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MORPHOLOGY OF THE SKIN IN LARGE WHITE YORKSHIRE PIGS

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ABSTRACT

Morphology of the skin in Large White Yorkshire pigs was studied using 12 animals of six to ten months of age. Skin of male animals was slightly thicker than that of the females. Maximum thickness for the skin, epidermis and dermis was noticed in the snout region and the minimum in the ventral abdominal region. Skin was thicker on the dorsal surface of the body than on the ventral surface. Maximum fat thickness was at the neck dorsal region minimum in the snout, dorsal nasal and carpal regions. Density of hair distribution was more in the male animals than the females. Maximum hair density was noticed in the dorsal nasal region and the carpal region.

Key words: Pigs, Skin, Regional Morphology

INTRODUCTION

Skin is the largest and the heaviest organ in the body. It is the barrier as well as the principal organ of communication between the animal and its environment. Important researches on the skin are going on in the fields of pathology, medicine, surgery and cosmetic industry. Thus it makes necessary to find a suitable experimental model to be used in research studies on human skin. Therefore, it is important to realise the remarkable similarities and significant differences existing between the skin of pigs and human beings. According to Montagna and Lobitz (1964), the skin of pig has a remarkable number of focal specialisations, the most significant being the snout. The reported differences in the skin of pig include the presence of a unique interfollicular muscle layer, presence of apocrine sweat glands, considerably less vascularity and a thicker stratum corneum (Monteiro-Riviere and Stromberg, 1985). 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 utilise the skin from swine, a thorough knowledge of its morphology is essential. Hence, the present work was undertaken to study the morphology, morphometry and the distribution of hair on the skin of different body regions in Large White Yorkshire pigs.

MATERIAL AND METHODS

Morphological and histological studies were conducted on the skin of Large White Yorkshire pigs of six to ten months of age. Skin samples from eight body regions were collected from 12 animals (six each from either sex) from the Meat Technology unit of Kerala Agricultural University, Mannuthy. Skin samples of 2 cm^2 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 centimeter area was also recorded. The skin samples were cut into smaller pieces of 2mm thickness and fixed in 10 percent neutral buffered formalin. The tissue pieces were processed in high melting paraffin (melting point, 58-60^{o}C).

Paraffin sections of 4 to 5 ìm thickness were taken for histological studies. 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 was analysed statistically (Snedocor and Cochran, 1985) to find out the relationship, if any between different parameters.

RESULTS AND DISCUSSION

The skin of Large White Yorkshire pigs was white with creased surface. Montagna and Lobitz (1964) opined that when shaved, the creased skin surface of pig resembled that of man. Even though the entire skin was white, areas of black spots could be seen occasionally. In general, skin of male animals was slightly thicker than that of the females. When compared using Student's-t-test, there was no significant difference in the skin thickness of males and females except in the dorsal nasal region. Yagci *et al.* (2006) observed that skin thickness was higher in male White New Zealand rabbits than in the females.

Thickness of the skin varied considerably in different regions of the body. Maximum thickness was noticed in the snout region with an average value of 6.43 ± 0.06 mm in female pigs and 6.58 ± 0.08 mm in males. Minimum thickness was noticed at the ventral abdominal region, which measured 2.15 ± 0.07 mm in females and 2.52 ± 0.14 mm in males (Table1). In general, skin was thicker on the dorsal surface of the body than on the ventral surface. Snout showed the maximum thickness followed by the dorsal nasal area, carpal, dorsal neck, dorsal abdomen, lateral abdomen, ventral neck and the ventral abdomen regions. This is in accordance with the findings of Montagna and Lobitz (1964). Smith and Calhoun (1964) observed that the porcine skin was thickest over the dorsal surface of the body and on the lateral surface of the limbs, which gradually became thin towards the ventral side of the body and medial surface of the limbs.

Skin was composed of the superficial epidermis and the deeper dermis. Both the layers were thickest in the snout region, that too in the male pigs. Contrary to this, Smith and Calhoun (1964) reported that the skin of the snout region in females was thicker than that of the male animals.

Beneath the dermis, the subcutaneous tissue was massively infiltrated with adipose tissue to form the panniculus adiposus. Subcutaneous fat layer was slightly thicker in females. Thickness of the subcutaneous fat layer in different body regions varied considerably. It was very thin at the snout region, dorsal nasal region and the carpal region. Maximum thickness was noticed in the dorsal neck region and was 25.98 ± 0.72 mm (Table. 1). Subcutaneous fat layer was thicker in the dorsal neck, ventral neck, ventral abdomen, lateral abdomen and dorsal abdomen regions.

In the snout region, subcutaneous fat was relatively less and was formed of connective tissue fibres and cutaneous muscle bundles (panniculus carnosus). Cutaneous fascia was pale, thin and closely adherent to the skin. Presence of strands of striated muscle in the skin of the neck and face as muscles of expression is reported in human beings by Urmacher (1990). The subcutaneous fat was diffusely arranged between the dermis and underlying muscle tissue. It measured 0.98 ± 0.06 mm and 0.90 ± 0.02 mm in females and males, respectively.

