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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

**TREATMENT AND PREVENTION OF DYSPEPSIA IN
NEWBORN CALVES**

Specialty: 3109.01 – “Veterinary sciences (diagnosis and therapy of animal diseases, pathology and morphology of animals)”

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INTRODUCTION

Relevance of the Topic and Degree of Development. The prevention and treatment of diseases in newborn calves is a matter that requires serious experience and scientific approach in the field of veterinary medicine. The difficulties in this field mainly arise from gaps in the application of correct diagnostic and treatment methods. The high mortality rate of newborn calves can be significantly reduced through proper and timely intervention. Prophylactic measures, especially proper feeding and care of pregnant animals and calves, play an important role in prevention of disease. The health and rational feeding of pregnant animals result in healthy newborn calves.¹ Additionally, the establishment of delivery and examination departments in stables in accordance with veterinary requirements allows for early detection of diseases and timely initiation of treatment. The solution of emerging problems requires joint activity not only of veterinarians, but also of farm managers, zootechnicians, and livestock specialists.

In the modernization of new livestock complexes, one of the important issues in animal husbandry is obtaining healthy and viable offspring. However, some zoohygienic and technological methods applied in the feeding and housing conditions of pregnant cows in animal husbandry: raising calves during the colostrum period, failure to carry out therapeutic-prophylactic measures on time result in the birth of calves with low-level metabolism and resistance.²

As a result, in our republic's farms, morbidity among newborn calves is 70-80% (mainly related to gastrointestinal tract damage), and their mortality ranges from 10% to 60%.

The high level of morbidity among young animals is related to the weak development of defense reactions in the organism of newborn calves. In this regard, it has become important for newborn

¹ Blum, J. W. Nutritional physiology of neonatal calves // Journal of Animal Physiology and Animal Nutrition. 2006, Vol.90- P. 2-3.

² Zarcu S., Cernescu H., Knop R., Colostral immunity in newborn calf: methods for improvement of immunoglobulins absorption // Lucrări Stiințifice Medicină Veterinară, 2008, vol. 12., p. 195-196.

animals to have special favorable housing and feeding conditions.

Under intensive production conditions of livestock, young animals are exposed to strong stresses. At this time, enteritis and diarrhea, which are usually observed with imbalance of intestinal microflora, are most noticeable³. In this case, unlike feeding with colostrum when calves are raised in natural conditions, timely colonization of the gastrointestinal tract with microorganisms does not occur in such calves. The normal microflora of a healthy calf's gastrointestinal tract becomes stable in its composition and consists of bifido and lactobacteria, bacteroids, enterococci, escherichia, and yeasts.

Traditional treatment methods carried out with the application of antibacterial, sulfonamide, and nitrofurantoin preparations in sick calves do not always give positive results, and often have a negative effect on the immune status and obligate microflora of newborn calves. Irrational therapeutic tactics of antibiotic application, as well as their unjustified widespread use, lead to the formation and development of microorganism strains resistant to medicinal preparations. In recent years, the use of formic acid for obtaining curd through fermentation of colostrum and bulk milk has found wide application in the treatment and prophylaxis of gastrointestinal diseases in calves⁴.

In this regard, recently there is a need to replace antibiotics with alternative, ecologically safe means for the purpose of protecting animal health.

One of the current directions in the prophylaxis of gastrointestinal tract diseases and optimal feeding is the application of living microorganisms called probiotics, which are symbiotic microflora of the animal gastrointestinal tract, among which lactic acid, propionic acid ($\text{CH}_3\text{CH}_2\text{COOH}$) bacteria, and bifidobacteria are considered Object and subject of the study.

³Муралинов К.К., Саттарова Р.С., Оспанкулов Н.К. Аутоиммунная диспепсия молодняка // Вет. патология. - 2003. - №4, - с.13-14.

⁴Стегний, Б.Т. Перспективы использования пробиотиков в животноводстве // Ветеринария. - 2006, №11, с. 24.

Object and subject of the study.

The object of the study was “R – AQRO” LLC, located in the Imishli district, which is of strategic importance in the country, especially in agriculture. The subject of the study is the study of the effectiveness of antibiotics, Vetom 15.1 probiotic and formic acid-fermented (fermented) colostrum (collected milk) in groups created for the prevention and treatment of dyspepsia in newborn calves. red the most promising.

Research Tasks and Objectives. The aim of the research was to evaluate the therapeutic-prophylactic effectiveness of antibiotics, probiotic "Vetom 15.1," and formic acid-acidified (fermented) colostrum in newborn calf dyspepsia. For this purpose:

1. Study of immunoglobulin levels in colostrum of mother cows depending on their age and lactation.

2. Study of clinical, biochemical, and morphological blood status during dyspepsia disease in newborn calves.

3. Assessment of some biochemical parameters in the blood of pregnant cows and newborn calves, and immunoglobulin levels in colostrum.

4. Comparative analysis of various schemes used for treatment and prophylaxis purposes during dyspepsia in newborn calves.

5. Study of the effectiveness of antibiotics and formic acid-acidified (fermented) colostrum (bulk milk) in groups created for the prophylaxis and treatment of dyspepsia in newborn calves.

6. Conducting microbiological tests in the differential diagnosis of dyspepsia.

Research Methods. Clinical experimental examinations were conducted from October 2017 to March 2018 at "R-AGRO" LLC in Imishli district, which has strategic importance especially in the country's agriculture.

For the research, pregnant cows of "Holstein-Friesian" breed in the last month of pregnancy, as well as calves up to ten days of age obtained from these cows, were selected considering age, live weight, and number of lactations.

Statistical data processing was carried out using Microsoft Office Excel program. The obtained material was processed using

Student's variable statistical method. In the work, all data are presented in the form of arithmetic mean (M) and standard error ($\pm m$).

