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Dynamics Of The Development The Endocrine Glands Of Pigs Of Various Genotypes.

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ABSTRACT

The article presents data on the development and histological structure of the thyroid, goiter and adrenal glands of pigs of various breeds and hybrids, fattened to live weight of 100, 120 and 140 kg. It has been established that pigs of early maturing breeds, Duroc breeds and hybrids have better development and functional activity of endocrine glands, which contributes to an enhancement of metabolic processes in their bodies and increase of meat production.

Keywords: pigs, thyroid gland, thymus gland, adrenals, histological structure.

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INTRODUCTION

Currently, pig breeding is widely used hybridization with the use of specialized meat breeds of domestic and foreign breeding. However, the use of hybrid animals, characterized by increased early maturity and high meat qualities, along with positive results, give a number of negative consequences [1, 2, 3].

The increased stress-sensitivity of meat animals grown under industrial technology adversely affects the physicochemical and commodity-technological parameters of pork and is the cause of meat malformations-PSE (pale color, softness, and exudation) or DFD (excessively dark color, dryness, and stiffness). This confirms the need to further study the productivity, interior features, and quality of pork obtained from pigs of different breeds and hybrids [4, 5].

Humoral regulation of the activity of individual organs in the animal body is caused by the endocrine system - special glandular organs that produce biological highly active substances - hormones that enter the blood and are carried throughout the body, reaching the organs and tissues that are regulated by it. Hormonal regulation is primarily aimed at slow reactions in the body, so hormones have an important role in the regulation of slowly developing formative processes, as well as growth, reproduction, and metabolism [6-12].

The purpose of our studies was to study the development and histological structure of the thyroid, goiter and adrenal glands of pigs of various breeds and hybrids, fattened to a living weight of 100, 120 and 140 kg.

MATERIALS AND METHODS

Experimental studies were carried out on pigs of large white breed (CB), steppe type of early maturing breed (SM -1), Duroc (D) and hybrids obtained on their basis.

To study the development and functional activity of the endocrine glands, at the slaughter of 100, 120 and 140 kg, thyroid, thymus and adrenal glands were removed. The object of histological studies became the thyroid gland and adrenal glands.

RESULTS AND DISCUSSION

The results of our studies showed that the mass of the thyroid gland in all the experimental groups increases with increasing pre-bodily mass (Table 1).

Table 1: Thyroid mass of experimental pigs

Group	Genotype	When slaughtered with live weight, kg		
		100	120	140
I	Large white	5,62 ± 0,18	6,70 ± 0,22	7,54 ± 0,21
II	SM-1, steppe type	6,50 ± 0,19	7,67 ± 0,24	7,50 ± 0,23
III	Duroc	6,38 ± 0,22	7,42 ± 0,19	8,45 ± 0,20
IV	KB x SM-1 (CT)	6,69 ± 0,17	7,85 ± 0,20	7,72 ± 0,22
V	KB x D	6,62 ± 0,21	7,65 ± 0,25	8,86 ± 0,19
VI	SM-1 (ST) x D	6,72 ± 0,20	7,90 ± 0,23	8,77 ± 0,22

Among the studied breeds and hybrids the smallest absolute mass of the thyroid gland had animals of a large white breed. They yielded at the slaughter of 100 kg of live weight to the analogues of early maturing meat by 15.66%, and Duroc breeds by 13.52% (P <0.01), while slaughtering at 120 kg, respectively, by 14.48% and 10, 75% (P <0.05-0.001), with slaughter of 140 kg, respectively, at 12.73% and 12.07% (P <0.001).

