ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Productive Indicators And Physiological And Biochemical Status Of Dairy Cows Received Biotechnological Additives.

IN Mikolajczyk[1]*, LA Morozova[1], OG Loretts[2], OA Bykova[2], VG Chumakov[1], and GU Abileva[1].

[1]Federal state educational institution of higher education "Kurgan state agricultural academy of T.S. Maltsev" Kurgan Region, Ketovsky district, village Lesnikovo.
[2]Federal State Budget Educational Institution of Higher Education "Ural State Agrarian University" (FGBOU VO Ural GAU), Ekaterinburg, Karla Liebknechta str., 42.

ABSTRACT

Positive results have been obtained in studying the introduction of biotechnological additives into the diet of cattle. To carry out scientific and business experience, four groups of black and white cows were formed. Animals of the control group received the basic ration adopted in the farm. In addition to the basic ration, cows of the experimental group were fed the Laktur probiotic supplement (Cenzone, USA) in an amount of 2 kg / ton of concentrated feed, and the analogs of the experienced 2 were prebiotic additive Acid Lac (Kemin Europa NV, Belgium) in an amount of 3 kg / t of concentrated feed and cows 3 of the experimental group - probiotic additive "Laktur" in the amount of 1 kg / t in combination with the prebiotic additive "Acid Lac" in the amount of 1.5 kg / t. It was found that the use in the rations of cows 3 of the experimental group of the probiotic additive "Laktur" in the amount of 2 kg / ton and the prebiotic additive "Acid Lac" in the amount of 3 kg / ton from the mass of concentrated feed contributed to an increase in the milk production level, an improvement in the biological value of milk, and also had a positive effect on the physiological and biochemical status of cows.

Keywords: cow, milk composition, probiotic and prebiotic feed additives, milk production, cicatricial metabolism, feed digestibility.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

At present time, the animal organism is exposed to a whole complex of anthropogenic factors affecting the normal functioning of the main vital systems, including environmental degradation, an increase in the number of stressful situations, the mass uncontrolled use of chemotherapeutic drugs, etc. [1] Adaptogens, immunomodulators and other biologically active feed additives are used to normalize the physiological and biochemical status, increase the productivity and resistance of animals in industrial farms, along with measures aimed at improving the feeding and housing conditions [2,3]. One of the most promising ways to use beneficial forms of microorganisms in animal husbandry is the use of probiotic preparations [4,5].

The feeding of probiotics and prebiotics contributes to a better digestion and use of nutrient and biologically active substances of rations, the normalization of metabolic processes and an increase in the overall resistance and productive qualities of animals [6].

At the same time, the assessment of the effect of combinations of probiotics with various dietary supplements, including prebiotics, on the organism of highly productive cows during the period of milking, requires further study.

MATERIAL AND RESEARCH METHODS

The experimental part of the work was carried out in the CJSC “Glinka” of the Kurgan Region on full-aged highly productive black-and-white cows, which included scientific, economic and physiological experiment. To carry out experiment, there were formed four groups of cows on the principle of analogues, taking into account the origin, age, body weight, productivity for the previous lactation and dates of fruitful insemination. The conditions for feeding and keeping animals were the same, except for the factor under study. Accounting of palatability was carried out once a decade, for two adjacent days, and in the period of physiological experience, which was carried out daily according to the generally accepted method [7]. The feeding of cows was normalized taking into account the chemical composition of feed, its actual palatability in accordance with the norms of the Russian Academy of Sciences [8].

In the main period of the experiment, the experimental animals received a basic ration consisting of 34.5 kg of feed mixture, 4.0 hay of bone-meat, 1.7 kg of rapeseed meal, 1.0 kg of crushed corn, 5.0 kg of fresh brewer's grain, 0, 5 kg protein vitamin-mineral concentrate -60-10 and 0.5 kg of molasses fodder. The composition of the concentrated feed was introduced by 100 g of chalk and 100 g of salt. In addition to the basic ration, cows of the experimental group were fed the probiotic supplement “Laktur” (Cenzone, USA) in the amount of 2 kg / ton of concentrated feed, and the analogs of the 2 experimental group were fed the prebiotic additive “Acid Lac” (Kemin Europa N.V., Belgium) in the amount of 3 kg / t of concentrated feed and cows of 3 experimental group were fed the probiotic additive "Laktur" in the amount of 1 kg / t in combination with the prebiotic additive "Acid Lac" in the amount of 1.5 kg / t.

