highly developed in males than in females. The same confliction could be noticed in the reports dealing with the morphological features of the active and non-active gland (Singh and Bharadwaji 1978 and Taha and Abdalla, 1980). There is no adequate information pertaining to the function of these glands. The poll glands are thought to be one of the target organs of androgens as the concentration of androgens and activities of metabolic enzymes for androgen in these glands reach their peak from January to March (Yagil and Etzion, 1980 and Tingari et al., 1984).

Histologically, The poll glands are apocrine glands, the secretory cells of which are known to undergo seasonal changes (Singh and Bharadwaj, 1978 and Tingari et al., 1984). In the rutting season, secretory cells excrete a substance containing polysaccharides by both apocrine secretion and exocytosis (Singh and Bharadwaji 1978; Tingari and George, 1984 and Taha et al., 1994). Using lectin histochemistry Atoji et al., 1998 showed the presence of glycoconjugats containing galactose, N-acetyl-D-galactosamine and N-acetyl-D-glucosamine in the Golgi area and cytoplasmic granules in the secretory cells and suggested that, these glycoconjugats are released from the secretory granules by exocytosis.

The aim of the present study is to give more informations on the ultrastructural morphology of the active poll glands of the one humed camel and to clarify if there is any evidence for the steroid secretion or not?.

MATERIALS AND METHODS

ample collection:

The samples were collected from ten camels at slaughter houses in Cairo and Pelbees. Six of these camels (four males and two females) were in rutting season (November - March) and four (two males and two females) were in non rutting season (April - August).

tissue preparation:

Following fixations in 4% paraformaldehyde in 0.1M phosphate buffer saline (pH 7.4) (PBS) for 72 hours, the samples were rinsed in the same buffer, dehydrated in gradual ethanol series, infiltrated and embedded in paraffin. Sections of 4 µm. were stained with Gill's haematoxylin (Gill et al., 1974) for general histological assessment.

For Electron microscopic study, The samples were carefully removed, fixed by immersions in three changes of 4% paraformaldehyd and 2% glutaraldhyed in 0.1M phosphate buffer saline (pH 7.4) (PBS) for 24 hours. The samples were thoroughly rinsed in PBS, three times (two hour each). Dehydration was done in cold gradual ethanol series (50%, 70%, 80%, 90%, and two changes of absolute) and infiltrated in propalenoxide and finally embedded in Epon 812. Ultra-thin sections were cutted with glass knife on LKB ultratome, mounted on nickel grids, stained with uranyl acetate and lead citrate and examined with 100 CX Joel microscope in the medical research institute, Alexandria university.

RESULTS

Anatomy:

The poll glands are subcutaneous symmetrical bodies situated on the back of the neck behind the ear. They much more highly developed in males than in females. The gland measured 3.6 inches in length, 2.5 inches in width and 1.6 inches in thickness. It produces yellowish watery secretion of characteristic offensive odour in rutting season.

Light microscopic observations (LM):

The poll glands are a compound tubuloalveolar gland covered by thick fibrous capsule which is composed of irregularly arranged dense collagenous fibers. From the inner surface of the capsule arose connective tissue trabeculae separating the gland into lobules (Fig. 1). Connective tissue strands arise from the trabeculae to surround the alveoli and the duct of the gland (Fig. 2). The intra lobular connective tissue was reduced to thin strands (Fig. 3).

The secretory part and the tubules of the active gland are lined by cuboidal to low columnar epithelial cells with many blebs, protruding from the apical surface of the cells depending upon the secretory phase. The secretory units of the gland are not in the same stage of secretion i. e., some of the these units contain blebs and the others are not (Figs. 2, 3). The blood vessels are located in the connective tissue strands between the secretory units (Fig. 2). The intra lobular ducts of the active glands are lined with low columnar cells with flocculant materials present inside their lumen (Fig. 5).

The inactive poll gland showed an increase in the intraglandular connective tissue between the secretory units. The lining epithelium of the secretory units is low cuboidal to flattened cells and the intralobular ducts are lined with columnar cells and their lumen is devoid from any secretory materials (Fig. 4).

