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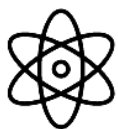
Proceedings of the 1st
International Scientific and
Practical Conference

**SCIENCE, EDUCATION, INNOVATION:
TOPICAL ISSUES AND MODERN ASPECTS**



TALLINN, ESTONIA

16-18.12.2020



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This issue of Scientific Collection «InterConf» contains the International Scientific and Practical Conference. The conference provides an interdisciplinary forum for researchers, practitioners and scholars to present and discuss the most recent innovations and developments in modern science. The aim of conference is to enable academics, researchers, practitioners and college students to publish their research findings, ideas, developments, and innovations.

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ZOOLOGY AND VETERINARY MEDICINE

UDC 636.22/.28.085.16

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**EFFICIENCY OF USING NICOTINIC ACID, METHIONINE AND
CHOLINE PREPARATIONS IN FEEDING HIGH-PRODUCING COWS
WITH FATTY LIVER SYNDROME**

The key factor to animal health is the proper choice of balanced food. The diet of cows must be compliant with the period (calving, lactation, dry period) in which the cow is at the moment.

A particularly important point in feeding is to maintain maximum food intake, which, in turn, provides favourable conditions for rumen microorganisms necessary for digesting fibre and especially for microbial protein. It should also be noted that the acidity of the environment, which must be at least $\text{pH} > 6$, is an important condition for rumen microorganisms.

During the first weeks after calving, high-producing cows have difficulties with metabolism. In this period energy need of cows rises exponentially, while feed consumption is not high enough to restoration. Thus, the body fat reserves are reduced. To cover energy need, forced formation of ketone bodies occurs, this process is an indicator of invading of large amount of fatty acids into the liver. When energy is not compensated at this point, plasma glucose decreases, fat begins to accumulate in the liver, and the concentration of ketone bodies in the blood and urine increases even more [5]. This leads to the development of ketosis in dairy cows. Ketosis is characterized by metabolic disorders, accumulation of ketone bodies in the tissues and blood and the release of acetone with exhaled air, urine and milk. Effective prevention of ketosis is important for the health and productivity of cows.

Consumption of concentrated feeds should be under extreme attention, since their



use increases the level of acidity in the animal body, reduces the consumption of dry matter and, thus, displaces the share of roughage in the diet. As a result, the cow cannot achieve a positive energy balance, while the activity of rumen microorganisms disrupts, which reduces the level of breakdown of carbohydrates and microbial protein [4].

Approximately 50% of dairy cows during lactation have displays of "fatty liver syndrome" of various degrees of severity, from moderate to severe. This syndrome can be diagnosed in many cows. They have hormonal changes: the level of fatty acids increases during calving and immediately after it, which leads to a negative energy balance. In cows with normal weight during calving, the liver may accumulate about 0.5 kg of fat in the first 24 hours, which increases the weight of the liver by 5% [1].

According to the analysis of recent researches, fatty liver syndrome in high-producing cows can be minimized if the diet includes protected methionine, choline (vitamin B4), nicotinic acid (vitamin B5) [6].

Protected amino acids and vitamins, unlike traditional ones, have a lipid shell that prevents the destruction of the molecule from disrupting by the microorganisms of rumen. They are not disintegrated in the rumen, but reach the abomasum and intestines, where this shell is dissolved from stomach acid, and they are absorbed into the blood. Adding these preparations to the diet of high-producing cows prevents the accumulation of fat in the liver [7].

Metabolic disorders in high-producing cows can be significantly reduced with balanced, in accordance with detailed rules, feeding [2].

The purpose of research. To determine the effectiveness of nicotinic acid, choline and protected methionine in the feeding of high-producing cows to reduce the effects of fatty liver syndrome.

Research methodology. For the scientific and economic experiment, 40 Holstein cows were selected during the 2nd lactation at "Agrofirma named after Gorkyi" Novomoskovsk district Dnepropetrovsk region, and 4 groups were formed. Selection of animals and formation of groups were carried out on the principle of analogous



groups, in accordance with generally accepted methods [3].