Laboratory studies were conducted on the basis of the testing laboratory "Veles" self-employed entrepreneur Iltyakova D.V. (v. Chastoozerye, Kurgan region, Russia) and in the laboratories of the department "Technologies of storage and processing of livestock products" Kurgan State Agricultural Academy named after T.S. Maltseva (Lesnikovo Village, Kurgan Region, Russia).

Feed, its residues, metabolic products obtained from animals during the experiment, were subjected to chemical analysis according to generally accepted methods [9] and on the basis of its results were calculated: digestibility of dietary nutrients, nitrogen, calcium, phosphorus balances and energy metabolism in animals.

To control the state of metabolic processes in the body of cows, there were determined the morphological composition and metabolites of blood: red blood cells, hemoglobin, white blood cells, alkaline reserve, glucose, total nitrogen, residual nitrogen, total protein and its fractions, calcium and inorganic phosphorus. For research, blood was taken in the morning 2 hours before feeding from three animals from each group.

ISSN: 0975-8585

In order to study the characteristics of digestion, ruminal fluid taken from three animals in each group was studied using a food probe three hours after morning feeding.

In the filtered liquid was determined: the concentration of hydrogen ions using a pH meter; ammonia - according to Conway; common and non-protein nitrogen (with protein precipitation) - by the Kjeldahl method; protein nitrogen - on the difference between total and non-protein; volatile fatty acids (VFA) - by the method of steam distillation using a Markgam apparatus followed by distillation on a gas chromatograph according to the method [11].

The milk production of animals was taken once a decade by the method of control milking. The study of milk included the determination of density, the content of dry matter, nonfat milk solids, milk fat and protein, lactose and ash according to generally accepted methods [12].

The obtained digital data is processed by methods of variation statistics. Statistical processing of the obtained digital data was performed using a computer licensed software package Microsoft Office 2007 (USA). There was used t- criterion of Student to assess the materiality of the differences between the two average values. Differences were considered statistically significant at P <0.05; P <0.01; P <0.001.

RESULTS AND DISCUSSION

The digestibility of nutrients in the diet depends on the level of productivity of animals, the quality of food and its taste, the speed of passage of food through the gastrointestinal tract, the ratio of nutrients in the diet. The amount of nutrients digested by cows during physiological experience is presented in table 1.

Table 1: The average daily amount of nutrients digested by cows, g ($\overline{X} \pm S_{\overline{x}}$)

Index	Group			
	control	1 experimental	2 experimental	3 experimental
Dry matter	17591,09±257,79	18045,56±272,59	17823,56±135,80	18297,40±186,75
Organic matter	16619,87±187,46	17050,41±197,66	16817,25±117,92	17257,96±181,53
Crude protein	2415,13±26,95	2491,43±42,57	2478,82±17,33	2530,73±22,49*
Crude fat	594,44±5,98	619,56±12,24	603,74±9,30	631,40±16,19
crude fiber	2417,82±37,45	2517,25±19,07	2449,95±35,35	2569,83±24,83*
free-nitrogen extract	11192,48±185,65	11422,17±143,45	11284,74±72,89	11526,00±148,98

Here and below: *P<0,05; **P<0,01; *P<0,001

According to the table, it was found that animals of the 3experimental group digested more: dry matter by 706.31 g (4.02%), by 251.84 g (1.40%) and 473.84 g (2.66%); organic matter - 638.09 g (3.84%) (P <0.05), by 207.55 g (1.22%) and 440.71 g (2.62%); crude protein - 115.60 g (4.77%) (P <0.05), by 39.30 g (1.58%) and 51.91 g (2.09%); crude fat - 36.96 g (6.22%), by 11.84 g (1.91%) and 27.66 g (4.58%); crude fiber - 152.01 g (4.14%) (P <0.05), by 52.58 g (2.09%) and 119.88 g (4.89%); free-nitrogen extract - 333.52 g (2.98%), by 103.83 g (0.91%) and 241.26 g (2.14%) than the herdmates from the control, 1 and 2 experimental groups, respectively.

Research has shown that feeding the cows of the experimental groups of the “Laktur” probiotic supplement and the “Acid Lac” prebiotic supplement contributed to an increase in the digestibility of the dietary nutrients, which are presented in Table 2.

