

## HISTOLOGICAL AND HISTOCHEMICAL STUDIES OF SWEAT GLANDS IN GOATS (*Capra hircus*)

**\*Dr. U.P. Mainde, Dr. S.B. Banubakode, Dr. N.C. Nandeshwar, Dr. S.W. Bonde,  
Dr. R.Y. Charjan, Dr. A.M. Salankar and Dr. P.M. Gedam**

Department of Anatomy & Histology

Nagpur Veterinary College, Nagpur

E-mail: drumeshmainde@gmail.com (\*Corresponding Author)

**Abstract:** The present study was conducted on 220 skin samples, 20 each collected from different body regions namely dorsal neck, lateral neck, ventral neck, dorsal thorax, lateral thorax, ventral thorax, dorsal abdomen, lateral abdomen, ventral abdomen, lateral thigh and medial thigh. The histological observations were recorded from the tissues stained by Hematoxyline and Eosin for study of normal histological structure. Histochemical staining for demonstration of Polysaccharides by Periodic acid Schiff stain and Lipid by Sudan black B stain was also performed on paraffin sections.

Histologically skin was almost similar in all body regions. Sweat glands were simple tubular type. These were located at the junction of papillary and reticular layer. The glands were lined by simple cuboidal epithelium resting on basement membrane. The secretory cells showed apical protrusion. The glands were associated with primary hair follicle. The polysaccharides and lipid activity was present in sweat gland. The glands were associated with primary hair follicle.

**Keywords:** Sweat gland, Hair follicle, Dermis.

### Introduction

The skin is the largest organ in mammalian body and constitutes 8.5 per cent of live body weight. The skin of goat is considered extremely durable and used by the tannery industry to make rugs and carpet binding. It is often used for making gloves and boots. Skin is a versatile organ, which is extremely important for protection, perception, water regulation and wound healing. Skin is thicker on the dorsal and extensor surfaces than on the ventral and flexor surfaces. It is thicker in the male. The capacity of the skin to move and stretch depends on its own thickness, the number of folds, intrinsic elasticity, firmness of fixation by the tela subcutanea and age of individual (Montagna, 1956).

### Material and methods

The skin samples of goats were collected from healthy animals irrespective of sex from Slaughter house of Nagpur Municipal Corporation and also from animals after natural death. The total of 220 samples, 20 each from different body regions namely dorsal neck,

lateral neck, ventral neck, dorsal thorax, lateral thorax, ventral thorax, dorsal abdomen, lateral abdomen, ventral abdomen, lateral thigh and medial thigh were collected.

The samples of skin were collected in ice box and brought to the laboratory. The skin was washed and cleaned by removing hairs using shaving blade and cut into pieces of 4 - 6 mm size. Samples were fixed in 10 per cent Neutral buffered formalin, Bouin's fluid and Zenker's fixative for histological and histochemical studies. Tissue blocks of paraffin were prepared and sections were cut at 4 - 5  $\mu$  thickness with the help of rotary microtome. Both transverse and vertical sections were taken from each body region. Sections were mounted on clean albuminized glass slide dried on a hot plate at 45 - 50°C for three hours. The Sections prepared were stained with Haematoxyline and Eosin for study of normal histological structure as per the method of Singh and Sulochana (1996). Differential staining for demonstration of basement membrane epithelial lining and connective tissue were also performed. Histochemical staining for demonstration of Polysaccharides, Lipid were also performed on paraffin sections.

### **Result and Discussion**

During the present study, it was observed that sweat glands were coiled tubular acinar apocrine or merocrine in different body regions distributed frequently in the deeper part of base of hair follicle in group I and group II. They were associated with primary hair follicles and arranged in cluster (Fig. 1). This finding coincides with the observations reported by Taha and Abdalla (1980) in dromedary camel, Nagaraju *et al.* (2012) in deer, cattle, goat, Razvi *et al.* (2013) in goat and Barhaiya *et al.* (2014). The secretory portion was lined with tall cuboidal or columnar cells depending upon the activity and rested on the basement membrane (Fig. 2). These observations of the present study are in agreement with the findings reported by Barhaiya *et al.* (2014) in eyelid of goat. The secretory cells showed apical protrusion (Fig. 2) in goat. This finding coincides with the observations reported by Sar and Calhoun (1966) in American goat. The duct part was narrower than secretory part and duct part was lined by double layer of cuboidal epithelium (Fig. 2). The discontinuous layer of dove tailed myoepithelial cells were present between the secretory cells and basement membrane and myoepithelial cells were parallel to long axis of gland (Fig. 3). This finding coincides with the observations reported by Dellaman and Eurell (1988), Baba *et al.* (1990) in sheep and goat, Sar and Calhoun (1966) in American goat, Barhaiya *et al.* (2014) in eyelid of goat and Das *et al.* (2014) in cattle and yak. The thick basement membrane is present outside the gland. This finding coincides with the observations reported by Das *et al.*

