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BIOCHEMICAL BLOOD PARAMETERS IN THE TREATMENT FOR DYSPEPSIA

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БИОХИМИЧЕСКИЕ ПОКАЗАТЕЛИ КРОВИ ПРИ ЛЕЧЕНИИ ДИСПЕПСИИ

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Abstract. Many issues of newborn calves diseases etiology have not been fully studied and the practical experience of many veterinarians shows with proper diagnosis and treatment that it is possible to achieve a sharp reduction in the young animals mortality. With the birth of calves complex adaptation processes to new conditions occur. The next level of development depends on immunity development. Although a range of different drugs are used to treat dyspepsia in newborn calves, they are not always successful, and it depends on the complex of measures used. The aim of the conducted research is to study the state and dynamics of metabolism in the neonatal period with dyspepsia in newborn calves; to study the effectiveness of the probiotic, along with its impact on the clinical situation; to determine the effectiveness of the drug when used for therapeutic and prophylactic purposes. Probiotic Vetom-15.1 was used in different age groups. As a result, it was found that biochemical blood parameters improved significantly.

Аннотация. Многие вопросы этиологии болезней новорожденных телят изучены не до конца, и практический опыт многих ветеринарных врачей показывает, что при правильной диагностике и лечении можно добиться резкого снижения смертности молодняка. С рождением телят происходят сложные адаптационные процессы к новым условиям. Следующий уровень развития зависит от развития иммунитета. Хотя для лечения диспепсии у новорожденных телят используют целый ряд различных препаратов, они не всегда эффективны и зависят от комплекса применяемых мероприятий. Целью проведенного исследования является изучение состояния и динамики обмена веществ в неонатальном периоде при диспепсии у новорожденных телят; изучение эффективности пробиотика, а также его влияния на клиническую ситуацию; определение эффективности препарата при использовании с лечебной и профилактической целью. Пробиотик «Ветом 15.1» применялся в разных возрастных группах. В результате было установлено, что биохимические показатели крови существенно улучшились.

Keywords: serum, protein, albumin, globulin, dyspepsia, vitamin A, probiotic Vetom-15.1.

Ключевые слова: сыворотка, белок, альбумин, глобулин, диспепсия, витамин А, пробиотик «Ветом-15.1».

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In order to assess the biochemical status of newborn calves during the treatment and prevention of dyspepsia, various methods were used to study the main biochemical parameters of blood serum - i.e. total calcium, inorganic phosphorus, alkaline reserve of the blood [6] vitamin A, total protein and protein fractions [2, 4]. Information on these parameters is necessary for the purpose of a comprehensive assessment of the treatment and prevention of dyspepsia in calves, as well as for determining the level of non-specific body resistance, since these parameters characterize the state of metabolism in the body of newborn animals [1].

Depending on the time of feeding with colostrum and its composition, the young animals cannot receive a sufficient amount of gamma globulin, vitamins and minerals in time [2]. As a result, the barrier function of the gastrointestinal system is disrupted and favorable conditions for the passage of microorganisms are created. [3]. Deficiency of vitamins and minerals seriously affects the activity of the glands that produce digestive juices. In addition, this complicates the digestion of colostrum, as well as milk. From this point of view, it is important to regularly give young animals clean water to drink.

When there is a lack of water in the baby's body, the digestive glands cannot produce a sufficient amount of enzymes, and in this case, digestion is disrupted [5].

Materials / methodology

The studies were conducted on black-and-white Holsteinized animals in the private farm of "Imishli R Agro" LLC in the Imishli district. The territory of the Imishli district is located on the Mil-Mugan plain, which belongs to the Kura-Araz lowland. Most of its territory is below sea level. The Kura River flows along the northern border of the district, and the Araz River flows along its central part. The district is represented by gray-meadow, partly gray and grassy gray soils, and semi-desert vegetation. The climate of the district is moderately hot, semi-desert and dry desert with arid summer. The average temperature in January reaches 1.6˚C, and in July - 29.1˚C. The annual precipitation is 300 mm.