ISSN: 0975-8585

Table 2: Nutrient Digestibility Ratios, % ($\overline{X} \pm S_{\bar{x}}$)

Index	Group			
	control	1experimental	2 experimental	3 experimental
Dry matter	72,39±0,91	73,86±1,07	73,11±0,66	74,54±0,65
Organic matter	74,06±0,62	75,56±0,84	74,70±0,60	76,11±0,65
Crude protein	63,46±0,78	65,25±1,10	64,99±0,49	66,18±0,56*
Crude fat	61,51±0,60	63,76±0,99	62,19±1,00	64,89±1,67
crude fiber	54,01±0,65	55,90±0,32	54,48±0,80	56,74±0,63*
free-nitrogen extract	84,84±1,05	86,06±1,07	85,28±0,66	86,34±0,90

Research has shown that the coefficients of the nutrient digestibility are higher in 3 experimental groups compared to the control, 1 and 2 experimental groups on: dry matter by 2.15%, 0.68 and 1.43%; organic matter - by 2.05%, 0.55 and 1.41%; crude protein — by 2.72% (P <0.05), 0.93, and 1.19%; crude fat - by 3.38%, 1.13 and 2.70%, crude fiber - by 2.73% (P <0.05), 0.84 and 2.26%; free-nitrogen extract - by 1.50%, 0.28 and 1.06%, respectively.

We have studied some indicators of ruminal digestion in cows, the results of which are presented in table 3.

Table 3: Composition of the contents of the rumen after 3 hours after feeding ($\overline{X} \pm S_{\bar{x}}$)

Index	Group			
	control	1experimental	2 experimental	3 experimental
pH	6,57±0,15	6,29±0,10	6,34±0,09	6,21±0,07
volatile fatty acids, mmol / l	86,83±4,56	102,08±6,14	99,17±3,33	109,33±4,69*
including, %:				
acetic	60,71±1,41	63,48±0,53	62,95±0,82	64,59±0,60
propionic	18,73±0,78	19,89±1,00	19,33±1,10	20,03±0,92
butyric	20,56±1,16	16,63±1,38	17,72±1,63	15,38±1,50

It has been established that the concentration of hydrogen ions has a significant effect on metabolic processes in the rumen, which, in turn, depends on the degree of formation of fatty acids. In our studies, the lowest concentration of hydrogen ions in the ruminal fluid of cows was observed in animals of the 3experimental group — 6.21, which is 0.36 units less than in the control group and 0.08 and 0.13 units compared to 1 and 2 experimental groups, respectively.

The highest content of volatile fatty acids was found in the rumen fluid of cows of the 3 experimental group, which was significantly higher than the herdmates of the control group by 25.91% (P <0.05) and by 7.10 and 10.25% compared with analogues 1 and 2 experimental groups respectively.

The level of acetic and propionic acids was also the highest in the ruminal fluid of cows 3 of the experimental group, compared with animals of the control group by 3.88 and 1.30%, and in comparison with 1 and 2 experimental groups by 1.11-0, 14% and 1.64-0.70% respectively.

However, the level of butyric acid in the ruminal fluid of cows of the control group increased by 3.93 and 2.84% compared with the 1 and 2 experimental groups, respectively, and by 5.18%, than in the 3 experimental groups.

An increase of acetic acid and a decrease of the butyric content in the ruminal fluid of the cows of the experimental groups increased the acetate and, consequently, the use of fermentation products is aimed at increasing its milk productivity.

ISSN: 0975-8585

The content of nitrogenous substances in the rumen fluid is given in table 4.

Table 4: Content of nitrogenous substances in the ruminal fluid 3 hours after feeding, mmol / l ($\overline{X} \pm S_{\bar{x}}$)

Index	Group			
	control	1experimental	2 experimental	3 experimental
Total nitrogen	247,98±3,82	241,52±6,12	242,77±6,67	238,92±5,46
Protein nitrogen	215,96±4,65	206,97±5,10	208,76±8,60	202,93±6,50
Residual nitrogen	32,02±0,86	34,55±1,55	34,01±2,03	35,99±1,22
Ammonia	15,84±0,64	14,45±0,74	15,36±0,77	14,17±0,51

Due to the analysis of the data in the table it was established that the content of total and protein nitrogen was less in 3 experimental group compared to similar indicators of the control group by 3.79 and 6.42%, and in comparison with 1 and 2 experimental groups by 1.09 -1.99% and 1.61-2.87%, respectively. The amount of residual nitrogen in the ruminal fluid of cows of the experimental groups averaged - 34.85 mmol / l, which is 8.84% more than the corresponding indicator of the control group.

