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MORPHOLOGICAL AND BIOCHEMICAL PARAMETERS IN PIG BLOOD UNDER USE OF LG-MAX AND SEL-PLEX FEED ADDITIVES IN FEEDING

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Abstract. *The article presents scientific results of the determination of blood morphological and biochemical parameters in young pigs and fattening pigs under the use of the Lg-Max and Sel-Plex organic feed additives in the diet.*

The Lg-Max together with Sel-Plex feed additives was introduced as part of a premix to animal feed in the experimental group, taking into account the need of animals in ω-3 unsaturated fatty acids (a daily requirement for pigs in ω-3 is 672 mg, the experimental feed additive contains 353 mg of ω-3 in 1 g), and the preparation Sel-Plex – at a dose of 0.5 mg/kg.

According to the results of the study, it was found that the studied morphological parameters of pig blood were within physiological limits according to age.

Biochemical parameters of blood serum in pigs of the experimental group in comparison with the control of the corresponding age are in the following dynamics: in 45-day-old pigs, the concentration of globulins (α2-globulins and β-globulins) significantly increases and aspartate transaminase activity significantly decreases; in 120-day-old pigs, the content of total protein and magnesium significantly increases, cholesterol content and alkaline phosphatase activity significantly decrease; in 155-day-old pigs, the concentration of calcium significantly increases and the concentration of cholesterol significantly decreases.

Keywords: *young pigs, fattening pigs, blood morphological and biochemical parameters, natural feed additives*

Introduction

Omega-3 fatty acids are important to reduce the risk of cardiovascular disease, can have long-term effects on the immune system and bone health, reduce the risk of cancer and mental illness in humans. Unfortunately, the consumption of ω-3 fatty acids is insufficient for humans, especially for the population of most industrialized countries. At the same time, meat and meat products do not contain enough ω-3 fatty acids, and pork is no exception. Therefore, enriching pork with ω-3 fatty acids may be an effective way to increase ω-3 fatty acid intake and may improve the ratio of ω-6 to ω-3 fatty acids or the ω-3 index in health-conscious consumers (Huang et al., 2021).

Fatty acids are chemically short-, medium- and long-chain. Short- and medium-chain fatty acids are absorbed directly into the blood through the capillaries of the intestinal tract and pass through the portal vein, along with other nutrients. Fatty acids with longer chains are too large to get directly through the small openings of the intestinal capillaries. Instead, they are absorbed by the fatty villi of the intestinal wall and re-synthesized into triglycerides. Short- and medium-chain fatty acids, regardless of their cellular signaling functions, are important substrates of energy metabolism and anabolic processes in mammals. Unlike long-chain fatty acids, their cellular metabolism depends on fatty acid-binding proteins. These acids modulate the tissue metabolism of carbohydrates and lipids, which is manifested mainly by an inhibitory effect on glycolysis and stimulation of lipogenesis or gluconeogenesis. Also, they exert no or only weak protonophoric and lytic activities in mitochondria and do not significantly impair the electron transport in the respiratory chain, and modulate mitochondrial energy production by two mechanisms: they provide reducing equivalents to the respiratory chain and partly decrease the efficacy of oxidative ATP synthesis (Schönfeld & Wojtczak, 2016).

At the same time, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are those ω-3 fatty acids that are mainly found in fatty fish and fish oil. Functionally, they are able to act on the chemotaxis of white blood cells, the expression of adhesion molecules, the production of eicosanoids such as prostaglandins and leukotrienes, ie to promote the production of anti-inflammatory cytokines. The mechanism of anti-inflammatory action of EPA and DHA is based on a change in the composition of phospholipids of the fatty acid cell membrane, a decrease in the expression of inflammatory genes and the activation of the anti-inflammatory factor activated by the γ peroxisome proliferator (Calder, 2017; Tortosa-Caparrós et al., 2017; Cholewski et al., 2018).

It is known that feed additives enriched with ω-3 fatty acids improve the productivity and health of pigs. However, recent studies have shown that animal productivity is affected by feeding and the ratio of ω-6 to ω-3 fatty acids. The predominance of ω-6 fatty acids in the diet contributes to the development of many diseases, including cardiovascular, cancer, as well as inflammatory and autoimmune diseases. The optimal ω-6 to ω-3 ratio can suppress immune stimulation, providing more energy and nutrients for high productivity (Nguyen et al., 2020).

