

Acid-Base Balance and Mineral Levels in Dual Purpose Cows

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Under grazing conditions, nutrition of animals depends basically on pasture and supplementing. Mineral deficiencies in dual purpose cows in the tropics are frequent, commonly occurring in a subclinical form, and they are frequently accompanied by infertility and decrease in the milk production. Until now there is no information on acid-base disorders in dual purpose cows in Mexico. The objective of this study was to determine dynamics of acid-base parameters and levels of minerals in blood plasma of dual purpose cows in the tropics in the period of one year. In 10 cows (F1 Holstein x Zebu) on grazing conditions with mineral and molasses supplementation, physical examinations of animals and samples of blood were taken in the following periods: 2-3 weeks prepartum, 3 weeks, 2, 3, 4 and 7 months postpartum. Acid-base values were determined in blood samples by the Blood Gas Analyzer*. Minerals were determined in heparinized plasma, electrolytes were measured by a Na/K/Cl Analyzer**, Ca, inorg. P and Mg levels were obtained by a spectrophotometer***, and Cu and Zn by atomic absorption spectrophotometry****. Obtained results are presented in Tables 1 and 2. Body condition at the parturition was 3 to 4.5, but at the 3rd month postpartum it was 1.5 to 2.5. Before the parturition it was found in cows hypocupremia (in 100%), hypophosphoremia and hypozincemia (in 60%), hypochloremia (in 50%) and mild metabolic acidosis (in 30% of all cows). During postpartum period hypocupremia was found in 80% of cows, being constant this proportion during all periods. The levels of plasma calcium were in the range of reference values in all samplings. Acid - base values in those cows are significantly higher than these once in specialized dairy cows. This can be explained by intake of grass without grains, and by low milk yield (8-12 kg /day). High ambiental temperature predispose animals to respiratory alkalosis. The low levels of trace elements in blood plasma were seen before and after parturition. It is important to identify the differences in the acid-base values between specialized dairy cows and dual purpose for exact interpretation of alterations. For the prevention

Table 1. Plasma electrolyte and acid-base values in dual purpose cows at different stages of the reproductive cycle.

	Na mmol/l	K mmol/l	Cl mmol/l	pH	pCO ₂ mmHg	HCO ₃ mmol/l	BE mmol/l
a	146.3 ±3.5	4.52 ±0.42	108.9 ±2.82	7.409 ±0.035	40.8 ±10.6	24.0 ±1.7	0.8 ±2.7
b	142.8 ±2.1	4.89 ±0.03	103.6 ±1.4	7.410 ±0.007	49.7 ±6.3	28.7 ±2.6	6.1 ±2.6
c	147.0 ±0.7	4.50 ±0.19	106.1 ±6.3	7.450 ±0.014	42.2 ±3.5	28.7 ±2.2	6.1 ±2.8
d	131.2 ±8.4	4.29 ±0.28	94.3 ±6.3	7.440 ±0.014	43.1 ±5.6	28.2 ±3.9	5.2 ±4.3
e	147.9 ±0.7	4.17 ±0.32	102.8 ±3.5	7.450 ±0.063	45.4 ±9.9	30.2 ±0.6	7.8 ±0.4
f	142.4 ±2.8	4.86 ±0.22	100.3 ±4.9	7.420 ±0.007	44.8 ±4.9	27.8 ±2.9	5.0 ±3.1
X	142.9	4.53	102.6	7.430	44.3	27.9	5.1
s.d.	6.1	0.29	5.0	0.020	3.1	2.1	2.3

a.- 2-3 weeks prepartum

b.- 3 weeks postpartum

c.- 2 months postpartum

X.- mean

BE.- Base excess

d.- 3 months postpartum

e.- 4 months postpartum

f.- 7 months postpartum

s.d.- standard deviation

Table 2. Plasma mineral levels in dual purpose cows at different stages of the reproductive cycle.

	Cu µg/dl	Zn µg/dl	Mg mg/dl	Ca mg/dl	inorg P mg/dl
a	59.4 ±32.5	89.1 ±28.2	2.68 ±0.35	11.50 ±0.35	5.83 ±1.62
b	64.9 ±18.3	90.0 ±17.6	3.00 ±0.07	11.53 ±0.21	4.20 ±0.42
c	59.5 ±12.7	111.0 ±27.7	2.31 ±0.03	9.19 ±0.81	4.60 ±0.49
d	71.2 ±9.9	91.5 ±23.5	2.02 ±0.07	9.07 ±0.21	5.33 ±0.35
e	61.0 ±11.3	110.2 ±17.0	2.20 ±0.28	11.52 ±0.42	5.33 ±0.35
f	58.6 ±12.7	85.0 ±22.4	2.00 ±0.49	10.30 ±0.20	6.17 ±0.42
X	62.4	96.1	2.36	10.51	5.24
s.d.	4.8	11.3	0.39	1.16	0.73
% increased	0	0	26.6	8.3	3.3
% decreased	95	53.3	13.3	11.6	38.3

a.- 2-3 weeks prepartum

b.- 3 weeks postpartum

c.- 2 months postpartum

X.- mean

d.- 3 months postpartum

e.- 4 months postpartum

f.- 7 months postpartum

s.d.- standard deviation

* Ciba Corning, 238. Essex, United Kingdom.

** Ciba Corning, 644. Essex, United Kingdom.

*** Ciba Corning, Microchem 565, Essex, United Kingdom.

**** Perkin Elmer, 3110. Norwalk, CT, USA.

of mineral deficiencies, it is convenient to determine plasma levels of those elements in the different seasons of the year, and make the dietary corrections with appropriate mineral supplementation. The deficiencies of minerals in animals depend on their intake by diet, relation among the minerals and absorption from gastrointestinal tract.

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