The final product of the breakdown of protein and non-protein nitrogenous feed compounds is ammonia. The concentration of ammonia in the rumen of cows in the 3experimental group was 14.17 mmol / l, which is 11.79% less than in the control group and 1.98 and 8.39% compared with the 1 and 2 experimental groups, respectively.

Thus, the introduction of the probiotic additive “Laktur” into the diet of highly productive cows of the 3 experimental group in the amount of 2 kg / t and the prebiotic additive “Acid Lac” in the amount of 3 kg / t from the mass of concentrated feed had a positive effect on the processes of ruminal fermentation, namely increased the amount of volatile fatty acids, the concentration of the synthesis of acetic and propionic acids, and also contributed to the reduction of total nitrogen and ammonia in the ruminal fluid of animals.

As practice shows, feeding the animals, balanced according to physiological needs, contributes to the most complete absorption of energy, and the provision of energy to it is one of the main factors determining the level of productivity.

Indicators of the calculation of energy metabolism in the body of cows are given in table 5.

Table 5: Indicators of energy costs for cows, MJ / day ($\overline{X} \pm S_{\bar{x}}$)

Index	Group			
	control	1experimental	2 experimental	3 experimental
Consumed gross Energy	438,26±1,70	440,60±1,20	439,69±1,20	442,55±1,33
Energy secretedwith feces	110,61±2,42	104,76±3,56	108,24±2,76	102,94±2,66
Digest energy	327,65±3,45	335,84±3,76	331,45±2,24	339,61±2,48*
%	74,76	76,22	75,38	76,74
energy secreted with urine	21,00±0,38	21,28±0,94	21,22±0,84	21,20±0,23
Losses in the gastrointestinal tract with methane and heat of fermentation	47,50±1,04	48,53±0,87	47,86±0,90	49,06±0,78
exchange energy	259,15±2,72	266,03±2,97	262,37±1,85	269,35±2,05*
%	59,13	60,38	59,67	60,86
Heat production	158,67±3,51	158,03±2,19	156,32±1,86	159,82±1,70
Energy of production	100,48±1,56	108,00±0,87	106,05±0,56	109,53±2,04*
%	38,77	40,59	40,42	40,66

ISSN: 0975-8585

Analysis of the obtained results indicates a positive effect of immunobiological additives on energy metabolism in the body of cows. Indicators of the calculation of energy consumptions in the body of cows allow us to conclude that the consumption of gross energy in experimental animals is almost the same and is at the level of 440.28 MJ / day. At the same time, the cows of the experimental groups emitted energy with feces on average 105.31 MJ, which is 5.30 MJ, or 5.03% less compared to the analogs of the control group.

Cows of the 3 experimental group better digested energy of the diet compared with the control group at 11.96 MJ, or 3.65% (P <0.05), compared with 1 and 2 experimental groups at 3.77 MJ, or 1.12 % and 8.16 MJ, or 2.46%, respectively. There was no significant difference between the groups in the release of energy from the urine, losses in the gastrointestinal tract with methane and the heat of fermentation. Higher rate of exchange energy was observed in cows of the 3experimental group compared with the control group at 10.20 MJ (3.94%) (P <0.05), and compared to 1 and 2 experimental groups at 3.32 MJ (1.25%) and 6.98 MJ (2.66%), respectively. The largest amount of energy expended on production was observed in animals of the 3rd test group compared to the control group, 1 and 2 test groups at 9.05 MJ (9.01%) (P <0.05), at 1.53 MJ (1.42%) and 3.48 MJ (3.28%), respectively.

By researches of a number of scientists [36] also was established a higher energy efficiency due to a higher level of gross energy in the diet, which increases the speed of passage of food through the digestive system, reducing its consumption and reducing energy loss with feces.

On the basis of physiological data and chemical composition of feed, residues, feces, urine, the nitrogen balance was studied (Table 6).

