
8 Summary

Sven Frömer

Examinations of the effect of various anionic supplements on the renal excretion of macro elements and their diagnostic value with regard to the prevention of hypocalcaemic parturient paresis in dairy cows.

Despite years of intensive research on causes and in search of preventive methods, hypocalcaemic parturient paresis is still one of the most common metabolic disorders of high-yielding dairy cows. The high incidence, follow-up diseases in connection with these disorders as well as the reduction of fertility and effective productivity have been signs for the economic significance of milk fever. Compared with other preventive measures the dietary-cation-anion-balance (DCAB) and the use of anionic salts in connection with it have caused an intensified interest in dry cow feeding management. This method has gained increasing practical influence but experiences have been contradictory up till now.

The objective of this study was to compare the effects of various anionic supplements in form of single salts ($\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$; $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$; $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ -D10 (degree of granulate: 10 μm); $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$; NaCl ; NH_4Cl ; $(\text{NH}_4)_2\text{SO}_4$) and mixed salts ($\text{CaCl}_2 \cdot 2\text{H}_2\text{O} + \text{MgSO}_4 \cdot 7\text{H}_2\text{O}$; $\text{NH}_4\text{Cl} + \text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) on the urinary excretion of macro elements and to evaluate the diagnostic value of these elements with regard to the use of anionic salts in dairy cows. Therefore experimental examinations were carried out with $N = 11$ cows belonging to the breed German black pied cows x Holstein Friesian, each with a ruminal fistula. All animals were female, not pregnant, not lactating and had past at least two previous lactations. The tested salts were given in a daily dose of 2 equivalents per animal over a time span of 2 weeks per test period. The sequences were randomized according to an 11 x 11 Latin square design. The salts were administered directly into the rumen during feeding time.

Among all included macro elements in the urine, calcium is best to show the effects of anionic salts and their influence on acid-base-balance (ABB) as well as on calcium metabolism. The close relations to parameters of ABB and to DCAB claim the classification of the urinary concentration of calcium in connection with net-acid-base-excretion (NABE) and DCAB as top monitoring parameter. A concentration of calcium in urine from 8 to 15 mmol/l as well as a renal fractional excretion of calcium from 2.5 to 3.5% can be seen as dimensions with optimal effects when using anionic rations.

The concentrations of potassium and phosphate in the urine were relatively stable during the treatment with salts. Hyperphosphaturia as a result of acidogenic conditions does not occur.

Compounds formed out of sodium, magnesium and chloride lead to a significantly increased urinary excretion of these elements depending on the ingestion.

In this study the determination of the renal fractional excretion of macro elements does not offer any clear advantages compared to the determination of the urinary concentration of macro elements.

The 24-hour quantity of urine was slightly increased during the use of anionic salts but remains within physiological limits.

A certain rhythm depending on the time of a day can be proved for the renal excretion of chloride but not for the renal excretion of calcium. Further studies of underlying influences seem to be necessary here.

Referring to the results at hand the salts CaCl_2 , $\text{CaSO}_4\text{-D10}$ and NH_4Cl show the strongest reactions to the parameters NABE, urinary-pH and renal concentration of calcium. Including criteria like effectiveness and palatability $\text{CaSO}_4\text{-D10}$ presents itself as top anionic salt.