



# Immunotropic Drugs of the Prevention and Salus Series in Realizing the Potential of Reproductive and Productive Qualities of Cattle



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## Abstract

**Problem and purpose:** The purpose of this work was the veterinary and hygienic justification of immunoprophylaxis of the body of cattle with new generation biopreparations of the Prevention and Salus series in the realization of reproductive and productive qualities.

**Methods:** The research work was carried out in the period from 2007 to 2023 and consisted of 3 stages. The objects of the study were cows in the periods of deadwood, newness and lactation, calves received from them from birth to the age of 540 days, imported heifers from Belarus. During scientific research, we studied the blood parameters and immunoreactivity of animals 35-30, 15-10 and 10-5 days before calving, as well as 3-5 days after calving. The addition, the bioamine profile of the blood of Belarusian heifers was analyzed before and after transportation, the reproductive organs after calving, the quantity and quality of the milk received were examined. In calves, the conditions of growth, morbidity and preservation, physiological data, blood picture, and the state of resistance of the body to 1-, 15-, 30-, 60-, 90-, 120-, 150-, 180- e, and in young animals – on the 360th and 540th day of life with using standard methodological techniques. The studies were carried out using the developed drugs Prevention-N-C, Prevention-N-E, Salus-PE and Salus-EG on the 45-40, 25-20 and 15-10 days before calving, calves on 2-3 and 7-9 days after birth, heifers 7 days before and 2 days after transportation, and electropuncture sessions were offered to new-bodied cows for 15 minutes with an interval of 48 hours using the Vocal-V device.

**Results:** It has been established that the proposed biologics prevent transport stress and contribute to the selective mobilization of the bioresource potential of production and productive qualities of cows in the periods of deadwood, newness and lactation, calves obtained from them from birth to the age of 540 days and imported heifers, improve the morphological and biochemical picture of blood, stimulate metabolic activity, cellular and humoral links of nonspecific resistance the body.

**Conclusion:** Based on many years of research, we have given a veterinary and hygienic justification for immunoprophylaxis of the bovine body with new generation biopreparations of the Prevention and Salus series in the implementation of reproductive and productive qualities.

**Keywords:** cattle; immunotropic drugs; immunity, Prevention-N-C; Prevention-N-E; Salus-PE; Salus-EG.

## Introduction

In the Russian Federation, dairy farming is the main and one of the most profitable branches of livestock farming. However, over the past ten years, scientists in our country have concluded that due to economic reforms and a decrease in domestic production of livestock products, the volume of Russian agricultural products depends on imports. Currently, this problem is actively associated with the "blocking" of countries importing products into our country [1].

Today, the genetic pool in livestock production is in decline due to the lack of new breeding programs and strategies. Intensification of production technologies, replacement of breeds in the direction of productivity, active use of artificial insemination and embryo transplantation can affect the genetic resources of animals [2].

As the analysis showed, in dairy farming, the volume of crossing local breeds with Holsteins is increasing every year, which is

the main method of improving the production performance of black-and-white cows and other breeds of domestic selection. When grading cattle, it was found that about 50% of animals were obtained because of crossing different breeds, of which 60% were bred using absorption crossbreeding in the second generation, 28% were by backcrossing and less than 2% were bred within themselves. Such breeding may soon lead to a reduction in internal genetic diversity. In populations, genetic variability is narrowed, the period of economic use of animals and resistance to diseases is reduced, and the adaptive and valuable qualities of breeds are lost [3].

A new strategy for the development of livestock farming to obtain organic products should be based on the fullest realization of the potential of livestock productivity by creating optimal zoo hygienic conditions for keeping and feeding [4]. Based on the experience of the last decade, it has become obvious that innovative technologies introduced into production increase the efficiency of using production facilities and equipment, personnel productivity, but do not consider the biological characteristics and mechanisms of highly productive livestock, bringing them closer to a biological machine to produce target products. Thus, despite the processes of increasing use of promising technologies on farms, the required level of livestock productivity and industry profitability is not achieved.

