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THE PATTERNS OF SHEEP' MUSCLE WEIGHT GROWTH

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Abstract:

The intensity of sheep' muscle growth is divided into three groups: slow-growing, moderately growing and rapidly growing; weight and size of muscle fibers depends on functional activity. At the same time, the literature does not sufficiently cover the issues of weight growth of muscles and separate muscles. To achieve this goal, the carcasses obtained for dissection were carefully removed from the irrigation fat, then the muscles on the left side of each carcass were dissected. Each muscle was released from fat and then weighed with its tendons. In the process of dissection the muscles were divided in accordance with the biological division of muscles of the axial and peripheral parts of the skeleton. As for the muscles of the axial skeleton, the longest, widest, thoracic surface, thoracic deep muscles and the rest of the axial skeleton musculature were studied. The peripheral part of muscles was divided into the muscles of the thoracic limb (double-headed, three-headed, abutment, radial, patella, finger flexors and extensors and the rest of the thoracic limb musculature) and pelvic limbs (tensor fascia of the thigh, double-headed, gluteus, semi-tendinous, semi-membranous paliperidonesee, quadriceps, adductor, triceps tibia, fibula, finger flexors and extensors and the rest muscles of the pelvic limbs). The analysis of the materials at the time of lambs' birth showed that the degree of limb muscles development (to the weight of adults) was higher (12.11%) than the muscles of the trunk (10.57%).

After birth, the muscles of the body increases more vigorously (growth coef. 9,460) than the muscles of the limbs (growth coef. 8,260), as a result, the degree of development at the age of 13 months was higher in the first (89,96 %) than in the second (86,17%). The relative muscle mass of the axial skeleton increases on average by the age of 13 months and reaches to a maximum 61.99 % of the total muscle mass, while the muscles of the peripheral part decreases and reaches a minimum with 38.01% by this age.

Key words: *musculature, two-headed, three-headed, abutment, radium, scapula, finger flexors and extensors and the rest of the musculature of the thoracic limb*

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INTRODUCTION:

The ultimate goal of the livestock industry is the rapid and efficient production of muscle tissue relatively free from adipose tissue. As the biological mechanisms involved in embryonic and postnatal muscle development play an important role in the final volume of muscle tissue, as well as in the efficiency and speed of its growth, it is important to know more about these mechanisms and the factors that control them at different stages of development [1].

The establishment of growth regularities of individual parts of the body, tissues, systems and organs of farm animals in different periods of individual development allows to reveal the nature of these animals and to identify the relationship between the degree of development of certain tissues and economically useful features [2,3,4,5,6,7,8,9,10]. In connection with this, the comparative morphological studies of animals in different age periods are becoming more relevant.

Many researchers were interested in questions of breed and age morphology of sheep of various breeds and hybrids [11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22].

The growth rates of individual muscle groups are different: in the post-embryonic period: the most intensive growing belongs to the muscles of the trunk and pelvic limbs, the muscles of the thoracic limbs grow less intensively, so the relative weight of the first increases with age, the latter, on the contrary, falls. In sheep, the intensity of muscle growth is divided into three groups: slow-growing, moderately growing and rapidly growing; weight and size of muscle fibers depends on functional activity.

The function changing in the process of individual life of animals causes changes in the length and thickness of the fibers, their grouping, the nature of muscle attachment to the bones, the amount of connective tissue.

At the same time, the literature does not sufficiently cover the issues of weight growth of muscles and individual muscles.

MATERIALS AND METHODS OF RESEARCH:

The irrigation fat was carefully removed from the carcasses obtained for dissection, then the muscles on the left side of each carcass were prepared. Each muscle was released from fat and weighed with its tendons. During cutting, the carcass was covered with fresh steamed skin, which protected it from cooling.

The anatomical research technique was adopted. In the process of dissection the muscles were divided in accordance with the biological division of the muscles of the axial and peripheral parts of the skeleton.

As for muscles of the axial skeleton, the longest, widest, thoracic surface, thoracic deep muscles and the rest of the musculature of the axial skeleton were studied.

The muscles of the peripheral skeleton, in its turn, was divided into the muscles of the thoracic limb (double-headed, three-headed, osteal, abound, radial, scapular, finger flexors and extensors and the rest musculature of the thoracic limb) and the pelvic limb (fascia tensor of the thigh, double-headed, gluteus, semi-tendon, quadriceps, adductor, three-headed of calf, tibia, thumbs flexors and extensors and the rest of the muscles of the pelvic limb). The muscle tissue of the whole carcass, including the diaphragm and muscles of the head were also taken into account.

