DOI 10.32900/2312-8402-2025-135-53-65
UDC 636.4:619:612.11

A NEW APPROACH TO MINIMIZING THE IMPACT OF TECHNOLOGICAL STRESS FACTORS ON THE CLINICAL AND PHYSIOLOGICAL STATE OF PIGGLES

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Stress in farm animals is interpreted as a complex adaptive response of the body to unusual or extreme conditions caused by intense stimuli that can potentially disrupt its normal functioning. Among them, technological stresses, which are most common in modern pig breeding, are of particular importance. In such circumstances, the use of anti-stress drugs is considered as an effective tool for reducing their negative consequences.

The article presents the results of experimental studies aimed at scientific substantiation of effective approaches to reducing the effect of technological stress factors on the clinical and physiological state of young pigs by using a new anti-stress drug, in comparison with traditional means. Based on laboratory data, it was established that the introduction of the experimental drug from the very beginning of the development of the stress reaction activates hematopoietic processes in the body of young animals of Group III, causing an increase in the blood content of red blood cells by 8.4% ($p<0.05$) and 3.5%, white blood cells-by 3.4 and 0.9%, hemoglobin concentrations – by 5.7 and 4.3% and Total Protein – by 10.5% ($p<0.001$) and 5.2% ($p<0.001$), compared with analogues control and II experimental groups, maintaining the general trend of increasing these indicators at the end of the fattening period. In addition, the results of the studies clearly demonstrate the positive effect of the applied anti-stress drugs on the functional state of young pigs, while the studied indicators remained within the physiological norm, regardless of the group. At the initial stage of the experiment, piglets of Group I showed a slight increase in the respiratory rate, compared with peers of groups II and III by 0.4 and 0.8 movements/min or 1.1 and 2.2%, acceleration of the heart rate by 2.8 and 4.2 beats/min or 2.6 and 3.9% against the background of stable body temperature parameters, the difference in which was respectively 0.24 and 0.30 ^{o}C or 0.6 and 0.8% greater in young animals of the control group. At the final stage of the study, a similar dynamics of changes in clinical and physiological parameters was noted.

Keywords: pigs, young animals, stress resistance, blood, body temperature, pulse rate and respiration.

НОВИЙ ПІДХІД ЩОДО МІНІМІЗАЦІЇ ВПЛИВУ ТЕХНОЛОГІЧНИХ СТРЕС-ЧИННИКІВ НА КЛІНІКО-ФІЗІОЛОГІЧНИЙ СТАН ПОРОСЯТ

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Стреси у сільськогосподарських тварин трактують як комплексну адаптаційну реакцію організму на незвичні або екстремальні умови, спричинені дією інтенсивних подразників, що потенційно можуть порушувати його нормальне функціонування. Серед них особливе значення мають технологічні стреси, які найбільш поширені в сучасному свинарстві. За таких обставин, використання антистресових препаратів розглядається як ефективний інструментарій для зниження негативних їх наслідків.

У статті наведено результати експериментальних досліджень, спрямованих на наукове обґрунтування ефективних підходів щодо зниження дії технологічних стрес-чинників на клініко-фізіологічний стан молодняку свиней шляхом застосування нового антистресового препарату, порівняно з традиційними засобами. На основі даних лабораторних досліджень установлено, що введення експериментального препарату з самого початку розвитку стрес-реакції активує кровотворні процеси в організмі молодняку ІІІ групи, зумовлюючи збільшення у крові вмісту еритроцитів на 8,4 % ($p<0,05$) і 3,5 %, лейкоцитів – на 3,4 і 0,9 %, концентрації гемоглобіну – на 5,7 і 4,3 % і загального білка – на 10,5 % ($p<0,001$) і 5,2 % ($p<0,001$), порівняно з аналогами контрольної та ІІ дослідної груп, зберігаючи загальну тенденцію щодо зростання цих показників наприкінці періоду відгодівлі. Окрім того результати досліджень чітко демонструють позитивний вплив застосованих антистресових препаратів на функціональний стан молодняку свиней, при цьому досліджувані показники залишалися в межах фізіологічної норми незалежно від групи. На початковому етапі досліду в поросят І групи спостерігалося незначне підвищення частоти дихання, порівняно з ровесниками ІІ та ІІІ груп на 0,4 і 0,8 рухи/хв або 1,1 і 2,2 %, прискорення серцевого ритму на 2,8 і 4,2 удара/хв або 2,6 і 3,9% на тлі стабільних параметрів температури тіла, різниця за якими була відповідно 0,24 і 0,30 °С або 0,6 і 0,8 % більшою у молодняку контрольної групи. На завершальному етапі дослідження відзначали аналогічну динаміку змін клініко-фізіологічних показників.