In conditions of intensification of dairy cattle breeding with the constant negative impact of stress factors, animal productivity leads to an increase in the load on the body associated with the mobilization of the working activity of organs and systems. Today, the activity of the resistance system is not always sufficient, which increases the likelihood of developing diseases, and the health of animals directly determines their productive efficiency. In this regard, it becomes clear why highly productive cows are the most vulnerable to diseases of the mammary gland and genital organs. Such livestock are characterized by increased metabolism, since milk is produced through the active transformation of feed nutrients at low costs per unit of production, which leads to a decrease in the immunobiological status of cows with high milk productivity even with the slightest changes in feeding and housing conditions. Inflammation of the mammary gland affects the entire reproductive system of animals. It is known that 25% or more of cows with mastitis are diagnosed with endometritis, functional disorders of the ovaries and reproductive function [5].

The primary task of modern veterinary medicine is to ensure animal health, realize the genetic potential of productivity and obtain safe and high-quality products. Prevention of diseases and increased productivity of farm animals are possible with a targeted impact on the body's resistance system. In production conditions, it is more expedient and more effective not to treat animals, but to use preventive measures that stimulate nonspecific resis-

tance, whereas most often the indication for the use of therapeutic agents in animal husbandry is the occurrence of a disease [6,7].

Microflora plays an important role in the etiology of the disease, since secondary pathology often develops against the background of an immunodeficiency state, which, as a rule, leads to the use of antibiotics and other means of etiotropic therapy. But at the same time, the effectiveness of specific etiotropic drugs in an immunodeficient state of the body is significantly reduced, since the complete elimination of pathogenic microorganisms is carried out by phagocytic active cells. Therefore, we have tested biological products of the Prevention and Salus series, developed by scientists of the Chuvash State Agrarian University, which have complex immunotropic properties.

The purpose of this work is a veterinary and hygienic substantiation of immunoprophylaxis of the body of cattle with new generation biological products of the Prevention and Salus series in the implementation of reproductive and productive qualities.

### Materials and Methods

The research work was carried out from 2007 to 2023 and included 3 stages.

In the conditions of the dairy farm of LLC "Krasnoe Sormovo" of the Krasnoarmeysky municipal district of the Republic of Chuvashia, the first stage of research was carried out to realize the bioresource potential of cows at the stage of deep pregnancy and calves obtained from them.

The second stage of experiments, dedicated to the immunoprophylaxis of the body of heifers, was carried out in the production conditions of the farm of the Yantikovsky municipal district of the Chuvash Republic of JSC Firm Akkond-Agro.

At the third stage, the prevention of diseases of new-calf cows and the implementation of the biological potential of their productive qualities and reproduction functions were carried out based on JSC "Churachikskoye" of the Cheboksary municipal district of the Chuvash Republic. In the first experiment of scientific work, using the principle of analogues, cows were selected 45 days before calving and three groups of 45 animals were formed - two experimental ones and a control, then the experiment lasted the entire lactation period. In addition, after the cows calved, calves up to 540 days of age were included in the experiment. To increase the milk productivity of cows because of activating the productivity potential, immunotropic drugs Prevention-N-C and Salus-PE were used intramuscularly in a dose of 10 ml 45-40, 25-20 and 15-10 days before calving, respectively, in cow's 1st and 2nd. the experimental groups. In the control group, the developed drugs were not used. The research methodology is shown schematically in Figure 1.

