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Correction Of The Metabolism Of High-Yielding Cows By Energy Supplements.

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ABSTRACT

The use of energy feed additives makes it possible to regulate metabolic processes that are violated in the case of a concentrate type of feeding cattle. In this case, the complex experimental studies on the use of energy feed additives in the feeding of highly productive dairy cattle is of scientific and practical interest. These studies are devoted to the study of use the fodder supplement "Megalak". Carried out studies on highly productive animals have shown that the optimal dose that provides need of animals in the metabolic energy which increases their milk production is 300 g / head / day. The high milk productivity of animals in the experimental groups was determined by the best possible nutritional status, the conversion rates of the nutrients in the cows that received the feed suplement, exceeded the control group for the dry matter by 0.61-1.78%. The feeding of the "Megalak" feed additive from the harvesting of 300 g / head / kg provided the best use of nitrogen, calcium and phosphorus for the production of milk from the accepted - at 3.33% . The use of fodder additive "Megalak" in the rations of high-yielding cows did not appear to have a negative effect on the physiological state of animals. The parameters of reproductive dysfunction are indicative of the positive effect of addition on the decrease in the severity period and the maternal period in cows on 10 and 12 days compared with the control. The milk production of the animals, whose basic diet included the "Megalak" supplementation in the amount of 300 g / head / day, was above 317.5 kg, or 11.45% ($P < 0.05$), and the transformation of the PLV and nitrogen was associated with an increase of the mass fraction of fat and protein in milk is 0.05 and 0.03% in comparison with the control.

Keywords: Feed additives, digestion, milk productivity, physiological state, metabolic energy.

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INTRODUCTION

For implementation of the high genetic potential of milk production and preserve health, it is necessary to provide cows with rations with a high content of exchange energy, since in the first third of lactation significantly increased metabolism and all the biochemical processes associated with the use of a great amount of energy and nutritious feed in milk. The problem of increasing the full-value of feeding should be solved on the basis of knowledge of the laws of metabolism and digestibility of food [1-5].However, concentrate diets adversely affect the process of fermentation in the rumen, significantly reducing the activity of microorganisms involved in the digestion of feed, while the metabolic processes are disrupted and the productivity of animals' decreases [6, 7].In modern conditions, this problem can be significantly weakened by using energy feed additives, the variety of which necessitates a detailed study of their effectiveness in dairy cattle feeding [8, 9].In this regard, the implementation of comprehensive experimental studies on the use of energy feed additives in the feeding of highly productive dairy cattle is of scientific and practical interest and determines the relevance of the studies.

MATERIAL AND METHODS OF RESEARCH.

The experimental part of the work was carried out in the agricultural enterprise of the Kurgan region on full-grown high-yielding cows of black- and- white breeds, which included scientific and economic and physiological experience.To conduct scientific and economic experiencethere were formed three groups of cows according to the principle of analogues, taking into account the origin, age, live weight, productivity for the previous lactation and dates of fruitful insemination. Conditions for feeding and keeping animals were the same, except for the studied factor.The account of eaten feed was made every ten days, for two adjacent days, and in the period of physiological experience, which was carried out according to the standard method - daily [10].The feeding of cows was normalized taking into account the chemical composition of feeds, their actual consumption in accordance with the norms of the Russian Academy of Agricultural Sciences [11].

In the experiment accounting period, the experimental animals received a basic diet consisting of 48.0 kg of feed mix, 2.0 - clover hay, 4.0 - fresh beer pellet, 1.5 - sunflower meal, 1.5 - molasses and 1, 0 kg protein-vitamin-mineral premix -60-10.To the concentrated feeds were added 100 g of chalk and 100 g of common salt.In addition to the main ration, the cows of the 1st experimental group were fed a feed additive "Megalac" in the amount of 300 g per head per day, analogues of the 2nd experimental - 400 g.

Energy feed additive "Megalak" contains 84.0% of fat and 9.0% of calcium and complies with the existing European safety standards and quality standards.Including in the composition of calcium, protects fatty acids from destruction in the rumen, which reduces the negative impact of fatty acids on its functioning.Further passes through the abomasum, where it is hydrolyzed and then digested in the small intestine.Thisreducestheriskofacidosisincows.

Feeds, their residues, metabolic products obtained from animals during the balance experiment, underwent chemical analysis by conventional methods [12] and based on their results it was calculated that the digestibility of nutrients in the rations, the balance of nitrogen, calcium, phosphorus and energy exchange in the body.To calculate the energy exchange, were used the conventional regression equations [11].

To monitor the state of metabolic processes in the body of cows, were determined the morphological composition and metabolites of the blood: erythrocytes, hemoglobin, leukocytes, alkaline reserve, glucose, total nitrogen, residual nitrogen, total protein and its fractions, ketone bodies, cholesterol, thymol test, urea, total bilirubin , creatinine, alkaline phosphatase, calcium and inorganic phosphorus.For studies, blood was taken in the morning 2 hours before feeding in three animals from each group.

