

8 Summary

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Influence of intraruminal administration of anionic salts on systemic acid-base balance (Henderson-Hasselbalch equation, Stewart's strong ion model) in cattle

In a clinical comparative study different anionic salts were evaluated for their effects on systemic acid-base status and calcium balance. For the description of changes in acid-base balance the Henderson-Hasselbalch approach and Stewart's strong ion model were compared.

Eight anionic salts, two salt mixtures and aqua dest. as a control were tested on eleven nonlactating, nonpregnant Holstein cows for 2-week periods in a 11 x 11 Latin square design. All salts were given intraruminal through a rumen fistula at the rate of 2 equivalents/cow/day. Each 2-week salt-application was followed by a 2-week "wash out"-period without any salt exposure. Twice a week blood and urine samples were taken. To monitor a prospective circadian rhythm of urinary pH and NABE (net-acid-base excretion) urine was sampled every 4 h during 24 h at the last day of each "salt period".

Anionic salt treatments induced a metabolic acidosis evidenced by slightly decreased blood pH and BE as well as a marked decrease in urinary pH and NABE. The strong ion difference (SID) in serum was significantly reduced by 6 supplemented anionic salts. The acidosis may be explained by increased serum-[Cl] and/or decreased serum-[Na] or -[K] on the basis of Stewart's strong ion model. The changes in serum-[Cl] may be a result of raised intestinal anions by application of chloride salts. Nevertheless serum-SID either decreased in animals getting CaSO₄-D10 which seemed to activate secondary mechanisms to increase chloride-ions in serum. Alterations in urinary [chloride] and [SID] were associated with feeding components and for the present can't be used for control of deviations in acid-base balance by anionic salts.

In contrast to the control-animals, cows getting an acidogenic diet showed hypercalciuria. At the same time no effect of the anionic salts was measured in serum-[Ca] or activity of the ionized calcium. This indicates an improved turnover of calcium which could help to maintain the serum calcium level when it is under marked stress as it would occur at onset of lactation.

Urinary pH and NABE followed a circadian rhythm in cows obtaining anionic salts. Both parameters presented a significant decrease in between 7:00 am and 7:00 pm, whereas urinary pH and NABE of the control animals were unaffected. Therefore the time of sampling should be included in the view of acidification by anion salt supplementation for prevention of parturient paresis.