



REGIONAL HISTOLOGY OF STRATUM LUCIDUM OF EPIDERMIS IN LARGE WHITE YORKSHIRE PIGS*

K. B. Sumena¹, K. M. Lucy², J. J. Chungath³,
P. Kuttinarayanan⁴ and N. Ashok⁵

Department of Veterinary Anatomy and Histology
College of Veterinary and Animal Sciences
Mannuthy - 680 651, Thrissur, Kerala

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Abstract

Histology and regional distribution of the stratum lucidum of the epidermis in Large White Yorkshire pigs were studied using 12 animals of six to ten months of age. Skin samples of 2 cm² area were collected immediately following exsanguination from eight areas of the body viz., the snout, dorsal nasal, dorsal neck, ventral neck, dorsal abdomen, lateral abdomen, ventral abdomen and carpal regions. Stratum lucidum appeared as a clear, bright, homogenous, strongly eosinophilic layer consisting of flattened, compact, eosinophilic cells without clear cell boundaries and the nucleus. A definite stratum lucidum was seen only in the snout, dorsal nasal and ventral abdominal areas.

Keywords: *Stratum lucidum, Skin, Large White Yorkshire pig*

Skin is a turbulent tissue and it grows, differentiates and renews itself continuously. The high prolificacy, short generation interval, fast growth rate and other biological advantages contribute to the selection of pig as a biological experimental model in the field of research. Because dermatologic, cutaneous,

pharmacologic and toxicological studies in human beings utilise the skin from swine, a thorough knowledge of its structure in different body regions is important. Hence, the present work was undertaken to study the regional histology of the stratum lucidum of the epidermis in Large White Yorkshire pigs. This study is contributory to the existing anatomical knowledge and will form a basis for further physiological, pathological, biochemical and cosmetic studies.

Materials and Methods

Histological studies were conducted on the skin of Large White Yorkshire pigs of six to ten months of age. Skin samples were collected from 12 animals (six each from either sex) from the Meat Technology Unit, Mannuthy. Skin samples of 2 cm² area were collected immediately following exsanguination from eight areas of the body viz., the snout, dorsal nasal, dorsal neck, ventral neck, dorsal abdomen, lateral abdomen, ventral abdomen and carpal regions. Thickness of the skin and subcutaneous fat was measured using Vernier Callipers. Number of hairs per square centimetre area was also recorded. The skin samples were cut into smaller pieces of 2 mm thickness and fixed in 10 per cent neutral

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¹ Veterinary Surgeon, AHD, Kerala

² Associate Professor

³ Professor & Head, Dept. of Vety. Anatomy & Histology, CVAS, Pookode

⁴ Professor & Head, Dept. of Livestock Products Technology, CVAS, Mannuthy

⁵ Professor & Head

buffered formalin. The tissue pieces were processed in high melting paraffin (melting point, 58-60°C) using the following procedure:

Steps for the processing procedure:

1. Washing in running tap water – overnight
2. 50 per cent Alcohol – 1 hour
3. 70 per cent Alcohol – 12 hours
4. 80 per cent Alcohol – 30 minutes
5. 90 per cent Alcohol – 30 minutes
6. Absolute alcohol I – 2 hours
7. Absolute alcohol II – 2 hours
8. Absolute alcohol III – 2 hours
9. Xylene I – 20 minutes
10. Xylene II – 20 minutes
11. Xylene III – 20 minutes
12. Paraffin I – 2 hours
13. Paraffin II – 2 hours
14. Paraffin III – 2 hours
15. Paraffin IV – 2 hours
16. Embedding

Paraffin sections of 4 to 5 μ thickness were taken and standard staining procedures were adopted for histological studies (Luna, 1968 and Singh and Sulochana, 1996). Measurements of the layers were taken using an ocular micrometer. The data were analysed statistically (Snedecor and Cochran, 1985) to find out the relationship, if any between different parameters.

Results and Discussion

Among the eight areas under study, stratum lucidum could be detected only in the snout, dorsal nasal and ventral abdominal regions. This layer appeared as a clear, bright, homogenous, strongly eosinophilic layer and consisted of flattened, compact, eosinophilic cells without clear cell boundaries and nucleus (Fig.). Monteiro-Riviere (1998) found that the cytoplasm of these cells lacked keratohyalin granules, but possessed protein-bound phospholipids and eleidin. Eleidin had a different staining property compared to keratin and was the precursor of keratin. The thickness of the lucidum was controlled by the rate of mitosis of the epidermal cells.

Stratum lucidum was adherent to the stratum granulosum ventrally and was continuous with the stratum corneum at the outer surface. According to Mc Grath *et al.* (2004) and Tortora and Derrickson (2009) melanocytes determined the darkness of the stratum lucidum and the cells of stratum lucidum contained an oily substance as a result of exocytosis of lamellar bodies accumulated during the movement of keratinocytes through the stratum spinosum and stratum granulosum.

Thickness of stratum lucidum varied in the snout, dorsal nasal and ventral abdominal regions and was $301.67 \pm 0.66 \mu\text{m}$, $17.28 \pm 0.55 \mu\text{m}$ and $24.05 \pm 0.27 \mu\text{m}$, respectively in the female pigs and $325.17 \pm 4.83 \mu\text{m}$, $9.87 \pm 1.58 \mu\text{m}$ and $18.91 \pm 0.27 \mu\text{m}$, respectively in males. This layer could not be detected in the dorsal neck, ventral neck, dorsal abdomen, lateral abdomen and the carpal regions. Smith and Calhoun (1964) reported that this layer was not apparent in the skin of pig. The regional limitation of stratum lucidum to the planum nasale, lip and margin of the hoof was reported in sheep by Kozlowski and Calhoun (1969). Mandage *et al.* (2003) recorded absence of stratum lucidum in the epidermis of the Deccani sheep.



Fig. Section of skin showing well developed stratum lucidum. H&E. x 100
1. Stratum corneum; 2. Stratum lucidum, 3. Stratum granulosum, 4. Stratum spinosum 5. Stratum basalis, 6. Dermal papilla

In the present study, presence of stratum lucidum in the snout, dorsal nasal and ventral abdominal regions can be related to the total thickness of the epidermis, pattern of hair growth and the physical stress to that region. Among the eight regions under study, maximum thickness of the epidermis was

recorded in the snout region, followed by the ventral abdominal and dorsal nasal regions. In these three regions all the five layers of the epidermis were very clear. Monteiro-Riviere (1998) cited that in dog, stratum lucidum was found only in specific areas of exceptionally thick skin and in hairless regions like planum nasale and footpads. According to Eurell and Frappier (2006) and Singh (2006), stratum granulosum and stratum lucidum were present only in the thick non-hairy regions.

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