

## SEBACEOUS GLAND DISTRIBUTION IN DIFFERENT REGIONS OF BUFFALO SKIN

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## SUMMARY

The present study was conducted on skin of 24 buffaloes collected from slaughter house and postmortem hall of GADVASU, Ludhiana. The skin samples were collected from dorsal, lateral and ventral regions of head, neck, thorax, abdomen and tail. The tissues were fixed in 10% neutral buffered formalin and processed for paraffin block preparation. The sections of 5-6  $\mu\text{m}$  thickness were cut with rotary microtome and stained with hematoxylin and eosin and Masson's trichrome stain. The sebaceous glands of buffaloes were simple or compound alveolar type and were associated with hair follicles present in reticular layer of dermis. The micrometrical observations on number of sebaceous glands/ $\text{mm}^2$  in different regions and diameter of sebaceous glands were recorded and data was statistically analyzed.

**Key words:** Buffalo, Sebaceous glands, Skin

The sebaceous glands secrete sebum, a fatty substance making it slippery for water and mud. Moreover, the sebum layer melts during hot weather and become glossier to reflect many heat rays, thus relieving the animal from the excessive external heat load. However buffaloes exhibit great distress when exposed to direct solar radiation or when working in the sun during a hot weather. This is due to the fact that their bodies absorb a great deal of solar radiation because of dark skin and sparse coat of hair and in addition to that they possess a less efficient evaporative cooling system (Debdarma, 2016).

In literature histomorphological studies on sebaceous glands are available in sheep (Purushothaman *et al.*, 2010; Mamde *et al.*, 2010; Mobini 2012), goat (Pathak *et al.*, 2012; Nagaraju *et al.*, 2012), pig (Sumena *et al.*, 2010), cattle (Nagaraju *et al.*, 2012) and buffalo (Singh *et al.*, 1974 and Dhandu *et al.*, 1998) but scanty information is available regarding regional distribution of sebaceous glands in buffalo skin. So the present study was planned.

The present study was conducted on skin of 24 buffaloes collected from slaughter house and postmortem hall of GADVASU, Ludhiana. The skin samples were collected from dorsal, lateral and ventral regions of head, neck, thorax, abdomen and tail. The tissues were fixed in 10% neutral buffered formalin and processed for paraffin block preparation by acetone benzene schedule (Luna, 1968). The blocks were prepared and sections of 5-6  $\mu\text{m}$  thickness were cut with rotary microtome. These paraffin sections were stained with hematoxylin and eosin. The micrometrical observations on number of sebaceous glands/ $\text{mm}^2$  and diameter of sebaceous glands were recorded on hematoxylin and eosin stained sections. The data was statistically analyzed.

The sebaceous glands of buffaloes were simple or

compound alveolar type and were associated with hair follicles present in reticular layer of dermis (Fig. 1, 2). The duct of these glands opened into hair follicles to form pilosebaceous canal as reported in water buffaloes (Jenkinson and Nay, 1975), domestic animals (Dellmann, 1993), in pigs (Sumena *et al.*, 2010), in Sheep (Mamde *et al.*, 2010; Mobini, 2012) and in goat (Pathak *et al.*, 2012). The secretory unit of glands consisted of solid mass of epidermal cells (Fig. 2) enclosed by connective tissue covering that blended with the surrounding dermis. At the periphery of the glandular tissue a single layer of low cuboidal cells was observed. This layer gives rise to new cells of the gland as reported by Dellmann (1993). The glands were associated with smooth muscles strands called arrectorpilli muscle. The sebaceous glands were associated with hair follicles of upper row whereas hair follicles of lower row were mostly devoid of sebaceous glands (Fig. 1, 3). The hair follicles were surrounded from all the sides by sebaceous glands (Fig. 4) as reported by Singh *et al.* (1974) in buffalo calves, in pigs (Sumena *et al.*, 2010), sheep (Mamde *et al.*, 2010, Mobini, 2012; Razvi *et al.*, 2015) and goat (Pathak and Sarma, 2013). Sebaceous glands release sebum by holocrine mode.

The distribution of sebaceous glands in different areas of head, neck, thorax, abdomen and tail has been summarized in table 1. In head and neck region, number of the sebaceous gland/ $\text{mm}^2$  were more in dorsal side but it did not vary significantly ( $p < 0.05$ ) from lateral and ventral side. In thorax region, the number of sebaceous gland/ $\text{mm}^2$  were maximum on lateral side but did not vary significantly ( $p < 0.05$ ) from dorsal and ventral area. In abdomen, lateral area has significantly higher number of sebaceous glands/ $\text{mm}^2$  than dorsal and ventral sides. Also, in tail region, number of sebaceous glands/ $\text{mm}^2$  in lateral area was significantly higher than tail dorsal and tail ventral.

