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Seasonal Study for Histological Characteristics of Dermal Glands in Cows

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Abstract: This study aimed to investigate the histological structure of the skin glands (i. sweat and sebaceous glands) in different regions of the cow's skin and its changes during winter and summer seasons. The total thickness of the skin, depth of the glands and their density in different regions for both seasons were determined. The highest thickness of skin was in the abdominal region in front of the navel during winter (2722 µm, while, it was its lowest in the region of the mid-dorsal surface during summer, which was 1690 µm). The sebaceous gland depth was the highest in the abdominal region in front of the navel during the summer a (849 µm). However, the lowest depth of sebaceous gland was in the region of the dorsal surface during the winter (712 µm). It the presence of larger hair follicles was during the summer than the winter. The largest diameter for the sweating unit was in the abdomen in front of the navel during the summer (187 µm). However, the smallest diameter was in the mid-dorsal surface region during winter (174 µm).

Keywords: Cows, Histological, Dermal glands, Seasons

The skin is the outer envelope of the body, which accounts for 16% of body size that protects the body from mechanical and physiological damage. The comparative histological and chemical studies were done on the sweat gland secretions in the black goat (ALUmeri and ALMamoori 2016), buffalo, cow, and camel. Moreover a histological topography and comparative morphological studies were done for the basic components of different regions of sheep skin studied the histological and morphological study of the skin of the one-humped camel (Ham 1979, Abduljawaad 2018).Examined the hair density and the correction factor of hair density in the skin of native cattle, black goats, domestic buffalo, and domestic cow. Also, Ibrahim et al (2018) and Henrikson et al (1997) investigated comparative histological topography of the skin in Shami and black goats. Other studies investigated the growth of the sebaceous glands, which is controlled by sex hormones, especially androgen and estrogen, which become effective after puberty, also studied the variation in the size, shape and location of sebaceous glands in many animals, in addition to variation in size and number in different regions of the animal skin as (Luna 1968, Leeson et al 1985, ALUmeri and ALMamoori 2016) which studied the skin of male Shami goats and black goats and showed that the sebaceous glands are large and deep in the dermis of most of the studied regions in the Shami goats compared to their counterparts in the black goats. It was also noted that sebaceous glands vary in size and extends in different regions studied in both animals. Therefore, the aim of this study was to investigate the histological structure of the skin glands (i.e. sweat and sebaceous glands) in different regions of the cow's skin and its changes during winter and summer.

MATERIAL AND METHODS

Skin samples were collected from twenty adult native cows, aged 1-2 years during summer in July (n=10) and winter in January 2017 (n=10) from the abdomen and the dorsal of the skin. The samples size was 0.5-1 cm. Samples were taken. Then placed in the stabilizer (i.e. neutral buffered formalin) with 10% concentration to fixation of samples for 48 hrs and then was processed. The routine histological techniques were used to prepare the histological slides which stained with Hematoxylin and Eosin (Keskin et al 2007). Finally, 50 microscopic fields from a similar number of slides in each group were randomly selected and photographed using a digital camera.

RESULTS AND DISCUSSION

The study showed differences in the total thickness of the skin as well as the depth and density of glands in different studied regions, and in the different seasons of the year (Fig. 1, Table 1).

The lowest total thickness was in the abdomen in front of the navel, 1640 µm during the winter, while the highest was in the mid-dorsal surface, 2722 µm. There was also a significant difference in thickness between summer and winter; this could be attributed to the difference in temperature between the two seasons which may lead to an increase in fat cells and the number of hair follicles in the winter to resist coldness, in which it was associated with the presence of skin glands with

hair follicles. Moreover, the extent of the eccrine sweat glands in the depth of the dermis is inversely proportional to the hair density (Samuelson 2007, Sar and Calhoun 2013).

The less thickness of the total skin and dermis in the abdominal region compared to the mid-dorsal surface, may be due to the regularity of the fibers in the dermis of these regions (Mesher 2016, Najimaldeen 2009) and is attributed this lack of thickness to the lack of hair density in these parts in sheep. Thus, there is a positive relationship between the total thickness of the skin and dermis, indicating that the type of animal has an effect in determining the thickness of the skin and dermis. However, the presence of many sweat glands in regions of the hair-less abdomen and the medial surfaces of the front and back limbs compared to dorsal and dorsal surfaces of the depth reflects that sweating is less in the parts of high-density hair than the parts of a few density hairs. This is because these exposed regions need sweating to moisturize the skin and prevent it from drying, in addition to maintaining the temperature of the body. All glands pour secretion in primary hair follicles (Fig. 3).