We determined the differences between the obtained measurements with the help of Student's T-criterion. Pearson's degree correlation coefficient was used to establish statistical interrelationships among the obtained data.

Defended Propositions:

- Depending on the treatment method and prophylaxis of the disease, determination of clinical, morphological, and biochemical blood status of calves sick with dyspepsia revealed decreased erythrocytes and hemoglobin, while hematocrit and band neutrophils showed elevation.

- It has been confirmed that the concentration of immunoglobulins in colostrum of newly calved cows increases with each lactation, reaching its maximum level at the fourth lactation.

- The probiotic preparation "Vetom 15.1" has influenced the clinical, morphological, and biochemical status of newborn calves.

- The biochemical parameters of blood in newborn calves sick with dyspepsia have determined the levels of immunoglobulins.

- It has been determined that the application of "Vetom 15.1" probiotic at a dose of 50 mg per kg body weight for prophylactic purposes, and 75 mg per kg body weight during dyspepsia illness has a positive effect on blood biochemical parameters.

Scientific Novelty of the Research. For the first time, the effectiveness of antibiotics, "Vetom 15.1" probiotic, and formic acid-acidified colostrum (bulk milk) in the treatment and prophylaxis of dyspepsia in newborn calves has been studied comparatively. When studying the morphological composition of blood in cows that had dried off, minimal deviations from the norm were determined.

The effect of "Vetom 15.1" probiotic on morphological and biochemical blood parameters, as well as on the clinical status of newborn calves during dyspepsia, has been studied.

The level of immunoglobulins in colostrum during the first ten days of milking in cows during second, third, fourth, and fifth lactation periods, and the concentration of γ -globulins in blood

serum of calves obtained from them have been studied. In the 1st and 3rd experimental groups one month and 10 days before calving, and in the 4th group 10 days before calving, the amount of carotene was 25% below the physiological norm. The deviation of total calcium from the norm during initial examinations was 12% in the 1st and 4th groups, 20% in the 2nd and 3rd groups, and during the second examination 16% and 20% respectively in the 1st and 2nd experimental groups. The lowest level of inorganic phosphorus (1.3 ± 0.28 mmol/l) was determined in the blood serum of cows in the 2nd experimental group, which was 13.3% below the norm. Four dynamics of globulin levels in calf blood serum during the first three days of life have been determined.

Theoretical and Practical Significance of Research. As a result of the research conducted, the application scheme and doses of Vetom 15.1 probiotic have been determined. Based on the dissertation materials, recommendations on "Treatment and prophylaxis of dyspepsia in newborn calves with 'Vetom 15.1' probiotic preparation" have been developed and published. In the research work, an effective therapy scheme combining prophylactic and treatment measures has been applied, probiotics have been used as a biological control agent in dyspepsia disease, and the probiotic has helped normalize the bacterial flora of the intestine and increase the general resistance of the organism. As a result, due to the probiotic used in the treatment of dyspepsia disease in calves at the farm, complications from the disease among calves were very rare, and in calves requiring treatment, the recovery rate increased.

Effective recommendations for predicting the immune status of newborn calves have been provided. Based on production trials, we have recommended the use of "Vetom 15.1" probiotic in farms to reduce the duration of treatment for dyspepsia in newborn calves.

Approbation and Application. Eleven works related to the dissertation topic have been published, of which 8 are scientific articles. The dissertation materials have been presented at ASAU, All-Republican Scientific-Practical Conference (2015), GDU 2nd International Scientific Conference of Young Scientists (2017), and

at the conference on "Theoretical Hypotheses and Empirical Results" at the 10th International Scientific Conference (2025).

Farm Where the Dissertation Work Was Conducted. The dissertation work was carried out at the large cattle breeding complex "Imishli R Agro LLC" located in Qaralar village, Imishli district. The farm project is designed for keeping 5000 head of cattle. During the research visit to the farm, there were 1400 heads of Simmental and 1100 head of Holstein breed animals. 1200 heads of animals were recorded in the milking group. The farm had 24 stables, 8 silage pits, 1 large feed warehouse, 3 units of 12-cube and 1 unit of 24-cube CAT MIX equipment for grinding, mixing and distributing feed, and a 60-head rapid-exit milking system was installed.

General Volume of the Dissertation with Separate Volume of Structural Sections. The dissertation work consists of an introduction, five chapters, conclusions, a list of 136 references used, and appendices. The total volume of the dissertation is 150 pages of computer text. The general text part of the dissertation (excluding figures, tables, graphs, and bibliography) is 204.005 characters.

CHAPTER I MAIN CONTENT OF THE WORK

In this chapter, the organism of newborn calves has been analyzed for differentiation according to a series of characteristics - natural immune resistance and reactivity, metabolism and digestive processes, blood circulation and respiration, functional state of all organs and systems such as the nervous system, and the effects of probiotics.

CHAPTER II TERRITORIES WHERE RESEARCH WAS CONDUCTED, METHODS AND MATERIALS USED IN THE ANALYSIS OF RESEARCH SAMPLES

2.1. Characteristics of Research Objects.

The dissertation work was carried out at the large cattle breeding complex "Imishli R Agro LLC" located in Qaralar village, Imishli district. Laboratory examinations were performed at the Veterinary-Sanitary Examination Laboratory (biochemical

department) located in Goygol district. The results of the research work were tested in 2019 at the livestock complex located in Qaramaryam village, Ismayilli district, and at the large cattle breeding complex in Muzdurlar village, Goranboy district for the purpose of treatment and prophylaxis of dyspepsia disease in newborn calves.

