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Changes in Levels of Formed Elements in Pig Blood with Reference to Activity in Conditions of their Eleovite Use

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ABSTRACT

In the presented work, it was possible to show the connection between the type of higher nervous activity of pigs and the dynamics of the content in their blood of the main varieties of corpuscular elements under the influence of the biological stimulator eleovite. The highest level of erythrocytes, leukocytes and platelets in the outcome was found in pigs with a strong balanced mobile type of higher nervous activity. The smallest number of them was noted in animals with a weak type of higher nervous activity. This state persisted even after the use of a biological stimulant - the most pronounced changes in the levels of blood corpuscles occurred during the study in pigs with a strong balanced type of higher nervous activity. The lowest level of erythrocytes, leukocytes and platelets in comparison with the rest of the pigs during the entire study was characteristic of animals with a weak type of nervous processes. As a result of the study, it became clear that the introduction of a biological stimulant has an effect on the content of erythrocytes, leukocytes and platelets in the blood of animals, largely mediated by regular influences of the cerebral cortex. At the same time, the dynamics of the level of blood corpuscles with the use of eleovite largely depends on the strength of the excitation processes during the implementation of higher nervous activity in animals.

KEY WORDS: PIGS, TYPES OF HIGHER NERVOUS ACTIVITY, ELEOVITIS, ERYTHROCYTES, LEUKOCYTES, PLATELETS.

INTRODUCTION

The continuous increase in the world's population creates a great need to increase the volume of food production (Zavalishina, 2020b), especially of meat origin (Zavalishina, 2020c). Currently, there is a continuous improvement of technologies for raising farm animals and especially pigs as very fast-growing and highly productive (Sharnin, 2006). Of great importance in the formation of individual biological and productive characteristics of pigs is the level of functioning of their brain, and especially in terms of higher nervous activity. For this reason, there is an active improvement of tests to determine the type of higher nervous activity in pigs (Zotko, 2011).Earlier observations of the behavior of young pigs of different ages revealed that already soon after birth, they actively form reflexes to a specific nipple of the sow (Zavalishina, 2020a). Soon after birth, piglets clearly understand and identify the sounds associated with the feeding process (Kabanov, 2002). Moreover, the formation of these conditioned reflexes in piglets can be inhibited by the peculiarities of the functioning of their central nervous system (Smirnov, 2011). In this regard,

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there is great interest in the study of the dynamics of individual indicators of pigs, which occurs under the influence of environmental factors (Tkacheva and Zavalishina, 2018).

Currently, there is a methodology available in application for assessing conditioned reflex processes in pigs (Trokoz, 2012). It was possible to establish that animals with different types of higher nervous activity differ in hematological parameters, in the level of meat and milk productivity, the rate of maturation, the level of fertility, and do not equally respond to a decrease in stress. This was largely due to the presence of stress resistance in the first category of animals, and explicit stress sensitivity in the second (Kokorina, 1986).Also, a connection was found between the features of processes in the nervous system and the course of functions in the body of animals, which helped to make a proposal about the greatest resistance of animals to abrupt changes in environmental conditions in the presence of a strong balanced type of higher nervous activity and the least resistance of animals in the presence of a weak type of higher nervous activity (Zavalishina, 2018a; Zavalishina, 2018b).

Modern animal husbandry technologies imply changes in the previous stereotype of keeping animals. The need for quick and successful adaptation of animals without stressing all body systems becomes clear. This is due to the fact that in the case of insufficient adaptation-compensatory processes, they cannot sufficiently neutralize the negative effects of the environment on the body, in addition, they will quickly deplete, worsening the general condition of animals and lowering their level of productivity (Shcherbinin, 2011). It is recognized that all parts of the nervous system participate in the formation of the reactivity of the organism, the functional readiness of which determines any reactions of the organism to the effects of the environment. It becomes clear that the peculiarities of the general reactivity of an animal's organism can be understood only by taking into account the indicators of its central nervous system (Yurchenko, 2009).

