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MORPHOLOGICAL AND BIOCHEMICAL PARAMETERS OF PIG BLOOD WHEN USED FEEDING FEED ADDITIVES LG-MAX AND SEL-PLEX

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Abstract. *The article presents scientific research to determine the morphological and biochemical parameters of blood in young pigs and pigs for fattening for the use in the diet of organic feed additives «Lg-Max» and «Sel-Plex».*

Feed additives «Lg-Max» together with «Sel-Plex», was 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 (daily requirement of pigs in ω-3 is 672 mg. In 1 g of experimental feed additive contains 353 mg of ω-3), and the drug «Sel-Plex» - in the amount 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 in the serum of the experimental group of pigs in comparison with the control of the corresponding age are in the following dynamics: in pigs of 45 days of age probably increases - the concentration of globulins; α_2-globulins and β-globulins, and probably decreases the content of aspartate transaminase (AST); in pigs 120 days of age is likely to increase - the content of total protein and magnesium; probably decreases - the content of cholesterol and activity alkaline phosphatase; in 155-day-old pigs, the concentration of calcium probably increases, and the concentration of cholesterol probably decreases.

Key words: *young pigs, fattening pigs, morphological and biochemical parameters of blood, 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 act in mitochondria without or weak protonophoric and lytic measures, and do not significantly impair electron transfer in the respiratory chain, and simulate the production of mitochondrial energy by two mechanisms: they provide a reduction in equivalents to the respiratory chain and partially reduce the efficiency of 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 leukocytes, 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 with ω-3 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 ratio of ω-6: ω-3 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 using 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 as: number of erythrocytes, hemoglobin concentration, number of leukocytes, leukocyte blood formula, concentration of total protein and protein fractions of 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, and which can be said about the intensity of metabolism, which in turn affects the level of their productivity. Metabolism is influenced by genotype, sex, age, level of feeding of animals, etc. (Stryzhak et al., 2014).Разом із тим, нині доведена дія препаратів які містять селен на різні вікові групи свиней, на тлі розвитку транспортного стресу, що характеризувалася зміною співвідношення різних форм лейкоцитів у крові, характерною для розвитку стадії резистентності стрес-синдрому та збільшенням кількості еритроцитів і лейкоцитів, вмісту гемоглобіну, та показнику гематокриту. Також, спостерігали зростання вмісту Т-лімфоцитів на 45,4% і В-лімфоцитів на 12,5%. У тварин на відгодівлі, яким попередньо вводили препарат, спостерігаються біохімічні зміни, пов’язані з підвищенням інтенсивності росту кісткової і м’язової тканини (Iefimov, 2015).

Also, the use of sodium selenite and its combination with an amino acid supplement in experimental groups of piglets led to an increase in the number of erythrocytes, hemoglobin concentration, due to increased redox processes, and also leads to increased protein content in the serum of piglets. 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 the quality of meat (Zhang et al., 2020).

A number of scientific studies have shown that feeding diets of pigs 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).

At the same time, one study showed that the growth rates of pigs fed a omega-6 to omega-3 ratio of 5: 1 were the best. However, the group fed 1:1 ω-6 to ω-3 ratios had the highest muscle mass and the lowest adipose tissue mass. Such ratios of Omega-6 to Omega-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).Разом з тим, іншими дослідниками доказано, що залежно від кількості поліненасичених чи насичених жирних кислот у годівлі свиней їх буде різний вміст у м’язовій та жировій тканинах і буде збільшуватися середньодобовий приріст свиней на відгодівлі (Upadhaya et al., 2016).

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

Materials and methods of research

The efficiency of using the studied additive «Lg-Max» together with «Sel-Plex» during fattening of young animals and pigs for fattening 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 equalization period, groups of analogues (5 heads in the control and experimental groups) by origin, age and live weight were formed (Table 1).

The experimental groups were formed from wild boars – young castrated male pigs.