Hybrid pigs in all weight categories outnumbered the thyroid gland of purebred animals. Thus, when slaughtering 100 kg of live weight, the hybrid gilt pigments of the IV, V, VI groups exceeded the analogues of the large white breed (group I) by this indicator by 19.07; 17.79; 19.57% (P <0.001), the steppe type of early ripening meat (group II) - 2.92; 1.85; 3.38%, duroc (III group), respectively, at 4.86; 3.76; 5.33%. When

slaughtering 120 kg of live weight, the hybrid pigs of the IV, V, VI groups exceeded the I group by 17.16; 14.18; 17,91% (P <0,01), and at slaughter in 140 kg accordingly on 15,65; 14.85; 15.92% (P <0.01). Between animals II, III and IV, V, VI, no statistically significant differences were observed.

Histological studies are of great importance in the study of endocrine glands. The results of our studies indicate that the pigs of a large white breed had a larger diameter of the follicles (Table 2).

Table 2: Histological structure of the thyroid gland

Group	Genotype	The diameter of the follicle, mkm	Height of follicular epithelium, mkm
When slaughtered with live weight of 100 kg			
I	Large white	104,89 ± 0,19	8,37 ± 0,11
II	SM-1, steppe type	94,32 ± 0,13	11,77 ± 0,12
III	Duroc	96,50 ± 0,14	11,42 ± 0,16
IV	KB x SM-1 (CT)	94,00 ± 0,15	12,08 ± 0,15
V	KB x D	93,09 ± 0,20	11,94 ± 0,18
VI	SM-1 (ST) x D	92,88 ± 0,17	12,80 ± 0,17
When slaughtered with live weight of 120 kg			
I	Large white	114,10 ± 0,14	9,61 ± 0,13
II	SM-1, steppe type	98,43 ± 0,16	11,50 ± 0,16
III	Duroc	101,97 ± 0,20	11,33 ± 0,13
IV	KB x SM-1 (CT)	100,55 ± 0,23	11,94 ± 0,23
V	KB x D	98,77 ± 0,25	12,06 ± 0,20
VI	SM-1 (ST) x D	97,80 ± 0,21	12,38 ± 0,19
When slaughtered with live weight of 140 kg			
I	Large white	118,67 ± 0,19	9,23 ± 0,16
II	SM-1, steppe type	100,24 ± 0,18	12,10 ± 0,20
III	Duroc	104,72 ± 0,23	12,00 ± 0,26
IV	KB x SM-1 (CT)	99,80 ± 0,17	12,44 ± 0,22
V	KB x D	99,25 ± 0,22	13,05 ± 0,19
VI	SM-1 (ST) x D	99,12 ± 0,27	13,10 ± 0,23

At slaughter in 100 kg of live weight they surpassed analogs II, III, IV, V, VI groups on this indicator on 11,21; 8.69; 11.58; 12.68; 12.93% (P< 0.01-0.001), with slaughter of 120 kg - by 14.75; 11.89; 13.48; 15.52; 16,67% (P< 0,01-0,001), at slaughter in 140 kg - on 18,39; 13.32; 18.91; 19.57; 19.72% (P<0.01-0.001).

In contrast, the height of the follicular epithelium was the smallest in animals of a large white breed and the largest in hybrid pigs. Animals of a large white breed were inferior in this ratio to their analogues of II, III, IV, V, VI groups, when slaughtering 100 kg of live weight by 3.04; 3.05; 3.71; 3.57; 4.43 mkm (P< 0.01), with slaughter of 120 kg - at 1.89; 1.72; 2.33; 2.45; 2.77 microns (P< 0.05-0.01), with slaughter of 140 kg - at 2.87; 2.77; 3.21; 3.82; 3.87 mkm (P< 0.01-0.001).

Histological studies have established that the diameter of the follicles and the height of the follicular epithelium of the thyroid gland increase with age in pigs of all experimental groups. This is due to the fact that the secret of the thyroid gland is formed in thyroid cells by the type of continuous mehrriane secretion. Simultaneously with the formation of a colloid, also continuously occurs and its release from the follicle. With reduced release of blood into the blood, when it is deposited in the form of a stock, the follicles become larger, and their epithelium is lower, which is typical for animals of large white breed. In hybrid pigs, the secret is intensively absorbed by the epithelium of the follicle, so they are smaller in size, they have little colloid, and epithelial cells are prismatic.