Electron microscopic observations (EM):

The EM of the lining epithelial cell of the active gland appeared pyramidal in shape with it's narrow part at the lumen (Figs. 6 & 7). In the resting phase of the active gland the apical part of the cells were healed together with the junctional complex (Figs. 8 & 9). As the secretion accumulates, the apical part of two adjacent cells was apart from each others forming secretory canaliculi and the protruding part of the cells becomes tongue like shape (Figs. 7 & 9). Many microvilli were present at the luminal surface (Fig. 6). The nucleus of the secretory cell is located in the distal half of the cell, it is rounded with irregular contour and clumped heterochromatin at the periphery (Figs. 6 & 7). Mitochondria with tubular cristae are present in the supranuclear part of the cell (Figs. 7 & 12). Some mitochondria contain fibrillar structure (Fig. 10). Well developed Golgi complex and smooth endoplasmic reticulum are present at the supra nuclear region (Figs. 11 & 13) but the rough endoplasmic reticulum is abundant in the apical part of the cell (Figs. 8, 9).

The prominent feature was the presence of a large vacuole in the vicinity of Golgi apparatus (Fig. 11) which press on the nuclear envelope making invagination in it (Figs. 7 & 12). The content of this vacuole varies in their density from electron lucent to electron dense (Figs. 9, 10, 11 & 12). The mitochondria (Figs. 10 & 12) and smooth endoplasmic reticulum (Fig. 13) were present around these vacuoles. Some mitochondria make identation in the membrane of these vacuoles. The flocculate electron dense materials increase to occupy most of the

vacuole (Fig. 10) and then the membrane was pored and small vacuoles was escaped (Fig. 13). Some of the escaped vacuoles were electron dense and others were electron lucent. These vacuoles accumulate at the apical tongue like protrusion of the cell close to the canaliculi (Figs. 8 & 9).

The tongue like protrusion in the apical part of the cells becomes constricted at the base of the canaliculi, then this part was detached. The detached part contained secretory vacuoles of different shapes, mitochondria and rough endoplasmic reticulum. (Figs. 8, 9, 14 & 15). The detached part loses their microvilli and its content disappeared to form flocculant material in the lumen of the secretory units (Fig. 15).

DISCUSSION

The present study showed that secretory unit of the active gland was lined by cuboidal to low columnar epithelial cells with many blebs protruding from the apical surface of the cells. On the other hands, the inactive gland was lined with low cuboidal or even flattened epithelium and showing increase in the intraglandular connective tissue between the secretory units. These finding are essentially similar to those of Purochit and Singh (1958), Singh and Bharadwayj (1978). Contrary to this result Taha and Abdallah (1980) did not find any evidence of the increase of the intraglandular connective tissues and suggested that the only structural difference between the active and inactive poll gland is the height of the lining epithelium. In agreement with Tingari et al. (1983) and Tingari and George (1984) the secretory alveoli of the active poll gland are not in the same functional state, as some alveoli contain apical protrusion (blebs) others not contain. This suggestion also strengthed by the EM observations, as different forms of secretory vacuoles of different electron densities.

In this study, the EM observations showed that, the secretory cells of the active poll gland contain mitochondria, rough and smooth endoplasmic reticulum, Golgi complex, smooth endoplasmic reticulum, and vesicles of electron lucent and electron dense materials. These results are in agreement with Taha et al. (1994) who claimed that smooth endoplasmic reticulum was abundant, which is the prominent feature of the gland. On the other hand, Tingari et al. (1984) and Tingari and George (1984) noticed the absence of the smooth endolpasmic reticulum. This contradictory could be explained on the basis of the examined alveoli could be in different functional state.

In this study, the secretion of the active poll gland starts with appearance of large vacuoles contained electron lucent materials in the vicinity of Golgi. These vacuoles were surrounded with mitochondria, smooth endoplasmic reticulum which could act on the enzymatic ripping of the content of these vacuoles. Then the membrane of these vacuoles ruptured and small membrane bounded vesicles with different electron densities escaped to the apical part of the cell. As the secretion accumulates, the apical part of two adjacent cells becomes a part from each others forming secretory canaliculi and the protruding part of the cells becomes tongue like shape. The mode of secretion in this study occurs in two ways, the first is apocrine type, in which the apical part of the cell was detached with the secretory vesicle, some rough endoplasmic reticulum and mitochondria. The other type is merocrine where the vacuoles are present juxtaposed to the cell membrane of the lumnal surface and canalicular part. The presence of myoepithelial cells, with their numerous myofibrils, between the secretory cell and the basal lamina aid in the evacuation of the secretory substance to the lumen of the poll gland tubule by its contraction. This suggestion strengthed by Atoji et al. (1998) who described these myofibrils as it is an actin filament.