Ключові слова: свині, молодняк, стресостійкість, кров, температура тіла, частота пульсу і дихання.

Introduction. During the rearing period from birth to retirement, pigs are exposed to a complex of stressors that negatively affect their physiological state (Suprun I. O., 2012; Lykhach V. Ya. et al., 2021; Koroban M. et al., 2023). Technological stress factors generated in the production process most significantly arise due to changes in traditional conditions of keeping, high density of livestock in a limited area, insufficient feeding front, excessive noise level, violation of requirements for planning solutions of premises (Rossi R. et al., 2008). These stress factors have both direct and indirect negative effects on animals. Their mediated action leads to a significant violation of the usual regime for animals, which causes imperceptible stress reactions. Direct exposure is immediately

noticeable and can be eliminated quickly, while indirect exposure is usually delayed when animals are already showing a decrease in productivity (Minka N. S. O. & Ayo J., 2007; Van de Perre V., 2011; Dovhii Yu. Yu., & Feshchenko D. V., 2018).

Along the way, it should be noted that in the piglet rearing system, due attention should be paid to rational space during maintenance (Nielsen S. S. et al., 2022). Failure to comply with technological standards of the area of maintenance restricts the mobility of animals, makes it impossible or reduces the desire to be near their peers, suppresses social interactions and makes it difficult to move around the machine and freely access to feed and water (Fels M. et al., 2014). Reducing the retention area increases aggressiveness in the group, which, in turn, significantly increases the level of injuries. The problem of crowding is especially aggravated by the growing age of young animals and the increase in the size of the group. In the conditions of Group maintenance of piglets, a potential source of stress is not only the size of the group, but also the density of their maintenance. Violation of the parameters of the content density causes stressful situations, accompanied by an increase in the number of aggressive fights between peers in the group and a reduction in the duration of feed consumption, especially among weak and timid animals (Harris M. J. et al., 2006; Braun Dzh. A., & Seddon Yu. M., 2014; Verdon M. et al., 2015).

According to published data (Gillman C. E. et al., 2008; Temple D. et al., 2012; Van Staaveren N. et al., 2018), the source of stress factors for pigs in the rearing process can be the type of floor and the level of its sanitary condition. Keeping animals on a completely latticed floor without bedding eliminates an important element of the technological process – increased comfort.

Individual researchers (Li Y. Z. & Johnston L. J., 2009). we concluded that the live weight of piglets and the introduction of new individuals into groups can negatively affect their behavior, productivity and physiological state. In this context, it is necessary to highlight the well-founded positions of specialists in the field of pig breeding (Tokarchuk T. S., 2017; Lykhach V. Ya. et al., 2020), which emphasize that among the negative sources of stress factors in industrial pork production, an important place is occupied not only by changes in the conditions of detention, but also by the influence of environmental factors and feeding features. However, in their opinion, a significant stress factor for piglets is the period of re-formation of groups.

Comprehensive research (Schrøder-Petersen D. L. & Simonsen H. D., 2001; Martin J. E. et al., 2015) demonstrated that regrouping piglets contributes to the formation of adaptive behavior at the fattening stage, while purposeful Organization of socialization and game interaction between piglets in machines significantly reduces the manifestations of agonistic behavior after weaning, which is important for increasing their stress tolerance and optimizing productivity.

Today, the frequency of manifestations of heat stress is becoming an increasingly urgent problem in the pig industry, which is due to global changes in climatic conditions, in particular, an increase in ambient temperature, a decrease in humidity and air velocity. According to (Trouw Nutrition, 2025), the agricultural sector annually suffers losses due to heat stress in the amount of about 200 billion US dollars. Research by other scientists (Yu J., 2010) indicate that heat stress in pigs leads to an increase in rectal temperature on the body surface and a synchronous increase in serum cortisol levels against the background of a significant increase in the expression of small intestine protein genes as evidence of activation of adaptive mechanisms at the molecular level.

