ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ

Х А Б А Р Ш Ы С Ы

ВЕСТНИК

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

THE BULLETIN

THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN

PUBLISHED SINCE 1944

6

NOVEMBER – DECEMBER 2019

ALMATY, NAS RK

NAS RK is pleased to announce that Bulletin of NAS RK scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of Bulletin of NAS RK in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential multidiscipline content to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы "ҚР ҰҒА Хабаршысы" ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Web of Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабаршысының Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді мультидисциплинарлы контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Вестник НАН РК» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Вестника НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному мультидисциплинарному контенту для нашего сообщества.

© Национальная академия наук Республики Казахстан, 2019

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

UDC 636.035.1:636.22/.28.053.2

**O. Yu. Petrov[1], D. A. Baimukanov[2], V. G. Semenov[3], V. G. Tyurin[4], N. N. Kuzmina[1],
A. K. Nesipbayeva[5], M. M. Zhylkyshybayeva[5], M. Sh. Yerezhepova[5], K. B. Apeev[5]**

[1]Mari State University, Yoshkar-Ola, Mari El Republic, Russia,
[2]Kazakh Scientific Research Institute of Animal Breeding and Fodder Production, Almaty, Kazakhstan,
[3]Chuvash State Agricultural Academy, Cheboksary, Chuvash Republic, Russia,
[4]All-Russian Scientific Research Institute of Veterinary Sanitation, Hygiene, and Ecology, Moscow, Russia,
[5]Kazakh National Agrarian University, Almaty, Kazakhstan.
E-mail: tmspetrov@yandex.ru,dbaimukanov@mail.ru, potyemkina@mail.ru,
semenov_v.g@list.ru, kuzmina221995@mail.ru,Aigul_n78@mail.ru,
m.malikovna78@mail.ru, princessa.maki@mail.ru, Kuanysh_apeev@mail.ru

PRODUCTIVE ACTION OF DIFFERENT FAT LEVELS
IN DIETS OF BULL-CALVES

Abstract. One of the important factors determining the quality of animal origin products is the conditions of their production. Meat productivity of animals is directly affected by their full feeding, providing the body with all the necessary nutrients. Lipids are crucial in the full feeding of animals. However, many issues of lipid nutrition of young cattle during fattening associated with its impact on product quality are not yet sufficiently disclosed.

In this regard, studies were conducted in which the effect of increasing the fat level in the diets of fattening bull-calves on their meat productivity and a number of qualitative indicators of beef and some products of slaughter was studied. Sunflower oil additives to the level of 4 and 5% (II and III groups) were input in reliance on the dry matter in the diets of fattening bull-calves. The control was the first group of animals, which received the usual economic diets with a fat content of 3% of dry matter.

Different investigations have shown that an increase in the fat level in the diets of fattening young bulls had a positive effect on meat productivity, contributed to an enhancing the intensity of their growth, improving slaughter indicators, chemical composition and some functional and technological properties of beef and physicochemical parameters of adipose tissue.

Improvement of the fat level in diets contributed to an increase in the intensity of lipid and protein metabolism processes, which characterize strengthening of assimilation processes in the body of young stock, which is consistent with an increase in their live weight gain.

In this respect, the obtained results indicate that bull-calves fed with a diet with a 5% of fat content in terms of dry matter had higher meat productivity. The beef obtained from them was characterized by the best quality indicators, that made it possible to consider this fat level as optimal.

Keywords: high-productive animals, bull-calves, fat level in the diet, meat productivity, beef, offal, adipose tissue, chemical composition, functional and technological indicators, physical and chemical parameters, lipid metabolism, protein metabolism, optimal fat level, digestibility.

Introduction. In Russian agro-industrial complex, cattle breeding occupies a special place, and the level of its development is one of the indicators of food prosperity and economic resilience in society.

The high social significance of this branch of agriculture is directly related to the acceleration of the intensification of production of milk and meat, and the maximum manifestation of animal capacities.

Judging by the emerging trends in world food production, in the next decade, the human community will not stop eating natural meat, so it is necessary to make efforts to ensure that meat and meat food retain their excellent consumer qualities [1].

The formation of specified properties of raw meat during the animal's lifetime gives reason to believe that the optimization of feed diets is undoubtedly the first determining factor in influencing the composition and properties of beef [2].

Proper breeding of young stock determines the optimal manifestation of genetically incorporated productive abilities of animals [3]. The feeding level of young animals should provide a planned gain in live weight [3-7].

To solve this problem, it is necessary, in addition to improving existing breeds and breeding new ones, to use the capacity of animals by creating favorable conditions for their feeding and keeping [7-9].

Within this framework, recently the interest of researchers to optimize the lipid nutrition of animals and, especially, highly productive ones, has increased, and the young stock is particularly sensitive to changes in feeding conditions and, in particular, to the fat level in the dry matter diets [9].

The use of fats allows to increase the energy value of diets of high-productive livestock to a level that is difficult to achieve through the use of traditional feed and thereby increase the productive effect of diets.

Lipids manifest a nitrogen-saving effect in the body, eventually, oxidation of amino acids is reduced to ensure its energy requirements and their direction for the synthesis of milk proteins and muscle tissue.

Despite the obvious theoretical and practical feasibility of using fat in the diets of ruminants, the efficiency of its use in the organization of full feeding of highly productive cattle has not yet been sufficiently studied.

