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Study Of Dominant Bacterial Species In Vaginal And Uterine Mucosal Microbiocenosis In Clinically Healthy Cows In The Natal And Postpartum Period

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Abstract. Dysbiotic conditions most often precede clinical occurrences of pathological processes. Lactobacilli are components of the microflora, which usually affect and cause a local immune response. The presence of a sufficient number of lactobacilli on a detected membrane is a crucial factor that ensures an adequate level of local immunity. Knowledge of the microbiota in the genital tract and its variation is essential for understanding the characteristics of different infectious pathologies. It allows us to develop appropriate treatment and preventive measures and thus reduce the occurrence of obstetric and gynecologic pathologies in cows. This study focuses on dominant bacterial species in vaginal and uterine microbiocoenosis in postpartum cows, in relation to morphological and immunological parameters in cow's blood. Studies of vaginal swabs were carried out on 30 Holstein-Friesian cows from 1 to 45 days after calving using microbiological techniques. Species identification of isolated microorganisms was performed using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS). Morphological and immunological parameters of blood were studied on days 1, 14, and 28 after calving, using commonly accepted methods and a hematology analyzer.

It has been established that the species-specific composition of microflora varies and is represented by families such as Enterobacteriaceae, Streptococcaceae, Staphylococcus, Pseudomonas, Enterococcus, and Bacillus. Members of the genera Moraxella and Pasteurella were isolated from individual animals, as well as other species. The symbiotic microflora also includes Lactobacillus, Bacillus, and Pediococcus, which were isolated from cows.

When acute postpartum endometritis occurs in cows, only pathogenic microflora is isolated. Lactobacilli are not isolated from vaginal swabs. It has been established that changes in cell immunity factors, including phagocytic indicators such as phagocytosis, phagocyte numbers, and phago index and capacity, are recorded when cows are sick with acute post-partum endometritis. The number of T cells in cows with endo metritis is significantly higher than in clinically healthy cows by 23.5% on day 14 after calving, while all cows with acute endometritis also have an increase in the number of B cells compared to animals without signs of disease. Lysozyme activity in blood serum is 1.7 times lower on the first day after calving than normal values but by the end of postpartum period, it exceeds reference levels by a factor of one. The insemination index was 1.71, and the service period for cows was 115 days. This indicates a relationship between local immune mechanisms in cow's reproductive systems and overall immunity factors during the postpartum period, as well as their effect on the occurrence of postpartum pathology. Thus, when endometritis occurs, the normal microbiota is replaced by pathogenic bacteria, and cellular and humoral immunity factors are activated at the same time.

Keywords: cows, microbiocenosis, endometritis, blood, reproduction.

In modern conditions of animal husbandry, one of the most important tasks is the problem of reproduction and prevention of infertility [12, 14]. A high level of reproduction and milk productivity of cows is possible only in healthy animals. Specialists of farms and complexes often reject highly productive cows in the first, second lactation due to impaired reproduction functions, which causes enormous economic damage. [1, 2, 9]. Infertility is a violation of the reproductive function of cows, arising from the influence of various factors. A closed regime of large-group keeping with limited mobility and insolation, increased microbial contamination of the habitat and birth canal lead to the development of vaginal dysbiosis, and subsequently to bacterial contamination of the uterus with the development of an inflammatory process against the background of reduced general and local resistance of the body and genitals [3, 4, 9, 10,11]. A decrease in resistance of the animal macroorganism can lead to a change in biocenosis in the vagina and, therefore, to a violation of its interaction with the immune system of the host organism. As a result, homeostasis is disturbed, this does not allow the macroorganism to fight the penetration of foreign agents into it. Changing or disrupting the microflora in the vagina, or the appearance of "enthetic" bacteria, leads to adaptive or irreversible changes in the microbiome. The microbial community of various biotopes of the body is characterized by a complex system of relationships, it quickly reacts to the influence of external and internal factors with qualitative and quantitative changes, possibly even without visible clinical manifestations. [5, 6, 9, 10, 15, 16]. Some researchers conducted their work on studying the relationships between the qualitative composition of uterine discharge in endometritis, its color, odor, consistency, and quantitative composition of pathogenic microflora, as well as changes in the phase of blood protein construction [17]. Others compared the quantitative and qualitative composition of the uterine flora in healthy and metritis cows. They found that the number of pathogenic bacteria in uterine contents increased significantly with the development of endometritis. Lactobacilli, bacilli and pediococci were isolated from all cows [2, 7, 13, 16]. In this regard, the study of the issues of normal and pathological physiology of the after calver period and the development of effective methods for the diagnosis, prevention and treatment of obstetric pathology in cows is one of the ways to systematically increase herd reproduction rates. [7, 8].

