The influence of biologically active substances on safety of pigs

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Abstract. The results of the influence of the biologically active substance "Amylocin" on nonspecific factors of protection of the organism of sows in the second half of gestation and in the first decade after farrowing are presented. It was found that the cellular indications of the natural resistance of the organism throughout the experiment were higher in the experimental group of the lactating sows, that received the biologically active substance, in comparison with the gestating and lactating sows of the control group. Humoral indications of natural resistance of the organism: lysozyme activity of blood serum was higher in the experimental group of the lactating sows in comparison with gestating and lactating sows of the control group by 12.5 and 5.2%; On the contrary, bactericidal activity of blood serum was higher in group of sows during the second half of gestation by 18.9 and 24.9% than in the experimental and control groups of farrowing sows. There were no postpartum complications in the experimental group of sows, the safety of the obtained young growth was higher by 8.6% in comparison with the control group.

1. Introduction
The conditions for keeping, feeding and breeding pigs in individual farms are very different from the conditions of existence of pigs in their natural habitat, which sets a difficult task for scientists and specialists of agricultural enterprises in creating stable and unpretentious breeds of pigs that can increase the economic efficiency of this industry [1]. In this regard, research work is continuously being carried out to study the effect of biologically active substances in order to prevent diseases, due to which the growth and development of young growth is accelerated, the protective properties of the organism of sows are increased, the time for breeding of the obtained young growth is reduced, feed cost per unit of production is reduced and the profitability of this industry increases [2, 3]. For this, recently, not only feed antibiotics have been used, but also correctly selected natural or synthetic substances identical to natural ones, which strengthen health and prevent the development of diseases (parapharmaceuticals), which are biologically active substances (BAS), or substances that ensure the functional activity of the intestinal microflora (eubiotics) [4].

With the development of the microbiological industry, the number and varieties of dietary supplements are constantly increasing. Pigs as a biological object have their own characteristic
features in the digestive system, which imposes certain rules in their normalized feeding [5]. Therefore, the purpose of our research was to study the effect of the probiotic "Amylocin" based on the bacteria of the type Bacillus of the bacillus B. subtillus and B. Amyloliquefaciens strains on the cellular and humoral blood indications of gestating and lactating sows, the presence of postpartum complications and the safety of the obtained offspring.

2. Materials and methods
The studies were carried out at JSC "Batayskoye" of the Azov district of the Rostov region on hybrid of large white and Landrace sows. For this purpose, an experimental and control group of main gestating sows, 15 heads each, were formed. During the periods of gestation and lactating, sows of all groups were kept under the same conditions, and they were fed according to the standards of Russian Research Institute of Animal Husbandry [6]. Sows of the experimental group, during the second half of gestation from day 80 to farrowing, were given 20 g of “Amylocin” each with feed. The sows of the control group did not receive the medicament.

To study the humoral and cellular factors of the organism's natural resistance, blood from gestating and lactating sows of the experimental and control groups was taken in the morning, at the same time, before feeding from the jugular vein at the beginning of the experiment (the 80th day of gestation) and on the 7th day after farrowing. Cellular and humoral indications of natural resistance were determined in the blood:
- lysozyme activity of blood serum - by the method of Dorofeychuk modified by Chebotkevich and Lyutinskiy (1998) photocolorimetric method using a daily culture of Micrococcus ljiodeicticus;
- bactericidal activity of blood serum - according to Smirnova and Kuzmina (1966). Escherihia coli strain 04 was used as a test microbe;
- phagocytic activity of neutrophilic granulocytes, phagocytic index and phagocytic blood capacity according to Fedyuk et al;
- reaction of bacterial agglutination according to Birger (1982) [7].

The data obtained during the experiment were processed biometrically according to Plokhinsky (1970) and Merkuryeva (1970).

3. Results and discussion
Knowing of the characteristics of cellular and humoral factors of natural resistance of sows in different physiological states allows to interpret correctly and, if necessary, adjust the level of nonspecific organism protective properties to obtain healthy and viable offspring [8].

During the study, we were interested to find out which animals will have higher indications of nonspecific organism protective properties and how they will affect postpartum complications and the safety of the obtained offspring [9].

Throughout the entire observation period, when conducting studies on the effect of the probiotic "Amylocin", both during gestation and during lactation of the experimental animals, a decrease in response to external stimuli, depression, decrease or lack of the appetite, decrease in motor activity were not noticed. Aggressiveness or increased excitability towards the attendants were not observed. The gestation period proceeded without deviations from the physiological norm, i.e. abortion, toxicois, appetite perversion were not observed. However, after farrowing, one of the sows in the control group had agalactia, and 60% of the obtained offspring of the other sow of the same group, were born dead. No postpartum complications were observed in the experimental group of the sows.