Among the most significant sources of stress in pig farming, which negatively affect the physiological state of animals, transportation is singled out. Its consequences are associated with a decrease in productivity, deterioration of the quality of meat raw

materials, an increase in the incidence of respiratory and digestive pathologies (Urrea V. M. et al., 2021). The researchers found that during transportation, pigs experience a whole range of physiological and behavioral changes as evidence of activation of stress responses. Violation of homeostasis is manifested in the form of tissue hypoxia, dehydration of the body, changes in hematological and biochemical parameters of blood (the level of red blood cells, white blood cells, hemoglobin increases), the concentration of hormones, metabolites, nitrogenous compounds, protein fractions and enzymes (Kushnerenko V. H., 2023). Among the criteria for systematic assessment of the impact of technological stress factors on animals, blood and physiological state indicators are of leading importance, which most fully reflect the functional state of their body. That is why, given the multifaceted nature of the action of stress factors inherent in modern pig breeding, which affect the functional state of the body of young animals, their productivity and level of well-being, the assessment of the stress state caused by weaning piglets from the sow, transferring them to rearing and fattening sites for the use of clinical and physiological indicators, the role of which in this system is still insufficiently justified, becomes particularly relevant. Equally important is the search for innovative and more effective solutions to reduce the negative effects of these stress factors on the body of young pigs. In the context of the study of adaptation processes, such biologically active compounds as the amino acid glycine ($c_2h_5no_2$), succinic acid ($C_2H_6O_2$) and nutrient medium 199 are of particular scientific interest. their use contributes to the activation of metabolic processes, the intensification of growth and development of animals, the improvement of reproductive function and the increase in the level of natural resistance of the body. At the same time, today there are not enough comprehensive generalizations that highlight the practical feasibility of combined use of these substances in a single pharmaceutical form and their possible synergistic effect in pig farming. The available scientific publications are mainly devoted to the study of the effects of these agents separately, mainly in sheep, Mink and cattle breeding. This, in turn, highlights the need for scientific justification of the effectiveness of their combined use to increase the adaptive stability of young pigs.

The aim of the research is to develop a new approach to minimize the impact of technological stress factors on the clinical and physiological state of young pigs.

Materials and methods of research. Scientific and economic research was carried out in the production conditions of the complex for the production of pork PE AF "Svitanok" Novovodolazhsky District of Kharkiv region, the experimental part – the laboratory of breeding and Technological Research in small animal husbandry and horse breeding of Livestock farming institute of NAAS of Ukraine.

To organize and conduct the planned work, generally accepted requirements for conducting zootechnical experiments were applied. The experimental pig population was represented by first-generation piglets, which were obtained as a result of reproductive crossing of Landrace boars with Yorkshire sows and were imported from Denmark. To form the experimental population in the conditions of the basic farm, imported sows were inseminated with Duroc boars. As part of the experiment, key technological stress factors included: weaning piglets from the sow, transferring them to rearing and fattening sites.

To conduct the experiment during weaning, three groups of piglets were formed-analogues by genotype, age, gender and live weight, 10 heads each. Piglets of the III (experimental) group were intramuscularly administered an experimental drug at a dose of 1.5 ml/10 kg of live weight per day, animals of the II (experimental) group – a similar dose (1.5 ml/10 kg of live weight per day) of a traditional anti-stress drug, and piglets of the I (control) group were given an equivalent amount of sterile saline solution instead of the studied drugs, in order to level the influence of the very fact of injections as a stress

factor. Injections of drugs were made into the inner surface of the pelvic limb of the animal, on an empty stomach, in the first half of the day two days before and two days after the action of each stress factor.

Clinical studies were performed on the basis of a veterinary laboratory. Biomaterial was obtained in the morning, two hours before feeding, from five animals of each group from the large ear vein. Blood was collected in two dry, sterile test tubes, one of which was pretreated with heparin to prevent clotting. The hemoglobin content was determined by the hemoglobin cyanide method, the number of red blood cells was calculated using the Goryaev chamber, and white blood cells were calculated using the conductometric method. The leukocyte formula was evaluated by microscopy of blood smears previously stained by the Romanovsky-Giemsa method, followed by counting individual types of white blood cells (neutrophils, lymphocytes, monocytes, basophils, eosinophils). The total protein concentration was determined in the blood serum using a biuret reaction on a semi-automatic biochemical analyzer Rayto RT-1904c and the use of certified reagents produced by NPP Filisit-Diagnostics LLC. The content of albumins and globulin fractions (α-, β - and γ-globulins) was studied in accordance with the guidelines of the same manufacturer on an ULAB 102 spectrophotometer. glucose levels were determined by the glucose oxidase method using the rayto RT-1904c analyzer. The albumin-globulin coefficient was calculated as the ratio of the albumin concentration to the total content of globulin fractions.

