Universidade Federal de Pelotas
Faculdade de Veterinária
Núcleo de Pesquisa, Ensino e Extensão em Pecuária

Análise das concentrações dietéticas de cálcio para reduzir os riscos de hipocalcemia em vacas leiteiras submetidas a uma dieta com diferença cátion-aniônica

Apresentadoras: Aline Marangon de Oliveira
Orientador: Rubens A. Pereira

Fator de Impacto: 1.720

Animal Feed Science and Technology 164 (2011) 147–153

Contents lists available at ScienceDirect

Animal Feed Science and Technology

journal homepage: www.elsevier.com/locate/anifeedsci

Dietary Ca concentration to minimize the risk of hypocalcaemia in dairy cows is affected by the dietary cation–anion difference

M. Oba[a,*], A.E. Oakley[a], G.F. Tremblay[b]

[a] Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB, Canada, T6G 2P5
[b] Agriculture and Agri-Food Canada, Soils and Crops Research and Development Centre, Québec, QC, Canada, G1V 2J3

ARTICLE INFO

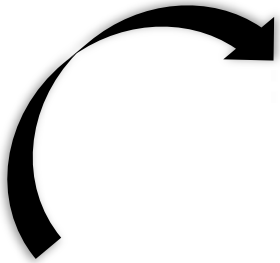
Article history:
Received 20 July 2010
Received in revised form 4 January 2011
Accepted 11 January 2011

Keywords:

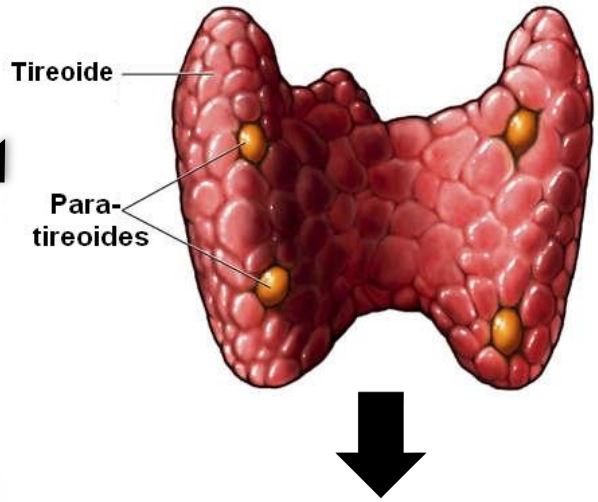
ABSTRACT

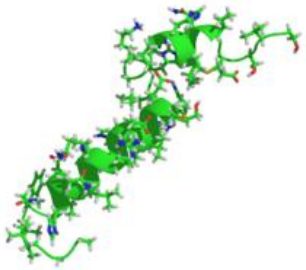
The objective of this study was to determine whether dietary Ca concentration affects the ability to maintain Ca homeostasis in non-lactating non-pregnant dairy cows fed diets differing in dietary cation–anion difference (DCAD). Eight non-lactating non-pregnant multiparous Holstein cows (594 ± 80.3 kg body weight; 34.5 ± 11.4 month old) were fed diets Low or High in DCAD (−64 *vs.* 82 mequiv./kg dry matter, respectively) in combinations with Low or High dietary Ca concentration (3.0 *vs.* 9.1 g/kg of dry matter, respectively) in a