In order to study the digestive features, a study was made of scar tissue from three animals in each group, using a food probe three hours after the morning feeding.In the filtered liquid, the concentration of hydrogen ions was determined using a pH meter; ammonia - by Conway method; general nitrogen and non-protein (with protein precipitation) –using Kjeldahl method; protein nitrogen - by the difference between total and non-protein nitrogen; volatile fatty acids (VFA) - by steam distillation on a Markham apparatus followed by distillation on a gas chromatograph according to the procedure [14].

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The account of milk productivity of animals was madeonece in a decade by a method of control milking.The study of milk included determination of the density, dry matter content, non fat milk solids, milk fat and protein, lactose and mineral substances according to conventional methods [15].

RESULTS OF THE RESEARCH AND ITS DISCUSSION.

In the process of digestion, nutrients are extracted from feeds and used by animals to maintain life, build tissues, organs, regulate metabolism and production of outputs.The search for methods aimed at increasing productivity is associated with the study of the laws of the digestion processes, absorption and distribution of nutrient and biologically active feed substances.The amount of nutrients digested by the cows during the physiological experience is shown in Table 1.

Table 1: Average daily nutrient intake digested by cows, g ($\overline{X} \pm S_{\overline{x}}$)

Index	Group		
	Control	I experimental	II experimental
Dry matter	17117,46±260,03	17311,27±220,41	17635,37±221,32
Organic matter	16115,90±147,35	16326,86±162,33	16715,92±139,83
Crude protein	2346,29±12,57	2413,90±16,45	2410,14±43,66
Crude fat	469,71±9,68	479,71±7,41	490,65±6,71
Crude fiber	2530,36±70,29	2602,72±46,31	2655,28±48,73
Nitrogen-free extractive substances	10769,54±78,27	10830,53±135,78	11159,85±65,14

According to the table, it follows that the animals of II experimental group better digested: dry matter at 517.91 g (3.03%) and 324.10 g (1.87%); organic matter - 600.02 g (3.72%) and 389.06 g (2.38%); crude fat - by 20.94 g (4.46%) and by 10.94 g (2.28%); crude fiber - at 124.92 g (4.94%) and 52.56 g (2.02%); nitrogen-free extractive substances - by 390.31 g (3.62%) and 329.32 g (3.04%) respectively, than the herdmates of the control and I experimental groups.However, the animals of the I experimental group compared with the analogues of the control and II experimental groups digested crude protein better at 67.61 g (2.88%) and 3.76 g (0.16%), respectively.

In the works of many scientists it is noted that the efficiency of the use of nutrients in feed for the synthesis of products depends on sex, age of animals, type and level of feeding.The study of the degree of influence of each of these factors makes it possible to identify ways to reduce the unproductive expenses of the organism and increase the efficiency of feed.

Studies have shown that feeding the energy feed supplement "Megalak" to the cows of the experimental groups contributed to an increase in the digestibility rations of nutrients in the diet, which are presented in Table 2.

Table 2: Digestibility coefficient of nutrients % ($\overline{X} \pm S_{\overline{x}}$)

Index	Group		
	Control	I experimental	II experimental
Dry matter	70,96±1,07	71,57±0,94	72,74±0,74
Organic matter	71,91±0,69	72,65±0,79	74,20±0,42*
Crude protein	65,49±0,45	67,28±0,43*	67,20±1,13
Crude fat	61,25±1,38	62,41±0,81	63,63±0,89
Crude fiber	54,49±1,44	55,90±0,89	56,84±0,84
Nitrogen-free extractive substances	80,26±0,61	80,45±1,12	82,73±0,15*

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

Analysis of the table shows that the digestibility ratios of nutrients in the animals of the 2nd experimental group were higher than in the control group: on dry matter - by 1.78%; organic matter - by 2.29 (P <0.05); crude fat - by 2.38; crude fiber - by 2.35;nitrogen-free extractive substances - by 2.47% (P <0.05).The digestibility of crude protein is greater in the first experimental group than in the control group by 1.79% (P <0.05), and with the II experimental group by 0.08%, respectively.

Consequently, the cows fed the feed additive "Megalac" in the ration were better able to digest the nutrients of the feed, and thus had an additional source for the formation of products.

An indncative feature of digestion in the rumen of ruminant animals is the presence in it of a huge number of various microorganisms - bacteria and protozoa, with the participation of which the transformation of complex organic feed compounds into extremely important for the body volatile fatty acids (VFA), amino acids and ammonia. The indices of cicatricial metabolism are presented in Table 3.

