COMPARATIVE HISTOLOGICAL STUDY ON THE GLANDS OF SKIN IN BUFFALO AND COW

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ABSTRACT

This study was done to compare between the skin of buffaloes and cows. Six samples from different regions of the body were collected from local abattoirs in Baghdad. The skin specimens were fixed in formalin solution. Routine histological techniques were carried out on these samples. For staining, hematoxylin and eosin stains were used then samples were examined under light microscope. Even the excretory ducts of sweat glands in both cows and buffaloes were stratified cuboidal epithelium, the sweat glands in buffaloes were poorly developed, less numerous, smaller in size and lies deeply in the dermis with longer duct comparing to that of the cows. Their secretory acini were surrounded by fewer number of myoepithelial cells. The apocrine sweat glands were distributed all over the body regions while the merocrine sweat glands were distributed in limited body regions. On the other hand, the sebaceous glands of buffaloes were well developed and appeared as larger in size and more lobulated comparing to the cows. The above thoughts explain why the buffaloes considered as poor thermoregulator animals. In regard to the mechanism of thermoregulation, the present study concluded that there was a reverse relationship between the function of sebaceous and sweat glands.

Key words: Histology, skin, sweat gland, sebaceous gland, Buffalo, Cow.

INTRODUCTION

A comparison with cattle, the buffalo is less tolerance to high temperature, therefore, the buffaloes tend to wallow into water to decrease high temperature that is due to the black color of body and very few numbers of sweat glands (Ali and Alwan, 1991). The sebaceous glands are classified to simple or simple branched alveolar glands of holocrine type which responsible for the production of sebum (Choi, 2002). The sebum was a protective and heat isolator, make a barrier against the foreign microorganism also prevent their entrance and decrease the water loss and regarded as a precursor for the formation of vit D (Kligman, 1963). The sebaceous glands in the cows are small and lobulated and they are located at the upper third of the hair follicle (Hafez *et al*., 1955; Abdul Raheem and Al-Hety, 1997). The sebaceous gland in buffaloes are large and multilobulated and they are located at the upper third of the hair follicles (Ali,

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2008). The sweat gland of mammals is responsible for excretion of sweat, which may be considered as an important mean of heat dissipation during hot weather by evaporation (Gotter *et al*., 1995 ; Hori, 1995 ; Bovell *et al*., 2007)). Based on their morphological and functional characteristics, sweat glands are separated into two types: apocrine and merocrine glands (Ross *et al*., 2003; James and Jeffery, 2006 ; Li and Urmacher, 2007).

MATERIALS AND METHODS

A-Samples Collection

Skin specimens were collected immediately after slaughtering from adult males of buffaloes and cows from the local Shu'lla abattoir. The specimens were taken from six body areas (muzzle, neck, thorax, dorsum, abdomen and perineum).

B-Tissue processing

Samples were fixed in 10% Neutral buffered formalin for 24 hours. Specimens were dehydrated using upgrading of alcohol from 50, 60, 70, 80, 90, and 100%. Xylen was used as clearing reagent. Paraffin was used for infiltration and embedding. Paraffin blocks were cut about (5-7 µm), (Luna, 1968). Ocular oculometer was used for measurement of diameters of duct of the apocrine sweat glands. The number of secretory acini of the sweat glands, the number of myoepithelial cell/acinus of sweat gland. The length of the sweat glands also were measured from the basement membrane to the location of acini, dimensions of the main lobe of the sebaceous glands and size of lobule of the sebaceous glands (length× width/2).

RESULTS AND DISCUSSION

The sebaceous glands were simple branched alveolar glands which were associated with hair follicles. Sebaceous glands were embedded in the dermis in all the examined regions. The acini of sebaceous gland consist of a basal layer of flattened epithelial cells which rest on a basement membrane. The central layers contains rounded cells containing different amounts of fatty droplet in their cytoplasm, their nuclei gradually shrink and then apoptotic nuclei appear and the cells become filled with fat droplets and secreted by holocrine type of secreting. Generally, these sebaceous glands in buffaloes was larger and more lobulated (Figure 1) than in the cows (Figure, 2), this was in agreement with the finding of Ali (2008) in buffaloes, who stated that the sebaceous glands were of large size, multilobulated and opened at the upper part of the hair follicles. Also, the present result similar to the finding of Hafez *et al*. (1955) who stated that the sebaceous glands of the cows was small and lobulated and of a holocrine type,

the result variance with Mahdi (1979) in camel, who stated that the sebaceous glands were multilobulated in the upper lip only.