Table 6: Balance and use of nitrogen in experimental animals, (g / head) ($\overline{X} \pm S_{\bar{x}}$)

Index	Group			
	control	1 experimental	2 experimental	3 experimental
Taken with feed	611,84±0,75	613,81±0,76	613,14±0,39	614,75±0,52
Secreted with feces	222,51±5,01	212,27±6,67	213,62±3,06	206,92±3,34
Digested	389,33±4,31	401,54±6,81	399,52±2,77	407,83±3,60*
Secreted with urine	190,84±3,47	193,48±8,58	192,94±7,64	192,76±2,05
Secreted with milk	191,07±1,68	200,07±5,53	198,91±3,87	206,43±3,86*
Stay in body, (balance)	7,42±0,42	7,99±0,86	7,67±1,53	8,64±0,42
Used, %:				
from taken	32,44	33,90	33,69	34,98
from digested	50,98	51,82	51,71	52,74
including on milk, %:				
from taken	31,23	32,59	32,44	33,58
from digested	49,08	49,83	49,78	50,62

Analyzing the obtained data, it should be noted that the excretion of nitrogen from the feces in the cows of the control group was more - by 4.82% more than in the 1st experimental group and by 4.16% and 7.53% than in 2 and 3 experimental groups responsibly. At the same time, animals of the 3rd experimental group digested nitrogen ration better than their control counterparts, 1st and 2nd experimental groups by 4.75% (P <0.05), 1.57 and 2.08%, respectively.

A significant difference in the excretion of nitrogen with urine in the groups was not observed.

However, animals of 3rd the experimental group emitted more nitrogen with milk compared to the control, 1st and 2nd experimental groups by 8.04% (P <0.05), 3.18 and 3.78%, respectively.

The highest positive nitrogen balance was in cows of the 3experimental group and amounted to 8.64 g, which is 16.44% more than the herdmates of the control group and by 8.13 and 12.65% in comparison with analogues of 1 and 2 experimental groups respectively.

Better used nitrogen from the accepted and digested was in 3rd experimental group at 2.54 and 1.76% than in the control group, at 1.08 and 0.92% compared with 1st experimental group and 1.29 and 1.03 % compared with 2nd experimental group. Also, animals of 3rd experimental group more effectively used accepted and digested nitrogen for the formation of milk protein - by 2.35 and 1.54% than the control herdmates, by 0.99 and 0.79%, than the analogues of the 1st experimental group and by 1.14 and 0.84% compared with cows of the 2nd experimental group, respectively.

It follows that the animals of the experimental groups consumed an average of 168.99 g of calcium, which is 0.32 g more than the analogs of the control group.

At the same time, animals of the control group emitted calcium with feces by 3.02% more than animals of the 1st experimental group and by 2.67 and 4.03% in comparison with herdmates of 2nd and 3rd of the experimental groups, respectively. There is a similar trend in urinary calcium excretion.

Cows of the 3rd experimental group have isolated with milk more calcium than animals of the control group by 8.23%, and in comparison with 1st and 2nd experimental groups, by 1.93 and 2.04%, respectively. A higher positive calcium balance was observed in cows of the 3rd experimental group and amounted to 7.87 g, which is 1.43 g more than the analogues of the control group and by 0.49 and 0.92 g compared to 1st and 2nd experimental groups, respectively.

Better used of calcium from the accepted was in the 3rd experimental group at 2.93%; 0.80 and 1.07%, respectively, in comparison with the control, a 1st and 2nd experimental groups. Using calcium on milk also shows a tendency of the benefits of animals from experimental groups. So, cows of the 3rd experimental group compared with the control group used more calcium per milk - by 2.09%.

The analysis shows that the animals of the experimental groups took almost the same amount of phosphorus with feed, which averaged 114.51 g (0.44 g less than in the control group). However, the animals of the control group phosphorus with feces and urine by 2.62 and 2.42% more than the analogues of the first experimental group; by 2.17 and 1.60% compared with the 2nd experimental group and by 3.77 and 10.92% compared with the 3rd experimental group, respectively.

The largest amount of excreted phosphorus with milk was by 3rd experimental group in comparison with the control, 1st and 2nd experimental groups at 7.62%, 3.29 and 3.63%, respectively. The balance of phosphorus in the animals' body had no significant differences.

Phosphorus from the accepted were better used by 3rd experimental group by 2.91 and 1.06% in comparison with herdmates of the control and 1st experimental groups, and in comparison with 2nd experimental groups by 1.40%, respectively. The cows of the 3rd experimental group used phosphorus per milk better than the analogs of the control group by 2.14%, and compared to the 1st and 2nd experimental groups, by 0.93 and 1.02%, respectively.

Hematological, biochemical and other indicators of various systems occupy a special place and are very important both for assessing the physiological status of the animal and for the timely diagnosis of pathological conditions. The morphological and biochemical blood parameters of cows that consumed probiotic and prebiotic additives are presented in Table 7.