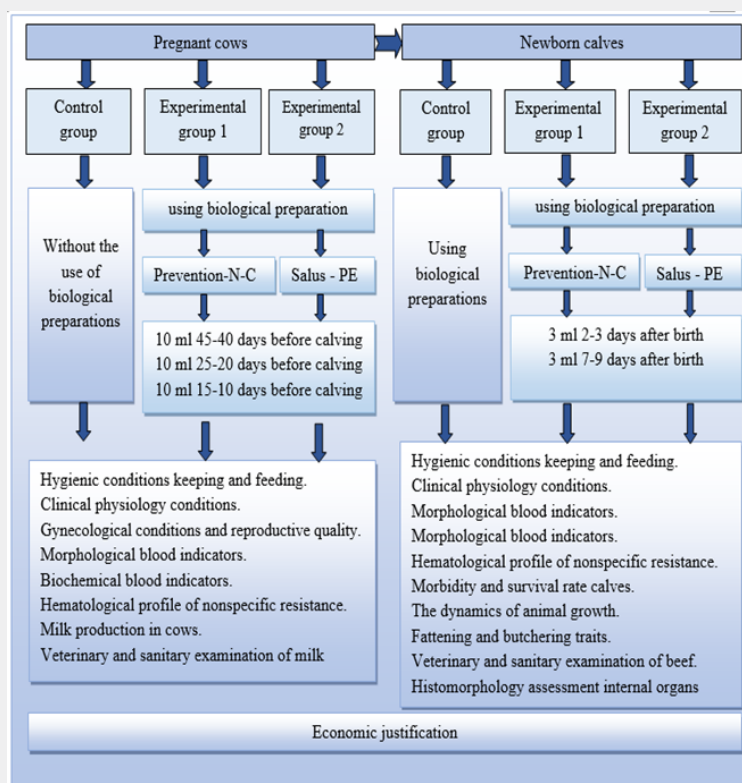


Figure 1: The scheme of the first experience

The day after the cows calved, the newborn calves were moved to the calf barn, where they lived in separate houses until they reached 30 days of age, and then they were housed in groups. Using the principle of analogues, 30 newborn calves at the age of 1 day were selected, which were divided into one control and two experimental groups. To better adapt calves of the 1<sup>st</sup> and 2<sup>nd</sup> experimental groups to production stress factors and increase productive function in the future, they were prescribed the biological products Prevention-N-C and Salus-PE, 3 ml, respectively, on days 2-3 and 7-9 after birth. Calves from the control group participated in the experiment without the use of drugs.

Against the backdrop of the import of Holstein heifers from the Republic of Belarus by JSC Firm Akkond-agro, the second stage of our research was carried out. The experiment was carried out after the formation of three analogue groups of heifers consisting of 45 heads. Heifers of the 1<sup>st</sup> and 2<sup>nd</sup> experimental groups received intramuscular injections of Prevention-N-E and Salus-EG, respectively, in a dose of 10 ml seven days before removal from the farm of the Republic of Belarus and on the 2<sup>nd</sup> day after delivery to the quarantine group based on JSC Firm Akkond-agro. The third group was a control group, so these animals were not subjected to the prevention of transport stress with the drugs we developed (Figure 2).

Figure 3 shows a diagram of the third scientific experiment on cows 45 days before calving and up to 6 days after calving. Since the dairy farm of JSC "Churachikskoye", animals of the Holsteinized black-and-white breed are kept. This experiment was carried out on four analogue groups, each of which included 10 heads - 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> experimental and control. Animals of the 1<sup>st</sup> and 2<sup>nd</sup> experimental groups, respectively, were treated with Salus-PE and Salus-EG 10 ml three times 45-40, 25-20 and 15-10 days before the preliminary calving date, intramuscularly. In the third group of experiments, cows after calving were given electropuncture sessions, based on the data from the atlas of G.V. Kazeeva (2000) using the Vocal-V device [8].