High-productive animals noticeably react to insufficient and poor-quality feeding, and often even a slight deviation in the diet causes a decrease in productivity. At the same time, rationed feeding based on a comprehensive analysis of the chemical composition, of a specific set and feed ratio, as well as scientifically grounded detailed norms and balance of diets on them is the decisive criterion for the realization of the genetic capacity of animals with high productivity. A number of studies by domestic and foreign scholars have been devoted to the rationing of fat in feeding cattle for decades since the beginning of the last century. But, by now, there is no consensus among scientists about the optimal fat content in dry matter of diets of cattle, especially high-productive. The analysis of economic diets of cattle with high capacity for milk and meat productivity convinces of the need to optimize them for the content of crude fat in connection with the discrepancy revealed to detailed feeding rates

The aim of this work is a scientific, industrial and economic rationale for the rationing of the fat level in the diets of fattening young cattle with high capacity for meat productivity.

To achieve the aim, the following objectives were set*:*

- to determine the concentration of crude fat in the economic diets of young cattle for fattening;

- to determine the effect of different fat levels in diets on the growth rate of bull-calves, their meat productivity and chemical composition of meat, on physicochemical parameters of muscle and adipose tissues, on functional and technological indicators of beef;

- to identify the degree of digestibility of nutrients and the assimilation of nitrogen by animals;

- to study the effect of different fat levels on the biochemical blood parameters of young animals;

Materials and methods of research. The objects of the research, in the conditions of the Azanovsky breeding farm of the Mari El Republic, were bull-calves of the Holstein Black-and-white breed with high productivity capacity.

Scientific and economic experiments to study the productive action of different levels of fat in the diets of young bulls were carried out in three experimental groups, 10 animals each, formed by the method of pairs-analogues.

Feeding of young stock for fattening was carried out according to diets balanced in the content of nutrients and energy. They consisted of clover haylage, beet molasses, concentrated feed. The energy concentration in 1 kg of dry matter was in the range of 0.98-1.03 EFU. The bulls of the control group received a diet with a fat content of 3.0% in accordance with detailed feeding norms. The increase in the fat level in the diets of bulls of the II and III groups to 4.0 and 5.0% of the dry matter was carried out due to the sunflower oil introduced into the diet by mixing with the concentrated feed.

Meat productivity of animals was studied by indicators of live weight, absolute, average daily and relative gains. Animals were weighed monthly in the morning before feeding. Upon completion of the fattening of animals (at the age of 17 months), a controlled slaughter was conducted (3 bull-calves from each group with a live weight close to the average value) to study their fattening and meat qualities. At the same time, the pre-slaughter weight, the hot carcass weight, the internal fat and the slaughter yield were taken into account. The chemical composition of meat, the calculation of its caloric content and the physicochemical parameters of muscle and fatty tissues were investigated by standard methods.

Research results. Studies have shown that with increasing the fat levels in the diets of bull-calves, their growth rate increases significantly (table 1).

Table 1 – Meat productivity of fattening bull-calves

Indicator	Group					
	I-Control		II-Experimental		III- Experimental	
	at the beginning of the test	at the end of the test	at the beginning of the test	at the end of the test	at the beginning of the test	at the end of the test
Live weight, kg	243.20	430.70	243.00	440.00**	243.60	446.60***
Average daily gain, g	1054.84	871.88	1122.58	971.88***	1177.42*	1006.25***
Relative gain, %	13.45	6.93	14.32	7.61	14.98	7.77
*P < 0.05; **P < 0.01; ***P < 0.001.						

By the end of the experiment, the young stock of the experimental groups exceeded their peers in the control in the average daily gain by 11.47-15.41% and in the relative growth rate by 0.68-0.84%, respectively. During the test period from each bull of the II group, the increase in live weight was 2.16%, and of the III group - 3.69% more than from analogs of the group I. The data show that the most optimal is the concentration of fat in the diets of bull-calves at the level of 5.0%, it contributes to a more effective use of nutrients for the formation of products.

Increasing the fat level in the diets of bulls have a positive impact on the value of their slaughter indicators (table 2).

Table 2 – The results of the controlled slaughter of bull-calves

Indicator	Group		
	I - Control	II - Experimental	III - Experimental
Pre-slaughter live weight, kg	438.33±1.67	445.00±1.87*	455.67±0.41**
Slaughter weight, kg	230.63±2.58	240.34±2.10*	252.70±0.92**
Slaughter yield, %	52.62±0.78	54.01±0.45	55.46±0.20*
Internal fat mass, kg	8.30±0.37	9.17±0.22*	10.70±0.35*
Fat yield, %	1.85±0.06	2.01±0.03**	2.28±0.04**
1 category offal, kg	14.17±0.38	13.05±0.14*	13.48±0.24*
1 category offal yield, %	3.23±0.13	2.93±0.10	2.96±0.05
2 category offal, kg	55.31±1.02	52.64±1.10	54.24±0.70
2 category offal yield, %	12.62±0.29	11.83±0.23	11.90±0.15

At the same time, they surpass their peers in control in the pre-slaughter weight by 1.52% (P<0.05) and 3.96% (P<0.01), in the slaughter weight by 4.21% (P<0.05) and 9.57% (P<0.01), in the slaughter yield by 2.64% and 5.40% (P□0.05). Differences in the mass of offal are insignificant and not reliable. The results indicate a more significant effect of increasing the fat level in the diets of bull-calves of group III on their slaughter indicators and reflect their best meat productivity.

Beef obtained from the young animals of the II and III groups differs significantly (P<0.01-P<0.001) with lower humidity (table 3).

The increase in the fat level in the diets of youngstock of the groups II and III contributes to a reliable (P<0.001-P<0.01) increase in their meat content of dry matter (by 1.39-0.86%) and nutrients, causing a high biological value of beef: protein (by 0.79-0.66%) and fat (1.31-1.36 times higher). A significant increase in the fat content and its share in relation to protein provides an increase in the calorific value of meat (by 10.85-10.62%).

