Hyperkaluria as a Risk Factor for Periparturient Paresis in Dairy Cows - Case Study of a Herd without a Hypocalcemia Prevention Program

Eicher R, *DMV, DES, FVH*[1]; **Stettler M,** *DMVt, FVH*[2]; **Tschudi P,** *Prof DMV*[3]
[1]*Division Reproduction and Population Medicine, University of Berne, Switzerland*
[2]*Bovine Practice, Heimenschwand, Switzerland*
[3]*Division of Clinical Pathology, University of Berne, Switzerland*

Introduction

Periparturient hypocalcemia is one of the main metabolic challenges in dairy cows. Traditionally, high dietary calcium during the dry period was hypothesized to be the major risk factor for periparturient paresis. However, recent research has shown that metabolic alkalosis induced by high potassium in the diet plays a major role in the development of parturient hypocalcemia[1]. Therefore, anionic diets are increasingly being used in practice to prevent milk fever. In rations based on forages with high potassium content, anionic diets are problematic because of the quantity of anionic salts needed, leading to a reduction of dry matter intake. The following case report illustrates the influence of a high potassium load on the incidence of milk fever in a herd without a prevention program for periparturient hypocalcemia.

Materials and Methods

A herd with high incidence of milk fever in the previous year (five cases in 25 calvings) was studied during a calving season. Blood and urine samples were taken from 14 dairy cows at 5-10 days before calving. Seven cows experienced milk fever (MF), whereas the other seven had a normal periparturient period without signs of clinical hypocalcemia (NO). A complete metabolic profile, including metabolites of energy and protein metabolism as well as measures of mineral supply and excretion, was performed on serum, plasma and urine. Urine pH was also measured. Differences between Groups MF and NO were tested with the Mann-Whitney U test, and differences between samples were tested with the Wilcoxon signed-rank test for paired samples.

Results

No difference in age or milk production was found between groups. As expected, after calving, cows in the MF group had significantly lower serum total calcium and inorganic phosphorus than NO cows (Ca 1.78 mmol/L vs 2.02 mmol/L, respectively; P 1.03 mmol/L vs 1.51 mmol/L, respectively). No other relevant differences were found in blood or urine in the post-calving sample.

In contrast, some interesting observations were made before calving. NO cows had higher—although statistically not significant—urinary calcium concentrations than MF cows (1.00 mmol/L vs 0.55 mmol/L, respectively), although no difference in urinary pH was found. Furthermore, urinary potassium and fractional excretion of potassium were significantly higher in the MF than in the NO group (K 425.4 mmol/L vs 296.5 mmol/L, respectively; FE[K] 106.2 mmol/L vs. 90.1 mmol/L, respectively).

Conclusions

Our findings are consistent with the strong ion difference theory. A high level of dietary potassium was identified as a significant risk factor for milk fever, whereas no significant differences in calcium, phosphorus or magnesium supply were found. This emphasizes the fact that, in situations where anionic diets cannot be used, prevention has to focus on reduction of the dietary potassium rather than on reduction of dietary calcium.

Reference

Goff JP, Horst RL: Effects of the addition of potassium or sodium, but not calcium, to prepartum rations on milk fever in dairy cows. *J Dairy Sci* 80:176-186, 1997.