

SKIN GLANDS AND LAYERS IN SOME BREEDS OF SHEEP

By

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SUMMARY

The total thickness of skin, thickness of most of the different layers, strata, sub-strata were greater in the Ossimi and Barki sheep than in the Texel and Merino sheep at most of the ages studied. Meanwhile, at birth, the Texels showed higher values than all other groups of sheep.

The sebaceous glands conical shape was wider in the outer margin and less pointed in the Texels and Merinos than in the Ossimi and Barki sheep. While, the apocrine glands were sacshaped in the different groups of sheep studied at birth, but were more elongated in the Texel and Merino sheep. In the older ages, the apocrines became more elongated and more coiled in the different groups of sheep studied. The apocrines of the Ossimi and Barki sheep extended into the skin not more than the level of the bulb of the deeper follicles, while it extended to a deeper level than that of the follicles bulb in the Merino and Texel sheep.

INTRODUCTION

Sholohov (1944, 1945) reported that the separate components of the skin became more clearly differentiated and increase in size as the animals grew older. Meanwhile, no increase was observed in the total thickness of skin with age (Sholohov, 1945).

The present research was done to study the histological features of skin in different breeds of sheep surviving in the U.A.R. environments.

MATERIALS AND METHODS

The materials used and the methods followed in this study were those previously described by Marai and Shafei (1964).

Statistical analysis were carried out after Snedecor (1952).

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The abbreviations used in the following plates are listed as below :

- Ap. gl. : Apocrine gland.
 Ap. gl. d. : Apocrine gland duct.
 Bb. s. : Bulb of secondary follicle.
 Bl v. : Blood vessel.
 Med. : Medulla.
 Seb. gl. p. : Sebaceous gland of primary follicle.
 Seb. gl. s. : Sebaceous gland of secondary follicle.

RESULTS AND DISCUSSIONS

A.—Skin thickness :

At birth, the average skin thickness was found to be greater in the Texel, followed by the Merino, Ossimi and Barki sheep (Table 1). The differences between the Merino and Ossimi and between the Ossimi and Barki sheep were not significant, while it was highly significant ("t" value was 4.443) between the Texel and Merino sheep. At one year of age, the skins of the Texel, Ossimi and Barki were thicker than that of the Merino sheep (Table 1). The differences between the Texel and Ossimi and between the Ossimi and Barki sheep were not significant, while they were highly significant ("t" value was 10.421) between the Barki and Merino sheep. The mentioned trend between the different breeds agrees with the observations of Burns and Clarkson (1950) who reported that fine-wool breeds tend to have thinner skins than the coarser woolled sheep. Generally, the total thickness of skin increased with highly significant values with age (Tables 2 and 3). This agrees with the findings of Margolena (1954).

TABLE 1.—THE MEAN THICKNESS OF SKIN IN SOME PURE BRED SHEEP (millimeter)

Age (Months)	Groups			
	Merino	Texel	Ossimi	Barki
Birth . . .	1.56	2.72	1.44	1.38
6	1.91	2.79	2.75	2.86
12	2.32	3.30	3.30	3.11

TABLE 2.—EFFECT OF AGE ON THE THICKNESS OF SKIN REPRESENTED AS PERCENTAGE VALUE TO THE INITIAL 100% VALUE AT BIRTH

Age (Months)	Groups			
	Merino	Texel	Ossimi	Barki
Birth	100	100	100	100
6	122	103	191	207
12	149	121	229	225

However, Sholohov (1945) observed no increase in the total thickness of skin.

TABLE 3.—TEST OF SIGNIFICANCE ("T" VALUE) FOR THE EFFECT OF AGE (BETWEEN BIRTH AND TWELVE MONTHS) ON THE THICKNESS OF SKIN AND SKIN LAYERS

Items	Groups			
	Merino	Texel	Ossimi	Barki
<i>Thickness of:</i>				
Skin	11.247*	2.359†	17.739*	21.608*
Epidermal layer	2.583†	1.825	—	3.650*
Sub-epidermal stratum . . .	0.674	2.731†	6.364*	0.595
Sub-sebaceous gland sub-stratum	2.523†	0.740	0.184	2.646†
Sebaceous gland sub-stratum	0.873	1.107	3.277†	4.824*
Apocrine gland sub-stratum	3.449*	1.663	6.342*	13.684*

† Significant at 95% probability.

* Significant at 99% probability.

All the other values are not significant.

