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Histomorphological differentiation of skin epidermis in Labrador and non-descriptive breeds of dog in Kerala

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Abstract

Present study was conducted on skin of six adult dogs i.e. two Labrador and four non-descriptive breeds of dogs. The skin was divided into three layers viz., epidermis, dermis and hypodermis. Epidermis was lined by keratinized stratified squamous epithelium in both Labrador and non-descriptive breeds. Epidermis consisted of stratum basale, stratum Spinosum, stratum Granulosum and stratum corneum from interior to exterior. Melanin pigment was present in stratum basale. Clear cells were present in non-descriptive breeds but they were absent in Labrador. The thickness of the epidermis in Labrador is maximum in dorsal neck whereas in non-descriptive breed maximum in ventral neck.

Keywords: Histomorphological, skin, epidermis, breeds, stratum basale

Introduction

The dog or domestic dog (*Canis familiaris* or *Canis lupus familiaris*) is a domesticated descendant of the wolf, which is characterized by an upturning tail. The dog derived from an ancient, extinct wolf and the modern grey wolf is the dog's nearest living relative. Skin is one of the largest and the most important organic system of the body and acts as a barrier between the external and internal environment of the body (Montage, 1960) [12]. It is responsible for protection, thermoregulation, external sensory awareness, immunological defence, wound healing, perception and excretion. The skin is an effective barrier which prevents desiccation of electrolytes and macromolecules from the body (Dyce *et al.* 2002 and Bhattacharya *et al.* 2003) [11, 10].

Materials and Methods

Present study was conducted on skin of six adult dogs i.e. two Labrador and four non-descriptive breeds. Samples were collected from the Department of Veterinary Pathology, CVAS Pookode. Skin samples (1 X 1 cm) were collected from six different regions viz., dorsal and ventral regions of neck, abdomen and tail. Specimens for histological purpose were fixed in 10 per cent neutral buffered formalin (10% NBF), for 48 hours. The fixed specimens were washed, dehydrated and embedded in high melting paraffin (MP 58-60 °C). Serial sections of 5µm thickness were made and stained histologically using Haematoxylin and Eosin for routine studies, Gomori's one step trichrome method for collagen and muscle fibres.

Results and Discussion

The skin has mainly three layers i.e. epidermis, dermis and hypodermis. The epidermis was lined by keratinized stratified squamous epithelium in both Labrador and Non-descriptive breeds. Epidermis consisted of stratum basale, stratum spinosum, stratum granulosum and stratum corneum from interior to exterior. Similar observations were observed in Maya *et al.* (2019) [8] in deer, goat and sheep, Hole *et al.* (2008) [7] in red khandari cows.

In the present study, the stratum corneum was outermost layer and consisted of four to five layers of flattened keratinized keratinocytes. The cell boundaries were not prominent and pale cytoplasm. These findings are in accordance with the observations reported by Baba *et al.* (1998) [2] in palpebral epidermis of sheep, Nagaraju *et al.* (2012) [5], Razvi *et al.* (2015) [6] in goats and Mainde *et al.* (2018) [9] in goats. In the present study, the stratum granulosum consisted of single layer of cells with oval nuclei and presence of granules in cytoplasm. Similar findings were observed in Gayen *et al.* (1989) [3] in goat, Baba *et al.* (1998) [2] in sheep, Gaykee *et al.* (2008) [4] in pig and Mainde *et al.* (2018) [9] in goats, Maya *et al.* (2019) [8]

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(1989) ^[3] in goat, Baba *et al.* (1998) ^[2] in sheep, Gaykee *et al.* (2008) ^[4] in pig and Mainde *et al.* (2018) ^[9] in goats, Maya *et al.* (2019) ^[8] in deer, goat and sheep. In the present study, the stratum spinosum having two to three layers of polyhedral shaped cells. This layer had serrated margins with spiny or pointed apices. Similar findings were reported by Razvi *et al.* (2015) ^[6] in goat. In the present study, the stratum basale were low columnar to cuboidal shape with elongated nucleus. Melanocytes were observed in stratum basale. This findings of the present study is in agreement with the observations recorded by Gayen *et al.* (1989) ^[3] in black Bengal goat and Baba *et al.* (1990) ^[1] in goat.