The density of hairs presents in different animals, help to link with canals of sweat glands. The sebaceous glands are of the simple branching acinar kind, each acinus be lined by applied cells with no internal cavity. Acinus sizes vary according to the body regions studied. The secretions are secreted into canals that flow into the primary hair follicles in the upper third of the dermis. This canal is called the sebaceous capillary canal (Obeyes 2016). In a few cases, especially in the winter, parts of the secretion units are

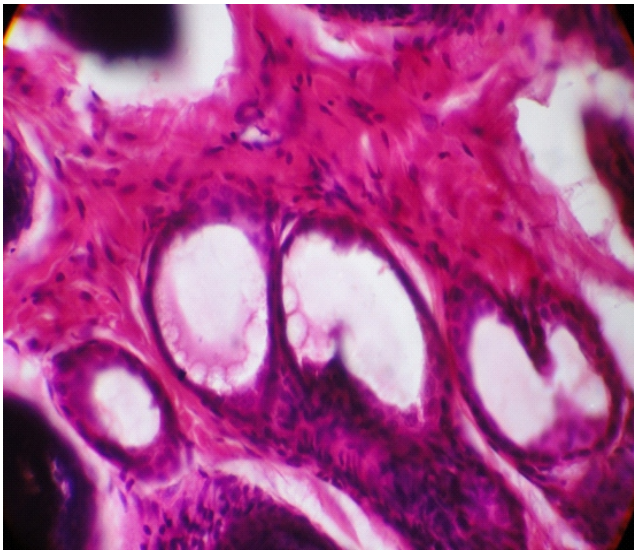

Fig. 2. Transverse section of the skin in the dorsal region, note the presence of Sweat Gland in the deep part of the dermis (in the suµmer), Hematoxylin-Eosin 360X

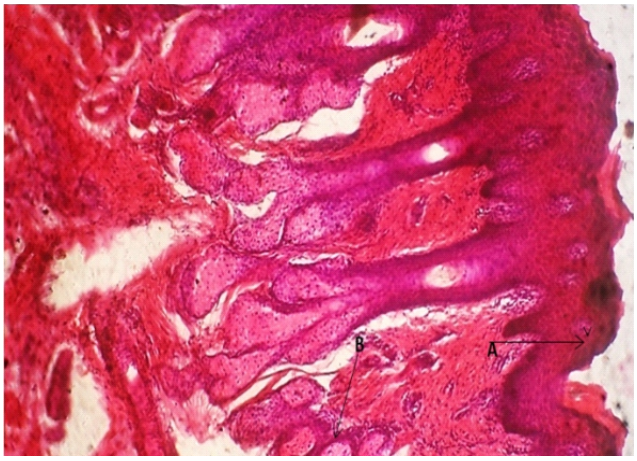

Fig. 1. A vertical section of the skin in the abdominal region (in the winter), note the lack of thickness of the skin, especially Epidermis, increase sebaceous glands, Hematoxylin-Eosin 370X

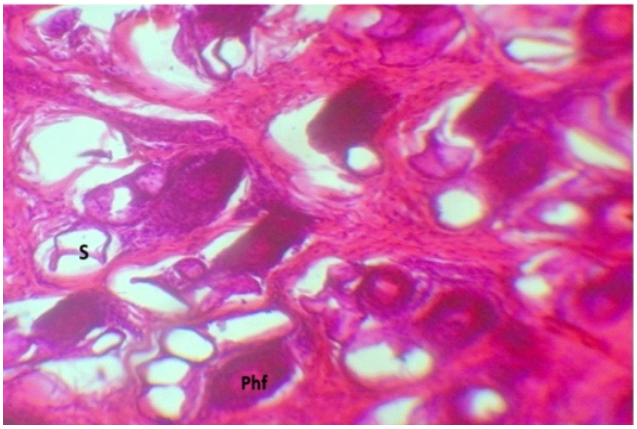

Fig. 3. Transverse section of the dermis in the abdominal region (in the summer) Notice the increase of Sweat gland (S) associated with primary hair follicles (phf), Hematoxylin-Eosin 370X

Table 1. Total thickness of the skin and dermis layer of the cows for winter and summer

Anatomical sites for sampling	Abdominal region in front of the navel		Mid-dorsal region	
	Summer	Winter	Summer	Winter
Total thickness of the skin	*1940±16	*2722±29	*1690±11	*1788±15
Thickness of the dermis layer	*1569±23	*1689±15	*2022±23	*2119±11

(*) Represents a significant difference between the studied regions by seasons of the year at the probability level P≤ 0.05. The tables represent the mean ± computational error

Table 2. Depth of the sweat glands and sebaceous glands of the cows for winter and summer