In the course of research on dyspepsia in newborn calves, a comparative assessment of the therapeutic and prophylactic efficacy of the probiotic "Vetom-15.1" and acidified colostrum (collected milk) was carried out. Practical tests were conducted from November 2017 to March 2018. The experiment on calves began with the selection of groups of newborn calves from birth to ten days of age. The groups of calves were created based on the principle of analogy. Three groups of newborn calves (n=30) with 10 calves in each group (n=10) were involved in the experiment.

In the 1st experimental group, antibiotics were used according to the scheme adopted on the farm; in the 2nd experimental group, the calves were given the probiotic preparation "Vetom 15.1" according to the dosage of 50 mg per 1 kg of live weight once a day starting from the first day of birth, and if the disease occurred, the dosage was increased to 75 mg; in the 3rd experimental group, the calves were fed colostrum (collected milk) acidified with formic acid from the 4th day of life, and if the disease was detected on the 3rd day of life, it was started from the moment the disease began. Experimental groups were formed as the animals were born and the disease developed. A group of examinations was conducted, and the therapeutic effect began to be measured after the introduction of the preparations used after the group was formed and the symptoms of the disease were observed. In the 1st experimental group, antibiotics were used 7 days after the onset of the disease according to the scheme adopted on the farm. In the second experimental group, the probiotic "Vetom-15.1" was administered once every 7 days from the day of birth at a dose of 50 mg per 1 kg of live weight, and if the disease occurred, the dose was increased to 75 mg and the total course of treatment lasted 7 days.

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In the third experimental group, acidified colostrum was given for 7 days, from the 4th to the 10th day, starting from the day of birth.

Results and Discussions

The results of the studies are presented in Table 1. When analyzing the data in the table, it becomes obvious that in the 1st group, the average group concentration of total calcium in the blood serum of calves was 7.4% lower than physiological values (2.5±0.06 mmol/l). The studied indicator in the 2nd and 3rd experimental groups was within the normal range (2.8±0.05 mmol/l and 2.7±0.04 mmol/l).

Table 1

BIOCHEMICAL PARAMETERS
OF NEWBORN CALVES BLOOD IN EXPERIMENTAL GROUPS

Indicator	*Reverence Value*	*Days of Age*	*Experimental Groups*		
			1	*2*	*3*
Total calcium, mmol/1	2,7-3,2	1	2,7±0,14	2,8±0,15	2,7±0,07
		3	2,6±0,06	2,7±0,13	2,5±0,12
		7	2,5±0,10*	2,8±0,05*	2,6±0,07*
		10	2,3±0,19**	3,0±0,05**	2,8±0,06**
		on average	2,8±0,06	2,8±0,05	2,7±0,04
Inorganic phosphorus, mmol/1	1,5-2,3	1	2,2±0,07	2,1±0,16	2,1±0,29
		3	2,2±0,07	2,4±0,13	2,3±0,27
		7	2,0±0,09*	2,4±0,10*	2,4±0,24
		10	1,6±0,10**	2,3±0,18**	2,1±0,21**
		on average	2,0±0,03	2,3±0,18	2,2±0,15
Alkaline reserve, mmol/1	22,3-23,1	1	19,8±0,82	19,2±2,10	21,3±0,92
		3	20,5±0,75*	22,6±0,43*	23,0±0,68*
		7	21,9±0,34	22,8±0,67	21,2±0,72
		10	18,6±0,50**	22,7±0,93**	23,3±0,89**
		on average	20,2±0,25	21,8±0,41	22,2±0,37
Vitamin A, µmol/1	1.4 и выше	1	0,6±0,08	0,4±0,1	0,4±0,03
		3	0,7±0,18	0,8±0,09	0,7±0,15
		7	0,7±0,21	0,8±0,10	0,7±0,08
		10	0,3±0,10**	1,0±0,30**	0,7±0,09**
		on average	0,5±0,09	0,8±0,06	0,6±0,06