Analysis of recent research and publications

Evaluation of morphological and biochemical parameters of pig blood after application of different types of natural feed additives in pig feeding is a necessary study to establish scientific evidence of their effects on the body (Kluczek, 2006; Bondarenko, 2017; Hrushanska & Kostenko, 2017; Kucheriavyi & Boichuk, 2017).

The mechanisms of natural resistance are especially important – cellular and nonspecific humoral protection is provided by the circulatory system. The state of humoral mechanisms of natural resistance can be assessed by such indicators: number of red blood cells, hemoglobin concentration, number of white blood cells, leukocyte blood formula, the concentration of total protein and protein fractions in blood including albumins and globulins, of which α-, β- and γ-globulins. The morphological and biochemical composition of blood greatly affects the intensity of metabolic and redox processes in pigs, which in turn affects the level of their productivity. Metabolism is influenced by genotype, sex, age, level of animal feeding, etc. (Stryzhak et al., 2014). At the same time, it has already been proven that preparations containing selenium have an effect on pigs of different age groups, against the background of the development of transport stress, which was characterized by a change in the ratio of different forms of white blood cells in the blood. Also, there was an increase in the content of T-lymphocytes by 45.4% and B-lymphocytes by 12.5%. Biochemical changes associated with increased bone and muscle growth have been observed in fattened animals previously administered the preparations (Yefimov, 2015).

Also, the use of sodium selenite and its combination with an amino acid supplement in experimental groups of piglets leads to an increase in the number of red blood cells, hemoglobin concentration, due to increased redox processes, and also leads to increased protein content in blood serum due to albumin, but also due to the increase in the accumulation of globulins. At the same time, it has been shown that replacing inorganic selenium with organic in the diet of pigs can improve meat quality (Zhang et al., 2020).

Several scientific studies have shown that feeding pigs with diets containing sufficient ω-3 fatty acids helped to reduce the concentration of low-density lipoproteins and triglycerides in the blood (Meadus et al., 2012; Liu & Kim, 2018).

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At the same time, one study showed that the growth rates in pigs fed diets with ω-6 to ω-3 ratio of 5:1 were the highest. However, the group fed the dietary ω-6 to ω-3 ratios of 1:1 had the highest muscle mass and the lowest adipose tissue mass. Such ratios of ω-6 to ω-3 had a positive effect on lipid metabolism and reduced inflammation, which led to a large amount of energy and nutrients to ensure high productivity and homeostasis (Li et al., 2015). However, other researchers have shown that depending on the amount of polyunsaturated or saturated fatty acids in the feeding of pigs, their content will be different in muscle and adipose tissues and will increase the average daily weight gain in fattening pigs (Upadhaya et al., 2016).

The purpose of the study – to determine blood morphological and biochemical parameters in fattening pigs during the use of Lg-Max together with Sel-Plex natural feed additives.

Materials and methods of research

The efficiency of using the studied Lg-Max together with Sel-Plex feed additives during the growing of young animals and fattening pigs was evaluated on the basis of production indicators of LLC "Payovyk-C" of Pereyaslav-Khmelnytskyi district.

The following periods of pig breeding are used in the experimental farm: suckling period – 28 days; growing period – 30–90 days; fattening – 90–180 days.

For research, after a 15-day equalizing period, groups of analogs (5 animals in the control and experimental groups) by origin, age, and live weight were formed (Table 1).

The experimental groups were formed from young castrated male pigs.

Blood was collected from the marginal ear vein in the morning before feeding pigs before the beginning of the study, on days 45, 120, and 155, which coincided with the rearing periods.

Throughout the study period, the animals were fed twice a day with dry granular fodder with water ad libitum.

The Lg-Max together with Sel-Plex feed additives were introduced as part of a premix to animal feed of the experimental group, taking into account the need of animals in ω-3 unsaturated fatty acids (a daily requirement for ω-3 is 672 mg). The experimental feed additive contains 353 mg of ω-3 in 1 g. The Sel-Plex feed additive was given in the amount of 0.5 mg/kg.

Blood serum was obtained from whole blood by centrifugation. Blood serum biochemical parameters were evaluated by a GBG ChemWell 2910 (USA) automatic biochemical analyzer and using a Global Scientific (USA) test system.