Table 1. The number of erythrocytes in the blood of pigs with different types of higher nervous activity against the background of the use of a biological stimulator

The number of erythrocytes in the blood of pigs with different types of higher nervous activity					
Terms of research		strong balanced agile, n=28	strong balanced inert, n=31	strong unbalanced, n=26	weak, n=25
The initial state		6.7±0.44	6.4±0.65	6.0±0.45*	5.5±0.57**
After the first introduction eleovita, day	3	7.3±0.52	6.7±0.38	6.3±0.51*	5.8±0.47**
	7	7.7±0.61 P<0.05	7.3±0.57 P<0.05	6.8±0.48* P<0.05	6.1±0.43** P<0.05
	12	7.5±0.39 P<0.05	6.9±0.48 P<0.05	6.7±0.37* P<0.05	6.0±0.46** P<0.05
	16	7.2±0.45	6.7±0.63	6.3±0.42*	5.7±0.38**
	21	6.8±0.60	6.4±0.73	6.1±0.76*	5.4±0.54**
After repeated introduction of eleovite, da	3	7.4±0.43 P<0.05	6.8±0.35	6.3±0.51*	5.7±0.44**
	7	7.8±0.52 P<0.05	7.2±0.47 P<0.05	6.9±0.42* P<0.05	6.2±0.50** P<0.05
	12	7.5±0.33 P<0.05	7.0±0.49 P<0.05	6.7±0.39* P<0.05	6.0±0.43** P<0.05
	16	7.3±0.42	6.7±0.44	6.2±0.40*	5.5±0.47**
	21	6.8±0.46	6.3±0.39	6.0±0.45*	5.3±0.48**

Note. Significance of differences in indicators in comparison with animals of a strong balanced mobile type of higher nervous activity *–p<0.05; ** - p<0.01, p - reliability of the dynamics of indicators in animals of each type of higher nervous activity in comparison with the initial state.

In this case, special importance should be attached to the type of higher nervous activity as a factor significant for the reactivity of the organism as a whole (Pavlov, 1951). At the same time, it has not yet been possible to connect the individual characteristics of the hematological parameters of pigs and the type of their higher nervous activity. In this regard, it is of great interest to elucidate the relationship between the influence of the type of higher nervous activity on the level of the amount of basic formed elements in their blood that is significant for the growth and development of animals. This is especially important in conditions of use of a biological stimulator in pigs with different types of higher nervous activity.The aim of this work is to assess the influence of

the activity of the nervous system on the dynamics of the amount of the main blood corpuscles in pigs under the conditions of using a biostimulator.

MATERIAL AND METHODS

The work was carried out in full compliance with the ethical standards defined by the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (adopted in Strasbourg on March 18, 1986 and was fully approved in Strasbourg on June 15, 2006) and supported by the local ethics committee of the Moscow State University of Food Production (Protocol No11 of January 17, 2018). The study was carried out on six-month-old large white pigs taken to the tribe, a total of 110 heads. When taken under observation, all the pigs were examined for their type of higher nervous activity. The determination of this characteristic was based on an assessment of the characteristics of the animal's behavior, on the elucidation of the characteristics of its reaction to the researcher, to giving him food, to sharp and unexpected stimuli of a sound and light nature. The conclusion about the type of higher nervous activity was carried out in gilts on the basis of the results of tests that assess the strength, mobility and balance of nervous processes: "Formation and extinction of a conditioned reflex", "Feed to a hungry animal", "Test for an unexpected sound stimulus" (Trokoz, 2012).

All pigs, regardless of the type of higher nervous activity, underwent biological stimulation of their bodies twice by injecting a multivitamin preparation eleovita (manufactured by the company "Askont+", Russia), 2.0 ml intramuscularly in the thigh area. The drug was administered twice with an interval of 21 days. After the first biological stimulation, all animals were examined on days 3, 7, 12, 16 and 21. Re-introduction of eleovite was carried out on the 22nd day after its first injection with the examination of the gilts after the second injection of the preparation also on the 3, 7, 12, 16 and 21 days after the second injection.In all pigs, the number of erythrocytes, the total number of leukocytes and the concentration of platelets in the blood was determined by conventional methods. Statistical processing of the obtained digital material was carried out using Microsoft Excel using the Student's test, correlation and analysis of variance.