2.2. General Characteristics of Methods and Approaches Used During Research.

Ten animals were selected in each calf group (n=10). Groups were created as animals were born or during the period they became ill. In the first experimental group, calves were treated using antibiotics and following a diet according to the scheme accepted at the farm. The second group calves were given colostrum and/or Vetom 15.1 probiotic preparation internally (prophylactic dose of 50 mg per kg body weight). When clinical signs of dyspepsia appeared, we increased the probiotic dose to 75 mg. When clinical signs decreased, the dose of Vetom 15.1 probiotic preparation was reduced to 50 mg per kg body weight. The duration of Vetom 15.1 probiotic administration was 10 days from the day of birth. The third experimental group calves were given formic acid-acidified colostrum (bulk milk) according to the scheme accepted at the farm. Clinical examinations were conducted daily in calves according to general methodologies accepted in veterinary medicine, taking into account the general condition of animals, body temperature, heart rhythm and respiratory rate, condition of skin, hair coat, mucous membranes, and characteristics of fecal mass.

Morphological examinations of calf blood included: determination of total number of erythrocytes and leukocytes, erythrocyte sedimentation rate (ESR), hemoglobin level determination, hematocrit value and leukocyte formula; biochemical examinations included: determination of alkaline reserve, total protein and protein fractions, inorganic phosphorus, total calcium, vitamin A, and ketone bodies. Morphological and biochemical studies in calves were conducted on the first, third, seventh, and tenth

days of life, additionally γ -globulin was determined in blood serum on the second day of life.

For morphological blood examination, blood was collected from calves in the morning hours before feeding in citrated test tubes of "Vacutest" brand. The purpose of collecting blood in citrated test tubes was that the examination should be performed with non-coagulated blood. Clinical examinations were conducted daily in calves according to general methodologies accepted in veterinary medicine, taking into account the general condition of animals, rectal body temperature, heart rhythm and respiratory rate, condition of skin, hair coat, mucous membranes, and characteristics of fecal mass.

The first scientific-economic experiment was conducted on cows, and for this purpose four experimental groups consisting of cows in different lactations were formed: first experimental group (n=10) - second lactation, second experimental group (n=10) - third lactation, third experimental group (n=6) - fourth lactation, fourth experimental group (n=4) - fifth lactation.

Clinical, biochemical, and morphological examinations were conducted in cows one month and ten days before calving.

The relative density of colostrum from 30 mother cows was determined during the first ten milkings before giving to calves (when colostrum temperature was 20°C) using the "Krise Colostrum Densimeter" lactodensimeter. Then, based on the results obtained regarding the relative density of colostrum, the amount of immunoglobulins (Ig) was calculated according to the appropriate methodology. The second scientific-economic experiment was conducted on calves obtained from the four experimental groups of cows mentioned earlier. During the research, 30 offspring were obtained from cows in experimental groups, and 3 experimental groups were created from newborn calves based on the similarity principle.

Morphological and biochemical studies in calves were conducted on the first, third, seventh, and tenth days of life, additionally the indicator of γ -globulin fractions was determined in blood serum on the second day of life.

Morphological examinations of calf blood included: determination of total number of erythrocytes and leukocytes, erythrocyte sedimentation rate (ESR), hemoglobin level determination, hematocrit value and leukocyte formula; biochemical examinations included: determination of alkaline reserve, total protein and protein fractions, inorganic phosphorus, total calcium, vitamin A, and ketone bodies.

Morphological and biochemical studies in calves were conducted on the first, third, seventh, and tenth days of life, additionally the indicator of γ -globulin fractions was determined in blood serum on the second day of life.

Biochemical examinations of blood serum were performed using the following methods:

1. Total protein was determined by a refractometric method using KFK-2 refractometer. The principle of the method consists of determining the refractive index coefficient of blood serum, based on which the percentage amount of total protein is found.

2. Protein fractions (γ -globulins, albumins) were determined by turbidimetric (nephelometric) method based on precipitation of blood serum protein fractions with different concentrations of phosphate solutions. Very fine precipitate forms currently, and the solution becomes turbid. Based on the degree of turbidity of the tested solutions, the concentration of proteins in the sample was determined using a photoelectrocolorimeter.

3. Alkaline reserve was determined by diffusion method in double flasks according to I.P. Kondrakin. The principle is based on the action of sulfuric acid on blood serum, because of which carbon dioxide contained in bicarbonates is released. One part of the released carbon dioxide is absorbed by sodium hydroxide without reacting with it, and the remaining part is titrated with sulfuric acid solution because of CO_2 absorption formed by sodium carbonate (Na_2CO_3). According to the bound volume of sodium hydroxide, the amount of carbon dioxide released from serum is determined, which is equivalent to the composition of bicarbonates (N_aHCO_3). The calculation is performed using the following formula:

$$X (\text{CO}_2 \text{ total}\%) + (\text{Vn} - \text{Vt}) \cdot 0,488) \cdot 100, \quad (1)$$

where: Vn – amount of 0.02 normal sulfuric acid solution used for titration of control sample, ml.

Vt – amount of 0.02 normal sulfuric acid solution used for titration of test sample, ml.

Vn-Vt – amount of 0.02 normal NaOH solution (ml) bound with CO_2 .

Vpl – amount of blood plasma.

0.488 – coefficient for recalculation of 0.02 normal sodium hydroxide solution.

100 – coefficient for converting results to 100 ml blood plasma.

The result of total CO_2 percentage is obtained by multiplying the difference in titration of 0.02 normal sulfuric acid solution by the coefficient 89.6.

4. Total calcium was determined by complexometric method. The main principle of this method is based on titration of calcium ions with disodium salt of ethylenediaminetetraacetate (EDTA) with the participation of murexide as an indicator in alkaline medium. Calcium ions combine with the indicator and give a qualitative reaction in titration with EDTA, separating the indicator, as a result of which the latter colors the solution purple.

