Prevention of postpartum complications and management of reproductive qualities of cows with the use of Prevention-N-B-S bio-preparation

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Abstract. The article describes a method of preventing postpartum obstetric-gynecologic diseases and improving the reproductive function of cows by increasing the nonspecific resistance of the organism with the use of Prevention-N-B-S bio-preparation. For the first time the newly developed bio-preparation was injected to cows of Experimental Group 2 intramuscularly with a dose of 10 ml 35-30, 15-10 and 10-5 days before the expected calving date, while Dorogov’s antiseptic stimulant 2 fraction and Eleovit at the ratio of 1:9 were injected to the animals of Experimental Group 1 60 days before the estimated calving dates. It was established that the first estrus of Experimental Group 2 cows (28.8±0.36 days) was 5.8 and 14.4 days earlier than that of the same-age cows of Experimental Group 1 (34.6±0.93 days) and the Control Group (43.2±1.64 days). The service period in Experimental Group 1 (64.6±1.62 days) and Experimental Group 2 (57.8±1.50 days) became shorter, comparing to the Control Group (89.2±3.02 days). Use of bio-preparations in critical pregnancy periods of cows reduced the risks of subinvolution of uterus, endometritis and mastitis in the postpartum period and increased reproductive qualities of cows. The effect was most apparent when Prevention-N-B-S bio-preparation was used.

1. Introduction
A limiting factor in the intensive development of dairy cattle breeding, both in our country and abroad, remains the realization of the reproductive potential of cows. Reducing the terms of use of cows, reducing the number of young stocks and reducing reproduction rates in most specialized farms requires the search for simple and effective approaches to solve this problem. In conditions of industrial milk production and increased productivity in cows, an increase in the length of the inter-hotel period is noted. This is due to a slightly longer process of uterine involution after calving in
highly productive animals and lengthening of the service period due to insufficient detection of animals in hunting. Most of the life of a mature female takes place at the stage of sexual dormancy (anestrus). Puberty, as well as periods associated with pregnancy and lactation, in general, take longer than relatively short periods of sexual activity. However, the focus is on precisely these periods. At this time, a person often intervenes in the reproductive process and therefore identifies most of the problems associated with the reproduction of animals. The course of calving and the postpartum period is one of the main critical periods that determine how quickly the animals show the next sexual hunt, and, accordingly, the probable fertilization [1].

The right herd reproduction organization is one of the most important tasks in dairy farming [2]. Effective cattle management is impossible without implementation of a complex of organizational and zooveterinary measures [3]. It is necessary to adhere to the hygienic regulations and rules of keeping and using cows, balanced feeding diets, artificial insemination, provision of herd replacements [4]. All this depends on high-quality work of zooveterinary specialists. Great demands are made on dairy farming. It is impossible to increase milk productivity of animals and obtain high-quality products from them without improvement of the reproductive function, which determines the animal yield as well as the genetic potential of animals. A low conception rate and, as a result, barrenness of cows cause great damage to animal breeding [5].

The reproduction problem remains unsolved, although various methods of increasing calf crop are used: hormonal estrus synchronization, service-period reduction and others [6]. Owing to reproductive function impairment in cows one can observe service-period prolongation, conception rate increase, calf crop reduction, milk production decrease, which leads to culling of 26-35 % of cows. The issue of productive longevity of cows is also relevant. According to statistical data, cows of 2.5-3.5 lactation, most often highly-productive ones, retire, which negatively affects the payback of total costs of animal keeping and care in the field [7].

A higher milk production may not translate into a higher profitability if the cow fertility, longevity, and health decline. The milk yield and the reproductive performance are both considered fundamentally important to achieve a high profitability. Moreover, the declining reproductive performance has a negative effect on the milk production [8].

The aim of the present work is prevention of postpartum diseases and fulfillment of the potential of reproductive qualities of cows through activization of nonspecific resistance of the organism with the use of Prevention-N-B-S bio-preparation.