Liberação do PTH

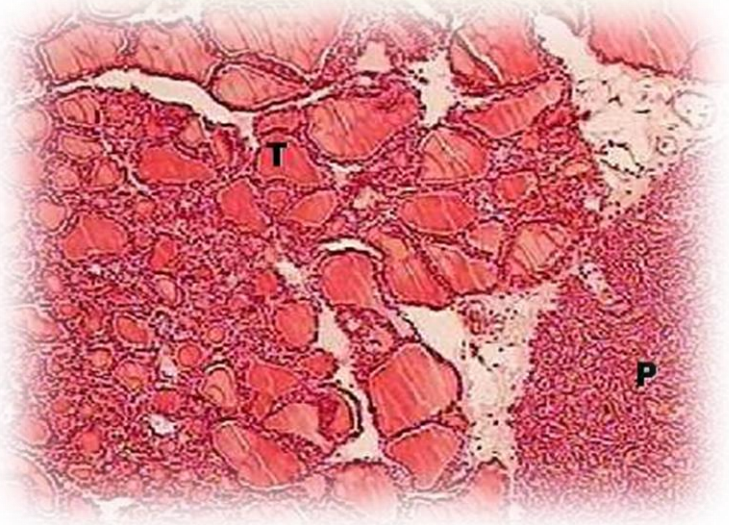


↓ Ca

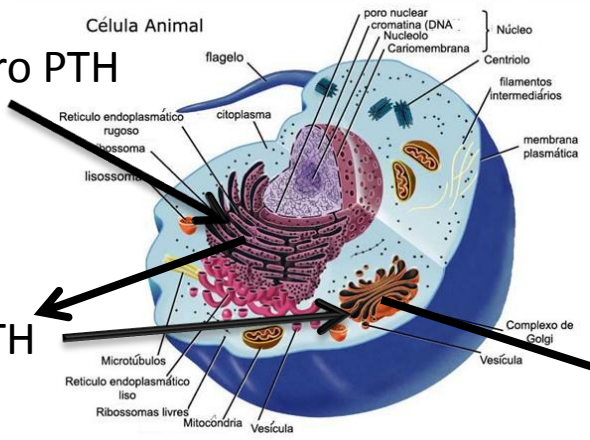




↑ PTH



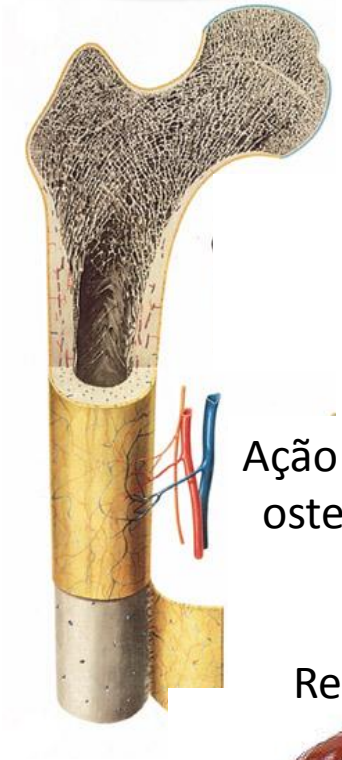
Pré-Pro PTH



Pró - PTH

PTH

Funções do PTH



Ação parácrina osteoclástica

↑ Ca → ↓ PTH ↑ Calcitonina

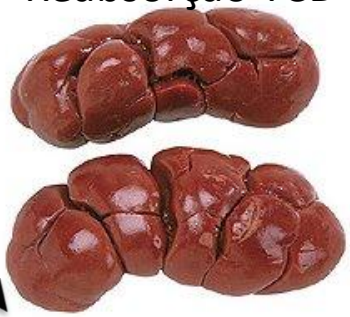
↓ 1,25 (OH)2 D3

↑ 24,25 (OH)2 D3

↑ 1,25 (OH)2 D3

Em situações normais, mas e na vaca lactante ?

Reabsorção TCD



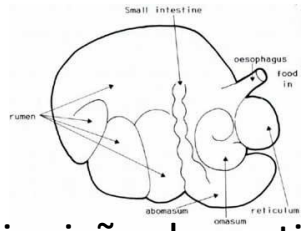
↑ PTH

1 alfa hidrolase

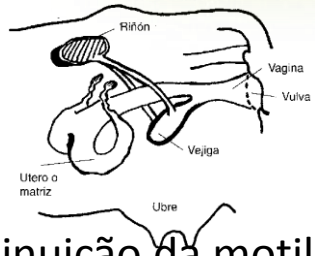
Colecalciferol (pele)

Cascata de eventos em um quadro de hipocalcemia

Hipocalcemia



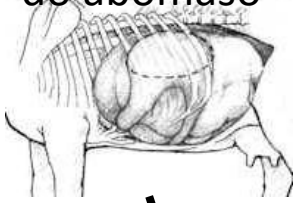
Diminuição da motilidade digestória e do rúmen