It is known that the immune system is one of the most important homeostatic factors of the organism. It largely determines the health of animals and their adaptive capabilities; in addition, it is an indicator system of ecological trouble and is sensitive to changes in the environment [10]. Analysis of Table 1 shows that the phagocytic activity of neutrophilic granulocytes on the fourth day after farrowing of the sows receiving the probiotic "Amylocin", after 30 minutes of phagocytosis was 3.2 (P > 0.99) and 7.5% (P > 0.999) higher than gestating sows and sows of the control group, that did not receive the biologically active substance, had.
The phagocytic number of the sows of the experimental group after farrowing was 9.5% higher than in the control group, but lower than of the gestating sows by 1.9%. The phagocytic capacity of the lactating sows of the experimental group also exceeded the gestating and lactating sows of the control group by 0.70 ($P > 0.999$) and $0.54 \times 10^3/l$ ($P > 0.999$).

### Table 1. Indicators of natural resistance of sows.

| Indicators of natural resistance | Pregnant sows before administration of the drug | On the 7th day after farrowing |
|---------------------------------|-----------------------------------------------|-------------------------------|
| Phagocytosis 30 minutes         |                                               |                               |
| Phagocytic activity, %          | 47.10 ± 1.02**                               | 50.50 ± 1.12                  | 43.00 ± 1.04***               |
| Phagocytic number, units        | 1.65 ± 0.06                                  | 1.62 ± 0.07                   | 1.48 ± 0.04                   |
| Phagocytic blood capacity, 10^{7}/l | 1.20 ± 0.03***                             | 1.90 ± 0.01                   | 1.36 ± 0.02***                |
| Phagocytic index, units         | 0.76 ± 0.02                                  | 0.80 ± 0.03                   | 0.60 ± 0.02                   |
| Phagocytosis 120 minutes        |                                               |                               |
| Phagocytic activity, %          | 43.00 ± 1.08*                                | 47.20 ± 1.14                  | 40.00 ± 0.96**                |
| Phagocytic number, units        | 1.55 ± 0.10                                  | 1.43 ± 0.06**                 | 1.35 ± 0.04***                |
| Phagocytic blood capacity, 10^{7}/l | 1.10 ± 0.01***                             | 1.80 ± 0.02                   | 1.03 ± 0.02***                |
| Phagocytic index, units         | 0.67 ± 0.02                                  | 0.65 ± 0.02                   | 0.51 ± 0.01**                 |
| PL                              | 1.4                                          | 1.25                          | 1.15                          |
| Bactericidal activity of blood serum, % | 52.60 ± 1.40                              | 33.70 ± 1.05***              | 27.70 ± 1.10***              |
| Lysozyme activity of blood serum, % | 14.90 ± 1.63***                             | 27.40 ± 1.40                 | 22.20 ± 1.32*                |

$P > 0.95^*$, $P > 0.99^{**}$, $P > 0.999^{***}$.

After 120 minutes of phagocytosis, both in gestating and lactating sows of the experimental and control groups, the results obtained differed from the indicators of phagocytosis after 30 minutes in the direction of their decrease. However, after farrowing of the sows receiving the probiotic, the cellular indications of natural resistance were higher than phagocytic activity, phagocytic blood capacity and phagocytic index in control group by 7.20% ($P > 0.99$), $0.77 \times 10^3/l$ ($P > 0.999$) and 0.14 units.

As we know, the system of organism natural resistance was formed in the process of evolution and the formation of new breeds of domestic animals. It determines their adaptability to exogenous and endogenous stresses, which are caused by the action of pathogens, unfavorable natural and climatic conditions, which is especially important in relation to animals that are kept in livestock buildings all year round. An important part in the natural protection of the organism is taken by the enzyme lysozyme, which is able to dissolve and destroy both positive and negative pathogenic microorganisms, thereby being a barrier to the penetration of pathogens into the organism [11].

Analyzing the obtained indicators of lysozyme activity of blood serum of the lactating sows of the experimental group, its increase in comparison with gestating and control lactating sows by 12.50 ($P > 0.999$) and 5.20% ($P > 0.99$), respectively. In the control group of the lactating sows, this indicator was 7.2% higher than in the group of gestating sows in favor of the sows in the control group. We associate these changes with a significant change of physiological processes in the organism of sows during farrowing, since the effect of lysozyme on bacteria is to dissolve specific mucopolysaccharides of the membranes of microbes, which also inhibits the growth and stops the vital activity of many bacteria [12].
The second studied indicator of humoral body defense (bactericidal activity of blood serum) was high in group of sows during the second half of gestation and amounted to 52.60%, which is 18.9% (P > 0.999) and 24.9% (P > 0.999) higher than in the experimental and control groups of lactating sows on day 7 after farrowing. In the control group of lactating sows, the difference in the bactericidal activity of the blood serum was 5.20% (P > 0.95) less than in the experimental group that received the probiotic "Amylocin".

4. Conclusion
An increase in the cellular and humoral indications of the blood serum of lactating sows in the experimental group made it possible to increase their natural resistance of the organism, which had a positive effect on the obtained offspring, the safety of which increased by 8.6% and the absence of postpartum complications.

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