The presence of stress in the body of piglets was also concluded on the basis of changes in clinical indicators. The heart rate was determined by palpation of the caudal artery, the frequency of respiratory movements – by visual observation of fluctuations in the abdominal wall with counting the number of respiratory movements per minute, and the body temperature was recorded using a rectal thermometer.

Statistical data analysis was performed using the licensed STATISTICA 10.0 program (StatSoft) for the Windows operating system. The student's t-criterion was used to compare the differences between the groups. The difference was considered statistically significant if $p< 0.05$.

Research results. Generalization of the values of changes in the morphological composition of blood indicates their intensive formation at the initial stage of the study, which coincides with the period of the most active increase in productivity in experimental animals. As the age of young animals increased, ambiguous changes were observed in the blood profile: an increase in some shaped elements or a decrease in others. At the same time, taking into account the stimulating effect of the studied drugs, the blood parameters remained at the level of the physiological norm (Table 1).

The most pronounced increase in blood saturation with shaped elements at the beginning of the experiment is inherent in young animals of Group III, which prevailed over peers of Group I in terms of red blood cell content by 8.4% ($p<0.05$), white blood cells – by 3.4% and hemoglobin concentration – by 5.7% and individuals of Group II – by 3.5, 0.9 and 4.3%, respectively. This was due to increased hematopoietic function, better adaptive ability of their body to stress due to the use of an experimental drug, and higher growth rate. In animals that were given a standard stress reliever, compared to Group I analogues, the increase in these blood components was less significant: only by 4.8, 2.5 and 1.3%, respectively.

In the leukogram of the blood of young animals of the experimental groups, a decrease in the content of eosinophils by 16.7 and 22.2%, monocytes – by 9.1 and 33.3%, as well as an increase in the level of Rod neutrophils – by 4.8 and 9.5%, lymphocytes – by 8.2 and 5.7%, which indicates an improvement in the immune status of these animals and a decrease in the intensity of the non-specific immune response to stress, while an

increase in the content of eosinophils and monocytes in the structural spectrum of blood leukocytes Group I piglets are a typical response of the body to stress-induced activation of the immune system.

Table 1

Morphological composition of the blood of experimental young animals, (n=5), $\bar{x} \pm S_{\bar{x}}$

Indicator	Group		
	I – control	II – experemental	III – experemental
At the beginning of the experiment			
Red blood cells, 10^{12}/L	5,46±0,11	5,72±0,19	5,92±0,16*
White blood cells, 10^{9}/L	12,92±0,60	13,24±1,12	13,36±0,72
Hemoglobin, G/L	109,20±3,89	110,60±4,99	115,40±5,42
Leukocyte formula, %			
including: eosinophils	3,60±0,51	3,00±0,32	2,80±0,37
basophils	1,40±0,68	1,60±0,81	1,20±0,58
neutrophils: rod-shaped	4,20±0,58	4,40±0,51	4,60±0,51
segmentonuclear devices	39,40±3,19	39,40±4,30	37,80±2,82
lymphocytes	49,00±3,79	49,40±3,33	51,80±3,60
monocytes	2,40±0,51	2,20±0,58	1,80±0,37
At the end of the experiment			
Red blood cells, 10^{12}/L	5,92±0,31	6,08±0,19	6,36±0,36
White blood cells, 10^{9}/L	12,56±0,69	12,68±0,51	12,94±0,65
Hemoglobin, G/L	120,20±5,70	123,20±5,67	127,60±5,52
Leukocyte formula, %			
including: eosinophils	3,20±0,58	2,80±0,37	2,60±0,40
basophils	1,20±0,73	1,80±0,92	1,80±0,80
neutrophils: rod-shaped	3,40±0,60	3,60±0,60	3,80±0,66
segmentonuclear devices	50,40±4,31	50,20±4,34	48,80±2,85
lymphocytes	38,20±3,75	38,40±3,04	40,80±2,85
monocytes	3,60±1,03	3,20±0,86	2,20±0,58