During the experiments, we observed the animals, taking blood from the subcaudal vein at certain times: 35-30, 15-10 and 10-5 days before calving, 3-5 days after calving. In addition, the blood profile of Belarusian heifers was analyzed before and after transportation, the reproductive organs were examined after calving, and the quantity and quality of milk received. In calves, research results were recorded on the 1<sup>st</sup>, 15<sup>th</sup>, 30<sup>th</sup>, 60<sup>th</sup>, 90<sup>th</sup>, 120<sup>th</sup>, 150<sup>th</sup>, 180<sup>th</sup> days, and in young animals - on the 360<sup>th</sup> and 540<sup>th</sup> day after birth using standard methodological techniques.

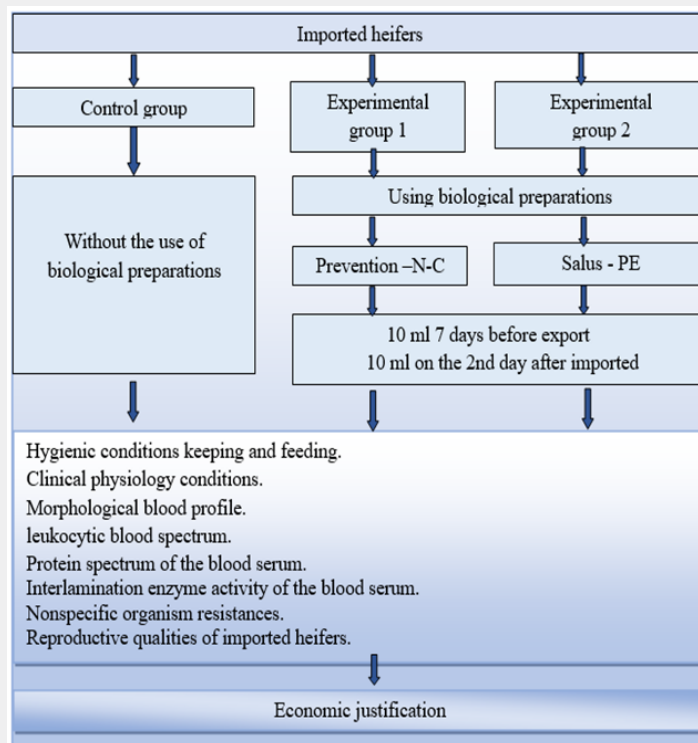


Figure 2: The scheme of the second experience

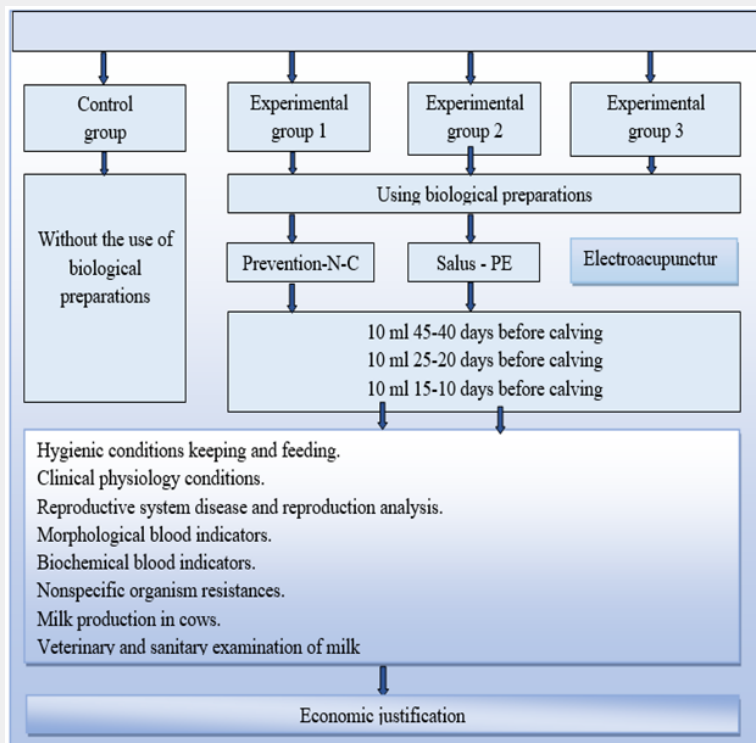


Figure 3: The scheme of the third experience

## Results and Discussion

It has been established that the air environment of premises for keeping experimental animals is designated by regulated Methodological Recommendations for the Technological Design of Agriculture and Cattle Complexes - RD-APK 1.10.01.02-10. The animals were fed with diets balanced in nutrients, energy, vitamins, macro- and microelements, in accordance with the developed standards. Developed immunotropic drugs for use in cows 45-40, 25-20 and 15-10 days before calving, calves aged 2-3 and 7-9 days, heifers a week before and 2 days after transportation, as well as proposed electropuncture sessions fresh cows, do not negatively affect the clinical condition and physiological parameters of the body, including in the long-term periods of lactation of cows, rearing and fattening of young animals.

It was found that thanks to the drugs Prevention-N-C and Salus-PE, the time of separation of the placenta in cows was reduced to 6.0 and 6.4 hours, no retention of the placenta was detected, and udder diseases were prevented. Prevention-N-C prevents uterine subinvolution and endometritis by 13.3 and 6.6%, respectively, and these diseases were not recorded with Salus-PE ( $P < 0.05$ ). Moreover, against this background, the first heat of experimental cows occurs earlier by 11.6 and 14.2 days, the insemination index decreases by 1.6 and 1.8 times, the service period is reduced by 22.4 and 28.4 days, fertilization increases during the first insemination by 20.0 and 26.7%, respectively ( $P < 0.05-0.01$ ).