1. Scheme of scientific and economic experience

Group	Livestock of animals, heads	Periods (age, days)		
		comparative period (30–45)	growing (30–90)	fattening (90–180)
Control	5	MD (main diet)	MD	MD
Experimental – D	5		MD +2,0 g supplements «Lg-Max» and «Sel-Plex» (0,5 мг/кг)	MD +2,0 g supplements «Lg-Max» and «Sel-Plex » (0,5 мг/кг)

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

Throughout the study period, the animals were fed twice a day with dry granular feed with free access to water.

Feed additives «Lg-Max» together with «Sel-Plex», was 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 (daily requirement of pigs in ω-3 is 672 mg. In 1 g of experimental feed additive contains 353 mg of ω-3), and the drug «Sel-Plex» - in the amount of 0.5 mg/kg.

Serum was obtained from whole blood by centrifugation. Serum biochemical parameters were evaluated on an automatic biochemical analyzer GBG ChemWell 2910 (USA) and using a test system – Global Scietific (USA).

The obtained figures were statistically processed using the software package "Microsoft Excel" with the calculation of the arithmetic mean and its error ($M \pm m$), 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

Organic feed additive «Lg-Max» - 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 preparation contains algae Schizochytrium limacium and rosemary extract Rosmarinum officinalis. «Lg-Max» is a feed additive that is a source of replenishment of polyunsaturated fatty acids of the ω-3 class, namely docosahexaenoic, which promotes the development of the nervous system and brain of animals, improves skin and fur, enhances immunity and anti-inflammatory functions. Therefore, it is used for dogs and cats (Tkachyk & Tkachuk, 2019).

«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 components. The drug «Sel-Plex» contains 1000 mg/kg of selenium. Most of which (98%) are selenomethionine and selenocysteine.

The results of the study of the number of erythrocytes, leukocytes and hemoglobin 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 - 2.0 g/day together with «Sel-Plex» feed additive, the number of erythrocytes and leukocytes 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 number of erythrocytes in the blood of pigs of experimental group D significantly increased by 14.5% ($P < 0.05$) compared with the control.

At the same time, on day 45, the number of leukocytes in the blood of pigs of this experimental group significantly increased by 5.0% ($P < 0.05$) compared with the control.

1. Morphological parameters of pig blood with the use of feed additive «Lg-Max» (2.0) g and «Sel-Plex», M ± m, n=5

Indicator	Control 45 діб	D 45 діб	Control 120 діб	D 120 діб	Control 155 діб	D 155 діб
Erythrocytes, $\times 10^{12}$/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
Leukocyte, $\times 10^{9}$/L	13.6 ± 0.19	14.28 ± 0.20*	16.76 ± 0.11	16.96 ± 0.08	16.66 ± 0.19	16.9 ± 0.12
Hemoglobin, g/L	115.6 ± 0,6	115.0 ± 0.48	136.6 ± 1.89	140.2 ± 0.58	144.96 ± 2.34	146.0 ± 0.71

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

Although the number of leukocytes increased, it was within physiological limits in terms of their number – this 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 in the feed additive «Lg-Max» up to 56% eicosapentaenoic acid.

Table 2 shows the biochemical analysis of pig blood for use in feeding the feed additive «Lg-Max» (2.0 g/day) together with «Sel-Plex».

2. Biochemical parameters of pig serum with the use of feed additive «Lg-Max» (2.0 g/day + «Sel-Plex»), M ± m, n = 5

Indicator	Control 45 days	Group				
		D 45 days	Control 120 days	D 120 days	Control 155 days	D 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, % in particular:	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, μmol/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, mmol/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 ±	845.40 ±	860.80 ±	797.80 ±	852.13 ±

		82.24	30.24	11.56	36.23	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
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***
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*

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

According to the obtained results (Table 2) it follows that all studied biochemical parameters in the serum of pigs of the experimental group were within physiological limits according to the age of pigs. However, on day 45 in the blood of pigs of the experimental group the content of α_2-globulins was lower by 5.7% (P <0,05), compared with the control.