In the preparatory period, work on the formation of groups and adaptation of animals to the conditions of the experiment was carried out. Within the group, the differences of animals in weight, age, productivity were not more than 10%, and the average indexes between animals in the group were not more than 5%. Feeding of cows was similar, only differing in the number of preparations. The control group of animals received the basic diet during the experiment, other groups were additionally fed with nicotinic acid (2nd experimental groups), choline chloride (3^d experimental groups), protected methionine (4th experimental groups) during the main period.

Research results. Analysis of the diets of high-producing Holstein cows in the conditions of "Agrofirma named after Gorkyi" Novomoskovsk district Dnepropetrovsk region showed that they are balanced in protein, but deficit in digestible carbohydrates.

Enrichment of diets with nicotinic acid (B5) increased the milk productivity of cows during the whole experiment by 9.7% compared to the control, and in terms of 4% milk, this advantage was 10.7%. Moreover, the intensification of milk production occurred more during the second period of the experiment, i.e. in the conditions of winter feeding.

However, insufficient amounts of choline in most species of animals disrupt fat metabolism and cause fatty liver, anaemia, high reserve blood alkalinity. The most important function of choline in the composition of phospholipids (lecithins) is lipotropic action, i.e. prevention of fatty degeneration of the liver. After use of (B4), cows from the 3^d group gave 4% milk more by 3.5% during the experiment. With the use of synthetic methionine in the diet, the milk productivity of cows increased by 4.5% compared to the control.

It was found that calorific capacity of milk in cows from the control group was lower by 2.11% kcal compared to the second group; by 1.80% kcal compared to the third group; by 2.62% kcal compared to the fourth group. The fat content of milk in animals from the second group during the experiment was more by 0.02%, in cows from the third group more by 0.01%, which remained almost at the same level; and in



cows from the fourth group increased by 0.60% compared to a similar control indicator. The protein content was also better in the experimental groups: by 3.05% in animals from the 1st control group; by 0.19% in cows from the 2nd group, by 0.13% in cows from the 3^d group and by 0.21% in cows from the 4th group, respectively.

Enrichment of diets with the above mentioned supplements improves milk quality. The content of dry nonfat milk residue increased in cows from the experimental groups compared to the control: in 2nd by 0.38%; in 3^d by 0.40%; in 4th by 0.41%; dry matter content in milk of animals from the 1st group by 13.33%; 2nd group by 13.65%, 3^d by 13.66% and 4th group by 13.72%; lactose content in the milk of cows from the 1st group by 4.65%; 2nd by 4.94%, 3^d by 4.95% and 4th group by 4.96%; density and ash also changed, but not significantly.

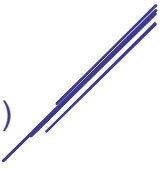
Mineral substances contained in milk are of high importance for the normal growth and development of animals. Milk is rich in salts of calcium, sodium, potassium, phosphates.

Thus, as a result of research, we were able to increase the productivity of the dairy herd and reduce the percentage of culling of cows connected with the occurrence of fatty liver syndrome, due to the inclusion nicotinic acid, choline chloride and protected methionine in the diet.

Conclusion:

1. Nutritional intervention of amino acids and vitamins to the cow diet in the period after calving provides a positive energy balance, which means the rational use of energy during early lactation and reduce the accumulation of fat in the liver. This also helps to achieve a positive economic effect in increased daily milk yield per cow, high animal reproduction, reduced costs for treatment and prevention of ketosis (protected choline reduces ketosis) and a number of other infectious diseases; the need for forced slaughter of animals reduces.

2. To stabilize metabolism, in particular to reduce the risk of ketosis, we recommend giving protected methionine in the daily norm of 12 g per day per 1 cow. To prevent ketosis and fatty liver syndrome in high-producing cows, nicotinic acid



should be used in amount of 10-12 g per 1 cow per day. It should be fed 2 weeks before calving and 10-12 weeks after calving.

3. To optimize fat metabolism, we recommend using choline in a dose of 25 g per day per 1 cow.

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