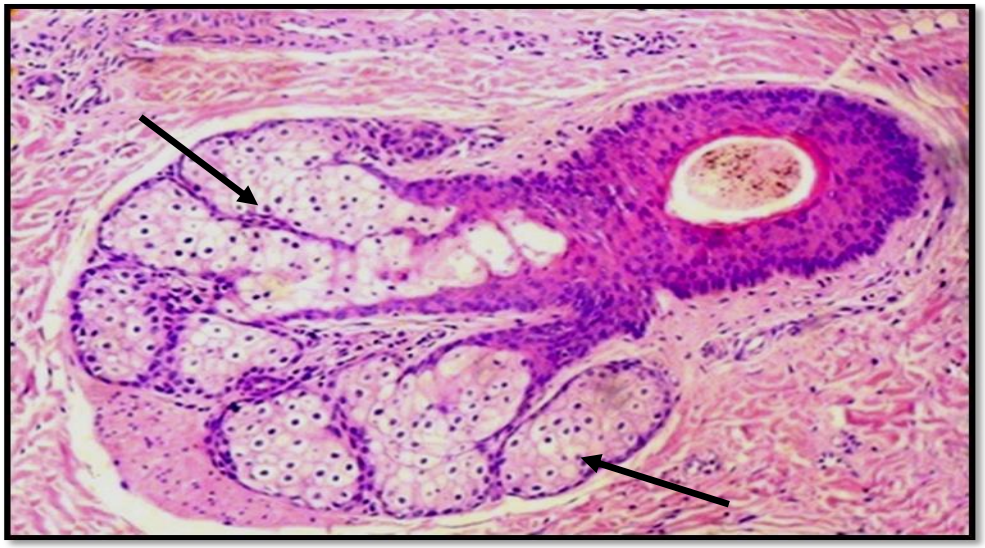

Figure 1. Showed multilobulated well developed sebaceous glands in buffaloes (arrows) (H&E, X100).

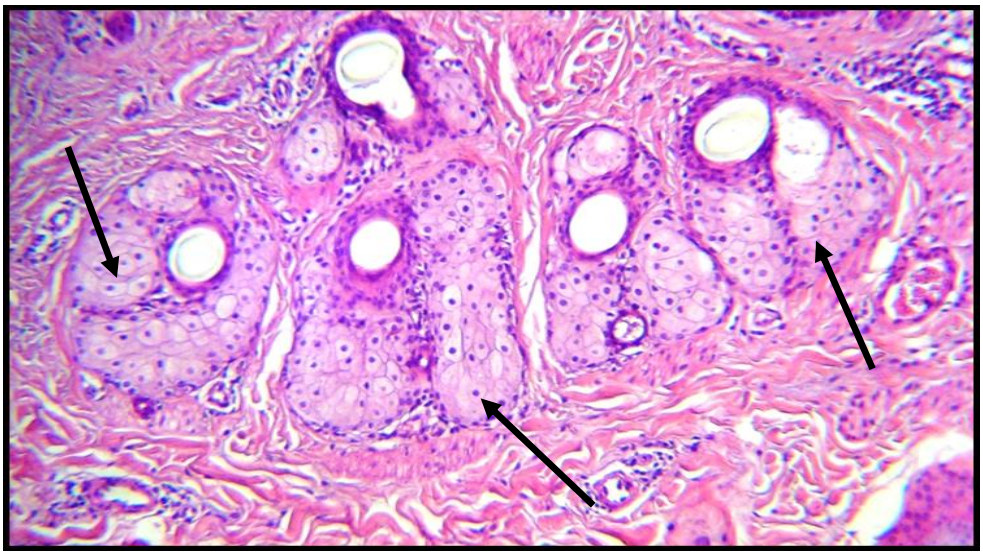

Figure 2. Showed poorly developed lobulated sebaceous glands in the cow (arrows) (H&E, X100).

Table (1) showed that the highest dimension of the sebaceous glands in buffaloes and cows was in the chest region (385.8 and 161.9 µm), respectively and the lowest dimension was in the dorsum (246.2 and 123.4 µm), respectively. The number of sebaceous glands/ mm^2 was (2.47 mm^2 and 5.13mm^2) in buffalo and cow respectively, this was similar to result of Sar and Calhoun (1966) in common American goat; Abdul Raheem and Al-Hety (1997) who referred that there were marked species differences in location, size, shape and number of glands per single hair follicles. The current result was in accordance with

Kligman (1963) who found that the sebum was decreased the water loss and consequencely a reverse relationship between sebaceous and sweat gland in regard to thermoregulation was recorded.