Table 7: Morphological and biochemical parameters of cows' blood ($\overline{X} \pm S_{\overline{x}}$)

Indicator	Group			
	control	1 experimental	2 experimental	3 experimental
Red blood cells,10^{12}/l	6,53±0,13	7,01±0,13	6,88±0,15	7,09±0,14*
Hemoglobin, g / l	102,93±2,34	109,75±2,68	107,43±2,04	111,86±1,81*

ISSN: 0975-8585

Globular value	1,02±0,03	1,02±0,04	1,02±0,04	1,03±0,03
White blood cells,10^9/l	6,93±0,18	7,51±0,21	7,24±0,17	7,65±0,21
Alkaline reserve, mg%	525,33±4,84	514,90±5,40	519,52±5,52	510,38±6,79
Glucose, mmol / l	3,06±0,05	2,85±0,07	2,96±0,05	2,83±0,10
Total nitrogen, mg%	2825,61±31,85	2842,44±31,59	2837,70±28,30	2856,55±21,94
Residual nitrogen, mg%	50,62±1,31	51,44±1,40	51,13±1,68	52,63±1,30
Calcium, mmol / l	2,72±0,10	2,83±0,12	2,79±0,14	2,85±0,12
Inorganic phosphorus, mmol / l	1,58±0,07	1,67±0,07	1,64±0,03	1,70±0,08

The results of studies of collected blood samples showed that the largest number of erythrocytes was noted in the blood of cows in the 3rd experimental group compared to the control group by 8.58% (P <0.05), and compared to 1st and 2nd experimental groups by 1, 14 and 3.05% respectively. The hemoglobin level was higher in the blood of animals of the 3rd experimental group by 8.68% (P <0.05) than in the control group and by 1.92 and 4.12% compared to 1st and 2nd experimental groups, respectively.

The average hemoglobin content in the erythrocytes or the globular value in experimental animals was at the same level and averaged 1.02. The number of leukocytes in the groups did not have significant differences, while it should be noted that in the experimental groups their level averaged - 7.47x109 / l, which is 7.79% more compared to the control group.

The indicator that is responsible for the acid-base balance in the animals' organism was the highest in the blood of cows in the control group and amounted to 525.33 mg%, which is 2.03%, 1.12 and 2.93% more than that of their herdmates from 1st, 2nd and 3rd experimental groups, respectively. The glucose content in blood of the experimental groups averaged - 2.88 mmol / l, which is 6.25% less than in the control group. It should be noted that the amount of total nitrogen in the blood of experimental animals did not have significant differences, while in the blood of 3rd experimental group of total nitrogen was 1.09% more compared to the control group. The indicator characterizing the intensity of protein metabolism and specifically, the residual nitrogen in the blood of cows in the 3rd experimental group is on 3.97% higher than in the control group and by 2.31 and 2.93% compared with the 1st and 2nd experimental groups respectively.

For the normal course of physiological and biochemical processes in the body it have matter not only the content of calcium and phosphorus in the blood, but also the respect for the ratio between them. The highest content of calcium and inorganic phosphorus was observed in the serum of cows in the 3rd experimental group, which is 4.78 and 7.59% more than control; by 0.71 and 1.79% compared to the 1st experimental group and by 2, 15 and 3.66% compared with the 2nd experimental group, respectively.

The protein composition of the blood serum of experimental animals is presented in table 8.

Table 8: Content of total protein and its fractions in the serum of dry cows ($\overline{X} \pm S_{\overline{x}}$)

Index	Group			
	control	1 experimental	2 experimental	3 experimental
Total protein, g / l	75,77±1,37	81,70±2,07	80,36±1,30	82,03±1,52*
Albumin fraction,%	40,04±1,27	43,73±1,31	43,17±1,18	45,06±1,19*
Globulin fraction, %:	59,96±1,27	56,27±1,31	56,83±1,18	54,94±1,19*
α–globulins	14,92±0,69	16,34±0,56	16,19±0,92	17,37±0,74
β–globulins	12,43±0,91	11,54±0,55	12,03±0,68	11,09±0,58
γ–globulins	32,61±1,71	28,39±0,39	28,61±0,99	26,48±2,15
albumin-globulin coefficient	0,67±0,04	0,78±0,04	0,76±0,04	0,82±0,04

Analysis of the table data allowed us to establish some increase in the amount of total protein in the body of cows from the experimental groups, which is probably due to the optimization of protein metabolism. Thus, the highest content of total protein was observed in the 3rd experimental group, which is by 8.26% (P <0.05), 0.40 and 2.08% more in comparison with the control group, 1st and 2nd experimental groups,

respectively. The content of the albumin fraction is also higher in the 3rd experimental group by 5.02% (P <0.05) as compared with the control and by 1.33 and 1.89% in comparison with the 1st and 2nd experimental groups, respectively. The total amount of the globulin fraction in experimental groups on average was 56.01%, which is 3.95% less than that of the control group (P <0.05). Typically, the intensity of protein biosynthesis in the body of animals is judged by the protein index (albumin-globulin coefficient), the higher it is, the more intensively protein synthesis proceeds. In the studies, the protein index of the blood of cows in the experimental groups exceeded the control by 17.91%.