The host gland is a large body of internal secretion. Thymus gland functions only in young animals. This gland plays the role of a hemopoietic organ, lymphocytes multiply in it, in addition, it participates in the development of immunity.

Our studies have established that the mass of the thymus gland in all experimental groups increases with increasing pre-bodily mass (Table 3).

Table 3: Dynamics of the absolute and relative mass of the pigs' thymus gland

Group	Live weight, kg					
	100		120		140	
	absolute mass, g	relative mass, %	absolute mass, g	relative mass, %	absolute mass, g	relative mass, %
I	120,0±3,56	0,120	100,8±4,21	0,084	91,6±2,91	0,065
II	121,8±4,97	0,122	104,8±5,02	0,087	95,7±4,00	0,068
III	120,9±4,69	0,121	104,2±4,75	0,087	95,2±3,89	0,068
IV	122,0±5,00	0,122	105,0±5,10	0,087	96,1±4,00	0,069
V	121,9±4,06	0,122	104,8±6,00	0,087	96,9±3,33	0,069
VI	122,4±3,99	0,122	105,1±4,86	0,088	97,5±3,62	0,070

With age, the absolute and relative mass of the thymus gland decreases in pigs of all breeds and hybrids. The mass of the thymus gland at slaughter of 120 kg decreased, in comparison with slaughter in 100 kg, respectively in groups of 19.2; 17.0; 16.7; 17.0; 17.1; 17.3 g, and at the slaughter of 140 kg at 28.4; 26.1; 25.7; 25.9; 25.0; 25.1 g.

The highest mass of the thymus gland was in hybrid animals and in animals of ripening meat and Duroc breed, in all studied periods, and the smallest in animals of a large white breed. So animals II, III, IV, V, VI groups exceeded the analogues of group I in 100 kg of live weight by 1.8; 0.9; 2.0; 1.9; 2.4 g, in 120 kg of live weight - by 4.0; 3.4; 4.2; 4.0; 4.3 g, in 140 kg of live weight, respectively, by 4.1; 3.6; 4.5; 5.3; 5.9 g. The relative mass of the thymus gland was also greater in animals with higher meat qualities. However, the marked differences are statistically unreliable.

The adrenal gland secretes hormones that affect the intermediate metabolism of carbohydrates, proteins, fats, and minerals. The adrenal gland consists of two independent endocrine tissues - a cortical and brain substance.

The results of our studies showed that the weight of the adrenal glands in pigs of all experimental groups increases with age (Table 4).

Table 4: Dynamics of absolute weight of the adrenals of experimental pigs (n = 6)

Group	Genotype	When slaughtered with live weight, kg		
		100	120	140
I	Large white	4,07±0,03	4,28±0,07	4,66±0,08
II	SM-1, steppe type	4,25±0,02	4,60±0,08	4,88±0,07
III	Duroc	4,26±0,05	4,55±0,06	4,87±0,10
IV	KB x SM-1 (CT)	4,27±0,04	4,68±0,11	4,93±0,09
V	KB x D	4,26±0,03	4,65±0,07	4,90±0,09
VI	SM-1 (ST) x D	4,31±0,04	4,70±0,05	4,99±0,08

The greatest absolute mass of the adrenals among the breeds studied were animals of the steppe type of the early ripening meat and Duroc breed, and the smallest - the animals of a large white breed. Thus, the animals of groups II, III exceeded group I by slaughtering 100 kg of live weight by 4.42; 4.67%, with slaughter of 120 kg - at 7.48; 6.31% (P <0,01), at slaughter in 140 kg - on 4,72; 4.51% (P <0.01).

