Jockey Club College of Veterinary Medicine and Life Sciences
香港城市大學
City University of Hong Kong
In collaboration with Cornell University

Oral calcium at calving. A good complement to prevent hypocalcemia?

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Subclinical Hypocalcemia

- Transient
- Permanent
- Delayed

(Neves et al 2018; McArt & Neves 2020)

Hypocalcemia

- Prevention
  - Calcium Restriction. Bentonites, Zeolites
  - **Negative DCAD (Body ACIDIFICATION)**
- Complement
  - **Ca Supplement at calving (± Vit D)**

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1071M. The effect of oral or subcutaneous calcium at calving on ionized calcium and milk yield in Holstein cows fed anionic diets

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Prepartum Diet

Ingredients	AF kg	DM kg
Prepartum mix	2.00	1.79
Corn Grain Ground Fine	1.70	1.50
Soybean Hulls Pellet	1.50	1.37
Wet Brewers Grain	6.00	1.80
Soybean Meal	0.55	0.49
Brome Hay	3.50	3.15
Corn Silage	8.17	2.53
Alfalfa Haylage	2.20	0.70
Nutrient	**Unit**	**DM**
DM	%	52.00
CP	%	15.89
aNDFom	%	42.13
Starch	%	16.64
Sugar (WSC)	%	4.66
NFC	%	28.32
EE	%	3.79
Ash	%	9.68
Ca	%	1.18
P	%	0.38
Mg	%	0.54
K	%	1.12
Na	%	0.18
Cl	%	1.21
S	%	0.22
DCAD (mEq/kg DM) (Na+K)-(Cl+S)	mEq	-113.0

- Con: No Calcium
- SC: 500 mL Borog. Ca 23%
- Oral: 2 boluses Ca/Calmin

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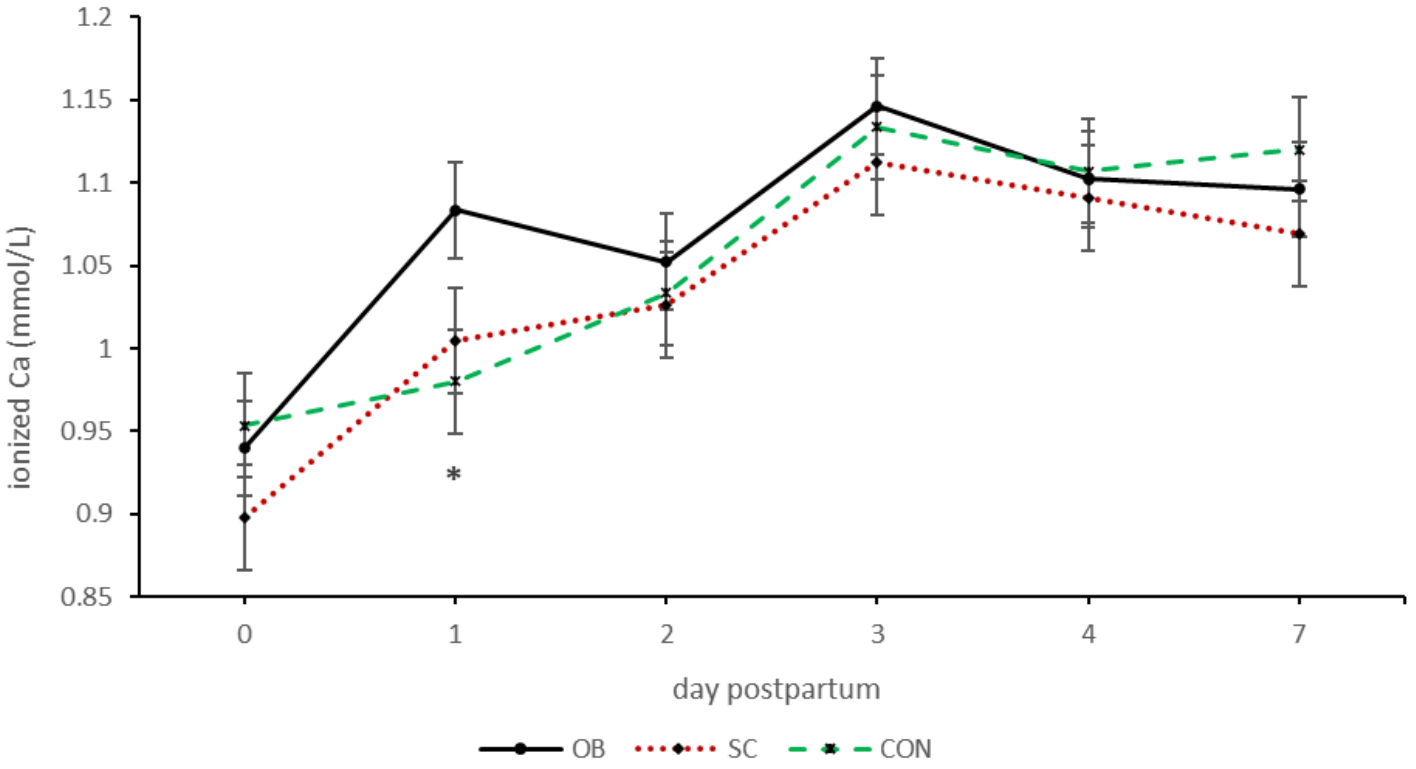
Ionized Ca