5. Inorganic phosphorus was determined by photolorimetric method with vanadium-molybdenum reagent in the modification of V.F. Koromyslov and L.A. Kudryavseva according to Pulsa. The essence of this method consists of yellow-lemon coloration, which is measured in KFK-2 photoelectrocolorimeter. The calculation is performed using the following formula:

$$A = P \cdot 400/1000, \quad (2)$$

where: A – Phosphorus (mg%);

P – phosphorus according to graph (mg/kg);

400 – dilution of filtrate,

1000 – conversion to mg%.

Vitamin A was determined by a colorimetric method. The principle of this method is based on the interaction of vitamin A with

antimony trichloride, because of which a blue-colored compound is obtained, and its intensity depends on the amount of vitamin A.

6. Ketone bodies in blood were determined using express Ketotest device.

The amount of carotene in blood serum was determined by the method of Karp and Preys in Yudkin's modification. The method is based on separation of carotene from blood serum proteins using petroleum ether or aviation gasoline.⁵

For morphological examination, Mindray Hematology analyzer was used. The number of erythrocytes was determined in Goryaev chamber. The number of leukocytes was also determined in Goryaev chamber. The number of leukocytes in diluted blood in a certain volume of the chamber was determined.

CHAPTER III DETERMINATION AND ASSESSMENT OF IMMUNOGLOBULINS IN COLOSTRUM OF MOTHER COWS DEPENDING ON THEIR AGE AND LACTATION

3.1. Assessment of the general health of mother cows

During the intensive development of the livestock industry, conditions are created for the emergence of various etiologies. Insignificant violations in the feeding and housing conditions of newborn calves lead to pathological processes in the organism, mainly in the digestive system, and consequently to the development of dyspepsia. Also, an important factor in the development of dyspepsia is the health of mother cows.

When studying the morphological composition of blood in cows that had dried off, we determined minimal deviations from the norm. Thus, in the 3rd and 4th experimental groups one month before calving, the hematocrit indicator was 6.8% higher and 0.57% lower than the lower physiological norm.

⁵Zarcula, S. Colostral immunity in newborn calf: methods for improvement of immunoglobulins absorption // *Lucrări Stiințifice Medicină Veterinară*, 2008, Vol. 12, p. 195-196.

More significant changes were determined when studying the biochemical status in the blood serum of experimental group cows. Thus, in the 1st and 3rd experimental groups one month and 10 days before calving, and in the 4th group 10 days before calving, the amount of carotene was 25% below the physiological norm. The deviation of total calcium from the norm during initial examinations was 12% in the 1st and 4th groups, 20% in the 2nd and 3rd groups, and during the second examination 16% and 20% respectively in the 1st and 2nd experimental groups. The lowest level of inorganic phosphorus (1.3 ± 0.28 mmol/l) was determined in the blood serum of cows in the 2nd experimental group, which was 13.3% below the norm.

Ten days before calving in the 2nd, 3rd, and 4th experimental groups, the alkaline reserve indicator decreased by 4.2%, 3.1%, and 6.8% respectively by groups, which indicated a shift in acid-base (pH) balance toward acidosis.

Also, one month before calving in the 1st, 2nd, 3rd, and 4th experimental groups, low levels of α -globulins were noted, constituting $7.2 \pm 1.24\%$, $7.8 \pm 0.66\%$, $8.6 \pm 1.65\%$, and $5.8 \pm 0.29\%$ respectively. At this time, the concentration of β -globulins in these groups was conversely 78.7%, 78.1%, 40%, and 100.6% higher than normative indicators. Ten days before calving, only in the 2nd, 3rd, and 4th experimental groups, a decrease of α -globulins by 37%, 3%, and 46% respectively was noted, and only in the 2nd group was a high level of γ -globulins ($19.8 \pm 3.21\%$) recorded.

3.2. The amount of immunoglobulins in the colostrum of newborn cows and biochemical indicators in blood serum.

To evaluate the comparative effectiveness of antibiotics, probiotics, and acidified colostrum application during dyspepsia in newborn calves, clinical, morphological, and biochemical examinations were conducted. Thirty newborn calves obtained from 30 cows in the experiment were divided into 3 groups with 10 head in each group: in the first group - newborn calves were treated using antibiotics and complex farm methods, second - group treated with "Vetom 15.1" probiotic, third - group receiving formic acid

fermented acidified colostrum. During research lasting up to ten days, 73% of all newborn calves became ill with dyspepsia. Among them, 100% of calves in the first group, with 70% recurrence, 60% in the second group, 70% in the third group, with 10% recurrence were noted. No recurrence was noted in the second experimental group calves.

In eight calves of the first experimental group, the disease was noted in mild form, and in two heads in toxic form. In this group of animals, general lethargy of the organism, decreased appetite or complete loss was observed. The animals' skin was dry, elasticity decreased, conjunctiva was dry and pale. Their feces were liquid, yellow colored with a sharp putrid odor. In the second experimental group calves, we noted lethargy, preserved appetite, moist and elastic skin cover, moist and shiny conjunctiva. Fecal masses were liquid, yellow colored with specific or sweet odor.

In the third experimental group calves, general lethargy of the organism, decreased appetite, liquid consistency feces, yellow-colored and putrid, containing undigested casein and blood clots were observed.

When assessing the general condition of the organism, we determined that throughout the entire experimental period, body temperature in all experimental group calves was around the physiological norm. At this time, in the first experimental group calves, respiration was 8% higher on the second and fourth days of examinations, and 35% higher than physiological norm on the ninth and tenth days, which corresponded to the minimal number of sick calves. In the first group, the pulse rhythm of calves on the ninth and tenth days of life was also 11.2% higher than the physiological norm.

