

Comparative histological study of the skin layers of black goats in north Iraq

Mayan A. Saleemm Ronak S. Habeeb Mahdi A. Abdullah

Coll. of Vet. Med. / Univ. of Duhok

emial: mahdibazkrt@yahoo.com

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Abstract

In this study the histological characteristic of skin layers in black goat in Kurdistan region were investigated. A total of 10 male black goats of different ages were studied. Samples of skin were taken from the different regions of body (back, flank, abdomen and scrotum) to determine the thickness of epidermis, dermis with its layers papillary and reticular, thickness of whole of skin, hair follicles of skin with (primary and secondary follicles) and other skin appendages. The result show there was variation between the thickness with different layers of skin samples, the whole thickness of dermis were recorded in flank region 2688 μm , 1887.2 μm in abdomen while in back and scrotum was less 1536 μm , 1248 μm respectively, and the whole thickness of epidermis of back region were more than abdomen, scrotum and flank region. The whole thickness of skin was 2793.2 μm , 2092.4 μm , 1646.8 μm , 1302 μm in flank, abdomen, back and scrotum respectively. This variation which we founded with this study with variation of skin appendages in different regions of body compared to other studies belongs to farm species of animals.

Key words: Skin, histology, goat.

دراسة نسجية مقارنة لطبقات جلد الماعز الأسود في شمال العراق

ميان احمد سليم روناك صابر حبيب مهدي علي عبدالله
كلية الطب البيطري/ جامعة دهوك

الخلاصة

تم التحقيق في هذه الدراسة عن السمات النسيجية لطبقات جلد الماعز الاسود في اقليم كردستان. اجريت الدراسة على 10 ذكور من الماعز الاسود وبأعمار مختلفة. اخذت عينات الجلد من مناطق مختلفة من الجسم (الظهر، الخاصرة، البطن وكيس الصفن) لتحديد سمك البشرة، الأدمة، سمك الجلد، الطبقات الحليمية والشبكية، بصيلات الشعر وبنوعيتها الأولية والثانوية والزوائد الجلدية الاخرى. أظهرت النتيجة بان هناك تباين في سمك عينات طبقات الجلد المختلفة، حيث سجل سمك الأدمة الكلي في منطقة الخاصرة 2688 مايكرومتر و 1887.2 مايكرومتر لمناطق البطن بينما كان اقل لمنطقتي الظهر وكيس الصفن 1536 و 1248 مايكرومتر على التوالي، وكان سمك البشرة لمنطقة الظهر اكثر من سمكها في منطقة البطن، وكيس الصفن، والخاصرة. كما وسجلت الدراسة سمك الجلد الكلي 2793.2، 2092.4، 1646 و 81302 مايكرومتر في منطقة الخاصرة، الظهر، البطن، والخاصرة على التوالي الجلد. هذه الاختلافات التي وجدناها في دراستنا الحالية مع الاختلافات في الزوائد الجلدية لمناطق الجسم المختلفة قد قورنت مع دراسات في الحيوانات الحقلية الاخرى.
الكلمات المفتاحية: الجلد، الانسجة، الماعز الاسود.

Introduction

Skin is the largest organ of the body which consists of an epidermis, dermis and skin appendages (1). The epidermis generally in mammalian are consist of stratified squamous epithelium which are regenerated continuously starting with proliferation, migration, differentiation and cornification from basement membrane toward the surface of skin which contain many of cells like keratinized cells, melanocytes, Langerhans

cells and Merkel cells (2).The classification of thickness of epidermis of skin generally divided into two parts; thick epidermis and thin epidermis. The thin epidermis covered largest part of body while thick epidermis found in palm of the hand, sole of the foot and tail of animals (3).The dermis of skin is thicker than epidermis and classified as dense irregular connective tissue extends to the hypodermis can be divided into a superficial

papillary layer and a deep reticular layer (1,4). The thickness is varying according different species of animals as well as different layers of body in same animal (5). The Skin appendages derive from interactions of the epidermis and dermis within the skin which provide specialized physiological functions to individual ranging from environmental adaptation to child rearing (3,6). And consist of hair follicles, sweat gland and specious gland. The number, density, types and arranged of these organs are varies according to animals species and regions of body (7). The aim of the present work is to study the histological characters of different regions of local black goat skin layers in north Iraq.