2. Materials and methods
The methodology of the present work consists in the use of the developed bio-preparation Prevention-N-B-S for down-calving cows to reduce the incidence of postpartum obstetric-gynecologic diseases and to increase their reproductive qualities. The experimental part of the research work was carried out on the commercial dairy farm of LLC “Smak-Agro” in Mariinsky Posad Region of the Chuvash Republic. The biomaterials obtained during the experiment were analyzed in the Budgetary Institution of the Chuvash Republic “Chuvash Republican Veterinary Laboratory” of the State Veterinary Service of Chuvashia and in the clinical hematological laboratory of the Chuvash State Agricultural Academy (Russia).

Based on the principle of analogues, 3 groups of cows, 10 heads in each, were formed: one control group and 2 experimental groups. During selection of groups productive qualities, physiological condition and live weight of animals were taken into account. All animals had similar feeding diets and were kept in similar conditions.

In order to increase nonspecific resistance of pregnant cows’ organisms, to prevent postpartum obstetric-gynecologic diseases and to increase reproductive qualities of the white-and-black cattle Prevention-N-B-S, a new-generation bio-preparation, was used.

The cows of Experimental Group 1 had an intramuscular injection of ASD-F2 in combination with Eleovit at the ratio of 1:9 before drying-off (60 days before the estimated calving date); the animals of Experimental Group 2 had an intramuscular injection of the newly developed bio-preparation
Prevention-N-B-S with a 10-ml dose 35-30, 15-10, 10-5 days before the estimated calving date, and no medicines were prescribed for the Control Group.

For intramuscular injection, a 40 mm needle was used, with a sharp bevel, with an acute and straight, non-bent cannula. Blunt needles will give animals more pain. Disposable syringes were used for the procedure. Intramuscular injection of the cow was carried out according to the scheme:

1. The area for injection was selected.
2. The needle insertion site was wiped with an alcohol solution.
3. A syringe was brought to the animal's body at right angles.
4. A 2/3 depth needle was injected.
5. The piston pushed the preparation out of the syringe.
6. The needle was removed from the body.
7. The injection site was treated with iodine.

The procedure is fast. The cow does not have time to respond to the pain.

Dorogov’s antisepctic stimulant 2 fraction (ASD-F2) is an aqueous solution of low-molecular organic and mineral substances – these are carboxylic acids, ethers, peptides, amines, amides, inorganic nitrogen compounds and others. It is used both by farmers and owners of personal farmsteads and domestic animals to treat and prevent diseases of various etiology, increase general resistance and productivity of animals, it has immunomodulating, antisepctic, adaptogenic and anti-inflammatory activities. It was developed by LLC “Research and Innovation center “Agrovetzaschchita” (Moscow, Russia).

Eleovit is a vitamin and mineral preparation containing such active substances as retinol, pantothenic acid, tocopherol, phylloquinone, thiamine, riboflavin, pyridoxin, cyanocobalamine, biotin, nicotinamide, pantothenic and folic acids as well as auxiliary compounds (milk albumin hydrolysate, glucose, distilled water). The preparation is used to prevent and treat hypovitaminoses in productive animals. The preparation is produced by LLC “Research and Production Company “Askont+” (Moscow Region, Russia).

Prevention-N-B-S is a bio-stimulant containing a polysaccharide mixture of *Saccharomyces cerevisiae* immobilized in agar gel with inclusion of a benzimidazole derivative and bactericides of groups of penicillins and aminoglycosides in an aqueous suspension. The invention is intended for increasing nonspecific resistance of the organism, prevention and treatment of gynecological disorders in cows. The developer organization is the Federal State Budgetary Educational Institution of Higher Education “Chuvash State Agricultural Academy” (Cheboksary, Russia).