In the beef of the young animals of the experimental groups, after 24 hours of maturation, the pH value decreases (by 1.23-2.29%), which improves its moisture-binding capacity (by 3.44 and 1.20%) and contributes to a decrease in the weight loss of meat during cooking (by 6.45-1.73%).

The biological role of adipose tissue is to accumulate energy, to perform protective, thermoregulatory functions, mechanical work. In addition, adipose tissue is an integral component of meat and meat products. Adipose tissue is a type of loose connective tissue.By anatomical and topographic origin in the

Table 3 – Chemical composition and some functional and technological indicators of meat of bull-calves, %

Indicator	Group		
	I - Control	II - Experimental	III - Experimental
Moisture content	74.52 ± 0.21	73.13 ± 0.17***	73.66 ± 0.18**
Dry matter content	25.48 ± 0.21	26.87 ± 0.17***	26.34 ± 0.18**
Protein content	22.69 ± 0.11	23.48 ± 0.12***	22.84 ± 0.11
Fat content	1.62 ± 0.12	2.12 ± 0.05**	2.21 ± 0.07***
Ash content	1.17 ± 0.04	1.27 ± 0.03	1.30 ± 0.08
Calorific value, kcal	118.00 ± 6.42	130.80 ± 2.99	130.53 ± 3.49
Protein : fat ratio	1 : 14.01	1 : 11.08	1 : 10.33
pH	5.68 ± 0.03	5.61 ± 0.05	5.55 ± 0.04
BCC, % of the total moisture	49.14 ± 0.90	52.58 ± 1.14	50.34 ± 0.68
Losses during cooking, %	46.46 ± 1.20	40.01 ± 0.32**	44.73 ± 0.83

body of animals distinguish subcutaneous, intermuscular and internal adipose tissues. This largely determines its physicochemical properties. The quantity and quality of body fat of animals depend on their type, nutrition, and physiological state.

In studies, it was conducted research on changes in the physicochemical properties of subcutaneous and internal adipose tissues in carcasses of young cattle under the influence of various fat levels in haylage diets (table 4).

Table 4 - Physical and chemical indicators of adipose tissue of fattening bull-calves

Indicators	Group		
	I - Control	II - Experimental	III - Experimental
Melting temperature, °C			
subcutaneousadiposetissue	51.92 ± 3.90	55.05 ± 2.03	56.13 ± 1.80
internal adipose tissues	46.75 ± 1.79	47.18 ± 2.47	50.45 ± 0.61
Iodinevalue, g/100 g			
subcutaneousadiposetissue	54.92 ± 3.05	54.45 ± 3.68	50.06 ± 3.48
internal adipose tissues	38.91 ± 1.35	41.04 ± 2.57	39.26 ± 1.93
Acid number, mg KOH			
subcutaneousadiposetissue	1.16 ± 0.04	0.85 ± 0.16	0.79 ± 0.06**
internal adipose tissues	1.25 ± 0.07	1.18 ± 0.10	1.18 ± 0.09

The research results showed that different fat concentrations in the dry matter of the calvesdiet had a definite influence on the physicochemical properties of adipose tissue of carcasses.

The melting temperature of fat in carcasses of bull-calves of experimental groups has changed towards its increase. In subcutaneous fat of animals of group II, it was higher by 6.0%, and in group III, it was 8.1% higher compared to the group I of young bulls. Less significantly, the melting temperature increased in internal fat (by 0.9% and 7.9%). In this regard, in the experiments of N. Willey et al., it was found that after feeding the bulls with vegetable oil, their depot fat contained more stearic acid and less oleic acid than the bull-calves not received any oil additives. The authors suppose that this is due to the formation, absorption, and deposition of stearic acid, which increases the melting point of the fat, and stearate is formed in the rumen by complex hydrogenation of the C18-unsaturated fatty acids in the oil by microorganisms. At the same time, the determination of the iodine value confirmed that the unsaturated acids of edible oils were subjected to significant hydrogenation.

Iodine value, along with the indicator of the melting temperature, allows to judge the degree of unsaturation of fats. In the conducted studies, no significant effect of various fat levels in the dry matter of diets on the change of this indicator was found.

In case of a large amount of unsaturated fatty acids in the fat, its ability to self-oxidation enhances, resulting in the formation of dangerous oxidation products - peroxides and hydroperoxides. The use of fat supplements in diets promoted a decrease in the acid value in the subcutaneous fat of young bulls of the

group II by 26.7% and by 31.9% in carcasses of bulls of the group III compared to this indicator in the first group. A less significant effect of fat diets on the acid number was observed in the internal fat. In the II and III groups, the indicator under studies was lower only by 5.6%.

Feeding bull-calves with diets containing 5% of fat in the dry matter to a greater extent helps to increase slaughter indicators and increase protein content, fat in meat and its calorific value, improve water binding capacity of muscle tissue and increase fat deposition, herewith the acid number declines.

The data obtained in the course of tests show that with advancing fat content in the dry matter of diets of fattening young animals from groups II and III, the digestibility (P<0.05-0.01) of dry matter (by 2.43 and 0.39%) and organic matter (by 2.15 and 0.38%), crude protein (by 2.30 and 2.83%), crude fat (by 2.56 and 3.56%), cellulose (by 3.40 and 0, 23%) (table 5).