The aim of the studies was to identify dominant bacterial species in the vaginal mucosal microbiocenosis of clinically healthy cows in the pre-natal and post-natal period. To achieve the goal, the following tasks were set. To study microbiocenosis of bovine rhodopol pathways from the first to 45 days after calving. Study the change in morphological and immunological indicators of cow blood. Study the reproduction rates of the studied cows.

RESEARCH MATERIALS AND METHODS.

Studies were carried out in the Krasnodar Territory in 30 cows at the dairy complex of the NPH "Korenovskoye" with tethered keeping passive regimen. The washes from the uterus and vagina of cows on the first day after calving after the separation of the afterbirth before the administration of antibacterial drugs used to prevent postpartum pathology according to the scheme used on the farm were examined. Subsequent sampling was carried out every 5-7 days until 45 days after calving.

Microbiological studies were carried out on the day of material selection on the basis of the microbiology laboratory of the Center for Biotechnology of the Federal State Budgetary Educational Institution of Higher Education Kuban GAU named after I.T. Trubilin. Material for the study was collected in gynecological pipettes using a Janet syringe, after sampling, the pipette was sealed on both sides. The sample was homogenized with saline at a ratio of 1:10, a series of 10-fold dilutions was prepared. The inoculum was transferred according to the Drygalski method in an amount of 100 μL to elective media: Levina, Enterococcagar, Staphylococcagar, Endo, Lactobacagar, poured into 20 mL Petri dishes, followed by incubation at 35 ± 1 ° C under aerobic conditions for 24 hours, in anaerobic conditions for lactobacagar under conditions of 48 hours. A dense Bifidum medium was used to isolate the lactic acid bacteria by the above method and culturing at 35 ± 1 ° C 4-6% CO2 in the atmosphere for 48 hours. Microorganisms were counted according to GOST ISO 7218-2011. Species identification was performed using matrix-activated laser desorption/ionization with time-of-flight mass spectrometry (MALDI-TOF MS).

Laboratory blood tests were performed on an automatic biochemical analyzer DIRUI CS-600 (Dirui Industrial Co., Ltd, China). The reagent kit "Dia Vet Test" was used for biochemical studies of animal blood serum on automatic and semi-automatic analyzers. Hematological studies were performed using Urit-5160 Vet hematological automatic analyzer (URIT Medical Electronic Co., China), State Register No. 76807-19. To determine non-specific resistance factors, a bacterial neutrophil phagocytosis test was used, taking into account the degree of its completeness in relation to Staphylococcus aureus bacteria (No. 209 P) according to I.V.

Nesterova et al. (1996). The bactericidal activity of blood serum (BASK) was determined by O. V. Smirnova and T. A. Kuzmina (1966), lysozyme (LASK) - by D. G. Dorofeichuk.

Results of own research. At the dairy complex of NPH "Korenovskoye"there are 2,000 cattle, including 1,200 milch cows. Keeping cows tied with passive walking in the cattle stands. Feeding by group. Linear milking. During insemination, schemes for synchronizing sexual hunting are used, using insemination with ordinary unsexed sperm. Prevention of postpartum pathology is carried out by antibacterial and uterotonic drugs. Immediately after calving, cows are injected with furosolidone candles in the amount of 2 pcs. Oxytocin or uterotone is used intramuscularly. In the treatment of endometritis, Endometramag-T is used, which is throw intrauterine in a dose of 100 ml using a Zhane syringe 24 hours before clinical recovery. The therapeutic course is 3-5 injections.

On the first day after calving, 80% of the samples were sterile in the vaginal contents of cows, and only 20% isolated bacteria of the families*Enterobacteriaceae*, *Streptococcaceae*, *Staphilococcaceae*, *Enterococcaceae*. Pathogenic and opportunistic bacteria of the family *Enterobacteriaceae* isolated in an amount from 2×10^2 to 3×10^2 CFU/ml. most commonly reported *E. coli* 2×10^2 CFU/ml (80% of tested samples). Among the representatives of the family *Streptococcaceae* (40% of samples tested) were most frequently isolated *Str. pluranimalium* 1×10^3CFU/ml*Str. haemoliticus* 8×10^2CFU/ml. Bacteria of the family *Staphilococcaceae* were found in 83,3% of the contents of the uterus and vagina of cows immediately after calving, among them the most often recorded *St. chromogenes*to 1×10^2CFU/mland *St. uberis* up to 2×10^3CFU/ml. The Enterococcaceae family in the uterine and vaginal contents of cows was represented by Ent bacteriafaecalis in an amount of up to 9×10^2 CFU/ml. In addition, up to 2×10^2 CFU/ml of Moraxelleaeequi was isolated in 16,6% of the tested samples in the bovine vaginal and uterine washes.

