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Ensuring the Health and Productivity of Pigs with New Immunotropic Preparations

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ABSTRACT: The efficiency of using immunotropic preparations PigStim-C and PigStim-M for newborn piglets for commercialization of the bioresource potential of productivity has been assessed. It has been found that PigStim-C and PigStim-M do not have a negative effect on the clinical and the physiological state of the organism, and ensure the health and preservation rate of pigs. The tested immunotropic preparations activate cellular and humoral factors of nonspecific protection of the organism and contribute to the commercialization of the bioresource potential of meat productivity.

Keywords: pigs, immunotropic preparations pigstim-c and pigstim-m, immunity, lysozyme activity, bactericidal activity, incidence rate, preservation rate, productivity.

I. INTRODUCTION

The key prerequisite for the growth of profitability and competitiveness in livestock breeding is the development and improvement of technical, organizational, economic, and managerial mechanisms. However, it often happens that innovations disrupt the relationship of the organisms of farm animals with the environment established in the process of phylogeny [1-6]. In such circumstances, pigs' organisms are exposed to environmental factors, which results in disruption of the metabolism, decreased resistivity of their organisms, and, ultimately, in high disease incidence rates and low productivity [7-14].

In view of the fact that eliminating the influence of many factors seems impossible, preventing the negative influence of stressors, on the one hand, and improving the adaptive abilities of animals to the conditions of commercial keeping, on the other hand, become priorities [15-20]. Special attention should be paid to newborn piglets, since they are more exposed to the environmental factors, while the adaptive mechanisms of the organism have not yet been formed. On the other hand, the early period of postnatal ontogenesis is optimal for targeted effect on the process of forming protective-adaptive mechanisms in the organism [21-27].

This paper is aimed atcommercialization of the bioresource potential of the pig organism by activating the nonspecific resistivity with the new immunotropic preparations PigStim-C and PigStim-M.

II. MATERIAL AND METHODS

The research study was performed at the pig-breeding farm of the CJSC Progress in the Cheboksary district of the Chuvash Republic. The materials were processed at the laboratory of bio- and nanotechnologies, and at the laboratory of the Department of Morphology, Obstetrics and Therapy of the Chuvash State Agricultural Academy.

The objects of the research were suckling piglets, weaned piglets, and young pigs fattened before slaughtering for meat. Three groups of newborn piglets (control, 1st experienced and 2nd experienced) were chosen by the principle of analogs, given the clinical medical state and the live weight, 50 animals in each group.

To determine the nature of the effects on the clinical medical state, the haematological and biochemical blood profiles, the indicators of nonspecific resistivity of the organism, growth, diseases incidence rate, preservation rate and productive qualities of young pigs, the newborn piglets in the experimental groups were injected intramuscularly with immunotropic preparations PigStim-C and PigStim-M at the dosage of 0.3 ml per animal three times — on the first, the fourth, and the seventh day of life. The animals of the reference groups were not injected.

The animals of all groups were monitored, the morphological and biochemical composition of their blood was monitored along with the cellular and humoral factors of the nonspecific resistivity of the organism; the growth dynamics, diseases incidence rate and preservation rate of young livestock were assessed. After slaughtering at the age of 210 days, the quality of the pigs' carcasses and meatiness of the semi-carcasses were assessed.

III. RESULTS AND DISCUSSION

The conditions of keeping and feeding pigs at the pig-breeding complex of the CJSC Progress in the Cheboksary district of the Chuvash Republic met the

recommendations, and contributed to manifestation of the genetically inherent potential productivity in animals, while compliance with the veterinary and sanitary rules and the conditions of farm operation ensured its veterinary well-being [28, 29].

Over the time or observation, no clear differences have been found in the behavioral reactions of the animals, except for the short-term stress reaction in the piglets in the experimental group after intramuscular injection of immune modulating preparations, and sporadic cases of diseases in the experimental groups described below.

The number of erythrocytes, leukocytes, and concentration of hemoglobin in the blood of pigs in the experimental groups during all periods of the study were within the physiological norms.

Starting with the age of 14 days until the end of the observation period, the number of erythrocytes in the blood of the pigs in the 1st and the 2nd experimental groups was higher than the reference value by 5.1 and 7.6 %, and 5.7 and 8.8 %, respectively.