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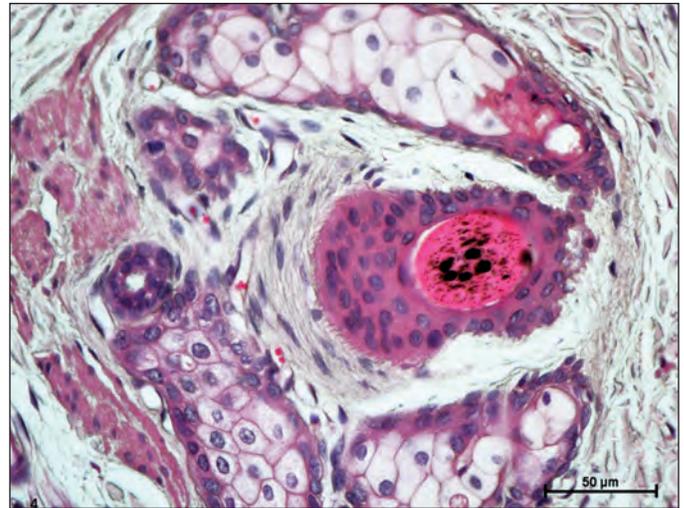
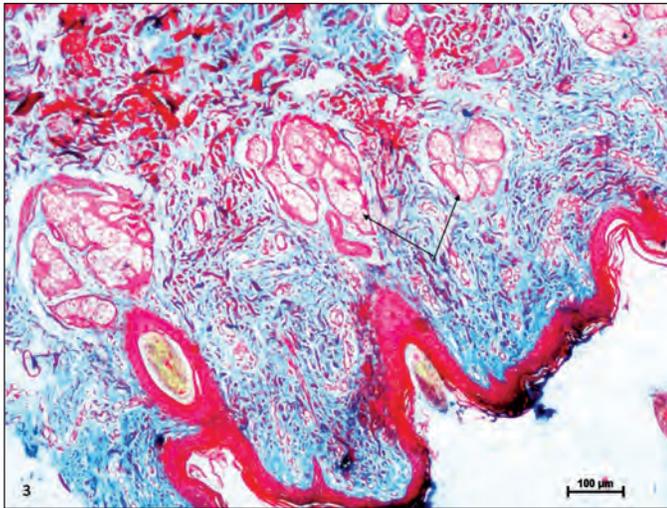
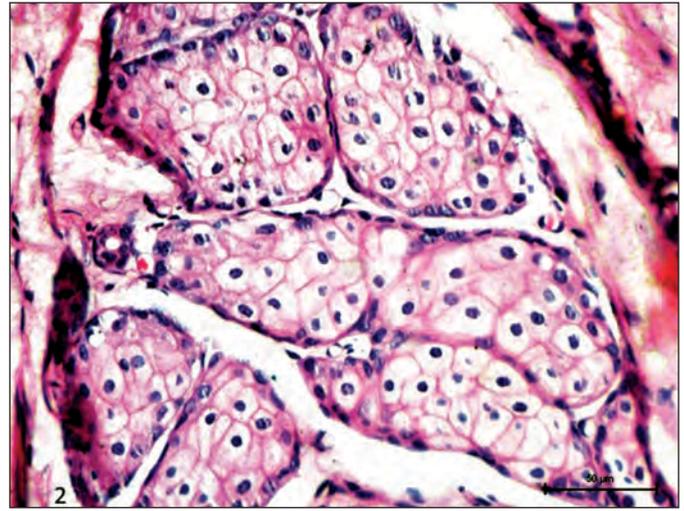
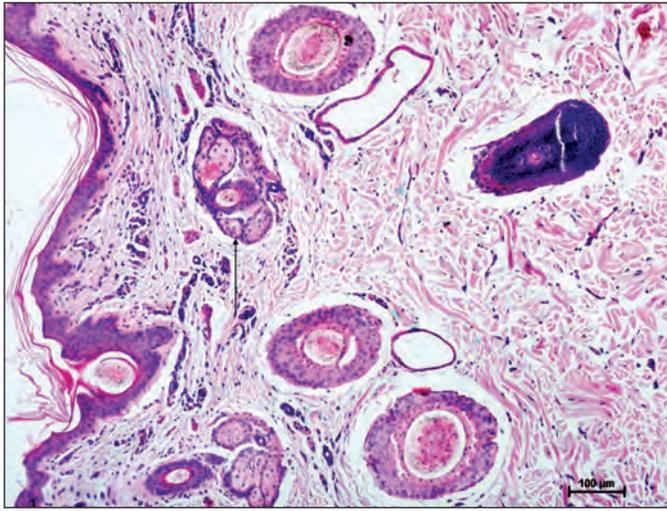