(2014) in cattle and yak. The duct of sweat gland was found to open into hair follicle above the sebaceous gland (Fig. 4). These findings of the present study are in accordance with those reported by Kapadnis and Bhosle (2004) in Osmanabadi goat. Reticular fibers were present around the duct of sweat glands (Fig. 4).

In the lateral thigh regions in the group I and group II ducts of the sweat gland were parallel with hair (Fig. 5). These observations were not recorded by Ahmad *et al.* (2010) in sheep. Sweat glands were present in the reticular layer or junction of reticular and papillary layer of dermis (Fig. 1).

The shape of sweat gland did not show any age and region difference. In group II the gland alveoli are surrounded by thick connective tissue as compared to group I (Fig. 1). This finding coincides with the observations reported by Ahmad, *et al.* (2010) in Madras red sheep.

The glands were less developed in group I and arranged in linear fashion in the deeper dermis in the quiescent stage (Fig - 5). In group II sweat glands were well developed with wide lumen with vertically oriented secretory unit which were parallel to hair follicle in dorsal neck region (Fig. 2). The lateral neck region showed comparatively well developed sweat gland as compared to dorsal neck part in group I. The depth of hair follicle and density was also found decreased as compared to dorsal neck. In the ventral neck region in group I sweat glands were arranged in horizontal direction.

In the present study, mild to moderate PAS activity was present at the basement membrane and the lining epithelium (Fig. 3). This finding coincides with the observations reported by Montagna *et al.* (1951) in human skin, Taha and Abdalla (1980) in dromedary camel and Ahmad *et al.* (2010) in Madras red sheep. However moderate PAS positive activity was present in the lumen of sweat gland (Fig. 3).

In sweat gland mild to moderate lipid activity was present in the basement membrane and the lining epithelium in group I and group II (Fig. 6). This finding coincides with the observations reported by Baba *et al.* (1990) and Razvi *et al.* (2013) in goat.

## References

- [1] Ahmad MS, OR Sathyamoorthy and G Ramesh, 2010. Regional variations in the Microscopic structure of skin in postnatal Madras red sheep (*Ovis aries*). Ind. J. of Vet. Anatomy. 22: 8-11.

- [2] Baba MA, RD Sinha, R Prasad and J Prasad, 1990. Comparative histological and histochemical studies on the palpebral sweat glands of goat and sheep. *Ind. J. of Animal Science*. 60 : 1203-1205.
- [3] Barhaiya RK., Malsawmkima, YL Vyas and DM Bhayani, 2014. Histomorphological study of the eyelid in Adult Marwari Goat (*Capra hircus*). *Indian J. of Veterinary Anatomy*. 26 : 113-114.
- [4] Bhayani DM, KN Vyas, AM Patel and Y L Vyas, 2004. Post-natal study on the sweat glands of Patanwadi and Marwari sheep. *Indian J. of Animal Science*. 74: 7-10.
- [5] Das P, R Ranjan and S Paul, 2014. A comparative histological study on the sweat gland of cattle (*B. Indicus*) and Yak (*P. Poephagus*). *Explor Animal Med Res* 4: 183-187.
- [6] Dellmann, H.D. and J.A. Eurell (1998) *Text book of Veterinary Histology*. 5<sup>th</sup> Edition. Williams and Wilkins, London: 303 – 332.
- [7] Kapadnis PJ and NS Bhosle, 2004. Microscopic anatomy of the integument of Osmanabadi Goat. *Indian Veterinary J*. 81: 912 - 914.
- [8] Montagna W, 1951. Histology and cytochemistry of Human skin. *J. Biophysic and Biochem*. 1: 13-21.
- [9] Montagna, W. (1956) *The structure and function of skin*. Academic Press Inc, New York.
- [10] Nagaraju GN, RV Prasad, K.V. Jamuna and V. Ramkrishna (2012) Histomorphological features in the differentiation of skin of spotted Deer (*Axis axis*), Cattle (*Bos indicus*) and Goat (*Capra hircus*). *Indian J. of Veterinary Anatomy*. 24: 10-12.
- [11] Razvi, R, S. Suri and R. Sharma (2013) Histomorphological study on the sweat glands in Bakerwali goats. *Indian J. of Veterinary Anatomy*. 25: 113-114.
- [12] Sar, M and M.L. Calhoun (1966) Microscopic anatomy of the integument of the common American goat. *American J. Vet. Res*. 27: 444 – 456.
- [13] Singh, U.B. and S. Sulochana (1996) *Handbook of Histological and Histochemical technique*, 1<sup>st</sup> Edn, Premier Publishing House, Hyderabad.
- [14] Taha, A.A., and A.B. Abdalla (1980) Light and electron microscopy of the sweat glands of the dromedary Camel. *Acta Vet. Brno* 49: 31-35.

