RESULTS IN DAIRY COW NUTRITION BASED ON AMINO ACID BALANCING IN HUNGARY

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Introduction

Although the microorganisms inhabiting the rumen can build up all amino acids, great attention should be paid to the quality of protein supply provided to the host animal. This especially applies to *intensive breeds of high milk yield.* The microorganisms living in the rumen cannot synthesise all essential amino acids at the same rate. Therefore, in the practical nutrition of cattle, especially high-yielding dairy cows, it is necessary to use *limiting amino acids* and to adjust the *amino acid balance.* This will determine the rate of protein synthesis. For the microbial protein synthesised in the bovine rumen is the *most deficient in methionine*, followed by lysine and then threonine.

Therefore, the ration of cattle breeds characterised by intensive metabolism and high milk production should in most cases be supplemented with *methionine.* It occurs primarily in the case of *corn- and soybean-based feeding* that the crude protein taken up with the ration is deficient in *methionine* and requires methionine supplementation. This supplementation can be given in the form of methionine protected from ruminal breakdown e.g. Mepron® M85, manufactured by Degussa AG, Germany. The ration based on amino acid balance can be easily formulated with the help of the AminoCow feed optimising programme (DEGUSSA AG).

Materials and methods

The *aim of the study* was to measure the effect of amino acid balancing with MEPRON® on the daily milk production, milk composition, and cost of the milk production as well as health status of high producing dairy cows under field condition. The experiment was carried out at the Kiscséripuszta dairy farm belonging to Enying Agricultural Company.

Two hundred in calf second and third parity Holstein Friesian cows were selected randomly to control and experimental groups of 100, 40-80 days after parturition. The grouping was carried out just some days before starting the experiment. The milk yield in the previous lactation and actual BCS of cows was taken in consideration at the selection as well. The duration of the experiment was 90 days. Within the groups "*a group nucleus*" of 12 clinically healthy cows was assigned in each group for taking samples for metabolic profile test (MPT). The feeding regime of the *control* animals was the same as usual at the dairy farm during the duration of the trial. The daily ration of the *experimental* cows was the same one as the controls till the first sampling, and from one day after the first sampling onward the experiment the feeding regime was formulated by using *AminoCow* software. The ration of the methionine met the requirement of the cows, calculated.

Results

As regards the *energy balance,* it was established that the *glucose concentration of blood plasma samples* decreased in both the experimental and the control group during the experiment, but it did not fall below the lower limit of the physiological range (2.3 mmol/l) in either group. The time-related average of blood acetoacetic acid concentration was not significantly different either from the baseline value (p=0.858) or between the two groups (p=0.227). The *NEFA concentration* was similar in the two groups at the beginning of the experiment (p=0.896). The NEFA concentration decreased in both groups with the progression of the experiment, and the change over time was statistically significant (p=0.028). The *AST activity* of the blood plasma was the same in the control and in the experimental group (p=0.616). AST activity was found to increase in both groups during the experiment; however, that increase was not statistically significant as compared to the baseline value (p=0.660).

The *urea* and *urea-N* concentration of the *blood plasma* samples was similar in the two groups at the beginning of the experiment (urea: p=0.958; urea-N: p=0.854). Both the urea and the urea-N concentration increased in both groups during the experiment. The rate of increase was not significant (urea: p=0.415; urea-N: p=0.142). However, the rate of increase was different in the two groups: the values of the control group increased at a higher rate (urea: 4.1% vs. 25%, p=0.002; urea-N: 9% vs. 21%, p=0.001). The time-related average of the groups was higher than, but not significantly different from, the baseline value (urea: p=0.949; urea-N: p=0.632). However, the time-related average of urea and urea-N concentration was significantly higher in the control than in the experimental group (urea: p=0.036; urea-N: p=0.04).

At the beginning of the experiment, the difference between the two groups in *daily milk production* was not significant. During the experiment, with the increase of the number of lactation days, milk production decreased in both groups. In the experimental group, it dropped to 86.8% of the baseline value (33 l) while in the control group to 84.5% of the baseline value (32.2 l). The change of milk production over time was significant in both groups ($p=0.048$); however, in the tendency of temporal changes there was no significant difference between the two groups. The time-related average value of milk production was significantly lower than the value measured at time T_0 ($p<0.001$). It was higher in the experimental group (the experimental cows produced more milk), but the difference was not statistically significant ($p=0.088$). Average milk production projected to the entire duration of the experiment was 35.9 ± 1.7 l in the experimental group and 35.3 ± 1.9 l in the control.

At the beginning of the study the *protein content of milk* was similar in the experimental and the control group (3.05% vs. 3.02%, $p=0.429$). Milk protein percentage increased in both groups during the experiment (in the experimental group it increased to 3.28%, the rate of increase was 7.5%, while in the control group it rose to 3.22%, the rate of increase was 6%). However, in the tendency of increase there was no statistically significant difference between the two groups ($p=0.308$). The time-related average of milk protein content was higher during the experiment than at the beginning of the study ($p=0.001$). The time-related average milk protein content of milk produced by the experimental group was higher than in the control group ($p=0.001$).

The cost of the *experimental ration* was markedly lower (by 8.6%) than that of the control ration. As a result, the feed cost of producing one litre of milk was also substantially lower (by 2.81 Forint per litre) in the experimental group as compared to the control (26.09 vs. 28.90).

Overall, it could be established that milk production per cow increased, the protein content of milk increased, the health status of the animals improved, the urea and urea-N concentration of blood and milk decreased, blood acetoacetic acid concentration decreased, and the feed costs per feeding day and per one litre of milk produced also decreased.

Conclusions

- The milk production increased by 10% at the peak of lactation,
- The protein content of the milk was increased by 7,5%,
- The health status of the cows was improved (less ketosis occurred in the experimental animals),

- The urea and urea-N concentration decreased in blood and in the milk,
- The SCC decreased,
- The feed cost for 1 kg of milk decreased considerably.

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The references are available at the authors in case of interest.