The milk of cows to which the developed immunotropic drugs Prevention-N-C and Salus-PE were used met the requirements of the Technical Regulations of the Customs Union "On the Safety of Milk and Dairy Products" (TR CU 033/2013) and GOST 31449-2013 "Raw cow's milk. Technical conditions". In the first experiment, in cows on days 3-5 after calving, there was an increase in the level of erythrocytes in the blood by 9.0 and 10.0% and an increase in hemoglobin concentration by 4.3 and 6.2%, respectively. An increase in the level of total protein in the blood serum of animals was revealed in the experiment against the background of the use of biological products by 5.2 and 3.8 g/l, due to an increase in albumin by 1.8 and 1.3 g/l and globulin fractions, mainly  $\gamma$ -globulin - by 2.8 and 2.1 g/l ( $P < 0.05-0.01$ ). In cows of the 1st and 2nd experimental groups, there was also an increase in reserve blood alkalinity by 3.8 vol%CO<sub>2</sub>, or 7.7% ( $P < 0.05$ ), and by 5.2 vol%CO<sub>2</sub>, or by 10.5% ( $P < 0.01$ ), glucose levels - by 0.29 mmol/l, or 12.3% ( $P < 0.01$ ), and 0.21 mmol/l, or 8.9% ( $P < 0.05$ ), inorganic phosphorus by 0.26 and 0.22 mmol/l, or by 17.1% ( $P < 0.05$ ) and 14.5% ( $P > 0.05$ ), total calcium by 0.18 and 0.20 mmol/l, or by 7.4 and 8.2% ( $P < 0.05$ ), respectively. Indicators of nonspecific resistance of mother cows of the 1st and 2nd experimental groups on days 3-5 after calving, namely the phagocytic activity of neutrophils, lysozyme activity, bactericidal activity of serum and the number

of immunoglobulins in the blood were significantly higher by 6.1 and 6, respectively .9%, by 2.6 and 2.6%, by 5.0 and 5.2%, by 19.4 and 17.5%. Consequently, there was an activation of metabolic processes and resistance factors of the body (cellular and humoral profile).

