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The influence of energoprotein concentrate on biochemical parameters of dairy cows' blood serum

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Abstract. The article presents the results on the study of the influence of activated protein concentrate BioGumMix on biochemical parameters of dairy cows. Research and production experiment was carried out on the milk farm of the Vakhitov Agricultural Productive Cooperative (APC) in Kukmor region. The experiment lasted for 73 days of which 10 days were a preparatory period and 63 days – registered. 24 dairy cows were chosen for the experiment. The research results indicate that biochemical blood parameters of dairy cows in the experimental group have standardised.

1. Introduction

Blood composition in a greater degree reflects various biochemical and physiological processes which occur in the animal's body. It allows determining metabolic rate intensity and the level of animals' productivity [1, 2].

The interrelation of nitrogen metabolism between the microorganisms of the rumen and the animal is a peculiar feature of metabolism. Proteins synthesize twice in ruminants: in the rumen from ammonia and amino acids and in the tissues during deamination of amino acids. Almost all physiological processes that occur in the organism to some extent are connected with protein metabolism and they influence the correlation between their fractions, where albumins perform a plastic function and globulins – a protective one. The study of proteins in blood allows, on the one hand, regulating health condition of the animal and on the other one – finding interdependence with productivity [3-5].

The objective of the research is to determine the impact of activated energoprotein concentrate BioGumMix on some biochemical parameters of the blood of dairy cows.

2. Experimental

Research and production experiment was carried out on the milk farm of the Vakhitov APC in Kukmor region. The experiment lasted for 73 days: 10 days – a preparatory period and 63 days – a registered one. 24 dairy cows were assigned into two groups on the principle of analogous pairs, 12 animals in each group, on the basis of their productivity, breed, age, body weight and month of lactation [6].

In accordance with the experiment design, the animals of the first (control) group got their basic diet (BD) with different vitamin-mineral premixes during the whole experimental period. The animals



of the second group got a BD together with BioGumMix activated energo-protein concentrate (AEPC) on the basis of 0.50 kg per head during a day. The diets for cows in both groups were prepared in accordance with the feeding rate of All-Russian Research and Development Institute of Farm Animals Breeding and guaranteed high productivity of animals [7].

The data were processed with the help of variation statistics method using a computer application programme spreadsheet on Microsoft Office Excel 2007 processor. The research results were processed on the basis of Student's distribution criteria [8].

3. Results and considerations

The research indicated (table 1) that during the preparatory period the content of crude protein and albumins in the blood serum of all the animals was below the limit of physiologically normal state and changed ranging from 68.42...69.75 g/l.

The 35 day showed the increase of crude protein level in the blood serum of the second group by 2.7 %. At the end of the experiment the content of crude protein in the blood serum of the cows in the control group was the highest and amounted to 79.54 g/l.

In the middle of the experiment and its end the content of albumins in the blood was slightly lower in the first group ranging from 32.65...35.32 g/l.

The highest content of urea nitrogen was found in the blood of the experimental group. In the control group this index was 3.7 % lower. On the 73 day, in the test group, the content of urea nitrogen was the lowest and amounted to 2.54 mmol/l or 4.3 % lower than in the control group.

Blood carbohydrates are the source of energetic and partially plastic resources for all the organs and tissues of the animal. The importance of carbohydrate-fat metabolism in the body of animals can be judged by the concentration of cholesterol, triglycerides, glucose and amylase activity in the blood serum [6, 8].

The results of the analysis of cows' blood in the preparatory period of the experiment showed that the blood glucose content of the animals in the control and experimental groups was slightly below the physiological norm. On the 35th day of the experiment in all groups, the concentration of glucose tended to increase, and at the end of the experiment the highest index was found in the second group and was 3.77 mmol / l, an average of 5.6% higher than the control animals.

The content of cholesterol and triglycerides in the blood characterizes the intensity of fat metabolism in the body. Studies have established that the cholesterol content in the preparatory period in the animals of the experimental groups was within the limits of the average values of the physiological norm

On day 35 of the experiment, in all groups, this index tended to decrease compared to background values. However, at the end of the experiment, the cholesterol content in the blood of the animals in the experimental group was the highest and amounted to 3.15 mmol / l, which is 18.9% higher than in the control group.

The content of triglycerides in the serum of animals of all groups in the preparatory period corresponded to the values of the physiological norm and amounted to 0.13 ... 0.14 mmol / l. At the end of the experiment, the concentration of triglycerides in the animals of the second group was the highest at 0.15 mmol / L, which is 15.4% higher than in the control group.

Table 1 Dynamics of biochemical parameters of blood serum of cows.