Diminuição da motilidade uterina

↓consumo de alimento

Deslocamento do abomaso



Mobilização de reservas

BEN

↑Retenção de placenta

↑Involução uterina

↑Metrite

Cetose

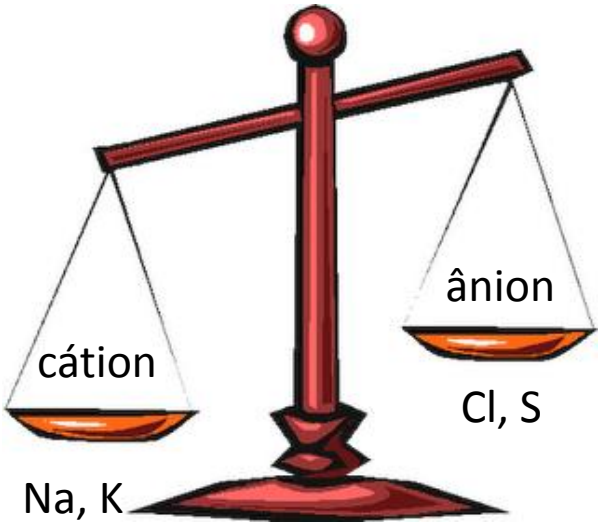
Diminuição Produção Leiteira

Diminuição da Fertilidade

Fatores predisponentes da hipocalcemia

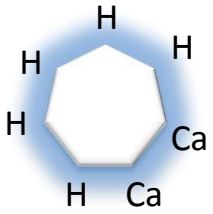
- Vacas entre segundo e quinto partos
- Vacas de alta produção
- Raça: Jersey X Holandês
- Dietas alcalinas
- Dietas ricas em Fósforo ou deficientes em Magnésio
- Alto consumo de Ca pré-parto

Dieta cátion-aniônica como forma de prevenção de hipocalcemia



Acidose metabólica leve

Carbonato de cálcio



↑ []Ca ionizado

Hipótese e Objetivo

Hipótese:

A concentração ótima de Ca em uma dieta, capaz de estimular o PTH, varia de acordo com DCAD.

Objetivo:

Determinar se a concentração de Ca na dieta afeta a capacidade de manter homeostase do Ca em vacas não lactantes e não gestantes da raça Holandês alimentadas com DCAD.


Materiais e
Métodos

Delineamento experimental

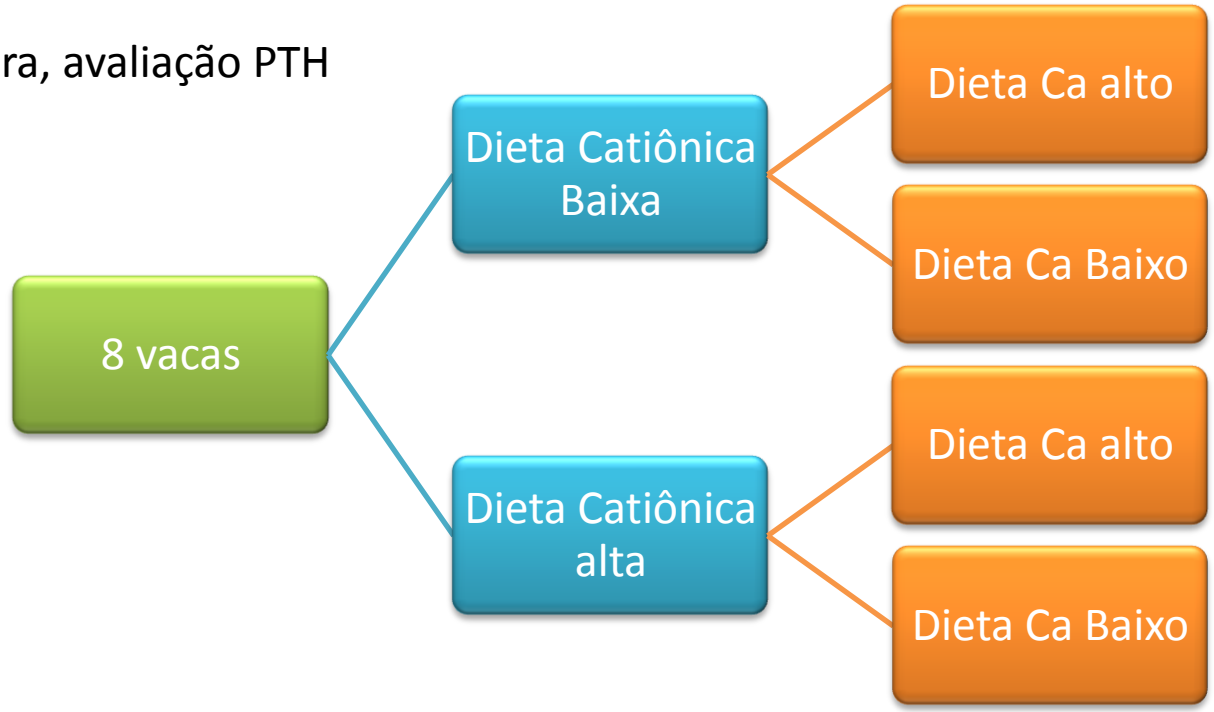
8 vacas

- Não gestante
- Não Lactantes
- Multíparas
- 594 ± 80 Kg
- 34,5 ± 11 meses
- Sem histórico clínico

