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HISTOLOGICAL AND MORPHOLOGICAL CHANGES IN THE SKIN AND COAT OF BARKI LAMBS AS AFFECTED BY SALINE WATER AND GROWTH PROMOTER

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ABSTRACT

This study was carried out to investigate the effect of saline water and flavomycin as a growth promoter on the wool follicle activities and some wool characteristics in Barki sheep. Forty ram lambs 6 months old and 26.0 Kg live body weight were divided into four groups, ten animals each. Group (1), as a control group, group (2), treated with saline water, group (3), treated with flavomycin at a level of 20 mg/h/day, and the fourth (4) was given saline water and flavomycin. All groups were fed on a basal diet to cover their requirements.

Treatments continued for six months. Wool follicles' activities were measured using skin sections and wool samples were taken to study some wool characteristics from the animals.

The group treated with saline water showed a highly significant increase in the external diameter of primary follicles, but there were no significant differences in the external diameter of secondary follicles. Saline water had no effect on internal diameter of primary follicles, while it had highly significant effect on that of secondary follicles. Wall thickness exhibited highly significant differences due to salinity in both primary and secondary follicles.

Treatment with flavomycin had no effect on the external diameter of primary follicles, but had a highly significant effect on external diameter of secondary follicles. Internal diameter showed significant differences due to flavomycin in both primary and secondary follicles. Wall thickness in primary follicles showed no significant differences, while in secondary follicles the effect of flavomycin was highly significant.

Saline water and flavomycin had no significant effect on fiber diameter, staple length, and greasy fleece weight in treated animals. Medullation and Kemp percentages showed significant differences due to saline water and flavomycin.

It was concluded that both saline water and flavomycin had some effects on activities of wool follicles and some fleece characteristics. However, these treatments need to be applied for a longer time to ensure their effects on the successive fleeces.

Keywords: sheep, growth promoter, saline water, wool and skin characteristics.

INTRODUCTION

Sheep on desert ranges are exposed to numerous stresses, including heat, shortage of food, scarcity of water and water salinity. El-Sherif and El-Hassanein (1996) affirmed that long term administration of saline water decreased growth rate and final body weight of Barki ram lambs. Wool coat is not only utilized as a textile fibre, but also plays an important role in protecting

sheep from the extremes of climatic and environmental conditions. Hence, wool improvement is a vital objective to increase economic benefits from sheep production. Flavomycin was reported to increase daily gain in sheep (Murray *et al.*, 1992; Paitil *et al.*, 1996 and Martini *et al.*, 1996), in addition to significant improvement in feed conversion efficiency during the growth period of lambs (Rogers *et al.*, 1991, El-Basiony, 1994, El-Sherif *et al.*, 2001). As well, it changes the pattern of volatile fatty acids production in favor of propionate, which being energetically more efficient to the animal and reduces the requirements for amino acids in gluconeogenesis (Casson *et al.*, 1986). MacGregor and Armstrong (1984) found that the glycopeptide's antibiotic avoparcin increased the absorption of amino acids from the small intestine. Since wool is chemically a protein, the effect of antibiotic growth promoters is expected to be very important for wool production. Rowe *et al.* (1982) suggested that the action of flavomycin on wool production was mainly post ruminal. Antibiotic growth promoters proved to affect wool production through increasing activity of wool follicles (Abdou *et al.*, 2002). Moreover, flavomycin proved to act as antistressor (Davey, 1980). This antibiotic growth promoter proved to reduce salt stress in rabbits (El-Sherif *et al.*, 2002 and Mohamed, 2003).

The aim of the present study was to determine the response of wool growth in terms of skin histology, fiber diameter and fleece weight in Barki lambs to the inclusion of antibiotic growth promoter flavomycin in the diet under the effect of saline load.

MATERIALS AND METHODS

This study was carried out at Maryout Research Station of the Desert Research Center, located 35 km south west of Alexandria (Latitude 31.02N, longitude 29.80E). Forty Barki ram lambs averaging 26.038 ± 0.798 kg live body weight and 186.1 ± 2.102 days old were divided into 4 groups. Two groups drank fresh tap water (505 ppm TDS), and the other two groups drank saline water (12499 ppm TDS), which was obtained by diluting seawater with tap water in the ratio of 1:2, respectively. The electrolyte contents as ppm were measured by means of an electrical conductivity apparatus (Table 1). This level of salinity was considered as the maximum salt tolerance level for sheep (Peirce, 1966). Seawater was collected weekly from EL-Agamy shore, Alexandria in clean plastic tanks.

