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Physiological changes in the body of young cattle when the feed additive "Bacitox" is introduced into their diet

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Abstract. The experience of continuous intensification of animal husbandry accumulated by modern science confirms the need for further improvement of feeding schemes for young and adult cows. In this regard, it is of great importance to continue to optimize the enrichment of their diets with complexes of special feed additives. The systematic consumption of balanced feed additives by young animals largely compensates for the lack of plastic and regulatory substances in their body and stimulates the course of all physiological functions and biochemical processes. The inclusion of the feed additive "Bacitox" into the diet of growing heifers made it possible to effectively increase the energy nutritional value and minimize the risk of ketosis in animals. We can say that the use of this additive can increase the average daily gain in live weight in growing heifers with a decrease in the level of feed costs. The use of "Bacitox" stimulates their growth in growth energy. In the heifers of the control group, who did not receive this feed additive, the main indicators taken into account were in a less functionally advantageous state. This indicated a lesser intensity of their viability and productivity, thereby demonstrating the undoubted advantages of using the feed additive "Bacitox" in young cattle.

1. Introduction

Modern animal husbandry in many regions of the world is traditionally the most important branch of agriculture [1,2]. In many countries, the share of livestock products in the total production of agricultural products reaches 65%, and sometimes even more [3,4].

The acute problem in the world of intensifying the production of food dictates the need to intensify the development of animal husbandry, which in many respects has a need to solve the problem of providing cattle at all stages of ontogenesis with high-grade high-quality feed [5]. At the same time, the rational enrichment of their rations in terms of compound feeds by introducing balanced complexes and special feed additives into them is of great functional importance [6,7].

It is recognized that the regular consumption of such modern feed additives by animals can fully compensate for any deficiency of energy, plastic and regulatory substances of food origin in the body



[8] and has an effective regulatory effect on the state of physiological processes and the course of biochemical reactions [9,10].

Modern technologies for the production of feed additives used in practice provide a complete physiologization of the nutrition of farm animals [11,12], providing a complex positive effect of them on the course of physical [13], chemical [14] and biological [15] processes in the body throughout ontogenesis [16]. It is becoming clear that many changes in vital indicators during the use of feed additives have not yet been fully studied. The biological effects of the "Bacitox" additive are of great interest and require further study.

Objective: to evaluate the biological effects of introducing the feed additive "Batsitoks" into the diet of replacement heifers.

2. Materials and methods

The work was carried out in full compliance with the ethical standards defined by the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (was adopted in Strasbourg on March 18, 1986 and was fully approved in Strasbourg on June 15, 2006) and was supported by the local ethics committee of Kursk State Medical University (Protocol No. 11 of January 17, 2018).

The study included 40 completely healthy black and white heifers at the age of 4 months. They were randomly divided into control and experimental groups of 20 animals each. The scheme of the study is shown in table 1. The control group in the performed work was kept on a completely standard diet. The feed additive "Bacitox" was added to the feed of the experimental group, otherwise the diet of these heifers was comparable to that of the control group. The conditions of keeping the heifers of both groups were completely standard.

Table 1. Scheme of the study.

Observation groups	Number of animals, heads	Study duration, days	Live weight at the end, kg	Feeding features
Control group	20	90	104	general ration: haylage, silage, molasses and compound feed of our own production
Experienced group	20	90	106	General diet + 50g feed additive "Bacitox"

The feed additive "Bacitox" produced by the "Scientific and Technical Center BIO" (Russia) was introduced daily into the diet of the experimental young cattle during their rearing in the period between 4 and 6 months of age (the value of live weight when included in the study is 105-106 kg) at the rate of 50 g of supplement per head per day.

During the research, the following parameters were taken into account. The amount of feed given and its residues were recorded using the control feeding method. The chemical characteristics of the composition of the feed and its nutritional value were found out by means of generally accepted zootechnical methods. Sampling of feed was carried out at the end and at the end of the scientific study being carried out.