Fig. 1. Skin from abdomen lateral showing sebaceous glands (arrow) along hair follicle. H.&E.×100; 2. Skin from head lateral region showing compound sebaceous glands. H.&E.×400; 3. Skin from neck dorsal showing sebaceous glands (arrow) along hair follicle. Masson's trichrome×100; 4. Skin from abdomen dorsal showing sebaceous glands. H.&E.×400

When the distribution of glands/mm<sup>2</sup> was compared among different body areas i.e. dorsal, lateral and ventral areas of different body regions, it was concluded that among dorsal areas of all body regions, head dorsal region had maximum number of sebaceous gland/mm<sup>2</sup> with significant ( $p < 0.05$ ) difference from abdomen and tail area. Among lateral areas of different body regions, head had non significantly ( $p < 0.05$ ) higher number of sebaceous glands/mm<sup>2</sup> than thorax lateral, abdomen lateral and tail lateral but significant difference from neck lateral. Among ventral areas of different body regions, head ventral region had maximum number of sebaceous gland/mm<sup>2</sup> and the number was significantly ( $p < 0.05$ ) higher than abdomen ventral and tail ventral.

The distribution of number of sebaceous gland/mm<sup>2</sup> in head, neck, thorax, abdomen and tail had been summarized in table 2. Maximum number of sebaceous gland/mm<sup>2</sup> were observed in head region and minimum in tail region. The number of glands in head region was

significantly more than neck, abdomen and tail regions.

The diameter of sebaceous glands from different areas of head, neck, thorax, abdomen and tail region has been summarized in table 1. In head region, the maximum diameter of sebaceous glands was observed in lateral side followed by head dorsal and head ventral area ( $p < 0.05$ ). In neck region, maximum diameter was recorded in neck dorsal followed by neck ventral and neck lateral ( $p < 0.05$ ). In thorax, maximum diameter was observed in ventral area followed by lateral and dorsal areas. Similarly in abdomen, the maximum diameter was observed in ventral area followed by dorsal and lateral areas but without any significant difference. In tail region, maximum diameter was observed in tail ventral with a significant difference ( $p < 0.05$ ).

When the diameter of sebaceous gland was observed in dorsal areas of all body regions, it was inferred that maximum diameter was in neck dorsal area followed by abdomen dorsal, head dorsal, tail dorsal and thorax dorsal.

**Table 1**  
**Distribution and diameter of sebaceous glands in different areas of body region**

Body region	Area	No. of sebaceous gland/mm <sup>2</sup>	Sebaceous gland diameter (mm)
Head	Dorsal	1.40±0.16 <sup>a</sup>	173.7±6.60 <sup>b</sup>
	Lateral	1.14±0.26 <sup>a</sup>	200.95±8.59 <sup>a</sup>
	Ventral	0.91±0.54 <sup>a</sup>	169.35±7.59 <sup>b</sup>
Neck	Dorsal	0.92±0.11 <sup>a</sup>	213.21±15.0 <sup>a</sup>
	Lateral	0.88±0.14 <sup>a</sup>	95.69±6.35 <sup>b</sup>
	Ventral	0.81±0.1 <sup>a</sup>	119.34±7.86 <sup>b</sup>
Thorax	Dorsal	0.92±0.07 <sup>a</sup>	127.50±6.78 <sup>a</sup>
	Lateral	1.02±0.11 <sup>a</sup>	164.40±11.17 <sup>a</sup>
	Ventral	0.89±0.08 <sup>a</sup>	167.55±16.59 <sup>a</sup>
Abdomen	Dorsal	0.66±0.07 <sup>b</sup>	202.85±12.46 <sup>a</sup>
	Lateral	1.11±0.12 <sup>a</sup>	179.55±14.82 <sup>a</sup>
	Ventral	0.22±0.05 <sup>b</sup>	206.65±9.13 <sup>a</sup>
Tail	Dorsal	0.68±0.15 <sup>ab</sup>	142.54±5.66 <sup>b</sup>
	Lateral	0.89±0.12 <sup>a</sup>	120.46±2.88 <sup>b</sup>
	Ventral	0.33±0.05 <sup>b</sup>	179.19±13.02 <sup>a</sup>

Mean values for individual region with same superscript within column do not differ significantly at p<0.05.