Table (1): Total dissolved solids (TDS) and some elements in different types of water (in part per million, ppm)

Type of water	TDS	Na^+	K^+	Mg^+	Cl^-
Tap water	505	180	11	19	220
Sea water	36480	12000	550	1312	13165
Diluted water	12499	4122	191.9	453	4532

From each water type category one group was offered flavomycin at the level of 20 mg/h/d, (Flavomycin was provided by Hoechst, Western Germany), while the other one had no additives. Water was available to the

animals to drink *ad libitum* twice or 3 times daily. The levels of feeding were given according to Kearl (1982) to cover nutritional requirement of 100 g gain/day. All groups were given the concentrate mixture and berseem hay (*Trifolium alexandrium*) at a ratio of 1:1 of TDN. The concentrate portion consisted of barley grains and concentrate feed mixture (CFM) at the ratio of 1:3, respectively. The CFM consisted of cotton seed cake 50%, wheat bran 18%, yellow maize 15%, rice polish 11%, molasses 3%, limestone 2%, and common salt 1%. Actual feed intake was measured and samples of different diet ingredients were collected and analyzed according to A.O.A.C. (1980). Chemical composition of different diet ingredients is presented in Table (2). The level of requirements was adjusted continuously according to the changes in live body weight. Animals were housed in shaded pens (4.5 X 5.5 meters) that were roofed with asbestos sheets at the height of 3 - 3.5 meters.

Table (2): Chemical composition of feed ingredients as fed to animals

Item	DM%	OM	CP	CF	EE	Ash	NFE
		% of DM					
CFM	84.85	92.40	13.91	12.11	2.99	7.60	63.39
Barley grains	87.65	95.55	9.11	6.631	1.92	4.45	78.21
Berseem hay	90.65	85.57	12.31	28.31	2.19	14.43	42.76

DM%= dry matter percentage, OM= organic matter, CP= crude protein, CF= crude fibres, EE= ether extract, NFE= nitrogen free extract

Histological traits:

Skin and wool samples were collected from the mid side region of randomly chosen five experimental animals from each group. Samples were taken at the start of applying the treatments at August 2000, thereafter at February 2001 when the animals became nearly 12 months old. At this age, wool follicles are known to attain maximum growth and maturity (Gurgis *et al.*, 1981). Skin samples were fixed in 10% formalin, then embedded in paraffin wax, sectioned at 6-8 µm thickness and stained with Haematoxylin and Eosin (Drury and Wallington, 1980). The histological measurements included the external and internal diameters of both primary and secondary wool follicles. The follicle wall thickness was calculated. A total of 739 primary follicles and 2142 of secondary follicles were measured.

Fibre diameter:

Wool samples were used to measure fibre diameter and the percentages of medullated and Kemp fibres. Three hundred snippets from each sample were used to measure these traits. The fibres were mounted in paraffin oil and spread on a microscope slide using the method suggested by El-Gabbas (1998). Fibre diameter was estimated using the image Analyzer (Video Pro, Leading Edge Ltd. S. Aust.). While measuring the fiber diameter, the numbers of medullated and Kemp fibres were estimated, and their percentages were calculated.

Greasy fleece characteristics:

The treatments lasted to August 2001 for evaluating their effects on the physical characteristics of the first fleece. The greasy fleece weights were estimated for the experimental animals, which became 18 months of age.

Average staple length of 10 staples from each fleece was estimated without stretching using a ruler to the nearest 0.5 cm.

Statistical analysis:

SAS software was used (SAS, 1998) for statistical analysis of the data according to 2x2 factorial design ((two water types (fresh and salt water) and two levels of the growth promoter (20 mg/h/d flavomycin and 0 mg/h/d flavomycin)).

RESULTS

1. Histological parameters:

1.1. Primary follicles:

Table (3) showed that the highest (P<0.01) overall mean of the external diameter of primary follicles (124.7µm) was that of the animals that drank saline water (SW). The highest mean (135.2µm) was that of the animal group which drank SW and had flavomycin (FL). At the end of measurements, the animals received SW without FL for six months showed lower (P<0.01) external diameter (114.3µm) than that of the control group (120.6µm), which received fresh water (FW). The trend was reversed by adding flavomycin, resulting in significant interaction. Figures (1 and 3) demonstrated histologically the effect of SW on this parameter. Results in Table (3) showed insignificant differences in the internal diameter due to type of water.

Table (3): Average values (means ± SE) of external and internal diameters (EXT and INT) and wall thickness (WT) in µm of the primary follicles as affected by type of drinking water and adding flavomycin

Parameter	Stage[1]	Water type	Flavomycin level		Overall	SE		
			NF	FL		SW	FL	W X F
EXT	At start	FW	92.5±4.31	76.7±4 61	**84.6±3.15**	1.10 **	1.10 ns	1.56 **
		SW	95.4±4.31	103.8±4.61	**99.6±3.15**			
	Overall		**94.0±3.05**	**90.2±3.26**				
	At end	FW	120.6±3.52	110.2±3.26	**115.4±2.40**			
		SW	114.3±3.85	135.2±4.06	**124.7±2.80**			
	Overall		**117.4±2.61**	**122.7±2.60**				
INT	At start	FW	59.2±2.65	46.7±2.83	**52.9±1.94**	0.68 ns	0 68 **	0.96 **
		SW	52.1±2.65	63.3±2.50	**56.3±1.94**			
	Overall		**55.6±1.87**	**53.6±2.00**				
	At end	FW	64.4±2.16	56.9±2.00	**60.7±1.47**			
		SW	67.3±2 37	63.7±2.50	**65.5±1.72**			
	Overall		**65.9±1.60**	**60.3±1.60**				
WT	At start	FW	33.3±3.47	30.0±3.71	**31.7±2.54**	0.89 **	0.89 ns	1 253 ns
		SW	43.3±3.47	43.3±3.71	**43.3±2.54**			
	Overall		**38.3±2.46**	**36.7±2.62**				
	At end	FW	56.1±2.83	53.3±2.62	**54.7±1.93**			
		SW	47.0±3.11	71.5±3.27	**59.2±2.26**			
	Overall		**51.6±2.10**	**62.4±2.10**				