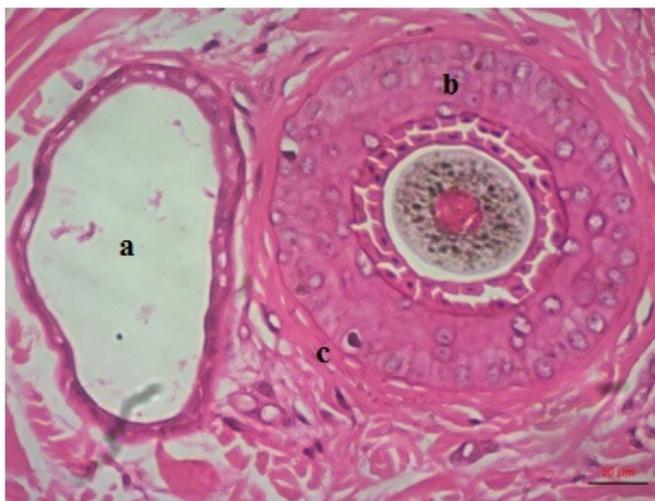


Fig - 1. Photomicrograph of group - I skin showing sweat gland associated with primary hair follicle (H & E 400 X)  
 (a) Sweat gland, (b) Primary Hair follicle and (c) Connective tissue sheath

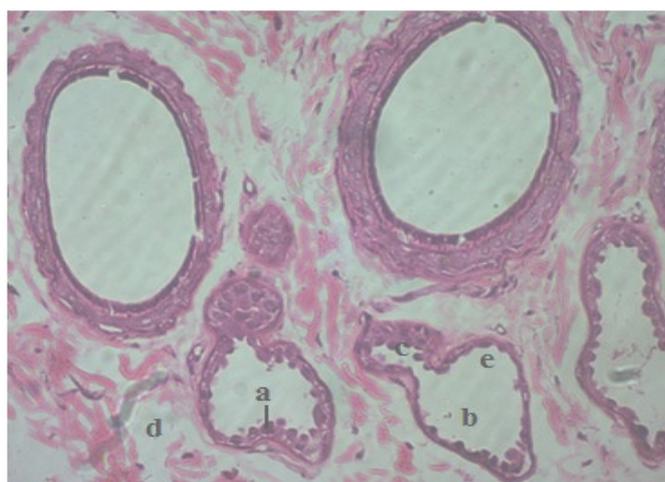


Fig - 2. Photomicrograph of skin showing sweat glands lined with tall cuboidal or columnar cells (H & E 200 X)  
 (a) Secretory part, (b) Duct part, (c) Sweat gland and (d) Cuboidal epithelium

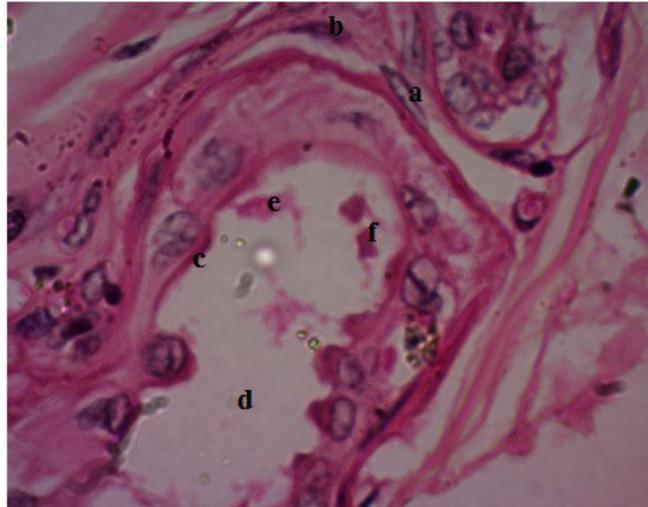


Fig 3. Photomicrograph of skin showing secretory cells of sweat gland showed apical protrusion (PAS 1000 X)