The microclimate in animal houses was controlled monthly, three days in a row in three areas: the middle of the house, diagonal end corners (at the distance of 1.0-3.0 m from the walls; at the height of 0.6 and 1.2 m from the floor). Besides, the temperature, humidity and illumination intensity in the houses were measured using the “TKA-PKM” multimeter, Model 42 (manufactured by LLC “TKA Scientific Instruments”, St. Petersburg, Russia), the air velocity was measured with the “TKA-PKM” thermoanemometer, Model 50 (manufactured by LLC “TKA Scientific Instruments”, St. Petersburg, Russia), CO₂ content in air and NH₃ and H₂S concentration were measured with the use of the YG-2 multipurpose gas analyzer (manufactured by LLC “Promecopribor”, St. Petersburg, Russia), the microbial content and dust were measured using the Yu.A. Krotov apparatus (manufactured by LLC “NIKI MLT-Povolzhye”, Penza, Russia), the natural illumination intensity was measured by calculating the light factor (LF) and the daylight factor (DLF). LF was determined with the ratio of the total area of all windows to the same of the cow house floor, and DLF was determined with the ratio of illumination inside the cow house to the outside illumination, and the factors were expressed in per cent:

\[
DLF = \frac{O_i}{O_o} \cdot 100,
\]

where \(O_i\) is illumination in the cow house, \(lx\); \(O_o\) is outside illumination (with diffuse sky light), \(lx\).

The temperature of the animals was measured with a medical thermometer, the pulse rate was
registered over the caudal artery by palpation, the number of breaths per minute – by counting the respiratory sounds in the lungs during breathing in and out using a phonendoscope by the auscultation method.

The red blood cell count, hemoglobin concentration, total leukocyte count and types of leukocytes were determined with the use of the PCE 90 Vet automatic veterinary hemato logical analyzer (Erma Inc, Japan). The analyzer state, measurement result and printing are displayed on a large LCD screen. The instrument is controlled by means of an integrated compact keyboard. The analyzer automatically takes the blood sample, dilutes, mixes, lyses, supplies and flushes it. The total protein level and serum protein assay were determined using the IDEXX VetTest 8008 biochemical analyzer (IDEXX, Russia). The analyzer VetTest suggests fulfilling a number of steps, accompanying each of its suggestions with a short audio signal, which enables the user to promptly prepare a pipette dispenser, insert a sample and start the analysis. The dosing device automatically takes the required quantity of the sample and then distributes it onto a slide in the order of 10 μl. When the sample passes through the slide layers, biochemical reactions take place, which lead to consecutive color changes. The optical system of the VetTest analyzer determines the colors and their intensity. The analyzer transforms the results of measurements in numerical values of measurement that are displayed on the analyzer screen and printed.

The digital material of the experiments was processed by the method of variation statistics on the validity of the difference in the compared indicators \( P < 0.05-0.001 \) using a personal computer in the Microsoft Excel program.

### 3. Results and discussion

The air basin indices in the cow house and maternity pen are given in table 1.

| Parameter                               | Place            |
|-----------------------------------------|------------------|
|                                        | cow house        | maternity pen   |
| Air basin temperature, °C               | 9.9 ± 0.27       | 14.9 ± 0.39     |
| Relative air humidity, %                | 71.3 ± 1.13      | 70.0 ± 0.97     |
| Air velocity, m/s                       | 0.29 ± 0.05      | 0.21 ±0.06      |
| LF                                      | 1 : 15           | 1 : 14          |
| DLF, %                                  | 0.71 ± 0.04      | 0.86 ± 0.03     |
| Concentration of air pollutants:       |                  |                 |
| \( \text{NH}_3 \), mg/m³                | 14.1 ± 0.53      | 7.9 ± 0.47      |
| \( \text{H}_2\text{S} \), mg/m³         | 8.3 ± 0.26       | 3.7 ± 0.23      |
| CO\(_2\), %                             | 0.17 ± 0.02      | 0.15± 0.02      |
| Microbial contamination, ths/m³         | 41.6 ± 1.31      | 29.3 ± 1.22     |
| Content of solid aerosols, mg/m³        | 5.1 ± 0.19       | 2.7 ± 0.20      |

The table data demonstrate that the basic microclimate parameters both in the cow house and maternity pen during all periods of the scientific experiment were within the hygienic standards.