Table 3: Composition of rumen after 3 hours after feeding, $\overline{X} \pm S_{\bar{x}}$

Index	Group		
	Control	I experimental	II experimental
Pн	6,52±0,11	6,27±0,08	6,40±0,13
Volatile fatty acids, mmol/100 мл	8,92±0,44	11,13±0,45*	10,08±0,73
Including, %:			
Acetic	60,63±1,04	64,80±0,45*	63,91±0,87
Propionic	17,34±0,59	18,86±0,31	18,01±0,84
Butyric	22,03±0,91	16,34±0,52	18,08±1,51

The pH of the ruminal content has a significant effect on the metabolic processes in it.The degree of formation of a particular fatty acid depends on the pH.It was established that the greatest concentration of hydrogen ions in ruminal fluid of cows was noted in animals of the 1st experimental group.Thus, the pH of the ruminal fluid of the cows in control group was 6.52, which is 0.25 and 0.12 units higher than in the animals of I and II experimental groups.

As a result of the breakdown of glycoproteins, proteins, lipids and nucleic acids, which are also present in the rumen of ruminant animals, in different types of fermentationthere are formed VFA which provide at least 40-60% of the requirement energy.An important source of energy is acetic acid, which decomposes in the muscles into CO_2 and H_2O with the formation of energy.In the ruminal fluid of the cows of the 1st experimental group the amount of VFA was 11.13 mmol / 100 ml, which is 24.78% (P <0.05) higher than the control group and 10.42% than for the analogues of the second experimental group.

On average, 550 to 2500 g of acetic acid is formed in the rumen, which is formed during the cleavage of polysaccharides with the formation of hexose and propionic acid, and is the main part of the VFA.Entering the blood acetate is mainly involved in fat metabolism, in particular in the synthesis of milk fat.During the breakdown of starch and sugar is formed propionic acid, which is used in carbohydrate metabolism.Protein of feed is formed after the fission of fodder proteins.

In our studies, the share of acetic and propionic acid increased in the ruminal fluid of animals of the experimental groups.Accordingly, in animals of I and II experimental groups by 4.17-1.52% and 3.28-0.67% in comparison with the control.At the same time, in the ruminal fluid of the cows in control groupthe percentage of butyric acid increased by 5.69% and 3.95%, respectively of similar indicators of the I and II experimental groups.The increase of acetic acid and the decrease ofbutyric acid content in the ruminal content of the animals of the experimental groups ensured the enhancement of acetate and, consequently, the use of fermentation products is directed to increase their milk productivity.

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One of the unique properties of the transformation of nitrogenous substances in ruminant pancreatic is the ability of rumen microorganisms to use low molecular weight nitrogen-containing compounds for the synthesis of amino acids and protein.The amount of nitrogen-containing substances in ruminal fluid of cows is given in Table 4.

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

Index	Group		
	Control	I experimental	II experimental
Total nitrogen	247,98±2,39	240,53±1,14	241,03±1,31
Albuminous nitrogen	215,71±3,90	203,92±1,46	206,65±1,20
Residual nitrogen	32,27±1,63	36,61±1,30	34,38±1,12
Ammonia	15,58±1,02	14,51±0,49	14,99±1,29

Analysis of the obtained results indicates that in ruminal fluid of cows of the 1st experimental group of total and albuminous nitrogen were less than in the analogues of the 2nd experimental group by 3.09 and 0.21%, and in comparison with the control at 5.78 and 1.34%.Residual nitrogen was less in the ruminal fluid of the control group cows at 13.45 and 6.54%, respectively, than in the cows of I and II experimental groups.

An important role in the processes of nutrient conversion of the diet is ammonia that is the final product of the breakdown of protein and non-protein nitrogenous feed compounds.The concentration of ammonia in the rumen of the cows of the 1st experimental group was 14.51 mmol/l, which is 7.37% less than in the control group cows and 3.31% than in the 2nd experimental group.

Analyzing the conducted studies, it should be noted that the use of the energy feed supplement "Megalac" in the diets of highly productive cows increases the processes of ruminal metabolism, increases the amount of VFA, the amount of acetic and propionic acids, and also reduces the level of total nitrogen and ammonia in the rumen of cows.

The balance of energy could sayabout the material changes in the body. It is possible to calculate the energy balance with a sufficiently high accuracy using various mathematical equations.The calculations assume that part of the received energy is lost in feces, urine, gaseous products, in the form of heat, with saturated water vapor, with exhaled air, and part is concentrated in milk.

Inadequate provision of animals with energy at the beginning of lactation leads to a relatively early onset of the top milk yield and a rapid decline in the lactation curve.Underfeeding after calving even for several days leads to a significant decrease in productivity for lactation.The indices of the calculation of energy metabolism in the organism of cows are given in Table 5.

