Clinical and biochemical status of calves with dyspepsia when using the probiotic "MAXLAC/DW" (Uzbekistan)

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Abstract. The article analyzes data on treating calf dyspepsia based on an etiopathogenetic principle aimed at normalizing digestion and metabolism. Calves in the first experimental group were treated with a 6-hour fasting diet, followed by hourly administration of warm rehydration solution (300 ml/10 kg) for six hours. After fasting, calves were fed 350 ml of colostrum and 350 ml of warm saline solution four times a day for the first two days, preceded by 40 ml of artificial gastric juice 15 minutes before colostrum feeding. From the second day, the probiotic Vetom 1.2 (Bacillus subtilis VKPM I-10641) was administered orally at 50 mg/kg four times a day for four days.The second experimental group also underwent a 6-hour fasting diet with hourly administration of warm rehydration solution (300 ml). For the first two days, calves were fed 350 ml of colostrum + 350 ml of warm saline solution four times a day, with 40 ml of gastric juice given 15 minutes before colostrum feeding. On the first and third treatment days, 3 ml of water-soluble trivitamin was added to colostrum. From the second day, the probiotic MAXLAC/DW, containing Enterococcus faecium (DSM 7134), was administered orally at 1g three times a day with colostrum for four days. Intramuscular injections of citrated maternal blood irradiated with ultraviolet rays (0.5 ml/kg) were given every 48 hours, three times in total. The control group received a fasting diet and hourly administration of 500 ml of warm saline solution. Intramuscular injections of the antibiotic Macrolan 200 (1 ml/10 kg) were given once a day for five days. The study revealed that the most positive results were observed in calves from the second experimental group. Thus, a comprehensive method for treating calf dyspepsia has been developed improving digestion, metabolic processes normalizing intestinal microbiota, contributing to the treatment of dysbiosis, reducing metabolic acidosis, intoxication as well as weel dehydration.

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1 Introduction

Diseases of the digestive tract of calves up to 10 days of age are very common in those farms where irrational feeding of dry cows or the technological regime of feeding newborns is disrupted. Among non-communicable diseases of newly born calves, dyspepsia occupies a significant share and causes an enormous economic damage.

There is a lot of work on the study of etiology and therapeutic and preventive measures in newly born calves in domestic and foreign literature. Despite this, the development of effective methods of therapeutic and preventive measures is not enough [1, 5, 9]. Therefore, determining the causes of dyspepsia, the mechanism of its development, and the development of more modern methods of therapy for this pathology on an etiopathogenetic basis are urgent tasks of veterinary medicine.

The economic damage from calf dyspepsia consists of a shortfall in offspring due to high mortality, treatment costs and stunting.

Calf dyspepsia often occurs as a result of the intrauterine hypotrophy associated with the lack of necessary conditions during the reproduction period of cows. The welfare of pregnant animals, rational feeding, and normal zoohygienic parameters in animal farming have a significant impact on fetal development. The degree of safety of newly born calves depends on these factors. Therefore, the prevention of diseases of young animals should be started during the pregnancy of cows, especially during the last two months [2, 10, 13].

Many cases of diseases of calves are noted in those farms where pregnant cows are fed substandard silage or haylage with the presence of butyric acid in them. The imbalance in the diet of pregnant cows, especially during the dry season, leads to a decrease in the biological value of colostrum, a decrease in protein, carbohydrates, vitamins, minerals and gamma globulins in it.

During postnatal ontogenesis, the cause of dyspepsia may be delayed delivery of colostrum after 1.5-2 hours or feeding milk from mastitis cows, which contributes to disruption of the colonization of the intestine with normal microflora [6, 15].

In recent years, a large number of pedigreed, highly productive cows have been imported to our Republic. In some farms, due to the disobey of the rules of feeding and keeping cows unwatered, the lack of vitamin, mineral, and carbohydrate metabolism develop in their body. Such cows give birth to hypotrophic calves that are prone to developing dyspepsia.

Belated delivery of the first portion of colostrum to newly born calves, drinking chilled milk to them, lead to intestinal dysbiosis, followed by a violation of the ratio of gram-positive and gram-negative microorganisms leading to the development of toxicosis [15].