Among the symbiont microflora in cows immediately after calving, bacteria of the Bacillaceae family were isolated - B. licheniformis in an amount of up to 1×10^2 CFU/ml and B. amyloliquefaciens 1×10^2. These microorganisms are widespread in the environment, and are also part of the normal microflora of mammals, birds and insects. Field strains of B. licheniformis have high antagonistic activity associated with the production of antibiotic-like substances, in addition, according to some reports B.licheniformis strains also have antiviral properties, and high survival in the biotope due to the formation of spores, as well as the production of penicillinases and other enzymes, amino acids and other biologically active substances [2, 4, 5, 6].

5-7 days after calving and carrying out all measures for the prevention of obstetric and gynecological postpartum pathologies of cows in NPH "Korenovskoye", representatives of the families *Staphilococcaceae*, *Enterobacteriaceae*, *Enterococcaceae* represented by *St. sciuri* 9×10^3 CFU/ml, *E. coli* $5{,}2 \times 10^7$ were isolated in uterine mucus CFU/ml and *E. faecium* 1×10^8 CFU/ml. All microorganisms were isolated in associations. Among the symbiont microflora, *L. fermentum* 6×10^3 was isolated in 70% of cows. Clinical signs of catarrhal-purulent endometritis were manifested in 10% of cows

10-14 days after calving, uterine flora was represented by *Staphilococcaceae* such as *St. equorum* $1{,}6 \times 10^4$ CFU/ml, *St. uberis* $1{,}5 \times 10^4$, *St. epidermidis* 7×10^3, *St. hominis* 3×10^5 and *Mammaliicoccusvitulinus* $1{,}6 \times 10^4$ CFU/ml. The *Enterobacteriaceae* family was represented by *E. coli* $5{,}0 \times 10^5$. Ent was isolated from the *Enterococcaceae* family *hirae* 1×10^3CFU/ml, *Ent. mundtii*1×10^4 . Streptococci were represented by *St. pluranimalium* $1{,}3 \times 10^4$.Also, representatives of the genus *Arthrobacter* were identified in cows: *Arthrobactergandavensis* 2×10^5, *Arthrobactercitreus* 1×10^3, *Arthrobacteroxydans* 4×10^3 (from the Greek "articulated stick") - a genus of bacteria that are usually found in soil. All species of this genus are gram-positive obligate aerobes, which are rods during exponential growth and cocci in the stationary phase. Symbionts were represented by representatives of the *Lactobacillaceae* family: *L. fermentum* 6×10^3 CFU/ml and *L. acidophilus* 8×10^3 CFU/ml and the *Bacillaceae* family: *B. amyloliquefaciens* 1×10^2 CFU/ml.

In 6 cows (20%), clinical signs of acute postpartum purulent catarrhal endometritis were detected, only pathogenic and opportunistic microorganisms *St. uberis* 1×10^3 CFU/ml, *St. epidermidis* 5×10^5 CFU/ml and *E. coli* 5×10^5 CFU/ml were recorded in the uterine contents.

After 21 days, treated animals after calving showed a decrease in the titer of staphylococci in contrast to *E. coli*, microflora was represented by *Staphylococci St.* uberis $3{,}2 \times 10^2$ CFU/ml, *St. equorum* $6{,}6 \times 10^4$ CFU/ml. *Enterococci Ent.cassei, flavus* $1{,}1 \times 10^4$ CFU/ml and *E. faecium*$1{,}9 \times 10^5$ CFU/ml were also isolated in cows. The amount of *E. coli* in 1 ml increased to $2{,}6 \times 10^6$. In addition, *Str. dysagalactiae* $1{,}3\times10^5$ CFU/ml, *Achromobacter denitrificans* 7×10^4CFU/ml, *Stenotrophomonas maltophilia* 2×10^4 CFU/ml, *Micrococcus luteus* 1×10^2CFU/ml, *Exiguobacterium sp.* 1×10^6CFU/ml, *Trueperella pyogenes* 1×10^3CFU/ml.*S. maltophilia* is a novel nosocomial