A similar pattern was noted in the dynamics of the general biochemical and immunological blood profiles of young animals that were born from cows that received Prevention-N-C and Salus-PE biological products during the dry period. The greatest effectiveness of biological products affects the indicators of cellular and humoral resistance factors of the calf body. It was found that the drugs tested in the first experiment caused eosinophilia in the blood of experimental groups of animals; the most pronounced effect was observed when using Salus-PE. If in the initial stages of studying the blood of calves in the experimental groups, a predominance of band forms of neutrophils was observed, then segmented neutrophils demonstrated a quantitative advantage in subsequent periods of observation. However, segmented neutrophils in the blood of animals in the experimental groups had a significant advantage over the control throughout the entire experiment. Under the influence of biological products, a shift of the neutrophil nucleus to the right occurred, which indicates a stimulating effect on cellular resistance factors.

Biological products Prevention-N-C and Salus-PE, used in deep-pregnant cows of the 1st and 2nd experimental groups, reduce the incidence of illness in newborn calves by 28.6 and 35.8%, respectively, and reduce the recovery time by 2.4 and 4.2 days, which indicates the effective prevention of diseases of the respiratory and digestive systems with proven drugs, as well as stimulation of the growth and development of young animals. For example, by the end of the growing period, the live weight of the experimental groups of calves (1<sup>st</sup> and 2<sup>nd</sup> experimental groups) was higher than the control by 5.0 and 7.0 kg, at the end of the growing period - by 13.8 and 16.6 kg, at the time of transfer from the fattening group - by 19.2 and 24.0 kg ( $P < 0.001$ ). When using biological products, the pre-slaughter weight of young animals increased by 20.1 and 24.2 kg than in the control, the weight of the fresh carcass - by 12.4 and 15.4 kg, the slaughter weight - by 13.4 and 16.1 kg, and the weight internal fat - by 0.7 and 0.9 kg. The requirements of the Technical Regulations of the Customs Union "On the safety of beef and meat products" (TR CU 034/2013) have been met, which indicates the safety of using our biological products; they do not have a negative impact on the quality of meat carcasses.

In the second stage of experiments, we established that the use of biological products Prevention-N-E and Salus-EG corrects the conditions that make it possible to reduce or eliminate the impact of stressors on the picture of clinical and physiological parameters

of heifers imported from abroad. How the animal's body reacts to stress while testing immunotropic drugs can be confirmed by analyzing blood morphology. In the initial period of research after transportation, the level of red blood cells in heifers of the 1st and 2nd experimental groups turned out to be significantly lower by 14.0 and 13.9% ( $P < 0.001$ ), hemoglobin - by 12.4 and 11.7% ( $P < 0.01$ ), white blood cells - by 72.1 and 59.0% ( $P < 0.001$ ), neutrophils (band and segmented) - by 3.5 and 4.9% and by 13.1 and 12.2% ( $P < 0.001$ ) than in the control group. Even if the number of lymphocytes in the experimental groups decreased, monocytes, eosinophils, lymphocytes, on the contrary, showed an increase relative to the control by 0.26 and 0.44%, respectively ( $P > 0.05$ ), 1.6 and 2.3 times, by 15.8 and 15.5% ( $P < 0.001$ ).

When using complex drugs with an immunotropic effect in animals of the 1<sup>st</sup> and 2<sup>nd</sup> experimental groups, negative changes in protein metabolism that were observed in heifers under transport stress in the control group are excluded. It has been established that there is a decline in the level of total protein and its globulin fractions on the 10<sup>th</sup> day after importation;  $\gamma$ -globulins are most susceptible to this influence - their level is reduced by 27.7 and 24.8%, respectively, compared to the control ( $P < 0.05 - 0.01$ ).

The activity of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) was increased due to the need for pyruvate formation on the 1st day after the use of biological products to provide animals with energy during adaptation to stress. 5 days after the delivery of imported heifers, the need to produce transamination enzymes in their bodies decreases, which also contributes to the accumulation of glutamic and aspartic acids in the blood - participants in metabolism. Therefore, animals become more resistant to stress factors during transportation.