Materials and methods

Skin samples were collected from back, flank, abdomen and scrotal regions of ten adult male black local goats at Dohuk slaughter house. Specimens were fixed in 10% of formalin solution and processed routinely. The samples were dehydrated by ascending grades of ethyl alcohol, cleared with xylene and infiltrated with paraffin wax of 56° C melting point. Then the tissue samples were stained by H& E stain (8). The important point which are focusing during this study are various histologic structures of skin among different regions of an animal were carried out using light microscope and the morphological characters of the hair follicles, sweat gland and sebaceous glands densities, approximately 10 sections 5µm thick, were cut per samples but only every alternate series of five sections were stained and counted.

Results

Back region:

The epidermis was thick, consisted of stratum basalis and spinosum which was covered by thick layer of granulosa. The dense irregular connective tissue of the dermis containing a large number of primary and secondary follicles. Follicles are arranged in groups. Each group consisting of primary and secondary follicles. Primary follicles were large and long and most commonly being arranged in clusters of three

or trios forming a straight or slightly curved line. Secondary follicles were more in number but smaller and shorter than the primary ones and occupied one side of the primary follicles predominantly the opposite side of sebaceous glands. All the primary follicles were associated with relatively small sebaceous glands, while the majority of the secondary follicles were not accompanied by sebaceous gland. Apocrine sweat gland of the back region was recorded and relatively small. The amount of hair follicles, sweat gland and specious gland are less compared than other part of regions of body (Table 1, 2, 3) (Fig. 1, 2).

Table (1): Thickness of different layers of regions of body (µm).

Thickness	Abdomen	Scrotum	Back	Flank
Papillary layer	67.2	96	192	288
Reticular layer	1920	1152	1344	2400
Whole dermis	1887.2	1248	1536	2688

Table (2): Thickness of different regions of body (µm).

Thickness	Abdomen	Scrotum	Back	Flank
Keratinized layer	38.8	Zero	19.8	28.8
Whole epidermis	67	54	96	38.4
Whole skin	2092.4	1302	1646.8	2793.2

Table (3): Numbers of sebaceous and sweat glands in different regions of skin.

No.	Abdomen	Back	Scrotum	Flank
Specious gland	3	3	4	14
Sweat glands	8	10	20	5
	Apocrine	Apocrine	Merocrine	Merocrine

Abdominal region:

The epidermis of skin was thin compared to back region and consist also three layers while the dermis of the skin was thicker compared than the back and scrotum regions which consist of dense irregular reticular and papillary layers. Results show moderate number of hair follicles which was arranges as triangular with its two types, as well as moderate number of sweat gland and specious gland. Apocrine sweat gland resembled those of the back region (Table 1, 2, 3) (Fig. 3, 4).

Scrotal region:

The scrotum skin is constituted of epidermis and dermis, and the epidermis was formed by stratified keratinizing epithelium, organized in basale, spinosum, granulosum, and corneum stratum. The epidermis was thinner compared to back and abdominal regions, independent of the scrotum configuration, increased gradually from the proximal to the distal region. The whole of skin layer was thinner compared three other regions of study. The papillary layer of dermis of scrotum occupied with greater quantity of merocrine sweat glands and less amount of species and hair follicles (Table 1, 2, 3) (Fig. 5, 6).

Flank region:

The whole thickness of skin flank region was found consist of three layers, and it was thicker in compared with the all three parts of regions of study. The epidermis of flank region was thinner compared to three parts of study, and the dermis was thicker which occupied with a large number of species glands, moderate number of hair follicles (primary and secondary) which arranged like other trio regions. The number of sweat glands and also apocrine types of sweat gland were less compared to other regions of study (Table 1, 2, 3) (Fig. 7,8).

Hair follicles:

The following significant morphometrical differences among the regions of body of the study were found. All the primary hair follicles were larger and well recognized compared to secondary. All primary follicles of the various skin regions had a medulla, sweat gland, sebaceous glands and arrector pilli muscles except the secondary follicles. The numbers of hair follicles of skin in different parts of body region were found to be a maximum in back, abdomen, flank and scrotum of skin respectively as well as there were differentiation between the number of both follicles in different study region. The number of primary follicles in flank region was less than in back region which located in the papillary layer of dermis of skin; while the secondary follicles were more than in back region, also most of them were located in the papillary layer of dermis of skin. The number of secondary follicles in abdominal region was more in compared to flank, and scrotum region, which arranged a maximum number (six) of secondary follicles to the primary. The result shows the number of both primary and secondary follicles at scrotum was less compared to the other (Table 3).