CHAPTER IV

STUDY OF CLINICAL, BIOCHEMICAL AND MORPHOLOGICAL BLOOD STATUS DURING DYSPEPSIA DISEASE IN NEWBORN CALVES

4.1. Morphological status of blood in newborn calves.

To objectively assess the health condition of newborn calves during dyspepsia, morphological and biochemical blood parameters

were studied.

When studying the morphological parameters of calf blood, relative erythropenia was determined in all experimental groups.

To study the clinical status of cows in the last month of pregnancy, their body temperature was measured, heart rate, respiratory rhythm and rate, and rumen contractility were determined.

In all experimental groups, the heart rate of cows was at the same level (63-72 per minute), which corresponded to normative indicators.

In experimental animals, respiratory rhythm throughout the entire examination period corresponded to physiological indicators, constituting 17-21 respiratory movements per minute. In all animals in the experiment, rumen contractility indicators corresponded to physiological norm, constituting 3-4 contractions in 5 minutes. During the examination period, the values of the studied indicators did not have reliable differences ($P>0.05$). The general condition of cows 1 month and 10 days before calving was assessed as satisfactory. No pathological changes were recorded in the mucous membranes of the oral cavity, nose, birth canal, and conjunctiva.

When determining hematocrit in the blood of cows in the 3rd and 4th experimental groups one month before calving, a decrease of this indicator by 6.8% and 0.5% compared to physiological norm was observed.

When analyzing the average group indicators of erythrocyte, leukocyte, and hemoglobin levels in the blood of all experimental group cows, it was determined that these indicators did not deviate from physiological norm (Figure 1).

The severity of the disease, as well as the effectiveness of the treatment administered, was determined by the leukocyte formula of the blood. When studying the leukocyte formula of calves' blood in the experimental groups, deviation from the norm was determined only in the first experimental group. Being in direct contact with the organism's tissues, blood tissues possess all reactive properties, but their sensitivity to pathological processes is higher and weaker. Thus, any effect on tissues is reflected in the blood composition.

Therefore, the leukocyte formula was determined for the purpose of complete and perfect assessment of the organism's condition. The research results are reflected in Table 4.1.

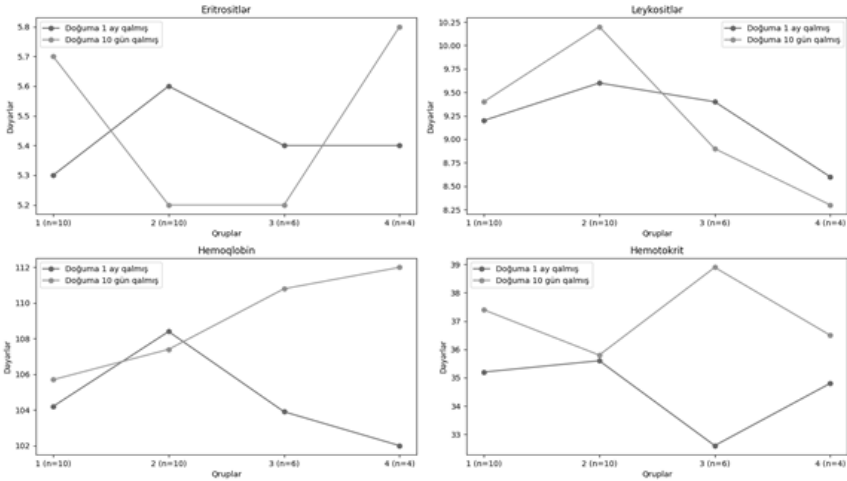


Figure 4.1. Morphological dynamics of blood parameters in cows from experimental groups.

During the analysis of the leukocyte formula of the examined cows, we determined that in the second experimental group, in the second examination ($2.2 \pm 0.56\%$), the number of basophils was 10% higher than the normative indicator.

In the second stage (10 days before calving), in the 1st, 2nd, and 3rd experimental groups, the number of young neutrophils was also 20%, 30%, and 40% higher than normal, respectively. We believe that such regenerative movement of neutrophils toward young cells is related to the organism's physiological condition before calving.

On the tenth day of examinations, eosinophilia was noted. On the third, seventh, and tenth days of examinations, simple regenerative left-shift neutrophilia was observed, which was related to the slowing of proliferation and differentiation of mature forms of neutrophils.

Table 4.1.
Leukocyte formula of experimental group cows' blood (M±m)

Indicator	Norm	During examination	Groups			
			1(n=10)	2(n=10)	3(n=6)	4 (n=4)
Basophils	0-2	1 month before birth	1,6±0,44	1,8±0,30	2,0±0,76	1,7±1,20
		10 days before birth	2,0±0,48	2,2±0,28	0,8±0,52	1,6±0,04
Eosinophils	5-8	1 month before birth	5,6±0,78	6,0±0,12	6,2±0,51	6,5±0,15
		10 days before birth	6,1±0,82	6,3±0,17	6,4±0,08	6,0±0,68
Young neutrophils	0-1	1 month before birth	0,6±0,40	0,7±0,92	0,8±0,10	0,5±0,42
		10 days before birth	1,2±0,82	1,3±0,33	1,4±0,26	0,5±0,18
Band neutrophils	2-5	1 month before birth	4,2±1,36	3,4±0,85	3,8±0,02	4,2±1,38
		10 days before birth	3,2±0,57	3,6±0,40	3,4±2,08	4,1±1,46
Segmented neutrophils	20-35	1 month before birth	28,2±2,18	32,5±2,02	32,9±2,38	33,1±1,92
		10 days before birth	34,2±1,40	33,4±1,28	34,2±1,84	31,4±2,10
Lymphocytes	40-65	1 month before birth	55,2±2,14	54,4±2,62	52,4±1,18	54,8±2,62
		10 days before birth	52,8±1,48	53,4±1,66	53,6±2,31	52,4±3,83
Monocytes	2-7	1 month before birth	3,2±0,55	2,8±0,82	3,3±1,30	5,6±1,14
		10 days before birth	3,4±1,36	3,5±0,70	2,7±0,64*	4,4±0,46*

Note: "*" indicates statistical significance of differences between groups P<0.05

The left shift of neutrophil nuclei is explained by the formation of young forms of neutrophils in the blood, which mainly occurs during infectious diseases, acute inflammatory processes, and intoxications. This is observed during inflammatory and purulent-septic diseases and is an indicator of high bone marrow activity. The concentration of γ -globulins in the blood serum of newborn calves depends on the Ig level in the colostrum of mother cows, which in turn depends on the amount of total protein in the blood serum of cows, mainly on the γ -globulin fraction of protein in the blood of mother cows.

