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# Indexes of nitrogenous exchange in organisms of high-yield cows in dependence from various concentration of lipids in diets

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**Abstract.** Animals of control groups received a diet with the maintenance of 3,5% of fat according to the detailed norms of feeding. Increase in level of fat in diets of analogs II and III groups up to 4,5 and 5,4% of its nonvolatile solid was carried out at the expense of the sunflower-seed oil entered into a diet by interfusing with concentrated compound feed. Zootechnical, hematological and biochemical researches were conducted with use of the practical standards. In this article the expediency of optimization of level of crude fat in diets of high-yield cows of golshinsky breed is experimentally proved. It improves a condition of proteometabolism in their organism what the positive nitrogen balance, increase in extent of its deduction in a body and uses on formation of milk to testifies. Thus, strengthening of lipids in nonvolatile solid of diets of the high-yield lactating cows renders particular and, in general, positive influence on key indicators of nitrogenous metabolism in their organism.

## 1. Introduction

In an organism of high-yield cows exchange processes intensively proceed, a large amount of energy and nutrients for synthesis of milk is spent. All systems of an organism work with larger tension [1–3]. In this regard recently more and more attention is given to researches of separate groups of substances.

Researchers are devoted to studying of change of the key indicators characterizing a condition of proteometabolism in an organism of high-yield cows under the influence of various concentration of lipids in nonvolatile solid of their diets. An object of researches was cows of golshinsky breed who received diets with the different level of fat [4]. Change of level of fat in diets of cows of experienced groups was carried out by padding inclusion in their diets of the seed fat added to concentrated compound feed. As a result of the conducted researches it was established that increase in level of fat in diets of cows from 3.5 to 4.5 and 5.4% respectively, in general, promoted strengthening of the common nitrogen in cicatricial liquid increases that in turn promoted increase in formation of microbial protein [5]. Also by us it was established that increase in level of fat in diets promotes improvement at them oxidation-reduction processes and use of a protein from diets that was expressed in decrease of selection of nitrogen with a feces and urine and to strengthening of its adjournment in an organism of cows and formations of milk. For confirmation of the positive influence increased (in comparison with control group) the level of fat milk from experienced cows was investigated. Various concentration of fat had no significant effect on the content of the common protein, at simultaneous increase in maintenance of a casein in milk of the second group to both quite noticeable and its reliable decrease in the third group. On the basis of the researches conducted by us, it is possible to draw a



conclusion that optimum it is necessary to consider the level of 4.5% of fat from nonvolatile solid of a diet of cows.

## 2. Experimental research

The purpose of our researches was studying of influence of different levels of fat in diets of high-yield cows on a condition of nitrogenous exchange and, in particular, on the level of nitrogenous fractions in a fluid part of contents of a hem, on balance and digestion of nitrogen from diets, on protein content and a casein in milk of cows of experienced groups.

For the solution of an objective, in breeding economy of the Republic of Mari El, we made experiments on studying of influence of various concentration of fat in nonvolatile solid of diets of cows of golshinsky breed during the second period of lactation.

Animals of control groups received a diet with the maintenance of 3.5% of fat according to the detailed norms of feeding. Increase in level of fat in diets of analogs II and III groups up to 4.5 and 5.4% of its nonvolatile solid was carried out at the expense of the sunflower-seed oil entered into a diet by interfusing with concentrated compound feed.

Zootechnical, hematological and biochemical researches were conducted with use of the practical standards.

## 3. Results and considerations

In the conducted researches change of a condition of nitrogenous exchange under the influence of different levels of fat in diets (table 1) is studied.

**Table 1.** Key Indicators of Nitrogenous Exchange in an Organism of Cows.

Indexes	Groups		
	I	II	III
Concentration of nitrogenous fractions in contents of a hem, g/l			
Total nitrogen	0.891±0.01	0.952±0.01 *	0.920±0.01
Non-protein nitrogen	0.371±0.01	0.377±0.005	0.361±0.009
Protein nitrogen	0.520±0.01	0.574±0.006 *	0.558±0.005 *
Use of nitrogen of diets			
It is accepted with a forage, g	254.6±0.21	255.4±1.06	255.2±1.36
It is allocated with a stake, g	84.9±1.44	77.9±1.29 *	83.9±2.07
It is digested, g	169.7±1.32	177.5±0.84 **	171.3±2.40
It is allocated with urine, g	103.4±2.46	103.4±2.11	102.7±2.38
It is allocated with milk, g	54.1±1.38	59.6±1.17	58.5±1.54
Use % for milk:			
from accepted	21.2±0.16	23.3±0.15 **	22.9±0.18 *
from digested	31.8±0.21	33.5±0.28 *	34.1±0.27*
It is withheld in a body, g:	12.2±0.10	14.5±0.12 **	10.1±0.14 **
in % of accepted	4.8±0.06	5.7±0.07 **	3.9±0.05 *
from digested	7.3±0.08	8.1±0.10 *	5.9±0.11
It is used on milk and withheld in a body, g:			
in % of accepted	66.3±1.54	74.1±1.32 *	68.6±1.66 *
in % of digested	26.0±0.22	29.0±0.25 *	26.9±0.23
	39.1±0.29	41.5±0.38 *	40.3±0.38
Content of the general protein and casein in milk			
General protein, g	30.76±0.06	30.76±0.06	29.58±0.05
including casein. g	24.08±0.04	24.20±0.03*	22.86±0.04

Note: \* P<0.05 \*\* P<0.01.