Table 5 – Coefficient of digestibility of feed nutrients

Nutrient	Group		
	I - Control	II - Experimental	III - Experimental
Dry matter	63.99±0.47	66.42±0.46*	64.38±0.40
Organic matter	66.72±0.58	68.87±0.49*	67.10±0.76
Protein	60.76±0.39	63.06±0.36*	63.59±0.44**
Fat	75.76±0.34	78.32±0.42**	79.32±0.32**
Cellulose	49.74±0.35	53.14±0.44**	49.97±0.78
Nitrogen-free extractive substances	84.50±0.57	84.96±0.65	83.06±0.67

The effectiveness of positive effect of the elevated fat levels in the diets of young stock from experimental groups on the digestibility of feed protein is confirmed by the nitrogen balance and a reliable (P<0.05-0.01) increase in retention rate in the body by 3.17-5.61% (table 6), caused by the strengthening assimilation processes in them, and, consequently, metabolic processes.

Table 6 – Use of nitrogen, g

Indicator	Group		
	I - Control	II - Experimental	III - Experimental
Received with forage, g	223.38±0.58	222.97±0.21	223.35±0.43
Allocated with feces, g	87.66±0.94	82.38±0.57*	81.32±0.96*
Digested, g	135.72±0.37	140.60±0.79*	142.03±0.53*
Allocated withurine, g	81.21±0.60	84.35±0.77*	84.46±0.84*
Retained in the body, g:	54.52±0.49	56.25±0.52*	57.58±0.34**
% of the received	24.41±0.26	25.22±0.25*	25.78±0.19*
% of the degested	40.17±0.46	40.02±0.53	40.53±0.65

With an increase in the fat level in the dry matter of the diets of young bulls, there is a significant (P<0.05-0.01) improvement in the digestibility of nitrogenous substances in the digestive tract (by 3.60-4.65%). Therefore, at optimizing the fat content in the diet, the nitrogen-saving effect is clearly manifested. Nitrogen is more efficiently used by the body of young animals for plastic purposes, which is consistent with an increase in their live weight (Table 1). In general, the most favorable effect on nitrogen absorption of fodder is provided by the fat level of the calves diets equal to 5%.

Metabolic disorders occur as a result of inaccuracy of feeding, keeping and economic use of animals. The imbalance in diets, even for several nutrients, can cause serious disturbances in the life activity of the whole organism, leading to a decrease in dairy productivity and a deterioration in the health status of cows. At the same time, changes caused by exposure to environmental factors, which include feeding, are reflected in the body primarily on the composition and parameters of the blood [10, 11].

All changes in the metabolism ongoing in the body of animals under the influence of their physiological state, age, disease, feeding and other factors are quite clearly reflected in hematological parameters. In this regard, a study was conducted on the effect of different fat levels in the dry matter of the diet on the state of lipid and nitrogen metabolism in fattened young cattle.

Blood is a kind of indicator reflecting the pattern of metabolism in the animal body. It is one of the most important systems playing an indispensable role in its life activity, it is a "mirror" in which all

changes in metabolic processes are clearly reflected, it predicts the appearance of the first, poorly-defined clinical symptoms of the disease [12].

All types of metabolism are closely related to each other and when the shift of one of the links of metabolism, any other is broken. Therefore, to ensure the productivity of bull-calves, it is necessary to monitor all the important indicators that most reflect all aspects of metabolism and the state of health of the animal.

In this connection, changes in the blood chemistry values characterizing lipid and protein metabolism were studied, with increasing fat levels in the dry matter of diets of the Holstein bull-calves.

It is known that the main lipidic components of blood are: neutral fats or triglycerides, phospholipids, cholesterol esters, free cholesterol and non-esterified fatty acids. The body uses lipids mainly as a source of energy for various metabolic processes. However, some lipids, especially cholesterol, phospholipids and a small portion of triglycerides perform plastic functions in the formation of membranes and structural components of cells.

Increase in the fat content in bull-calves has an effect on the increase in the lipid components level in their blood, which generally speaks for an improvement in the biochemical parameters characterizing lipid metabolism (figure 1).
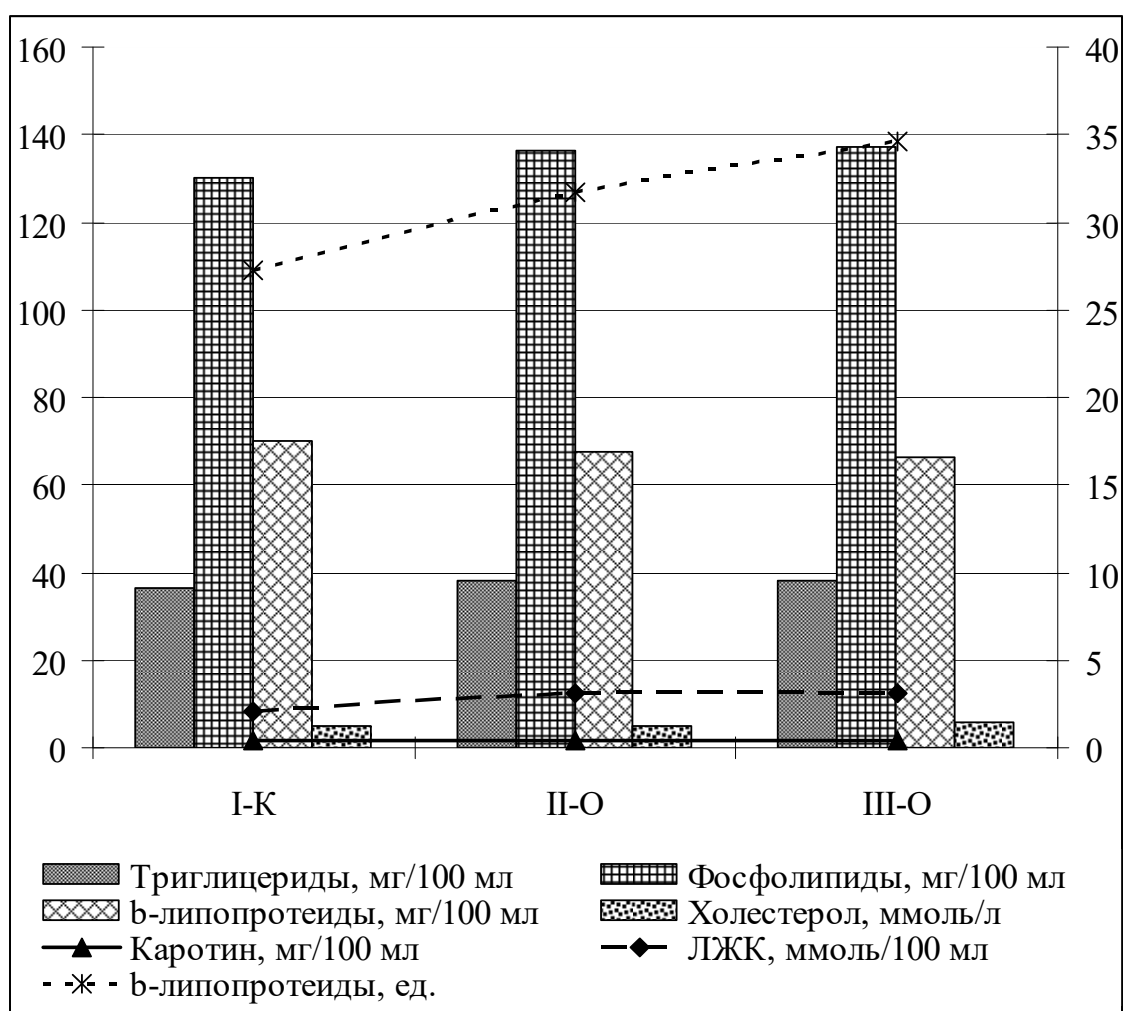