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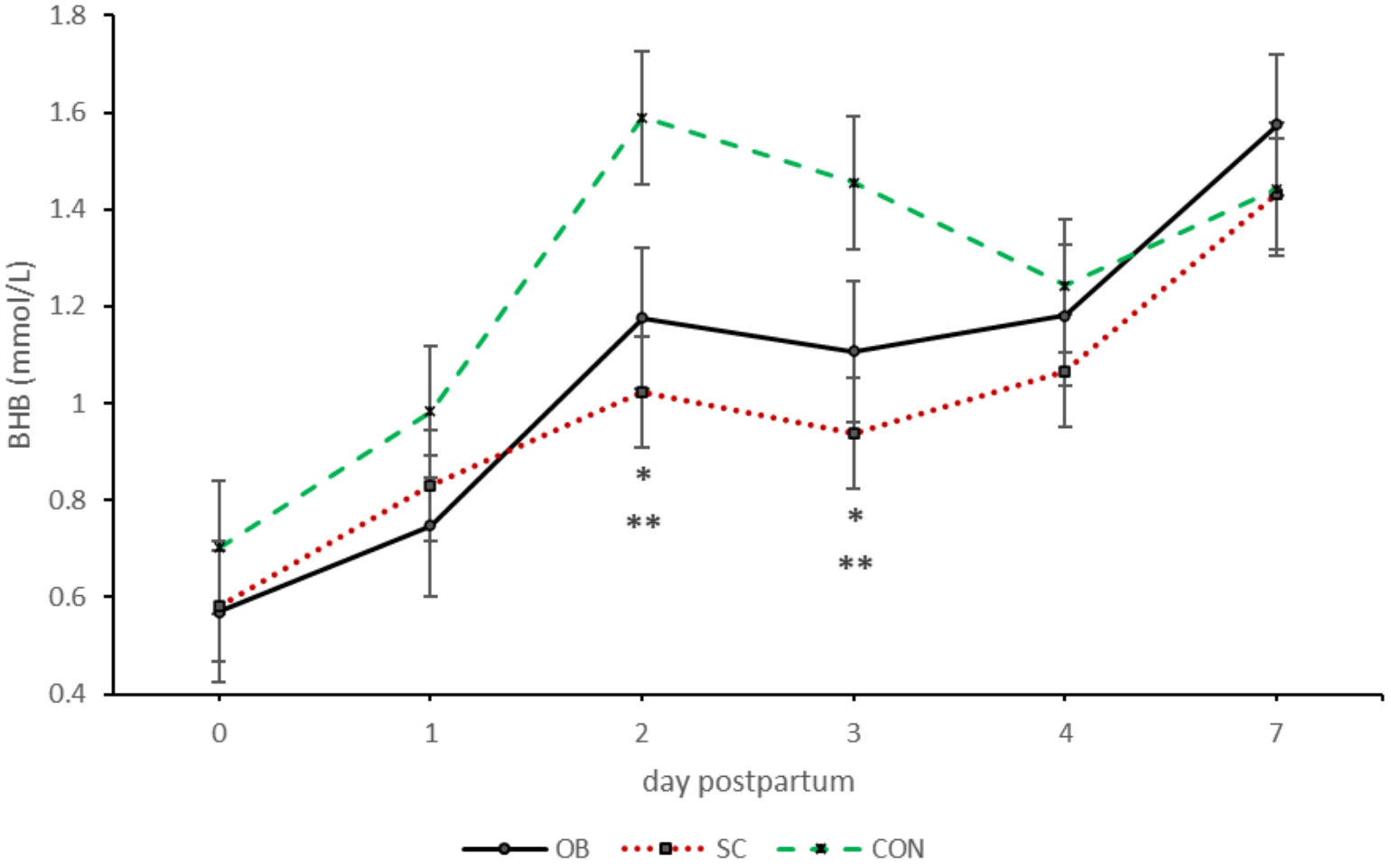
BHB (ketones)