*Note. *p<0.05 – probability of difference relative to Group I*

At the final stage of rearing young animals of the experimental groups, an increase in adaptive resistance to technological stress factors was noted, which probably made it impossible to obtain statistically significant differences in the morphological composition of blood between them and their peers of the control group. At the same time, compared with its onset, the content of red blood cells in the blood increased by 6.3–8.4%, and the concentration of hemoglobin – by 10.1–11.4%, and the leukocyte formula also changed in the direction of increasing the specific proportion of segmentonuclear neutrophils – by 27.4–29.1%, against the background of an increase in the content of monocytes – by 22.2–50.0%, which directly depended on the age characteristics of the formation of its cellular composition, but the values of other parameters, on the contrary, decreased.

The use of anti-stress drugs contributed to an additional increase in the number of red blood cells in the blood of animals of the experimental groups by 2.7 and 7.4%, leukocytes – by 1.0 and 3.0%, hemoglobin concentration – by 2.5 and 6.2%, the level of Rod neutrophils – by 11.8% in both cases of comparisons and lymphocytes – by 0.5 and

6.8% compared to analogues of the control group. At the same time, regardless of the group of animals, the content of segmentonuclear neutrophils prevailed over all forms of white blood cells in the leukogram. Less significant and statistically unlikely discrepancies in these indicators were between the analogues of groups III and II in favor of the former.

The content of total protein in the blood serum, the ratio between its fractions and the concentration of glucose became important indicators of the changes that occurred in the body of young animals (Table 2).

Table 2

Formation of biochemical parameters of blood serum, (n=5), $\bar{x} \pm S_{\bar{x}}$

Indicator	Group		
	I – control	II – experemental	III – experemental
At the beginning of the experiment			
Total Protein, G/L	65,20±0,39	68,50±0,29***	72,10±0,26***/^{aaa}
Protein fractions, %:			
albumins	42,90±2,11	42,62±1,06	41,98±0,64
globulins	57,10±2,11	57,38±1,06	58,02±0,64
including: Alpha globulins	13,38±0,38	12,92±0,15	12,58±0,27
beta globulins	13,00±3,20	13,08±1,63	13,30±0,63
gamma globulins	30,72±1,41	31,28±1,20	32,14±1,37
A/G coefficient, units	0,75±0,06	0,74±0,03	0,72±0,02
Glucose, mmol/L	5,08±0,09	4,42±0,19*	4,15±0,22**
At the end of the experiment			
Total Protein, G/L	72,62±2,29	73,40±1,68	76,26±1,13
Protein fractions, %:			
albumins	44,12±0,65	44,06±0,11	43,42±0,30
globulins	55,88±0,65	55,94±0,11	56,58±0,30
including: Alpha globulins	13,10±0,07	12,82±0,09	12,00±0,07
beta globulins	13,74±0,18	13,86±0,05	14,48±0,27
gamma globulins	29,04±0,49	29,26±0,11	30,10±0,35
A/G coefficient, units	0,79±0,01	0,79±0,00	0,77±0,01
Glucose, mmol/L	6,28±0,52	5,74±0,44	5,55±0,68

*Note. *p<0.05; **p<0.01; ***p<0.001-probability of difference in relation to Group I; ^{aaa}p<0.001 – in relation to Group II*

Analyzing the obtained data on the content of these components, we also note that the features of their formation in the blood serum of animals of all groups had a similar direction of changes. At the same time, the use of experimental and standard anti-stress drugs already at the beginning of the research provided significant changes in the protein composition of blood serum, characterized by higher indicators of the content of globulins, and above all, the gamma-globulin fraction. Meanwhile, a positive reaction of the body of young animals of the experimental groups to the administration of drugs was also noted for the content of total protein in the blood serum, which was higher than in the peers of the control group by 5.1 and 10.6% (p<0.001 in both cases of comparison).