When analyzing the formation of protective-adaptive reactions in experimental animals, we assessed the factors of nonspecific resistance. It is noteworthy that in animals of all groups (control, 1<sup>st</sup> and 2<sup>nd</sup> experimental) one day after transportation there was a decrease in the activity of phagocytes, bactericidal activity of blood serum, lysozyme activity of blood plasma, and the level of immunoglobulins in blood serum by 26.5%, respectively. 10.7 and 11.2% ( $P < 0.01 - 0.001$ ), 27.4%, 13.6 and 13.0% ( $P < 0.001$ ), 10.4%, 2.7 and by 3.3% ( $P < 0.05 - 0.001$ ), by 33.9%, 16.3 and 18.8% ( $P < 0.01 - 0.001$ ). Intramuscular administration of biological products to heifers of experimental groups smooths out the negative effects of transport stress and restores nonspecific resistance during the first 10 days.

It was found that the heifers of the experimental groups, compared with the control, significantly improved their reproduction rates against the background of the use of biological products Prevention-N-E and Salus-EG. Namely, the service period decreased - by 7.8 and 12.2 days, respectively, the fertilization index - by 1.47

and 1.75 times, and the percentage of fertilization at the first insemination increased by 2.0 and 3.0 times ( $P < 0.05 - 0.01$ ) than in the control group.

The biological products Prevention-N-E and Salus-EG used in the experiments had a positive effect on enhancing the milk productivity potential of imported Holstein heifers, which is genetically inherent in them. It was recorded that calved heifers during the lactation period demonstrated a higher milk yield than in the control, by 121 and 157 kg ( $P < 0.05$ ). Similar dynamics occurred in the nutritional value of milk: the proportion of fat and protein in the milk of animals of the 1st and 2nd experimental groups were respectively higher than the control data by 0.08 and 0.09% and by 0.03 and 0.05%.

During the second experiment, against the background of the use of biological products for heifers during transportation, we obtained cows in which milk quality indicators such as dry matter, dried skim milk, lactose, minerals, density, acidity, QMAFAnM, somatic cell content are improved than in the control. Thus, the farm has sold high-quality products that meet the requirements of the Technical Regulations of the Customs Union "On the safety of milk and dairy products" (TP CU 033/2013) and GOST 31449-2013 "Raw cow's milk. Technical conditions".

During the third experiment, it was found that the use of biological products Salus-PE and Salus-EG before calving of cows and three sessions of 15 minutes each with an interval of 48 hours of electropuncture stimulation stimulate nonspecific defense of the body, prevent postpartum gynecological diseases in cows, which contributes to the improvement of reproductive and productive qualities.

When assessing the above effects, we found that in the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> experimental groups, the time of separation of membranes decreased by 5.3 hours, 6.0 and 5.4 hours, the incidence of uterine subinvolution decreased by 4.0 times, 4.0 and 2.0 times, in the 3rd experimental group the development of endometritis decreased by 2.0 times, and in the 1st and 2nd experimental groups it was completely excluded. The percentage of occurrence of inflammatory processes in the udder when using Salus-EG was 3.0 times lower than when using Salus-PE, and 1.5 times lower than when using electropuncture. Tested methods of immunoprophylaxis reduced the number of cases of subclinical ketosis among experimental groups of animals by 4.0 times.

In addition, in experimental animals (1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> experimental groups) indicators of reproductive function improved. The first estrus in the experimental groups occurred earlier than in the control group, at 14.1 days, 18.8 and 14.9 days, the insemination index decreased by 27%, 30 and 23% and the service period was 25% less. 2 days, 35.5 and 23.0 days, and the percentage of fertil-

ized cows in the first estrus increased in the 1<sup>st</sup> and 3<sup>rd</sup> experimental groups by 30%, in the 2<sup>nd</sup> – by 40%.