Table 2. Correlation relationships between the number of erythrocytes in the peripheral blood and the properties of higher nervous activity in pigs under conditions of using eleovite

Terms of research		The number of erythrocytes in the blood of pigs with different types of higher nervous activity		
		property strength	property poise	property mobility
The initial state		0.58**	0.55**	0.52**
After the first introduction eleovita, day	3	0.52**	0.48*	0.45*
	7	0.42	0.40	0.39
	12	0.40	0.38	0.32
	16	0.52**	0.47*	0.47**
	21	0.57**	0.54**	0.51**
	3	0.51**	0.46*	0.46*
After repeated introduction eleovita, day	7	0.42	0.41*	0.38
	12	0.40	0.39	0.31
	16	0.51**	0.47*	0.46*
	21	0.59**	0.56**	0.53**

Note: the reliability of the correlation coefficients: * $p < 0.05$; ** $p < 0.01$.

RESULTS AND DISCUSSION

The initial number of erythrocytes in the blood of animals showed its dependence on the type of higher nervous activity available to them (Table 1).Before the use of eleovite, the content of erythrocytes in the blood of the observed pigs remained within the normal range. At the same time, in animals with a strong balanced mobile type of higher nervous activity, this indicator exceeded those in individuals with a strong balanced inert type, with a strong unbalanced type and with a weak type of higher nervous activity by 4.7%, by 11.7% ($p < 0.05$) and by 21.8% ($p < 0.01$), respectively.

The introduction to pigs of all types of higher nervous activity of eleovite caused them to change the quantitative content of erythrocytes in their blood. The observed dynamics of their level consisted in all cases in an increase in the number of these cells. The reliability of changes in all types of higher nervous activity observed in the work of gilts was noted on the 7th day after administration of the drug and was maximum during

these periods. Subsequently, the level of erythrocytes began to decrease. By 12 days after injection, it remained significantly higher than the initial level, and by 16 and 21 days after the first injection, it did not differ significantly from the outcome level.

At the same time, the degree of increase in the number of erythrocytes in the blood of the observed animals differed depending on the type of higher nervous activity they had. So, in animals on the 7th day after administration of the drug in the presence of a strong balanced mobile type of higher nervous activity, this indicator increased by 14.9%, in those with a strong balanced inert type by 14.0%, in the presence of a strong unbalanced type by 13.3%, in those who had a weak type of higher nervous activity by 10.9%.After the second injection of eleovite in the blood of pigs, a similar increase in the number of erythrocytes was repeatedly observed with its maximum level on the 7th day after administration of the drug and a subsequent decrease in this indicator, as after the first use of the drug.

Thus, the level of erythrocytes in the blood of pigs was closely related to the activity of their cortical processes. With their low amount in the blood, one can suspect the presence of weakness of these processes, and a consistently high number of erythrocytes gives reason to talk about the presence of strong and balanced processes in the animal's brain during the implementation of higher nervous activity.Considering that the highest levels of erythrocytes in the blood are characteristic of pigs with a strong balanced mobile type of higher nervous activity, it was of great interest to find out the severity of the relationship of each of these properties with the level of erythrocytes in the blood of animals, and, consequently, with the activity of erythropoiesis.

Using correlation analysis, the authors were able to establish the following. The highest values of the correlation coefficients of the level of erythrocytes in the blood of animals with a separate property of their nervous processes were found in the outcome with strength ($r = 0.58$; $p < 0.01$), with equilibrium ($r = 0.55$; $p < 0.01$), with mobility ($r = 0.52$; $p < 0.01$). The values of the correlation coefficients given in Table 2 between the properties of the nervous processes of the observed pigs and the level of erythrocytes in their blood proves that they have a clear control on the part of the central nervous system over the production of erythrocytes in the bone marrow. In this case, the most significant for the course of erythropoiesis were two properties of the processes of the central nervous system - strength and balance. The property of mobility of processes in the cerebral cortex of pigs was to a somewhat lesser extent associated with erythropoiesis in the bone marrow, but not so much that it could be neglected when considering this issue.

Table 3. The strength of the influence of the main properties of nervous processes on the level of erythrocytes in the blood of pigs, $\eta^2 x$

Terms of research		Properties of nervous processes in the examined gilts		
		property strength	property poise	property mobility
The initial state		0.16*	0.19*	0.14*
After the first introduction eleovita, day	3	0.15*	0.18*	0.10
	7	0.05	0.04	0.04
	12	0.09	0.06	0.06
	16	0.11	0.12	0.07
	21	0.16*	0.19*	0.13*
After repeated introduction eleovita, day	3	0.14*	0.17*	0.09
	7	0.06	0.05	0.04
	12	0.10	0.09	0.06
	16	0.10	0.11	0.08
	21	0.17*	0.19*	0.15*

Note: reliability of indicators - * $p < 0.05$; ** $p < 0.01$.