Figure 1 – Indicators of lipid metabolism in the blood of bull-calves

An increase of total lipids in the blood concentration (by 10.38–18.62%) and triglycerides (by 4.75%) indicates a positive effect of an adjustment of fat concentration in diets on the functional activity of liver, which synthesizes these substances.

Cholesterol enters the body of animals not only with fodder, also its significant amount is synthesized in the liver. Consequently, an increase in cholesterol concentration in blood of bulls of the group III by 14.20% compared to the control indicates an efficient functioning of the liver and improvement of metabolic processes in the body. Strengthening the absorption of VFA in the rumen was reflected in a significant increase (P<0.01) of their content in the bulls' blood by 1.5-1.6 times.

Increasing the fat concentration in their diets had no significant effect on the β-lipoproteins level in their blood. In the blood serum of animals received elevated fat levels in diets, the content of carotene increases by 4.88 and 9.76%, which better provides the provitamin metabolism of the body.

Thus, with an increase of fat level in the diet of bulls to 5%, its impact on lipid metabolism is more obvious, which is suggested to be optimal.

An important indicator of body metabolism and blood condition is the proteins content and the protein fractions ratio. Serum proteins play a significant role in maintaining blood viscosity, colloid-oncotic pressure, in ensuring the transport of many substances. Elevating the fat level in the dry matter of the diet has some effect on the blood indicators of young bulls, which characterize nitrogen metabolism.

With an increase in fat concentration in the dry matter of the diets of bulls, the protein content in the blood serum grows (by 4.24-5.56%), including the albumin and globulin fractions (figure 2), it indicates the strengthening the protein synthesis in the liver of fattening young stock due to a significantly better (P<0.05-0.01) digestibility of the protein of the consumed feed, nitrogen retention rate in the body (P<0.05) and directly related to the level of protein concentration in the blood serum.
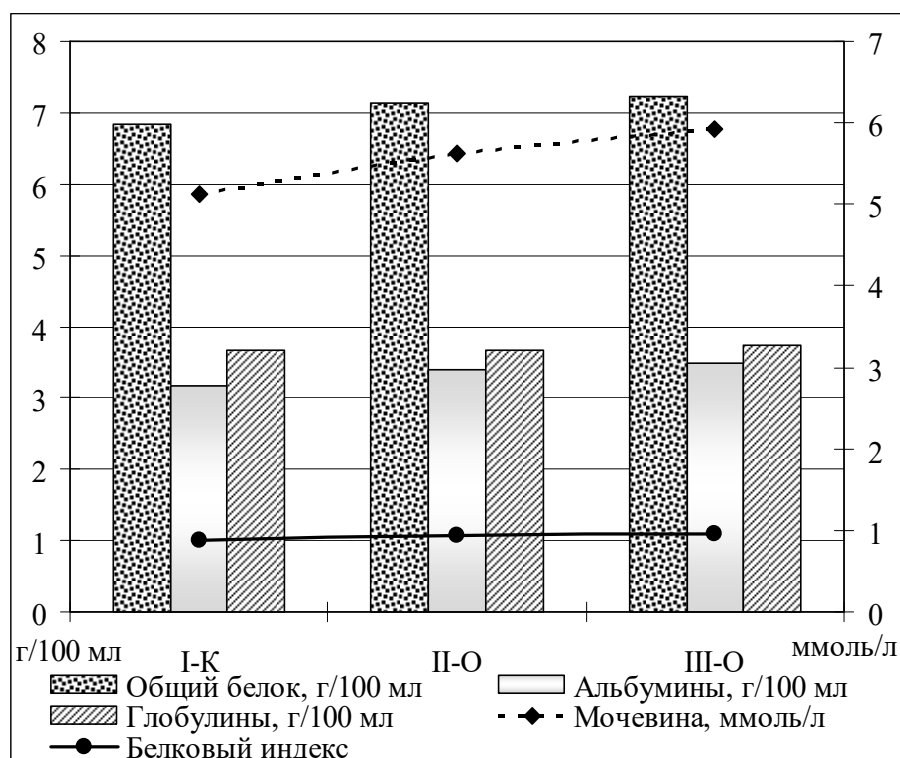

Figure 2 – Indicators of nitrogen metabolism in the blood of bull-calves

Increase of albumin in total protein (by 7.26-10.10%) shows the enhancement of assimilation processes that ensure the synthesis of specific tissue proteins and those serving as the body's amino acid reserve, which resulted in a more intense absolute and relative growth rate of bull-calves of the experimental groups (table 1).