B.—*Skin layers:*

In all the breeds studied, the epidermis layer was thin while the cornium stratum was not clear. The dermis layer comprised three distinct strata. The first was the sub-epidermal stratum which was constructed of thin, short and compact fibres. The second was the glandular stratum which included the skin glands, the wool follicles and the pili muscles inclosed in a meshwork of connective tissue fibres. This stratum was divided into the sebaceous gland, sub-sebaceous gland and apocrine gland sub-strata. The third stratum was composed of thick compact mingling fibre bundles (Plates 1-12). Clear plexus of large blood vessels were found between the two last strata (Plate 7).

The average thickness of the epidermal layer was nearly the same at most ages of all groups studied (Table 4). However, highly significant differences ("t" value was 4.472) were found between the Ossimi and Merino or Barki groups at six months of age.

TABLE 4.—THICKNESS OF THE EPIDERMAL LAYER IN SOME PURE BRED SHEEP (millimeter)

Age (Months)	Groups			
	Merino	Texel	Ossimi	Barki
Birth	0.02	0.03	0.03	0.02
6	0.03	0.04	0.04	0.03
12	0.03	0.04	0.03	0.04

The average thickness of the sub-epidermal stratum was larger in the Ossimi and Barki sheep than in the Texels and Merinos, especially at six and twelve months of age (Table 5). The difference between the Ossimi and Barki and between the Barki and Texel sheep were not significant, while they were significant ("t" value was 2.331) and highly significant ("t" value was 3.818) at six and twelve months of age respectively, between the Texel and Merino sheep. Generally, the large sub-epidermal stratum in the native sheep may establish a great area for the heat radiating bed of sub-epithelial blood capillaries which make the fat-tailed sheep more tolerant for the effect of heat than the more fine-wool breeds, since it increases their power for heat dissipation.

TABLE 5.—THICKNESS OF THE SUB-EPIDERMAL STRATUM IN SOME PURE BRED SHEEP (millimeter)

Age (Months)	Groups			
	Merino	Texel	Ossimi	Barki
Birth	0.09	0.13	0.11	0.08
6	0.13	0.18	0.28	0.21
12	0.10	0.21	0.29	0.28

The average thickness of the sebaceous gland, sub-sebaceous gland and apocrine gland sub-strata were larger in the Texel than in the Merino and native sheep, at birth (Tables 6, 7 and 8). At later ages, the native breeds surpassed the other breeds in the thickness of sebaceous and apocrine glands sub-strata (Tables 6 and 8).

TABLE 6.—THICKNESS OF SEBACEOUS GLAND SUB-STRATUM IN SOME PURE BRED SHEEP (millimeter)

Age (Months)	Groups			
	Merino	Texel	Ossimi	Barki
Birth	0.24	0.31	0.19	0.22
6	0.22	0.27	0.36	0.35
12	0.26	0.24	0.33	0.38

The superiority of the Texel and Merino breeds over the native breeds in the mentioned measurements of the skin components at birth may give evidence to indicate that the growth of the skin structures is more rapid in the foreign breeds than in the native breeds before birth. While after birth the contrary occurs since the dimensions of the skin components measurements increase largely in the native breeds than that of the foreign breeds (Tables 1, 4, 5, 6, 7, and 8). Studying the pre-natal building up of the skin components in the mentioned breeds of sheep may reveal much of the nature of differences observed in the wool types of these breeds.

TABLE 7.—THICKNESS OF SUB-SEBACEOUS GLAND SUB-STRATUM
IN SOME PURE BRED SHEEP (millimeter)

Age (Months)	Groups			
	Merino	Texel	Ossimi	Barki
Birth . . .	0.12	0.46	0.36	0.06
6	0.25	0.44	0.10	0.17
12	0.24	0.57	0.35	0.25

TABLE 8.—THICKNESS OF APOCRINE GLAND SUB-STRATUM
IN SOME PURE BRED SHEEP (millimeter)

Age (Months)	Groups			
	Merino	Texel	Ossimi	Barki
Birth . . .	0.65	0.98	0.29	0.51
6	0.81	0.98	0.91	1.04
12	0.91	0.68	1.04	1.49

Generally, most of the measurements of the thickness of layers, strata and sub-strata of skin were significantly affected by age in the groups studies (Tables 1, 3, 4, 5, 6, 7 and 8). The native sheep and the Merino groups Measurements were the more affected by age (Table 3). Some of the measured layers, strata and sub-strata of skin might have been squeezed at certain ages as a result of the high differential growth of the other neighbouring skin structures (Tables 1, 4, 5, 6, 7, and 8).