Table 5: The level of metabolic costs in cows (MJ / day), ($\overline{X} \pm S_{\overline{x}}$)

Index	**Group**		
	Control	I experimental	II experimental
Consumed gross energy	432,06±1,38	433,22±1,94	434,23±1,35
Energy is allocated with feces	119,64±3,09	116,81±3,61	110,40±1,59
Digested energy	312,42±2,82	316,41±3,07	323,83±2,62*
% from gross energy	72,31	73,04	74,58
Energy released in urine	21,29±1,85	20,47±0,54	20,52±0,35
Loss in the gastrointestinal tract with methane and heat of fermentation	41,79±2,03	43,21±0,88	44,72±0,34
Metabolic energy	249,34±2,21	252,73±2,42	258,59±2,20*

% from gross energy	57,71	58,34	59,55
Heat production	168,55±3,31	161,50±2,41	165,48±4,38
Energy is allocated with milk	80,79±4,48	91,23±2,30	93,11±4,48
Efficiency of using ,%	32,40	36,09	36,01

According to the table, it is established that the consumption of gross energy by animals is practically the same.Thus, the animals of the experimental groups isolated energy with feces on average by 3.20 MJ / day, or 5.31% less than in the control group.

The cows of II experimental group digested the energy of the diet better - by 3.65 ($P<0.05$) and 2.35%, respectively more than the animals of the control and I experimental group.The coefficient of digestibility ofgross energy of the feed was also higher in the cows of the 2nd experimental group, by 2.27% compared to the control group and by 1.54% than in the animals of the 1st experimental group.

There was no significant difference between the groups in the release of energy in the urine, losses in the gastrointestinal tract with methane and heat of fermentation, but in the animals of the experimental groups, these indicators are somewhat less.

The level of metabolic energy in animals of the 2nd experimental group was 258.59 MJ / day, which is 9.25 MJ / day, or 3.71% ($P <0.05$) more than in the control group and 5.86 MJ / day, or 2.32% compared with the I experimental group.

The minimum energy loss in the form of heat was established in the cows of the 1st experimental group - 161.50 MJ / day, which is 7.05 and 3.98 MJ / day, or 4.37 and 3.98%, respectively, less than in the control and II experimental groups.

The maximum of metabolic energy for the production of milk was spent by the animals of the 2nd experimental group.The cows of the control and I experimental groups used less energy for 10.44 MJ / day (12.92%) and 1.88 MJ / day (2.06%), respectively.

The effectiveness of the use of metabolic energy was higher in cows of the 1st experimental group by 3.70 and 0.09% than in the animals of the control and II experimental groups.

Thus, feeding the energy feed supplement "Megalak" positively affects the energy metabolism in the animals and the maximum energy use for milk.

In the metabolism between the body and the environment the leading place takesnitrogen metabolism.This is explained not only by the fact that the basic structural elements of the cells, tissues and organs of animals are protein formations, but mainly the very nature of proteins, their various specific physico-chemical and biological properties inherent in them as carriers of life.In ruminant animals protein is synthesized twice: in the rumen of ammonia and amino acids and in tissues with deamination of amino acids.The nitrogen balance was studied based on the data of physiological experience and the chemical composition of fodders, residues, feces, urine (Table 6).

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

Index	Group		
	Control	I experimental	II experimental
Accepted with food	548,51±11,50	549,28±12,95	550,58±11,84
Ejected with feces	197,85±2,93	187,80±2,41	189,70±6,23
Digested	350,66±13,35	361,48±11,31	360,88±9,32
Ejected with urine	193,55±16,79	186,04±4,88	186,56±3,22

Ejected with milk	149,16±7,92	166,35±6,06	165,29±6,97
Postponed in the body, (balance)	7,95±1,80	9,09±0,57	9,03±0,46
Used, %:			
from the adopted	28,61	31,94	31,66
Including: for milk	27,19	30,29	30,02
from digested	44,80	48,53	48,30
Including: for milk	42,54	46,02	45,80

Analyzing the obtained data it should be noted that the excretion of nitrogen with feces and urine in the control group was more - by 10.05 and 7.51 g, than in the I experimental group and by 8.15 and 6.99 g than in the II experimental group, respectively.In this case, the nitrogen of the diet was better digested by the cows of I experimental group in comparison with the analogous index of the animals of the 2nd experimental and control groups by 2.91 and 3.09%, respectively.

The excretion of nitrogen with milk was also greater in the cows of the 1st experimental group, 166.35 g, which is 11.52% than in the control group and 0.64% compared to the analogues of the second experimentsl group.The higher positive nitrogen balance was observed in the cows of the 1st experimental group and amounted to 9.09 g, which is 0.66 and 14.34% more than in the case of the second experimental and control groups, respectively.
Better used of nitrogen from the accepted was in animals of the I experimental group by 3.33% and from digested - to 3.73%, than in the control group and by 0.28 and 0.23% in comparison with the analogs of the second experimental group.Also, the animals of I experimental group used accepted and digested nitrogen for milk protein formation more effectively - by 3.10 and 3.48%, than the control herd mates and by 0.27 and 0.22%, than the analogues of the second experimental group.

Consequently, after studying the metabolism of nitrogen in the body of experimental cows, we can note the positive effect of Megalak's energy feed additive on digestibility and the use of feed nitrogen.