After the first and second injection of eleovite, the strength of the correlations of all the properties of the nervous processes taken into account weakened by the 3rd day, and by the 7th day it lost its reliability. After the first and after the second administration of the biostimulant on the 12th day, the correlation coefficients decreased further, without changing the reliability. On the 16th and 21st days of observation, after both injections, an increase in the correction coefficients was noted with the achievement of the reliability level. These changes in the correlation coefficients took place after both injections of eleovite, ensuring the achievement on the

21st day in both cases of the values of the correlation coefficients characteristic of the levels of the initial values.

The found changes in the values of the correlation coefficients in gilts with different types of higher nervous activity after the initial and after repeated use of the biostimulator indicate a temporary weakening of the control from the cerebral hemispheres of the brain over the red sprout of the bone marrow under conditions of exposure to the body that can intensify hematopoietic processes.This opinion was confirmed by the data of the analysis of variance carried out, the results of which are given below (Table 3).

All considered properties of nervous processes influenced the level of erythrocytes in the blood of pigs. The greatest influence on their amount in the blood in the initial state was demonstrated by the strength and balance of cortical processes. At the same time, the influence of mobility was more modest, but it was at the level of reliability. When using a biological stimulator, the effect of the considered properties of cortical processes on the number of erythrocytes in the blood of animals decreased up to 12 days of observation, and then began to increase. It becomes clear that under the influence of eleovite on the body of the animal, nervous processes control erythropoiesis weaker. Moreover, the property of strength and the property of balance of nervous processes lost the reliability of the strength of their influence on erythropoiesis between 7 and 16 days after the first and second administration of the drug. At the same time, after the injection of a biological stimulant, the property of mobility of nervous processes in the central nervous system quickly lost its effect on erythropoiesis in the observed gilts and restored it only on day 21 after the first and second use of the drug.

Thus, the properties of nervous processes in the central nervous system, and, therefore, the type of higher nervous activity largely determines the level of erythrocytes in the blood of pigs. It is clear that against the background of a temporary loss of strict control on the part of the central nervous system over the content of erythrocytes in the blood, under the action of a biostimulator, their number can actively and physiologically beneficially increase in the blood of pigs with strong types of higher nervous activity. The most significant in the process of increasing the content of erythrocytes under conditions of biostimulation are the properties of higher nervous activity - strength and balance. In this regard, the most pronounced increase in erythrocytes occurs in the blood of animals with a strong balanced mobile type.

Table 4. The total number of leukocytes in the blood of pigs with different types of higher nervous activity against the background of the use of a biological stimulator

The total number of leukocytes in the blood of pigs with different types of higher nervous activity					
Terms of the study		strong balanced agile, n=28	strong balanced inert, n=31	strong unbalanced, n=26	weak, n=25
The initial state		15.2±0.92	14.2±0.86	12.9±0.47*	11.5±0.56**
After the first introduction eleovita, day	3	17.2±0.45 P<0.05	14.2±0.71* P<0.05	15.9±0.66 P<0.05	12.5±0.49** P<0.05
	7	18.9±0.64 P<0.01	17.2±0.72 P<0.01	15.5±0.52* P<0.01	13.1±0.63** P<0.05
	12	17.2±0.58 P<0.05	15.8±0.74 P<0.05	14.9±0.81* P<0.05	12.7±0.58** P<0.05
	16	16.3±0.60	15.0±0.54	13.8±0.49	12.2±0.45**
After repeated introduction of eleovite, day	21	15.5±0.55	14.3±0.63	13.2±0.65*	11.7±0.57**
	3	16.8±0.63 P<0.05	16.0±0.71 P<0.05	14.4±0.60* P<0.05	12.7±0.54** P<0.05
	7	18.6±0.59 P<0.01	17.0±0.48 P<0.01	16.2±0.37* P<0.01	13.2±0.52** P<0.05
	12	17.5±0.44 P<0.05	15.9±0.49 P<0.05	15.0±0.62* P<0.05	12.8±0.57** P<0.05
	16	16.6±0.75	15.4±0.62	14.4±0.57*	12.5±0.60**
	21	15.7±0.48	14.7±0.54	13.3±0.50*	11.8±0.63**

Note. Significance of differences in indicators in comparison with animals of a strong balanced mobile type of higher nervous activity * - p <0.05; ** - p <0.01; p - reliability of the dynamics of indicators in animals of each type of higher nervous activity in comparison with the initial state.