In case of dorsal neck and dorsal and lateral abdominal regions, subcutaneous fat layer was found

Table 1: The skin thickness, subcutaneous fat thickness and hair distribution of the different body regions of the pigs

Sl. No.	Body regions	Skin thickness (mm) Mean ±S.E.		Subcutis fat thickness (mm) Mean ±S.E.		No. of hairs per cm^2 Mean ±S.E.	
		Female	Male	Female	Male	Female	Male
1	Snout	$6.43\pm0.06^{a}{}_{ns}$	$6.58\pm0.08^{a}{}_{ns}$	$0.98\pm0.06^{e}{}_{ns}$	$0.90\pm0.02^{d}{}_{ns}$	$8.17\pm0.47^{d}{}_{ns}$	$9.67\pm0.70^{c}{}_{ns}$
2	Dorsal nasal	$4.00\pm0.07^{bc}{}_{**}$	$4.31\pm0.05^{b}{}_{**}$	$1.50\pm0.11^{e}{}_{ns}$	$1.48\pm0.12^{d}{}_{ns}$	$58.00\pm2.33^{a}{}_{ns}$	$61.50\pm2.60^{a}{}_{ns}$
3	Neck dorsal	$3.73\pm0.10^{bc}{}_{ns}$	$3.71\pm0.09^{c}{}_{ns}$	$25.93\pm0.99^{a}{}_{ns}$	$25.98\pm0.72^{a}{}_{ns}$	$18.67\pm1.16^{b}{}_{ns}$	$22.17\pm1.23^{b}{}_{ns}$
4	Neck ventral	$2.72\pm0.26^{d}{}_{ns}$	$2.63\pm0.10^{d}{}_{ns}$	$12.27\pm0.29^{d}{}_{ns}$	$11.32\pm1.28^{c}{}_{ns}$	$12.67\pm0.29^{cd}{}_{*}$	$14.00\pm0.31^{c}{}_{*}$
5	Abdomen dorsal	$3.68\pm0.09^{bc}{}_{ns}$	$3.72\pm0.11^{c}{}_{ns}$	$20.70\pm0.91^{b}{}_{ns}$	$19.92\pm0.65^{b}{}_{ns}$	$18.00\pm1.07^{b}{}_{ns}$	$21.17\pm1.23^{b}{}_{ns}$
6	Abdomen lateral	$3.53\pm0.05^{e}{}_{ns}$	$3.65\pm0.07^{c}{}_{ns}$	$14.88\pm0.80^{c}{}_{ns}$	$13.52\pm1.07^{c}{}_{ns}$	$17.00\pm1.14^{bc}{}_{ns}$	$19.67\pm0.91^{b}{}_{ns}$
7	Abdomen ventral	$2.15\pm0.07^{e}{}_{ns}$	$2.52\pm0.14^{d}{}_{ns}$	$12.58\pm0.86^{d}{}_{ns}$	$13.38\pm1.28^{c}{}_{ns}$	$11.83\pm0.27^{d}{}_{ns}$	$12.83\pm0.41^{c}{}_{ns}$
8	Carpal	$4.15\pm0.24^{b}{}_{ns}$	$4.28\pm0.10^{b}{}_{ns}$	$1.60\pm0.11^{e}{}_{ns}$	$1.60\pm0.12^{d}{}_{ns}$	$56.50\pm2.25^{a}{}_{ns}$	$59.00\pm2.64^{a}{}_{ns}$

$P < 0.01$, significant at 1% level. Means having same superscript are not significantly different in different body regions (ANOVA).

ns - Non significant difference between male and female pigs

* Significant at 5 per cent level

** Significant at 1 per cent level (Student's-t-test)

as a separate sheet under the dermis. Moreover, in the dorsal and lateral abdominal regions, the fat was occasionally arranged in two layers. The panniculus adiposus of swine was pronounced in the trunk region as compared to the extremities which provided insulation. According to Vardaxis *et al.* (1997), both human and swine relied on fat and not on fur or hair for insulation and fat layer was pronounced in swine. Large blood vessels supplying the subcutaneous tissue were grossly visible in certain regions. A thin muscular layer was interposed between the layers of fat in the lateral abdominal area. In the ventral neck and abdominal regions, the subcutaneous fat was arranged loosely in small lobules.

Hair was sparsely arranged in the swine when compared to other domestic animals. The number as well as size of hair varied from region to region. Straight stiff guard hairs, the bristles, provided the hair coat. Longer ones were seen in the neck and abdominal regions. Compared to the ventral and lateral body regions, lengthier ones were found on the dorsal aspect. The hair arrangement was simple, but grouping of hairs was evident. Snout region lacked hair on the rostral region. Density of hair distribution was more in the male animals than the females (Table. 1).

Maximum number of hairs was present in the dorsal nasal region (61.50 ± 2.60 per sq. cm) and the carpal region (59.00 ± 2.64 per sq. cm). The number of hairs at the ventral abdomen, ventral neck, lateral abdomen and dorsal abdomen was 12.83 ± 0.41, 22.17 ± 1.2, 19.67 ± 0.91 and 21.17 ± 1.23 per sq. cm, respectively. Number of hairs was more in males compared to the female animals. In general, density of hair distribution increased from the ventral side to the lateral and was maximum at the dorsal surface of the body.

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