# CALCULATION OF THE NITROGEN, PHOSPHORUS AND POTASSIUM USE EFFICIENCY AND BALANCE IN MILK PRODUCTION

## CÁLCULO DO BALANÇO E EFICIÊNCIA DE USO DO NITROGÊNIO, FÓSFORO E POTÁSSIO NA PRODUÇÃO DE LEITE

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Nutrient balance analysis is a valuable tool to estimate the difference between inputs and outputs of nutrients in any activity. Through this tool it is possible to measure the efficiency of the use of nutrients. This information can be adopted for measures to control and monitor nutrient flows, with the purpose of minimizing the sources of environmental contamination and improving the economic viability of dairy farming. In this sense, the objective of this study was to calculate the balance and evaluate the efficiency of nutrient-use (nitrogen, phosphorus and potassium) in milk production in a feedlot system, using diets with chitosan associated with the source of lipids, in order to demonstrate the importance of this tool in dairy farming. The nutrient balance was calculated based on data from an experiment conducted at the Dairy Cattle Research Laboratory of the Department of Animal Nutrition and Production of the School of Veterinary Medicine and Animal Science, University of São Paulo in Pirassununga. Twenty-four Holstein cows were kept in a feedlot with free stalls. Cows were distributed in six Latin squares. The diets were: i) control (C), diet without soybean oil supplementation and without inclusion of chitosan; ii) chitosan (Q), diet without soybean oil supplementation and inclusion of 150 mg kg$^{-1}$ of chitosan live weight; iii) soybean oil (O), including 3.3% soybean oil in the dry matter and without the addition of chitosan; iv) QO, with inclusion of 3.3% soybean oil in the dry matter and inclusion of 150 mg kg$^{-1}$ of chitosan live weight. The corn silage was composed of 50% dry matter. The data used to calculate the balance were composition, diet consumption and milk production. Based on the data from the experiment, simulation was performed for a herd with 100 lactating cows and average daily production of 33 kg of milk. The period of analysis was 305 days, that is, the lactation period. For the calculation, the elements nitrogen (N), phosphorus (P) and potassium (K) were considered, the inputs being the ingredients of the diet and the output of the milk product. Calculations were made on a dry matter basis. The balance was calculated by the difference between the amounts of N, P and K that entered through the feed and the exited through milk production. The efficiency of nutrient use was calculated by the relationship between the amount of nutrients in milk and the amount of nutrients in feeds. The balance was positive in all diets for the three nutrients, that is, the intakes were greater than the outputs in the lactation period of 305 days. The diet C presented a balance of 14,155.78 kg of N, 1,065.13 kg of P and 5,280.66 kg of K. In the diet Q, the balance was 13,021.31 kg of N, 925.75 kg of P and 4,833.80 kg of K. The diet O presented a balance of 11,905.13 kg of N, 813.23 kg of P and 4523.69 kg of K. In the QO diet, the balance was 12,313.19 kg of N, 851.30 kg of P and 4,588.37 kg of K. The N-use efficiency was 25%, the P 44% and the K 20% for diet C. The Q diet obtained 27% efficiency for the N, 48% for P and 22% for K. The efficiency of N use was 29%, P 50% and K 23% for diet O. The QO diet presented 27% use efficiency for N, 48% for P and 22% for K. The use of lipids in feeding lactating cows is an efficient strategy to reduce losses of nutrients to the environment, and the second strategy is the use of chitosan in the diet. Balance measurement is a useful tool to evaluate and guide strategies for planning, execution, monitoring and adjustments of nutritional management.

Keywords: environment, nutrition, nutrient balance.