Acid-base disorders in calves with chronic diarrhea

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Abstract

The aim of this study was to analyze disorders of acid-base balance in calves with chronic diarrhea caused by mixed, viral, bacterial and Cryptosporidium parvum infection. We compared results obtained with the classic model (Henderson-Hasselbalch) and strong ion approach (the Steward model). The study included 36 calves aged between 14 and 21 days. The calves were allocated to three groups: I – (control) non-diarrheic calves, group II – animals with compensated acid-base imbalance and group III calves with compensated acid-base disorders and hypoalbuminemia. Plasma concentrations of Na⁺, K⁺, Cl⁻, Cl₂⁺, Mg²⁺, P, albumin and lactate were measured. In the classic model, acid-base balance was determined on the basis of blood pH, pCO₂, HCO₃⁻, BE and anion gap. In the strong ion model, strong ion difference (SID), effective strong anion difference, total plasma concentration of nonvolatile buffers (ATot) and strong ion gap (SIG) were measured.

The control calves and the animals from groups II and III did not differ significantly in terms of their blood pH. The plasma concentration of HCO₃⁻, BE and partial pressure of CO₂ in animals from the two groups with chronic diarrhea were significantly higher than those found in the controls. The highest BE (6.03 mmol/L) was documented in calves from group II. The animals from this group presented compensation resulted from activation of metabolic mechanisms. The calves with hypoalbuminemia (group III) showed lower plasma concentrations of albumin (15.37 g/L), Cl⁻ (74.94 mmol/L), Mg²⁺ (0.53 mmol/L), P (1.41 mmol/L) and higher value of anion gap (39.03 mmol/L). This group III presented significantly higher SID₃ (71.89 mmol/L), SID₇ (72.92 mmol/L) and SIG (43.53 mmol/L) values than animals from the remaining groups (P < 0.01), whereas ATot (6.82 mmol/L) were significantly lower. The main finding of the correlation study was the excellent relationship between the AGcorr and SID₃, SID₇, SIG. In conclusion, chronic diarrhea leads to numerous water-electrolyte disorders. Characterization of acid-base disturbance in these cases suggests that classic model have some limitations. This model can not be recommended for use whenever serum albumin or phosphate concentrations are markedly abnormal.

Key words: calves, diarrhea, acid-base balance, strong ions difference, hypoalbuminemia