The conditions of mineral nutrition are of great importanceamong the factors determining the usefulness of feeding of farm animals.Mineral substances are of great importance for the normal functioning of the body.Despite the wide fluctuations in the content of mineral elements in feed, its level in the organs and tissues of animals remains fairly constant due to the body's ability to maintain the homeostasis of minerals.However, these regulatory mechanisms are not unlimited, and with intensive use of animals disturbances in mineral metabolism can become a serious limiting factor in the production of products.Table 7 and 8 show the balance and use of calcium and phosphorus in the body of experimental cows.

Table 7: Balance and use of calcium (g / head), ($\overline{X} \pm S_{\overline{x}}$)

Index	Group		
	Control	I experimental	II eperimental
Accepted with food	151,83±0,65	153,30±0,54	154,37±0,93
Ejected with feces	107,84±1,32	103,65±1,06	104,36±1,42
Ejected with urine	3,87±0,14	3,70±0,11	3,98±0,14
Ejected with milk	34,64±1,37	39,76±1,17*	39,48±1,38
Postponed in the body, (balance)	5,48±0,92	6,19±0,53	6,55±1,25
Used %:			
from the adopted	26,42	29,97	29,82
Including on milk	22,81	25,94	25,57

Table 8: Balance and use of phosphorus (g / head), ($\overline{X} \pm S_{\overline{x}}$)

Index	Group		
	Control	I experimental	II experimental
Accepted with food	100,71±0,05	100,97±0,09	101,04±0,17
Ejected with feces	65,74±0,64	61,61±0,85	62,44±1,07

Ejected with urine	2,32±0,16	2,15±0,55	1,93±0,11
Ejected with milk	28,46±0,61	32,93±1,41*	32,17±0,76*
Postponed in the body, (balance)	4,19±0,48	4,28±0,83	4,50±0,31
Used %:			
from the adopted	32,42	36,85	36,29
Including on milk	28,26	32,61	31,84

Based on the data of Table 7, it follows that the animals of Groups I and II consumed more calcium than in the control group by 1.47 and 2.54 g, respectively.At the same time, the animals of the control group ejected calcium with feces 4.04% more than the animals of the I experimental group and 3.33% in comparison with the analogues of the second experimental group.Calcium with urine was more ejected by the animals of II experimental group in comparison with the analogues of the control and I experimental groups by 2.84 and 7.57%, respectively.

The animals of the 1st experimental group ejected calcium with milk more than the control group analogs by 14.78% (P <0.05) and 0.71% than the peers of II experimental group.The higher positive balance of calcium was observed in cows of the 2nd experimental group and amounted to 6.55 g, which is 19.53% more than in the control group and 5.82% compared to group I experimental group.

Calcium from the received was better used by the cows of the 1st experimental group at 3.55 and 0.15%, respectively, in comparison with the control and II experimental groups.In the use of calcium on milk, there is also a tendency for the benefit of animals in test groups.Thus, the cows of the I experimental group used more calcium for milk compared to the control group, by 3.13%.

Analysis of Table 8 indicates that the animals of the experimental groups took practically the same amount of phosphorus with the feed, which on the average was 100.91 g.The animals of the control group ejeted phosphorus with feces and urine by 5.98 and 13.73% more than the analogues of the experimental groups.

The greatest amount of phosphorus with milk was ejected by animals I and II in experimental groups and on the average it was 32.55 g, which is 4.09 g, or 14.37% (P <0.05) more than in the control group.

Phosphorus from the adopted was better used by the animals of the I experimental group by 4.43 and 0.56% in comparison with the herd mates of the control group and the II experimental group, respectively.Cows of the I experimental group used phosphorus for milk better than the analogues from the control group by 4.35%, and in comparison with the II experimental group by 0.77%.

Consequently, the data of physiological experience indicate a positive effect of the energy feed supplement "Megalac" on the use of calcium and phosphorus in experimental animals.

Biochemical characteristics of blood take a special place and are very important both for assessing the physiological status of the animal's organism and for timely diagnosis of pathological conditions.To characterize the physiological state of animals, was made a morphological and biochemical blood test (Tables 9 and 10).

Table 9: Morphological indicators of cows'blood, ($\overline{X} \pm S_{\overline{x}}$)

Index	Group		
	Control	I experimental	II experimental
Erythrocytes,10^{12}/l	6,73±0,08	7,21±0,18	7,29±0,16*
Hemoglobin, g / l	102,00±1,87	105,83±1,55	108,57±1,09*
Globular value	0,98±0,01	0,96±0,01	0,97±0,03
Leukocytes,10^{9}/l	8,67±0,09	8,82±0,10	8,89±0,07

The analysis of the data made it possible to establish that the number of erythrocytes in the blood of the cows of the second experimental group was 7.29 × 10^{12} / l, which is by 8.32 (P <0.05) and 1.11% (P <0.05)

more than the indicator of the control and I experimental groups.The hemoglobin content in the blood is also significantly (P <0.05) more in the blood of the cows of the 2nd experimental group by 6.44% than in the control group and 2.59% in comparison with the I experimental group.

