THE DYNAMICS OF THE COMPOSITION OF THE SIMPLEST MICROORGANISMS IN THE RUMEN OF CALVES

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The article presents the results of the conducted studies, which prove that during the appearance of the ruminant process, the number of infusorians in the rumen of the control subgroups varied from 50.56 thousand/ml to 54.20 thousand/ml. In the calves of the experimental subgroups, the number of infusions in the content of the rumen was higher – from 54.60 to 58.30 thousand/ml. On average, at that time, the number of infusorians in the content of the rumen of calves of control subgroups was 7.86 % less.

Keywords: *rumen fermentation, calves, saliva, ruminant process.*

Presentation of the problem in general terms and its connection with important scientific and practical tasks. An important role in the vital functions of the body is played by the digestive system. It provides supply of nutrients into the body for the purpose of their further use to ensure the energy costs of the body, its plastic and growth processes, maintaining the gradient of concentration of ions. However, nutrients in the animal's organism can be used only after the previous mechanical and chemical treatment, during which they depolymerize and lose their specificity. In this regard, rumen digestion plays a significant role in ruminants. However, studies on this problem have practically been left out of the attention of scientists. With all responsibility it can be argued that the study of the processes of rumen digestion forming in calves is extremely relevant at the present stage of the development of veterinary science.

Communicate with important scientific and practical tasks. The conducted researches were an integral part of the thematic plan "Development of a multiparameter system of milk production on the basis of secretive function of the mammary gland, pre- and postnatal development of an animal organism and methods of their correction", state registration No. 0108U010281 (Section 2. "Physiological and biochemical parameters of pre - postnatal development of animals and their correction" (2010-2018)).

An analysis of major research and publications in which the solution of problem was initiated. The growth of viable and highly productive young animals is one of the important tasks of livestock and veterinary workers. Solving this problem requires a profound knowledge of the physiological processes of the growing organism. The problem of the formation of rumen digestion becomes of special significance in this process, because it ensures the maximum assimilation and use of nutrients, especially coarse forage. The main three periods are distinguished in the formation of age, morphological and functional peculiarities of digestive processes, such as embryonic, post-embryonic (period of dairy) and the period of transition to the consumption of plant fodder [1].

In the first period of growth and development, the body of the fetus is fed by nutrients that enter it through the fetoplacental complex from the mother's body. This is evidenced by data from researchers who have proved the presence of fluid in the stomach of the fetus, but physiologists did not attach importance to this phenomenon. No attention was paid to the functional activity of digestion, especially to the secretory activity of digestive glands in the embryonic period of growth and development of the fetus. It is believed that these facts indicate that embryos have intensively functioning glands of the digestive tract during the second development period [2].

A number of researchers believe that the allocation of digestive juices in the embryonic period is a prerequisite for metabolic secretion. It is the activity of the digestive system during the embryonic period that provides metabolic processes in the fetus. In the early neonatal period of growth and development the body of ruminants assimilates milk. It is proved that during this period the digestive glands of the digestive system of newborn animals function in synchrony with the breast of the mother's organism, which provides their nutrition. Newborns have insufficiently developed digestive organs in the functional and morphological sense. In this period juices of the glands of the digestive system contain very few enzymes available in the juices of the digestive tract of adult animals or they are virtually absent in them. Along with this, the milk of cows-mothers contains a significant amount of enzymes that provide digestion of the components of milk in the body of newborn calves [3].

The results of studies by a number of researchers [1] indicate exceptional weighting of the specific features of the digestive function of calves in the transition from milk to the use of plant fodder. This is due to the fact that the digestive process of the ruminants includes pre-stomachs over time. Growth and development of pre-stomachs in calves of the neonatal period is accompanied by the formation of a stable composition of intestinal chyme, redistribution of the function of regulation of intestinal absorption of solutions with different osmotic pressure.

The nature and overall level of digestive activity of calves is changing with age as well as in connection with the transition to nutrition with plant fodder: the amount of chyme and its absorption is

increased by almost 3 times. It is proved that in the milk period dry and organic matter of the feed (milk) is digested in the intestine [4]. In the transition period pre-stomachs became included into the process of digestion of nutrients with the commencement of feeding of plant fodder.

Researchers believe that there is a complete transition from the type of digestion in a single-chamber stomach to a multi-chamber only in the 6-month-old calves. About the age-old changes in the processes of digestion with the inclusion in this process in the multicomponent stomach of plant fodder is evidenced by the appearance of methane in the exhaled air of animals as a fermentation product of carbohydrates in the rumen.

Rubella fermentation has been studied by many researchers. In our opinion, such close attention to the processes of scar fermentation is due to the importance of metabolites which are formed in the rumen and used by the mammary gland in the process of secretion.