According to Anokhin B.M., (2004), Blazhnova M.V. (2004), Kondrakhina I.P., (2004), Fazullin H.V. (2003), of the diseases of the gastrointestinal tract, dyspepsia accounts for 80-95% of cases with a mortality rate from 15% to 70% of cases [1, 10, 13].

The lack of retinol in calves increases the permeability of intestinal epithelial barriers to microorganisms. Vitamin C deficiency negatively affects the secretory function of the stomach, a lack of minerals leads to a decrease in the production of hydrochloric acid in gastric liquid [8, 11].

Normal fetal development in the uterine period ensures the birth of viable calves with high natural resistance to adverse environmental factors starting from the first days of life, which is the basis for the prevention of calf dyspepsia [3-4].

There is a certain interaction between the intestinal microflora and the immune system. Microbial colonies are able to support the animal's protective response against pathogenic microorganisms by stimulating the gastrointestinal immune response. In ruminants, probiotics can be used as substitutes for anti-microbial growth stimulants [7, 12, 14].

The literature presents the results of numerous scientific experiments on the therapeutic effectiveness of probiotics on the body of young cattle. Probiotics are saprophytic microorganisms. When they enter the gastrointestinal tract, their colonies are formed, the growth of pathogenic microorganisms is suppressed, the natural resistance of the body is activated and the immune status of animals improves. Probiotics, unlike antibiotics, can be used for a long time without causing negative effects. Probiotics are used as part of complex therapy for calf dyspepsia [3, 7-8, 12, 15-16]. The use of antibacterial drugs in diseases of the gastrointestinal tract leads to a decrease in the number of pathogenic and saprophytic microorganisms. Suppression of the number of saprophytic microorganisms can lead to hypovitaminosis and lowers the immune status of the body [2, 7].

Treatment of calf dyspepsia should be based on the etiopathogenetic principle and be aimed at normalizing the digestive process, eliminating dysbiosis, dehydration and intoxication.

Isotonic or hypertonic solutions are administered to combat dehydration and restore impaired osmotic pressure. Hemotherapy is performed as a non-specific stimulating therapy for sick calves, parenterally administered polyglobulins or gamma globulins [10].

The current trend in the treatment of diseases of the gastrointestinal tract is the use of probiotics, among which lactic acid, propionic acid, bifidobacteria and lactobacilli turned out to be the most effective [6, 8, 12, 14, 16]. In recent years, probiotics have been used in veterinary practice to replace antibiotics as alternative means for the treatment and prevention of diseases of the gastrointestinal tract and stimulation of animal growth [7, 11]. Therefore, scientists and practitioners of veterinary medicine face the task of developing a comprehensive method of therapy and treatment regime for calf dyspepsia, the introduction of which did not exclude previously developed therapeutic and preventive measures, but improved existing ones.

The aim of our research was to improve the treatment of calf dyspepsia based on the use of the probiotic MAXLAC/DW – containing a highly effective strain of lactic acid bacteria Enterococcus faecium (DSM 7134).

2 Materials and methods

The experimental part of the study was conducted on the basis of a dairy farm of the farm "Jura" of the Pastdargom district on the calves of dyspepsia patients under the age of 10 days of the Holstein Friesian breed. Under the experiments there were 9 heads of calves with dyspepsia divided into 3 groups of 3 heads each. The first and second groups of calves were experimental and the third was a control group. Calves of the first experimental group were treated with a starvation diet for 6 hours and during this time, 300 ml (10 ml/kg) of warm Rehydration solution was drunk hourly. After a starvation diet, the calves were fed 350 ml of colostrum with the addition of 350 ml of warm saline solution for the first two days 4 times a day. Before the introduction of colostrum, 40 ml of artificial gastric juice (1 g of pepsin, 1.5 NSl, 100 ml of distilled water) was drunk in 15 minutes. From the second day of treatment, the probiotic Vet 1.2 (Bacillus subtilis VKPM I-10641) was administered 50 mg / kg 4 times a day for 4 days.

