Comparison of a voluntary calcium drink to a calcium bolus administered to dairy cows after calving

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Calcium status around calving

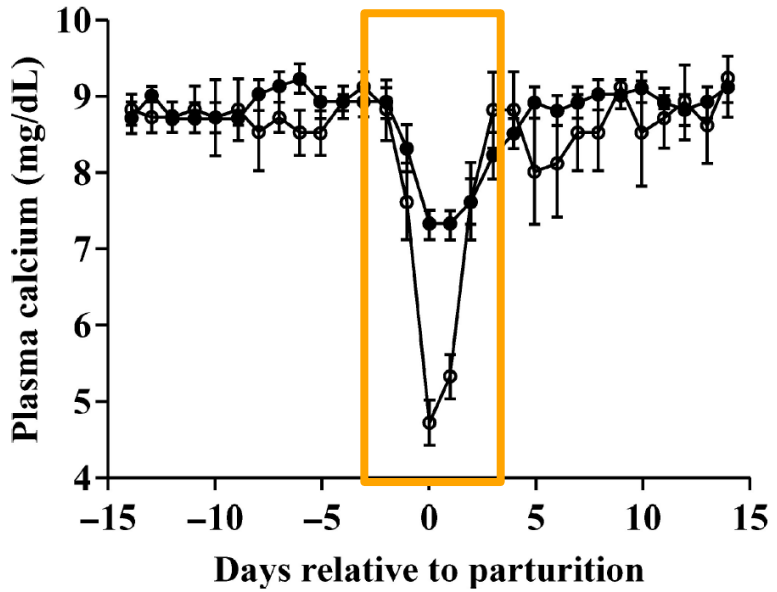

Figure 1. Plasma calcium concentrations (mean ± SEM) around the time of parturition in milk fever (○; n = 8) and nonmilk fever (●; n = 19) cows; d 0 = day of parturition.

Kimura et al. 2006

- Production of milk
- Sudden large demand for calcium
- Low body calcium status
- Mobilization of calcium from body

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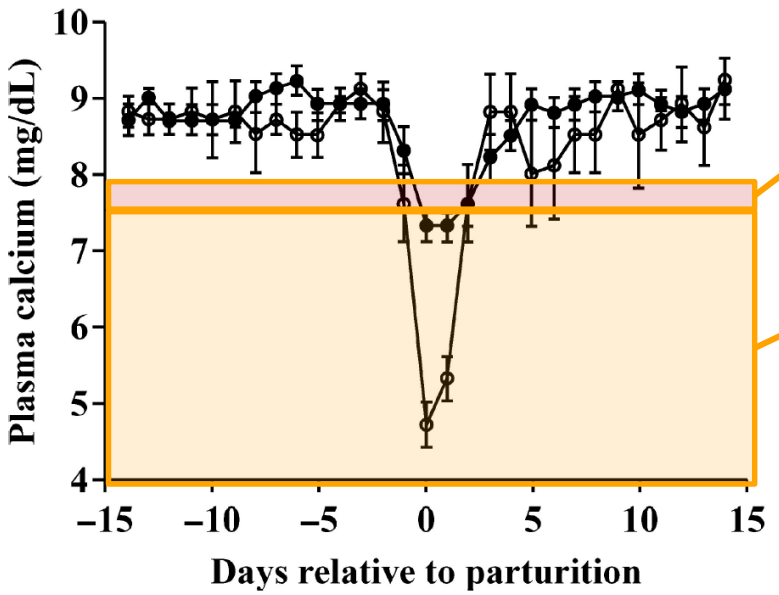
Hypocalcaemia



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Kimura et al. 2006

Subclinical hypocalcaemia:

Serum Ca 1.4 – 2.0 mM (7.6 – 8.0 mg/dL)

Clinical hypocalcaemia (milk fever):

Serum Ca < 1.4mM (<7.6 mg/dL)

Occurrence of serum Ca <2.0 mM:

25% heifers

41% second-lactation cows

Up to 54% of fifth-lactation cows

Martin-Tereso and Martens. 2014

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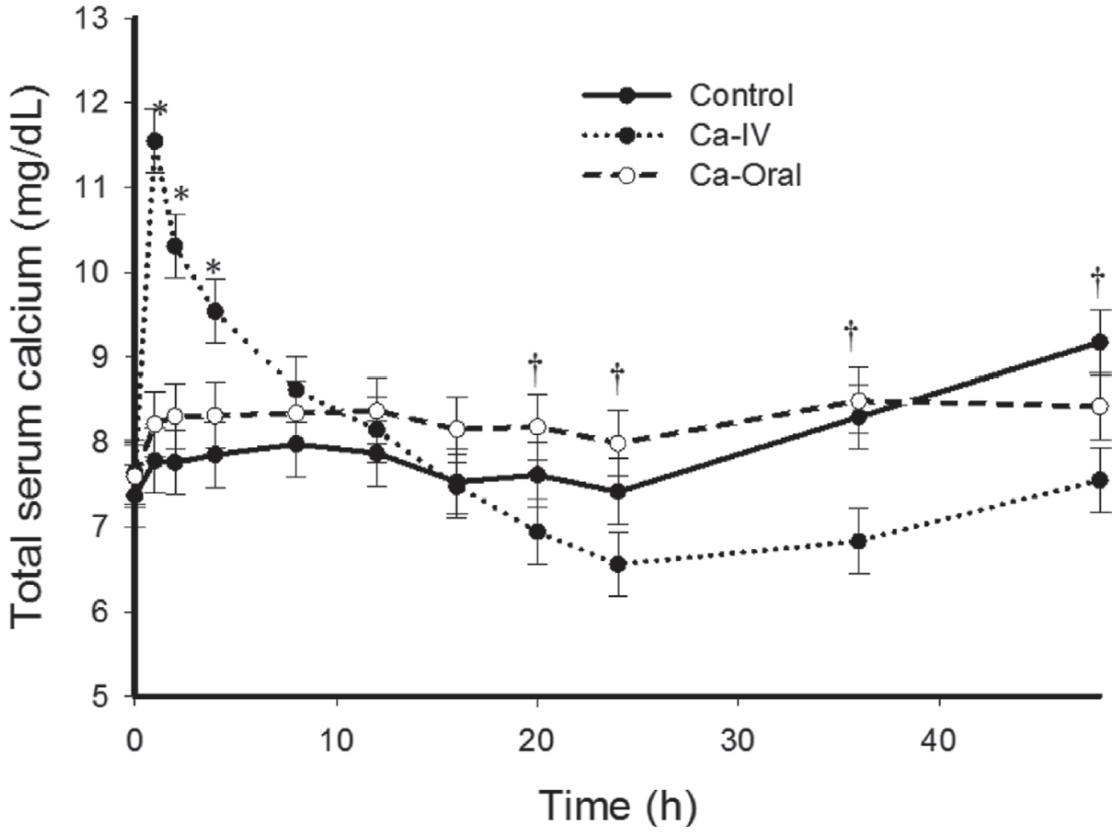
Consequences

- Effects on birth process:
  - Dystocia
  - More retained fetal membranes (Curtis et al. 1983, 1985; Goff, 2008; Reinhardt et al., 2011)
- Effects on immunity/health:
  - Increased susceptibility to mastitis (Curtis et al. 1983, 1985; Reinhardt et al., 2011)
  - Increased incidence of ketosis (Curtis et al. 1983, 1985; Reinhardt et al., 2011)
- Effects on smooth muscle contraction:
  - Reduced rumen and abomasal motility
    - Higher risk of displaced abomasum (Curtis et al. 1983, 1985; Goff, 2008; Reinhardt et al., 2011)
    - Lower feed intake (Goff, 2008; Reinhardt et al., 2008)

Solutions to hypocalcaemia

Solutions to (sub)clinical hypocalcaemia:

- Intravenous injection of Ca
- Oral Ca supplement
  - Force-fed Ca-bolus
    - 43 g Ca/bolus
      - Ca chloride, Ca sulfate, water, Non-glyceride ester of vegetable fatty acids, Xanthan gum
  - Voluntary Ca-drink
    - 44 g Ca/dose
      - Ca, Dextrose, vitamins, minerals



Blanc et al. 1997

Objective

Compare a Ca-drink on voluntary basis to application of a force-fed Ca-bolus and a negative control in periparturient dairy cows.