The strong balanced inert type is somewhat inferior to him, the strong unbalanced type and the very significantly weak type of higher nervous activity are even more inferior. This can be explained by the fact that in the presence of a strong type of higher nervous activity, the properties of strength and balance

characteristic of the processes of the central nervous system, to a large extent, activate metabolic processes throughout the body. This is able to lay the foundation for maintaining the level of red blood cells at a higher level in the event of any external influences on the body, including non-immune ones.

Before the use of the biological stimulant, the number of leukocytes in the blood of the examined pigs corresponded to the normative values and was associated with the type of higher nervous activity they had (Table 4).Before the first injection of eleovite, the greatest number of leukocytes was characteristic of gilts with a strong balanced mobile type of higher nervous activity. This indicator in these animals exceeded those in individuals with other types of higher nervous activity - strong balanced inert type, strong unbalanced type and weak type, respectively by 7.0%, by 23.6% ($p<0.05$) and 32.2% ($p<0.01$).

The use of eleovite was accompanied in all animals by the dynamics of the level of leukocytes in the blood. Moreover, in pigs with different types of higher nervous activity, different severity of this dynamics was noted. In all four groups collected, taking into account the existing type of higher nervous activity, compared with the initial values, there was a significant increase in the outcome level after the first and after the second injection of eleovite on days 3.7 and 12, followed by a return of the indicator to the outcome level.

The most pronounced increase in their level was noted in gilts with a strong balanced mobile type of higher nervous activity. On the seventh day after the first injection of the drug, they showed the greatest increase in the level of blood leukocytes compared to the initial state (by 24.3% at $p<0.01$). The least pronounced increase (by 13.9%) was noted in gilts with a weak type of higher nervous activity. At the same time, the pigs with a strong balanced inert (by 21.1%) and strong unbalanced (by 20.1%) had an intermediate degree of growth in the number of leukocytes in their blood and did not differ among themselves. In the subsequent periods of observation, they were found to decrease by 21 days and increase to a comparable degree after repeated administration of eleovite up to 12 days, followed by a decrease to the initial level by the end of observation (21 days after repeated administration of the multivitamin).

Table 5. Correlation relationships between the level of the total number of leukocytes in the peripheral blood and the properties of the higher nervous activity of pigs under the conditions of using eleovite

		Properties of nervous processes in the examined gilts		
Terms of the study		property strength	property poise	property mobility
The initial state		0.57**	0.53**	0.46*
After the first introduction eleovita, day	3	0.48*	0.43*	0.40*
	7	0.39	0.37	0.31
	12	0.41	0.40	0.36
	16	0.43*	0.46*	0.41*
	21	0.55**	0.56**	0.50**
After repeated introduction eleovita, day	3	0.47*	0.46*	0.41*
	7	0.38	0.39	0.30
	12	0.40	0.40	0.32
	16	0.43*	0.43*	0.36*
	21	0.55**	0.53**	0.47**

Note: the reliability of the correlation coefficients - * $p<0.05$; ** $p<0.01$.

Thus, it can be assumed that the level of leukocytes in the blood of pigs is closely related to the activity of their cortical processes. In this regard, a low number of leukocytes in the blood can indicate their weakness, and a consistently high content of leukocytes in the blood can be considered a marker of the presence of strong, balanced and mobile processes of excitation and inhibition in the animal's brain. Taking into account the revealed connection between the levels of leukocytes in the blood of pigs and the type of higher nervous activity they have, it was of great interest to find out the severity of this connection for each of the properties of a strong balanced mobile type of higher nervous activity. Applying correlation analysis, the work was able to establish the following (Table 5).

In the outcome, the highest values of the correlation coefficients of the level of leukocytes in the blood of animals were found with strength ($r = 0.57$; $p<0.01$) and with equilibrium ($r = 0.53$; $p<0.01$) of nervous processes. The values of the correlation coefficients given in table 5 between the properties of the nervous processes of pigs

and the level of leukocytes in their blood confirms the presence of a clear control by the central nervous system over the production of leukocytes by the bone marrow. At the same time, the most significant for leukopoiesis throughout the entire observation were two properties of processes in the central nervous system: strength and balance.