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Item	Treatments				Effects P-Value			
	Bol (n=17)	SC (n=15)	Con (n=14)	SEM	Tx	Day	Par	Tx * Day
Total Ca (mg/dl)	8.47	8.48	8.42	0.11	0.33	< 0.01	0.03	0.39
Ionized Ca (mmol/L)	1.06	1.07	1.01	0.02	0.20	< 0.01	0.02	0.18
Total Mg (mmol/L)	2.20	2.21	2.10	0.05	0.26	< 0.01	0.01	0.66
P (mg/dl)	5.18	5.39	5.33	0.20	0.77	< 0.01	0.64	0.65
BHB (mmol/L)	1.05	0.97	1.23	0.10	0.19	< 0.01	0.23	0.25
CO_2 (mEq/L)	29.7	29.7	30.7	0.50	0.33	< 0.01	0.46	0.04
Albumin (g/dl)	3.56	3.47	3.55	0.03	0.16	< 0.01	0.04	0.99
Milk Yield (kg/d)	40.1	40.9	40.5	1.40	0.93	<0.01	0.07	0.59

- Energy/nutrient partitioning

- GH/IGF-1 Axis Uncoupling

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The effect of oral calcium boluses at parturition on blood metabolites and milk yield in grazing Holstein cattle

Pedro Melendez, pgmelendezr@gmail.comConceptualization [a,*], Carlos Roeschmann [b], Alejandra Arevalo [c], Jan Moller [c]

- Control group: No Calcium
- Boluses: CaCl2 (50 g)

Table 2
Baseline comparison for cows treated at parturition with 2 boluses of oral calcium 24 h apart, and control cows at assignment.

Nutrient	Control (n=30)	Treatment (n=30)	Pooled SEM	P-value
Parity (median)	4.0	4.0	0.31	0.37
Days in prepartum (mean)	16.6	17.6	0.88	0.16
BCS at calving (median)	3.5	3.5	0.05	0.45
Last urine pH (mean)	7.19	7.28	0.15	0.18
Plasma tCa at calving (mmol/L) (mean)	2.08	2.14	0.07	0.51

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Third lactation

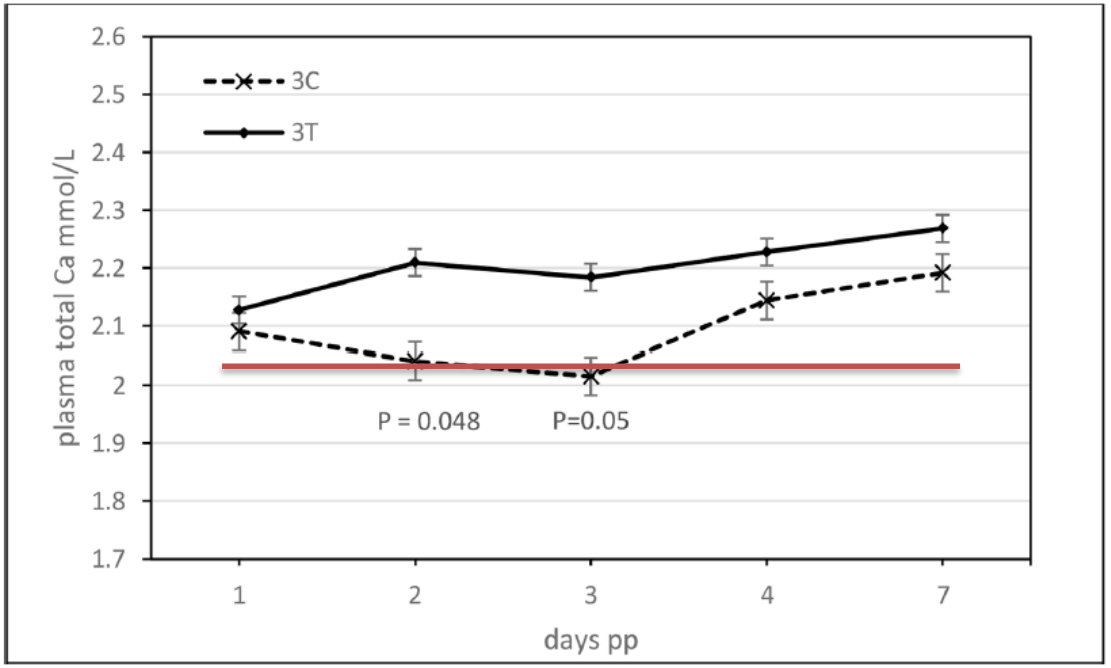

Fig. 2. Mean plasma tCa concentration ± SEM (mmol/L) in postpartum treated (n=10) and control (n=10) third lactation cows. 3C: control group (—x—); 3T: treated group (——◆——).