Anatomical sites for sampling	Abdominal region		Dorsal region	
	Summer	Winter	Summer	Winter
	Depth of the sweat glands and sebaceous glands (µm)			
Depth of the sweat gland	*1600±8.1	*1594±11.2	*1790±9	*1746±11
Depth of the sebaceous gland	*849±5.5	*832±4.5	*842±5.8	*712±7.3
	Sudoriferous and ducts sudoriferous diameters (µm)			
	Summer	Winter	Summer	Winter
An average of the sudoriferous diameters	*187±5.5	*175±6.4	*179±2	*174±11
Average of the sebaceous gland diameters	*32.8±1.2	*36±1.3	*32.1±1.3	*35.4±1.7

(*) Represents a significant difference between the studied regions by seasons of the year at the probability level P≤ 0.05. The tables represent the mean ± computational error

extended to the surface of the epidermis. Thus, winter is characterized by an increase in the size of the secretive units and the density of its presence compared to summer in the same studied regions (Fig. 4, 5).

Furthermore, the total secretion of sebaceous glands is done through the hair sebaceous canal in primary hair follicles and very little in secondary shown in Table 2 and Figure 6.

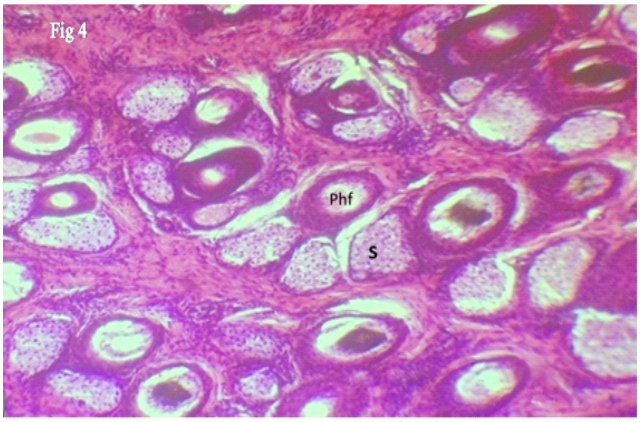

Fig. 4. A transverse section of the dermis showing the increase in sebaceous glands (SG) associated with primary hair follicles (PHF) and secondary abdominal region, Hematoxylin-Eosin 360X

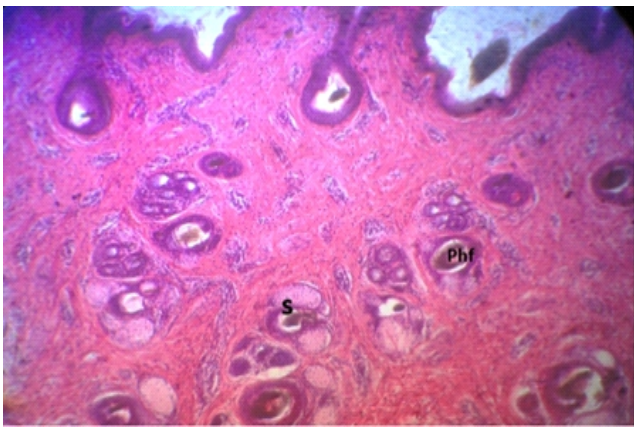

Fig. 5. Vertical section of the skin in the dorsal region (in the summer), noted the lack of Sebaceous Gland associated with Primary Hair Follicles, Hematoxylin-Eosin 360X

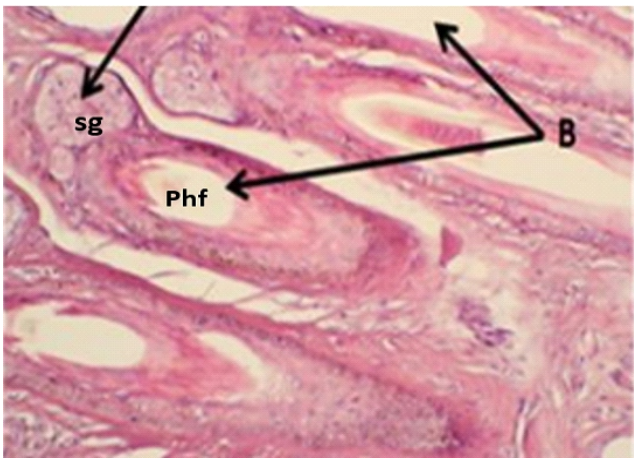

Fig. 6. A transverse section of the dermis showing the accompaniment of the sebaceous glands (sg) to the hair follicles of the dorsal region (in the suµmer), Hematoxylin-Eosin 20x

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