The animals of the second experimental group were also prescribed a 6-hour starvation diet with 300 ml of warm Rehydration solution every hour. During the first two days, the calves were fed 350 ml of colostrum + 350 ml of warm saline 4 times a day. Before the colostrum was drunk, 40 ml of gastric juice was given in 15 minutes. On the first and third days of treatment, 3 ml of water-soluble trivitamin was added to colostrum. From the second day of treatment, the probiotic MAXLAC/DW - containing a highly effective strain of lactic acid bacteria Enterococcus faecium (DSM 7134) was administered 1g 4 times a day with colostrum for 4 days. As a non-specific stimulating therapy that increases the

immunobiological reactivity of the body, calves were injected intramuscularly in the buttock area with citrated maternal blood irradiated with ultraviolet rays at a dose of 0.5 ml / kg of body weight, repeated after 48 hours only 3 times.

The calves of the control group were prescribed a starvation diet at the beginning of treatment and during this time 500 ml of warm saline was drunk hourly. The antibiotic Macrolan 200 was intramuscularly injected at a dose of 1 ml / 10 kg of body weight once a day for five days. Clinical observation was conducted daily in sick calves, the severity of clinical signs was studied.

Calves were subjected to a clinical examination assessing their physiological development, general condition, appetite, color of mucous membranes, skin condition, its elasticity, frequency, consistency and color of feces were determined.

Blood was analyzed in the laboratory of the Department of Internal Non-Communicable Diseases of the Samarkand University of the Russian Academy of Medical Sciences.

The amount of hemoglobin in the blood was determined by the hemoglobin cyanide method, glucose level by the glucose oxidase method using the Glucose-FCD device, the amount of total protein, bilirubin, activity of AST, ALT on the SYNCHRON CX4 PRO biochemical analyzer (USA). The mathematical and statistical analysis of the numerical data obtained from the results of scientific research was carried out using the Student and Fisher criteria in a Microsoft Excel spreadsheet.

3 Results and Discussion

In sick calves, clinical signs of dyspepsia were usually observed 1-2 days after birth. The initial signs of dyspepsia were characterized by depression of the general condition, a decrease, sometimes a lack of appetite, lack of mobility, and sounds of rumbling or transfusion of fluid in the intestine. The stool was liquid, watery in consistency, gray-yellow in color, with an unpleasant odor and a large amount of mucus admixture. Subsequently, there was a decrease in body temperature, especially of the ears and extremities, dry skin, and abdominal pain.

The general condition of the sick calves of the first experimental group improved on the fourth day of treatment, feces thickened, sucking reflexes appeared. At this time, the average body temperature was 38.42± 1.160 C, the pulse rate averaged 117.0± 1.94 beats per minute, the frequency of respiratory movements 50.6± 1.18 times per minute, versus 37.80±1.14 ° C, 128.4± 2.46, 52.4± 1.12, respectively, at the beginning of the treatment work.

The general condition of the calves of the second experimental group improved on the third day of treatment. At the end of treatment, the calves' body temperature averaged 38.94±1.18 ° C, the pulse rate averaged 114.4 ±2.00 times, the number of respiratory movements 48.8 ±1.76 times per minute, versus 37.94 ±1.12 ° C, 124.2±2.76 and 50.8±1.64, respectively, at the beginning of treatment (Table 1).

Table 1. Clinical indicators of calves with dyspepsia.

Groups of animals	The time of the reasearch	Body temperature °C	Pulse, beat/min	Respiration, breath/min
1- experienced	A	37.8±1.14	128.4±2.46	52.4±1.12
	B	38.42±1.16	117.0±1.94	50.6±1.18
2- experienced	A	37.94±1.12	124.2±2.76	50.8±1.64
	B	38.94±1.18	114.4±2.00	48.8±1.76
Control	A	37.90±1.16	126.4±2.24	52.2±1.54
	B	37.72±1.10	134.6±2.76	54.0±1.82

In the calves of the control group, clinical signs were characterized by weakness, signs of dehydration, decreased skin elasticity, diarrhea, a decrease in body temperature to an average of 37.72 ± 1.10 ° C, a decrease in pulse to an average of 134.6 ± 2.76 times per minute and an increase in the number of respiratory movements to an average of 54.0 ± 1.82 times per minute, even on the sixth day of treatment. To the last stages of the disease, i.e. On the 6th day of the treatment, 2 calves of the control group had a decrease in skin gloss, a sharp depression of the eyeball and dryness of the nasal mirror, cyanosis of the visible mucous membranes and severe weight loss. Due to paralysis of the anal sphincter, involuntary defecation has become specific.