It turned out that the property of mobility of processes in the cerebral cortex is to a lesser extent related to the production of leukocytes in the bone marrow, but not so much that it could be neglected when considering this issue. After the first and second injection of eleovite, the strength of the correlations of all the properties of the nervous processes taken into account weakened by the 3rd day, and by the 7th day it lost its reliability. And after the first and after the second administration of the biostimulant on the 12th day, the correlation coefficients experienced a tendency to increase. After both injections of eleovite, by 16 days the values of the correlation coefficients increased to the level of reliability, and by 21 days in both cases the values of the correlation coefficients reached the initial level.

The observed changes in the values of the correlation coefficients in gilts of different types of higher nervous activity after the primary and after repeated use of the biostimulator indicated the onset of a temporary weakening in animals of the regulatory function of the cerebral hemispheres under conditions of stimulation of the body's metabolism from the outside.This point of view was confirmed by the results of the analysis of variance (Table 6).

Table 6. The strength of the influence of the properties of nervous processes on the total level of leukocytes in the blood of pigs, η^2_x

Terms of the study		The property of nervous processes in the examined gilts		
		property strength	property poise	property mobility
The initial state		0,24**	0,22**	0,17*
After the first introduction eleovita, day	3	0,16*	0,15*	0,12
	7	0,08	0,06	0,05
	12	0,10	0,08	0,07
	16	0,15*	0,14*	0,11
	21	0,23**	0,21**	0,17*
After repeated introduction eleovita, day	3	0,09	0,05	0,04
	7	0.38	0.39	0.30
	12	0,10	0,08	0,07
	16	0,16*	0,15	0,11
	21	0,24**	0,22**	0,17*

Note: reliability of indicators - * p <0.05; ** p <0.01.

All the considered properties of nervous processes influenced the level of leukocytes in the blood of pigs. The greatest influence on the number of leukocytes in the blood was manifested by the strength and balance of cortical processes, while the influence of mobility was somewhat more modest. At the first application of a biological stimulator, the effect of the properties of cortical processes on the leukocyte content in the blood of pigs decreased until 7 days of observation, and then began to grow.In the process of repeated influence of eleovite on the body of the animal, the nervous processes also affected leukopoiesis weaker, and the property of strength and the property of balance in nervous processes also lost the reliability of their influence on leukopoiesis from 7 to 12 days. At the same time, after both injections of the biological stimulant, the property of mobility of nervous processes in the central nervous system lost its power of influence on leukopoiesis in the observed gilts from 3 to 16 days.

Thus, the properties of nervous processes in the central nervous system, and, therefore, the type of higher nervous activity largely determines the level of leukocytes in the blood of healthy pigs. As a result of the study, it became clear that animals with strong types of higher nervous activity against the background of a temporary loss of strict control from the central nervous system over leukopoiesis, under the action of a biostimulator, are able to very actively increase the number of leukocytes in their blood. At the same time, the properties of strength and balance were the most significant for the development of leukocytosis in pigs under conditions of biostimulation. In this regard, the most pronounced leukocytosis is noted in animals that received eleovitis, with a strong balanced mobile type, a strong balanced inert type is somewhat inferior to it, to which a strong unbalanced type is inferior. An increase in the number of leukocytes in the blood of pigs with a weak type of higher nervous activity is even less recorded. This pattern can

be explained by the fact that the properties of strength and balance during the implementation of processes in the central nervous system contribute significantly to the activation of metabolic processes throughout the body. This lays the foundations in these animals for a pronounced reaction of the level of leukocytes to any external influences, including biostimulation of a non-immune nature.

Before the start of the use of the tested biological stimulant, the number of platelets in the blood of pigs had a clear connection with their type of higher nervous activity (Table 7) and were within the normal range.Before the first injection of eleovite, the greatest number of platelets was found in the blood of pigs with a strong balanced mobile type of higher nervous activity. This indicator in these animals was higher than that in individuals that had other types of higher nervous activity - strong balanced inert, strong unbalanced and weak types of higher nervous activity, respectively by 6.5%, by 13.8% ($p<0.05$) and by 26.1% ($p<0.01$).