Note: "*" difference in accuracy between groups P<0.05, "**" difference in accuracy between groups P<0.01

On the first day of life, the amount of total calcium in the 1st, 2nd and 3rd experimental groups did not have reliable differences within the physiological reference value (P> 0.05). However, starting from the 3rd day of the study, compared with the physiological reference value, this indicator began to decrease by 3.7%, 7.4% and 14.8% compared with the second, third and fourth periods of studies in the 1st experimental group. In the second and third studies in the group receiving acidified colostrum (collected milk), the total calcium level in the calves blood serum compared with the physiological reference value was 7.4%, a decrease of 3.6% was noted.

In all other cases, when studying the calves blood serum the total calcium level in all experimental groups was within the reference value [7].

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On the seventh day of study, reliable differences were found between the 1st (2.8±0.05 mmol/l), 2nd (2.5±0.10 mmol/l), and 3rd (2.6±0.07 mmol/l) experimental groups (P<0.01). In the calves blood serum throughout the experimental period, the amount of inorganic phosphorus was near the physiological reference value. At this time, on the seventh day of calves life there were reliable differences between the indicators of the first (2.0±0.09 mmol/l) and second (2.4±0.10 mmol/l) experimental groups (P<0.05). Similar differences were noted in calves on the tenth day of life (P<0.05). The studied indicator in calves of second experimental group had more stable dynamics. During our assessment of bicarbonate buffer system, it was found that on the first day of calves life in the 1st (19.8±0.82 mmol/l), 2nd (19.2±2.10 mmol/l) and 3rd (21.3±0.92 mmol/l) experimental groups, this indicator was below the physiological reference value by 11.2%, 13.9%, 4.5%, respectively. During the next second examination, the serum alkaline reserve of calves was lower in the 1st experimental group and, compared with the reference value, this decrease was 8.1%. Also in the 1st experimental group, this indicator had reliable differences from the 2nd (22.6±0.43 mmol/l) and 3rd (23.0±0.68 mmol/l) experimental groups (P<0.05).

On the seventh day of life, the concentration of studied indicator in the 1st and 3rd experimental groups was 1.8% compared to the physiological reference value, a decrease of 4.9% was noted. The studied indicator in the 2nd experimental group corresponded to the reference value (22.8±0.67 mmol/l).

At the age of ten days, the calves alkaline reserve of the 1st experimental group decreased by 15.1%, and in the 3rd experimental group, the studied indicator exceeded the physiological reference value by 0.9%. The level of alkaline reserve indicator in calves of the experimental group that received the probiotic "Vetom 15.1" was within the physiological reference value (27.7±0.93 mmol/l). The study data between the 1st, 2nd and 3rd experimental groups for this studied indicator had reliable differences.

The average group vitamin A level was 64.3%, 42.9%, 57.1% lower than the standard level in the 1st, 2nd and 3rd experimental groups. During the first study, the vitamin A level was 0.6±0.08 μmol/l in eight calves of first experimental group, 0.4±0.10 μmol/l in three calves of the second experimental group and 0.4±0.03 μmol/l in five calves of third experimental group, traces of vitamin A were noted in the remaining calves. On the third day of the study, vitamin A was detected in five calves of the first and second groups and in seven calves of the 3rd experimental group. During this period of the study, compared with the previous period an increase in this indicator by 14.3%, 100% and 75% was noted in the 1st, 2nd and 3rd experimental groups. On the seventh day of life, the amount of vitamin A in the blood serum of six calves of the first group was 0.7±0.21 μmol/l, and in 10 calves of the 2nd and 3rd experimental groups — 0.8±0.10 mmol/l 0.7±0.08 mmol/1, respectively, traces of vitamin A were noted in the remaining calves. At the age of ten days, the amount of vitamin A in the blood serum of 10 calves of the first experimental group decreased by 57.1% compared with the previous study and by 78.6% compared with the reference value. In the second experimental group, this indicator was 25% higher compared with the previous study, but below the physiological indicator by 28.6%. This indicator was 50% below the reference value in the group receiving colostrum (collected milk) acidified with formic acid. The fourth study revealed reliable differences between the first and second, as well as the third experimental groups (P<0.01). The results of the studies are presented in Table 2.