THE RESEARCH RESULTS AND THEIR DISCUSSION:

The analysis of the received materials showed (tab. 1) that at birth, the mass of the muscles of the axial skeleton exceeded that of the peripheral by 36.4% and the proportion of the first relatively to the second was greater by 15.4%. But this ratio changed at the age of 4 months, as the intensity of growth during the suction period in the musculature of the axial skeleton was much higher than the peripheral part (table. 2.3). In addition, the absolute weight gain per day in axial muscles was on average by 64.0 % higher than that of the peripheral.

During the suction period, the rate of weight growth of the axial muscles exceeded those of the entire musculature, while the peripheral lagged, this had a significant impact on the mass of the muscles of both parts, increasing the difference to 58.5%, moreover the proportion of the axial skeleton muscles increased by 3.61%.

Table 1. The Muscle Mass of the Axial and Peripheral Parts of the Skeleton (According to the Average Data)

Age, months	Musculature, in total, kg	Including the Skeleton Muscles			
		Axial		Peripheral	
		kg	%	kg	%
At birth	1,546	0,892	57,70	0,654	42,30
4	8,507	5,216	61,31	3,291	38,69
8	8,953	5,371	60,00	3,582	40,00
13	12,246	7,591	61,99	4,655	38,01
18	13,840	8,438	60,97	5,402	39,03

Table 2. The Intensity of Muscles' Weight Growth of Both Parts of the Skeleton (According to the Average Data)

Indicators	Muscle Parts	Age, months					In total for 18 months.
		At birth	4	8	13	18	
Growth rate	Axial	1	5,848	1,030	1,413	1,112	9,460
	Peripheral	1	5,032	1,088	1,300	1,160	8,260
Average daily growth, g	Axial	1	34,6	1,3	15,1	5,4	13,8
	Peripheral	1	21,1	2,4	7,3	4,8	8,7
Precocity, %	Axial	10,57	61,82	63,63	89,96	100,0	
	Peripheral	12,11	60,92	66,31	86,17	100,0	
The muscles and skeleton mass ratio	Axial	2,954	3,761	3,340	3,805	3,637	
	Peripheral	1,643	2,429	2,462	3,035	2,900	

Table 3. The Coefficient of Muscles and Separate Muscles' Weight Growth (According to the Average Data)

Indicators	Age, months				
	At birth	4	8	13	18
Axial musculature	1	5,848	6,021	8,510	9,460
Peripheral musculature	1	5,032	5,477	7,118	8,260
The musculature of the thoracic limb	1	4,214	4,514	5,914	7,156
The musculature of the pelvic limb	1	5,516	6,046	7,830	8,912
Axial skeleton's muscles: the longest muscle of the back	1	6,750	7,141	10,817	11,740
the broadest back muscle	1	6,130	5,347	6,964	8,080
the deep muscle of the chest	1	5,520	6,075	7,586	8,830
The muscles of the thoracic limb: double-headed muscle	1	4,264	4,566	5,377	7,491
three-headed muscle	1	4,450	4,708	6,407	7,109
bone muscle	1	4,927	5,135	7,247	8,202
warning muscle	1	5,264	5,777	6,845	8,338
radial muscle	1	3,314	3,395	4,000	4,930
finger flexors and extensors	1	3,720	3,761	4,587	6,028
scapular muscle	1	3,688	4,238	4,675	6,313
Pelvic limb muscles: gluteus muscle	1	7,316	7,460	9,497	12,283
semi-transversal muscle	1	6,034	6,273	8,402	9,754
quadriceps muscle	1	5,339	5,624	7,290	8,989
three-headed muscle	1	4,879	5,009	6,535	6,940
two-headed muscle	1	5,173	5,970	7,677	9,684
semi-tendinous muscle	1	6,365	7,341	9,881	12,349
adductor	1	6,053	6,219	9,044	10,535
finger flexors and extensors	1	4,240	4,552	5,688	6,526
the tensor of the thigh fascia	1	6,250	5,809	7,456	11,029
tibia muscle	1	4,250	4,579	5,579	7,132

Table 4. The Twice Relative Coefficient of Musculature Weight Growth and that of Separate Muscles (to the Mass of the Entire Muscle, According to the Average Data)