The number of erythrocytes in the blood of calves of the first experimental group at the beginning of the experiments averaged 8.10±1.40 million/μl, and by the 5th day of treatment - 7.76±1.36 million/μl, the number of leukocytes -17.04±1.80 and 12.4±1.22 thousand/μl, respectively, hemoglobin - 121.6±2.34 and 112.4±2.46 g/l, glucose – 2.62±0.30 and 2.38±0.26 mmol/l, total protein – 54.4±1.76 and 64.8±1.80 g/l, hematocrit – 56.40±1.68 and 42.36±1.74% (Table 2).

Table 2. Morphological and biochemical blood parameters of the calves with dyspepsia.

Indicators	Groups of animals					
	1- experienced		2- experienced		3- experienced	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Erythrocytes million/μl	8.10±1.40	7.76±1.36	8.04±1±1.28	7.28±1.40	8.12±1.36	8.36±1.48
Leukocytes thousand/μl	17.04±1.80	12.4±1.22	17.40±1.76	12.0±1.46	17.34±1.56	17.70±1.92
Hemoglobin, g/l	121±2.34	112.4±2.46	122.6±2.30	111.6±2.42	125±2.54	124.3±2.80
Total protein, g/l	54.4±1.76	64.8±1.80	54.8±1.70	67.4±1.82	53.8±1.94	53.4±1.80
Glucose, mmol/l	2.62±0.30	2.38±0.26	2.64±0.28	2.48±0.18	2.70±0.22	2.74±0.18
Hematocrit, %	5.40±1.68	42.36±1.74	56.76±1.66	40.18±1.62	56.68±1.84	52.36±1.28

In the calves of the second experimental group, the number of erythrocytes in the blood at the beginning of the treatment averaged 8.04±1.28 million/μl, by the 5th day of treatment -7.28±1.40 million/μl, and the number of leukocytes was 17.40±1.76 and 12.0±1.46 thousand/μl, respectively, hemoglobin - 122.6±2.30 and 111.6±2.42 g/l, glucose – 2.64±0.28 and 2.48±0.18 mmol/l, total protein – 54.8±1.70 and 67.4±1.82 g/l, hematocrit – 56.76±1.66 and 40.18±1.62%, ($R<0.05$).

In calves of the control group, the number of erythrocytes in the blood at the beginning of the treatment averaged 8.12±1.36 million/μl, by the 5th day of treatment - 8.36±1.48 million/μl, the number of leukocytes – 17.34±1.56 and 17.70±1.92 thousand/μl, respectively, hemoglobin – 126±2.54 and 124.3±2.80 glucose – 2.70±0.22 and 2.74±0.18 mmol/l total protein – 53.8±1.94 and 53.4±1.80 g/l, hematocrit – 56.68±1.84 and 52.36±1.28% ($R<0.05$).

The most positive results were obtained in the sick calves of the second experimental group.

4 Conclusion

- The treatment of the sick calves with dyspepsia by prescribing a six-hour starvation diet, followed by giving 1/3 of colostrum with the addition of an equal amount of warm saline solution for the first two days 4 times a day. From the second day of the treatment, the use of MAXLAC/DW probiotic containing a strain of lactic acid bacteria Enterococcus faecium (DSM 7134) 1 g 3 times a day for 5 days improves digestion by

normalizing intestinal biocenosis treats dysbiosis, reduces metabolic acidosis, intoxication and dehydration.

- Intramuscular administration of quoted maternal blood irradiated with ultraviolet rays at a dose of 0.5 ml / kg, repeated after 48 hours only 3 times for calves as a non-specific stimulating therapy increases the immunobiological reactivity of the body.

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