As can be seen from Table 2, the total protein concentration throughout the study period was below the physiological reference value in all experimental groups. During this time, a decrease in this indicator by 1.1% (56.3±0.13 g/l) was noted in the 2nd experimental group. And in the 1st and 3rd experimental groups, this indicator decreased by 4.6% compared to the reference value and was 54.3±0.7 g/1 and 54.3±0.12 g/1, respectively. In the first days of life, the total protein concentration

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in the calves blood serum in the 1st, 2nd and 3rd experimental groups was below the standard values and was 53.0±0.12 q/1, 51.1±0.20 q/1, 49.4±0.19 q/1, respectively. No difference in accuracy was revealed during this period (P>0.05).

Table 2

THE AMOUNT OF TOTAL PROTEIN AND ITS FRACTIONS (VOLUME)
IN THE CALVES BLOOD SERUM ACCORDING TO EXPERIMENTAL GROUPS

Indicator		Reverence Value	Days of Age	Experimental Groups		
				1	*2*	*3*
Total protein, g/1		56,9-60,6	1	53,0±0,12	51,1±0,20	49,4±1,20
			3	57,1±0,25	57,6±0,23	54,0±0,08
			7	54,6±0,30	57,6±0,13	55,6±0,13
			10	52,6±0,16*	58,8±0,19*	58,1±0,24*
			on average	54,3±0,17	56,3±0,13	54,3±0,12
Protein fractions, %	Albumins	30-50	1	45,9±3,12	46,6±2,53	45,8±1,30
			3	40,1±2,67	48,7± 1,99	49,1 ±1,75
			7	40,4±2,93	47,6± 1,45	48,6±1,05
			10	32,8±2,58	49,3±1,77	47,1 ±2,25
			on average	39,8±1,19	48,0±0,78	47,6±0,84
	α -globulins	12-20	1	10,6±3,13	19,7±4,46	18,1±3,67
			3	20,1±2,83	14,6±2,92	14,0±2,15
			7	5,9±1,34**	19,6±4,42**	16,4±2,25**
			10	9,9±2,68	18,7±3,57	18,3±2,41
			on average	11,6±1,43*	18,1±2,73*	16,7±1,03*
	β - globulins	10-16	1	21,8±2,17	20,1 ±2,47	24,7±2,52
			3	22,1±3,50	19,2±2,51	24,7±2,52
			7	47,6±2,56**	19,2±2,51	21,1±1,85
Protein fractions, %	γ - globulins	25-40	10	53,6±2,00**	19,1±1,93**	19,6±1,27**
			on average	3 6,3± 1,45*	19,2±1,34	20,9±1,30*
			1	21,7±4,65	13,6±2,68	11,4±1,72
			2	18,6±3,64	17,5±2,70	16,3±2,92
			3	17,8±2,37	14,6±1,88	15,9±1,59
			7	6,1 ±0,45**	12,9±1,90**	16,6±1,03**
			10	3,8±0,40**	9,6±1,91**	15,0±1,13**
			on average	13,6±1,57	13,6±1,48	15,1±1,07

Note: "*" difference in accuracy between groups P<0.05, "**" difference in accuracy between groups P<0.01.