The use of eleovite was accompanied in pigs by the dynamics of the level of platelets in their peripheral blood. For animals of each type of higher nervous activity, the characteristic dynamics of their level was revealed. It was associated with a significant increase in their number already on the 7th day after the first injection of the drug (strong balanced mobile by 15.8%, strong balanced inert by 13.4%, strong unbalanced by 11.8%, weak by 10.1%). In all four observation groups, formed taking into account the type of higher nervous activity in animals, there was a significant increase in the number of platelets after the first injection of eleovite on the 12th day of observation. The greatest increase in their level during these periods was noted in gilts that had a strong balanced mobile type of higher nervous activity.

Table 7. The number of platelets in the blood of pigs of various types of higher nervous activity against the background of the use of a biological stimulator

The number of platelets in the blood of pigs with different types of higher nervous activity					
Terms of the study		strong balanced agile, n=28	strong balanced inert, n=31	strong unbalanced, n=26	weak, n=25
The initial state		362.3±1.25	340.2±0.98	318.4±0.72*	295.2±0.83**
After the first introduction eleovita, day	3	384.4±0.65	361.8±0.71	337.5±0.84*	295.6±0.64**
	7	419.6±0.72 p<0.05	385.7±0.78 p<0.05	355.9±1.07* p<0.05	325.1±0.99** p<0.05
	12	402.6±1.15 p<0.05	376.5±0.93 p<0.05	352.6±0.90* p<0.05	319.7±0.78** p<0.05
	16	386.3±1.00	357.6±0.75	336.2±0.68*	299.4±0.57**
	21	360.4±0.83	343.7±0.72	320.1±0.76*	290.6±0.81**
After repeated introduction eleovita, day	3	386.3±0.72	360.7±1.05	339.2±0.87*	299.5±0.84**
	7	420.6±0.52 p<0.05	387.0±0.74 p<0.05	362.7±1.03* p<0.05	322.6±0.67** p<0.05
	12	404.5±0.67 p<0.05	378.4±0.52 P<0.05	350.4±0.64* p<0.05	316.3±0.77** p<0.05
	16	386.3±0.92	359.1±0.73	339.9±0.84	300.1±0.79**
	21	365.2±0.80	346.0±0.86	320.6±0.72*	292.6±0.42**

Note. Significance of differences in indicators in comparison with animals of a strong balanced mobile type of higher nervous activity * - $p<0.05$; ** - $p<0.01$; p - reliability of the dynamics of indicators in animals of each type of higher nervous activity in comparison with the initial state

So, on the 12th day after the first injection of the drug in animals, the following degree of excess of the initial level of platelets in the blood was noted: in pigs with a strong balanced mobile type by 11.3% ($p<0.05$), in a pig with a strong balanced inert by 10.7%, with a strong unbalanced by 10.7%, in gilts with a weak type of higher nervous activity by 8.3%. After the repeated injection of eleovite, the dynamics of the platelet level in animals was similar to that after its first injection. At the same time, in all cases, the number of platelets in the blood of animals was restored at the level of outcome by 21 days after the first and second injection of the tested multivitamin.

Thus, the level of platelets in the blood of healthy pigs is closely related to the activity of their cortical processes. In this regard, with their low amount in the blood, it can be assumed that animals have weakness in the processes of higher nervous activity. At the same time, their high number gives reason to assume that the animal has strong, balanced and mobile processes of excitation and inhibition in the brain.Considering

that the highest levels of platelets in the blood are characteristic of gilts with a strong balanced mobile type of higher nervous activity, it was of great interest to clarify the severity of the relationship between each of these properties with the concentration of platelets in their blood, and, consequently, with the intensity of thrombocytopoiesis.

Applying the correlation analysis, the following was established in the work. In the outcome, the highest values of the correlation coefficients of the level of platelets in the blood of animals were found with strength ($r = 0.55$; $p < 0.01$) and with equilibrium ($r = 0.53$; $p < 0.01$).The values of the correlation coefficients given in table 8 between the properties of the nervous processes of pigs and the level of platelets in their blood confirm the presence of a clear control by the central nervous system over the production of platelets in the bone marrow. The most significant for thrombocytopoiesis were two properties of the processes of the central nervous system: strength and balance. The property of mobility of processes in the cerebral cortex was to a lesser extent associated with the production of platelets in the bone marrow, but not so much that it could be neglected when considering this issue.