1= the stage of measurements, SE = standard error, W X F = interaction water type x flavomycin level, * = P<0.05, ** = P<0.01, ns = insignificant

Figure (1): Cross section in the skin of Barki ram lambs of the control group showing the primary follicles (PF), secondary follicles (SF), wool fibre ((medulla (M), cortex (C), external diameter (EX), internal diameter (ID), outer root sheath (ORS)) and accessories of PF ((sweat gland (SW), sebaceous gland (Sb), erector pili muscle (E)), [H. & E. X120]

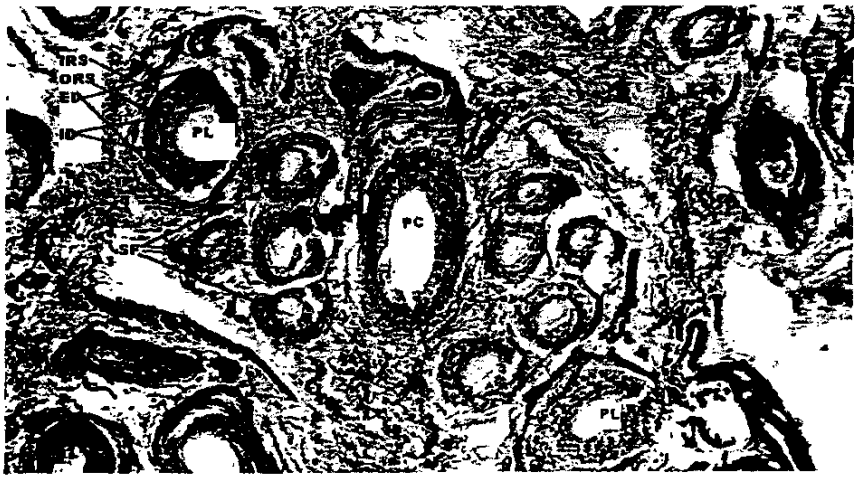

Figure (2): Cross section in the skin of Barki ram lambs of the flavomycin group showing the primary central follicles (PF), secondary follicles (SF), wool fibre ((medulla (M), cortex (C), external diameter (EX), internal diameter (ID), outer root sheath (ORS)) and accessories of PF ((sweat gland (SW), sebaceous gland (Sb), erector pili muscle (E)), [H. & E. X120]

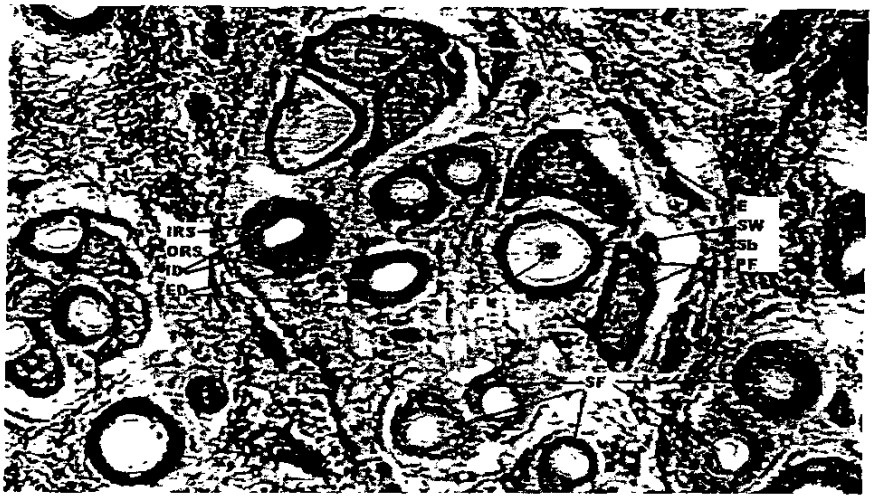

Figure (3): Cross section in the skin of Barki ram lambs showing the effect of saline water on the dimensions of the primary follicles (PF) associated with [sweat gland (SW), sebaceous gland (Sb), erector pili muscle (E)], secondary follicles (SF), and the structures of follicle (inner root sheath (IRS), outer root sheath (ORS), wool fibre (F), external diameter (ED), internal diameter (ID), [H. & E. X120]