In the study, a number of general hematological parameters were assessed: the levels of erythrocytes, leukocytes and hemoglobin using an automatic analyzer "Medonic-620" (Clinical Diagnostic Solutions, Inc., USA). In the blood serum of animals, the levels of total protein and its fractions, glucose, urea, calcium, phosphorus, magnesium, iron were determined using a Cormay Lumen BTS 370 Plus autoanalyzer (Biosystems S.A., Spain).

The live weight of heifers was determined as a result of individual weighing at the beginning and end of the study. The traditional methods were used to estimate the average daily gain, feed costs per 1

kg of gain, growth energy, feed conversion into gain, exchange energy costs per 1MJd in live weight gain.

The obtained digital material was processed by the methods of variation statistics using the Microsoft Excel mathematical software package using the Student's t test and correlation analysis [24].

3. Research results and discussion

The revealed initial nutritional value of the diets of both groups was comparable and amounted to 4.2 food units. They also did not differ significantly in terms of the level of metabolic energy. The initial concentration of metabolizable energy in dry matter was comparable, and by the end of the observation its highest level was noted in the experimental group of young animals, which received "Bacitox" in the diet. There were no significant changes in the dry matter in the diets. At the same time, the ratio of minerals in the diets of both groups was at the physiological level, which indicated a sufficient completeness of the diets used in animals.

Due to the fact that an important indicator of the success of feed intake by young cattle is the state of its blood parameters, a number of hematological parameters were assessed in the work.

The research results showed that in the blood of the observed heifers, after the inclusion of balancing supplements in their diet, its saturation with erythrocytes by 27.4% develops, while in the control this indicator remained unchanged. At the same time, the concentration of hemoglobin in the experimental heifers significantly increased and by the end of the observation exceeded the control by 12.8%, which indicated a significant intensification of the metabolism of nutrients in calves.

Statistical processing of the data obtained showed the presence of a high correlation ($r = 0.75$) between the degree of saturation of the blood of animals with hemoglobin and the activity of their growth ($p < 0.05$). Actively growing heifers had high indicators of the oxidative capacity of the blood, and in the case of a decrease in the severity of growth, a decrease in the level of hemoglobin in the blood of animals took place.

The inclusion of the "Bacitox" supplement in the diet increased the concentration of leukocytes in the blood of heifers from the experimental group by 30.5%. Apparently this should be associated with increased leukopoiesis in the bone marrow of animals, which significantly increases their general and specific resistance [17]. The use of this feed additive leads to rearing heifers to increase the total protein content by 18.8%, while in the control the indicator remained stable.

In the blood of the heifers of the experimental group, by the end of the observation, an increase in the level of albumin by 15.3% was noted in the absence of its dynamics in the control group. Comparison of the dynamics of growth in the level of globulins was found in the blood of experimental animals. Their increase during the observation period was 15.3%. At the same time, the level of globulins in the blood of experimental heifers by the end of the observation exceeded that by 11.4% in the control, which indicates the achievement of a higher level of metabolic processes under the influence of "Bacitox" and a greater balance of the experimental diet in terms of energy and protein content [18]. A high direct correlation was found between the level of the albumin fraction and the growth energy in the study performed ($r = 0.84$, $p < 0.05$). A high direct correlation was also noted between the level of globulins in experimental animals by the end of observation and the growth energy ($r = 0.82$, $p < 0.01$).

The initially normal blood glucose level of the experimental animals increased by 23.1% as a result of the introduction of the food additive "Bicitox" into their diet. In the control group, this indicator did not experience significant dynamics during the entire observation.

The initial concentration of urea between the observation groups varied slightly and was within the physiological norm. As a result of the use of "Bacitox" its level in the experimental group increased by 10.4%, remaining until the end of the observation at the initial level in the control group.