Hypotheses:

- **Administration of Ca via a drink is less stressful for the animals**
- **The Ca-drink improves the Ca balance of the cow at least as much as a Ca-bolus compared to a control**

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Experimental set up

Dry matter intake and **milk yield** measurements during 3 weeks after calving

Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7

-2 weeks
Blood
Sampling

Day 0
Calving
Product administration
+15 min: blood sampling

6h
Blood
Sampling

12h
Blood
Sampling

24h
Blood
Sampling

48h
Blood
Sampling

Treatments:

- Negative control (20L lukewarm water)
- Ca-drink (20L lukewarm product)
- Ca-bolus (+ 20L lukewarm water)

23 cows per treatment

(max 5 heifers per treatment)

Blood sampling:

- **Calcium** for Ca metabolism
- **NEFA** as measure for negative energy balance
- **BHB** as measure for negative energy balance
- **Cortisol** and **glucose** as measure for stress

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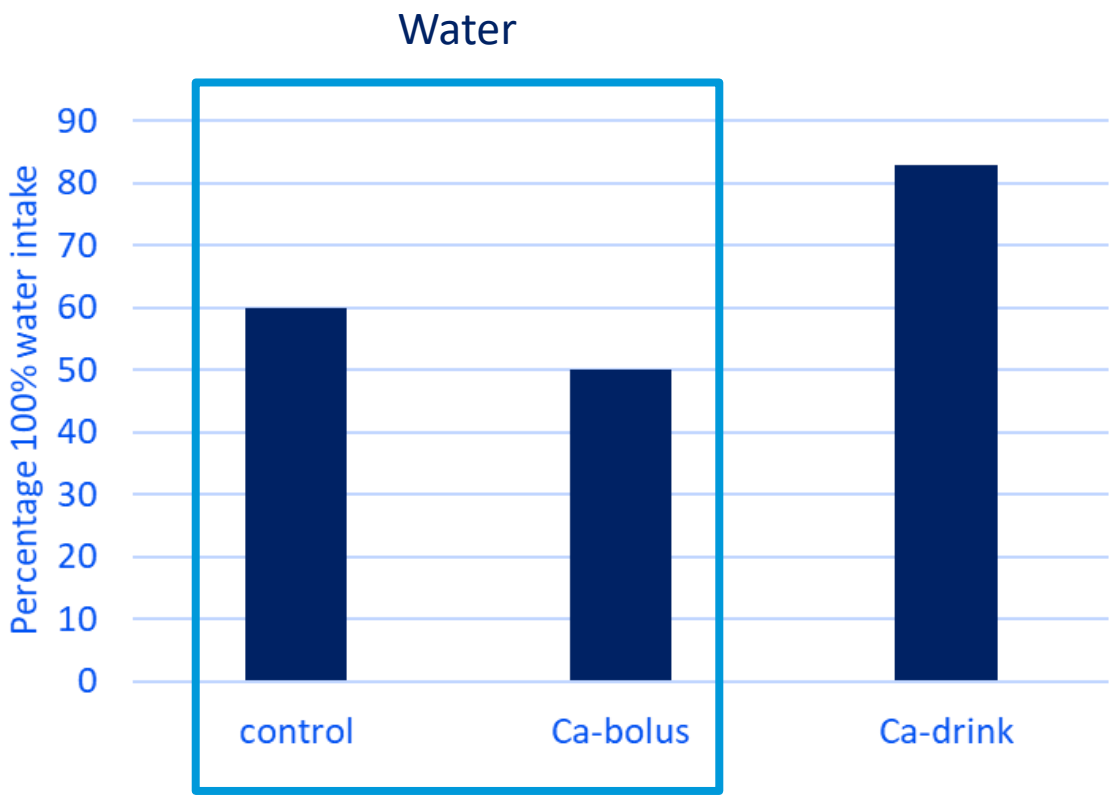
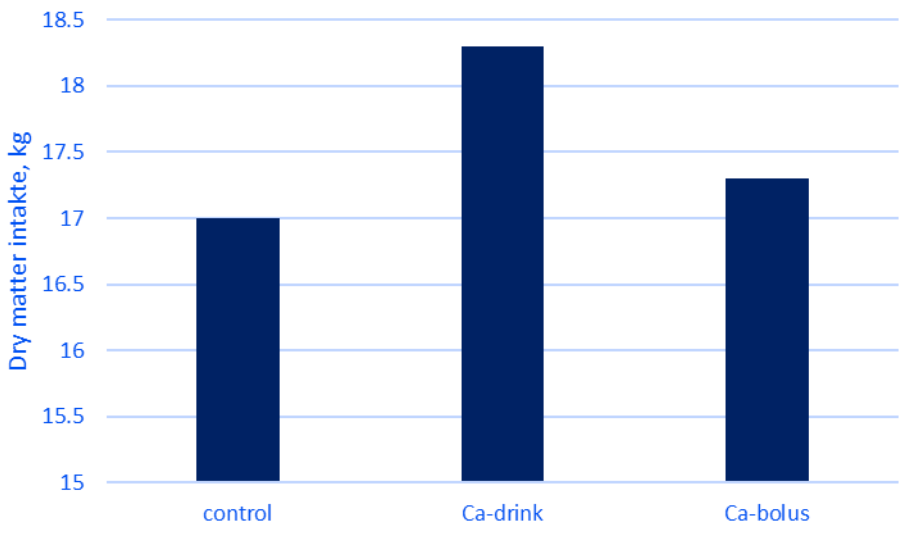
Results - voluntary intake