Table 1 .The dimensions of the lobes and lobules of sebaceous glands in buffaloes and cows (micrometer)

Areas	Lobes of sebaceous glands		Lobules of sebaceous glands	
	Buffaloes Mean ± SE	Cows Mean ± SE	Buffaloes Mean ± SE	Cows Mean ± SE
Muzzle*	350.8±1.5	141.3±0.8	119.9±1.2	103.8±0.5
Neck*	294.3±1.2	129.1±0.7	109±0.4	96.4±0.4
Chest*	385.8±1.7	161.9±1.4	136.9±0.5	116.9±0.7
Abdomen*	358±0.6	148.4±0.9	123.2±0.9	106.1±0.5
Perineum*	316.9±0.9	137.54±1.2	117.1±1.2	101.8±0.4
Dorsum*	246.2±1.3	123.4±0.7	98.2±0.6	78.7±0.7

* Represent significant differences at (P<0.05) between horizontal rows.

The study also revealed that the apocrine sweat glands in buffaloes and cows lied within the dermis and were of simple tubular gland type (Figure, 3and 4), with a coiled secretory portion and a straight duct. The secretory portion had a large lumen lined with cuboidal to coloumnar epithelial cells, depending on their secretory activity. Myoepithelial cells were located between the secretory cells and the basement membrane, these cells were well developed with contractile properties in cow and its number per acini was more in cow (2.8 cells) than that of buffalo (2 cells).

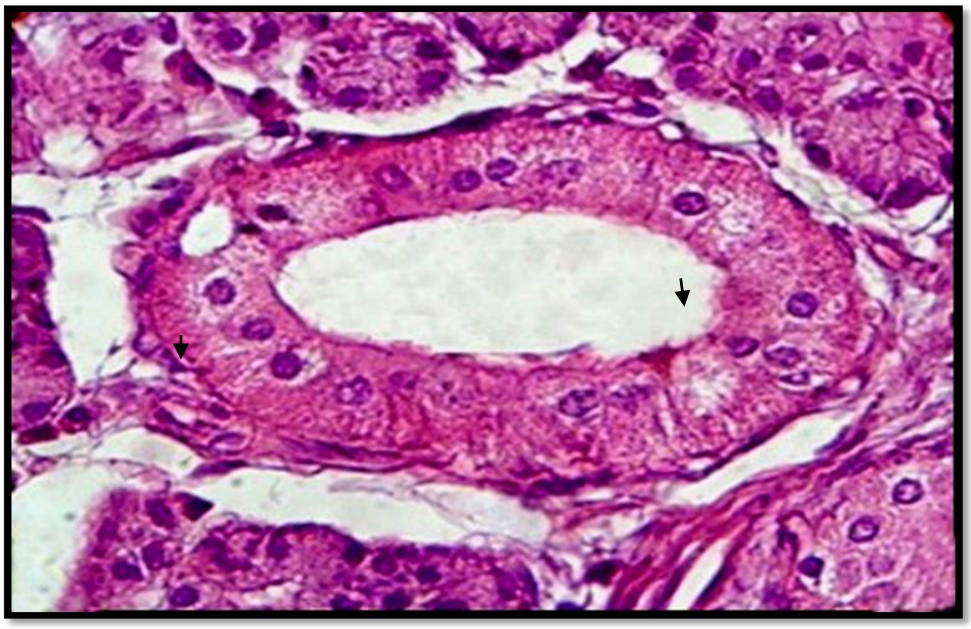

Figure 3. Showed duct of apocrine sweat gland in the buffalo. Note the few epithelial glandular cells with few small nuclei and non-prominent nucleoli (arrows) (H&E, X600).

