Histomorphological Study of the Eyelid in Adult Marwari Goat (*Capra hircus*)

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**ABSTRACT**

The present study was carried out on the eyelid of the adult Marwari goat (*Capra hircus*). The eyelid was composed of an outermost layer of typical skin, orbicularis oculi muscle, tarsal plate and the innermost layer of the palpebral conjunctiva. The eyelids were covered externally with typical skin containing a dense coat of fine hairs. The follicles of eyelashes were located at the marginal part of skin and were devoid of arrector pili muscle. The roots of the large eyelashes were in close association with prominent sebaceous glands (glands of Zeis) and modified sweat glands (glands of Moll). Beneath the outermost layer, there was the orbicularis oculi muscles which was separated from the posterior epithelial lining of the eyelids (i.e. palpebral conjunctiva) by dense connective tissue, the tarsal plate. Within the tarsal plate, modified multilobular sebaceous glands (Meibomian or tarsal glands) were embedded. The palpebral conjunctiva was the innermost layer which consisted of the stratified cuboidal or columnar epithelium that became more squamous towards the margin of the eyelid. The tarsal gland, gland of Moll, gland of Zeis, ground substance of eye lids and the goblet cells in conjunctiva revealed a positive reaction for PAS.

**Key words:** Eyelid, Goat, Histomorphology

The eyelids are musculofibrous dorsal and ventral folds of thin skin continuous with the facial skin. The eyelids play role to protect and exclude light from the eyes, to sweep foreign bodies from the anterior surface of the eyeball and to spread liquid tears across the cornea. The eyelids contain glands that lubricate the edges of the lids and help to prevent overflow of tear secretion (Gelatt, 2007). The follicles of eyelashes were located at the marginal part of skin and were devoid of arrector pili muscle. The roots of the large eyelashes were in close association with prominent sebaceous glands (glands of Zeis) and modified sweat glands (glands of Moll). Beneath the outermost layer, there was the orbicularis oculi muscles which was separated from the posterior epithelial lining of the eyelids (i.e. palpebral conjunctiva) by dense connective tissue, the tarsal plate. Within the tarsal plate, modified multilobular sebaceous glands (Meibomian or tarsal glands) were embedded. The palpebral conjunctiva was the innermost layer which consisted of the stratified cuboidal or columnar epithelium that became more squamous towards the margin of the eyelid. The tarsal gland, gland of Moll, gland of Zeis, ground substance of eye lids and the goblet cells in conjunctiva revealed a positive reaction for PAS.

**MATERIALS AND METHODS**

The present study was carried out on the eyelids of six adult Marwari goats (*Capra hircus*). Samples were collected from the abattoir and immediately fixed in 10% neutral buffered formalin. The samples were processed by routine paraffin embedding technique (Luna, 1968) and paraffin sections of 5 to 7 µ were subjected for hematoxylin and eosin staining (Singh and Sulochana, 1996) and periodic-acid Schiff (PAS) staining for demonstration of carbohydrate (Humason, 1967).

**RESULTS AND DISCUSSION**

The eyelid was composed of four layers viz; outermost layer of typical skin, orbicularis oculi muscle layer, tarsal plate and the innermost layer of the palpebral conjunctiva (Fig.1) as reported in domestic animals (Gelatt, 2007).

The eyelids were covered externally with typical skin containing a dense coat of fine hairs with small sebaceous and sweat glands. The thickness of epidermis varied from region to region and it was found to be thinnest in upper eyelids especially in the area of tarsal glands as reported by Ahmed (2012) in cattle. The epidermis of eyelid was devoid of stratum lucidum (Bacha and Bacha, 2000). The melanin granules were distributed between the cells of stratum basale and stratum spinosum. These granules were distributed between the hair follicles and dermal connective tissues (Fig. 2). The basal membrane was less wavy in the upper eyelids, lateral and medial canthus of the eye, while it was more wavy in the lower eyelids. Tactile hairs were also present on and near the eyelids (Gelatt, 2007).

The follicles of eye lashes were located at the marginal part of the skin and were numerous especially in the upper eyelids. The eyelashes were varied in extension and diameter and were present in double or triple rows in the upper and lower eyelids. The follicles of eye lashes were devoid of arrector pili muscle as reported by Ahmed (2012) in cattle. The roots of the large cilia were in close association with prominent sebaceous glands i.e. glands of Zeis and modified sweat glands i.e. glands of Moll or ciliary glands (Fig. 3). The modified apocrine sweat gland of Moll or ciliary gland was consisted of two portions: secretory part and duct system. These glands were spiral, but they
were not highly coiled in appearance. The epithelium of the gland consisted of an outer myoepithelial layer and an inner layer of flattened cuboidal to columnar glandular cells depending upon the activity of the cells (Fig. 4). The dimensions of these glands were smaller in the lower eyelid. The ducts of these glands emptied near the hair follicles of the eye lashes.

Beneath the outermost layer there was a bundle of orbicularis oculi muscle fibres in a row that extended nearly the full length of the eyelid. The muscles of the eyelids were separated from the posterior epithelial lining of the eyelids (i.e. palpebral conjunctiva) by a narrow layer of dense connective tissue i.e. tarsal plate (Fig. 5). Surrounding the orbicularis oculi muscle, fibres of smooth muscles (Muller’s muscles) were scattered (Ahmed, 2012). The tarsal plate provided structural rigidity to the eyelids. Within the tarsal plate, modified multilobular sebaceous glands (Meibomian or tarsal glands) were embedded (Figs. 1, 5). They secreted lipids that stabilized the precorneal tear film. These glands formed parallel rows of lobules, with their duct openings close to the lid margins, which were visible to the naked eye. The duct openings did not communicate with the hair follicle of the eyelashes. Tarsal glands were better developed in the upper eyelid than in the lower eyelid. The duct of the Meibomian gland was extensively lined by keratinized epithelium, which was visible at the gland’s orifice (Fig. 6).

The innermost layer was lined by the mucous membrane known as the palpebral conjunctiva which consisted of the stratified cuboidal to columnar epithelium that became more squamous towards the eyelid margin (Fig. 7). Goblets cells were scattered in the epithelium. Many structures like tarsal gland, gland of Moll, gland of Zeis, ground substance of eye lids and goblet cells in conjunctiva revealed positive reaction for PAS (Fig. 8).

REFERENCES