More cows consumed the total 20L when Ca-drink was offered compared to (lukewarm) water

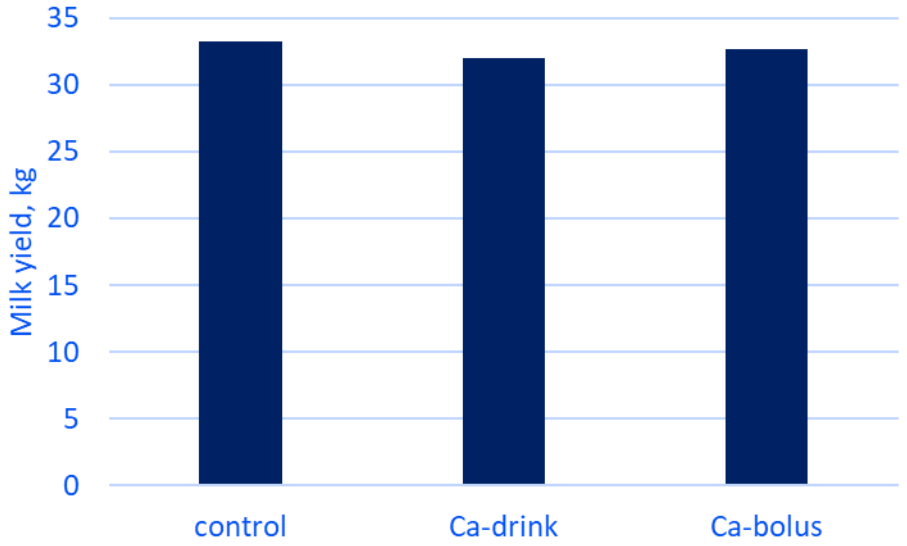


Results - dry matter intake & milk yield

Measured during 3 weeks after calving.
No significant differences between treatments.