Thus, the analysis of hematological parameters made it possible to establish that the use of immunobiological additives in cow rations helped to enhance the metabolic processes in their bodies. It should be noted that all indicators were within the physiological norms.

Feeding of 2 kg / t (from the mass of concentrated feed) the probiotic supplement "Laktur" and 3 kg / t of the prebiotic supplement "Aside Lac" in addition to the basic ration to high-yielding cows stimulated metabolic processes in their body, which had a positive effect on milk synthesis.

Researches have shown that the milk yield of natural fat status in the first 100 days of lactation in 3rd experimental group was 289 kg, or 8.32% more than in the control group and by 68.7 kg (1.86%) and 110.3 kg (3.02%) compared with analogues of the 1st and 2nd experimental groups, respectively. The average milk yield in terms of 4% milk was also greater in the 3rd experimental group - 3823.88 kg, which is 337.68 kg, or 9.68% (P <0.05) more than in the control group. A higher content of milk fat and protein was also noted in the milk of the 3rd experimental group - 154.54 and 128.28 kg, which is 10.74% (P <0.05) and 11.61% (P <0.05) more compared to the control group.

The chemical composition of cows' milk determines its nutritional and biological value and the quality of dairy products depends on it. The composition of milk is influenced by a number of different factors, first of all, feeding conditions.

Table 9 presents data on the chemical composition and properties of cows' milk in experimental groups.

Table 9: The chemical composition of the milk of experimental animals ($\overline{X} \pm S_{\overline{x}}$)

Indicator	Group			
	control	1 experimental	2 experimental	3 experimental
Energy value, MJ	2,86±0,04	2,91±0,03	2,89±0,05	2,94±0,04
Dry matter, %	12,36±0,13	12,54±0,09	12,51±0,14	12,63±0,05
Nonfat milk solids, %	8,51±0,09	8,62±0,10	8,60±0,09	8,68±0,08
Solidity, A°	27,79±0,33	28,20±0,40	28,18±0,31	28,37±0,38
Lactose, %	4,43±0,05	4,48±0,05	4,47±0,05	4,51±0,04
Fat, %	4,01±0,06	4,08±0,04	4,05±0,07	4,11±0,06
Total protein, %	3,30±0,09	3,39±0,10	3,36±0,08	3,41±0,06
Leach, %	0,74±0,03	0,80±0,02	0,77±0,03	0,82±0,03

Analyzing the data, it should be noted that the higher energy value had 3rd experimental group - 2.94 MJ, which is 0.08 MJ or 2.8% more than the control indicator. The dry matter content in milk was also higher in 3rd experimental group by 0.27%. The proportion of nonfat milk solids is also higher in 3rd experimental groups by 0.17% compared with the control group and by 0.06 and 0.08% compared with 1st and 2nd experimental groups respectively. The highest solidity of milk was in the experimental groups and averaged 28.25ºA, which is 0.46ºA more than in the control group. The lactose level in the milk of 3rd experimental group was 0.08% higher compared with the control. The fat level in the cows' milk of the experimental groups averaged 4.08%, which is 0.7% more than that of the control group. The fat level in the milk of cows in the experimental groups averaged 4.08%, which is 0.7% more than that of the control group. The protein content in the milk of 3rd experimental group was 0.11% higher than the control and 0.02 and 0.05% compared with the 1st and 2nd experimental groups, respectively. At the same time, the leach content in the milk of cows of the experimental

groups averaged 0.79%.

The use of the studied biotechnological additives had a positive effect on the reproductive ability of cows. An important indicator in assessing the milk productivity of cows is the service period. Its duration affects the duration of lactation and determines the economic feasibility of milk production. Analyzing the data it should be noted that cows of the 3rd experimental group that received 2 kg / ton (from the mass of concentrated feed) the probiotic additive "Laktur" and 3 kg / ton of the prebiotic additive "Acid Lac" in addition to the basic ration have the service period in 125 days, which is 8 days less than in the control group. The duration of the service period is the main component of another important indicator of reproductive ability - the calving interval. An increase in the service period leads to increasing of the duration of the calving interval and lactation. The analysis made it possible to establish that this indicator was less in the 3rd experimental group - by 13 days compared with the analogs of the control group, and compared to cows of the 1st and 2nd experimental groups by 4 and 3 days, respectively.