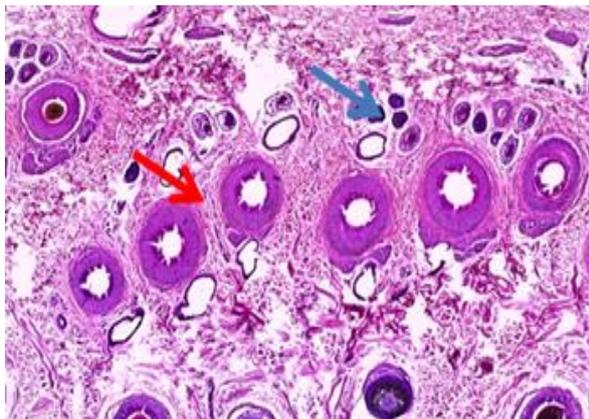


Fig. (1): Histological section of skin from back region of goat showing, triangular arrangement of primary hair follicles red arrow and groups of secondary follicles blue arrow (H&E Stain, X10).

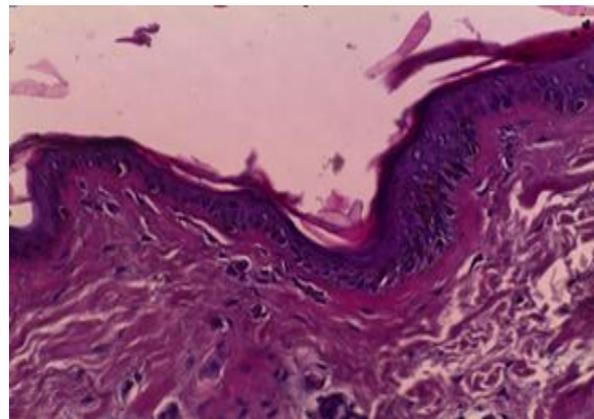


Fig. (2): Histological section of skin from back region of goat showing layers of epidermis (H&E Stain, X20).

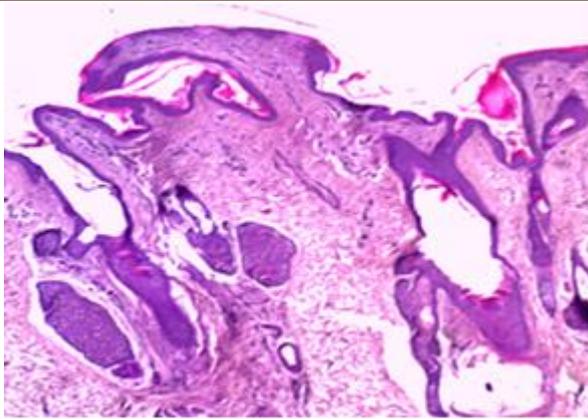


Fig. (3): Histological section of skin from abdominal region of goat showing, thickness of dermis layer compared to epidermis (H&E Stain, X10).

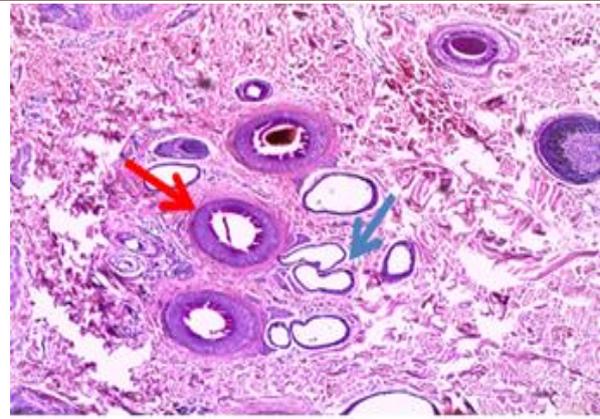


Fig. (4): Histological section of skin from abdominal region of goat showing, triangular arrangement of primary hair follicles red arrow and groups of apocrine sweat glands blue arrow (H&E Stain, X10).

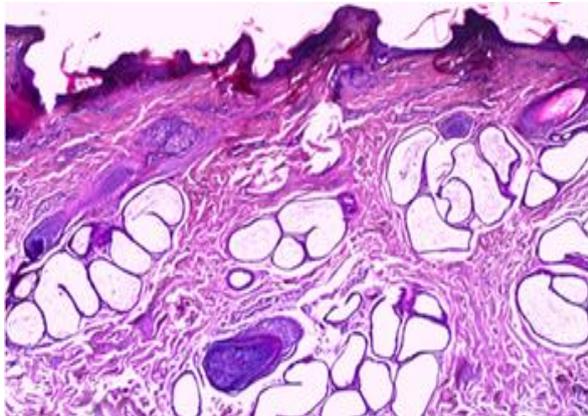


Fig. (5): Histological section of goat skin (scrotum region) showing thin layers of epidermis and dermis (H&E Stain, X10).