Because of the smooth endoplasmic reticulum contains the enzymes involved in the synthesis of cholesterol (Morris and Chaikoff, 1959) which is a source of steroids, the presence of smooth endoplasmic reticulum in the secretory cells promotes the idea of steroid synthesis.. However, some cautions were taken when interpreting these results. The poll gland could be steroid dependent rather than steroid synthesized organ because of the peack period of morphological, enzymatic, and secretory activity of the poll gland closely correlated with that of the testicular activity and rutting behavior of the male camel Tingari et al. (1984). Also Singh and Bharadwaj, (1978) and Taha and Abdalla, (1980) have shown that in castrated male camel the poll gland remained inactive through out, even during the rutting season. At the same time, the androgen detected in the secretions of the poll gland (Yagil and Etzon, 1980) could possibly captured from the general circulation by specific (receptors) or non specific mechanisms rather than it is locally synthesized.

Therefore, a better indication of the local synthesis of steroids in the poll gland might be obtained from immunohistochemical localization using antibodies directed against the other parts of the androgen

(dihydroxytestosterones or pregnenolone) rather than using antibodies directed against the mature circulating testosterone.

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LEGENDS

Fig. 1: Active poll gland showing interlobular connective tissue [C] separating the gland into lobules [L]. Bar = 100 µm.

Fig. 2: Active poll gland showing intralobular connective tissue [AC] surrounding the alveoli [A]. Bar =100 µm.

Fig. 3: Active poll gland showing different stages of secreting acini [A] the intralobular connective tissue was reduced [AC]. Bar =100 µm.

Fig. 4: Inactive poll gland showing intralobular connective tissues [AC] and inactive acini [A]. Bar =100 µm.

Fig. 5: Active poll gland showing intralobular duct [D] containing secretory materials. Bar =100 µm.

Fig. 6: Electronmicrograph of active poll gland showing secretory cell [1], lumen [2], myoepithelial cell [3], collagen [4] and basal lamina [5].

Fig. 7: Electronmicrograph of secretory cell showing intercellular canaliculi [IC] and large vacuoles [V].

Fig. 8: Electronmicrograph of secretory cell showing rough endoplasmic reticulum [RER] and junctional complex [J].

Fig. 9: Electronmicrograph of secretory cell showing blebs of apocrine secretion [BL] and intercellular canaliculi [IC].

Fig. 10: Electronmicrograph of secretory cell showing large vacuoles [V], mitochondria [M] and highly electron dense membrane of secretory vacuole [VM].

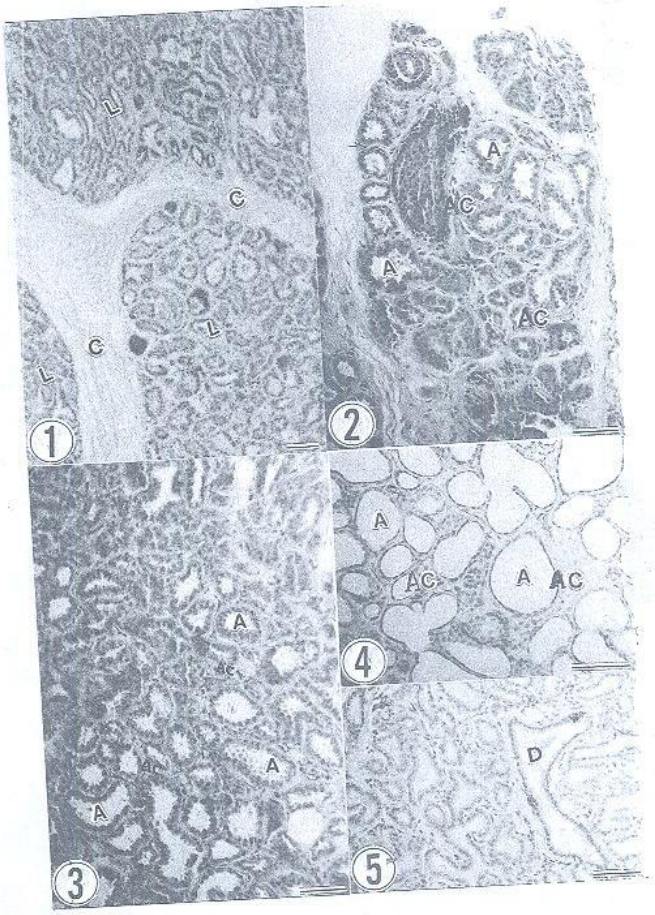
Fig. 11: Electronmicrograph of secretory cell showing nucleus [N], Golgi complex [G] and secretary vacuoles [V].