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≥ 4 lactation

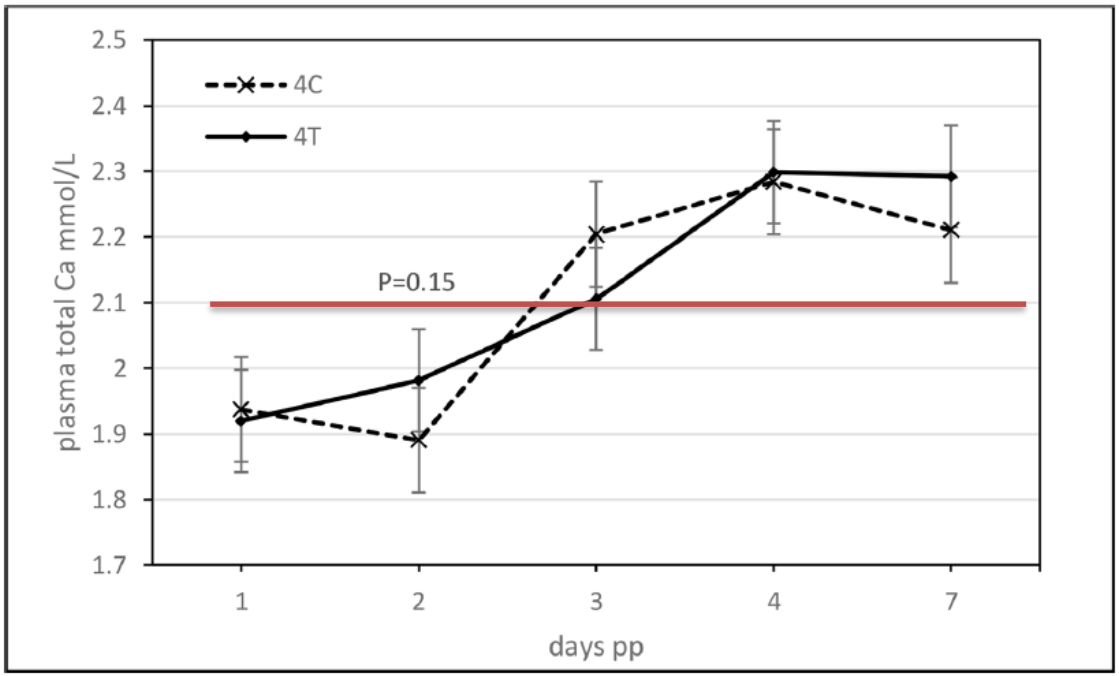

Fig. 3. Mean plasma tCa concentration ± SEM (mmol/L) in postpartum treated (n=10) and control (n=10) cows ≥ 4 lactations. 4C: control group (—x—); 3T: treated group (——◆——). Trend for higher concentration of plasma tCa in the treated group than the control group at d 2 pp (P=0.15).

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Milk: Second lactation

The system is shut down

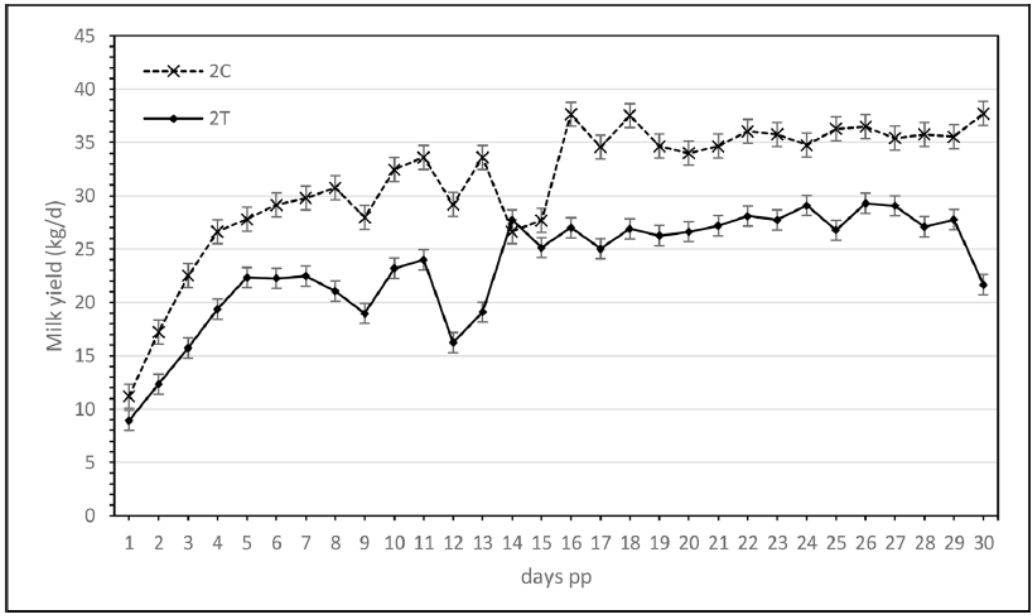

Fig. 5. Least squares means ± SEM for milk yield (kg/d) in postpartum treated (n=10) and control (n=10) second lactation cows. 2C: control group (—x—); 2T: treated group (——◆——). Days 12, 13, 30 pp ($P \leq 0.05$). Days 8, 9, 10, 11, 17, 18, 19, 25, 28 pp ($P \leq 0.15$).