Tratamentos

14 dias de tratamento

Coleta de amostra, avaliação PTH



Tratamentos

Nutrient composition of Low- and High-DCAD timothy hays and Low- and High-Ca concentrate mixes.

	Timothy hay		Concentrate mix	
	Low-DCAD	High-DCAD	Low-Ca[a]	High-Ca[b]
CP (g/kg DM)	75	79	179	168
aNDFom (g/kg DM)	671	647	224	203
Ca (g/kg DM)	3.4	3.0	2.5	22.8
P (g/kg DM)	1.4	1.4	4.8	5.1
Mg (g/kg DM)	1.2	1.2	7.0	7.2
Na (g/kg DM)	0.1	0.1	9.4	10.4
K (g/kg DM)	15.8	13.0	6.4	6.5
S (g/kg DM)	1.1	1.2	6.4	6.6
Cl (g/kg DM)	11.2	1.2	16.3	17.1
DCAD[c] (mequiv./kg DM)	24	231	−247	−270

[a] Contained 783 g/kg dry rolled barley, 117 g/kg canola meal, 70 g/kg premix of trace minerals and vitamins, 17 g/kg ammonium sulfate, and 13 g/kg magnesium oxide on an as-fed basis.

[b] Contained 733 g/kg dry rolled barley, 117 g/kg canola meal, 70 g/kg premix of trace minerals and vitamins, 50 g/kg limestone, 17 g/kg ammonium sulfate, and 13 g/kg magnesium oxide on an as-fed basis.

[c] Dietary cation–anion difference (DCAD) calculated as $Na^+ + K^+ - Cl^- - S^{2-}$ (Ender et al., 1971).

Indução de Hipocalcemia

No dia 14 as vacas foram submetidas a um desafio EDTA...

8,5 mL/min

↓ 60% do Ca ionizado

Amostra 10 min

pH, HCO_3, Na, K

Resultados

Resultados
Antes do desafio EDTA

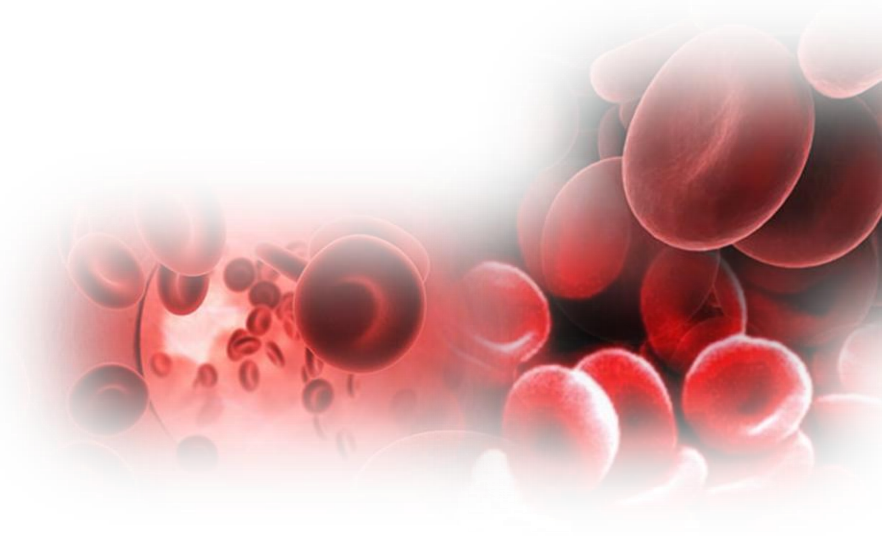
Responses of non-pregnant non-lactating dairy cows (n = 8 for each treatment) fed two dietary Ca concentrations with low or high dietary cation–anion difference (DCAD).