In turn, the lactation number has influenced not only the concentration of immunoglobulins in the colostrum of cows but also the incidence of dyspepsia in newborn calves.

Thus, according to the composition of immunoglobulins, the colostrum of newly calved cows is considered best in the fourth lactation and can be used in creating a colostrum bank on dairy farms.

CHAPTER V

DETERMINATION OF THE EFFECTIVENESS OF VETOM

15.1 PROBIOTIC

5.1. Analysis of biochemical parameters of blood.

During the treatment and prevention of dyspepsia with various methods, the main biochemical indicators of blood serum - total calcium, inorganic phosphorus, alkaline reserve, vitamin A, total protein and protein fractions - were examined to assess the biochemical status of newborn calves.

Data on these indicators are necessary for a comprehensive assessment of the treatment and prevention of dyspepsia in calves, as well as for determining the nonspecific level of body resistance, since these indicators characterize the state of metabolism in the newborn organism. The results of the examinations are given in table 5.1.

When analyzing the data of table 5.1., it is determined that in group 1 the average group concentration of total calcium in the blood

serum of calves was 3.7% lower than physiological values (2.6 ± 0.13 mmol/l). The studied indicator in the 2nd and 3rd experimental groups was around the norm (2.9 ± 0.13 mmol/l and 2.7 ± 0.08 mmol/l).

Table 5.1.

Biochemical parameters of the blood of newborn calves in the experimental groups

Indicator	Norm	During examination	Groups		
			1	2	3
Total calcium, mmol/l	2,7-3,2	1	$2,8 \pm 0,05$	$2,9 \pm 0,18$	$2,8 \pm 0,07$
		3	$2,7 \pm 0,14$	$2,7 \pm 0,02$	$2,6 \pm 0,12$
		7	$2,5 \pm 0,32^*$	$2,8 \pm 0,14^*$	$2,5 \pm 0,10^*$
		10	$2,4 \pm 0,04^{**}$	$3,1 \pm 0,18^{**}$	$2,9 \pm 0,03^{**}$
		middle	$2,6 \pm 0,13$	$2,9 \pm 0,13$	$2,7 \pm 0,08$
Inorganic phosphorus, mmol/l	1,5-2,3	1	$2,0 \pm 0,07$	$2,0 \pm 0,05$	$2,0 \pm 0,15$
		3	$2,1 \pm 0,07$	$2,3 \pm 0,15$	$2,2 \pm 0,28$
		7	$2,0 \pm 0,09^*$	$2,4 \pm 0,02^*$	$2,4 \pm 0,13$
		10	$1,6 \pm 0,10^{**}$	$2,3 \pm 0,10^{**}$	$2,0 \pm 0,22^{**}$
		middle	$2,0 \pm 0,08$	$2,3 \pm 0,08$	$2,2 \pm 0,19$
Alkali reserve, mmol/l	22,3-23,1	1	$19,2 \pm 0,56$	$19,8 \pm 2,14$	$21,8 \pm 0,36$
		3	$20,4 \pm 0,64^*$	$22,4 \pm 0,52^*$	$22,8 \pm 0,22^*$
		7	$21,0 \pm 0,28$	$22,9 \pm 0,78$	$21,8 \pm 0,66$
		10	$17,8 \pm 0,62^{**}$	$22,8 \pm 0,24^{**}$	$23,5 \pm 0,75^{**}$
		middle	$19,6 \pm 0,52$	$21,9 \pm 0,92$	$22,4 \pm 0,43$
Vitamin A, mkmol/l	1,4 and up	1	$0,7 \pm 0,08$	$0,5 \pm 0,04$	$0,5 \pm 0,05$
		3	$0,8 \pm 0,18$	$0,9 \pm 0,18$	$0,8 \pm 0,24$
		7	$0,8 \pm 0,21$	$0,9 \pm 0,10$	$0,8 \pm 0,08$
		10	$0,4 \pm 0,10^{**}$	$1,2 \pm 0,28^{**}$	$0,8 \pm 0,12^{**}$
		middle	$0,6 \pm 0,14$	$0,8 \pm 0,15$	$0,7 \pm 0,12$

Note: «*» difference in accuracy between groups $P < 0.05$, «**» difference in accuracy between groups $P < 0.01$

On the first day of life, the total calcium content in experimental groups 1, 2 and 3 did not have significant differences within the physiological norm ($P > 0.05$). However, starting from the

3rd day of the examination, this indicator began to decrease by 3.6%, 10.7% and 14.3% compared to the physiological norm in experimental group 1 compared to the second, third and fourth periods of the examination.

During the second and third examinations, a decrease in the total calcium level in the blood serum of calves in the group that received acidified colostrum (congealed milk) was noted by 3.7% and 7.41% compared to the physiological norm. In all other cases, during the examination of the blood serum of calves, the total calcium indicator in all experimental groups was at the level of the normative indicator.