The increase in the globulin fraction concentration (by 1.9%) in the blood of bulls of the group III was due to an increase in the γ-globulin content (by 3.47 and 12.50%). Lipoproteins are present in this fraction, therefore, an increase in the number of β-globulins is directly related to an increase in the fat level in diets and is coherent with an improvement of digestibility of fat and protein in diets.

An increase in the protein index in the blood serum (by 6.90–9.20%), due to an increase in the fat level in the bull-calves' diets, suggests a more efficient use of nitrogen feed and increased intensity of protein biosynthesis and protein metabolism. This is confirmed by a significant increase (P<0.05) in the nitrogen retention rate in the body and is consistent with enhancing live weight gain (Table 1).

Thus, feeding of young animals for fattening with diets containing the optimal fat level in a dry matter provides a higher level of realization of the hereditary meat productivity, which is manifested:

- in increasing the slaughter yield (by 2.84%, P<0.05), the protein and fat mass fractions in beef, (P<0.001), in increasing its calorific content and improving functional and technological properties - reducing the pH of meat by 2.29% and strengthening its water binding capacity;

- in increasing the intensity of lipid and protein metabolism, as evidenced by blood chemistry values: there is an enhancement of the concentration of VFA (1.6 times), total lipids (by 18.62%, P<0.05), phospholipids (by 5.73 %, P<0.05), triglycerides (by 4.75%), cholesterol (by 14.20%), urea (by 15.60%, P<0.05), the total protein content, including albumin, globulin fractions and protein index (by 9.20%) characterizing the enhancing in the intensity of assimilation processes in the body of young animals, which is coherent with the increase in their live weight gain;

- in multiplying of the intensity of carbohydrate and mineral metabolism, expressed in an increase in glucose concentration (by 8.09%, P<0.05) as an energy component in the blood of young bulls and inorganic phosphorus - by 10.26% used in the synthesis of nucleic acids and other substances.

Based on the results of scientific and economic experiments, complex physiological studies, in order to advance the usefulness and productive action of feeding at intensive fattening of young cattle with high productivity capacity, it is recommended to inject 5.0% of crude fat of the dry matter in the diet.

Conclusions. Feeding of young animals for fattening with diets containing the optimal fat level in a dry matter provides a higher level of realization of the hereditary meat productivity, which is manifested:

- in increasing the slaughter yield (by 2.84%, P<0.05), the protein and fat mass fractions in beef, (P<0.001), in increasing its calorific content and improving functional and technological properties - reducing the pH of meat by 2.29% and strengthening its water binding capacity;

- in increasing the intensity of lipid and protein metabolism, as evidenced by blood chemistry values: there is an enhancement of the concentration of VFA (1.6 times), total lipids (by 18.62%, P<0.05), phospholipids (by 5.73 %, P<0.05), triglycerides (by 4.75%), cholesterol (by 14.20%), urea (by 15.60%, P<0.05), the total protein content, including albumin, globulin fractions and protein index (by 9.20%) characterizing the enhancing in the intensity of assimilation processes in the body of young animals, which is coherent with the increase in their live weight gain.

Consequently, the obtained results convince us that bull-calves fed with a diet with 5% of fat per dry matter have higher meat productivity, beef obtained from them is characterized by the best quality indicators, which made it possible to consider this fat level as optimal.

О. Ю. Петров[1], Д. А. Баймуканов[2], В. Г. Семенов[3], В. Г. Тюрин[4], Н. Н. Кузьмина[1],
А. К. Несипбаева[5], М. М. Жылкышыбаева[5], М. Ш.Ережепова[5], К. Б. Апеев[5]

[1]Марий мемлекеттік университеті, Йошкар-Ола, Марий Эл Республикасы, Ресей,
[2]Қазақ мал шаруашылығы және азық өндіру ғылыми-зерттеу институты, Алматы, Қазақстан,
[3]Чуваш мемлекеттік аграрлық академиясы, Чебоксары, Чуваш Республикасы, Ресей,
[4]Бүкілресейлік ветеринарлық санитария, гигиена және экология ғылыми-зерттеу институты, Мәскеу, Ресей,
[5]Қазақ ұлттық аграрлық университеті, коммерциялық емес акционерлік қоғам, Алматы, Қазақстан

БҰҚАЛАР РАЦИОНЫНДА МАЙДЫҢ ӘРТҮРЛІ ДЕҢГЕЙЛЕРІНДЕГІ ӨНІМДІЛІГІНЕ ӘСЕРІ

Аннотация. Мал шаруашылығы өнімдерінің сапасын айқындайтын маңызды факторлардың бірі - оларды өндіру шарттары. Жануарлардың ет өнімділігі олардың толық қоректенуіне тікелей әсер етеді, бұл ретте денені қажетті қоректік заттармен қамтамасыз етеді. Липидтер жануарлардың толық тамақтануында маңызды. Дегенмен, бордақылау кезінде жас малдың липидті қоректенуінің көптеген мәселелері, оның өнім сапасына әсер етуі жеткілікті түрде ашылмаған.