The obtained data were statistically processed using the software package "Microsoft Excel" with the calculation of the arithmetic mean and its error (M ± m), the level of probability (P) according to the Student's table ($P < 0.05$; $P < 0.01$; $P < 0.001$).

Results of the research and their discussion

The Lg-Max organic feed additive – powder (according to the Registration Certificate for the drug Lg-max»), owner – Alltech (USA), registered in Ukraine for № AA-05713-04-15 from 25/02/2015. This supplement contains algae *Schizochytrium limacium* and *Rosmarinum officinalis* rosemary extract. The Lg-Max is a feed additive that is a source for replenishment of polyunsaturated fatty acids of the ω-3 class, namely docosahexaenoic, which promotes the development of the nervous system and brain in animals, improves skin and fur, enhances immunity and anti-inflammatory functions. Therefore, it is used for dogs and cats (Tkachyk & Tkachuk, 2019).

The Sel-Plex is a source of organic selenium. It is produced by strains of yeast grown on a selenium-enriched medium with low sulfur content, which is constantly monitored. In the process of life, yeast uses selenium to form cellular com-

1. Design of scientific and economic experiment

Group	Number of animals	Periods (age, days)		
		equalizing (30–45)	growing (30–90)	fattening (90–180)
Control	5	BD (basal diet)	BD	BD
Experimental	5		BD +2.0 g of Lg-Max and Sel-Plex (0.5 mg/kg)	BD +2.0 g Lg-Max and Sel-Plex (0.5 mg/kg)

ponents. The drug Sel-Plex contains 1000 mg/kg of selenium, most of which (98%) are selenomethionine and selenocysteine.

The results of the determination of the count of red blood cells, white blood cells, and hemoglobin content in the blood of pigs according to the scientific and economic experiment are presented in Table 1.

When Lg-Max feed additive was used in pig feeding in a dose of 2.0 g/day together with Sel-Plex feed additive, the number of red blood cells and white blood cells in the blood of pigs of the experimental groups, compared with the control, was within physiological limits according to age.

At the same time, on day 120, the red blood cell count in the blood of pigs of the experimental group significantly increased by 14.5% ($P < 0.05$) compared with the control.

Also, on day 45, the count of white blood cells in the blood of pigs of the experimental group significantly increased by 5.0% ($P < 0.05$) compared with the control.

Although the count of white blood cells increased, it was within physiological limits, which may indicate the potential for immunomodulatory activity (Fentona et al., 2013; Roselli et al., 2017) of these feed additives in pigs. The reasons for this are not clear but may be related to the content of eicosapentaenoic acid up to 56.0% in the Lg-Max feed additive.

Table 2 shows the biochemical analysis of blood serum in pigs after use in feeding the Lg-Max (2.0 g/day) together with Sel-Plex feed additives.

According to the obtained results (Table 2), it follows that all studied biochemical parameters in blood serum of pigs of the experimental group were within physiological limits according to their age. However, on day 45, the content of α_2-globulins in blood serum of pigs of the experimental group was lower by 5.7% ($P < 0.05$) compared with the control.

The serum aspartate transaminase activity in pigs of the experimental group was significantly lower by 1.5% ($P < 0.05$) compared with the control group. These enzymes are catalysts for the amine group transfer reaction between amino and keto acids, resulting in the formation of new amino acids, ie protein synthesis. The higher their concentration, the higher the activity of a particular metabolic process, the more active the enzyme, the more intense are the metabolic processes in the body (Bondarenko, 2017).

The rest of the biochemical parameters in blood serum of pigs of the experimental group showed a tendency to change in comparison with the control.

In particular, the stability of blood glucose indicates insulin resistance. Thus, a study of the acute effect of eicosapentaenoic acid on glucose homeostasis

1. Blood morphological parameters in pigs after use of Lg-Max and Sel-Plex feed additives (M ± m, n=5)

Parameter	Control 45 days	Experimental 45 days	Control 120 days	Experimental 120 days	Control 155 days	Experimental 155 days
Red blood cells, $\times 10^{12}$/L	5.10 ± 0.33	5.60 ± 0.51	6.0 ± 0.31	6.87 ± 0.03*	6.15 ± 0.02	6.27 ± 0.05
White blood cells, $\times 10^{9}$/L	13.60 ± 0.19	14.28 ± 0.20*	16.76 ± 0.11	16.96 ± 0.08	16.66 ± 0.19	16.90 ± 0.12
Hemoglobin, g/L	115.6 ± 0.6	115.0 ± 0.5	136.6 ± 1.9	140.2 ± 0.6	144.96 ± 2.4	146.0 ± 0.7

Note: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$ compared with the control of the corresponding age.