During the second period of the study, this indicator level in the 1st, 2nd and 3rd experimental groups increased by 7.2%, 11.3% and 8.5%, respectively, and reached its reference value in the 1st and 2nd experimental groups. During the third period of the study, the total protein indicator was below the physiological reference value by 4% (54.6±0.30 g/l) in the calves of the 1st experimental group and by 2.3% (55.6±0.30 g/l) in the calves of the 3rd experimental group. On the seventh day of their life, the total protein concentration in the 2nd experimental group remained at the same level and was 57.6±0.13 g/l. On the tenth day of calves life the total protein index in the 2nd and 3rd experimental groups, remaining within the reference value was 58.8±0.19 g/l and 58.1±0.24 g/l. In the 1st experimental group, this index was 7.6% lower than the statutory indicator and had a reliable difference from the 2nd experimental group (P<0.05).

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During the entire observation period, the concentration of albumin protein fractions in the 1st and 2nd experimental groups was close to the physiological reference value and had no reliable differences (P> 0.05). In the 1st experimental group, the average group indicator of α-globulins was 0.4% lower than the physiological reference value (11.6±1.43%), in the 2nd and 3rd experimental groups this indicator was at a normal level and amounted to 18.1±2.73% and 16.7±1.03%, respectively. During the examination period, no reliable difference was found between the 1st and 2nd experimental groups (P<0.05). On the first day of the study, the concentration of α-globulins in the 2nd and 3rd experimental groups was at a normal level (19.0±4.46%; 18.1±3.67%), and in the 1st experimental group it was lower and amounted to 1.4% (10.6±3.14%). No significant differences were found between the groups (P>0.05). On the third day of life in the 1st experimental group, the level of α-globulins was 6.1% lower than the physiological norm (5.9±1.94%). During this period, in the 2nd and 3rd experimental groups, this indicator had significant differences compared to the 1st group at the level of the physiological reference value (P<0.01). In the 2nd and 3rd experimental groups, the concentration of α-globulins in the blood serum of ten-day-old calves remained at the level of the standard indicator — 18.7±3.54% and 18.3±2.41%, respectively. In the group that received antibiotics for disease treatment the α-globulin indicator increased compared to the previous study but remained within 2.1% below the reference value and had a reliable difference compared to the level of the 3rd group (P<0.05). During the entire examination period, the β-globulin fraction in the blood serum of examined calves in all experimental groups was above the reference value. At this time, we found reliable differences between the 1st, 2nd and 3rd experimental groups at the third and fourth stages of the study (P<0.01). Reliable differences were also established between the indicators of the 1st and 3rd experimental groups (P < 0.05).

During the entire study period, the concentration of g-globulins in the blood serum of the examined calves in all experimental groups was below the standard value. The exact negative dynamics of β– globulins was established in calves of the 1st experimental group between the first (21.7±4.65%) and tenth (3.8±4.65%) days of life. In the 1st and 3rd experimental groups, the level of γ –globulins in the blood serum of calves increased and reached a maximum level on the second day of their life and amounted to 17.5±2.70% and 16.3±2.92%, respectively. During the entire study period, we found that the concentration of -globulins in the blood serum of the examined calves had reliable differences between the 1st, 2nd and 3rd experimental groups on the seventh and tenth days of calves life (P < 0.01). During the experimental period, ketone bodies were not detected in the blood serum of calves of all experimental groups. The study of the dynamics of γ – globulins in the blood of calves individually in the first three days of their life in each animal gives us reason to distinguish 4 types of dynamics: 1-growing; 2-decreasing; 3-growing and decreasing; 4-decreasing and growing. Thus, the introduction of the probiotic Vetom 15.1 leads to the improvement of metabolic processes, an increase in the level of γ – globulins in the calves blood serum, normalization of total protein reserves, total calcium and alkalis [10]. In the first days of newborn calves life, it is observed that the immunological reactivity and resistance of the body are at a weak and low level [8]. Therefore, they should be given special attention and care [9, 11]. This includes, among other things, strict adherence to their feeding regime, maintaining the microclimate in the premises and compliance with sanitary and hygienic rules [12, 13].

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