On the seventh day of the examination, significant differences were determined between the 2nd (2.8 ± 0.14 mmol/l) and 1st (2.5 ± 0.32 mmol/l), as well as the 3rd (2.5 ± 0.10 mmol/l) experimental groups ($P < 0.01$).

5.2. Determination of the dynamics of γ -globulins in the blood serum of calves.

In the group treated with antibiotics, the α -globulin index increased compared to the previous examination, but remained 20.8% lower than the norm and had a significant difference compared to the indicator of the 3rd group ($P < 0.05$).

During the entire examination, the β -globulin fraction in the blood serum of the calves examined in all experimental groups was above the norm. At the same time, in the third and fourth stages of the examinations, significant differences were determined between the 1st, 2nd and 3rd experimental groups ($P < 0.01$). There were also significant differences in the indicators between the 1st and 3rd experimental groups ($P < 0.05$).

In experimental group 1, significant negative dynamics was observed in the level of γ -globulins from the first day of life of calves ($23.2 \pm 4.40\%$) to the tenth day ($5.2 \pm 0.73\%$).

In experimental groups 1 and 3, the level of γ -globulins in the blood serum reached a maximum value on the second day of life, amounting to $19.2 \pm 2.28\%$ and $18.6 \pm 2.66\%$, respectively. Then this

indicator gradually decreased and was recorded at a lower level on the tenth day of life.

Throughout the study, it was determined that the concentration of globulins in the blood serum of calves on the seventh and tenth days of life showed statistically significant differences between experimental groups 1, 2 and 3 ($P < 0.01$).

5.3. Evaluation of the probiotic "Vetom-15.1"

As the pathological process develops, toxicosis takes on a major character, based on which the metabolism of all types of substances (electrolyte, protein, carbohydrate, fat) as well as acid-base balance is disrupted, resulting in the accumulation of intermediate and final products in high quantities. As a result of examinations, it became known that in the blood of calves with dyspepsia, the amounts of residual nitrogen, urea, and creatinine increased. However, a sharp decrease in total protein, albumins, and glucose was determined. Digestive disorders in newborn calves were associated with decreased resistance and activation of conditionally pathogenic microflora. Physiological dysbiosis was noted. The reason for its occurrence is the unformed microbiocenosis of the intestine. To eliminate this, special care and attention are required for calves from the day of birth.

In Greek, probiotic means "for life." A probiotic consists of the natural microflora of the intestine, or a mass of living microorganisms based on *Bacillus subtilis*. This new class of preparations affects non-specific resistance, metabolism in the organism, and immune status.

Unlike antibiotics, the mechanism of action of probiotics is not directed toward the destruction of gram-negative microflora, but toward the creation of probiont bacteria that inhibit the multiplication of pathogenic microflora in the intestine.

As a result of our conducted research, it became known that after treatment of calves with dyspepsia with Vetom 15.1 probiotic for 10 days, bifidobacteria and lactobacilli in $<10^8$ and 10^8 dilutions, lactose-positive and lactose-defective E.coli bacteria were observed in amounts of $<10^6$ CFU/g feces. The bacteriological

composition of 1 g of feces from calves in the first control group was determined by the increase of bifidobacteria and lactobacilli in 10^8 dilution, lactose-positive E.coli bacteria at 10^6 CFU/g and lactose-defective bacteria at $<10^6$ CFU/g feces. The multifaceted therapeutic effect of apathogenic bacilli results in the release of biologically active substances after the preparation enters the gastrointestinal tract, leading to the strengthening of microbial cell activity through pathological (direct effect on conditionally pathogenic microorganisms) effects and activation of specific and non-specific defense systems of microorganisms. During this period, the bacterial cells of the probiotic, acting as biocatalysts of many vital indicators in the digestive process, produce maximum amounts of enzymes (amylase, lipase, protease), vitamins, and other physically active substrates, because of which the complex therapeutic-prophylactic effect has been accelerated.

RESULTS

1. The concentration of immunoglobulins in the colostrum of newly calved cows increases with each lactation, reaching its maximum level in the fourth lactation. In Holstein cows, during the fourth lactation, immunoglobulins were at the level of 131 g/l during the first milking [1].

2. The clinical condition of newborn calves sick with dyspepsia is characterized by increased pulse and respiration (acceleration), while temperature remains within physiological norms. Decreased skin turgor, dryness of skin covering, dry and pale conjunctiva, and diarrhea were determined [6].

3. The morphological status of calves sick with dyspepsia was determined by the decrease of erythrocytes to $4,65 \pm 0,41 \times 10^{12}$, hemoglobin to 92.4 ± 4.66 g/l, ESR to 0.48 ± 0.07 mm/hour, hematocrit to $41.3 \pm 0.28\%$, and the increase of band neutrophils to $9.9 \pm 1.55\%$ [9].

4. The biochemical indicators of blood in newborn calves sick with dyspepsia showed a decrease in total protein and total calcium to 48.6 ± 1.18 g/l and 2.4 ± 0.04 mmol/l respectively, alkaline reserve

to 17.8 ± 0.62 mol/l, vitamin A concentration to 0.4 ± 0.10 mmol/l, α - and β -globulins to $5.7 \pm 1.28\%$ and $5.2 \pm 0.73\%$ respectively, and an increase in γ -globulins to $56.5 \pm 3.00\%$ [8].

5. The application of "Vetom 15.1" probiotic at a dose of 50 mg per kg of live weight for prophylactic purposes, and 75 mg per kg of live weight during illness with dyspepsia, allows for the increase of erythrocytes and hemoglobin in blood, normalization of the concentration of formed elements, total calcium and inorganic phosphorus, as well as an increase in the level of alkaline reserve. An increase in vitamin A in calves' blood was determined. The study showed the effectiveness of prevention [5].