	Low DCAD		High DCAD			P value		
	Low Ca	High Ca	Low Ca	High Ca	SEM	DCAD	Ca	INT [a]
Prior to EDTA challenge								
Plasma PTH[b] (pmol/L)	23.9	23.9	18.5	22.2	8.6	0.14	0.42	0.42
Blood pH	7.43	7.39	7.44	7.43	0.01	0.01	0.03	0.17
Blood Ca^{2+} (mmol/L)	1.22	1.21	1.22	1.25	0.02	0.42	0.20	0.33
Blood Na^{+} (mmol/L)	138	139	138	139	0.98	0.84	0.45	0.66
Blood K^{+} (mmol/L)	3.81	3.78	3.66	3.74	0.09	0.28	0.79	0.52
Blood HCO_3^{-} (mmol/L)	24.1	24.7	26.6	25.9	0.69	0.01	0.93	0.26

Means within a row followed by different letters (a–c) differ ($P<0.05$).

[a] Interaction of DCAD and Ca effects.

[b] Parathyroid hormone.



Resultados
Antes do desafio EDTA

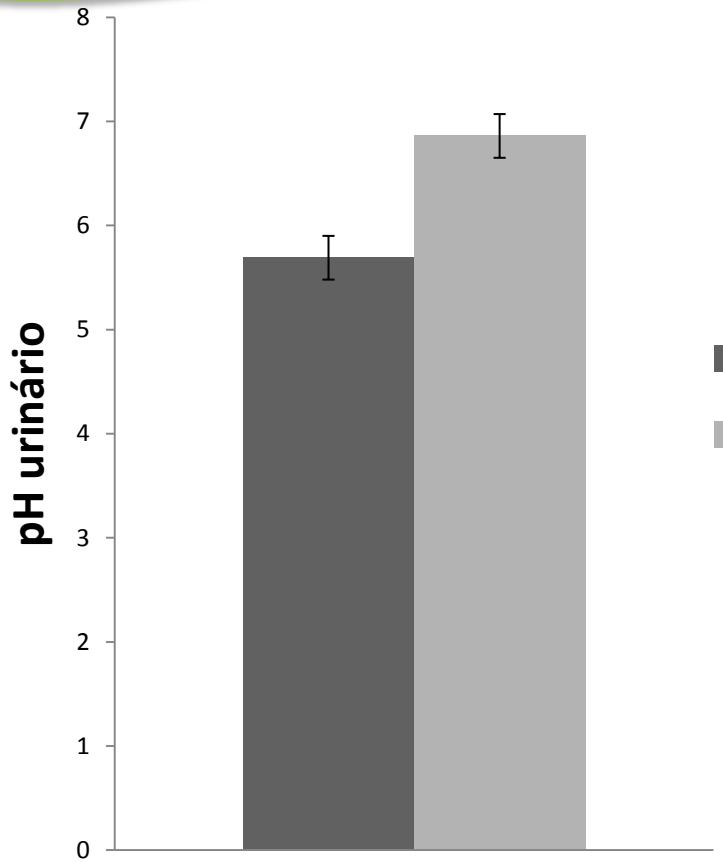


Figura 1: Determinação do pH urinário em vacas não gestante e não lactantes antes do desafio de EDTA, recebendo dietas com diferença cátion-aniônica ($p<0,001$).

Resultados
Após desafio de EDTA

Responses of non-pregnant non-lactating dairy cows (n = 8 for each treatment) fed two dietary Ca concentrations with low or high dietary cation–anion difference (DCAD).

	Low DCAD		High DCAD			P value		
	Low Ca	High Ca	Low Ca	High Ca	SEM	DCAD	Ca	INT [a]
During EDTA challenge[c]								
Blood pH	7.38	7.36	7.38	7.38	0.01	0.21	0.72	0.11
Blood Na^+ (mmol/L)	141	141	141	141	0.6	0.66	0.72	0.93
Blood K^+ (mmol/L)	3.75	3.87	3.64	3.57	0.08	0.01	0.76	0.20
Blood HCO_3^- (mmol/L)	22.5	21.8	23.5	23.3	0.5	0.02	0.32	0.58

Means within a row followed by different letters (a–c) differ ($P<0.05$).

[a] Interaction of DCAD and Ca effects.
[b] Parathyroid hormone.
[c] Mean values for the whole EDTA challenge period including both resistant and recovery time.
[d] Time required for blood ionized Ca concentration to recover to 90% of the initial concentration after the blood EDTA infusion.