The globular value gives an opportunity to know how saturated is each hemoglobin with the erythrocyte.And theglobular value indicates not the absolute content of hemoglobin in each erythrocyte, but some proportional to the absolute value.There are no significant differences in the globular value in the experimental groups.

In the experiment, the number of leukocytes in the groups did not have significant differences and was within the limits of the physiological norm.However, this indicator was somewhat larger in the II experimental group than in the control group - by 2.54% and in the 1st experimental group by 0.79%.

The active reaction of blood is caused by the concentration of hydrogen and hydroxyl ions in it, which is of great importance, since the normal function of all organs and systems is possible only with a certain reaction.In turn, the active blood reaction is maintained by an alkaline buffer.

Table 10: Biochemical indicators of cows'blood , ($\overline{X} \pm S_{\overline{x}}$)

Index	Group		
	Control	I experimental	II experimental
Alkali reserve,mg%	506,67±4,41	509,07±3,80	511,53±3,71
Glucose, mmol/l	2,98±0,12	2,84±0,05	2,76±0,03
Total nitrogen, mg%	2589,13±57,82	2637,10±41,75	2656,60±38,16
Residual nitrogen, mg%	37,80±1,71	40,17±1,99	39,30±1,32
Ketone bodies, mg%	4,84±0,11	4,73±0,05	4,69±0,07
Cholesterin, mmol/l	6,80±0,64	6,47±0,55	6,63±0,33
Thymol test, unit	0,58±0,13	0,65±0,16	0,55±0,13
Urea, mmol/l	6,63±0,18	6,07±0,22	5,40±0,32
Total bilirubin, mmol/l	8,70±0,99	7,37±0,69	7,83±0,87
Creatinine, mmol/l	83,73±3,69	80,67±3,07	78,60±4,35
Alkaline phosphatase, U/l	77,83±6,27	72,37±5,56	70,61±4,05
Calcium, mmol/l	2,48±0,08	2,63±0,06	2,66±0,06
Phosphorusinorganic, mmol/l	1,66±0,02	1,68±0,04	1,67±0,03

Thus, analysis of the data of the table made it possible to establish that the maximum alkali reserve was observed in the blood of the cows of the 2nd experimental group and amounted to 511.53 mg%, which is 0.95 and 0.48%, respectively, higher than in the control group and group I.

It should be noted that the glucose content is higher in the blood of the control group by 4.93% compared to the I experimental group and by 7.97% compared to the II group.

In the study of the chemical composition of blood, the determination of residual nitrogen, i.e. nitrogen of non-proteinaceous plasma substances, is of great importance.Thisindicatorcharacterizestheintensityofproteinmetabolism.In its disorder accumulate the final and intermediate products of protein metabolism, and the value of the residual nitrogen indicator increases significantly and goes beyond the upper limit of the norm.In our studies, the total and residual nitrogen was the maximum in the experimental groups and averaged 2646.85 and 39.74 mg%, respectively, which is 2.23 and 5.13% more than in the control group.The content of ketone bodies ranges from 4.73 mg% in the I experimental group to 4.84 mg% in the control, which generally corresponds to the norm.

Cattle, especially high-yielding cows, are prone to frequent liver diseases.To determine the functional work of the liver, were studied such blood indices as cholesterol, thymol test, urea, total bilirubin, creatinine and alkaline phosphatase (A. Golovin et al., 2012).The level of cholesterol in the experimental groups averaged 6.55 mmol / l, which is 3.82% less than in the control group.Such indicator as the thymol test ranged from 0.55 units in the animals of the IIexperimental group to 0.65 units in the analogues of the I experimental group,

which is close to the lower limit of the norm (0-4.7 units).Urea content was the lowest in the blood serum of the cows of the II experimental group at 22.78 and 12.41 in comparison with the control and I experimental groups, respectively.

One of the most specific liver function tests is the determination in the blood of the amount of bile pigment - bilirubin.This index was the lowest in the experimental groups and averaged 7.60 µmol / l, which is 14.47% less than in the control group.The level of creatinine was greater in the control group by 3.79 and by 6.53%, respectively, than in the I and II experimental groups.

To study the activity of liver cells or their lesions in the serum is determined alkaline phosphatase.This enzyme takes an active part in metabolism, its increase signals a tissue damage.

Studies have shown that the greatest activity of alkaline phosphatase was observed in the blood serum of control group, however, the activity of this enzyme was within the normal range (90-180 U / l).

It is recommended to use indicators of calcium and inorganic phosphorus in serumto assess the balance of mineral nutrition of highly productive cows.The content of calcium and inorganic phosphorus in the blood serum of cows was also within the norm and there were no significant differences.