The blood morphology indicators of animals of the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> experimental groups also improved relative to the control data. Thus, on days 3-5 after calving, the level of erythrocytes and hemoglobin in the blood was higher in the experimental groups by 6.1%, 9.8 and 4.7% and by 3.4%, 4.8 and 3.5%, respectively. ( $P < 0.05-0.01$ ). In the blood of animals in the control and 3<sup>rd</sup> experimental groups, the level of leukocytes on days 5-10 of new birth increased by 9.8% and 14.2%, and in the 1<sup>st</sup> and 2<sup>nd</sup> groups, on the contrary, decreased by 1.2% and 2.08% respectively. The content of total protein in the blood serum was higher in the 1<sup>st</sup> experimental group - 6.9%, in the 2<sup>nd</sup> experimental group - by 7.4%, in the 3<sup>rd</sup> experimental group - by 2.3% than in the control group, respectively ( $P < 0.05-0.01$ ).

Such important indicators as the level of  $\gamma$ -globulins, reserve alkalinity, glucose, total calcium, inorganic phosphorus, carotene, when studying the blood serum of animals of the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> experimental groups were higher than the control data. Thus, the above indicators of experimental animals after calving turned out to be higher than control data by 0.7 g/l, 0.4 and 0.5 g/l, respectively ( $P < 0.001$ ), by 8.4%, 9.1 and 0.8 % ( $P < 0.05-0.01$ ), by 23.7%, 26.2 and 21.1% ( $P < 0.05$ ), by 0.22 mmol/l (10.9%), 0.05 mmol/l (4.5%) and 0.01 mmol/l (2.3%) ( $P < 0.05$ ), by 0.23 mmol/l (16.4%), 0.27 mmol/l (19.2%) and 0.24 mmol/l (17.1%) ( $P < 0.05$ ), by 0.9 mg/%, 1.0 and 0.1 mg/%. And ALT activity in animals of the experimental groups (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> experimental) was significantly lower than in the control group, by 11.2 units/l, 8.15 and 9.77 units/l, respectively. l or by 21.3%, 15.5 and 18.6% ( $P < 0.05$ ), and AST – by 16.19 units/l, 13.39 and 15.13 units/l or by 13.73%, 11.36 and 12.83%, ( $P < 0.05$ ).

The use of immunotropic drugs Salus-PE and Salus-EG in deep-pregnant cows and the effect of electropuncture on them promotes the activation of the body's defenses and reactivity of the body's immune system, which was confirmed in the study of the body's nonspecific resistance.

It has been established that the biological products Salus-PE and Salus-EG, as well as electropuncture effects, most fully realize the bioresource potential of the productive qualities of cows. During the lactation period, experimental cows (1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> experimental groups) produced 156 kg, 201 and 34 kg ( $P < 0.01-0.001$ ) more milk than animals in the control group. The greatest effect was provided by the complex biological product Salus-EG.

The use of the developed methods of immunoprophylaxis made it possible to improve the quality indicators of cow's milk, which met the requirements of the Technical Regulations of the Customs Union "On the Safety of Milk and Dairy Products" (TP

CU 033-2013) and GOST 31449-2013 "Raw cow's milk. Technical conditions".

The use of proven immunotropic drugs from the point of view of economic efficiency per 1 ruble of additional costs in the first experiment was 6.59 and 8.34 rubles, respectively, the second - 3.39 and 3.33 rubles, the third - 3.42, 4.51 and 0.69 rubles respectively.

## Conclusion

Based on many years of research, we can conclude that the positive effect of using the developed drugs is achieved by stimulating the nonspecific resistance of the body (cellular and humoral factors) of cows.

The proposed biological products prevent transport stress and contribute to the selective mobilization of the bioresource potential of the production and productive qualities of cows during the dry periods, new calving and lactation, calves obtained from them from birth to the age of 540 days and imported heifers, improving the morphological and biochemical picture of the blood, stimulating metabolic activity, nonspecific resistance factors of the body (cellular and humoral).

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