The clinical physiological indicators of cows’ organism condition are given in table 2. The data show that the intramuscular injection to cows of Experimental Group 1 of ASD-F2 in combination with Eleovit at the ratio of 1:9 60 days before the estimated calving date and intramuscular injection of the developed biopreparation Prevention-N-B-S with a 10-ml dose to the animals of Experimental Group 2 35-30, 15-10 and 10-5 days before the estimated calving date did not influence the clinical physiological indicators of the cows’ condition. The obtained indicators stayed within the ranges of physiological standards in all experimental groups, with the difference between them being insignificant \( P>0.05 \).
Establishment of successful pregnancy in cows within a relatively short time after the previous calving is a major driver of productivity and profitability in dairy farming. Many of the diseases that afflict dairy cows occur most commonly in the first 2 months of lactation. Diseases of postpartum dairy cows impair reproductive processes, resulting in prolonged anestrus, reduced conception, and increased pregnancy attrition, regard-less of whether the initial disease precedes insemination (even by many weeks), occurs close to insemination, or follows fertilization. Inflammation is accompanied by increased oxidative stress [9].

Prevalence of endometritis, as diagnosed by endometrial cytology, is high in dairy cows, persisting up to and beyond the end of the traditional postpartum voluntary waiting period. Several studies have confirmed a high-prevalence of endometritis after 40 days postpartum and that the condition has a negative impact on subsequent reproductive performance [10].

Postpartum (pp) endometritis caused by persistent bacterial infection has a major impact on the fertility of dairy cattle. The most substantial effects of the disease are an increase in the number of days to conception, increased numbers of services needed for conception and an increased risk of culling. Because the effects of the disease are delayed and often only detectable with subsequent statistical analysis, the economic significance of this disease remains largely unknown, but it is speculated to exceed billions of dollars annually for the global dairy industry [11].

The statistical data of postpartum obstetric-gynecologic diseases in cows and their reproductive indicators are reflected in table 3. The data clearly show that the first estrus of Experimental Group 2 cows (28.8±0.71 days) was 5.8 and 14.4 days earlier than that of the cows of Experimental Group 1 (34.6±0.87 days) and the Control Group (43.2±1.53 days). One can observe a reduction in the conception rate for the cows of Experimental Group 1 (1.8±0.33) and Experimental Group 2 (1.4±0.26), comparing to the Control Group (2.6±0.29). The service-period in Experimental Group 1 (64.6±1.69 days) and Experimental Group 2 (57.8±1.55 days) was shorter comparing to the Control Group (89.2±2.97 days). 2, 4 and 6 cows became pregnant in the first estrus in the Control Group, Experimental Group 1 and Experimental Group 2, respectively. Use of biopreparations during the critical cow pregnancy periods reduced the risks of development of subinvolution of uterus, endometritis and mastitis postpartum and increased reproductive qualities of cows. The effect was most apparent with the use of Prevention-N-B-S bio-preparation.

### Table 2. Physiological cows’ organism condition indicators.

| Group of animals | Observation period, days before calving | Body temperature, °C | Pulse, beats/min | Breathing, mov/min |
|------------------|----------------------------------------|-----------------------|-----------------|-------------------|
| Control Group    | 35 – 30                                | 38.1 ± 0.14           | 76 ± 1.20       | 21 ± 0.62         |
|                  | 15 – 10                                | 38.1 ± 0.10           | 77 ± 0.82       | 22 ± 0.55         |
|                  | 10 – 5                                 | 38.0 ± 0.10           | 77 ± 0.93       | 22 ± 0.28         |
|                  | 3 – 5                                  | 38.2 ± 0.08           | 76 ± 1.03       | 22 ± 0.32         |
| Experimental     | 35 – 30                                | 38.1 ± 0.20           | 75 ± 1.78       | 21 ± 0.68         |
| Group 1*         | 15 – 10                                | 38.0 ± 0.10           | 76 ± 1.12       | 22 ± 0.51         |
|                  | 10 – 5                                 | 38.2 ± 0.09           | 76 ± 0.93       | 22 ± 0.26         |
|                  | 3 – 5                                  | 38.2 ± 0.11           | 76 ± 1.82       | 22 ± 0.58         |
| Experimental     | 35 – 30                                | 38.3 ± 0.02           | 76 ± 0.93       | 21 ± 1.20         |
| Group 2**        | 15 – 10                                | 38.1 ± 0.12           | 77 ± 0.65       | 22 ± 0.72         |
|                  | 10 – 5                                 | 38.2 ± 0.09           | 77 ± 0.26       | 22 ± 0.03         |
|                  | 3 – 5                                  | 38.1 ± 0.93           | 76 ± 0.72       | 22 ± 0.24         |

