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Preliminary data: blood gas analysis of neonatal Holstein calves

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INTRODUCTION

The neonatal period involves several physiological adaptations, including establishing efficient acid-base and electrolyte balance mechanisms. Blood gas provides relevant information about homeostasis and allows for the diagnosis of metabolic or respiratory acidosis/alkalosis and mixed disorders.

OBJECTIVES

This study aimed to describe the blood gas parameters of calves throughout the neonatal period.

MATERIAL AND METHODS

Eight male Holsteins were used, housed in individual suspended cages in a controlled environment at the Calf Research Laboratory of FMVZ/USP. Feeding (whole milk, with ≥12.5% total solids) was provided at a volume of 3L in two bucket feedings, totaling 6L/day, and water was available *ad libitum*. Fecal scoring was conducted daily. Blood samples were collected by jugular vein puncture with a 2mL heparinized syringe (Monovette®) at seven, 21, and 35 days of age, immediately following rectal temperature measurement. The equipment (Stat Profile Prime®) provided the following data: pH, partial pressure of carbon dioxide (PCO_2), bicarbonate (HCO_3^-), base excess (BE), Anion Gap (AG), sodium (Na^+), potassium (K^+), chloride (Cl^-), ionized calcium (iCa^{+2}), and lactate. Analysis of variance (ANOVA) was performed to assess differences over time.

CONCLUSION

Apart from the physiological adaptation of different body systems, the neonate faces various challenges in maintaining homeostasis, with diarrhea being the most relevant clinical manifestation during this period. One of the most significant consequences is the imbalance of water-electrolyte and acid-base, efficiently diagnosed through blood gas analysis.

RESULTS AND DISCUSSION

Venous pH means (D7: 7.345±0.019; D21: 7.357±0.031; D35: 7.362±0.023) increased as days progressed, while HCO3- concentrations (D7: 33.20±3.28; D21: 33.46±4.65; D35: 31.95±1.15) decreased. Despite calves showing a score of 3 for diarrhea around the 15th day of life, buffering mechanisms effectively prevented metabolic acidosis. However, fluctuation in HCO_3^-, BE, AG, and lactate values indicated utilization of the alkaline reserve. Electrolytes were similar across the three evaluated time points, except for iCa^{+2} (P=0.0002), which showed an increase with advancing age, though still within the normal range for the species.

Table 1. Blood gas parameters of the venous blood of Holstein calves at seven, 21, and 35 days of age, raised at the "Prof. Dr. Fernando José Benesi" Calf Research Laboratory at FMVZ/USP-São Paulo.

Parameters	D7	D21	D35	P-value
pH	7.34 ± 0.0192	7.35 ± 0.0311	7.36 ± 0.0236	0.4029
PO_2 (mmHg)	48.13 ± 16.87	16.87 ± 9.315	45.9 ± 4.14	-
PCO_2 (mmHg)	61.61 ± 6.57	59.95 ± 5.53	50.5 ± 19.3	0.2374
HCO_3^- (mmol/L)	33.2 ± 3.28	33.46 ± 4.65	31.95 ± 1.156	0.6352
SO_2 (%)	69.27 ± 2.57	72.51 ± 10.09	65.26 ± 10.09	-
Base Excess (mmol/L)	6.78 ± 1.33	7.2 ± 4.23	6.0 ± 4.23	0.7375
Änion Gap (mmol/L)	6.01 ± 3.72	5.4 ± 3.75	5.0 ± 3.75	0.7734
Hematocrit (%)	28.87 ± 1.21	30.12 ± 4.35	28.25 ± 4.35	0.7734
Na^+ (mmol/L)	136.65 ± 3.72	135.53 ± 1.47	136.37 ± 1.47	0.2097
K^+ (mmol/L)	4.63 ± 2.31	4.53 ± 0.11	4.47 ± 0.11	0.8632
Cl^- (mmol/L)	102.1 ± 0.05	101.9 ± 2.41	104.71 ± 2.41	0.0844
iCa^{+2} (mmol/L)	**1.20 ± 11.27^a**	**1.25 ± 0.016^{ab}**	**1.28 ± 0.016^b**	**0.0002**
Glucose (mg/L)	**74.62 ± 0.74^a**	**78.42 ± 7.25^a**	**88.62 ± 7.25^b**	**0.0245**
Lactate (mmol/L)	2.53 ± 0.32	2.11 ± 0.77	1.42 ± 0.77	0.209

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