Vol. XII (3-4), 1975

INFLUENCE OF AGE ON POPULATION AND DIAMETER OF FOLLICLES IN SALT RANGE LAMBS FROM BIRTH TO ONE YEAR.

Abdur Rehman, M. Jamil Qureshi and M. D. Ahmad*

An investigation was conducted to determine the influence of age on follicle population, type of follicle and diameter in Salt-Range lambs during the first year of their life. Samples from four randomly selected lambs were taken from the shoulder region at birth and each month thereafter till the age of 12 months. The number of primary follicles was highest at birth and decreased with advancing age. The mean secondary follicle population was minimum at birth. It increased upto third month of age and started decreasing gradually thereafter. The follicle diameter showed great variation at different ages. The diameter of primary and secondary follicles was minimum at birth and increased with the increase in age of the lamb.

INTRODUCTION

There are sixteen breeds of sheep found in Pakistan. Among them the Salt Range breed constitute 16 per cent of total sheep population and is important due to its wool and mutton qualities. Wool is one of the World's most valuable animal fibre and its unique characteristics have enabled it to hold its prestigeous place among all types of fibres. The research studies indicate that there is a great variation in number of fibres per unit area of skin among different breeds of sheep. The primary units from which wool fibres emerge are the follicles. They are of two types viz. primary and secondary follicles and are arranged in groups in a characteristic fashion (Wildman and Carter, 1939). Carter (1943) found that primary follicles have developed during the 35th to 85th day of prenatal life while the secondary follicles develop thereafter. At birth all the primary follicles and a small proportion of secondary follicles had reached maturity. Burns (1949) studied the follicle density and the ratio of secondary to primary follicles. He observed that ratio changed significantly with age, rising to a maximum of 6.6 in Romney

*Faculty of Animal Husbandry, University of Agriculture, Lyallpur.

lambs at three months age and then falling to 5.9 at nine months. This fall in secondary-primary ratio might be due to the degeneration and disappearance of some of the secondary follicles These types of follicle have different percentage in different breeds and are held responsible for the production of coarse and fine wool fibres. To improve the production of wool quantitatively and qualitatively, it is obligatory to study the wool bearing capacity of different breeds of sheep found in Pakistan. The present study was thus planned to find out the sequence of changes in follicle number, type and diameter from birth to one year of age at monthly intervals in Salt Range breed of sheep.

MATERIALS AND METHODS

This study was conducted on four randomly selected Salt Range lambs born at Livestock Experiment Station, University of Agriculture, Lyallpur during 1967. The samples of skin were taken from the shoulder region once at birth and each month thereafter. These samples were processed for studying the density of follicle population and measurement of their diameters.

The area of about two square inches was tatooed at the shoulder of each experimental animal for biopsy. The wool from the area was first clipped with fine hand clippers and then cleaned with a sharp razor. Skin sample was taken with the help of a biopsy punch with a diameter of one centimeter. The excision of each sample was done in such a way that the whole circumference of the cutting edge of biopsy punch rested gently on the surface of released skin. With a firm and moderate pressure one half twist of the punch in either direction was usually sufficient to cut through the whole skin thickness upto the dermal fascia. The skin samples were then removed from the cutaneous muscle lying underneath it and placed in properly labelled wide mouthed stoppered bottles containing about 10–15 ml of 5 per cent neutral formal-saline solution and shaken well to ensure thorough immersion in the fixative. These were kept for 48 hours. After fixation, the tissue was dehydrated in various grades of alcohol, cleared in Xylol and impregnated with paraffin for 6 hours at 52°C. Each skin sample was individually embedded in paraffin using brass moulds. The disc of the skin was pressed flate in a molten mixture under small piece of glass applied to the subcutaneous surface and held firmly until sufficient cooling had occured to hold epithelial surface securely against the plate to avoid folding or shrinkage of skin sample. Transverse serial sections were cut about six to eight micron in thickness with the help of microtome. These sections were floated on

water at 40°C and mounted on alluminized slides and dried at 45°C for 24 hours. The slides were stained by using a tripple staining method involving Mayer's haemalum, eosion and picric acid (Carter and Clarke, 1957).

Counting and measurement of follicles was made using "Liesagang" Projector and lens focused to give a magnification of 10,000. The projector was adjusted so that 100 square centimeter was equal to one square millimeter of the stained sections. Squares of 10 x 10 centimeters were marked on the screen. Six such squares were randomly selected for the data of primary and secondary follicle population. The follicle associated with accessory structures i. e. sweat gland, sebaceous gland, arrector pili muscle were classed as the primary follicles and the rest classed as secondary follicles. The average counts of primary and secondary follicles of each sample were multiplied by a correction factor described by Carter and Clarke (1957) to reduce the population estimate to those normally existing in the original living skin at the time of biopsy. This factor also corrected the number for shrinkage which normally occur in the specimen during processing. This corrected number of follicles per square milimerer was then multiplied by 100 to have value per square centimeter area. The diameter of primary and secondary follicles was measured from cross sectional tracings of 50 primary and 50 secondary follicles taken at random from each sample. These were focused at 10,000 magnification so that one millimeter of the magnified image was equal to 10 micron of the thickness of actual follicle and diameter was measured by transparent footrule from one edge of the follicle to the other.

RESULTS AND DISCUSSION

A. Follicle Population :

The average population of primary and secondary follicles found at various ages has been presented in Table 1.