One of the main factors for obtaining high milk productivity, good health and reproductive functions is the dry period of cows. In a very short period of time (from 50 to 60 days), there are laid prerequisites for the start of the next lactation, that is, the cow must rest and make the necessary supply of nutrients in the body. During this period, the mammary gland is prepared for subsequent lactation.

However, it should be noted that if the dry period is shorter than 40 days, then the glandular tissue of the udder is insufficiently restored, and if it is longer than 70 days, the efficiency of milk production decreases. We found that experimental cows had the dry period in the range of 57 to 63 days.

An important indicator characterizing the reproductive capacity is the reproducibility coefficient, which was the smallest in cows of the control group by 0.87 units.

The insemination index was lower in cows of the 3rd experimental group - 2.01, which is 0.27 sperm doses less than in the control group and by 0.08 and 0.11 compared with analogues of the 1st and 2nd experimental group, respectively.

CONCLUSION

Thus, the use in the rations of the 3rd experimental group of the probiotic additive "Laktur" in the amount of 2 kg / ton and the prebiotic additive "Acid Lac" in the amount of 3 kg / ton from the mass of concentrated feed contributed to an increase in milk yield, an improvement in its biological value, and also had a positive effect on the physiological and biochemical status of dairy highly productive cows.

GRATITUDES

The work was prepared with the support of the Federal budgetary educational institution "Kurgan State Agricultural Academy named after TS. Maltsev" and the Federal budgetary educational institution "Ural State Agrarian University".

REFERENCES

[1] Caro D., Davis S.J., Bastianoni S. & Caldeira K. 2014. Global and regional trends in greenhouse gas emissions from livestock. Climatic change, 126, 203–216. doi:10.1007/s10584-014-1197-x.

[2] Donnik I.M., Loretts O.G., Bykova O.A., Shkuratova I.A., Isaeva A.G., Romanova A.A. Use of natural minerals for effective increase in biological value of milk in animal industry. International Journal of Advanced Biotechnology and Research. 2017. T. 8. № 4. C. 923-933.

[3] Morozova L.A., Mikolaychik I.N., Morozov V.A., Loretts O.G., and Neverova O.P. 2018. Correction Of The Metabolism Of High-Yielding Cows By Energy Supplements. LA Research Journal of Pharmaceutical, Biological and Chemical Sciences. No. 9(5). 1972-1984

[4] Mikolaichik I.N., Morozova L.A., Stupina E.S. Efficiency of modern yeast probiotics in the correction of calf feeding // Dairy and Beef Cattle Breeding. 2017. No. 5. P. 23-25.

[5] Yarmukhametova V.R., Mukhamedyarova L.G., Bykova O.A., Loretts O.G., Neverova O.P. Dynamics of indicators of protein metabolism in the body of the bodies against the background of the use of a probiotic preparation // Agrarian Bulletin of the Urals. 2018. No. 3 (170). S. 8.
[6] Mikolaichik I.N., Morozova L.A., Arzin I.V. Practical aspects of the use of microbiological additives in dairy cattle breeding // Agrarian Bulletin of the Urals. 2018. No. 3 (170). S. 5.Ovsyannikov A.I. 1976. The main experimental animal in the livestock farm. Moscow: Kolos,. 91.
[7] Kalashnikov A.P. [and etc.]. 2003. Norms and rations of feeding of farm animals. Asked help. - 3rd ed., PERERAB. and additional. Moscow,.p/ 456.
[8] Lebedev A.P., Usovich P.T. 1976. Methods of testing forages, organisms and tissues of animals. Moscow: Rosselkhozizdat,. 376.
[9] Osipova N.A., Mager S.N., Popov Yu.G. 2003. Laboratory studies of animal blood. Novoshibirsk,. 48 .
[10] Drozdenko, N.P. 1985. Methodological recommendations on chemical and biochemical tests of livestock products and feed. VIZH,. 85 .
[11] Kugenev P.V., Barabanshchikov N.V. 1988. Practice on the milk industry. Moscow: VO Agropromizdat,. 224 .