* Injection of ASD-F2 in combination with Eleovit (at the ratio of 1:9) 60 days before the estimated calving dates;

** Injection of Prevention-N-B-S bio-preparation: 35-30 days, 15-10 and 10-5 days before the estimated calving.
Table 3. Gynecologic condition and reproductive qualities of cows.

| Parameter                        | Control Group | Experimental group 1 | Experimental group 2 |
|----------------------------------|---------------|----------------------|----------------------|
| Number of cows                   | 10            | 10                   | 10                   |
| Afterbirth expulsion, h          | 12.6 ± 0.97   | 7.2 ± 0.52*          | 5.8 ± 0.59*          |
| Retention of afterbirth          | 4             | -                    | -                    |
| Subinvolution of uterus          | 3             | 1                    | -                    |
| Endometritis                     | 2             | 1                    | -                    |
| Mastitis                         | 2             | -                    | -                    |
| Onset of the 1st estrus, days    | 43.2 ± 1.53   | 34.6 ± 0.87*         | 28.8 ± 0.71*         |
| Conception rate                  | 2.6 ± 0.29    | 1.8 ± 0.33*          | 1.4 ± 0.26**         |
| Time from calving to fertilization, days | 89.2 ± 2.97 | 64.6 ± 1.69**       | 57.8 ± 1.55**        |

Fertilized cows:
- at 1st fertilization: 2, 4, 6
- at 2nd fertilization: 2, 3, 4
- at 3rd fertilization: 6, 3, -

* P<0.05; ** P<0.01.

The dynamics of the white blood cell differential of cows is shown in Table 4.

Table 4. Dynamics of the cows’ blood leukogram during the observation period.

| Group                        | Observation period, days | Cow blood leukogram |
|------------------------------|--------------------------|---------------------|
|                              |                          | neutrophils        |
|                              |                          | stab               |
|                              |                          | segmento-nuclear   |
|                              |                          | lymphocytes        |
|                              |                          | monocytes          |
| Control Group                | 35 – 30                  | 10 ± 0.22          | 5.1 ± 0.12          | 4.2 ± 0.15          | 27.2 ± 0.82          | 57.8 ± 1.02          | 5.0 ± 0.74          |
|                              | 15 – 10                  | 1.3 ± 0.31         | 5.7 ± 0.08          | 4.7 ± 0.12          | 27.2 ± 0.42          | 56.9 ± 1.26          | 4.4 ± 0.26          |
|                              | 10 – 5                   | 1.2 ± 0.20         | 4.7 ± 0.12          | 3.9 ± 0.47          | 27.5 ± 0.73          | 58.0 ± 0.88          | 4.7 ± 0.08          |
|                              | 3 – 5                    | 1.4 ± 0.17         | 4.7 ± 0.43          | 4.0 ± 0.30          | 27.6 ± 0.80          | 59.1 ± 0.28          | 4.2 ± 0.45          |
| Experimental Group 1         | 35 – 30                  | 1.1 ± 0.33         | 5.4 ± 0.24          | 3.5 ± 0.46          | 27.6 ± 0.42          | 58.3 ± 0.76          | 5.1 ± 0.34          |
|                              | 15 – 10                  | 1.1 ± 0.25         | 6.4 ± 0.34          | 3.1 ± 0.26          | 27.3 ± 0.58          | 58.5 ± 0.44          | 4.6 ± 0.53          |
|                              | 10 – 5                   | 0.9 ± 0.06         | 5.2 ± 0.66          | 2.9 ± 0.08          | 28.5 ± 0.63          | 58.6 ± 1.76          | 4.7 ± 0.79          |
|                              | 3 – 5                    | 0.7 ± 0.31         | 5.7 ± 0.70          | 2.9 ± 0.32*         | 27.0 ± 0.96          | 59.2 ± 0.43*         | 4.7 ± 0.68          |
| Experimental Group 2         | 35 – 30                  | 1.1 ± 0.10         | 5.4 ± 0.22          | 3.4 ± 0.18          | 28.2 ± 0.24          | 58.2 ± 0.53          | 5.3 ± 0.22          |
|                              | 15 – 10                  | 0.8 ± 0.30         | 6.7 ± 0.60          | 2.8 ± 0.18          | 27.5 ± 0.87          | 58.4 ± 0.10          | 4.7 ± 0.03          |
|                              | 10 – 5                   | 0.4 ± 0.40         | 5.9 ± 0.12          | 3.0 ± 0.28          | 27.8 ± 1.36          | 58.9 ± 0.03          | 5.1 ± 0.46          |
|                              | 3 – 5                    | 0.5 ± 0.18         | 5.5 ± 0.82          | 3.1 ± 0.26*         | 27.3 ± 0.68          | 59.8 ± 1.08**        | 4.5 ± 0.23          |