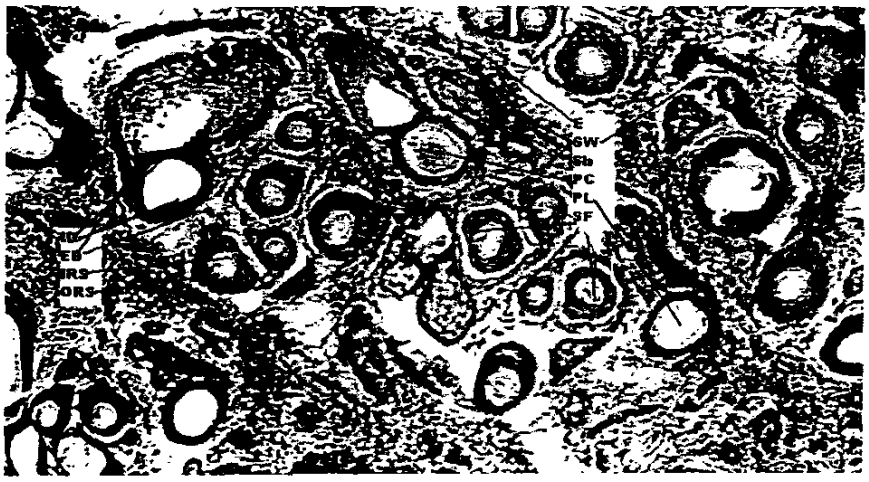

Figure (4): Cross section in the skin of Barki ram lambs showing the effect of saline water and flavomycin treatment on the dimensions of the primary follicles (PF) associated with [sweat gland (SW), sebaceous gland (Sb), erector pili muscle (E)], the secondary follicles (SF), and the structures of follicle (inner root sheath (IRS), outer root sheath (ORS), external diameter (ED), internal diameter (ID), [H. & E. X120]

The wall thickness of primary follicles was affected significantly (P<0.01) by the type of drinking water. Overall means demonstrated that animals which received SW had higher thickness (59.3μm) than those received FW (54.7μm). However, animals that drank FW had more increase (23.1μm) by the end of measurements than those received SW (15.9μm). The low rate of increase in the wall thickness of the primary follicles due to drinking SW might result from the increase in water intake and body fluids with high portion as intracellular fluid according to El-Sherif and El-Hassanein (1996), resulting in a hydraulic pressure inside the follicles.
Flavomycin administration affected significantly (P<0.01) the internal diameter of primary follicles. By the end of measurements, the animals received FL had lesser internal diameter (60.3μm) than those had not (65.9μm). The higher external diameter beside the lesser internal diameter by administration of FL for six months yielded higher, but insignificant, wall thickness (62.4 vs. 51.6μm). Generally, both FL and SW increased the activity of primary follicles as indicated by increasing the follicles' dimensions.

1.2. Secondary follicles:

Table (4) showed that the SW did not affect significantly the external diameter of the secondary follicles. The internal diameter showed highly significant differences (P<0.01) due to the type of drinking water in spite of the similar overall means at the end of measurements.

Table (4): Average values (means ± SE) of external and internal diameters (EXT and INT) and wall thickness (WT) in μm of the secondary follicles as affected by type of drinking water and adding flavomycin

Parameter	Stage[1]	Water type	Flavomycin level		Overall	SE		
			NF	FL		SW	FL	W X F
EXT	At start	FW	56.0±1.24	49.6±1.42	**52.8±0.94**	0.321 ns	0.321 **	0.454 ns
		SW	45.6±1.26	45.9±1.21	**45.8±0.87**			
	Overall		**50.8±0.88**	**49.8±0.93**				
	At end	FW	*60.7±0.99*	*57.1±0.90*	***58.9±0.67***			
		SW	52.1±1.10	59.7±1.22	**55.9±0.82**			
	Overall		**56.4±0.74**	**58.4±0.76**				
INT	At start	FW	34.6±1.04	27.1±1.19	**30.8±0.79**	0.270 **	0.270 **	0.383 **
		SW	23.3±1.06	23.7±1.02	**23.5±0.73**			
	Overall		**28.9±0.74**	**25.4±0.78**				
	At end	FW	32.7±0.83	32.5±0.72	**32.6±0.56**			
		SW	30.8±0.92	34.3±1.03	32.5±0.69			
	Overall		31.8±0.62	33.4±0.64				
WT	At start	FW	21.4±0.83	22.4±0.95	21.9±0.63	0.215 **	0.215 **	0.304 **
		SW	22.3±0.84	22.4±0.81	22.3±0.58			
	Overall		21.8±0.59	22.4±0.62				
	At end	FW	28.1±0.66	24.6±0.60	26.3±0.45			
		SW	21.2±0.73	25.4±0.82	23.3±0.55			
	Overall		24.6±0.49	25.0±0.51				

1= the stage of measurements, SE = standard error, W X F = interaction water type x flavomycin level, * = P<0.05, ** = P<0.01, ns = insignificant

The treated animals demonstrated more increase in the internal diameter from start to the end of measurements (from 23.5 to 32.5 μm), as compared

with those of the non-treated animals (from 30.8 to 32.6μm). This leads to a decrease ($P<0.01$) in the wall thickness of the secondary follicles for the animals that drank SW, which might be due to the increased intracellular fluids as demonstrated in the primary follicles.