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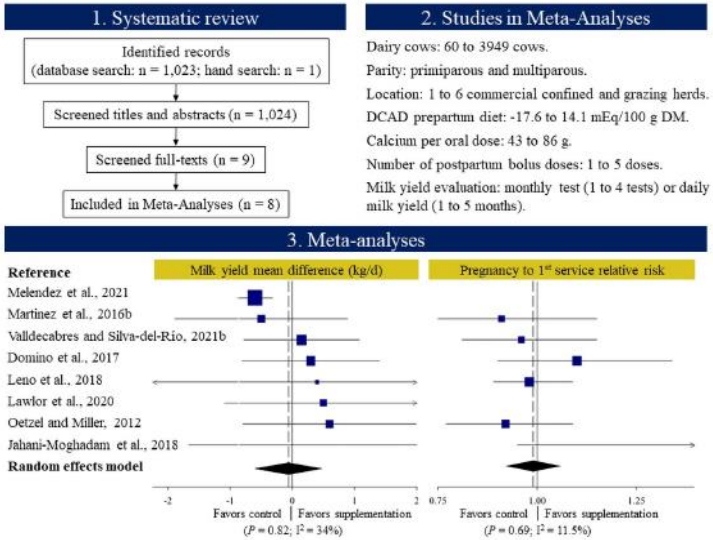
Mini-Review
Animal Nutrition and Farm Systems

Production and reproduction responses for dairy cattle supplemented with oral calcium bolus after calving: Systematic review and meta-analysis

Ainhoa Valldecabres,[1,2] Rúbia Branco-Lopes,[2,3] Christian Bernal-Córdoba,[2,3] and Noelia Silva-del-Río[2,3]*

Graphical Abstract



Highlights

- Oral Ca bolus supplementation was not associated with milk yield or pregnancy to first service.
- Supplementation protocols must be reevaluated if group level effects are sought.
- Further research is needed to evaluate target oral Ca bolus supplementation.

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Effects of oral calcium on reproduction and postpartum health in cattle: a meta-analysis and quality assessment

Zheng-Ren Ma[1], Ling-Li Ma[2], Fei Zhao[3]* and Yan Bo[3]*

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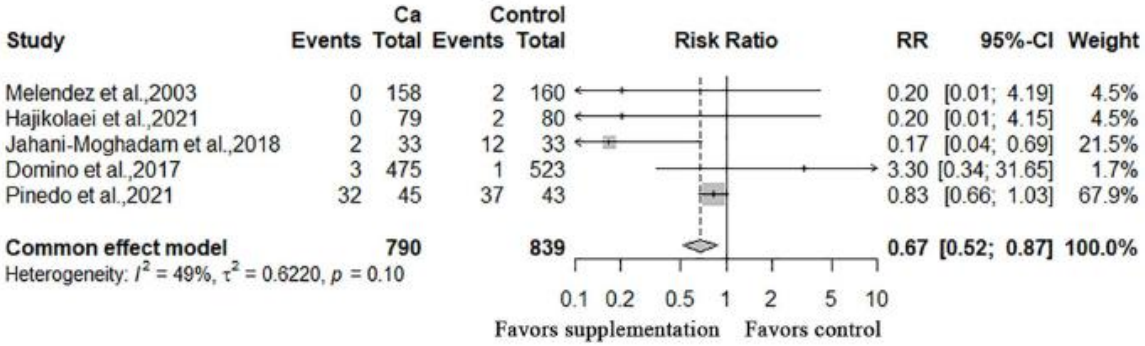
inconsistent. In most studies, the time for oral calcium administration was 0–6, 12, and 24 h after calving. The times for the treatment regimen was 1 to 3, only two articles administer oral calcium 5 times. The dose was also inconsistent (25–110 g).