Parameters	Unit. amend.	Groups	
		I	II
The preparatory period (n = 5) before the administration of the drug			
Crude protein	g/l	68.42 ±5,57	69.75 ±2.46
Albumin	g/l	32.34 ±3.04	33.75±1.23
Urea	mmol / l	2.47±0.24	2.47±0.36
Cholesterol	mmol / l	3.36±0.47	3.74±0.64
Triglycerides	mmol / l	0.13±0.06	0.14±0.04

Glucose	mmol / l	3.12±0.73	3.25±0.74
Total calcium	mmol / l	1.87±0.63	2.10±0.23
Nonorganic phosphorus	mmol / l	2.31±0.02	1.57±0.3
Alkaline phosphatase	E / L	246.40±2.85	242.86±4.36
Aspartate aminotransferase (AAT)	E / L	75.74±3.25	52.86±2.35
Alanine aminotransferase (ALT)	E / L	26.36±1.64	24.68±2.35
Lactic dehydrogenase (LDH)	E / L	1378.63±52.37	1286.05±35.47
on day 35 of drug administration			
Crude protein	g/l	76.53 ±5.84	78.57 ±1.63
Albumin	g/l	34.77 ± 4.43	32.65±1.64
Urea	mmol / l	3.65±0.43	3.53±0.25
Cholesterol	mmol / l	2.75±0.47	2.42±0.74
Triglycerides	mmol / l	0.12±0.02	0.11±0.02
Glucose	mmol / l	3.53±0.57	3.35±0.86
Total calcium	mmol / l	2.56±0.37	2.97±0.53
Nonorganic phosphorus	mmol / l	2.53±0.04	2.65±0.03
Alkaline phosphatase	E / L	275.56±5.43**	285.34±5.43**
Aspartate aminotransferase (AAT)	E / L	57.43±3.35*	74.35±1.74**
Alanine aminotransferase (ALT)	E / L	28.74±1.58	29.42±4.46
Lactic dehydrogenase (LDH)	E / L	1046.57 ±5.75**	1053.75±53.58*
on day 73 of drug administration			
Crude protein	g/l	77.46±6.54	79.54 ±5.76
Albumin	g/l	33.64 ±3.57	35.32±1.65
Urea	mmol / l	2.65±0.20	2.54±0.46
Cholesterol	mmol / l	3.65±0.46	3.75±0.43
Triglycerides	mmol / l	0.13±0.65	0.15±0.56
Glucose	mmol / l	3.57±0.83	3.77±0.63
Total calcium	mmol / l	2.56±0.56	2.63±0.73
Nonorganic phosphorus	mmol / l	2.83±0.85	2.26±0.37
Alkaline phosphatase	E / L	464.85±5.34***, 3	432.65±3.43***, 3
Aspartate aminotransferase (AAT)	E / L	75.35±2.75 ²	84.43±1.85***, 1
Alanine aminotransferase (ALT)	E / L	29.36±1.53	33.75±3.47
Lactic dehydrogenase (LDH)	E / L	1457.75 ±5.43 ³	1467.43±3.64***, 3

Note: * p <0.05; ** p <0.01; *** p <0.001 in comparison with the preparatory period; 1p <0.05; 2 p <0.01; 3 p <0.001 in comparison with the middle of the experiment.

The content of total calcium in the blood serum of animals of all groups in the preparatory period was slightly below the physiological norm and amounted to 1.87 ... 2.10 mmol / l. On the 35th day of the experiment, the total calcium content in the blood serum of both groups increased by 36.9 and 41.4%, compared with the preparatory period. At the end of the experiment, this indicator in the blood of the experimental group cows increased by 2.7% than in the control group.

In the cows of the experimental groups, the activity of AsAt, ALAT and LDH sera was higher at the end of the experiment. Thus, in the cows of the experimental groups, it exceeded the corresponding values of the control group for ASAT by 12.0% and ALAT by 14.9%, LDH by 0.7%.

4. Conclusion

Activated energy-protein concentrate "BioGumMix" used in the diets of lactating cows does not adversely affect the biochemical composition of the blood. In the cows of the experimental groups, the activity of AsAt, ALAT and LDH sera was higher at the end of the experiment. Thus, in the cows of

the experimental groups, it exceeded the corresponding values of the control group for ASAT by 12.0% and AIAT by 14.9%, LDH by 0.7%.

References

- [1] Kuralenko N 2002 *Dairy and beef cattle breeding* **2** 14-6
- [2] Nagaoka I *et al* 2007 *Immunology* **176** 3044-52
- [3] Tkachenko T E 2003 *Zootechnics* **4** 17-20
- [4] Mosrnnann T R 2006 *Immunology* **136** 2348-57
- [5] Yamamoto T *et al* 2013 *Physiological Measurement* **34(9)** 1179-91
- [6] Smolentsev S Yu *et al* 2014 *Research Journal of Pharmaceutical, Biological and Chemical Sciences* **5(6)** 1448-52
- [7] Termeer C *et al* 2011 *Immunology* **165** 1863-70
- [8] Pramono A *et al* 2017 *IOP Conf. Ser: Mat Sci and Eng.* **193** 012034 doi:10.1088/1757-899X/193/1/012034