Flavomycin affected significantly ($P<0.01$) all the dimensions of the secondary follicles (Table 4). From the start to the end of measurements, the treated animals showed a greater increase in overall means of the external and internal diameters from 49.8 to 58.4μm and from 25.4 to 32.4μm, respectively. The non-treated animals showed less increase from 50.8 to 56.4μm and from 28.9 to 31.8μm, respectively.

The wall thickness of the secondary follicles showed also significant differences due to flavomycin. The highest mean (28.1μm) was that of the control group, in which the animals drank FW and had no FL (NF). By the end of experiment, adding FL to the animals that drank SW resulted in an increase in wall thickness from 22.4μm to 25.4μm. Animals that drank SW without FL showed a decrease from 22.3 to 21.2μm. This made significant ($P<0.01$) interaction between water type and flavomycin.

2. Wool physical characteristics:

Flavomycin had no effect on fibre diameter. Similarly, Abdou *et al.* (2002) reported that the flavomycin did not affect fiber diameter in Barki ewe lambs. As well, the treatment with flavomycin did not affect the percentage of Kemp fibers where there was no significant difference between the treated and non-treated groups. Table (5) also showed that neither saline water nor flavomycin affected staple length and greasy fleece weights. In agreement, Abdou *et al.* (2002) found that antibiotic growth promoters had no significant effect on the weight of the first fleece. Murray *et al.* (1992) reported an increase in wool growth by 14.5% through using flavomycin, but only in adult sheep. It seemed that antibiotic growth promoter might require prolonged administration to exert an effect on fleece weight.

Drinking SW resulted in significant decrease in the percentages of Kemp and medullated fibres (Table 5). No much data were encountered dealing with the effect of saline load on wool characteristics. Medullated fibres decreased ($P<0.05$) also by adding FL. However, the group that drank SW and had FL did not show augmented decrease in medullated fibres, which resulted in significant interaction between water type and flavomycin. These results meant that the parameters affecting wool manufacture characteristics were improved by treatments. Further statistical procedure was applied to find out the correlation coefficients between the most physical or follicular parameters affecting the medullated and Kemp fibres percentages (Table 6). Since these types of fibres are produced mainly from the primary follicles (Ryder and Stephenson, 1968), only the dimensions of these follicles were included beside fibre diameter and staple length. Significant positive correlation coefficients were found between staple length and both Kemp and medullated fibre percentages, which meant that as the length of staple decreased these percentages decreased.

Table (5): Average values (means ± SE) of fibre diameter µm (FD), medullated fibres % (MD), Kemp fibres % (K), stable length cm (STL) and greasy fleece weight kg (GFW) as affected by type of drinking water and adding flavomycin

Parameter	Stage[1]	Water type	Flavomycin level		Overall	SE		
			NF	FL		SW	FL	W X F
FD	At start	FW	27.3±1.48	29.2±1.48	28.2±1.05	0.523 ns	0.523 ns	0.740 ns
		SW	35.5±1.48	30.0±1.48	32.8±1.05			
	Overall		31.4±1.05	29.6±1.05				
	At end	FW	36.3±1.48	34.1±1.48	35.2±1.05			
		SW	32.5±1.48	38.9±1.48	35.7±1.05			
	Overall		34.4±1.05	36.5±1.05				
MD	At start	FW	10.6±2.74	8.6±2.74	9.6±1.94	0.969 *	0.969 *	1.371 *
		SW	8.2±2.74	13.4±2.74	10.8±1.94			
	Overall		9.4±1.94	11.0±1.94				
	At end	FW	30.0±2.74	8.4±2.74	19.2±1.94			
		SW	7.4±2.74	9.4±2.74	8.4±1.94			
	Overall		18.7±1.94	8.9±1.94				
K	At start	FW	5.2±1.94	5.8±1.94	5.5±1.37	0.686 **	0.686 ns	0.971 Ns
		SW	4.4±1.94	4.6±1.94	4.5±1.37			
	Overall		4.8±1.37	5.2±1.37				
	At end	FW	17.6±1.94	15.8±1.94	16.7±1.37			
		SW	2.4±1.94	8.8±1.94	5.6±1.37			
	Overall		10.0±1.37	12.3±1.37				
STL	At start	FW	6.4±0.79	6.6±0.79	6.5±0.56	0.280 ns	0.280 ns	0.396 Ns
		SW	7.0±0.79	6.6±0.79	6.8±0.56			
	Overall		6.7±0.56	6.6±0.56				
	At end	FW	12.4±0.79	9.2±0.79	10.8±0.56			
		SW	10.6±0.79	9 8±0.79	10.2±0.56			
	Overall		11.5±0.56	9.5±0.56				
GFW	At start	FW	2.98±0.343	3.38±0.343	3.18±0.243	0.243 ns	0.243 ns	0.343 Ns
		SW	3.10±0.343	2.86±0.343	2.98±0.243			
	Overall		3.04±0.243	3.12±0.243				

1= the stage of measurements, FD= Fiber diameter, MD= Medullated fibre, K= Kemp fibre, STL= Staple length, GFW= greasy fleece weight, FW= Fresh water, SW= Saline water, FL= Flavomycin, N= No flavomycin, SE= standard error, W x F= interaction water type x flavomycin level, * =P<0.05, ** = P<0.01, ns = insignificant.