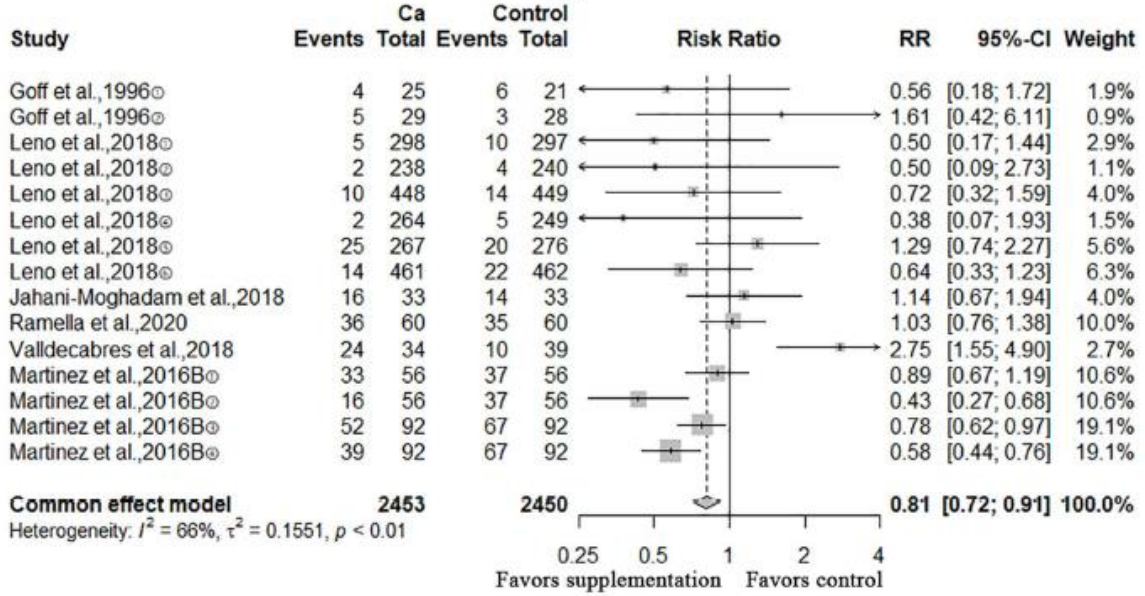
A

Incidence of clinical hypocalcemia



B

Incidence of subclinical hypocalcemia



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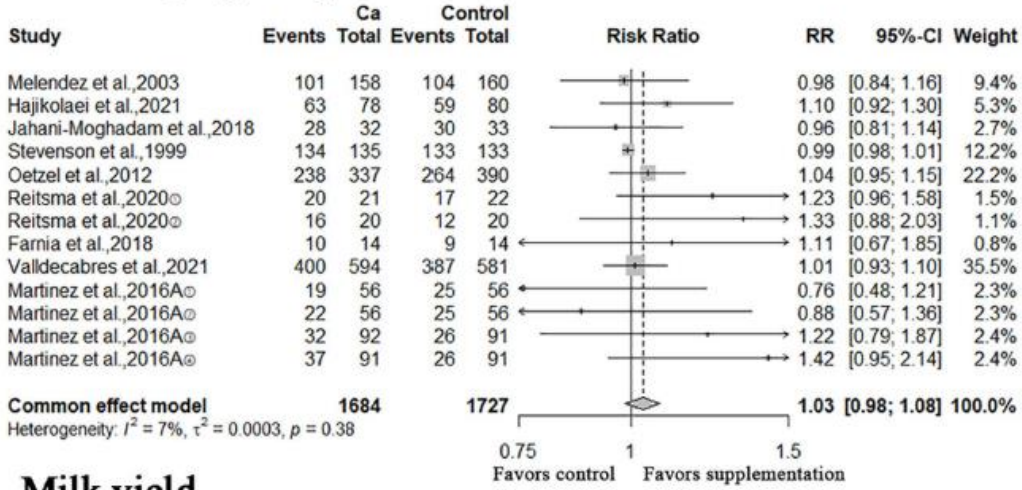
B

Overall pregnancy rate

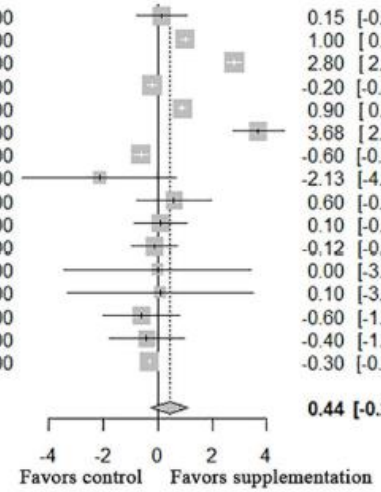


Study	Ca Events	Ca Total	Control Events	Control Total	RR	95%-CI	Weight
Melendez et al.,2003	101	158	104	160	0.98	[0.84; 1.16]	9.4%
Hajikolaei et al.,2021	63	78	59	80	1.10	[0.92; 1.30]	5.3%
Jahani-Moghadam et al.,2018	28	32	30	33	0.96	[0.81; 1.14]	2.7%
Stevenson et al.,1999	134	135	133	133	0.99	[0.98; 1.01]	12.2%
Oetzel et al.,2012	238	337	264	390	1.04	[0.95; 1.15]	22.2%
Reitsma et al.,2020①	20	21	17	22	1.23	[0.96; 1.58]	1.5%
Reitsma et al.,2020②	16	20	12	20	1.33	[0.88; 2.03]	1.1%
Farnia et al.,2018	10	14	9	14	1.11	[0.67; 1.85]	0.8%
Valldecabres et al.,2021	400	594	387	581	1.01	[0.93; 1.10]	35.5%
Martinez et al.,2016A①	19	56	25	56	0.76	[0.48; 1.21]	2.3%
Martinez et al.,2016A②	22	56	25	56	0.88	[0.57; 1.36]	2.3%
Martinez et al.,2016A③	32	92	26	91	1.22	[0.79; 1.87]	2.4%
Martinez et al.,2016A④	37	91	26	91	1.42	[0.95; 2.14]	2.4%
Common effect model		**1684**		**1727**	**1.03**	**[0.98; 1.08]**	**100.0%**