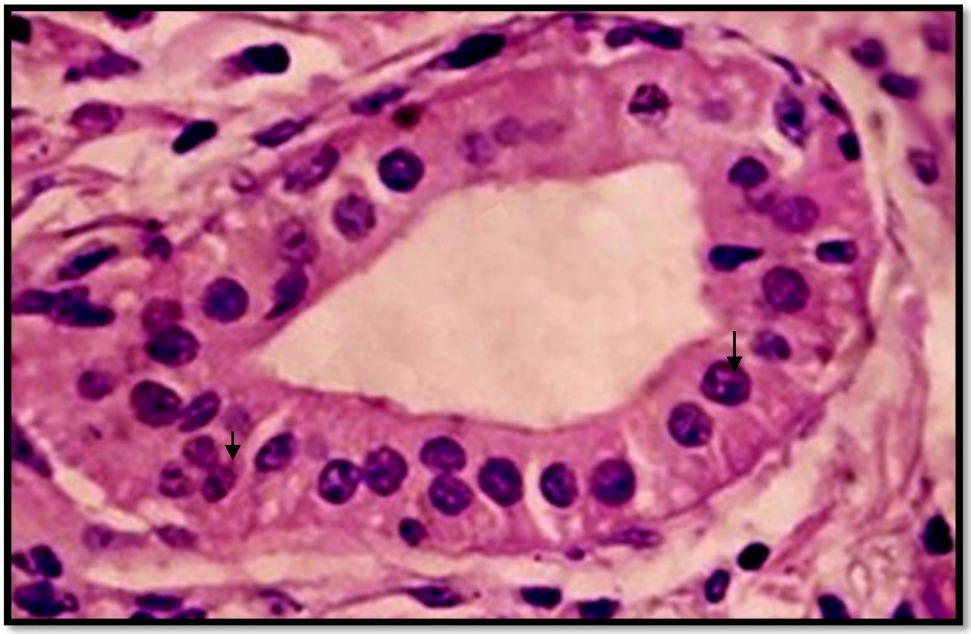

Figure 4. Showed duct of apocrine sweat gland in the cow. Note the abundant cytoplasm of the secretory cells with euchromatic large nuclei with more than one prominent nucleoli (arrows) (H&E, X600).

Besides, the present result found the presence of large numbers of merocrine sweat glands in muzzle, these glands lied within the dermis and extended into subcutaneous tissue, this was similar to the results of Hafez *et al*. (1955) in cow; Kozlowski and Calhoun (1969) in American sheep, Abdul-Raheem and Al-Hety (1997); Ali *et al*. (2003) and Sultan (2006) in local black goat, who referred to the presence of the two types of glands. Also the present result was in variance with the finding of Ali (2008) in buffalo, who stated that the muzzle region contain no sweat glands. The morphology of the merocrine sweat glands has one type of cells (serous cell), this was similar to the results of Kozlowski and Calhoun (1969) in American sheep, Yasear (1993) in buffalo and Sultan (2006) in local black goat. The ducts of sweat glands were relatively straight and open directly into the surface of the epidermis. The sweat glands have longer duct in buffalo (65µm, ± 05 SE) than the cow (35µm, ± 0.3SE). Table (2) showed that the diameter of the duct of sweat glands in cow was larger than in buffalo. The location of sweat glands was deeper in the dermis so that its duct is longer than in the cow and corresponding the secretory units of sweat glands nearer to the surface than in buffalo, the lumen of the acini in buffalo was narrower than in cow so that the secreted amount of sweat was lesser in buffalo and in turn, the heat dissipation in buffalo was little so that the buffalo was poor thermoregulator animal. However,the excretory duct of sweat gland in both cows and buffaloes lined by stratified cuboidal epithelium.

Table 2. The diameter of apocrine sweat glands in buffaloes and cows (micrometer)

Areas	Diameter of apocrine Sweat glands in Buffaloes Mean ± SE	Diameter of apocrine sweat glands in Cows Mean ± SE
Muzzle*	87.9±1.2	98.2±0.7
Neck*	27.7±3.7	46.3±0.8
Chest*	60.9±0.8	72.2±0.9
Abdomen*	70.9±1.2	85.6±0.9
Perineum*	48.1±0.7	58.3±0.3
Dorsum*	43.1±0.5	54.5±0.8

* Represents significant differences at (P<0.05) between horizontal rows.

REFERENCES

Ali, A. M. and A. F. Alwan. 1991. A biometrical study on oviduct and their abnormalities in Iraqi local breed cows. *Iraqi J. Vet. Sci.*, 2: 54-62.

Choi, Ch. M. 2002. Anatomy of the skin. http://wounds1.Com- Anatomy of the skin. htm.

Kligman, A. M. 1963. The uses of sebum, in: advances in biology of skin. vol. iv. The sebaceous glands. Eds. W. Montagna, R.A. Ellis and A.F. Silve. Oxford, Pergaman Press. Pp: 110-124.

Hafez, B. S., A. L. Badreldin and M. L. Shafei. 1955. Skin structure of Egyptian buffaloes and cattle with particular references to sweat gland. *J. Agric. Sci.*, 49: 19-30.