Table (6): The simple correlation coefficients between the different parameters related to medullation of fibres

Parameter	MD	K	ED	ID	WT	FD	STL
MD	1.00	0.57 **	0.25 ns	0.17 ns	0.22 ns	0.23 ns	0.50 *
K		1.00	0.33 ns	0.06 ns	0.40 ns	0.42 ns	0.50 *
ED			1.00	0.70 **	0.90 **	0.78 **	0.67 **
ID				1.00	0.32 ns	0.46 ns	0.57 *
WT					1.00	0.76 **	0.54 *
FD						1.00	0.58 *

MD= medullated fibres, K= Kemp fibres, ED= external diameter of primary follicles, ID= internal diameter of primary follicles, WT= wall thickness of primary follicles, FD= Fiber diameter, MD= Medullated fibre, K= Kemp fibre, STL= Staple length, * =P<0.05, ** = P<0.01, ns = insignificant,

Table (5) demonstrated that staple length decreased insignificantly by drinking SW and adding FL. Moreover, staple length had significant positive correlation coefficients with all other parameters, which meant that these parameters could affect Kemp and medullation indirectly. For verification, these relations need to be tested on large number of animals. External diameter of primary follicles showed a high ($P<0.01$) correlation with internal diameter, wall thickness and fibre characteristics (fibre diameter and staple length). Wall thickness had a high correlation ($P<0.01$) with fibre diameter, but it had a medium ($P<0.05$) correlation with staple length.

DISCUSSION

Generally, flavomycin at a level of 20 mg/h/d resulted in increasing the internal diameter of the primary follicles alongside the internal and external diameters of the secondary follicles in the growing Barki ram lambs. Abdou *et al.* (2002) reported a significant increase in wall thickness of the primary follicles and in the inner diameter of the secondary follicles when the same level of flavomycin was given to the growing Barki ewe lambs. Murray *et al.* (1989) and Haimoud *et al.* (1996) reported that adding growth promoters to the diet increased the molar proportion of propionate in rumen fluid, which might support the wall thickness growth of the follicles. Abdel Azez *et al.* (2000) stated that wool growth fluctuated with varying levels of nutrition and this was seen in the variation in length and diameter of the wool fibres. Thus, the intake of energy and protein above that required for the maintenance led to the formation of body protein and enhancement of wool production. Active wool follicles were found to be always rich in carbohydrates (Montagna, 1956 and Matter *et al.*, 1998). By examining the concentration of carbohydrates in both primary and secondary follicles, Abdou *et al.* (2002) showed that primary follicles increased activity by flavomycin 20 mg and secondary follicles by monensin 20 mg. Flachovsky and Richter (1991) demonstrated that increasing propionate in the rumen fluids by adding antibiotic growth promoters was energetically more efficient to animals in performance and high productivity. Additionally, increased propionate by antibiotic feed additives was suggested to spare amino acids normally used for gluconeogenesis (Leng *et al.*, 1967) and stimulate body protein synthesis (Potter *et al.*, 1968). Abdou *et al.* (2002) found that adding flavomycin or monensin at the level of 20mg/h/d to the growing Barki ewe lambs resulted in higher protein contents in the primary follicles. Parmer *et al.* (1988) stated that the protein content was larger in the active follicle sheath probably due to the increased protein synthesis in the cellular proliferation.

As well, the changes in follicles' dimensions in the treated group could be histologically attributed to the morphological changes in the connective tissue sheath, which accompanied that of the follicles during the activity periods. Montagna and Ellis (1958) stated that during follicle activity, the outer root sheath showed an increase in its thickness due to large number of cell layers leading to relatively large fibers. They demonstrated that in case of inner root sheath the only difference between small and large follicles

seemed to be in the size of Henle's and Huxley's layers' cells and the inner root sheath cuticle.

It is worth noting that, the thickness of the primary follicles was greater than that of the secondary ones. This might be due to the greater thickness of the outer root sheath and the number of cell layers constituting it, which can be explained by the greater activity in this layer during growth leading to relatively large fibre. This is in accordance with the findings of Mahgoub *et al.* (1974) and El-Sayed *et al.* (1999).

In conclusion, saline water and growth promoter (flavomycin) had an effect on the activities of wool follicles, but did not affect the amount of wool produced. The role of antibiotic growth promoters in increasing follicle's dimensions and contents of carbohydrates and proteins might improve the fibre characteristics such as fibre strength rather than increasing fleece weight or staple length. In addition, decreasing the percentages of medullated and Kemp fibres by FL or SW might indicate enhancement of the manufacture characteristics of wool, which needs more investigations. Moreover, these treatments must be administered for longer periods to investigate their effect on the successive fleeces. It is expected to hold more effect of growth promoters when animals became adults as shown by Murray *et al.* (1992).

REFERENCES

A. O. A. C. (1980). Association of Official Analytical Chemists. Official Methods of Analysis, 13th Ed. Washington D.C.

Abdel Aziz, N.M.; H.M. El-Gabbas; M.M. Abdelsalam and E.M. AL-Betar (2000). The responses of some factors and nutritional stresses on objective and subjective wool traits of some Egyptian breeds of sheep.