Resultados
Após o desafio de EDTA

Responses of non-pregnant non-lactating dairy cows (n = 8 for each treatment) fed two dietary Ca concentrations with low or high dietary cation–anion difference (DCAD).

	Low DCAD		High DCAD			P value		
	Low Ca	High Ca	Low Ca	High Ca	SEM	DCAD	Ca	INT [a]
Recovery time[d] (min)	134[a,b]	106[c]	125[b,c]	159[a]	15	0.73	0.03	<0.01

Means within a row followed by different letters (a–c) differ (P<0.05).

[a] Interaction of DCAD and Ca effects.
[b] Parathyroid hormone.
[c] Mean values for the whole EDTA challenge period including both resistant and recovery time.
[d] Time required for blood ionized Ca concentration to recover to 90% of the initial concentration after the blood EDTA infusion.

Acidose metabólica leve com absorção de cálcio.

Estimulo PTH

Resultados
Após o desafio de EDTA

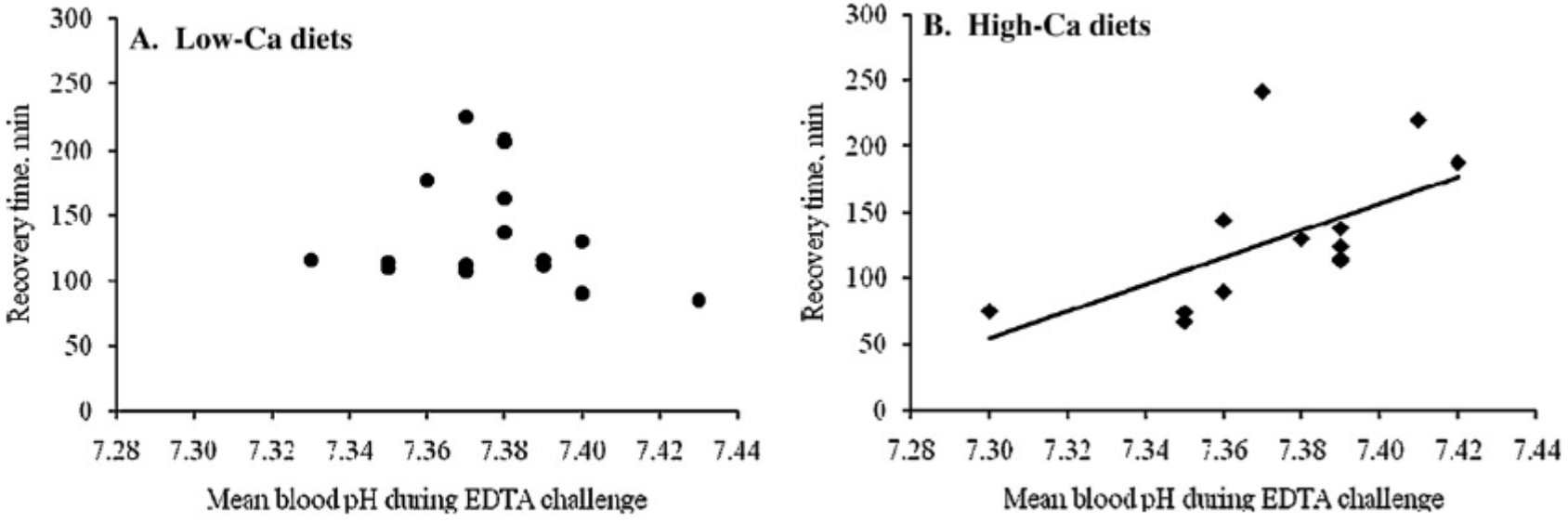


Fig. 1. Relationships between mean blood pH during the EDTA challenge (resistant time and recovery time) and recovery time in non-pregnant and non-lactating dairy cows fed Low-Ca diets (A; P=0.46; r^2 = 0.04) and High-Ca diets (B; recovery time = −7401 + (1021 × blood pH); P=0.03; r^2 = 0.33].

E no NUPEEC...

Influência da hipocalcemia subclínica no balanço energético de vacas leiteiras.

Vacas hipocalcêmicas: Maiores níveis de glucagon, AGNE, AST e maior relação glucagon/insulina com níveis normais de glicose.

Novas formas de prevenção..

Conclusão

A melhor concentração de Ca na dieta para minimizar o risco de hipocalcemia em vacas leiteiras, pode variar conforme os níveis de ânions da dieta.

Obrigada

aline-marangon@hotmail.com