Table 1: Thickness of the different layers of epidermis in skin of Labrador

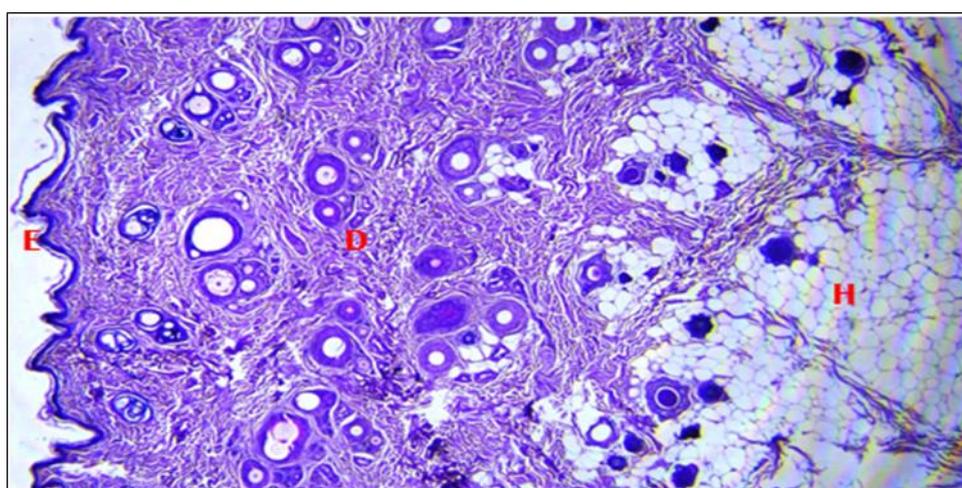
Description	<i>S. basale</i> (mean ±SE) μm	<i>S. spinosum</i> (mean ±SE) μm	<i>S. granulosum</i> (mean ±SE) μm	<i>S. corneum</i> (mean ±SE) μm
Dorsal neck	52.50±2.92	49.87±3.63	54.54±6.79	46.09±3.67
Ventral neck	5.33±0.50	7.21±0.36	6.07±0.34	9.66±1.10
Dorsal abdomen	7.26±0.65	6.30±0.53	3.05±0.23	4.32±0.29
Ventral abdomen	6.13±0.54	6.71±0.50	6.23±0.35	4.29±0.24
Dorsal tail	63.28±3.73	63.35±3.49	49.68±3.94	35.68±5.90
Ventral tail	46.53±3.17	43.95±4.73	41.61±2.69	27.58±3.96

Table 2: Thickness of the different layers of epidermis in skin of non-descriptive breed

Description	<i>S. basale</i> (mean ± SE) μm	<i>S. spinosum</i> (mean ± SE) μm	<i>S. granulosum</i> (mean ± SE) μm	<i>S. corneum</i> (mean ± SE) μm
Dorsal neck	6.54±0.14	7.26±0.43	5.39±0.19	3.76±0.10
Ventral neck	95.16±5.32	74.14±4.90	65.85±4.09	33.28±0.53
Dorsal abdomen	57.65±9.29	51.51±2.01	43.49±2.16	27.79±3.53
Ventral abdomen	30.36±11.35	35.28±4.10	55.18±3.48	36.57±2.38
Dorsal tail	64.63±3.38	63.68±3.38	50.46±3.97	37.84±7.37
Ventral tail	40.85±5.72	50.74±2.76	39.80±2.02	27.48±2.05

The skin thickness of the different layers of the epidermis of Labrador in dorsal and ventral region of neck, abdomen and tail. Among these maximum thickness were observed in dorsal neck region i.e. *S. basale* 52.50±2.92 μm, *S. spinosum* 49.87±3.63 μm, *S. granulosum* 54.54±6.79 μm, *S. corneum* 46.09±3.67 μm and minimum thickness will be in dorsal abdomen i.e. *S. basale* 7.26±0.65 μm, *S. spinosum* 6.30±0.53 μm, *S. granulosum* 3.05±0.23 μm, *S. corneum* 4.32±0.29 μm.

The skin thickness of the different layers of the epidermis of non-descriptive breed in dorsal and ventral region of neck, abdomen and tail. The maximum thickness will be in ventral neck i.e. *S. basale* 95.16±5.32 μm, *S. spinosum* 74.14±4.90 μm, *S. granulosum* 65.85±4.09 μm and *S. corneum* 33.28±0.53 μm. and minimum thickness will be in dorsal neck i.e. *S. basale* 6.54±0.14 μm, *S. spinosum* 7.26±0.43 μm, *S. granulosum* 5.39±0.19 μm and *S. corneum* 3.76±0.10 μm.