Abdou, Aisha, S.; M.M. EL-Ganaieny; A.H. Hammam and M.M.A. EL-Sherif (2002). Some characteristics of wool follicles and fibres in yearling Barki ewes as affected by addition of growth promoters to the diet. J. Agric. Sci. Mansoura Univ.; 27(3): 1427-1440.

Casson, P.A.; P.J. Murray and J.B. Rowe (1986). Increasing rumen propionate production in sheep using the ionophore lasalocid: Effect on glucose production. Proc. Nutr. Soc. Aust.; 11:122.

Davey, L.A. (1980). The rational use of feed additives in animal production. 31st Hahrestagung der Europaischen Vereiningung fur Tierzucht, 1-4 September, 1980, Munchen, Germany. Pp: 1-9.

Drury, R. A. E. and E. A. Wallington (1980). Carleton's histological technique 4th Ed. Oxford, New York, Toronto, Oxford University press.

El-Basiony, A.Z. (1994). Performance of growing lambs and buffalo calves given flavomycin as a feed supplement. Annals of Agricultural Science, Moshtohor; 32: 4, 1791-1800.

El-Gabbas, H.M. (1998). Wool fibre diameter and its distribution in Barki sheep with regard to the sampling positions and seasons. Egyptian J. Anim. Prod.; 35 (2): 123-141.

EL-Sayed, N.A.; F.A. ELSamannoudy; Sohair. A. ELkawy; Aisha. S. Abdou (1999). Studies on skin histology and some physiological traits in goats under desert conditions. Desert Inst. Bull., Egypt; 49 (1): 65-96.

El-Sherif, M.M.A. and..El-Hassanein E.E. (1996). Influence of drinking saline water on growth and distribution of body fluids in sheep. Alex. J. Agric. Res.; 41(3): 1-9.

EL-Sherif, M.M.A.; E.E. Tharwat; S.O. Amin; M.M.E. Ahmed and A.H. Hammam (2001). Effect of high level of feeding and growth promoters on thermal balance and growth performance of Barki ewe lambs under northwestern desert conditions. J. Envir. Sci.; 2: 323-352.

EL-Sherif, M.M.A.; S.M. El-Tantawy; A.M. Atta and A.M. Hassan (2002). Hematology, growth performance, and reproductive traits of rabbits as affected by saline water and addition of growth promoter. Egyptian Journal of Rabbit Science; 12(2): 165-186.

Flachovsky, G. and H. Richter (1991). Influence of flavomycin on apparent digestibility of nutrients in sheep, parameters of rumen fermentation in cattle as well as feed intake and daily weight gain heifers. Arch. Anim. Nutr.; 41: 303-310.

Gurgis, R.A.; S.O. Amin; Y.S. Ghanem and N.A. El-Sayed (1981). Post-natal development, dimension and birthcoat follicular origin in Barki and 3/8 Merino lambs. Journal of Agricultural Science, Cambridge; 96: 313-320.

Haimoud, D.A.; C. Bayourthe; R. Moncoulon, M. Vernay (1996). Avoparcin and monensin effect on digestive function in cows fed a high forage diet. J. Sci. FD Agric.; 70: 181-189.

Kearl, L.C. (1982). Nutrition requirements of rumination in developing countries, section International Feedstuffs Institutes UTAH State University, LOGAN, UTAH, USA. Pp. 45-58.

Leng, R.A.; J.W. Steel and J.R. Luick (1967). Contribution of propionate to glucose synthesis in sheep. Biochem. J.; 103: 785.

MacGregor, R.C. and D.G. Armstrong (1984). The feed antibiotic avoparcin and net uptake of amino acids from the small intestine of sheep. Can. J. Anim. Sci.; 64(suppl.): 134-135.

Mahgoup, A.E.; M.F.A. Fahmy and Y.S. Ghanem (1974). A histological study of the skin of some breeds of sheep. 1- Layers of the skin. The Egyptian Vet. Med. J. Faculty of Veterinary Medicine, Cairo University. VoL. XXII, No. 22.

Martini M.; P. Verita; F. Cecchi and D. Cianci (1996). Monensin sodium use in lambs from the second week of life to slaughter at 105 days. Small Ruminant Research; 20 (1):1-8.

Matter, F.E.; M.M. EL-Ganaieny; N.A. Shawky and A.S. Abdou (1998). Seasonal variations and wool follicles of Barki sheep raised under desert conditions in Egypt. Desert Inst. Bull., Egypt; 48 (2): 385-407.

Mohamed, Amal M.H. (2003). Some physiological and productive effects of promoting growth in rabbits drinking natural saline water. Ph. D. Thesis, Fac. Agric. Cairo Univ.

Montagna, W. (1956). The structure and function of the skin. Academic press, New York. P: 65.

Montagna, W. and R.A. Ellis (1958). The biology of hair growth. Academic press. New York. P: 65.

Murray, P.J.; S.G. Winslow and J.B. Rowe (1992). Conditions under which flavomycin increases wool growth and live weight gain in sheep. Aust. J. Agric. Res.; 43(2): 367-377.