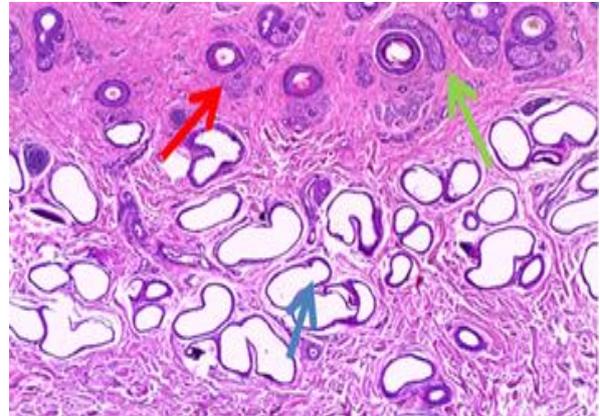


Fig. (6): Histological section of goat skin (scrotum region) showing excessive number of merocrine sweat glands blue arrow and less number of hair follicles red arrow and sebaceous gland green arrow (H&E Stain, X10).

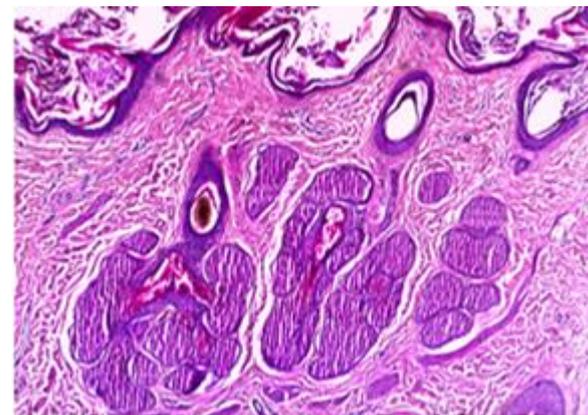


Fig. (7): Histological section of goat skin from flank region showing, thin layers of epidermis and thick layer of dermis (H&E Stain, X10).

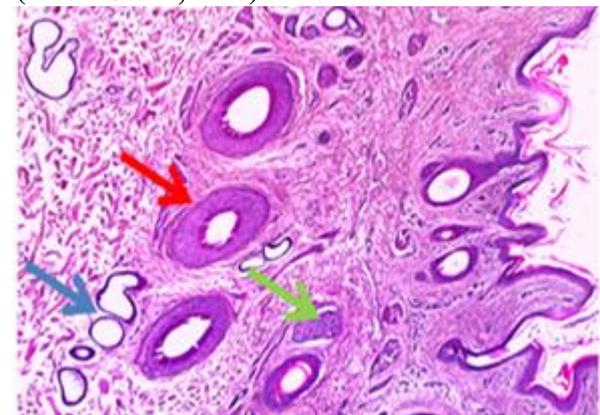


Fig. (8): Histological section of goat skin from flank region, showing thin layers of epidermis, trio appearance of primary hair follicles red arrow, less number of sweat gland blue arrow and sebaceous gland green arrow (H&E Stain, X10).

Discussion

The morphological characters of different regions of body in goat skin are varies in this study. In back region the skin consists of epidermis and dermis. Our study showing that the epidermis consists of three layers (stratum basalis and spinosum and thick layer of granulosum). This result is in agreement with (3) in local goats. This is also observed in the skin of local gazelle (9). As well this study showing that the dense irregular connective tissue of the dermis containing a large number of primary and secondary follicles and these follicles are arranged in groups, primary follicles are large, long, and most are commonly being arranged in clusters of three or trios forming a straight or slightly curved line, also this finding is agreement with (3,10) in sheep, and this finding is disagreement with some mammals like cow, horse and man who have no follicle groups (7). Secondary follicles are more in number but smaller and shorter than the primary ones and occupied one side of the primary follicles predominantly the opposite side of sebaceous glands, this is in agreement with (11) in black goats. The study showing that all the primary follicles are associated with relatively small sebaceous glands, while the majority of the secondary follicles are not accompanied by sebaceous, this result is similar to (3) in black goats, but in Iranian native sheep, these sebaceous glands which are always associated with hair follicles and located just above the sweat gland (10). In one humped camel the sebaceous glands are usually small and associated with all of the primary follicles and some of the secondary ones of the back region (12). Our study where recorded that the sweat gland was apocrine in three regions of body back, abdomen and flank while in scrotum we recorded as a merocrine type of sweat gland. The size was relatively small and simple coiled sacular in all skin regions. They are mostly below the sebaceous glands just between the hair follicles and the boundary of papillary layer