2. Biochemical parameters of blood serum in pigs after use of Lg-Max and Sel-Plex feed additives (M ± m, n = 5)

Parameter	Control 45 days	Group				
		Experimental 45 days	Control 120 days	Experimental 120 days	Control 155 days	Experimental 155 days
Total protein, g/L	51.24 ± 0.80	52.48 ± 0.35	73.00 ± 0.16	74.12 ± 0.45*	76.80 ± 0.81	75.36 ± 2.57
Albumin, %	57.94 ± 1.08	58.78 ± 1.87	52.60 ± 0.40	53.48 ± 0.24	48.60 ± 0.51	50.24 ± 1.62
α_1-globulins, %	3.68 ± 0.24	3.56 ± 0.82	3.40 ± 0.40	4.00 ± 0.32	3.80 ± 0.37	3.68 ± 0.25
α_2-globulins, %	16.40 ± 0.24	15.46 ± 0.24*	17.40 ± 0.51	16.80 ± 0.73	19.40 ± 1.50	19.09 ± 0.93
β-globulins, %	11.16± 0.24	11.56 ± 0.18	16.60 ± 0.51	15.80 ± 0.37	19.20 ± 0.86	17.51 ± 0.28
γ-globulins, %	10.82 ± 0.58	10.64 ± 1.07	10.00 ± 0.51	9.92 ± 0.49	9.00 ± 0.58	9.48 ± 1.52
A/G ratio	1.38 ± 0.03	1.43 ± 0.03	1.11 ± 0.23	1.15 ± 0.01	1.06 ± 0.02	1.01 ± 0.04
Glucose, mmol/L	6.26 ± 0.05	5.82 ± 0.51	6.94 ± 0.09	6.98 ± 0.12	6.46 ± 0.14	6.23 ± 0.05
Alanine transaminase, IU	41.00 ± 0.71	42.17 ± 0.34	46.20 ± 0.37	47.60 ± 1.21	46.80 ± 1.39	45.16 ± 2.43
Aspartate transaminase, IU	76.60 ± 1.47	65.36 ± 3.28*	66.40 ± 0.51	64.58 ± 0.75	63.60 ± 1.81	64.27 ± 2.31
Urea, mmol/L	2.72 ± 0.06	2.74 ± 0.06	4.68 ± 0.24	4.18 ± 0.16	4.72 ± 0.12	5.08 ± 0.16
Creatinin, mmol/L	102.20 ± 3.75	101.23 ± 1.89	116.0 ± 4.51	112.86 ± 2.43	162.00 ± 5.13	158.34 ± 4.98
Cholesterol, mmol/L	2.54 ± 0.16	2.63 ± 0.06	2.94 ± 0.07	2.66 ± 0.09*	2.94 ± 0.13	2.04 ± 0.15**
Alkaline phosphatase, IU	167.40 ± 2.09	164.38 ± 2.43	165.80 ± 1.94	152.00 ± 1.73***	155.20 ± 3.92	150.26 ± 4.72
Bilirubin, μmol/L	3.80 ± 0.49	4.26 ± 0.72	5.60 ± 0.24	6.12 ± 0.28	6.00 ± 0.71	6.79 ± 0.50
Amylase, IU	2145.20 ± 194.80	2352.41 ± 82.24	845.40 ± 30.24	860.80 ± 11.56	797.80 ± 36.23	852.13 ± 52.36
Calcium, mmol/L	2.45 ± 0.02	2.48 ± 0.03	2.50 ± 0.04	2.72 ± 0.15	2.42 ± 0.01	2.72 ± 003***
Phosphorus, mmol/L	1.72 ± 0.07	1.52 ± 0.16	2.00 ± 0.07	2.34 ± 0.14	2.42 ± 0.12	2.18 ± 0.14
Potassium, mmol/L	4.08 ± 0.18	4.97 ± 0.59	4.96 ± 0.07	4.72 ± 0.10	5.18 ± 0.08	5.38 ± 0.14
Sodium, mmol/L	142.20 ± 1.07	138.46 ± 1.23	145.20 ± 0.86	142.80 ± 1.34	147.80 ± 1.36	149.54 ± 1.26
Chlorides, mmol/L	99.00 ± 1.09	98.07 ± 1.59	104.80 ± 1.39	100.80 ± 1.46	103.00 ± 0.71	101.58 ± 1.43
Magnesium, mmol/L	1.22 ± 0.11	1.18 ± 0.16	1.54 ± 0.12	2.48 ± 0.07***	1.88 ± 0.09	2.96 ± 0.38*
Iron, μmol/L	25.70 ± 0.60	24.61 ± 0.48	24.48 ± 0.78	25.10 ± 1.29	28.08 ± 0,01	29.43 ± 0.12***