Hemoglobin concentration in the blood of the pigs in the 1st experimental group was higher than that in the reference group by 3.1 – 5.3 %, and in the blood of the animals in the 2nd experimental group — by 2.9 – 4.9 %.

The increased number of erythrocytes and increased hemoglobin concentration in the blood of the piglets in the experimental groups are the evidences of hematopoiesis intensification on the background of using immunotropic preparations PigStim-C and PigStim-M in the early period of postnatal ontogenesis.

The number of leukocytes in the blood of the pigs in the 1st experimental group was higher than that in the reference group by 11.8 – 25.3 %, and in the 2nd experimental group — by 12.0 and 25.8 %, respectively.

In the blood of the pigs in the 1st experimental group, there were more basophilic leukocytes by 0.4 – 0.8 %, and in the 2nd experimental group — by 0.6 – 1.0 % than in the reference group. The number of eosinophils in the blood of the piglets in the experimental groups was veraciously lower than that in the reference group. This fact was more pronounced in the piglets in the second experimental group.

No veracious difference has been found in the share of immature neutrophils in the experimental groups. The relative number of stab and segmentonuclear neutrophils and monocytes was lower in the blood of the piglets in the experimental groups than in the reference group. Moreover, the most pronounced difference was observed for segmentonuclear neutrophils. For instance, in the blood of the piglets in the 1st experimental group, the relative number of segmentonuclear neutrophils was below the reference value by 6.4 – 11.4 %, and in the 2nd experimental group — by 5.8 – 10.6 %. Meanwhile, in the experimental groups, the number of segmentonuclear neutrophils, relative to immature and the stab neutrophils increased, indicating a decreased number of neutrophils with the right nucleus shift.

The relative number of lymphocytes in the blood of the piglets in the 1st and the 2nd experimental groups was higher than that in the reference by 7.8 – 13.0 % and 7.2 – 12.4 %, respectively. Therefore, the studied immunotropic preparations cause lymphocytosis in the blood of piglets.

The results of studying nonspecific resistivity of the piglets in the experimental groups on the background of immunocorrection with preparations PigStim-C and PigStim-M are shown in Fig. 1–3.

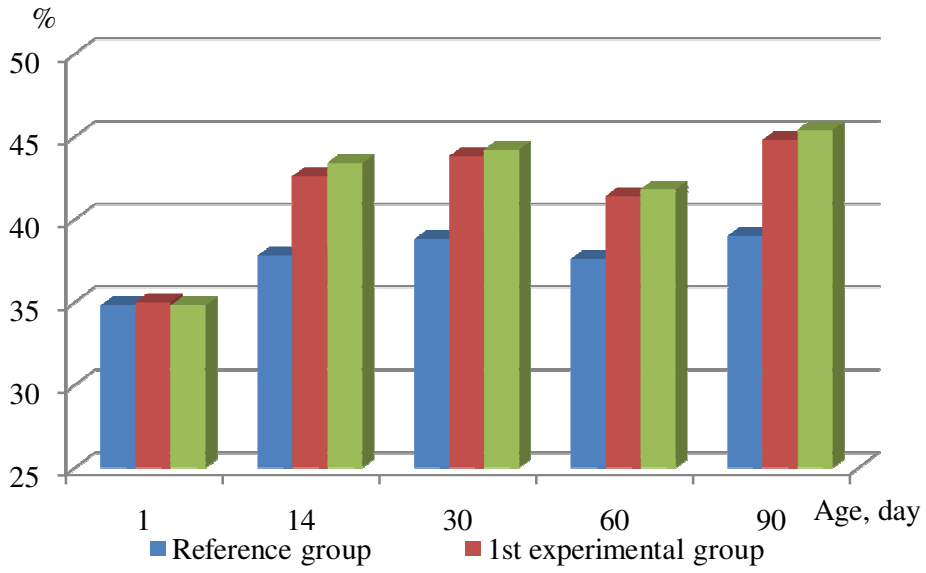

Fig. 1. Phagocytic activity of neutrophils in the blood of piglets.