* P<0.05; ** P<0.01.

The analysis of the white blood cell differential showed that the basophil count in the blood of down-calving and newly calved cows was within the following ranges: in the Control Group – 1.2±0.20–1.4±0.17 %, in Experimental Group 1 – 0.7±0.31–1.1±0.33 % and in Experimental Group 2 – 0.4±0.40–1.1±0.10 %. 35-30 – 15-10 days before the estimated calving date the count of eosinophils in...
the blood of cows of the Control Group, Experimental Group 1 and Experimental Group 2 slightly increased from 5.1±0.12 to 5.8±0.08 %, from 5.4±0.24 to 6.2±0.24 % and from 5.4±0.22 to 6.7±0.60 %, respectively. However, there was a decrease of these granulocytes before calving to 4.7±0.12 %, 5.2±0.66 % and 5.9±0.12 %, respectively, which speaks about the stress experienced by the animals. Significant changes were observed in the dynamics of stab neutrophils: by the end of pregnancy their level decreased in all groups from 4.2±0.15 to 3.9±0.47 %, from 23.5±0.46 to 29±0.08 % and from 34±0.18 to 30±0.28 %, respectively, and after calving these indices increased only in the animals of the Control Group and Experimental Group 2 to 4.0±0.30 and 3.1±0.26 %, respectively, while they remained the same in Experimental Group 1 (2.9±0.32 %).

It should be noted that during the dry period the count of segmentonuclear neutrophils in the blood of the animals of Experimental Group 1 and 2 was higher than in the Control Group: 30-25 days before calving – by 0.4-1.0 and 0.3-1.0 %. After calving there was a reduction in the count of the given forms of neutrophils in Experimental Groups by 0.6 and 0.3 % (P>0.05), respectively. These changes in the qualitative composition of neutrophils are indicative of activation of the cellular component of nonspecific resistance of the organism under the impact of tried bio-preparations.

We noticed a significant increase in the count of lymphocytes in the blood of Experimental Group 2 animals, which speaks about activation of production of the given agranulocytes by blood-forming organs associated with the use of Prevention-N-B-S bio-preparation.

The results of the analysis of the cow blood serum protein assay associated with the use of the bio-preparations are given in table 5.

Table 5. Cows’ blood serum protein assay associated with the use of the bio-preparations.