C.—*Skin glands* :

The sebaceous glands outer margins of the conical shaped lobes were wider, while the inner ends were less pointed in the foreign sheep than in the native ones (Plates 4 and 9).

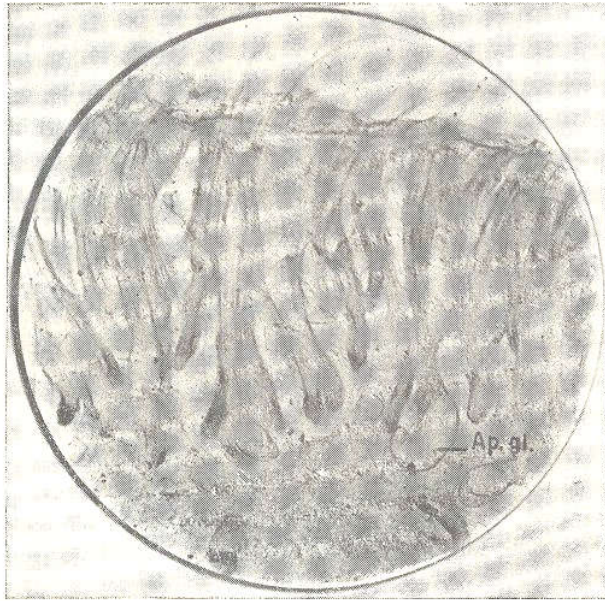


PLATE 1.—Vertical section of skin at one day old
in the Merino sheep ($\times 88$).

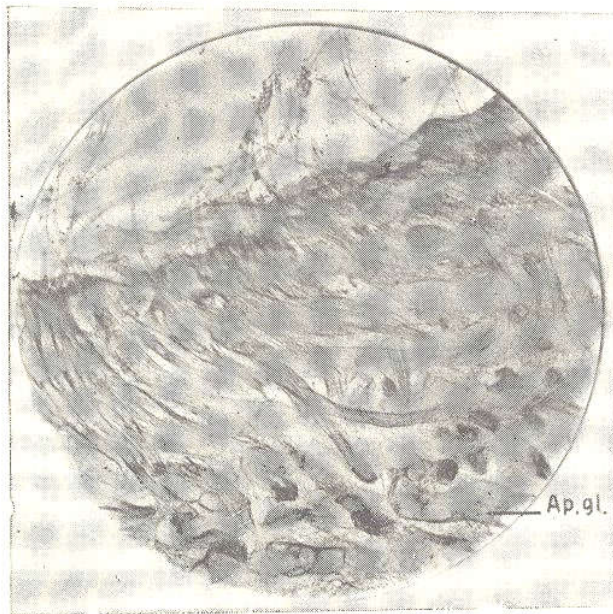


PLATE 2.—Vertical section of skin at six months old
in the Merino sheep ($\times 88$).

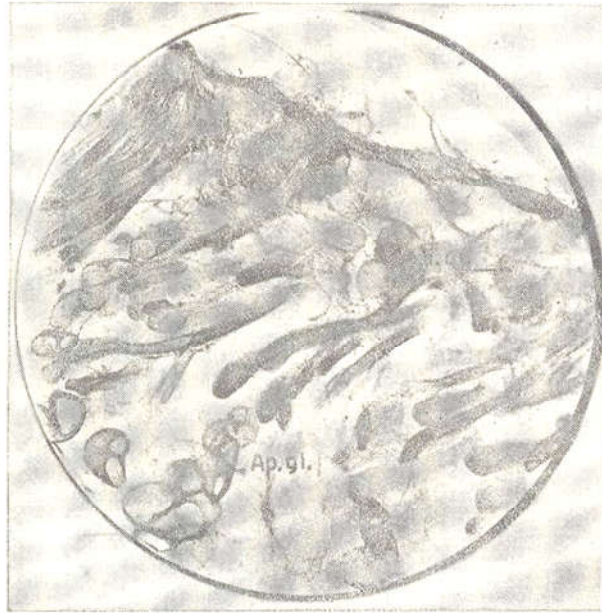


PLATE 3.—Vertical section of skin at twelve months age in the Merino sheep ($\times 88$).



PLATE 4.—Vertical section of skin at one day old in the Texel sheep ($\times 88$).