Concentration of nitrogenous substances in cicatricial liquid directly depends on structure of a diet and also some fodder factors what can be, for example, various concentration of fat in diet nonvolatile solid. Indexes of nitrogenous metabolism in a hem demonstrate that with increase in content of fat in a diet, the activity of the bacteria destroying a protein of forage and synthesizing microbial protein increases. Therefore, with increase in amount of fat in diet nonvolatile solid up to 4.2%, the amount of the common nitrogen in cicatricial liquid increases in comparison with the I group by 6.73% ( $P < 0.05$ ), that demonstrates improvement of digestibility of a protein of a forage and occurs due to transition of readily soluble proteins of a forage to cicatricial liquid and also synthetic processes in a hem, including formation of microbial protein. Further strengthening of fat up to 5.2% led to decrease in content of the common nitrogen in a hem for 3.5% concerning the second experienced group, but it was 3.14% higher in comparison with monitoring.

The nitrogen compound connections of proteinaceous and nonprotein character which came to a hem collapse with their subsequent deamination. Respectively, in a hem of cows of the II group body height of level of nonprotein nitrogen is noted (for 1.62%). The microflora of a hem uses nonprotein nitrogen and, in particular, ammonia for protein synthesis that caused reliable ( $P < 0.05$ ) increase in content of protein nitrogen in a hem of cows of the II group for 10.39%, and the III groups - for 7.31% and demonstrates activation of metabolic processes a hem.

Key indicator of proteometabolism in an organism is the nitrogen balance. The data indicating influence of various sources and levels of fat in diets of cows on balance and use of nitrogen of diets by them [1] are provided in references.

Increase in level of fat in diets of cows causes reliable strengthening at them oxidation-reduction processes and use of a protein, and, therefore, and processes of a metabolism.

During balance experience it is established that when strengthening fat in nonvolatile solid of a diet decrease in the nitrogen emitted with some feces was observed: in the II group for 8.25% ( $P < 0.05$ ), and in III for 1.2%.

Selection of nitrogen with urine in all groups was almost identical. With milk selection of nitrogen at animals of the II group increased by 10.2%, the third for 8.1%. At the same time extent of use of nitrogen from accepted with a forage increased respectively for 2.1 and 1.7%, and from digested for 1.7 and 2.3%.

The effectiveness of action of the increased fat level in a diet of cows of the II group on digestibility of a protein of forage is confirmed by a positive nitrogen balance and improvement of extent of its deduction in a body. Thus, with increase in level of fat in a diet from 3.2 to 4.2% deduction of nitrogen increased by 18.9%, and at increase it up to 5.2% deduction of nitrogen decreased by 17.2%.

Common use of nitrogen of forages on formation of milk and deduction in a body of animals at fat level in nonvolatile solid of a diet of 3.2% made 66.3 g. Increase in level of fat to 4.2% promoted improvement of use of nitrogen for 11.76%, and increase to 5.2% - for 3.47%. At the same time extent of use of nitrogen from accepted with a forage authentically increased respectively for 3.0 and 0.9%, and from digested - for 6.1 and 3.0%.

Therefore, more beneficial effect on use of nitrogenous substances of a forage was exerted by fat level in nonvolatile solid of a diet of cows of equal 4.2% as at cows of the II group the amount of the nitrogen emitted with feces decreases and, respectively, the share of digested increases, extent of its use on milk from accepted with a forage and from digested increases that is bound to body height of their yield of milk as milk protein content is rather constant. At the same time cows of the II group the amount of the nitrogen withheld in a body increases.

Content of the common protein and its separate fractions in milk of cows belongs to the most important indicators of proteometabolism having practical value [6, 7].

By the conducted researches it is established that increase in the fat coming to an organism with sterns had no significant effect on the maintenance of a mass fraction of protein in milk during experience. Despite slight influence of various levels of fat in diets of cows on the maintenance of a mass fraction of the common protein in milk, nevertheless, they affected change of maintenance of

proteinaceous fractions and, in particular, casein. At the same time some tendency of decrease in protein content in milk when feeding diets in which nonvolatile solid the level of fat was 5.2% was shown. At the same time, at the level of 4.2% of fat in nonvolatile solid of diets of cows of the II group, the number of the experience of milk protein got for the period from each cow increased by 11.5% that occurred, mainly thanks to increase in their lactic efficiency.