Note: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$ compared with the control of the corresponding age.

focused on the role of free fatty acid receptor 1 (FFAR1) and the chronic effect of ω-3 fatty acids of fish oil on insulin resistance. Insulin resistance was induced by feeding mice a high-fructose fatty diet (HFrHFD) for 16 weeks. In the first part, the acute effect of eicosapentaenoic acid alone and in combination with GW1100 and DC260126 (FFAR1 blockers) on hepatic homeostasis and hepatic phosphatidyl-inositol-4,5-bisphosphate. In the second part, the mice were treated with fish oil and ω-3 fatty acids for 4 weeks, starting at 13 weeks of HFrHFD feeding. At the end of the experiment, changes in markers of resistance to blood and liver tissue and insulin signals FFAR1 were recorded. The results showed that the presence of eicosapentaenoic acid affected blood glucose levels at 0 and 30 minutes after glucose loading in SCD-fed mice, but improved glucose tolerance in HFrHFD-fed mice. Moreover, FFAR1 blockers reduced the effect of eicosapentaenoic acid on glucose tolerance and hepatic PIP2 and DAG levels. On the other hand, chronic consumption of ω-3 fatty acid fish oil reduced serum insulin and triglyceride levels without improving the insulin resistance index. In addition, they increased the levels of β-arrestin-2, PIP2 and pS473 in the liver, but decreased the level of DAG. Thus, the presence of eicosapentaenoic acid in the diet dramatically improved glucose homeostasis in HFrHFD-fed mice by modulating FFAR1 activity (El-Fayoumi et al., 2020).

According to the results shown in Table 2, it was found that on day 120 of the study, the content of total protein in blood serum of pigs of the experimental group was significantly higher by 1.5% ($P < 0.05$) compared with the control. At the same time, the indicators of cholesterol content and alkaline phosphatase activity in blood serum of pigs of the experimental group were significantly lower by 9.5 ($P < 0.05$) and 8.3% ($P < 0.001$), respectively, compared with the control. Instead, one of the trace elements, the content of which in blood serum of pigs of the experimental group on day 120 was significantly higher by 61.0% ($P < 0.001$) than the control, is magnesium.

Subsequently, on day 155, the cholesterol concentration in blood serum of pigs of the experimental group was significantly lower by 30.0% ($P < 0.01$) and the level of calcium was higher by 12.4% ($P < 0.001$) compared with the control (Table 2). The reduction of blood cholesterol in pigs occurs during the use of fermented feed and at the beginning of lipid deposition in the fat depot, and therefore in blood serum of these animals they are found in smaller quantities (Derzhhovskyi, 2008; Kovalenko et al., 2010).

Other researchers have found that ω-3 polyunsaturated fatty acids can improve lipid and glucose homeostasis and prevent inflammation in animals. Little is currently known about the effect of ω-3 polyunsaturated fatty acids on the expression of adipocytokines and the accumulation of biologically active lipids under the influence of obesity caused by a diet high in fat. The experiments were performed on Wistar rats, divided into three groups: standard diet-control, high-fat diet and high-fat diet + fish oil. The concentration of glucose and insulin in fasting plasma was investigated. The addition of fish oil significantly reduced the plasma insulin concentration and the index of the homeostatic model of insulin resistance and reduced the content of biologically active adipose tissue lipids. Supplements of ω-3 polyunsaturated fatty acids have improved insulin sensitivity, can prevent the development of insulin resistance in response to high-fat feeding, and can regulate the expression and secretion of adipocytokines in animals (Chacińska et al., 2019).