Lsd: 1.3
P=0.095



Lsd: 2.3
P=0.363

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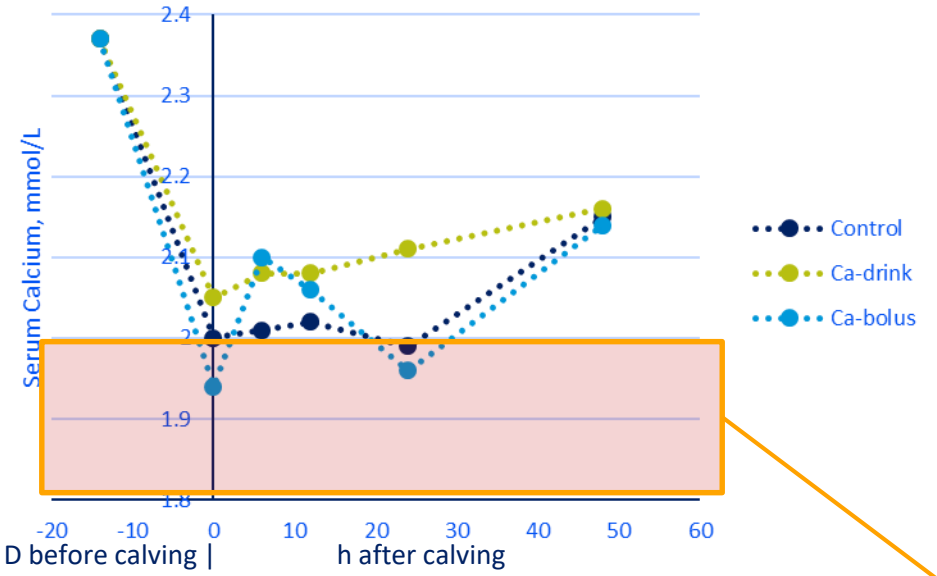
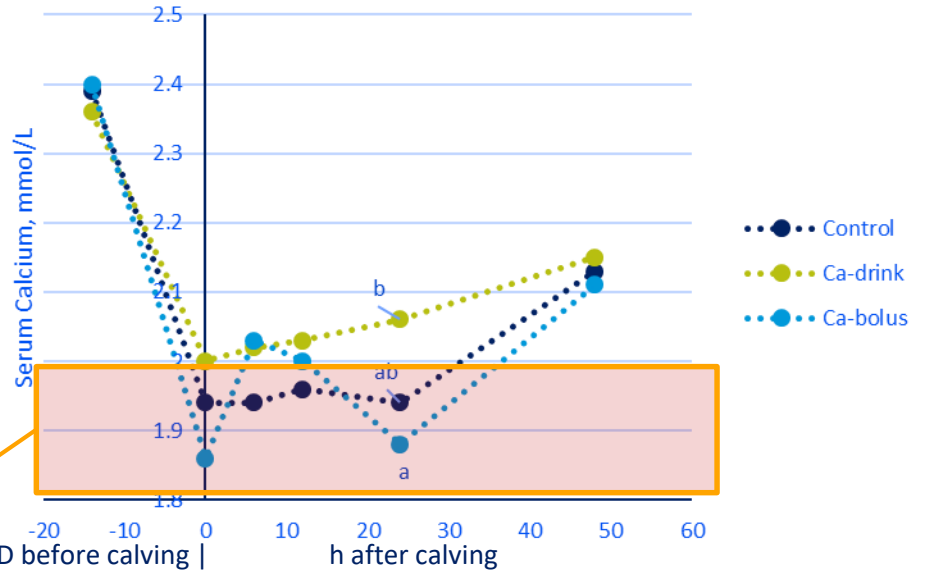
Results - calcium status

Cows + heifers



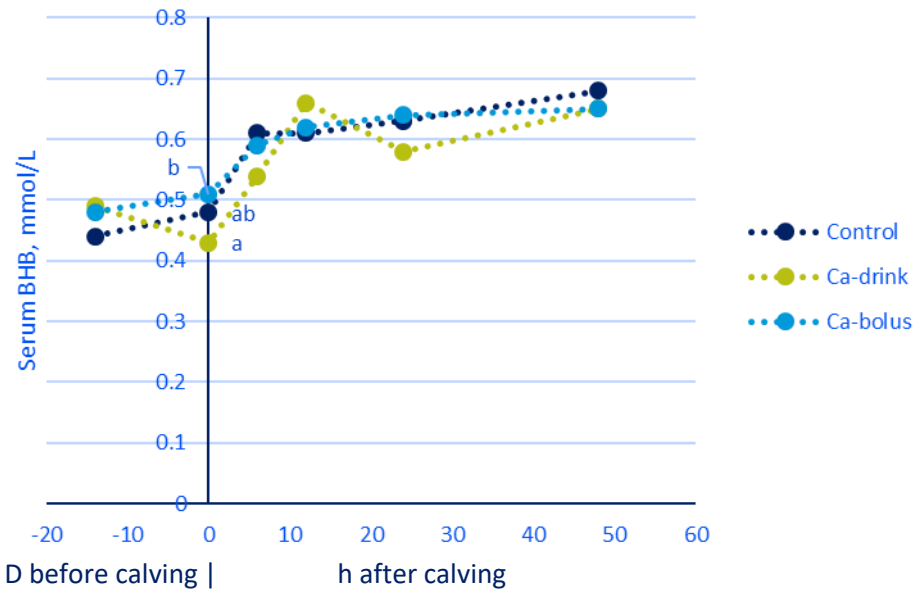
Cows (2nd lactation or older)