The phagocytic activity of neutrophils in the blood of the piglets in the 1st experimental group in the period from 14 to 90 days of age was higher than in the reference group by 3.8 – 5.8 %, and the 2nd experimental group — by 4.2–6.4 %.

Bactericidal activity of blood serum in the same period was significantly above the reference values in the pigs in the 1st experimental group by 3.6 – 8.6 %, and in the 2nd experimental group — by 3.4 – 9.8 %.

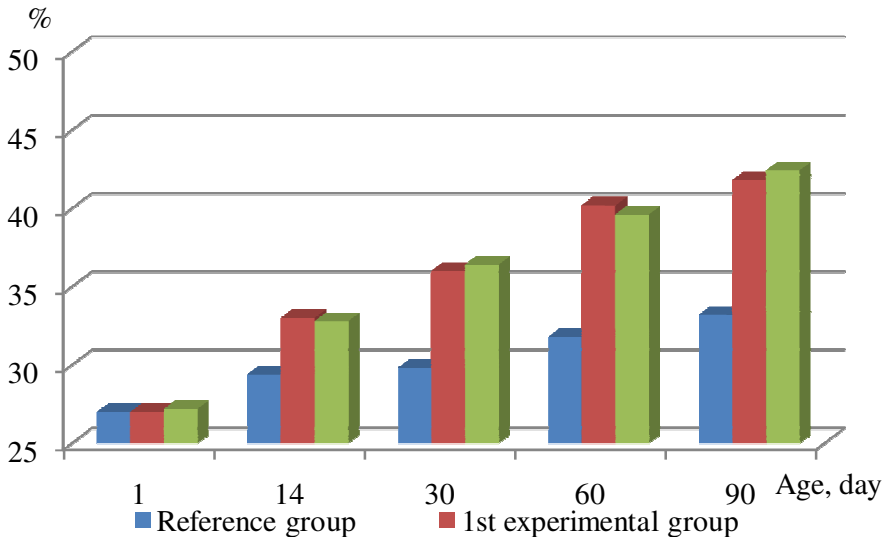

Fig. 2. Bactericidal activity of piglets' blood serum.

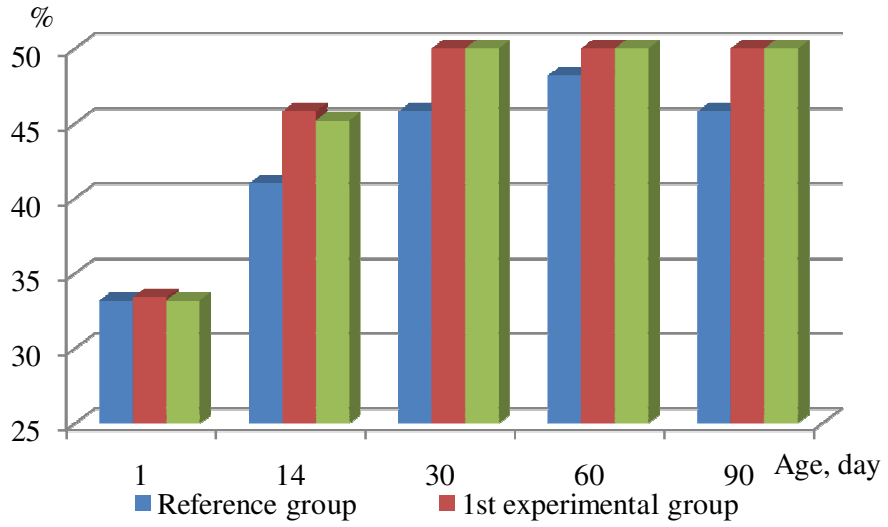

Fig. 3. Lysozyme activity of piglets' blood plasma.

Lysozyme activity of blood plasma was also higher in the piglets in the 1st and the 2nd experimental groups than in the reference group, by 4.8 – 8.6 % and 4.0 – 8.0 %, respectively.

Thus, the results of the immunological blood study show that intramuscular injection of piglets with immunotropic preparations PigStim-C and Pigtim-M in the early period of postnatal ontogenesis contributes to activation of cellular and humoral factors of nonspecific resistivity of the organism.