| Group           | Observation periods, days before calving | Total protein, g/l | Protein fractions, g/l |
|-----------------|-----------------------------------------|--------------------|------------------------|
|                 |                                         | albumins           | globulins              | α-globulins       | β-globulins       | γ-globulins       |
| Control Group   |                                         |                    |                       |                      |                      |                      |
| 35-30           |                                         | 74.3±0.24          | 31.0±0.70             | 43.3±0.43          | 11.2±0.37          | 9.9±0.15          |
| 15-10           |                                         | 74.5±0.34          | 30.8±0.43             | 43.7±0.86          | 11.0±0.24          | 10.1±0.08         |
| 10-5            |                                         | 74.5±0.19          | 30.7±0.07             | 43.8±0.76          | 11.0±0.28          | 10.2±0.16         |
| 3-5             |                                         | 72.4±0.60          | 30.3±0.28             | 42.1±0.81          | 11.1±0.30          | 10.2±0.43         |
| Experimental Group 1 |                                         |                    |                       |                      |                      |                      |
| 35-30           |                                         | 75.4±0.28          | 31.0±0.22             | 44.4±0.70          | 11.2±0.84          | 10.5±0.18         |
| 15-10           |                                         | 76.4±0.27          | 31.7±0.12             | 44.7±0.56          | 11.2±0.65          | 10.4±0.16         |
| 10-5            |                                         | 76.6±0.94          | 32.1±0.43*            | 44.5±0.45          | 10.9±0.38          | 10.4±0.31         |
| 3-5             |                                         | 75.8±0.45**        | 31.7±0.63*            | 44.1±0.19**        | 11.4±0.35          | 10.1±0.28         |
| Experimental Group 2 |                                         |                    |                       |                      |                      |                      |
| 35-30           |                                         | 75.4±0.76          | 31.7±0.25             | 43.7±0.46          | 11.6±0.37          | 10.0±0.20         |
| 15-10           |                                         | 77.7±0.58*         | 32.2±0.43*            | 45.5±0.84          | 11.8±0.04          | 10.2±0.16         |
| 10-5            |                                         | 77.4±0.93*         | 31.8±0.61*            | 45.6±0.27          | 11.7±0.43          | 10.3±0.22         |
| 3-5             |                                         | 76.1±0.72*         | 32.0±0.43*            | 44.1±0.37*         | 11.0±0.40          | 10.4±0.28         |

* P<0.05; ** P<0.01; *** P<0.001.

15-10 days before calving the total protein content in the blood serum of Experimental Groups 1 and 2 cows exceeded the Control Group data by 1.9 and 3.2 g/l and 2.5 and 4.1 % (P<0.05), respectively, 10-5 days before calving – by 2.1 and 2.6 g/l, i.e. by 2.7 and 3.4 %, while in the blood serum of the newly calved cows it was higher by 3.4 and 3.7 g/l (i.e. by 4.5 and 4.9 %), comparing to the Control Group (72.4±0.60 g/l; P<0.05-0.01). The obtained data demonstrate that the bio-preparations used for Experimental Groups 1 and 2 caused stimulation of protein synthesis in the
organism before and after calving. The effect was most apparent with the use of Prevention-N-B-S bio-preparation (P<0.05).

The serum albumin content for cows of Experimental Groups 1 and 2 15-10 days before the estimated calving date was 0.9 and 1.4 g/l or 2.8 (P>0.05) and 4.3 % (P<0.05) higher than in the Control Group, 10-5 days − 1.4 and 1.1 g/l, i.e. 4.4 and 3.5 % (P<0.05) higher, and after calving − 30.3±0.28 g/l, 31.7±0.63 and 32.0±0.43 g/l higher, respectively. The bio-preparations tried by us contributed to activation of synthesis of albumins that are the main material for fetal growth and development in a cow’s organism.

The concentration of γ-globulins in blood serum of Experimental Group 1 and 2 cows consistently increased till the end of the pregnancy period from 22.7±0.36 to 23.2±0.43 g/l and from 22.1±0.23 to 23.6±0.26 g/l and, on the opposite, it slightly decreased after calving. In Experimental Groups 1 and 2 the blood serum concentration of γ-globulins was higher than in the Control Group: 10-5 days before the calving by 0.6 and 1.0 g/l (by 2.6 and 4.2 %; P<0.05), 3-5 days after calving − by 1.8 and 1.9 g/l (by 8.0 and 8.4 %; P<0.001), respectively.

It can be assumed that the decrease of γ-globulins in blood serum of the cows after calving is connected with production of colostrum lactoglobulins. The increase of γ-globulins in blood serum of the Experimental Groups indicates activation of the humoral component of nonspecific resistance of the organism of dam cows under the influence of the bio-preparations.

4. Conclusion
The intramuscular injection of Prevention-N-B-S bio-preparation with a 10-ml dose to cows 35-30, 15-10 and 10-5 days before the expected calving day enables activating nonspecific resistance of their organism and prevent postpartum gynecologic diseases, thus improving the reproductive qualities.

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