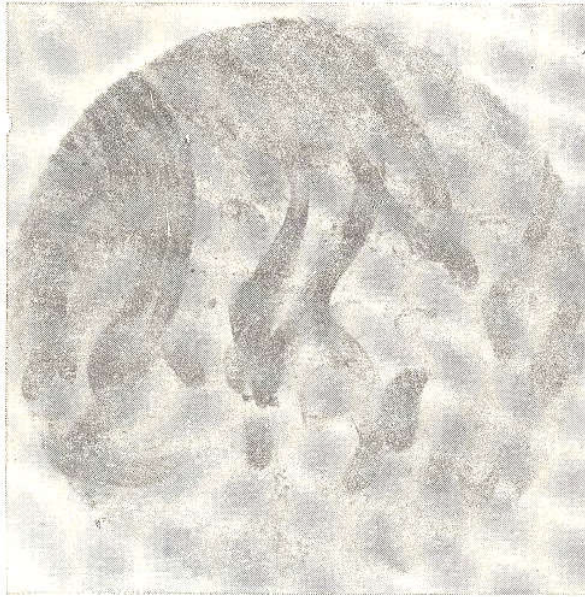


PLATE 5.—Vertical section of skin at six months old in the Texel sheep ($\times 88$).

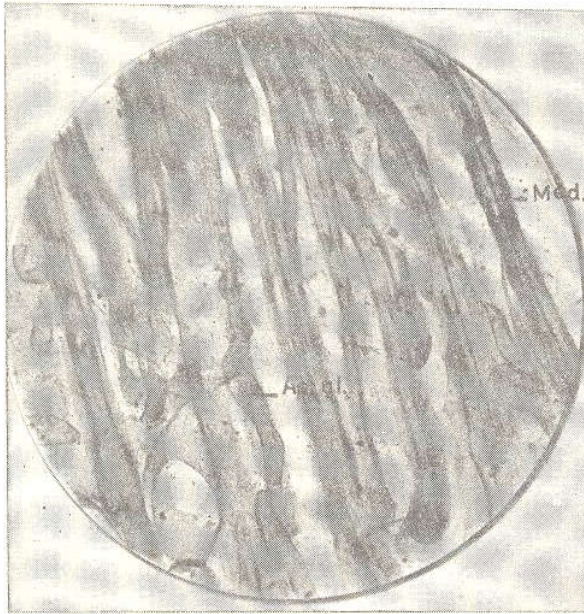


PLATE 6.—Vertical section of skin at twelve months of age in the Texel sheep ($\times 88$).

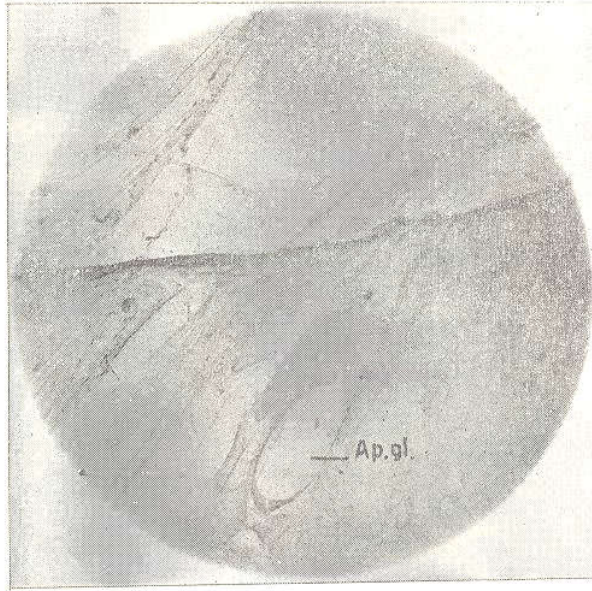


PLATE 7.—Vertical section of skin at one day old
in the Ossimi sheep ($\times 88$).

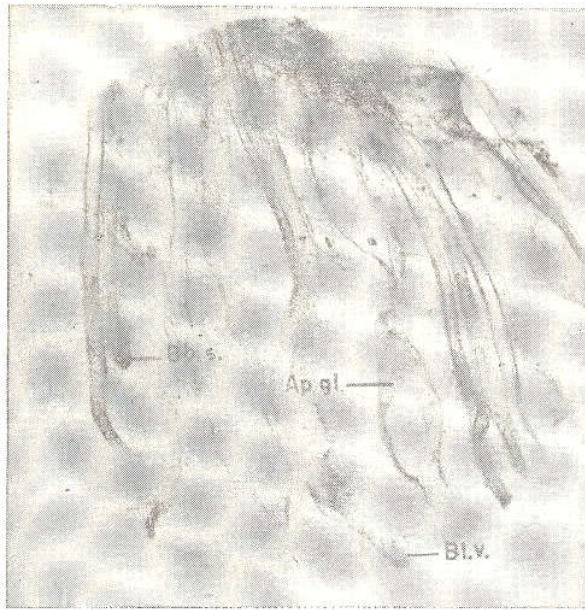


PLATE 8.—Vertical section of skin at six months old
in the Ossimi sheep ($\times 88$).