6. The application of "Vetom 15.1" probiotic led to the optimization of metabolic processes, resulting in 10% lower incidence of dyspepsia in calves compared to the group given colostrum acidified with lactic acid (pooled milk), and 40% lower compared to the group treated with antibiotics. During this time, the disease proceeds in a mild form, and recovery is observed 2-3 days after the start of treatment [7].

7. During bacteriological analysis of feces from sick calves in the experimental group, dysbiosis was noted: an increase in enterococci to 0.2×10^8 ... 0.4×10^9 CFU/g, and a decrease in bifidobacteria and lactobacillus colonies in $<10^8$ and 10^8 dilutions compared to the clinically healthy calves group. When the amount of enterococci was 10^6 CFU/g, an increase in bifidobacteria and lactobacilli was determined in 10^8 and 10^8 dilutions [11].

8. In calves treated with Vetom 15.1 probiotics, normalization of intestinal microflora occurs. During bacteriological analysis of feces, a decrease in enterococci to 10^8 CFU/g is noted, while no changes are observed with bifidobacteria and lactobacilli. In the group of calves using antibiotics, secondary dysbiosis develops: the amount of golden staphylococcus increases to 1.2×10^5 CFU/g, and a decrease in the growth of bifidobacteria in $<10^8$ dilution was determined [10].

9. The dynamics of γ -globulins in the blood serum of calves during the first three days of their lives has 4 types: 1) increasing, 2)

decreasing (descending), 3) increasing-decreasing, and 4) decreasing-increasing dynamics [3].

10. Considering the positive therapeutic effect, the use of "Vetom 15.1" probiotic has been economically beneficial [2].

RECOMMENDATIONS

1. For Holstein cows, high-quality first colostrum from fourth lactation cows should be used to form a colostrum bank.

2. During dyspepsia in newborn calves, it is recommended to use "Vetom 15.1" probiotic preparation at a prophylactic dose of 50 mg per 1 kg of calf's live weight once daily after receiving colostrum. The recommended dose should be increased to 75 mg per 1 kg of calf's live weight once daily during treatment when disease is observed, until recovery.

3. For the prevention of dyspepsia and to increase the resistance of newborn calves' organisms, "Vetom 15.1" probiotic should be used at a dose of 50 mg per 1 kg of live weight once daily from birth.

4. The results of scientific experimental research can be used by veterinary and biological specialists for educational and scientific purposes.

5. Limiting the use of antibiotics and promoting alternative treatment methods is recommended. The use of antibiotics in combating dyspepsia disease in the digestive system and other infectious diseases should be minimized. The use of natural treatment methods such as probiotics, immunomodulators, and biologically active substances should be prioritized. The use of probiotics helps normalize bacterial flora and increase the general resistance of the organism. In such cases, resistance to antibiotics used in disease treatment is prevented and opportunities for the development of effective treatment methods are created. Limiting the use of antibiotic preparations as much as possible should be used as it is more effective both in terms of sick animals' health and economic efficiency.

List of Scientific Publications Related to the Dissertation Work

1. Gəncəyev, İ.F, Abbasov, R.Ə. Некоторые функционально-химические свойства мочи и кислотная емкость крови у здоровых и больных простой диспепсией телят в первые 10 / ADAU-nun elmi əsərləri, Gəncə, 2015, №3, s.144-146.

2. Abbasov, R. Современные методы лечения диспепсии телят. // ADAU-nun elmi əsərləri, 2017, №1, s.77.

3. Abbasov, R. Dispersiyalı yeni doğulmuş buzovların müalicə və profilaktikası // ADAU-nun elmi əsərləri, 2017 №3, s.85-87.

4. Abbasov, R. Yeni doğulmuş buzovlarda dispersiyanın etiologiyası və patogenezi / Gəncə alimlərin II beynəlxalq elmi konfransı. Gəncə: GDU, 2017, №3, s.167-169.

5. Abbasov, R. Yeni doğulmuş buzovlarda dispersiyanın müalicəsində probiotiklərin tətbiqi // Elmi xəbərlər GDU, Gəncə, 2017, №3, s. 52-57.

6. Abbasov, R. Yeni doğulmuş buzovların nəcislərinin mikrobioloji tədqiqi // AMEA Gəncə bölməsinin Xəbərlər məcmuəsi, 2017, №3, s. 26-31.

7. Abbasov, R. Применение и оценка «ветом-15.1» при лечении и профилактике диспепсии новорожденных телят // Бюллетень науки и практики, 2024 , №8 с. 185-190.

8. Abbasov, R., Zeynalova Sh. Biochemical Blood Parameters in the Treatment for Dyspepsia // Бюллетень науки и практики, 2024, №11, pp. 328-335.

9. Abbasov, R. Факторы, влияющие на концентрацию иммуноглобулинов в молозиве новорожденных коров // International agricultural journal (Россия), 2024, №6 с. 1953-1963.

10. Abbasov, R. Baytarlıqda probiotiklərin tətbiqi // Elmi Xəbərlər. Gəncə. 2025 №1, с. 26-30.

11. Abbasov, R. Динамический анализ биохимических параметров крови у неонатальных телят с диспепсией. // Proceedings of the 10th International Scientific Conference «Theoretical Hypotheses and Empirical Results», Oslo (Norway), 2025, № 10, с. 253-256.

The defense of the dissertation will be held on 29 September 2025 at 14⁰⁰ during the meeting of the BFD 3.20 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at the Institute of Zoology of the Ministry of Science and Education of the Republic of Azerbaijan.

Address: AZ 1004, Baku city, Sabail district, A.Abbaszada str., 115.

Dissertation is accessible at the library of the Institute of Zoology of the Ministry of Science and Education of the Republic of Azerbaijan.

Electronic versions of the abstract are available on the official website of the Institute of Zoology of MSERA (<https://zoologiya.az>).

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