After the first and after the second injection of eleovite, the strength of the correlations of all the properties of the nervous processes taken into account by the 3rd day somewhat weakened, and between the 7th and 12th days of observation it lost its sufficiency. After the first and after the second administration of the biostimulant on the 16th day, an increase in the correlation coefficients was noted with the achievement of the level of reliability. In the subsequent periods of observation, an increase in the correlation coefficients was recorded in all animals, reaching the initial values on day 21 after both injections of the drug.

Table 8. Correlation relationships between the level of platelets in peripheral blood and the properties of higher nervous activity in pigs under conditions of using eleovite

		Properties of nervous processes in the examined gilts		
Terms of the study		property strength	property poise	property mobility
The initial state		0.55**	0.53**	0.50**
After the first introduction eleovita, day	3	0.45*	0.46*	0.44*
	7	0.39	0.40	0.35
	12	0.35	0.34	0.32
	16	0.46	0.41*	0.42*
	21	0.55**	0.54**	0.49**
After repeated introduction eleovita, day	3	0.44*	0.43*	0.45*
	7	0.38	0.41	0.38
	12	0.34	0.33	0.32
	16	0.45*	0.42*	0.41*
	21	0.54**	0.53**	0.49*

Note: the reliability of the correlation coefficients - * $p<0.05$; ** $p<0.01$.

The found changes in the values of the correlation coefficients in pigs with different types of higher nervous activity after the first and after repeated application of eleovite indicate the development of a weakening of the regulatory function of the cerebral hemispheres of the brain under conditions of biostimulation of the organism from the outside. These data were confirmed by the results of the analysis of variance carried out in the study (Table 9).

All the considered properties of nervous processes influenced the level of platelets in the blood of pigs. The most reliable effect on their number in animals under standard conditions was shown by the strength and balance of cortical processes. The effect of mobility on platelet count was more modest and did not reach the level of reliability. When using a biological stimulant, the strength of the influence of the properties of cortical processes on the number of platelets in the blood of pigs decreased, losing the reliability of strength and balance on days 7 and 12 after the first and second administration of the drug.The data obtained allow us to believe that the properties of the nervous processes occurring in the central nervous system of pigs, and, consequently, the type of their higher nervous activity, determine the level of platelets in the blood of these animals.

This pattern is only temporarily violated under the conditions of the use of a biostimulator, followed by a rapid restoration of control of nervous processes over thrombocytopoiesis and the level of thrombocythemia. At the same time, in pigs, even against the background

of biostimulation, the properties of strength and balance of nervous processes are most significant for the level of platelets in the blood. This can be explained by the fact that in animals with a strong type of higher nervous activity, the properties of strength and balance of the central nervous system contribute to the activation of metabolic processes in all tissues, which lays the foundation for a pronounced reaction of the platelet level to any external influences on the body, including those of a non-immune nature.

Table 9. The strength of the influence of the properties of nervous processes on the number of platelets in the blood of pigs, η^2x

Terms of the study		The property of nervous processes in the examined gilts		
		property strength	property poise	property mobility
The initial state		0.15*	0.19*	0.13
After the first introduction eleovita, day	3	0.14*	0.17*	0.12
	7	0.11	0.12	0.10
	12	0.09	0.11	0.08
	16	0.13*	0.18*	0.12
	21	0.15*	0.19*	0.13
After repeated introduction eleovita, day	3	0.15*	0.18*	0.12
	7	0.11	0.12	0.09
	12	0.09	0.10	0.07
	16	0.15*	0.17*	0.12
	21	0.16*	0.19*	0.13

CONCLUSION

It was of great scientific and practical interest to identify the characteristics of the reaction of blood corpuscles, considered as cellular components of a liquid medium that integrates the body to the introduction of the multivitamin remedy eleovit, taking into account the type of higher nervous activity of the mumps. The highest level of blood cells in pigs before exposure to eleovitis was recorded in animals with a strong balanced mobile type, and the lowest in animals with a weak type of higher nervous activity.

This picture persisted against the background of the use of the tested drug, demonstrating the greatest dynamics of the considered indicators in animals with a strong balanced mobile type of higher nervous activity. This pattern was true for the level of erythrocytes, leukocytes and platelets. The results obtained indicate the need to correct the doses of biological stimulants used in animals with different types of higher nervous activity. Based on the results obtained, there is reason to recommend assessing the severity of the effects of biostimulants with an increase in their dose in comparison with that traditionally accepted in gilts with a strong unbalanced type and a weak type of higher nervous activity.

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