- a. Myoepithelial cells, (b) Basement membrane, (c) Epithelium, (d) Lumen of sweat gland, (e) Old secretion and (f) New secretion

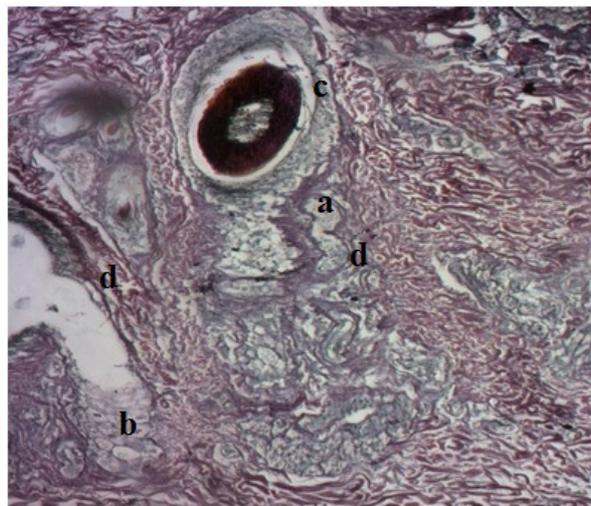


Fig 4. Photomicrograph of skin showing sweat gland with opening in hair follicle above sebaceous gland (Wilder's reticulin 200 X)

- (a) Duct of sweat gland, (b) Sebaceous gland, (c) Hair follicle, (d) Reticular fibers around sweat and sebaceous gland

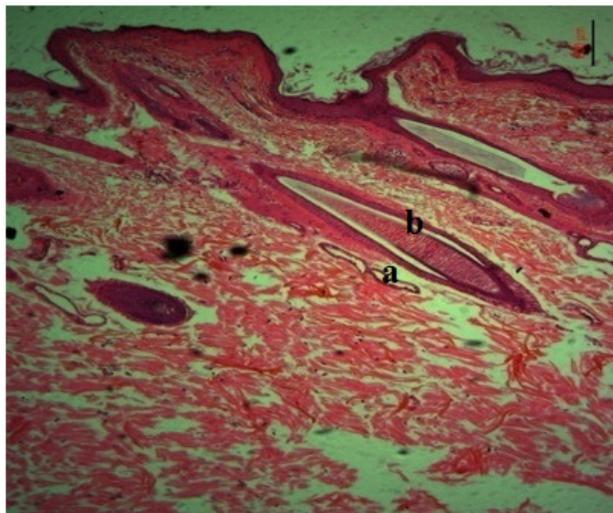


Fig – 5. Photomicrograph of skin of group - I showing sweat gland arranged in linear fashion and in quiescent stage in lateral thigh region in group - I (H & E, 40 X) (a) Sweat gland and (b) Hair

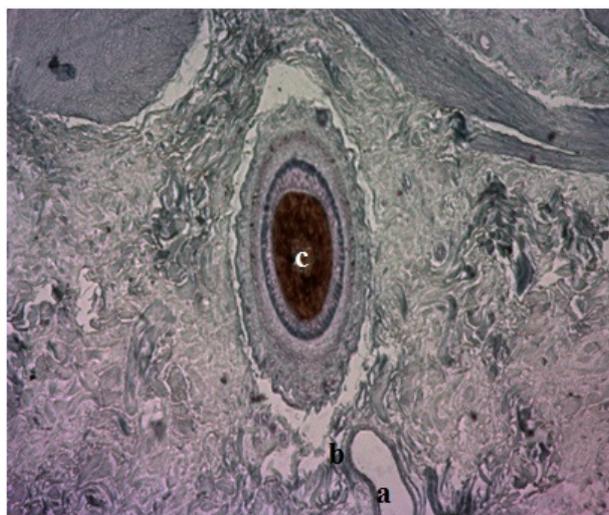


Fig – 6. Photomicrograph of skin showed mild to moderate lipid activity was present in sweat gland (H & E, 40 X)  
(a) Basement membrane, (b) Epithelium and (c) Hair follicle