The average number of primary follicles at birth was 1481.9 per square centimeter whereas at the age of 12 months, they were 458.5 per sq. cm. The maximum number was observed at birth, while the minimum number was recorded at eleventh month of age (1481.9 vs 430.9 per sq. cm.) The differences among the age groups were highly significant (Table 2). The differences in the number of follicles were more marked during the first three months of age. When compared with five and six months age groups,

TABLE 1. *Average population and diameter of primary and secondary follicles per square centimeter of skin at various ages in Salt Range lambs*

Age in months	Follicle population (per sq. cm.)			Follicle Diameter (microns)	
	Primary	Secondary	Total	Primary	Secondary
0 (birth)	1481.99	182.90	1664.90	55.90	37.51
1 month	968.75	260.40	1229.15	88.96	43.26
2 months	799.80	283.65	1083.45	95.29	45.32
3 "	664.95	302.25	967.20	107.60	45.76
4 "	595.20	299.15	894.35	108.57	48.45
5 "	567.30	282.10	849.40	108.52	49.57
6 "	540.95	251.10	792.05	115.02	50.09
7 "	511.50	246.45	757.95	117.72	48.97
8 "	497.55	243.35	740.90	117.70	52.21
9 "	496.00	255.75	751.75	115.68	50.82
10 "	457.25	230.95	688.20	117.20	52.32
11 "	430.90	221.60	652.50	116.89	51.90
12 "	458.80	201.50	660.30	118.35	53.61

TABLE 2. *Analysis of variance for primary and secondary follicles in Salt Range Sheep.*

Source of variation	d. f.	Mean squares of			
		Follicle population		Follicle diameter	
		Primary	Secondary	Primary	Secondary
Sheep	3	19706	4593	3.2	8.9
Periods	12	1709519**	25866**	1254.4**	80.7**
Error (Sheep x Period)	36	5558	1101	13.9	7.9

three months old animals had significantly higher number of follicles. The differences among seven months to 12 months age groups were statistically non-significant, though the number decreased with the advancing age. The follicle population per sq. cm. area of skin decreased fairly rapidly from birth to six months of age. This was due to the normal skin expansion accompanying growth. Thereafter rate of decline decreased and it was observed that the population remained nearly constant from nine months to twelve

months of age. The observations of the present study are in close agreement with the findings of Carter (1943). He noted that all the primary follicles and a small proportion of secondary follicles reached maturity at birth. The change in density, thereafter, merely reflected upon the normal skin expansion accompanying growth. Schinckel (1954) reported that the large sized animal at birth had a greater total number of primary follicles than small sized animals. However, the findings of this study are not in line with those reported by Burns (1949) who observed that the development of primary follicles appeared to be completed by the third month of postnatal life which might be due to breed differences.

The average number of secondary follicles from birth to 12 months of age range from 182.90 to 302.25 (Table 1). The maximum number was recorded at three months (302.25) while the minimum was noted at birth. The number of secondary follicles increased upto the age of three months and decreasd thereafter steadily till the age of twelve months when the number was reduced to 201.50 per sq. cm. It was observed in this study that the development of secondary follice population was completed by the 3rd month of age. The results of this study did not agree with those of Margolena (1954) who stated that the secondary follicles mature to its maximum at 7 to 21 days after birth. Another study on fat tailed revealed that the number of secondary follicles per unit area increased up to 45 days of postnatal life and decreased subsequently.

B. Follicle Diameter :

The average follicle diameter of primary and secondary follicles from birth to 12 months age has also been presented in Table 1. The diameter of primary follicles ranged from 55.90 microns at birth to 118.35 microns at 12th month. Significant differences between the diameter of primary follicles were noticed among various age groups (Table 2). There was significant increase in diameter from birth to three months. The increase in diameter during fourth and fifth month was non-significat but differed significantly from those recorded from 6th to 12th months of age.

The diameter of secondary follicles at different ages had a range from 37.51 to 53.61 microns (Table 1). The statistical analysis revealed highly significant differences among various age groups. The diameter was minimum at birth and increased with the increase in age. The results obtained for diameter of primary and secondary follicles were similar to the findings of Schinckel (1957) and Raevaskaja (1958), which indicated that the

coarse birth coat was associated with increase in variability of fibre diameter and decrease in crimp rate.

LITERATURE CITED

Burns, M. 1949 Studies of follicle population in relation to fleece changes in lambs of the English Leicester and Romney breeds. *J. Agr. Sci. 39* 64–79.

Carter, H.B. 1943. Studies in the biology of skin and fleece of sheep. Coun. Sci. Industr. Res. Aust. Bull. 164. (vide *Aust. J. Res.* 6 : 68-75).

Carter, H.B. and W. H. Clarke, 1957. The hair follicle group and skin follicle population of some non Merino breeds of sheep. *Aust. J. Agr. Res. 8 :* 109-119.

Margolena, L.A. 1954. Sequence of growth of primary and secondary fibre follicles in Karakul sheep. *J. Anim. Sci. 13 :* 765–780.

Raevskaja, V.V. 1958. Changes with age in wool quality and the histological structure of the skin in fine wooled precocatype sheep, *Sbdn. Trud. Harlkovsk. Zooteh. inst. 10* (1958) : 263-269. (vide. Anim. Breed. Abst. 30 : 309, 1962).

Schinckel, P. G. 1954. The relationship of skin follicle development to growth rate in sheep. *Aust. J. Agr. Res. 6 :* 308-323.

Schinckel, P. G. 1957 The relationship of lamb birth coat to adult fleece structure in a strain of Merino sheep. *Aust. J. Agr. Res. 9* : 567–577.

Wildman, A. B., and H. B. Carter 1939. Fibre follicle terminology in the mammalia. *Nature* (Lond.), *144* : 783.