pathogen, associated with opportunistic infections in animals. Ubiquitous in the aquatic environment, soil and plants. According to physicians, *S. maltophilia* can lead to nosocomial infections in immune compromised patients. The adhesion of this organism to abiotic surfaces, medical instruments poses a serious risk to hospital patients. *Micrococcus luteus* is an obligate aerobe and is widespread in the environment: it is found in soils, dust, water, air. It is also part of the normal surface microbiota of human and mammalian skin. In humans, *M. luteus* colonizes the oral cavity, mucous membranes, oropharynx, and upper respiratory tract.

Clinical recovery was observed in two animals. Symbiont microflora was isolated in 80% of animals and was represented by *L. fermentum* 6×10^3CFU/ml.

28 days after calving, cows with completed treatment regimen and those who were not treated were excreted with *St. epidermidis* 5×10^5 CFU/ml, *St. uberis* $1,2 \times 10^5$ CFU/ml, *E. coli* $1,1 \times 10^5$CFU/ml, *Str. haemoliticus* 2×10^3CFU/ml, *Ent. Faecium* $1,4 \times 10^4$ CFU/ml, *St. mitis* 4×10^3 CFU/ml and fungi *A. fumigatus* 4×10^4 CFU/ml. Symbiont and saprophytic microflora represented by *L. plantarum* $7,2 \times 10^4$CFU/ml, *Bac. subtilis* 1×10^2CFU/ml, *Bac. pumilis* 1×10^2CFU/ml, *Bac. licheniformis* 2×10^3CFU/ml. The cessation of the use of antimicrobial drugs made it possible to activate antibiotic-resistant strains.

After 35 days, *St. hominis* 1×10^5 CFU/ml, *St. uberis* 1×10^3 CFU/ml, *St. uberis* 2×10^6 CFU/ml and *E. coli* $3,6 \times 10^6$ CFU/ml remained among the opportunistic microflora. Symbionts are represented by *L. plantarum* $7,2 \times 10^3$ CFU/ml, *L. fermentum* $1,7 \times 10^4$ CFU/ml, isolated in 80% of animals.

After 45 days, a significant species and genus diversity of isolated microorganisms was noted in the vaginal contents. Staphylococci were represented by *St. sciuri* $3,1 \times 10^3$ CFU/ml, *St. hominis* $1,5 \times 10^3$ CFU/ml, *St. warneri* 4×10^2 CFU/ml, *St. chromogenes* 1×10^2 CFU/ml, *St. succinus* 8×10^9 CFU/ml, *St. uberis* $2,7 \times 10^4$ CFU/ml,*E. coli* $1,3 \times 10^5$ CFU/ml. Enterococci were represented by *E. faecium*and *E. faecalis* at 4×10^3CFU/ml and 5×10^3CFU/ml.In addition, *Str. gallolyticus* 1×10^5 CFU/ml, *Pseudomonas spp* $2,4 \times 10^4$ CFU/ml and *M. lubeus* 4×10^2 CFU/ml. The symbiont microflora was presented by *Pediococcusacidilactici* in an amount of $1,2 \times 10^3$ CFU/ml and *B. subtilis* 1×10^2 CFU/ml.

The pH of the vaginal and uterine contents was measured at each sampling. The measured pH ranged from 6 to 8 and averaged 7,4. Animals with endometritis had a pH of about 8.

As a result of a study of morphological parameters of cow blood, a decrease in the number of platelets was found (Table 1). Gestational thrombocytopenia is a decrease in platelet count below 150×10^9/L during pregnancy. When the platelet level is above 100×10^9/L, the hemostasis system is able to compensate for their decrease, which, as a rule, does not affect the well-being of the pregnant animal. The platelet count in cows was $103,33 \times 10^9$/L immediately after calving, which is 39,7% lower than the lower limit of normal. In cows with diagnosed postpartum endometritis, the platelet count was also within normal limits and 2 weeks after calving was $309,75 \times 10^9$/L.

In the blood of cows with acute postpartum endometritis, a decrease in hematocrit was also observed. Hematocrit is the ratio of the volume of red blood cells to the volume of the liquid part of the blood. A decrease in hematocrit may indicate hyperproteinemia, it is also characteristic of chronic inflammatory processes, injuries, starvation, chronic hyperasotemia, etc. Hematocrit was elevated in cows from days 5-7 to 28 after calving. The number of white blood cells in the blood of cows was within the reference values. At the same time, slight fluctuations in the percentage of white blood cells were observed at all study periods.