Such a result of bacterial fermentation as volatile fatty acids, microbial and protozoal mass, amino acids, peptides, ammonia and other end and intermediate exchange products are formed in the rumen. The results of studies indicate that changing the conditions of nutrient intake can adjust the level of scar fermentation and the ratio of individual volatile fatty acids, and, accordingly, the provision of the body with the necessary metabolism products.

Under normal conditions of keeping ruminants in mixed rations, microorganisms synthesize 22 g of microbial protein per 100 g of fermented organic matter. If we assume that about 60-65 % of digested organic matter is fermented in the rumen, then about 8.2 g microbial protein is synthesized for each MJ of energy [4].

Nutrient amount of microbial protein synthesized in the rumen is determined by its digestibility and biological value. The study of the composition of bacteria obtained from the content of rumen [3], revealed the presence of 65 % protein in total nitrogen. The content of nitrogen in the simplest was lower than in bacteria, due to the presence of a large number of polysaccharides in them. It was established that the digestibility coefficient of the proteins of the simplest of rumen is 80-85 %, the same one of the microbial protein is 55 %, and the coefficients of biological value were 68 and 66 %, respectively [5].

In our opinion, these data indicate that the targeted effect on the rumen fermentation in order to correct the synthesis of microbial or protozoal protein affects the provision of the body with a complete protein.

Many authors point out the features of the synthesis of bacterial protein by various groups of rumenal bacteria. However, microorganisms of the rumen not only transfer nutrients of feed to the digestible form, but also synthesize a number of vital substances such as amino acids and peptides.

In this regard, the **purpose of our research** was to determine the dynamics of the quantitative composition of the simplest in the rumen of calves.

Materials and methods of research. In order the conduction of study in the scientific research farm "First May" 3 groups of calves – analogues of the autumn-winter and the same number of animals of the winter-spring period of birth were formed, with 18 calves in each of group. Within the groups, the calves were divided into animals for control and experimental subgroups. In the course of experiments, we observed the manifestation of the ruminating process in calves of both subgroups. At occurrence of a ruminating process in calves the samples of their rumen content were carried out. The numbers of protozoa in them was determined by the counting method.

Results of own research. The number of infusorians in the rumen content evidences of the higher level of digestion in the rumen in calves of the experimental subgroups of the autumn-winter period of birth. It was established that during the appearance of the ruminant process, the number of infusorians in the content of rumen of the control subgroups varied from 50.56±3.60 thousands/ml to 54.20±2.00 thousand/ml. In the calves of the experimental subgroups, the number of infusorians in the rumen content was more – from 54.60±2.00 to 58.30±3.20 thousand/ml. On average, at this time, the number of infusorians in the content of rumen in calves of the experimental groups was 1.08, 1.12 and 1.08 times more than control ones ($p<0.05$). On the 45th day of life of animals, the number of infusorians in the content of their rumens was consistently increased. However, in calves of experimental subgroups of the autumn-winter period of birth, this indicator was significantly higher (fig. 1).

In animals of the control subgroup of the first group, the autumn-winter period of birth the number of infusorians increased by only 1 %, whereas in calves of the experimental subgroup this indicator increased by 1.11 times ($p< 0.05$) and was at 1.18 times more than in the control group's calves.

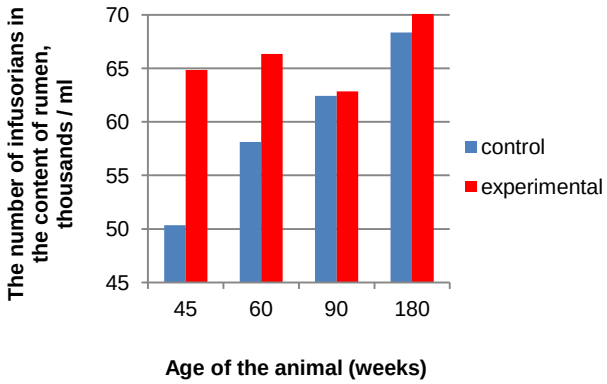


Fig. 1. The number of the simplest in rumen of calves of the first group of autumn-winter period of birth.

In animals of the control subgroup of the second group on the 45th day, the number of infusorians in the content of rumen practically did not change, and in calves of the experimental subgroup it was increased by 1.19 times ($p<0.01$). In calves of the experimental subgroup of the second group, the number of infusorians in the content of rumen (by the 45th day) was 1.28 times higher than that of the control group (fig. 2).