Among the piglets in the reference group, 26 cases of diseases were observed during the neonatal and suckling period, while therapy of the diseases was successful in only 24 cases, two piglets died of exhaustion and dehydration as a result of non-infectious diarrhea. In the 1st experimental group, 11 cases of piglets diseases were noted, of which 10 piglets were cured, and one piglet died; in the 2nd experimental group, nine cases of piglets diseases were noted, of which all recovered. The average disease duration in the pigs in the reference group was 1.96 days, in the 1st experimental group — 1.55 days, and in the 2nd experimental group — 1.67 days. The incidence rate in the piglets in the 1st and the 2nd experimental groups was below the reference value, respectively, by 30 and 34 %; besides, the indicators of efficiency of therapeutic intervention and preservation rate also significantly improved.

Among the weaned piglets in the reference group, 14 cases of noncontagious diseases were registered, therapy was successful in 13 cases, with the total disease duration of 2.43 days; one weaned piglet died. In the 1st experimental group, seven cases of the disease were registered, therapy was successful in all cases, and the average disease duration was 1.86 days. In the 2nd experimental group, fivedisease cases in the piglets were registered, therapy was successful, and the average disease duration was 2.00 days. Thus, the use of immune modulating preparations helped reduce the number of diseases in the piglets during the weaning period 2.0 – 2.8 times, and their duration — by 0.43 – 0.67 days.

During the fattening period, 12 cases of diseases were registered in the pigs in the reference group, seven

cases in the 1st experimental group, and eight cases in the 2nd experimental group. The average disease duration in the animals was 3.25, 2.86, and 2.88 days, respectively. With that, the therapy of diseases in all three groups was efficient.

Thus, based on the analysis of the incidence rate and preservation rate of the pigs during the neonatal, suckling, weaning and fattening periods, it has been found that intramuscular injection of immunotropic preparations PigStim-C and PigStim-M to piglets in the early period of postnatal ontogenesis reduces the number of diseases, shortens the recovery period, and improves efficiency of therapy. With that, the pig preservation rate in the experimental groups over the entire period of the study was 98.0 % and 100.0 % vs. 94.0 % in the reference group.

At the age of 210 days, five pigs from each group were check-slaughtered.

It has been found that the carcass yield in the pigs of the reference group was 67.83 %, with an average carcass weight of 70.40 kg. The slaughter weights of the pigs of the 1st and the 2nd experimental groups were 76.62 and 77.48 kg, respectively, which were 6.22 and 7.08 kg higher than the reference values (Table 1).

Table 1: Meat productivity of pigs.

Indicator	Group		
	reference	Experimental 1	Experimental 2
Pre-slaughter weight, kg	103.79	110.92	112.34
Absolute weight gain, kg	102.79	109.92	111.34
Average daily weight gain, g	489	523	530
Slaughter weight, kg	70.4 ± 0.28	76.62 ± 0.48	77.48 ± 0.62
Slaughter yield, %	67.83	69.08	68.97
Chilled semi-carcass weight, kg	34.74 ± 0.13	37.78 ± 0.24	38.22 ± 0.31
Trimmed pork, kg	21.65	23.53	23.81
Lard, kg	4.93	5.36	5.43
Skin, kg	2.36	2.57	2.60
Ribs for smoking, kg	3.13	3.40	3.44
Tendons, cartilages, kg	0.66	0.72	0.73
Process stripping and losses, kg	0.07	0.08	0.08
Bones, kg	1.95	2.12	2.14

The amount of trimmed pork obtained from the semi-carcasses of the pigs from the 1st experimental group was on average greater by 1.88 kg, and from the 2nd experimental group — by 2.16 kg than the reference value. Besides, from the semi-carcasses of the pigs in the 1st and the 2nd experimental groups, more lard was obtained by 0.43 and 0.50 kg, and ribs for smoking — by 0.27 and 0.31 kg than in the reference group, respectively.

IV. CONCLUSION

Immunotropic preparations PigStim-C and PigStim-M in the conditions of commercial technology do not have any negative effect on the clinical medical state of the organism, ensuring pigs health and preservation rate, stimulate haematopoiesis, cellular and humoral factors of nonspecific organism protection, and contribute to the commercialization of the bio-resource potential of meat productivity.

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