With the use of ω-3 polyunsaturated fatty acids in the feeding of pregnant sows and piglets. Thus, the addition of 1% of the supplement to the diet increased the ratio of ω -3: ω -6 in colostrum and milk compared to the control (P = 0.05). In the blood plasma of piglets on the 3rd day after weaning had a higher (P < 0.05) coefficient of polyunsaturated fatty acids ω-3: ω-6 compared with the control. Corticosteroid-binding globulin concentrations did not differ between groups. The result of the free cortisol index was lower (P = 0.02) compared to the control. These results suggest that the provision of ω-3 supplements for sows, from late pregnancy and lactation, may increase the ratio of ω-3: ω-6 in their offspring, which may improve growth and reduce the acute physiological response to stress in pigs after weaning (McAfee et al., 2019).

The serum content of AST in the pigs of the experimental group was significantly lower by 1.52% (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).

For the rest of the biochemical parameters in the blood serum of pigs of the experimental group compared with the control, there was a tendency to change.

In particular, the stability of blood glucose indicates insulin resistance. Thus, a study of the acute effect of eicosapentaenoic acid on glucose homeostasis focused on the role of free fatty acid receptor 1 (FFAR1) and the chronic effect of ω-3 fatty acids on 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 the serum of pigs of the experimental group was significantly higher by 1.53% (P <0.05), compared with the control. At the same time, the indicators of cholesterol and alkaline phosphatase content in the serum of pigs of the experimental group were significantly lower by 9.52 (P < 0.05) and 8.32% (P < 0.001), compared with the control, respectively. Instead, one of the trace elements, the content of which in the serum of pigs of the experimental group for 120 days was 61.0% (P < 0.001) significantly higher than the control – is Magnesium.

Subsequently, for 155 days (Table 2) in the serum of pigs of the experimental group, the concentration of cholesterol 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. The reduction of cholesterol in the blood of pigs occurs during the use of fermented feed and the beginning of lipid deposition in the fat depot, and therefore in the 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 (SD), high-fat diet (HFD) and high-fat diet + fish oil (HFD + FO). 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 (HOMA-IR) 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 the serum of pigs of the experimental group were significantly higher by 4.81 ($P < 0.001$) and 57.4% ($P < 0.05$), compared with the control, respectively.

From scientific sources it is known that Calcium and Magnesium are necessary in 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 magnesium and selenium associated reduces the amount 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 pigs for fattening of the natural feed additives Lg-Max together with Sel-Plex studied morphological parameters of pig blood were within physiological limits according to age.

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

– in the age of 45 days the concentration of α2-globulins was lower by 5.7% ($P <0,05$) and the content of AST - by 1,52% ($P <0,05$);

– in 120 days of age probably increases - the content of total protein by 1.53% ($P <0.05$), and magnesium - by 61.0% ($P < 0.001$); probably decreases – the content of cholesterol and alkaline phosphatase by 9.52 ($P < 0.05$) and 8.32% ($P < 0.001$);

– in 155 days, the concentration of calcium probably increases by 12.4% ($P < 0.001$) and the concentration of cholesterol probably 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 pigs for fattening.

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МОРФОЛОГІЧНІ ТА БІОХІМІЧНІ ПОКАЗНИКИ КРОВІ СВИНЕЙ ПРИ ЗАСТОСУВАННІ В ГОДІВЛІ КОРМОВИХ ДОБАВОК LG-MAX І СЕЛ-ПЛЕКС

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

Кормові добавки Lg-Max разом із Сел-Плекс вводили у 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 відповідно віку.

Біохімічні показники у сироватці крові дослідної групи свиней порівняно з контрольною відповідного віку знаходяться у наступній динаміці: у свиней 45-добового віку вірогідно підвищується – концентрація глобулінів; α_2*-глобулінів і β-глобулінів, а вірогідно знижується активність аспартатамінотрансферази (АСТ); у свиней 120-добового віку вірогідно підвищується – вміст загального білка і 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*