Fig. 12: Electronmicrograph of secretory cell showing invaginating nuclear membrane [NM], secretory vacuoles [V] and mitochondria invaginating the membrane of the secretory vacuole.

Fig. 13: Electronmicrograph of secretory cell showing nucleus [N], smooth endoplasmic reticulum [SER] and highly electron dense membrane of secretory vacuole [arrow].

Fig. 14: Electronmicrograph of secretory acini showing separation of the blebs of the secretory materials in the lumen [BL].

Fig. 15: Electronmicrograph of secretory acini showing the lumen [L] with different stages of secretion [*].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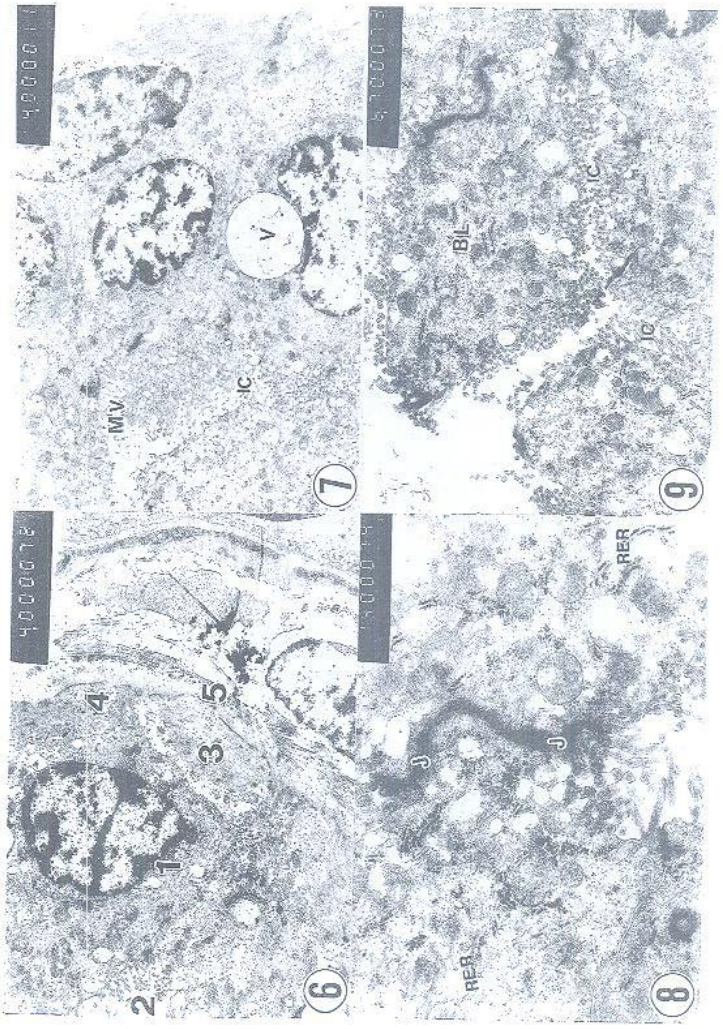
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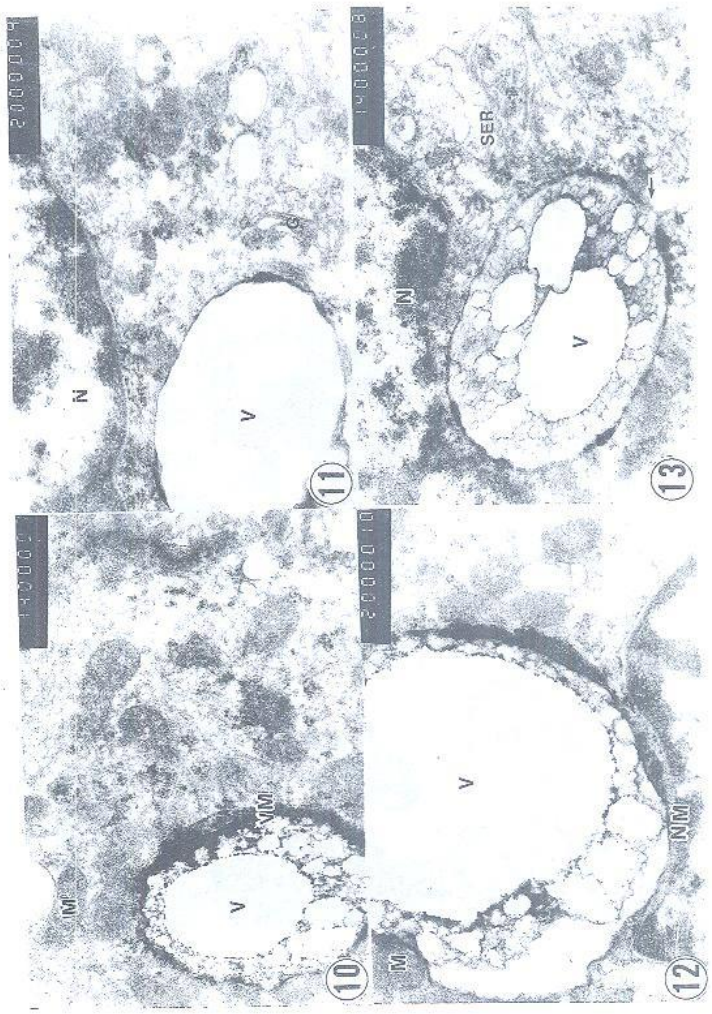
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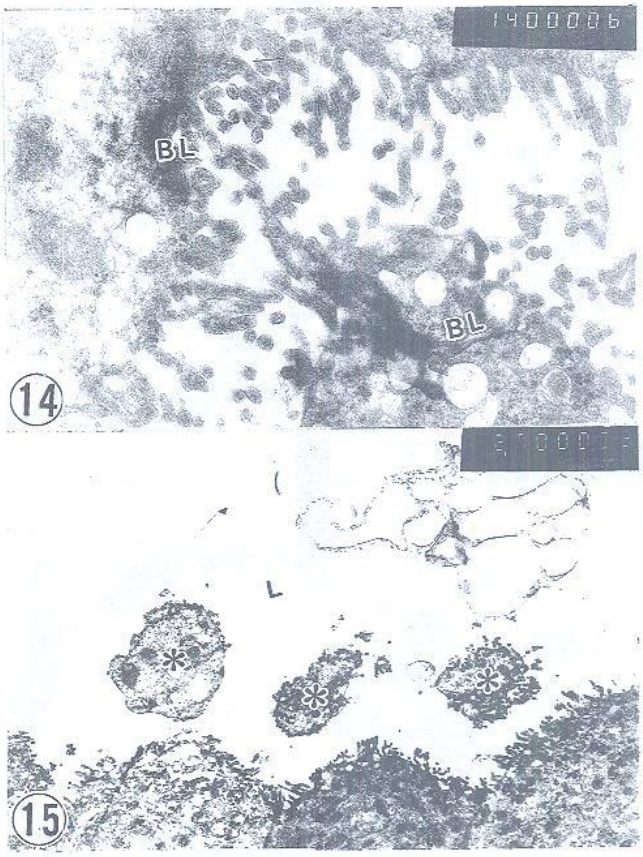
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