

HISTOCHEMISTRY OF DORSAL LACRIMAL GLAND IN CAMEL (*Camelus dromedarius*)

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ABSTRACT

Lacrimal glands of mammals synthesise and secrete an aqueous solution in which different chemical substances are present i.e. protein and mucosubstances. The objective of current study was to determine of mucopolysachharides of camel lacrimal glands. Ten pairs of dorsal lacrimal glands, from ten adult camels were examined for normal histological and histochemical findings at the Mashhad abattoir, northeast of Iran. In camel, dorsal lacrimal gland was elongated with irregular outline and located in dorsolateral part of the eyeball. Histological studies showed that, dorsal lacrimal gland consisted of tubuloalveolar serous units separated by dense sheets of connective tissue into numerous small and large lobules. Alcian blue and Periodic acid shiff staining were used for histochemical studies. Mucosubstance histochemistry revealed secretory units contain acidic and neutral glycoproteins with different staining pattern.

Key words: Camel, dorsal lacrimal gland, histochemistry

The lacrimal system or lacrimal apparatus consists of two components, a secretory component and excretory component. The secretory component produces the pre-ocular tear film, a trilaminar structure 7 micrometre thick (Carrington *et al*, 1987) which consist of lipid produced by the meibomian (tarsal) glands; aqueous, produced by the dorsal lacrimal and nictitans glands; and mucin, which is produced by the conjunctival goblet cells (Barnetr and Crispin, 1998). The anatomy of the dromedary lacrimal apparatus has not previously been clearly established, and the few references available in the literature are of rather general kind. Awkati and Al-Bagdadi (1971) concluded that the lacrimal gland in the camel is comparatively less developed than that of the horse or ox. Abdalla *et al* (1970) and Saber and Makady (1987) deny the existence of puncta lacrimalia in the camel. Even though morphology of the lacrimal glands is documented, histochemistry of camel dorsal lacrimal gland has not been studied. The aim of this study is to describe normal histological and histochemical findings of dorsal lacrimal gland in one humped camel.

Materials and Methods

Twenty dorsal lacrimal glands (ten right and ten left) from 10 camels were used in this study. The glands were removed immediately after slaughter from apparently healthy adult animals. The samples were collected from Mashhad slaughter house, Iran.

The glands were first exposed by careful dissection of the skin and the periorbita at the dorsolateral part of the eyeball and then removed. For histological studied, the glands were stained by haematoxylin and eosin staining and then examined to determine chemical content of the secretion by applying histochemical techniques (periodic acid shiff and alcian blue).

Results and Discussion

In camel, morphology and position of dorsal lacrimal gland was similar to other ruminant. It was flattened and elongated with indented borders. The lacrimal gland was situated within a special division of periorbita between caudodorsal part of the eyeball and the supraorbital process of the frontal bone and the frontal process of the zygomatic bone (Mohammadpour, 2008). In one humped camel, dorsal lacrimal gland is smaller than bovine. In cattle, there is an accessory lobe in dorsal lacrimal gland (Pinard *et al*, 2003).

Histologically, the camel dorsal lacrimal gland was compound tubuloalveolar with serous secretions. The gland was composed of distinctly small and large lobule that was separated by connective tissue. Three shapes of secretory units; acinus, tubule and alveoli separated from each other within a lobule. The most of secretory units of gland, consisted of tubular and alveolar units. Acini units were less than

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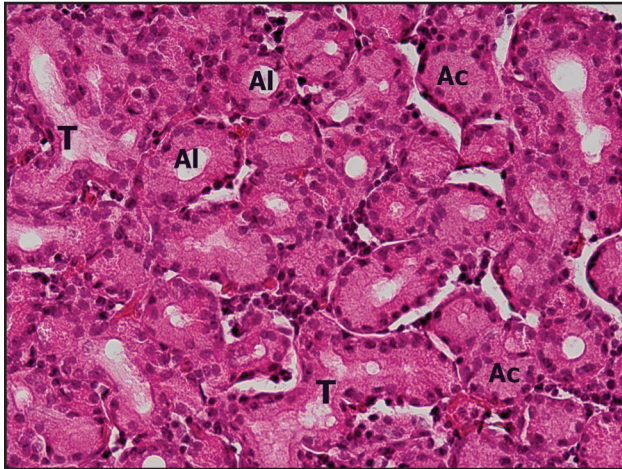


Fig 1. Showing that camel dorsal lacrimal gland with tubuloalveolar units. Tubular (T), alveolar (Al) and less numerous of acinar (Ac) units as shown here. (H&EX640)