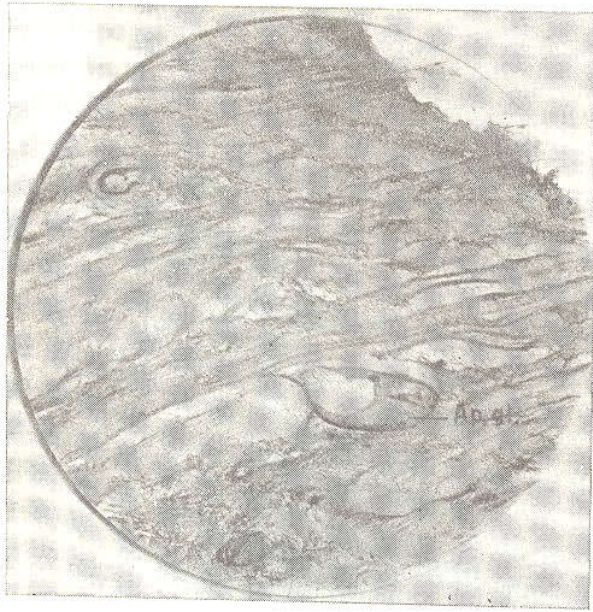


PLATE 9.—Vertical section of skin at twelve months of age in the Ossimi sheep ($\times 88$).

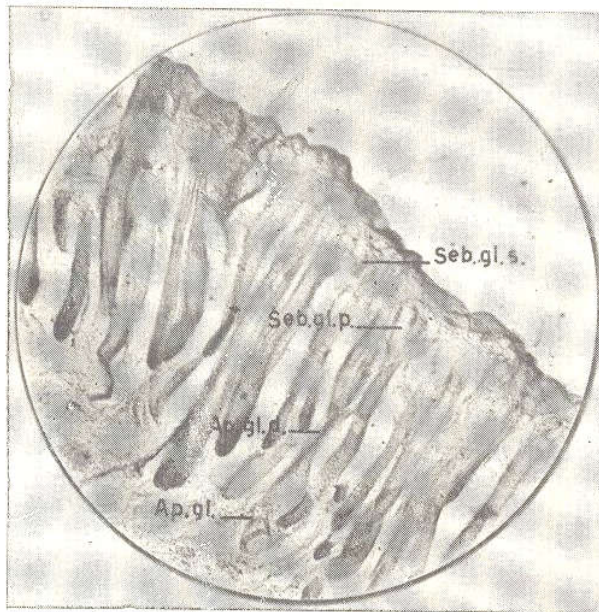


PLATE 10.—Vertical section of skin at one day old in the Barki sheep ($\times 88$).

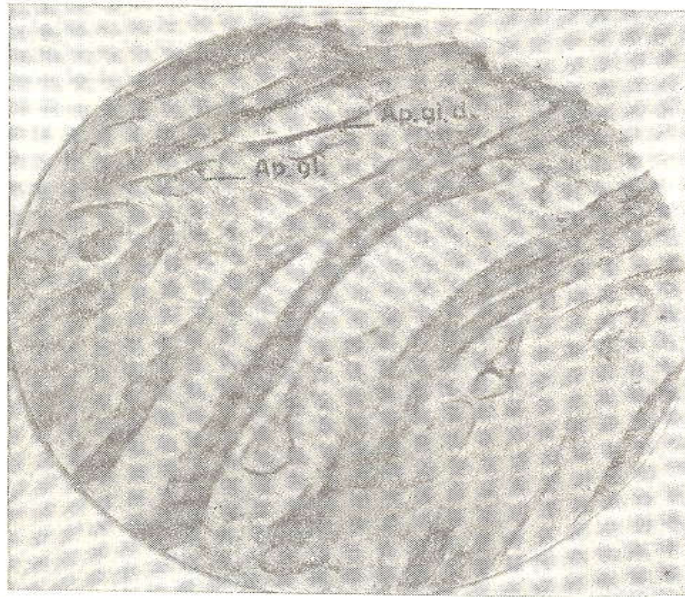


PLATE 11.—Vertical section of skin at six months old in the Barki sheep ($\times 88$).