and reticular layer of dermis, but in domestic animal are simple sacular or tubular (7). Our results observed that the epidermis of skin in flank region was thin compared to back region and consist of three layers, while study recorded by Abdul Raheem, M. and Al-Hety, M. (3) in black goat finding that the epidermis of abdomen is thickness, as in sheep. (10) finding that the epidermis of the abdomen is thicker than the flank region this is similar to the our finding. While the dermis of the skin was thicker compared than the back, abdomen and scrotum regions may be because it consists of dense irregular reticular and papillary layers. The study show the papillary layer was thinner than the papillary layer in sheep, while the reticular layer was thicker than the reticular layer in sheep with both abdominal and flank regions (10), these differences may be due to influence wool production and the environmental responsiveness and fiber diameter profiles of sheep (13). The study finding the dermis of the skin of flank region was thicker compared than the back, scrotum and abdomen regions which might be because consist of thick irregular reticular and papillary layers (10). The result observed the skin of scrotum was constituted of epidermis and dermis, while the epidermis was formed by stratified keratinizing epithelium, organized in basale, spinosum, granulosum, and corneum stratum. The epidermis was thinner in compared to back and abdominal regions this in agreement with (3) in black goats showed that the epidermis of skin of scrotum was considerably thicker than other studied regions this might be due to species of goat as well as the area (14). The whole thickness of skin recorded in flank region, then abdomen, back and scrotum and consist of three layer and thicker compared to all three parts of regions of study, this variation of thickness with whole of skin depend to species of goat and any other related factors.

References

- 1-Dellmann HD (1993) Text Book of Veterinary Histology, 4thed. Lea and Fibiger, Philadelphia, pp.285-298.
- 2-Al-Barwari SE, Al-Alousi RS, Nassir JK, (1988) A valuable method for the preparation of pure epidermal sheets from vertebrate skin & its

- advantages in histology & cell kinetics. Iraq. J. Vet. Sci. 29: 253- 265
- 3-Abdul Raheem, MH, Al-Hety MS (1997) Histological and morphological study of the skin of the black goat. Iraq. J. Vet. Sci. 10, pp.59-71
- 4-Aughey E, Feye FL (2001) Comparative Veterinary Histology with Clinical Correlates. 1sted., Manson, London, pp.129-130.
- 5-Steinhagem O, Dreyer JH, Hofmeyr JH (1986) Histological differences in the skin and fiber characteristics of ten- white-wooled sheep breeds. S. Afr. J. Animal Science., 16(2): 90- 94
- 6-Pourlis AF, Chritoulpoulos G (2008) Morphology of the hairs in the goat breeds *Capra prisca*. J. Anim. Vet. Adv. 7(9):1142- 1145
- 7-Nixon AJ (1993) A method for determining the activity state of hair follicles. Biotechnic and Histochemistry. 68(6): 316-325
- 8-Luna LG (1968) Manual of Histological Staining Methods of the Armed Forces Institute of Pathology, 3rded., McGraw-Hill Book Company, New York, pp.38-40,76-77, 82-8
- 9-Al-Abbas AH, Abdul Raheem MH, Chaudyhury MS, Hilmy MI (1999) The skin of Gazelle, Morphological studies. Ann. Coll. Med. Mosul. 5: pp.113-129
- 10-Mobini B (2012) Histology of the skin in an Iranian native breed of sheep in different ages. J. Vet. Adv. 2 (5): 226-231
- 11-Abdul Raheem MH, AL-Hety MS (2000) The correction factor of hair density in the skin of Awasi sheep and black goats. Iraqi. J. Vet. Sci. 13 (2): 27- 31
- 12-Abdul Raheem MH, AL- Hety MS (1999) Histological and morphometrical study of the skin of one humped camel (*Camelus dromedrius*). Iraqi. J. Vet. Sci. 12 (1): 1-13
- 13-Montaga W, Lobitz WC (1964) "The epidermis". A cadmic press, New York.
- 14-Nunes SN, Miguel FC, Antonio AN, Ana LA, Airton MG, José AT, Maria AM (2010) Scrotum histological description in native goats from Piaui State, according to scrotal bipartition level. Cienc. Rural. 40(8): 1808-1813.