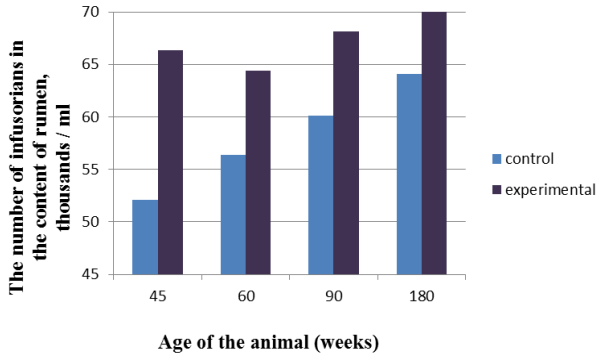


Fig. 2. The number of the simplest in rumen of calves of the second group of autumn-winter period of birth.

In the calves of the control subgroup of the third group of the autumn-winter period of birth at the time of the appearance of ruminant process and on the 45th day of our study the number of infusorians in the rumen was 1.08-1.14 times less than in the experimental subgroup of this group.

Subsequently, from the 60th to the 180th day of the life of calves, the number of infusorians in the content of rumen is consistently elevated. However, their number in calves of experimental subgroup in the 60th day was at 1.14, 1.151 and 1.06 times more than in calves of control subgroups, respectively, in the 90th day – at 1.10, in 1.13 and 1.09 times more, and in the 180th day – in 1.13, 1.12 and 1.10 times more ($p<0.05$).

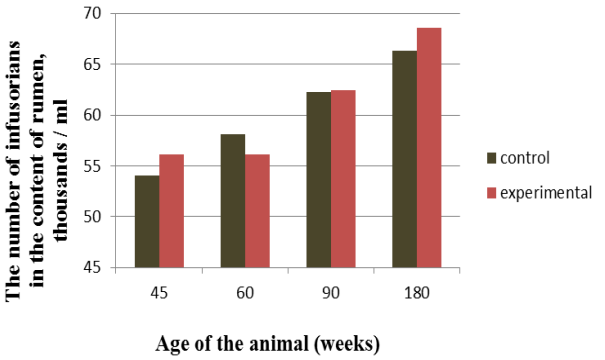


Fig. 3. The number of the simplest in rumen of calves of the third group of autumn-winter period of birth.

A similar dynamics of the number of infusorians in the rumen content was found in calves which were born in the winter and spring. In the calves of experimental subgroups, the number of infusorians in the content of rumen from the time of the appearance of ruminant process to the 180th day of life gradually increased on average by 1.29 times ($p<0.01$), and in calves of control subgroups – in 1.22 times ($p<0.01$) (fig. 3).

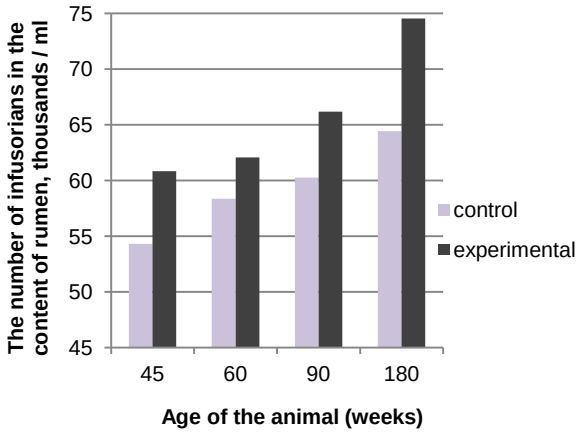
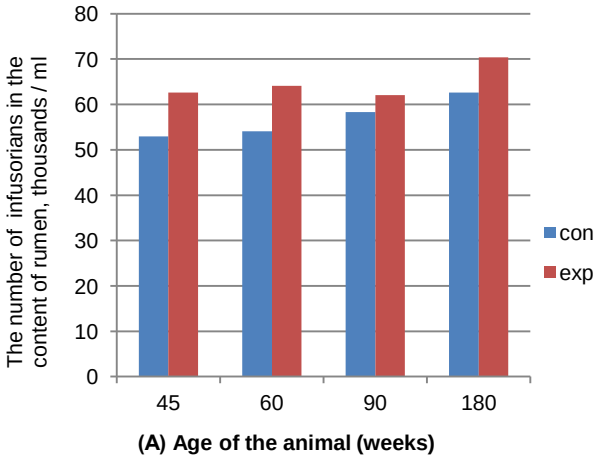


Fig. 4. The number of the simplest in rumen of calves of the first group of winter-spring period of birth.

In the calves of the control subgroups of the winter-spring period of birth, the number of infusorians in the rumen content was less than that of the experimental subgroups of calves. However, their number in calves of experimental subgroups of the autumn-winter period of birth was significantly higher than that in calves of experimental subgroups of the winter-spring period of birth (fig. 4).

At the 45th day of life of calves of control and experimental subgroups of the winter and spring period of their birth, the number of infusorians in the rumen content differed by 1.20 times ($p<0.01$), by 1.18 times and by 1.12 times ($p<0.05$), respectively (fig. 4).