Indicators	Age, months				
	At birth	4	8	13	18
Axial musculature	1	1,063	1,040	1,074	1,057
Peripheral musculature	1	0,914	0,946	0,899	0,923
The musclature of the thoracic limb	1	0,766	0,779	0,747	0,799
The musculature of the pelvic limb	1	1,002	1,044	0,989	0,996
Axial skeleton's muscles: the longest muscle of the back	1	1,227	1,233	1,366	1,131
the broadest back muscle	1	1,114	0,923	0,879	0,902
the deep muscle of the chest	1	1,003	0,946	0,955	0,986
The muscles of the thoracic limb: double-headed muscle	1	0,775	0,778	0,679	0,837
three-headed muscle	1	0,809	0,813	0,809	0,794
bone muscle	1	0,776	0,887	0,915	0,916
warning muscle	1	0,957	0,996	0,864	0,931
radial muscle	1	0,602	0,586	0,505	0,551
finger flexors and extensors	1	0,676	0,649	0,579	0,673
scapular muscle	1	0,670	0,732	0,590	0,705
Pelvic limb muscles: gluteus muscle	1	1,329	1,228	1,199	1,372
semi-transversal muscle	1	1,096	1,083	1,061	1,090
quadriceps muscle	1	0,907	0,971	0,920	1,004
three-headed muscle	1	0,887	0,865	0,825	0,775
two-headed muscle	1	0,940	1,031	0,969	1,082
semi-tendinous muscle	1	1,157	1,263	1,247	1,379
adductor	1	1,100	1,074	1,142	1,177
finger flexors and extensors	1	0,771	0,786	0,718	0,729
the tensor of the thigh fascia	1	1,113	1,003	0,941	1,232
tibia muscle	1	0,772	0,791	0,704	0,797

In the age period from 4 to 8 months, there was a sharp reduction in the growth rate of muscles of both parts, and from 8 to 13 months, on the contrary, the intensity of growth increased again, especially in the axial part.

In the future, from 13 to 18 months, there was a natural increase in the absolute weight of the muscles of both parts, but with a lower intensity than in the previous period, and, in terms of growth, the peripheral part was ahead of the axial one.

For the entire period, from birth to 18 months, we mentioned a higher intensity of muscle growth of the axial part of the skeleton, in addition, its average daily growth was by 58.6% more than in the peripheral part.

The calculations of twice relative coefficients showed that during the whole period the weight growth of the axial musculature exceeded the growth of the entire musculature, while in the peripheral it lagged (table. 4).

These factors contributed to the preservation of the share of axial musculature at the level of 60.97% and the excess of its weight over the peripheral by 56.2% (table. 2). It should be noted that in newborn lambs in the prenatal period, the muscles of the peripheral part of the skeleton received the best development, so as its relative weight at the time of birth (in relation to the weight of 18-month-old) reached 12.11, while the musculature of the axial part – 10.57%. However, due to the higher rate of the axial skeleton muscles' development, its relative weight at the age of 13 months reached to 89.96%, which is by 3.79% more than that of the peripheral muscles.

The uneven growth of muscle and skeleton of both parts of the experimental young's carcasses reflected in their ratio. Per a unit of axial skeleton there were more muscles, than per a peripheral. In newborn lambs, this difference was 79.8% and was further changed due to uneven muscle and skeleton growth.

At the suction period, there was a natural increase in this coefficient in the axial part of the

musculature by 27.3 and peripheral – by 47.8%. Such a significant difference in the growth of the coefficient between the departments is due to the higher rates of growth of the bones of the axial skeleton (coef. of growth - 4.59) in this period than peripheral (3.41).

At the age from 4 to 8 months in the axial part of the carcass there was a decrease in this coefficient by 12.3%, while in the peripheral it increased by 1.4%, that can be explained by a decrease in the growth rate of the musculature of the axial part and the best growth of its skeleton. The rate of growth of the skeleton of the peripheral part, on the contrary, was lower than that of the corresponding muscles (coef. of growth, was respectively, 1,070 and 1,088).

The period from 8 to 13 months was favorable for the growth of peripheral musculature, but from 13 to 18 months there was a decrease in the growth rate by 4.6 - 5.2 %, which is associated with an increase in the growth rate of the skeleton of both parts of the skeleton in this period in comparison with the corresponding parts of the musculature.

CONCLUSION:

- to the time of lambs' birth, the degree of development of limb muscles (to the mass of adults) was higher (12.11%) than the muscles of the trunk (10.57%). After birth, the muscles of the body increases more vigorously (coef. growth 9,460) of the muscles of the limbs (cal. growth 8,260), as a result of this, the degree of development at the age of 13 months was higher in the first ones (89,96 %) than in the second (86,17%);

- the relative muscles mass of the axial skeleton increases on average by the age of 13 months and reaches a maximum - 61.99 % of the total muscle mass, while the muscles of the peripheral part decreases and by this age reaches a minimum - 38.01%.

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