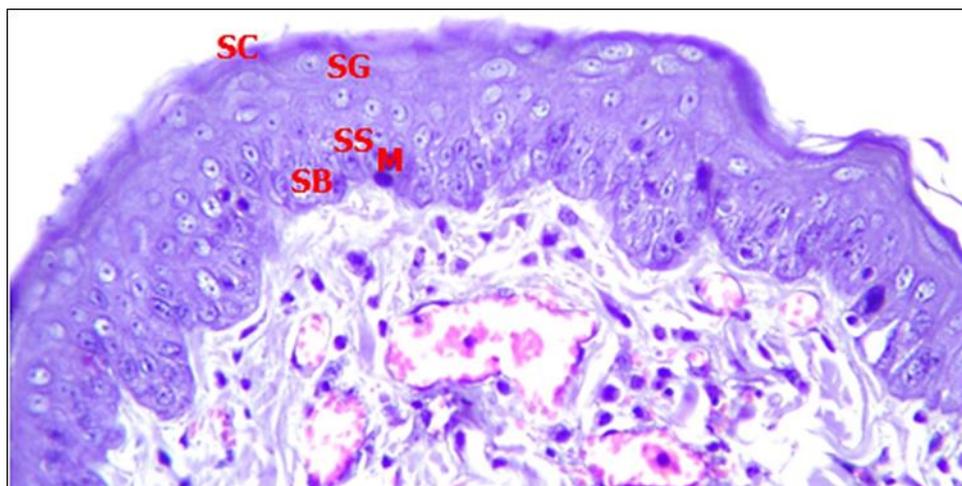
H&E X4

E-Epidermis

D-Dermis

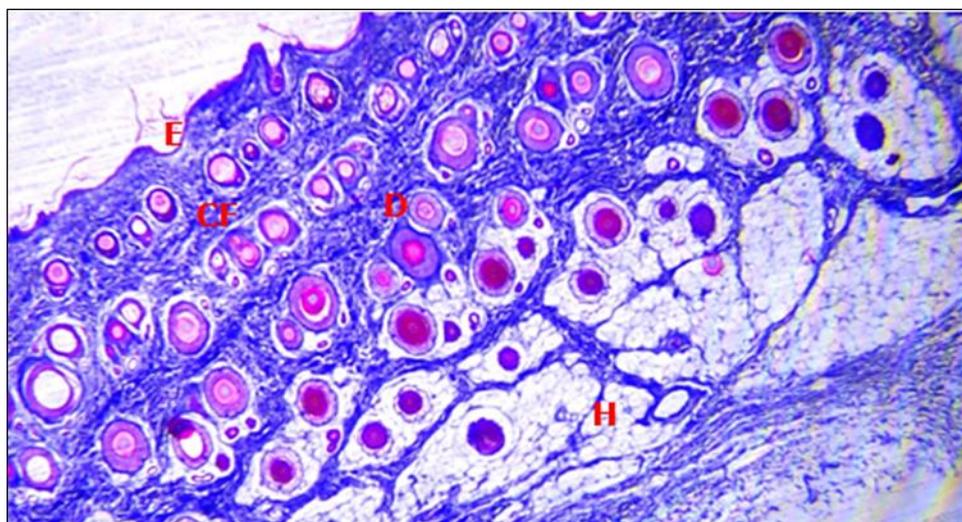
H-Hypodermis

Fig 1: Photomicrograph of the skin showing different layers of skin in non-descriptive breed of dog



SB-Stratum basale
 SS-Stratum spinosum
 SG-Stratum granulosum
 SC-Stratum corneum
 M-Melanin pigment

Fig 2: Photomicrograph of the skin showing different layers of epidermis in Labrador. H&E X40



E-Epidermis
 D-Dermis
 H-Hypodermis
 C-Collagen fibers

Fig 3: Photomicrograph of the skin showing different layers of skin in non-descriptive breed. Gomoris one step trichrome X4.

Discussion

The skin has mainly three layers i.e. epidermis, dermis and hypodermis. The epidermis was lined by keratinized stratified squamous epithelium in both Labrador and Non-descriptive breeds. Epidermis consisted of stratum basale, stratum spinosum, stratum granulosum and stratum corneum from interior to exterior. In present study, it was observed that the thickness of epidermis in Labrador were more in dorsal neck region i.e. *S. basale* $52.50 \pm 2.92 \mu\text{m}$, *S. spinosum* $49.87 \pm 3.63 \mu\text{m}$, *S. granulosum* $54.54 \pm 6.79 \mu\text{m}$, *S. corneum* $46.09 \pm 3.67 \mu\text{m}$ and minimum thickness will be in dorsal abdomen i.e. *S. basale* $7.26 \pm 0.65 \mu\text{m}$, *S. spinosum* $6.30 \pm 0.53 \mu\text{m}$, *S. granulosum* $3.05 \pm 0.23 \mu\text{m}$, *S. corneum* $4.32 \pm 0.29 \mu\text{m}$. In present study, the thickness of the epidermis in non-descriptive breed were more in ventral neck i.e. *S. basale* $95.16 \pm 5.32 \mu\text{m}$, *S. spinosum* $74.14 \pm 4.90 \mu\text{m}$, *S. granulosum* $65.85 \pm 4.09 \mu\text{m}$ and *S. corneum* $33.28 \pm 0.53 \mu\text{m}$. and minimum thickness will be in dorsal neck i.e. *S. basale*

$6.54 \pm 0.14 \mu\text{m}$, *S. spinosum* $7.26 \pm 0.43 \mu\text{m}$, *S. granulosum* $5.39 \pm 0.19 \mu\text{m}$ and *S. corneum* $3.76 \pm 0.10 \mu\text{m}$.

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