Increase in level of fat in diet nonvolatile solid from 3.2 to 4.2% promoted increase in maintenance of a casein during the second month of experience on the 3.06, third - on the 2.83, fourth - on the 2.45, fifth - on the 2.54, sixth - on 1.22, on average for experience - for 2.9%. Increase in level of fat in a diet up to 5.2%, on the contrary, caused decrease in maintenance of a casein in milk of cows of the III group, respectively on months on 33.13; 3.93; 3.24; 0.41; 5.51; 6.94 and on average for experience - for 3.8%.

It is known that biochemical indexes of blood quite precisely reflect a picture, the processes happening in an organism, especially, if it to fall into high-yield cows. Content of the common protein of a blood plasma and its distribution on separate proteinaceous fractions belongs to the most important indicators of proteometabolism having clinical value.

Due to the change of level of crude fat in a diet of cows, its slight influence on the content of the common protein and proteinaceous fractions in serum of their blood (Table 2) was observed.

**Table 2.** Indexes of proteometabolism in blood of cows.

Indexes	Groups		
	I	II	III
Common protein, g/l	92.12±2.37	86.68±1.27	84.66±0.83
Albumins, g/l	38.50±1.84	35.19±1.34	33.28±1.21 *
% to the common protein	41.80±1.77	40.60±1.44	39.31±1.14
Globulins, g/l	53.62±2.19	51.49±1.51	51.38±0.77
% to the common protein	60.25±1.77	59.40±1.44	60.68±1.14
including $\alpha$ -globulins, %	12.16±1.18	10.74±0.70	10.33±0.27
$\beta$ -globulins, %	12.92±2.75	11.78±0.79	10.82±0.90
$\gamma$ -globulins, %	28.54±2.09	28.98±.28	30.23±2.32
Proteinaceous index	0.70±0.04	0.69±0.04	0.62±0.03
Urea, mmol/l	5.16±0.19	5.80±0.20	6.10±0.23 *

In researches it is noted that at increase in level of fat to 4.2% there was a decrease in content in blood serum of the common protein by 5.9%, and at further increase at animals of the III group - for 8.1%

However, on the level of the common protein it is impossible to estimate objective the delivery level as this index can change under the influence of many factors that are not relating immediately to a delivery animal, but the characteristic of some metabolic disorders and function of a liver. In this regard, concentration of albumins in blood serum is controlled. Trial functions of albumins – maintaining of onkotichesky pressure, participation in transport of the free fatty acids, a bilirubin, steroid hormones, a magnesium, calcium, etc. With increase in level of fat in nonvolatile solid of diets of cows, the tendency to slight decrease of maintenance of albumins in blood serum on 3.31 and 5.22 g/l ( $P<0.05$ ), and globulins - on 2.13 and 2.24 g/l is noted. The maintenance of  $\alpha$ -globulins decreased only by 1.42 and 1.83%, and  $\beta$ -globulins - for 1.14 and 2.1%. Unlike these fractions of proteins, the share of  $\gamma$ -globulins increased. Increase in a share of  $\gamma$ -globulins by 1,54 and 5,92% demonstrates increase in nonspecific resistance of their organism that is especially important during intensive body height of a fruit.

Definition of compliance of quantity of a crude protein in a diet to biological requirements of an organism of cows can be carried out on concentration of urea in blood serum. It is known that urea quite precisely reflects concentration of ammonia in a hem of ruminants. Therefore, on urea level in blood serum it is possible to estimate with a big accuracy at all stages of a lactation of cows balance of

a diet on power-protein relation and to establish deficiency or surplus of a crude protein in diet nonvolatile solid.

Content of urea in blood is reflection of increase in level of cicatrice fermentation as a result of which ammonia is formed. The ammonia that was not affected by microorganisms is soaked up and liver turns into urea, joining in rumen-hepatic circulation, and then gets to blood.

Respectively, at cows of experienced groups the content of urea increases in blood (for 12.40 and 18.22%,  $P < 0.05$ ). Further, a part of urea is brought out of an organism with urine, but partially comes back in a hem with saliva and through a hem wall where further endogenic urea is used by microorganisms in protein synthesis.

Thus, on the basis of the conducted researches it is possible to make the reasonable conclusion that the most optimum concentration of fat in nonvolatile solid of diets of cows are 4.2%. Content of fat at the level of 3.2% is poor, and 5.2% - exuberant.

#### 4. Conclusion

Thus, strengthening of lipids in nonvolatile solid of diets of the high-yield lactating cows renders particular and, in general, positive influence on key indicators of nitrogenous metabolism in their organism.

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