Abdul Raheem, M. H. and M. S. Al-Hety. 1997. Histological and morphological study of the skin of black goat. *Iraqi*. *J. Vet. Sci.*, 10: 59-71.

Ali, S. A. 2008. Histological and histochemical study of the skin in local buffalo. M.Sc. Thesis, college of Veterinary Medicine. Al-Basrah University.

Gotter, J. D., M. J. Patterson and N. A. Taylor. 1995. The topography of eccrine sweating in humans during exercise. *Eur. J. Appl. Physiol.*, 71: 549-554.

Hori, S. 1995. Adaptation to heat. *Jap. J. Physiol.*, 45: 921-946.

Bovell, D. L., A. D. Corbett, S. Holme, A. Macdonalld and M. Harker. 2007. The absence of apocrine glands in the human axilla has disease pathogenetic implications including axillary hyper-hidrosis. *Br. J. Dermatol.*, 150(6): 1278- 1286.

Ross, M. H., C. I. Kaye and W. Pawlina. 2003. "Integumentary System. Histology (Text and Atlas)". 4th Ed. Lippincott. William and Wilkins, Awlters. Kluwer Company. Philadelphia. USA. Pp: 400-434.

James G. M. and M. Jeffery. 2006. "Lookinbill and Marks' Principles of Dermatology". 4th Ed. Elsevier Inc. P: 6.

Li, M. and C. D. Urmacher. 2007. "Histology for Pathologists". 3rd Ed. Lippincott, Williams and Wilkins. Pp: 1-79.

Luna, I. G. 1968. "Manual of Histology Staining Methods of the Armed Force Institute and Pathology". 3rd Ed. McGraw-Hill Book Company. New York.

Mahdi, A. H. 1979. Morphological and histochemical studies on the skin of camel (*Camelus dromedarius*). M. Sc. Thesis, Baghdad University. Pp: 29-54.

Sar, M. and M. L. Calhoun. 1966. Microscopic anatomy of the integu-ment of the common American goat. *Am. J. Vet. Res.*, 27: 444-456.

Kozlowski, G. P. and M. L. Calhoun. 1969. Microscopic anatomy of the integument of sheep. *Am. J. vet. Res.*, 30: 1267-1278.

Ali, S. H. K. N Taher and N. Sh. Ali. 2003. Histological study of skin of the local goat, number of hair follicles and some factors influencing there. *Al-Qadissiya J. Vet. Med. Sci.*, 1: 6-8.

Sultan,G. A. 2006. Comparative histological, morphometrical and topographical study of the skin of local black goat. M. Sc. Thesis, College of Veterinary Medicine. Al-Mousl University.

Yasear, A. Y. 1993. Histological and histochemical observations on the muzzle for buffalo (*Bubalis bubalis*) Murrah. *J. Res. Study*, 8: 137-148.

دراسة نسجية مقارنة لغدد الجلد في الجاموس والأبقار

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المستخلص

أجريت هذه الدراسة للمقارنة بين جلود الأبقار والجاموس من الناحية النسجية. جمعت ستة عينات من مناطق مختلفة من جسم الحيوانات من المجازر المحلية في بغداد.هذه المناطق تتظمن (الخطم- الرقبة- الصدر- الظهر-البطن- العجانية) ثبتت عينات الجلد بمحلول 10% من الفورمالين الداريء المتعادل، وأجريت عليها التقنيات النسجية الروتينية ثم صبغت بصبغات الهيماتوكسلين والايوسين وفحصت تحت المجهر الضوئي .استخدم المقياس العيني المصغر لقياس الابعاد المطلوبة. كانت الغدد الزهمية في الجاموس اكبر حجما واكثر تفصصا مما هي عليه في الابقار. أظهرت الدراسة الحالية ان الغدد العرقية في الجاموس اقل عددا وأصغر حجما وذات قناة أطول من مثيلتها في الابقار وقد أحيطت باعداد اقل من الخلايا العضلية الظهارية كانت القنوات الافرازية للغدد العرقية في كلا الابقار والجاموس ذات ظهارة مطبقة مكعبة. انتشرت الغدد العرقية قمية الافراز في جميع مناطق الجسم بينما اقتصر وجود الغدد العرقية ذات الافراز المنفرز في مناطق محددة من الجسم. فيما يخص التنظيم الحراري، استنتجت الدراسة أن هناك علاقة وظيفية عكسية بين الغدد العرقية والغدد الزهمية.

الكلمات المفتاحية: أنسجة، الجد، الغدد العرقية، الغدد الزهمية، الجاموس، الأبقار.