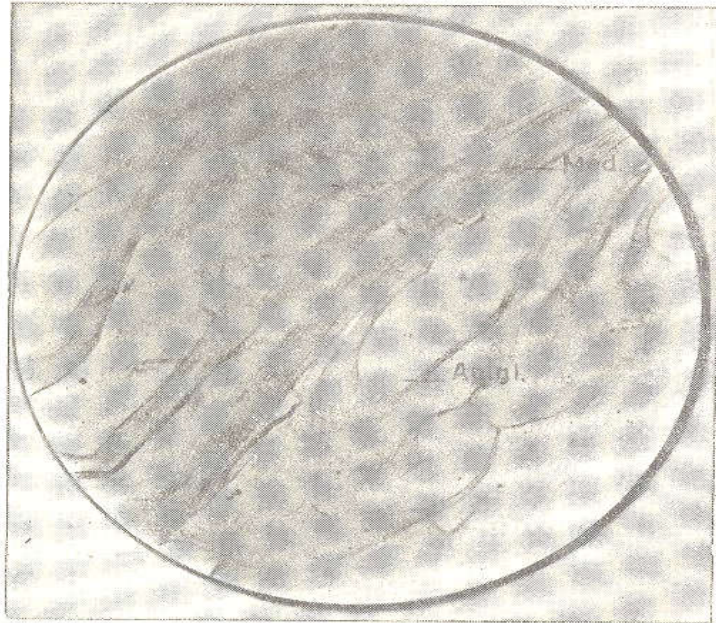


PLATE 12.—Vertical section of skin at twelve months of age in the Barki sheep ($\times 88$).

The apocrine glands were sac-shaped but more elongated in the Merino and Texel than in the Ossimi and Barki sheep at the early ages (Plates 1, 2, 3 and 4). At the later stages of age the glands became more elongated and very coiled in all the groups studied (Plates 5 - 12). The glands were nearly at the same level of the primary follicles bulb in the native sheep, while it extended lower than the follicle bulbs in the foreign sheep at all ages (Plates 1-12).

REFERENCES

- BURNS, M. AND CLARKSON, H. (1950). Some observations on the dimensions of follicles and of other structures in the skin of sheep. *J. Agric. Sci.* 39 : 315-334.
- MARAI, I.F.M. AND SHAFEL, M.M. (1964). The "Post-natal check" in the development of the wool follicles. *J. Anim. Prod. U.A.R.*, 4 (2) : 145-150.
- MARGOLENA, L.A. (1954). Sequence and growth of primary and secondary fibre follicles in Karakul sheep. *J. Anim. Sci.*, 13, 765-780.
- SHOLOHOV, V.A. (1944). Age variation of skin in Karakul lambs. C.R. (Dokl.) Acad. Sci. U.R.S.S. N.S., 49 : 393-395.
- (1945).—Age variation of the skin of Karakul sheep. C.R. (Dokl.) Acad. Sci. U.R.S.S. N.S., 49 : 58-61.

فدد وطبقات الجلد فى بعض أنواع الأغنام

المخلص

أوضحت الدراسات أن السمك الكلى للجلد وسمك معظم طبقاته المختلفه كانت أكبر فى حالة أغنام التكتسل عند الولادة عما فى أغنام المرينو والأوسيمى والبرقى - أما فى باقى الأعمار التى شملتها الدراسة فقد كانت الظواهر المذكورة أكبر فى الاغنام المحلية عما فى الأغنام المستوردة .

هذا وقد كانت الغدد الدهنية ذات شكل مخروطى كما كانت عريضة ونهاياتها أقل تدبياً فى أغنام التكتسل والمرينو عما فى أغنام الأوسيمى والبرقى - أما فيما يتعلق بالغدد العرقية فقد كانت ذات شكل كيسى فى كل أنواع الأغنام المحلية ولو أنها كانت أكثر استطالة فى حالة أغنام التكتسل والمرينو وذلك عند الولادة ، وفى الأعمار المتأخرة التى درست وجد أنها كانت أكثر استطالة وأكثر التفافاً فى مجموعات الاغنام . هذا وقد كانت هذه الغدد تمتد فى جلد أغنام الأوسيمى والبرقى الى مستوى بصيلات جيوب الصوف - أما فى أغنام المرينو والتكتسل فقد كانت تمتد الى مستوى أعمق مما ذكر وذلك فى جميع الأعمار .