Heterogeneity: I^2 = 7%, τ^2 = 0.0003, p = 0.38

C

Milk yield



Study	Ca Total	Ca Mean	Ca SD	Control Total	Control Mean	Control SD	MD	95%-CI	Weight
Valldecabres et al.,2021	520	31.61	7.5300	513	31.46	7.7000	0.15	[-0.78; 1.08]	6.8%
Leno et al.,2018①	272	33.70	0.9000	267	32.70	0.9000	1.00	[0.85; 1.15]	7.7%
Leno et al.,2018②	114	34.70	1.0000	110	31.90	1.0000	2.80	[2.54; 3.06]	7.7%
Leno et al.,2018③	454	46.80	1.2000	444	47.00	1.2000	-0.20	[-0.36; -0.04]	7.7%
Leno et al.,2018④	635	47.70	1.2000	629	46.80	1.2000	0.90	[0.77; 1.03]	7.8%
Jahani-Moghadam et al.,2018	33	46.68	2.0600	33	43.00	1.7900	3.68	[2.75; 4.61]	6.8%
Melendez et al.,2021	30	29.90	0.5500	30	30.50	0.5500	-0.60	[-0.88; -0.32]	7.7%
Ramella et al.,2020	60	28.86	8.3300	60	30.99	7.3300	-2.13	[-4.94; 0.68]	3.4%
Oetzel et al.,2012	412	41.10	10.1500	497	40.50	11.1500	0.60	[-0.79; 1.99]	5.9%
Melendez et al.,2003	158	40.20	4.4000	160	40.10	4.4300	0.10	[-0.87; 1.07]	6.7%
Stevenson et al.,1999	120	19.45	3.2900	124	19.57	3.3000	-0.12	[-0.95; 0.71]	7.0%
Reitsma et al.,2020①	21	23.50	5.6400	22	23.50	5.7700	0.00	[-3.41; 3.41]	2.6%
Reitsma et al.,2020②	21	23.60	5.6400	22	23.50	5.7700	0.10	[-3.31; 3.51]	2.6%
Martinez et al.,2016,A①	148	31.70	6.1000	148	32.30	6.1000	-0.60	[-1.99; 0.79]	5.9%
Martinez et al.,2016A②	148	31.90	6.1000	148	32.30	6.1000	-0.40	[-1.79; 0.99]	5.9%
Domino et al.,2017	475	46.70	0.4000	523	47.00	0.4000	-0.30	[-0.35; -0.25]	7.8%
Random effects model	**3621**			**3730**			**0.44**	**[-0.24; 1.13]**	**100.0%**

Heterogeneity: I^2 = 99%, τ^2 = 1.5584, p < 0.01

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https://doi.org/10.3168/jdsc.2023-0456
Short Communication
Health, Welfare, and Behavior

Does knowledge of blood calcium concentration at 2 days postpartum affect decisions of calcium supplementation?

H. A. McCray,[1] C. R. Seely,[2] and J. A. A. McArt[2]*

Highlights

- Providing oral Ca to parity 3 cows at 2 and 3 DIM supported milk production regardless of 2 DIM blood Ca status.
- Parity 3 cows with subclinical hypocalcemia at 2 DIM that were given delayed oral Ca produced the most milk.
- Delayed Ca bolus administration had minimal effects on milk production in parity 2 cows.
- Delayed oral Ca administration had minimal effects on 4 DIM blood Ca status.