Proteins of blood plasma are very important for the body of animals.They are actively involved in intermediate metabolism.Almost all the physical processes taking place in the body are to a greater or lesser degree related to the exchange of proteins and affect the state of the protein fractions.

The results of studies on the determination of serum proteins are presented in Table 11.

Table 11 - Content of total protein and its fractions in the serum of cows, ($\overline{X} \pm S_{\overline{x}}$)

Index	Group		
	Control	I experimental	II experimental
Total protein, g/l	76,60±3,04	77,93±2,89	80,73±3,45
Albuminous fraction фракция, %	38,10±1,05	40,30±1,64	42,27±1,06
Globulin-rich fraction, %:	61,90±1,05	59,70±1,64	57,73±1,06
α–globulins	16,10±0,72	17,17±0,88	18,07±0,71
β–globulins	12,20±0,89	11,53±0,50	11,40±0,72
γ–globulins	33,60±1,90	31,00±1,61	28,26±2,46
Coefficient	0,62±0,03	0,68±0,05	0,73±0,03

According to the table, it was found that the level of total protein in the blood serum of the cows of the II experimental group was 80.73 g / l, which is 5.39 and 3.59%, respectively, higher than in the control and I experimental groups.The content of the albumin fraction was larger in the II experimentalgroup than in the control group by 4.17%, and in comparison with the I experimental group by 1.97%.

During the period of increasing the milk yieldα-globulin contains more in highly productive animals than in animals with lower productivity.Was established a correlation between the milk yield and the dynamics of the α-globulin fraction.The amount of globulin fraction in the cows of the control group was 61.90%, which is 2.2 and 4.17%, respectively, higher than that of the I and II experimental groups.

The albumin-globulin coefficient was higher in the II experimental group than in the control group by 17.74%, and in comparison with the I experimental group by 7.35%.

Consequently, a high level of total protein in the blood serum is characteristic of highly productive animals, especially during the period of increasing the milk yield, when is observed an increase in the total protein and albumin fraction, and the use of the “Megalac” energy feed additive in the diet of highly productive cows positively influences the physiological state of the animals, morphological composition and metabolites of blood.

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The most important reserve for intensification of the industry is the realization of the created potential for productivity by improving feeding conditions, improving the system for growing maintenance young animals and keeping animals. Analysis of milk productivity of cows is presented in Table 12.

Table 12 - Milk productivity of experimental animals, ($\overline{X} \pm S_{\overline{x}}$)

Index	Group		
	Control	I experimental	II experimental
Milk yield for 100 days of lactation, kg:			
with naturalfat content	2772,8±102,34	3090,3±108,96*	3104,6±111,62*
at 4% fat content	2797,5±80,52	3149,0±150,33*	3164,9±152,09*
Fat mass fraction, %	4,07±0,12	4,12±0,12	4,13±0,18
Mass fraction of protein, %	3,10±0,10	3,13±0,10	3,12±0,09
Daily average milk yield, kg:			
with natural fat content	27,73±1,02	30,90±1,09*	31,05±1,12*
at 4% fat content	27,97±0,81	31,49±1,50*	31,65±1,52*
Milk fat, kg	112,86±3,19	127,31±7,34	128,24±7,83
Milk protein,kg	85,96±5,48	96,72±4,87	96,88±4,14

Analysis of milk productivity of experimental animals allowed to establish that the milk yield of natural fat content in cows of the II experimental group exceeded the control by 331.8 kg, or by 11.97% (P <0.05).In terms of 4% milk, as well as more milk yield is in the animals of the II experimental group.They exceeded their herd mates from the control group and the I experimental group by 367.4 kg (13.31%) (P <0.05) and 15.9 kg (0.50%), respectively.

The fat content of milk of cows depends on the diet of the feed, the breed, the stage of lactation, the season and other factors.The content of milk fat in milk can vary from 2.8 to 4.5%.Due to a lack of nutrients in the diet of milking cows, productivity can be reduced by 40%, fat content by 0.5 and protein by 0.3% or more.The higher fat content of milk was noted in the IIexperimental group and was 4.13%, which is 0.01% more than in the I experimental group and 0.06% than in the control group.When calculating the content of milk fat in kilograms, was also established the advantage of the cows of the II experimental group.

During lactation, the mammary gland is the main consumer of glucose, which is formed in the body from propionic acid.Its increase in the rumen improves the use of nitrogen and increases the level of protein in milk.In our studies, the protein content was at the same level and amounted to 3.10-3.13%.When converted into milk protein from the cows of the II experimental group was obtained 10.92 kg or 12.07% protein more than from the animals in the control group.

The quality of milk is characterized by a complex of chemical, biochemical and physiological properties.The chemical composition and properties of the milk of the cows of the experimental groups are presented in Table 13.