The diameter in neck dorsal was significantly (p<0.05) higher than diameter of glands in head dorsal and thorax dorsal. In the lateral side, maximum diameter was observed in head lateral followed by abdomen lateral, thorax lateral, tail lateral and neck lateral. The diameter of glands in head lateral was significantly higher (p<0.05) than the tail lateral and neck lateral areas. In ventral side, the maximum diameter was observed in abdomen followed by tail, head, thorax and neck but without any significance difference (p<0.05).

The diameter of sebaceous glands from head, neck, thorax, abdomen and tail region has been summarized in table 2. Among all these regions, the maximum sebaceous gland diameter was found in abdomen region followed by head, neck, thorax and tail region but the diameter was only significantly higher (p<0.05) from thorax and tail region. The minimum diameter of hair follicle among different body region was found in tail region.

## REFERENCES

- Debbarma, D. (2016). Histomorphological and histochemical studies on regional variation in skin architecture of buffalo. M.V.Sc. thesis submitted to Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India.
- Dellmann, H.D. (1993). Textbook of Veterinary Histology (4th edn.). Lea and Febiger, Philadelphia.

**Table 2**  
**Number of sebaceous gland/mm<sup>2</sup> and diameter of sebaceous gland (mm) in different body regions**

Body region	No. of sebaceous gland/mm <sup>2</sup>	Sebaceous gland diameter (mm)
Head	1.14±0.11 <sup>a</sup>	181.33±4.70 <sup>a</sup>
Neck	0.76±0.08 <sup>b</sup>	169.48±9.04 <sup>ab</sup>
Thorax	0.94±0.06 <sup>a</sup>	153.15±7.31 <sup>b</sup>
Abdomen	0.70±0.10 <sup>b</sup>	196.52±7.19 <sup>a</sup>
Tail	0.59±0.11 <sup>b</sup>	147.47±5.71 <sup>b</sup>

Mean values with same superscript within column do not differ significantly at p<0.05

- Dhande, P.L., Patil, A.S. and Nandeshwar, N.C. (1998). Sweat glands, sebaceous glands and hair follicles distribution in various body regions of Mehsana buffaloes (*Bubalus bubalis*). *Indian Vet. J.* **75**: 434-437.
- Jenkison, D.M. and Nay, T. (1975). The sweat glands and hair follicles of different species of bovidae. *Aust. J. Biol. Sci.* **28**: 55-68.
- Luna, L.G. (1968). Manual of histological staining methods of the armed forces institute of pathology (3rd edn.) McGraw-Hill Book Company, New York. pp. 258.
- Mamde, C.S., Bhosle, N.S., Mugale, R.R. and Lambate, S.B. (2010). Histological Studies of skin in sheep in relation with age, season and region. *Indian J. Vet. Anat.* **22**: 5-7.
- Mobini, B. (2012). Histology of the skin in an Iranian native breed of sheep at different ages. *J. Vet. Adv.* **2**: 226-231.
- Nagaraju, G.N., Prasad, R.V., Jamuna, K.V. and Ramkrishna, V. (2012). Histomorphological features in the differentiation of skin of spotted seer (*Axis axis*), cattle (*Bos indicus*) and goat (*Capra hircus*). *Indian J. Vet. Anat.* **24**: 10-12.
- Pathak, H. and Sarma, M. (2013). Seasonal variation in the epidermal thickness in the skin of indigenous goat of Assam. *Int. J. Sci. Res.* **4**: 2458-2460.
- Pathak, V., Rajput, R., Bhardwaj, R.L. and Mandial, R.K. (2012). Histological studies on the hair follicle and skin of Chegu goat. *Indian J. Small Rum.* **18**: 275-277.
- Purushothaman, M.R., Thiruvenkadan, A.K., Karunanithi, K. and Balasundaram, K. (2010). Skin thickness, histology and leather traits of Mecheri sheep. *Indian Vet. J.* **87**: 60-62.
- Razvi, R., Suria, S., Sarma, K. and Sharma, R. (2015). Histomorphological and histochemical studies on the different layers of skin of Bakerwali goat. *J. Applied Anim. Res.* **43**: 208-213.
- Singh, L.P., Prasad, J. and Yadava, R.C.P. (1974). A note on the microscopic structure of sebaceous glands in the paralumbar region of the Indian buffalo calves. *Indian J. Anim. Sci.* **44**: 280-281.
- Sumena, K.B., Lucy, K.M., Chungath, J.J., Kuttinarayanan, P., Ashok, N. and Harshan, K.R. (2010). Regional histology of the subcutaneous tissue and the sweat glands of large white Yorkshire pigs. *Tamilnadu J. Vet. Anim. Sci.* **6**: 128-135.