Hybrid animals had a somewhat larger mass of adrenals than animals of large white, C-1 (CT) and Duroc breeds. However, a statistically significant difference was noted between animals I and IV, V, VI groups. Thus, the hybrids of the IV, V, VI groups exceeded the purebred analogues of a large white breed by the weight of the adrenal gland in 100 kg of live weight by 4.91; 4.67; 5.9% (P <0.01-0.001), with slaughter of 120 kg of live weight, respectively, by 9.35; 8.64; 9.81% (P <0.001), with slaughter of 140 kg - at 5.79; 5.15; 7.08% (P <0.001).

Histological studies have shown that pigs of SM-1 and duroc meat breeds, as well as hybrids, have a higher thickness of the cortical layer and a smaller thickness of the adrenal medulla (Table 5)

Table 5: Thickness of the cortical and medulla of the adrenal glands, mkm (n = 6)

Group	Genotype	Cortical layer thickness	Thickness of the medulla
When slaughtered with live weight of 100 kg			
I	Large white	1224±0,11	1095±0,20
II	SM-1, steppe type	1282±0,14	1079±0,22
III	Duroc	1280±0,15	1075±0,28
IV	KB x SM-1 (CT)	1285±0,18	1074±0,25
V	KB x D	1280±0,20	1080±0,23
VI	SM-1 (ST) x D	1290±0,19	1058±0,25
When slaughtered with live weight of 120 kg			
I	Large white	1510±0,21	1240±0,23
II	SM-1, steppe type	1568±0,19	1199±0,21
III	Duroc	1567±0,20	1175±0,26
IV	KB x SM-1 (CT)	1582±0,25	1177±0,28
V	KB x D	1,576±0,18	1174±0,24
VI	SM-1 (ST) x D	1588±0,23	1162±0,28
When slaughtered with live weight of 140 kg			
I	Large white	1543±0,23	1322±0,29
II	SM-1, steppe type	1605±0,25	1280±0,026
III	Duroc	1615±0,27	1276±0,25
IV	KB x SM-1 (CT)	1610±0,29	1256±0,27
V	KB x D	1598±0,27	1240±0,31
VI	SM-1 (ST) x D	1622±0,24	1235±0,29

At slaughter in 100 kg of live weight of animals II, III, IV, V, VI surpassed on thickness of a cortical layer of adrenals of analogues of a large white breed on 58; 56; 61; 56; 66 mkm (P <0.01) and inferior in thickness of the medullar layer by 16; 20; 21; 15; 37, with slaughter of 120 kg, respectively - by 58; 57; 72; 66; 78 mkm (P <0.01) and at 59; 35; 37; 34; 22 microns, and at slaughter in 140 kg on 62; 72; 67; 55; 79 microns (P <0.01) and 42; 46; 66; 82; 87 mkm (P <0.01).

Of great theoretical interest is the study of the thickness of various zones of the cortical layer of the adrenals in pigs of different breeds and hybrids.

The results of our studies showed that animals of large white breed had the greatest thickness of the glomerular zone (Table 5). They also had the least output of meat in the carcass.

We have established a direct relationship between the thickness of the bundle zone of the cortical layer of the adrenals and the meat productivity of the pigs.

Thus, the early-ripened pigs of pigs exceeded in the thickness of the beam zone of their analogues of a large white rock by 47.49 mkm (P <0.001), and the Duroc breed at 46.29 mkm (P <0.01). Hybrid pigs of the IV, V, VI groups were highly reliable in this indicator of animals of a large white breed. Their superiority was 58.10; 55.57; 64.11 microns (P <0.001), respectively. On the thickness of the glomerular zone, the opposite picture was observed.

On the thickness of the reticular zone, the differences between the groups were insignificant and statistically unreliable.

CONCLUSIONS

On the basis of the conducted studies it can be concluded that pigs of the steppe type SM-1, Duroc breeds and hybrids have better development and functional activity of the endocrine glands (thyroid, goiter,

and adrenal), which enhances metabolic processes in their bodies and increases meat production.

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