At the same time, the use of an experimental drug with a distinctive effect on increasing the total protein content was also manifested in the peers of Group II and the

difference in their favor was 5.2% ($p<0.001$). Similar advantages of experimental animals over control animals, but with insignificant and statistically unlikely fluctuations in values, were observed in the content of globulins by 0.5 and 1.6%, beta-globulin fractions – by 0.6 and 2.3%, and gamma-globulins – by 1.8 and 4.6%.

The use of anti-stress drugs led to a decrease in the concentration of glucose in the blood serum by 6.5% ($p<0.05$) and 18.3% ($p<0.01$), which indicates the normalization of carbohydrate metabolism aimed at meeting the needs of the body in conditions of technological stresses. On the other hand, a statistically significant increase in blood glucose levels in Group I young animals is probably a consequence of the body's response to these stress factors.

By the end of the experiment, the total protein content in the blood serum of experimental animals increased by 11.4, 7.2 and 5.8% ($p<0.05$ in all cases of comparisons), which confirms the long-term positive effect of the drugs not only on reducing stress, but also improving protein metabolism. The protein level of the albumin fraction increased by 2.8, 3.4 and 3.5%, the beta-globulin fraction – by 5.7, 6.0 and 8.9%, and the glucose concentration – by 23.6%, 29.9 and 33.7%, respectively, in groups I, II and III. Despite the increase in glucose concentration during the experiment, its level remained lower in the experimental groups than in the control group, which may be a consequence of more effective assimilation against the background of the use of anti-stress drugs.

With an increase in the duration of the experiment, there was a decrease in the total level of globulins by 2.1, 2.5 and 2.5%, respectively, albumin fractions – by 2.1, 0.8 and 4.6%, gamma globulin fractions-by 5.5, 6.5 and 6.3%. The albumin-globulin coefficient in the blood of animals of all groups remained almost stable during the experiment and its values repeated the direction of albumin fluctuations, although in animals of Group I, its slight increase is due to the high content of the globulin fraction. Due to the nature of the detected changes, representatives of the II and III experimental groups exceeded the analogues of the I control group by 1.1 and 5.0%, the level of globulin fractions – by 0.1 and 1.3%, beta-globulin fractions – by 0.8 and 5.4%, and gamma-globulins – by 0.8 and 3.7%.

The next stage of the study was the determination of clinical indicators in young animals that characterize the functional state of the body's systems and allow us to assess the effectiveness of the use of anti-stress agents (Table. 3).

Table 3

Functional state of the experimental young animal's body, (n=5), $\bar{x} \pm S_{\bar{x}}$

Indicator	Group		
	I – control	II – experemental	III – experemental
At the beginning of the experiment			
Heart rate, beats/min	112,40±2,38	109,60±1,08	108,20±1,50
Respiratory rate,movements/min	37,80±0,86	37,40±0,51	37,00±0,77
Body temperature, °C	39,38±0,09	39,14±0,20	39,08±0,11
At the end of the experiment			
Heart rate, beats/min	107,40±2,04	105,40±1,81	103,80±1,69
Respiratory rate,movements/min	34,80±1,24	33,80±1,24	33,20±0,97
Body temperature, °C	39,15±0,06	39,04±0,22	38,88±0,12

The obtained research results convincingly indicate a positive effect of the anti-stress drugs used on the functional state of experimental animals, however, regardless of the group, it was at the level of the physiological norm. At the same time, at the beginning of the experiment in piglets of Group I, the respiratory rate was slightly accelerated by 0.4 and 0.8 movements/min or 1.1 and 2.2%, and the heart rate was higher – by 2.8 and 4.2 beats/min or 2.6 and 3.9%, compared with peers of groups II and III. At the same time, the body temperature was stable, and the difference between the control and experimental groups was only 0.24 and 0.30 ºC or 0.6 and 0.8 %.

At the end of the experiment, a similar dynamics was observed: in piglets of Group I, the respiratory rate remained slightly higher by 1.0 and 1.6 movements/min or 1.8 and 4.5%, respectively, compared to individuals of groups II and III. In addition, there was a tendency to increase the heart rate by an average of 2.0 and 3.6 beats/min, or 1.9 and 3.5%. The lowest variability was characterized by body temperature, for which a clear intergroup difference was not proved, although its higher values are also inherent in young animals of Group I by 0.24 and 0.3 ºC or 0.6 and 0.8%, compared to analogues of groups II and III.