Осыған байланысты бордақыланған бұзаудың рационында майдың деңгейін олардың ет өнімділігіне және сиыр етінің және союдың кейбір өнімдерінің сапалық көрсеткіштерінің артуы туралы зерттеулер жүргі-

зілді. 4 және 5% (II және III топтар) деңгейіндегі күнбағыс майы қосындылары бордақылаудағы бордақылау бұзауының рационында құрғақ заттарға қатысты есептелді. Бақылау - құрғақ заттардың 3%-дық құрамы бойынша әдеттегі экономикалық рационды алған жануарлардың I тобы.

Зерттеулер көрсеткендей, бордақылау қышқылдары рационында май деңгейінің өсуі ет өнімділігіне оң әсерін тигізді, олардың өсім қарқындылығының артуына, сиырдың көрсеткіштерін жақсартуға, сиыр етінің кейбір функционалдық және технологиялық қасиеттеріне және май тінінің физико-химиялық параметрлерін жақсартуға ықпал етті.

Майдың деңгейін оңтайландыру липидті және ақуызды алмасу процестерінің қарқындылығын артты-руға мүмкіндік берді, бұл жас жануарлар денесінде ассимиляция процестерінің өсуін сипаттайды, бұл олар-дың дене салмағының өсуіне байланысты.

Осыған байланысты, алынған нәтижелер құрғақ заттардың құрамында 5% май құрамымен рационымен тамақтандырылған бұқа етінің ет өнімділігі жоғары екендігін көрсетеді. Олардан жақсы сапа көрсеткіштері-мен ерекшеленген сиыр еті, бұл май деңгейін оңтайлы деп санауға мүмкіндік берді.

Түйін сөздер: жоғары өнімді жануарлар, бұқалар, рационадағы май деңгейлері, ет өнімділігі, сиыр еті, субпродукт, майлы тіндері, химиялық құрамы, функционалдық және технологиялық қасиеттері, физикалық және химиялық параметрлері, липидті метаболизмі, ақуыз алмасу, оңтайлы май деңгейлері, сіңімділік.

О. Ю. Петров[1], Д. А. Баймуканов[2], В. Г. Семенов[3], В. Г. Тюрин[4], Н. Н. Кузьмина[1],
А. К. Несипбаева[5], М. М. Жылкышыбаева[5], М. Ш. Ережепова[5], К. Б. Апеев[5]

[1]Марийский государственный университет, Йошкар-Ола, Республика Марий Эл, Россия,
[2]Казахский научно-исследовательский институт животноводства и кормопроизводства, Алматы, Казахстан,
[3]Чувашская государственная сельскохозяйственная академия, Чебоксары, Чувашская Республика, Россия,
[4]Всероссийский научно-исследовательский институт ветеринарной санитарии, гигиены и экологии,
Москва, Россия,
[5]Некоммерческое акционерное общество«Казахский национальный аграрный университет»,
Алматы, Казахстан

ПРОДУКТИВНОЕ ДЕЙСТВИЕ РАЗЛИЧНЫХ УРОВНЕЙ ЖИРА В РАЦИОНАХ БЫЧКОВ

Аннотация. Одним из важных факторов, определяющих качество продуктов животного происхожде-ния, являются условия их производства. На мясную продуктивность животных оказывает непосредственное влияние их полноценное кормление, обеспечивающее организм всеми необходимыми питательными веще-ствами. Важное значение в полноценном кормлении животных имеют липиды. Однако многие вопросы липидного питания молодняка крупного рогатого скота при откорме, связанные с его влиянием на качество продукции еще недостаточно раскрыты.

В связи с этим, проведены исследования в которых было изучено влияние повышения уровня жира в рационах бычков на откорме на их мясную продуктивность и ряд качественных показателей говядины и некоторых продуктов убоя. В рационы бычков, находящихся на откорме, вводились добавки подсолнечного масла до уровня 4 и 5 % (II и III группы) в расчете на сухое вещество. В качестве контроля служила I группа животных, получавшая обычный хозяйственный рацион с содержанием жира на уровне 3 % от сухого ве-щества.

Исследованиями установлено, что повышение уровня жира в рационах откармливаемых бычков оказало положительное влияние на мясную продуктивность, способствовало повышению интенсивности их роста, улучшению убойных показателей, химического состава и некоторых функционально-технологических свойств говядины и физико-химических показателей жировой ткани.

Оптимизация уровня жира в рационах способствовала повышению интенсивности процессов липидного и белкового обмена, характеризующих усиление ассимиляционных процессов в организме молодняка, что согласуется с увеличением прироста их живой массы.

В связи с этим, полученные результаты свидетельствует, что более высокую мясную продуктивность имели бычки, откормленные на рационе с содержанием 5 % жира в расчете на сухое вещество. От них полу-чена говядина, которая характеризовалась лучшими качественными показателями, что позволило считать этот уровень жира оптимальным.

Ключевые слова: высокопродуктивные животные, бычки, уровень жира в рационе, мясная продуктив-ность, говядина, субпродукты, жировая ткань, химический состав, функционально-технологические свой-ства, физико-химические показатели, липидный обмен, белковый обмен, оптимальный уровень жира, пере-варимость.