In a study of humoral immunity indicators of experimental cows, it was found that the lysozyme activity of blood serum in them from calving to the end of the postpartum period was 1,7 times lower than normal values on the first day and then increased 1,3 times higher than the reference values. In animals with acute postpartum endometritis, the lysozyme activity score was 8,4% higher relative to healthy cows (Table 2).

The study of bactericidal activity allows assessing the activity of neutrophils and monocytes, a decrease in the bactericidal activity of blood serum - leads to the failure of phagocytosis and chronization of the process. As a result of the studies, it was found that BASK (bacterial activity of blood serum) of cows from the first day after calving to the end of the postpartum period was within the standard values, and only in cows with acute postpartum endometritis this indicator was 3,3% lower than normal.

One of the main indicators of cell immunity activity in animals is phagocytosis indicators, including phagocytic activity, phagocytic number, phagocytic index, phagocytic capacity. Based on the literature, a decrease in phagocytic activity is associated with: chronic infectious diseases, immunodeficiency states, long-term intake of glucocorticoids or cytostatics. The indicators we studied show the state of immunodeficiency in cows. This is

manifested in a significant decrease in phagocytic activity. So on the first day after calving, the phagocytic activity of neutrophils was at the lowest level and was in the range of 28-31%, while within a month after calving this indicator gradually increased and reached 41,7% by day 28.It was also found that in cows with acute postpartum endometritis, phagocytic activity was higher than in clinically healthy cows and exceeded 13,6% 14 days after calving. The results of immunological studies indicate a change in the activity of absorption of antigenic components by phagocytes of peripheral blood, as indicated by an increased phagocytic number and phagocytic capacity in cows with acute postpartum endometritis compared to cows without clinical manifestations of the disease.

The number of T-lymphocytes in cows with postpartum endometritis was significantly higher than in clinically healthy cows by 23,5% 14 days after calving. All cows with acute postpartum endometritis also showed an increase in the number of B-lymphocytes compared to animals without signs of the disease by 20,8%, respectively, in the first and second farms.

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Table 1 – Morphological indices of cows' blood during the birth and postpartum periods

Name of the estation	Experienced animals cows	Morphologicalindicesofblood									
		Leukocytes, 10^9/l	Erythrocytes, 10^{12}/l	Platelets, 10^9/l	Hematocrit, %	Hemoglobin, g/l	Lymphocytes, %	Monocytes, %	Neutrophils, %	Eosinophils, %	Basophils, %
Standard indicators		4,5-12,0	5,0–7,5	260-700	28–46	90–120	40-75	2,00–13,00	20-35	3-8	0-2
NPH "Korenovskoye"	1 day after calving	5,91±1,01	6,72±0,24	**103,33±26,91**	27,9±1,26	98,17±4,21	**38,14±4,35**	15,03±1,58	**43,72±4,31**	3,18±1,46	0,06±0,01
	14 days after calving	6,97±1,27	6,62±0,46***	281±28,21	**26,74±1,69**	93,2±4,94	40,22±6,94	16,31±3,17	**42,58±9,5**	**0,86±0,153**	0,02±0,00
	28 days after calving	5,75±0,64	5,92±0,46*	**242±55,027**	**24,1±2,17**	86,33±5,84	42,65±2,01	13,65±1,42	**41,54±4,21**	**2,06±0,79**	0,04±0,02
	starting from 14 days after calving with signs of endometritis	8,04±2,28***	6,24±0,91	309,75±42,18	**26,95±3,30**	94,25±10,03	**24,20±11,96**	18,52±6,10	**48,76±13,60**	**0,55±0,10**	0,04±0,01

*P < 0,05; **P < 0,01; ***P < 0,001

Table 2 – Immunological parameters of cows' blood during the birth and postpartum periods