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Effects of timing of oral calcium administration on milk production in high-producing early-lactation Holstein cows

C. R. Seely,[1] C. N. Wilbur,[2] K. M. Fang,[2] and J. A. A. McArt[1]*
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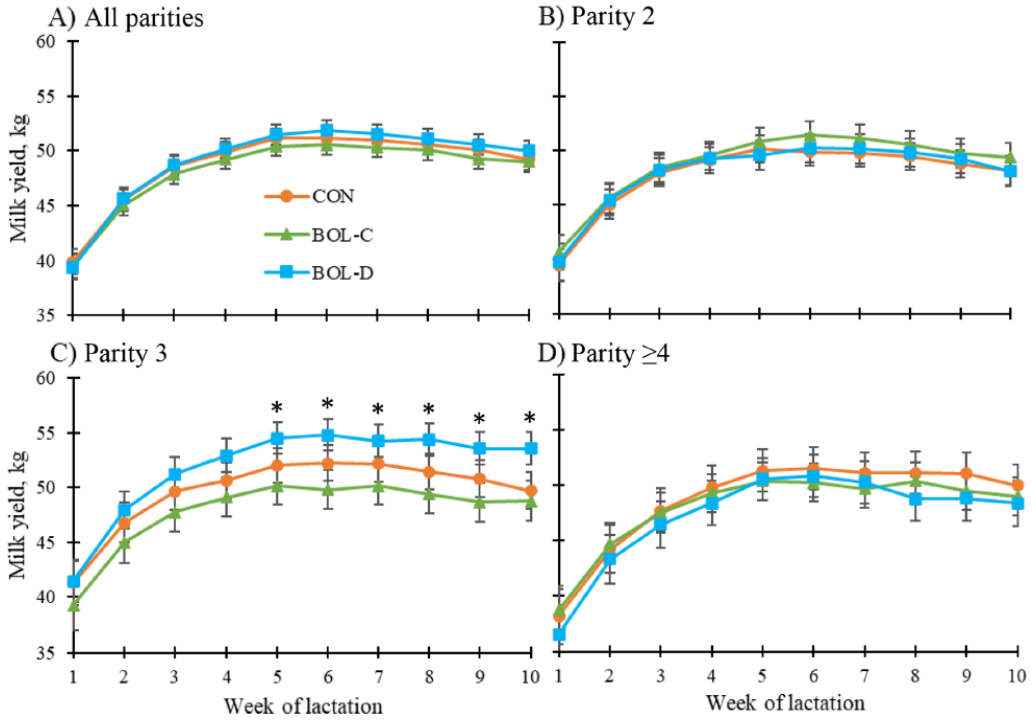

What about bolus at calving and at d 3 pp ????

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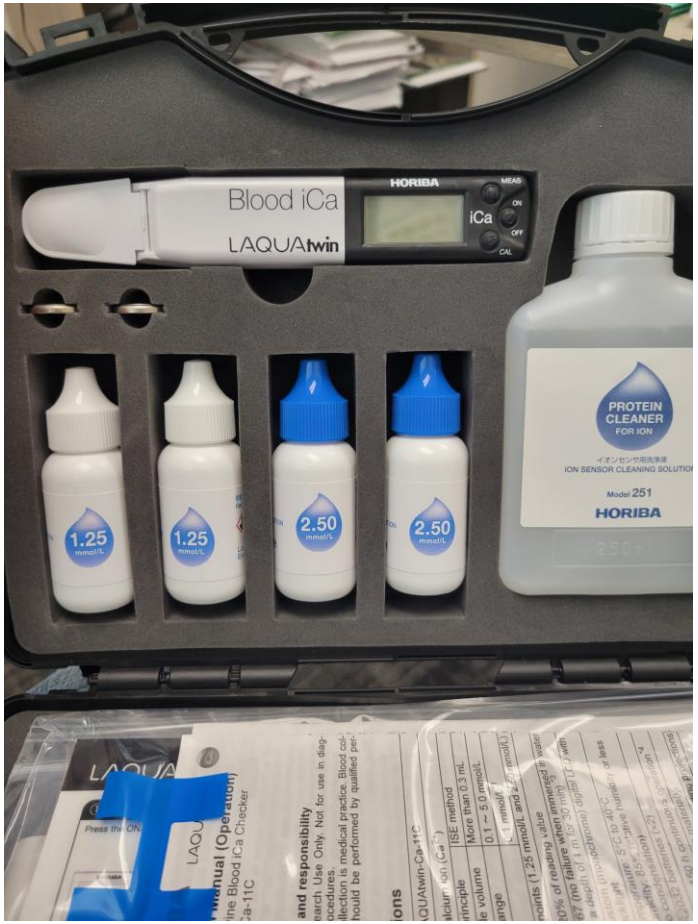
Diagnosis: Ionized Ca

- Field Test
- Ionized Ca (< 1 mmol/L)



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Proposed on-farm preventive program

- Anionic salts
  - Urine pH 6.0 – 6.8
  - Prepartum Mg 0.45-0.48% (Magnesium sulphate)

- At calving
  - In cows ≥ 3 lactations
  - Calcium boluses at calving and day 2 or 3 pp
  - Magnesium supplementation ???

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Take-Home messages

- Anionic salts are very effective in preventing hypocalcemia
- Mature cows are more likely to be hypocalcemic
- Oral Ca at calving is a good complement to anionic diets in mature cows

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Thank you very much !!!