At the same time, the levels of iron and magnesium in blood serum of pigs of the experimental group were significantly higher by 4.8 ($P < 0.001$) and 57.4% ($P < 0.05$), respectively, compared with the control.

From scientific sources it is known that calcium and magnesium are necessary for the body for the normal functioning of the nervous system, namely, to regulate the conduction processes of nerve endings and muscle contractions. These elements are involved in the formation of bone tissue, have a positive effect on cardiac activity, and play an important role in blood coagulation. Phosphorus and magnesium promote calcium metabolism. The main function of phosphorus is that it transfers biological energy, partly from ATP. Magnesium is an extracellular ion and plays a major role for many enzymes, namely those involved in the transport of phosphates, which are of great energy importance (Yefimov et al., 2009). However, supplementation with minerals such as chromium and magnesium can help increase muscle tissue and reduce fat deposition in meat due to the effects of redistribution of nutrients that affect carbohydrate and lipid metabolism (Apple et al., 2000). Magnesium supplements before slaughter have also been shown to reduce the effects of stressors, reducing the release of catecholamines and cortisol, muscle relaxation and reduced neuromuscular stimulation, preventing a sharp drop in muscle pH after slaughter. Thus, the use of bound magnesium and selenium reduces the number of lipids, helping to improve the lipid profile of pork for human consumption, without adversely affecting the quality and preservation, and it can be used as a tool to improve the nutritional aspects of pork (Carneiro de Albuquerqueduardo et al., 2019).

Conclusions and future perspectives

When used in the feeding of young pigs and fattening pigs of the Lg-Max together with Sel-Plex natural feed additives, the studied morphological parameters of pig blood were within physiological limits according to age.

Biochemical parameters in blood serum of young pigs and fattening pigs of the experimental group compared with the control of the appropriate age are in the following dynamics:

– at the age of 45 days, the concentration of α_2-globulins was lower by 5.7% ($P < 0.05$) and aspartate transaminase activity – by 1.5% ($P < 0.05$);
– on day 120, the content of total protein significantly increases by 1.5% ($P < 0.05$) and magnesium – by 61.0% ($P < 0.001$); the cholesterol content and alkaline phosphatase activity significantly decreases by 9.5 ($P < 0.05$) and 8.3% ($P < 0.001$), respectively;
– on day 155, the concentration of calcium significantly increases by 12.4% ($P < 0.001$) and cholesterol content significantly decreases by 30.0% ($P < 0.01$);

In the future, it is planned to investigate the effect of these feed additives on the content of ω-3 fatty acids in the subcutaneous fat of fattening pigs.

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Анотація. *У статті представлені результати визначення морфологічних і біохімічних показників крові в молодняку свиней та на відгодівлі під час введення до раціону органічних кормових добавок Lg-Max і Сел-Плекс.*

Кормові добавки Lg-Max разом із Сел-Плекс вводили в складі преміксу до комбікорму для тварин дослідної групи, з урахуванням забезпечення потреби тварин в ω-3 ненасичених жирних кислотах (добова потреба свиней у ω-3 становить 672 мг; у 1 г дослідної кормової добавки міститься 353 мг ω-3), а препарат Сел-Плекс – у кількості 0,5 мг/кг.

За результатами дослідження встановили, що досліджувані морфологічні показники крові свиней були у фізіологічних межах для відповідного віку.

Біохімічні показники сироватки крові свиней дослідної групи, порівнючи з тваринами контрольної групи відповідного віку, знаходяться в такій динаміці: у свиней 45-добового віку вірогідно підвищується концентрація глобулінів (α_2-глобулінів і β-глобулінів), а вірогідно знижується активність аспартатамінотрансферази; у свиней 120-добового віку вірогідно підвищується вміст загального білка й магнію, вірогідно знижується вміст холестеролу та активність лужної фосфатази; у свиней 155-добового віку вірогідно підвищується концентрація кальцію, а вірогідно знижується концентрація холестеролу.

Ключові слова: *молодняк свиней, свині на відгодівлі, морфологічні та біохімічні показники крові, натуральні кормові добавки*