Information about authors:

Petrov Oleg Yuriyevich, Doctor of Agricultural Sciences, Associate Professor of the Department of technology of meat and dairy products, Mari State University, Yoshkar-Ola, Mari El Republic, Russia; tmspetrov@yandex.ru; https://orcid.org/0000-0002-3647-5345

Baimukanov Dastanbek Asylbekovich, Doctor of Agricultural Sciences, Professor, Corresponding member of the National Academy of Sciences of the Republic of Kazakhstan, Chief Researcher of the Integrated Division of Dairy Cattle Breeding, Kazakh Scientific Research Institute of Animal Breeding and Fodder Production, Almaty, Kazakhstan; dbaimukanov@mail.ru; https://orcid.org/0000-0002-4684-7114

Tyurin Vladimir Grigoryevich, Doctor of Sciences in Veterinary, Professor, Head of the Laboratory of Zoo-hygiene and Environmental Protection, All-Russian Scientific Research Institute of Veterinary Sanitation, Hygiene and Ecology, Moscow, Russia; potyemkina@mail.ru; https://orcid.org/0000-0002-0153-9775

Semenov Vladimirl, Doctor of Biological Science, professor, honored worker of science of the Chuvash Republic, professor of Department of Morphology, Obstetrics and Therapy of the Chuvash State Agricultural Academy, Cheboksary, Chuvash Republic, Russia; semenov_v.g@list.ru; https://orcid.org/0000-0002-0349-5825

Kuzmina Nadezhda Nikolaevna, teacher-assistantof the Department of technology of meat and dairy products, Mari State University, Yoshkar-Ola, Mari El Republic, Russia; kuzmina221995@mail.ru; https://orcid.org/0000-0002-8552-6364

Nesipbayeva Aigul Kadirovna, Candidate of Sciences in Veterinary, Associate Professor of the Department of Physiology, Morphology and Biochemistry named after academician N. U. Bazanova, Kazakh National Agrarian University, Almaty, Kazakhstan; Aigul_n78@mail.ru; https://orcid.org/0000-0002-1986-3637

Zhylkyshybayeva Meruert Malikovna, Candidate of Science in Biology, Associate Professor of the Department of Physiology, Morphology and Biochemistry named after academician N. U. Bazanova, Kazakh National Agrarian University, Almaty, Kazakhstan; m.malikovna78@mail.ru; https://orcid.org/0000-0002-4746-9514

Yerezhepova Makpal Shamakhanovna, Master of Science, teaching assistantof the Department of Physiology, Morphology and Biochemistry named after academician N. U. Bazanova, Kazakh National Agrarian University, Almaty, Kazakhstan; princessa.maki@mail.ru; https://orcid.org/0000-0002-3945-4611

Apeev Kuanysh Bolatbekovich, Master of Science in Veterinary,teaching assistantof the Department of Physiology, Morphology and Biochemistry named after academician N. U. Bazanova,Kazakh National Agrarian University, Almaty, Kazakhstan; Kuanysh_apeev@mail.ru; https://orcid.org/0000-0001-7927-4589

REFERENCES

[1] Kudryashov L.S. (2008). Physicochemical and biochemical basis for the production of meat and meat products. Moscow: DeLiprint. 160 p. (in Russ.).

[2] Popova O.M., Giro T.M. (2012). Optimization of feed diets of livestock to improve the quality of raw meat. Meat industry. Moscow. № 1. p. 38-40. (in Russ.).

[3] Antal J., Blago R., Bulla J., Sokol J. (1986). Growing young cattle; transl. from Slovak E.I. Ptak Moscow: Agropromizdat. 186 p. (in Russ.).

[4] Batanov S., Krasnova O., Shakhova E., Safin R. (2009). Evaluation of the meat quality of black and white cattle. Dairy and beef cattle. Moscow. № 4. –p. 2-4.(in Russ.).

[5] Maksimyuk N.N., Skopichev V.G. (2004). Animal feeding physiology. The theory of nutrition, feed intake, especially digestion. SPb: Lan - 256 p. (in Russ.).

[6] Pykhtina L.A., Ulitko V.E., Desyatov O.A. (2018). Improving the efficiency of use of waste from technical production in the fattening of young cattle. Zootechnics. № 7. p. 13-17. (in Russ.).

[7] Semenov V.G., Mudarisov R.M., Nikitin D.A. (2018). The meat quality of black-and-white bull-calves when using biological preparations of the prevention series. Modern scientific research: current issues, achievements and innovations in the AIC. Coll. of materials of the All-Russian Scientific Practical. Conf., dedicated to the 145th anniversary of the Academy. P. 157-162. (in Russ.).

[8] Batanov S.D., Korepanov L.V. (2011). Meat productivity of purebred and crossbred bulls. Zootechnics. Moscow. № 6. p. 17-18.(in Russ.).

[9] Rozhentsov A.L. et al. (2009). The need of cattle in fat. Topical issues of improving the technology of production and processing of agricultural products. Mosolovskie readings: Proceedings of the regional scientific-practical conference. Yoshkar-Ola: Mari st.univ. Pp. 163-165. (in Russ.).

[10] KorchaginYu.A. (2010). Biochemical studies of serum. Bulletin. Yaroslavl: ICS AIC of the Yaroslavl region. № 6. 12 p. (in Russ.).

[11] Chabaev M.G., Tedtova V.V., Baeva Z.T., Kononenko S.I., Tarchokov T.T., Chopikashvili L.V. (**2018**). Effect of different adsorbent doses on the morphological and biochemical composition of blood of bull calvesin detoxication of heavy metals. Journal of Pharmaceutical Sciences and Research. T. 10. Vol. 5. P. 1122-1124.

[12] Baimukanov D.A., Pristupa V.N., Kolosov Yu.A., Donnik I.M., Torosyan D.S., Kolosov A.Yu., Orlova O.N., Yuldash-bayev Yu.A., Chylbak-ool S.O. (**2019**). Improvement of breeding and productive traits of Kalmyk cattle breed // Bulletin of national academy of sciences of the Republic of Kazakhstan. Volume 1, Number 378 (2019), 128 – 145. https://doi.org/10.32014/2019.2518-1467.51 ISSN 2518-1467 (Online), ISSN 1991-3494 (Print).

Publication Ethics and Publication Malpractice
in the journals of the National Academy of Sciences of the Republic of Kazakhstan