Table 13 - Chemical composition of milk of experimental animals ($\overline{X} \pm S_{\overline{x}}$)

Index	Group		
	Control	I experimental	II experimental
Energy value, mj	2,89±0,06	2,91±0,05	2,93±0,04
Density, ºa	29,37±0,26	29,53±0,35	29,80±0,44
Dry matter, %	12,79±0,15	12,87±0,14	12,97±0,13
Nonfat milk solids, %	8,91±0,08	8,96±0,09	9,03±0,11
Lactose, %	4,63±0,04	4,66±0,05	4,70±0,06
Leach %	0,78±0,03	0,80±0,03	0,84±0,03

According to the table, the higher energy value of milk was observed in the cows of the II

experimental group.This indicator exceeds the I experimental group by 0.69%, and the control group by 1.38%.

The density of milk depends on the temperature and the content of its constituents.This indicator in the milk of the experimental animals did not differ significantly and averaged 29.57 ° A.

The dry matter of milk includes all the chemical constituents that remain in the milk after the moisture is removed from it.The dry matter content depends on the milk composition and varies considerably (11-14%).Studies have shown that the content of dry matter in the milk of the cows of the II experimental group was 0.10 and 0.18% higher than in the animals in the I experimental and the control group, respectively.The proportion of nonfat milk solids is also higher in the II experimental group than in the control group by 0.12%.The lactose level in the milk of the cows of the control and I experimental groups did not differ, while in the II experimental group this index was more by 0.07%.

Cows with milk produce a large amount of minerals.The higher the daily milk yield is, the greater must be the concentration of minerals in the diet to meet the animal's need.It has been established by researches that the maximum leach content was observed in the milk of the cows of the II group - 0.84%, which is 0.06% more than in the same herd mates of the control group.

Consequently, in the aggregate of the obtained results, it can be stated that the inclusion in the rations of high-yielding cows of the energy feed supplement "Megalak" from the calculation of 300 g / head / day has positively affected their milk production and the chemical composition of milk.

CONCLUSIONS

[1] The optimal dose of using in the rations of high-yielding cows the Energetic fodder additive "Megalak", which provides for the consumption of animals in the exchange energy, which increases their milk productivity and the production of milk, is 300 g / head / day.

[2] The high milk productivity of animals in experimental groups is due to the best possible nutritional status. So, the coefficients of digestibility of nutrient substances in cows that received the food feed additive exceeded the control group for: dry matter - by 0.61-1.78%; to the organic substance - by 0,74-2,29% (P <0,05); the crude protein - by 1.79 (P <0.05) -1.71; crude fat at 1.16-2.38;crude fiber at 1.41-2.35; nitrogen-free extractive substances - at 0,19-2,47% (P <0,05).

[3] In physiological studies of the processes of ruminal nutrition, it is established that the accumulation of the energetic additive changes the concentration of hydrogen ions - by 0.25 units and the PLV - by 24.78% (P <0.05), the amount of the acetic and propionic acids by 4.17 (P <0.05) and 1.52%, and also reduces the level of total nitrogen and ammonia in the sruminal liquid of animals at 3.09 and 7.37%, respectively.

[4] The cows of the experimental groups more efficiently used a metabolic energy for the formation of milk. At the same time, cows that consumed Megalak in the amount of 300 g / kg / day, conducted analogues from the control and II experimental groups at 3.70 and at 0.09%. The balance of nitrogen, calcium and phosphorus was positive in animals in all groups. Feeding of the Megalak feed additive from the grating of 300 g / head / day provided the best use of nitrogen, calcium and phosphorus for the production of milk from the recieved - at 3.33%; 3.55 and 4.43% respectively.

[5] The use of fodder additive "Megalak" in the rations of high-yielding cows did not have a negative effect on the physiological state of animals, which is confirmed by their blood picture. According to the comparison with the control group, the content of erythrocytes in the blood of the cows of the I experimental group increased by 7.13%, the level of hemoglobin - by 3.75, the content of albumins - by 2.20%. At the same time, the content of cholesterin, urine, bilirubin and creatinin decreased by 5.10%; 9.23; 18.05; 3.79% correspondingly in the comparison with the control.

[6] The indicators of the reproductive ability evidence of the positive effect of additive on reducing the severity period and the intermodal period in cows on 10 and 12 days in comparison with the control.

[7] The milk production of the animals, whose basic diet included the Megalak additive in the amount of 300 g / head / day, was above 317.5 kg, or 11.45% (P <0.05), and the transformation of the VFA and nitrogen increased the mass fraction of fat and protein in milk by 0.05 and 0.03% in comparison with the control.

CONSEQUENCE

Thus, the use of the energy feed additive "Megalak" in the rations of high-yielding cows at a dose of 300 g / head / day is a promising direction for improving the feeding system of highly productive dairy cows, since its feeding positively affects the metabolic processes of digestion in cows and their milk productivity.

CONFLICT OF INTERESTS

The authors confirm that the presented data do not contain a conflict of interest.

GRATITUDES

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