Murray. P.J.; J.B. Rowe and E.M. Aitchison (1989). Effect of flavomycin and dietary protein on wool growth. Proc. Nutr. Soc. of Australia; 14: 140.

Paitil N.V.; G.B. Deshumkh; J.D. Hanmode; D.H. Rekhate; R.C. Takarkhede (1996). Effect of monensin on growth rate of Malpura lambs. Livestock Adviser; 21(5): 3-10.

Parmer, M.L.; R.D. Sinha; G. Prasad and J. Prasad (1988). Histochemical studies on hair follicles, and sebaceous and sweat glands in goat. Indian Journal of Animal Science; 58: 789-795.

Peirce, A.W. (1966). Studies on salt tolerance of sheep. VI. The tolerance of weather in pens for drinking water of the types obtained from underground water sources in Australia. Aust. J. Agric. Res.; 17: 209.

Potter, E.L.; D.B. Purser and J.H. Cline (1968). Effect of various energy sources upon plasma free amino acids in sheep. J. Nutr.; 95: 665.

Rogers, M.; J.P. Jouany; P. Thivend and J.P. Fontenot (1991). Comparative effects of feeding and duodenal infusion of monensin on digestion in sheep. Canadian Journal of Animal Science; 71 (4): 1125-1133.

Rowe, J.B.; J.S.W. Morrell and A.W.J. Broome (1982). Flavomycine as a ruminant growth promoter-investigation of the mode of action. Proc. Nutr. Soc.; 41: 56 A.

Ryder, M.L. and S.K. Stephenson (1968). Wool Growth. Academic Press Inc. (London) Ltd. New York.

SAS (1998). SAS procedures guide release 6.12 TS level 0020. SAS Institute Inc. Cary. NC. USA.

دراسات هستولوجية و مورفولوجية على الجلد و غطاء الجسم في الأغنام تحت ظروف استخدام الماء المالح و منشطات النمو

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أجريت هذه التجربة لدراسة تأثير استخدام الماء المالح و منشط النمو (فلافوميسين) على نشاط بصيلات الصوف و بعض الصفات الطبيعية لصوف الأغنام البرقى. استخدم فى التجربة ٤٠ حيوان ذكر من أغنام البرقى متوسط وزنهم ٢٦ كجم و متوسط أعمارهم ٦ شهور قسمت إلى ٤ مجاميع، كل مجموعة عشرة حيوانات.

المجموعة الأولى استخدمت كمجموعة مقارنة ولم تأخذ معاملات . بينما المجموعة الثانية عوملت بالماء المالح والمجموعة الثالثة تم معاملتها بمنشط النمو الفلافوميسين(٢٠ملجم/راس/يوم) .أما المجموعة الرابعة فتمت معاملتها بالماء المالح وكذلك الفلافوميسين . تمت تغذية كل الحيوانات لتغطية احتياجاتها بالكامل. استمرت التجربة مدة ٦ شهور.

أظهرت النتائج أن للماء المالح تأثيرا معنويا على القطر الخارجى للبصيلات الأولية، بينما لم يظهر أى تأثير على القطر الخارجى للبصيلات الثانوية. وعلى العكس القطر الداخلى للبصيلات الأولية لم يتأثر بالماء المالح بينما كان له تأثير معنوى على القطر الداخلى للبصيلات الثانوية. كان للماء المالح تأثيرا معنويا على سمك جدار كلا البصيلات الأولية والثانوية.

لم تظهر المعاملة بمنشط النمو (فلافوميسين) تأثيرا معنويا على القطر الخارجى للبصيلات الأولية ولكن كان له تأثير معنويا على القطر الخارجى للبصيلات الثانوية. كان للمنشط تأثيرا معنويا على مستوى (٥%) على القطر الداخلى للبصيلات الأولية ولكن كان له تأثيرا معنويا على مستوى (١%) على القطر الداخلى للبصيلات الثانوية. لم تظهر المعاملة بالمنشط تأثير معنوي على سمك جدار البصيلات الأولية بينما كان معنويا على سمك جدار البصيلات الثانوية.

الماء المالح ومنشط النمو لم يظهرا أى تأثير معنوى على قطر الليفة وطول الخصلة ووزن الجزة الخام فى الحيوانات المعاملة. بينما ظهر تأثير كلا منهما المعنوى على نقص نسبة الألياف ذات النخاع وألياف الكمب.

أستنتج من الدراسة أن شرب الماء المالح وإضافة منشط النمو الفلافوميسين لهما تأثير على نشاط بصيلات الصوف و لكن لم يؤثرا على كمية الصوف المنتج، وقد يكون لهما تأثير ايجابى على صفات الصوف ذات الأهمية فى الصناعة مثل انخفاض نسبة الألياف ذات النخاع وألياف الكمب. كما أن النتائج المتحصل عليها تدعو لاستمرار دراسة هذين العاملين لفترات أطول وعلى الجزات المتتالية حيث يمكن حدوث تأثيرات أكبر عند وصول الحيوانات لعمر النضج.