Introduction to the diet of animals of the experimental group of the additive "Bacitox" led to an increase in the amount of inorganic phosphorus in their blood - by 13.3%, exceeding the level of the control group by 6.2% by the end of the observation. At the same time, the level of magnesium and calcium in both groups remained stable.

The iron level in the outcome in both groups was within the physiological norm. By the end of the observation, in the heifers of the experimental group, the amount of iron in the blood exceeded the control by 16.2%, which, undoubtedly, can be considered a consequence of an increase in the level of oxygen absorption by the tissues of the young animals of the experimental group.

Evaluating the intergroup differences in blood counts found by the end of the observation, it became clear that they were all within the generally accepted physiological norm. This indicated a normal course of metabolic processes in all heifers, somewhat more favorable in animals of the experimental group [19].

The morpho-biochemical parameters of the blood of the observed young animals indicate their relationship with the level of the energy, protein and mineral composition of the feed, which forms the conditions for its growth and development in full accordance with the genetic program.

Productivity parameters have always been important indicators of the assimilation of rations, including the introduction of feed additives into the ration. Their condition in the observed animals is shown below (table 2).

Table 2. Dynamics of indicators of productivity of heifers during the study.

Index	Observation groups, M±m			
	control, n=20		experienced, n=20	
	exodus	end of observation	exodus	end of observation
Live weight of an animal, kg	104.7±1.25	172.3±0.97 ^b	106.6±1.14	189.1±0.81 ^b
Average daily gain, g	623.4±6.34	736.8±7.83 ^b	630.1±6.99	968.4±4.31 ^b
Feed costs per 1 kg gain, feed units	5.4±0.06	5.2±0.04	5.3±0.07	4.7±0.03 ^a
Growth energy, MJ	9.1±0.07	9.3±0.08	9.2±0.06	11.2±0.04 ^b
Energy conversion to gain, %	4.0±0.08	4.1±0.10	4.2±0.09	4.9±0.06 ^a
Exchange energy consumption per 1 MJ in live weight gain, MJ	4.6±0.03	4.5±0.07	4.7±0.04	4.1±0.02 ^a

Note: the reliability of the change in indicators - ^a - p < 0.05; ^b - p < 0.01.

When taken into the study, all heifers had a fairly high live weight, an average of 104.0-106.0 kg. At the same time, during the observation period, the young growth was more pronounced in the experimental group by 77.4 kg, exceeding the control level by 9.7% by the end of the observation. As a result of the introduction of "Bacitox" into the diet, the average daily gain increased by 53.6%, exceeding this indicator in the control by 31.5% by the end of the observation. This happened with a decrease in feed costs in the experimental group by 12.7%, which was inferior to the control level by 10.6%. The maximum growth energy was also noted in the experimental group, which is associated with the addition of "Bacitox" to the feed of heifers. This was accompanied in the experimental group of heifers by more physiologically beneficial changes in the indicators of energy conversion into gain (by 16.7%) and the cost of exchange energy per 1 MJ during the increase in their live weight (by 14.6%).

4. Conclusion

The world experience of continuous intensification of animal husbandry confirms the need to improve feeding schemes for young and adult cows. In this regard, the optimization of the enrichment of their diets with complexes of special feed additives is of great importance. It becomes clear that the systematic consumption of balanced feed additives by young animals largely compensates for the lack of plastic and regulatory substances in their body and stimulates the course of all physiological functions

and biochemical processes. The inclusion of the feed additive "Bacitox" in the diet of rearing heifers in the study was very effective in increasing energy nutrition and minimizing the risk of ketosis in animals. We can say that the use of this additive is able to provide growing heifers with an increase in average daily gain in live weight with a decrease in the level of feed costs. Also, the use of "Bacitox" provides them with an increase in the growth energy. In the heifers of the control group, who did not receive this feed additive, the main indicators taken into account were in a less functionally advantageous state. This circumstance indicated a lower severity of their viability and a lower productive potential, thereby demonstrating the undoubted advantages of using the feed additive "Bacitox" in young cattle.

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