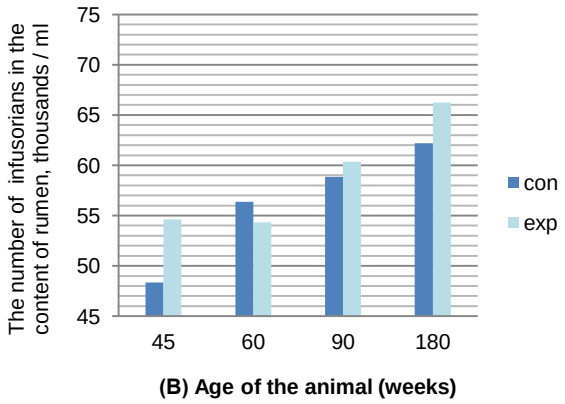


Fig. 5. The number of the simplest in rumen of calves (A) and the third group of calves (B) of the winter-spring period of birth.

In the 60th day of the study the number of infusorians in the content of rumen of the calves of the experimental subgroups was 1.06, 1.19 and 1.16 times ($p<0.05$) more than that of the control subgroups. Subsequently, on the 90th day of life of calves of experimental subgroups of the winter-spring period of birth, the number of infusorians in the content of rumen remained at 1.09, 1.13 and 1.10 times ($p<0.05$) higher.

By the 180th day of life of calves of experimental subgroups of the winter-spring period of birth, the number of infusorians in the content of rumen remained at 1.16, 1.12 and 1.10 times higher than that of the control subgroups.

It was found that during the appearance of the ruminant process, the number of infusorians in the content of rumen of the control subgroups, on average, was 7.86 % lower than that of the experimental subgroups of calves. In the 45th and 60th days of the life of calves, the number of infusorians in the content of rumen was consistently increased. In the calves of the control group of the first group a such number increased by 60th days in 1,08 times, the control subgroup of the second group – by 7.97 %, and the control group of the third group – by 1.15 times ($p<0.05$). On average, on the 45th and 60th day, the number of infusorians in the content of rumen of the calves of the experimental subgroups was found to be by 1.20 ($p<0.05$) and at the 60th day – 1.08 times higher (fig. 5).

In the succeeding, until the 180th day of life of calves the number of infusorians in the content of rumen of the calves of the control and experimental subgroups increases. However, on the 180th day the number of infusorians in the content of rumen of the calves of experimental subgroups was on average, by 1.16 times more ($p<0.05$). A similar dynamics of the number of infusorians in the content of rumen of the calves which were born in the winter-spring period. In calves of experimental subgroups the number of infusorians in the content of rumen gradually increased on average by 1.29 times ($p<0.01$) from the time of the appearance of the ruminants to the 180th day of life, and in calves of control subgroups – by 1.22 times ($p<0.01$). During the time of study, the number of infusorians in the rumen of calves of experimental and control subgroups was higher in calves which were born in the winter and spring periods (fig. 5).

Conclusions. 1. The number of the simplest microorganisms in the rumen of calves of experimental subgroups of winter-autumn and winter-spring periods of birth was higher than that of control subgroups.

2. At the 180th day of the study, the number of the simplest microorganisms in the rumen of calves of the experimental subgroups was by 1.16 times higher than in the control group ($p<0.05$).

3. The time of manifestation of the ruminant process in calves of experimental subgroups was 3-5 days earlier than in calves of control subgroups.

Further research on this problem will facilitate the development of practical science-based recommendations for optimizing and correcting the physiological formation of digestive processes in calves, which will surely increase the preservation and productivity of animals.

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Колечко А. В. Динаміка складу найпростіших у рубці телят.

В статті наведені результати проведених досліджень, які доводять, що під час появи жуйного процесу кількість інфузорій у вмістимому рубця контрольних підгруп коливалась від 50,56 тис./мл до 54,20тис./мл. У телят дослідних підгруп кількість інфузорій у вмістимому рубця була більшою – від 54,60 до 58,30 тис./мл. В середньому, в цей час кількість інфузорій у вмістимому рубця телят контрольних підгруп виявилася на 7,86 % менше.

Ключові слова: *рубцева ферментація, телята, слина, жуйний процес.*

Колечко А. В. Динамика состава простейших в рубце телят.

В статье приведены результаты проведенных исследований, доказывающих, что при появлении жвачного процесса количество инфузорий в содержимом рубца контрольных подгрупп составляла от 50,56 тыс./мл до 54,20 тыс./мл. У телят исследовательских подгрупп количество инфузорий в содержимом рубца была больше – от 54,60 до 58,30 тыс./мл. В среднем, в настоящее время количество инфузорий в содержимого рубца телят контрольных подгрупп составляла на 7,86 % меньше.

Ключевые слова: *рубцовая ферментация, телята, слюна, жвачный процесс.*