As the experiment lengthened, the breathing rhythm in all experimental animals decreased by 3.0–3.8 movements/min or 7.9–10.0%, and the number of pulse beats decreased by 4.2–5.0 beats/min or 3.8–4.4%. The body temperature of experimental animals changed slightly during the experiment, maintaining a general tendency for all groups to decrease by 0.18–0.23 ºC or 0.3–0.6%. The results obtained indicate a high level of adaptation of piglets of all groups to the effects of technological stresses.

The stability of the functional state of the body of young animals of experimental groups against the background of the use of anti-stress drugs both at the beginning and at the end of the experiment confirms their effectiveness in increasing the adaptive ability for the manifestation of technological stress factors.

Discussion. In modern conditions of pig breeding development, the problem of reducing the negative consequences of the impact of technological stress factors on the pig body is becoming a priority. Its solution is based on the introduction of a complex of interrelated approaches, among which an important place is occupied by pharmacological correction of the physiological state, optimization of feeding rations, selection on the basis of resistance to stress, as well as technological (improvement of conditions and parameters of maintenance, microclimate parameters, modernization of equipment, improvement of production processes).

The relationship between clinical and physiological parameters and stress resistance in pigs with the use of stress-correcting agents has been the subject of research by many scientists (Babenko S. P., & Cherniavskyi O. O., 2011; Hartnett P. et al., 2020; Martyshuk T. V. et al., 2021; Wang L. et al., 2023). At the same time, from a scientific and practical point of view, the use of our own approach, without reducing the significance of existing theoretical achievements, allowed us to reveal new aspects of the physiological role of these indicators in the formation of the adaptive ability of young pigs to the influence of technological stress factors.

Summarizing the accumulated experimental material, it was found that technological stress factors caused Intergroup differences in the formation of the Morpho-biochemical composition of blood, although these indicators were at the level of the physiological norm. The use of the experimental drug from the beginning of the experiment weakened the negative impact of stress factors on hematopoiesis function, contributing to an increase in the content of red blood cells by 8.4% ($p<0.05$), white blood cells-by 3.4 %, hemoglobin concentration – by 5.7% and Total Protein – 10.6% ($p<0.001$), compared with the peers of the control group. In animals of the II experimental

group, which were administered a standard anti-stress drug, these indicators for animals of the III group changed less clearly – respectively by 3.5, 0.9, 4.3 and 5.2% in favor of the latter, which indicates different effectiveness of the studied drugs. At the end of the experiment, there was a tendency to increase the corresponding indicators in the blood of young animals of both experimental groups, which confirms their long-term positive effect on hematopoietic function. However, regardless of the group and time period of the experiment, fluctuations in the leukogram and albumin-globulin composition of the blood were less significant. Similar confirmations regarding the effect of stress-correcting drugs on the indicators of non-specific immunity and antioxidant protection of pigs are highlighted in the works (Stoianovsky V., 2012; Stoianovsky V. H., 2013; Antonenko P. P. et al., 2013; Fotina T. I., & Rebenko H. I., 2015).

At the same time, changes in physiological parameters demonstrate a natural response of young animals to the influence of technological stress factors. In particular, both at the beginning and end of the experiment, they were slightly higher in piglets of the control group with an increase in serum glucose concentration, which indicates a more pronounced stress response of the latter's body to the action of these factors. In addition, a likely increase in total protein content against the background of a likely decrease in serum glucose levels is probably associated with an increase in the intensity of growth of young animals and optimization of metabolic processes occurring against the background of a decrease in stress load. Reducing the action of catecholamines and corticosteroids normalizes the functional state of the liver, stimulating the synthetic activity of hepatocytes and increasing the concentration of protein fractions in blood plasma, mainly globulins. A simultaneous decrease in glucose levels may reflect an increased use of energy substrates for growth needs, i.e. more efficient absorption of glucose by cells with a stable energy supply. But there was no direct evidence of the implementation of this process in the literature available to us.

Conclusion.

The use of anti-stress drugs had a positive effect on the morphological composition of the blood and protein-carbohydrate metabolism. In experimental animals, a significant increase in the content of red blood cells, total protein and individual protein fractions, in particular beta - and gamma-globulins, was noted against the background of a decrease in glucose concentration, which indicates an increased adaptation of the body to technological stresses and stabilization of its functional state. At the same time, the experimental drug turned out to be the best.

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