Name of the estation	Experienced animals cows	Immunological blood parameters												
		LASK, %		BASK, %		FA, 30 min, %	FA, 60 min, %	FI, 30 min, min/unit	FI, 60 min, min/unit	FC, 30 min, min/unit	FC, 60 min, min/unit	FE, 30 min, min, 10^9/l	FE, 60 min, min, 10^9/l	T-lymphocytes, 10^9/l	B-lymphocytes, 10^9/l
NPH "Korenovskoye"	Clinically healthy 1 day after calving	1,76±0,15	1,89±0,18	1,12±0,13	1,22±0,15	23±5,67	31,5±9,65	2,65±0,59	3,73±0,85	8,3±2,59	8,95±2,5	1,40±0,58	2,09±1,12	2,14±0,04	0,92±0,04
	14 days after calving	1,75±0,14	1,95±0,17	1,18±0,14	1,10±0,2	41,71±7,22*	46,29±7,51	4,67±1,03	4,56±0,97	9,4±2,28	8,67±1,82	1,17±0,34	1,71±0,67	2,3±0,08	1,01±0,05

	28 days after calving	1,45±0,40	1,58±0,34	1,28±0,41	1,28±0,48	50,8±9,32*	57,6±5,767*	5,5±1,04*	6,17±0,91	7,42±1,72	8,16±1,89	1,47±0,22	1,72±0,25	2,32±0,22	1,04±0,07
	starting from 14 days after calving with signs of endometritis	1,91±0,20	1,89±0,25	1,1±0,22	1,03±0,29	46,25±10,061*	52,5±8,893	3,71±1,55	4,08±1,14	7,85±2,28	8,2±1,945	1,46±0,54	3,22±1,10	2,84±0,11**	1,22±0,15

*P < 0,05; **P < 0,01; ***P < 0,001

The reproduction rates of the observed cows are presented in Table 3. The average insemination index was found to be 1,71. The service period for cows was 115 days, which is associated with a shift in the time of the first insemination no earlier than 65 days. The percentage of cows culled under observation was 16,7%, mainly associated with prolonged infertility - 3 heads, due to the influence of opportunistic microflora and reduced immune status, and due to low productivity - 2 heads.

Table 3 - Indicators of reproduction of experimental cows in NPH"Korenovskoye" (n=30, M±m)

Name of the estation	Obstetric and gynecological pathology (%)	Using estrus synchronization	Number of inseminations before fertilization	Service period	Culled cows, %
NPH "Korenovskoye"	20,0	Yes	1,71±0,124	115,065±7,658	16,7

Conclusions: Thus, when studying the microbiocenosis of the genitourinary tract of cows, the "Korenovskoye" NPH found that the genus-specific composition of the isolated microflora is very diverse and is represented by the families Enterobacteriaceae, Streptococcaceae, Staphilococcaceae, Pseudomonadaceae, Enterococcaceae, Bacillaceae. The pH of the vaginal mucus ranged from 6 to 8 and averaged 7,4. In addition, representatives of the families *Moraxellaceae, Pasteurellaceae* and others were recorded in single samples. Among the representatives of the *Enterobacteriaceae* family, the bacteria of the genera *Escherichia* and *Klebsiella* were most often distinguished. Staphylococci were represented by *St. chromogenes, St. uberis, St. scuiri, St. aureus*. The family S*treptococcaceae* was most commonly represented by *Str. pluranimalium, Str. haemoliticus, Str. anginosus, Str. dysagalactiae*. *Ent.faecalis* and *Ent.faecium* were the most frequently isolated from the members of the *Enterococcaceae* family. The family *Bacillaceae* was diverse and included members of the species *B. licheniformis, B. vallismorbis, B. amyloliquefacens*, *B. subtilis*. The main symbiont microorganisms were representatives of the *Lactobacillaceae* family: *L. fermentum, L. acidophilus, L. plantarum*, and *Pediococcus acidilactici* was also isolated in several cows. The presence of symbiotic microflora significantly reduced the incidence of purulent-catarrhal endometritis in animals, and ensured a faster recovery.

As a result of the change in the physiological status of experimental cows, we also recorded a change in cellular immunity factors, such as the activity of peripheral blood phagocytes to absorb antigenic components, as indicated by increased phagocytic number and phagocytic capacity in cows with acute postpartum endometritis compared to cows without clinical manifestations of the disease. The number of T lymphocytes in cows with postpartum endometritis was significantly higher than in clinically healthy cows by 23,5% 14 days after calving. All cows with acute postpartum endometritis also showed an increase in the number of B-lymphocytes compared to animals without signs of the disease by 20,8%, respectively. In a study of humoral immunity indicators of experimental cows, it was found that the lysozyme activity of blood serum in them from calving to the end of the postpartum period was 1.7 times lower than normal values on the first day and then increased 1.3 times higher than the reference values.

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