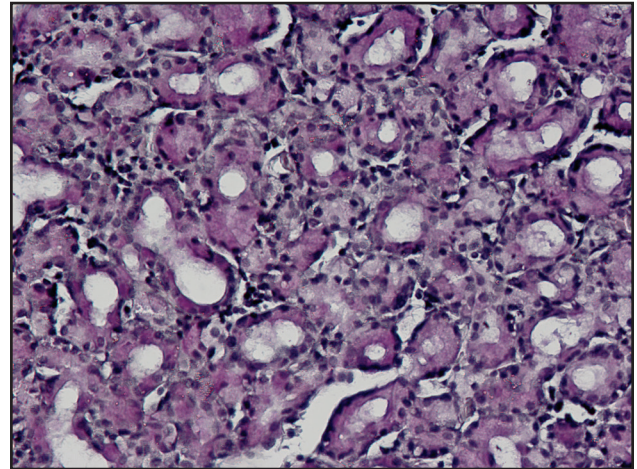


Fig 3. Micrograph of camel dorsal lacrimal gland. The reaction was different in secretory cells (PAS stainX640)

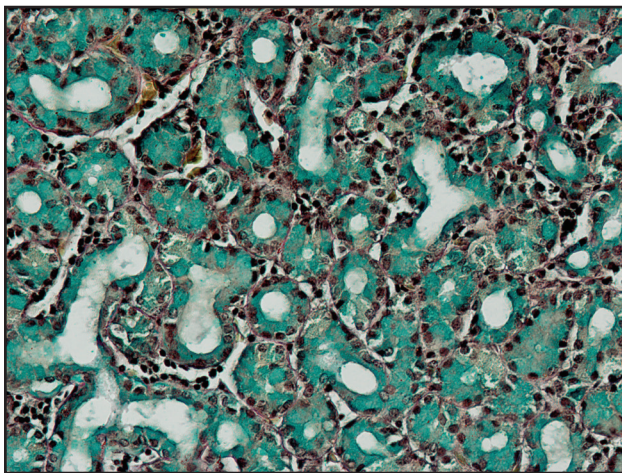


Fig 2. Micrograph of camel dorsal lacrimal gland. All of secretory units were stained (Alcian blue stain X640).

other secretory units. The acini were composed of tall pyramidal or columnar cells with small lumen; the tubules were bordered by short columnar cells with large lumens. The alveolar units were composed of cuboidal epithelium with very large lumen (Fig 1). In general, the lacrimal glands are tubuloalveolar structures that produce a mucoserous secretion. A difference exists in the composition of dorsal lacrimal glands in ruminants. Among domesticated ungulates, cattle and bison have tubuloalveolar secretory units with serous secretion (Pinard *et al*, 2003). Histological examination of the superior gland of third eyelid revealed compound tubuloacinar serous units that completely surrounded the hyaline cartilage shaft of the third eyelid. Dispersed alveolar units were also seen. The acini were composed of tall pyramidal or columnar cell with small lumen. The alveolar units were seen intermingled between the

nests of acini and composed cuboidal epithelium. The gland was surrounded in hyaline cartilage. The units separated by dense sheets of connective tissue into lobules. Single sheets of connective tissue separated tubuloacinar and alveolar units from each other within a lobule. In camel, tubuloacinar units completely surrounded the cartilage shaft of the third eyelid. In general, these tubuloacinar units were less compacted compared with dorsal lacrimal gland (Mohammadpour, 2008, 2009).

The Masson Trichrome stained connective tissue septae surrounding individual acinus and tubules in camel superior gland. Larger sheets of connective tissue were found and separated the gland into lobules. In these large sheets of connective tissue, inter and intralobular ducts, as well as veins and arterioles were seen. Goblet cells were present in the interlobular excretory ducts (Mohammadpour, 2009).

Sheep and goat lacrimal glands have been considered by most investigators to be compound tubuloacinar and mixed glands, consisting of both serous and mucous alveoli (Sinha and Calhoun, 1996).

Histochemical tests for glycoproteins revealed that the secretory cells give a strong positive reaction to Alcian blue staining. About 90% of the cells were positively stained. The rate of staining in all shapes of secretory units were similar (Fig 2). PAS staining revealed that various degrees of positively varying from moderate to strong. In apical portion of cells, secretory granules gave a strong reaction to PAS staining but in basal portion was weak reaction. As compared with Alcian blue staining, a few percentage of secretory units gave strong reaction to PAS staining (Fig 3).

Glycoprotein secretory products can be identified with PAS and Alcian blue. Neutral glycoproteins are PAS positive and alcian blue negative and acid glycoproteins are PAS and Alcian blue positive. In this study, dorsal lacrimal gland contained both neutral and acidic glycoproteins. It has been previously defined that neutral glycoproteins are contained within a serous cells and acidic glycoproteins are contained within mucous cells (Shackelford and Kapper, 1992). Therefore, our results suggest that the acinar cells are a mixture of serous and mucous secretory cells and that the tubules are serous.

In conclusion, our histochemical studies confirm that dorsal lacrimal gland of camel is a compound tubuloalveolar gland with serous secretory units. The secretory units contained both neutral and acidic glycoproteins.

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