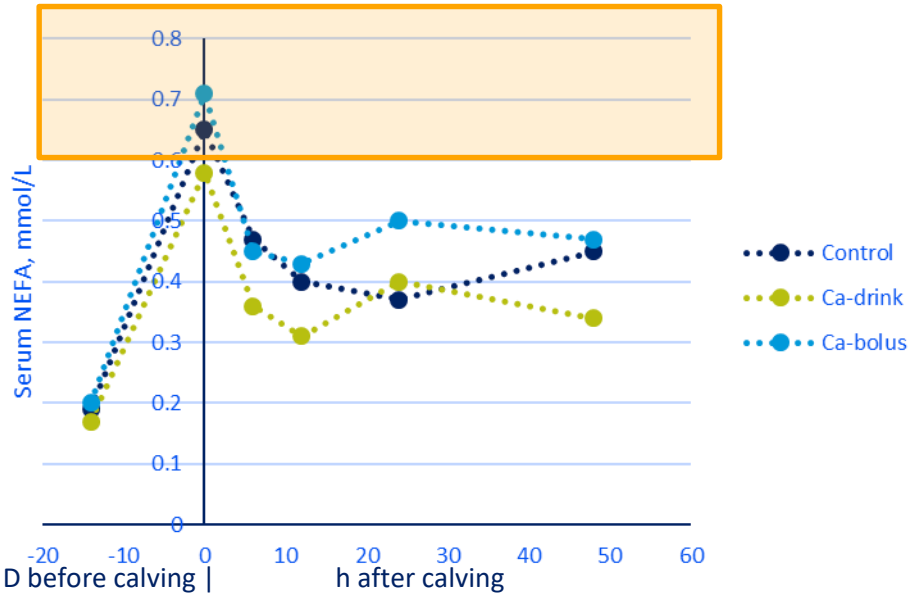
Subclinical hypocalcaemia

- After 24 hours, the serum Ca level was significantly higher in cows (2nd lactation or older) that received the Ca-drink compared to the Ca-bolus

Results - BHB & NEFA



Subclinical ketosis: BHB >0.9 mmol/L



Negative energy balance: NEFA >0.6 mmol/L

- Both BHB and NEFA levels were within the normal ranges, suggesting no subclinical ketosis or a negative energy balance

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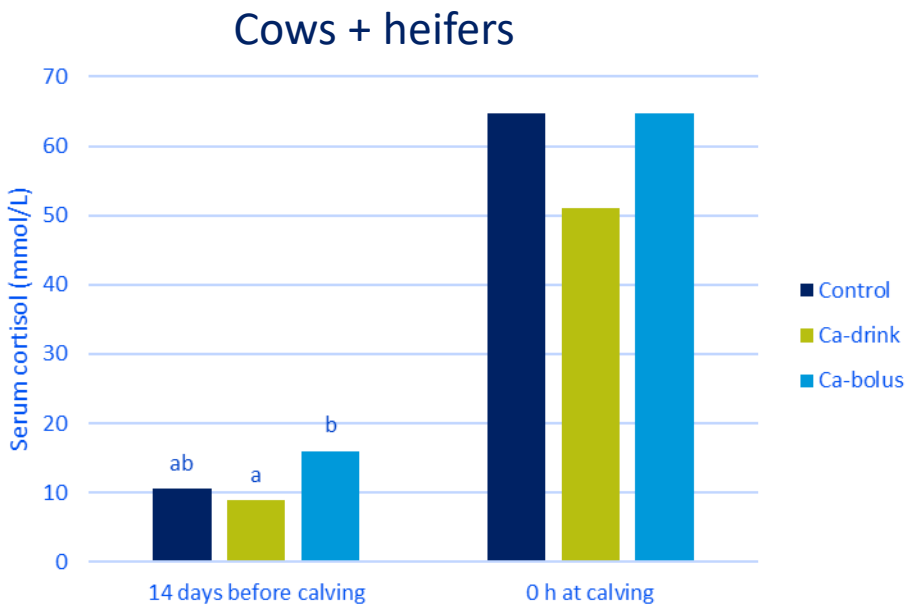
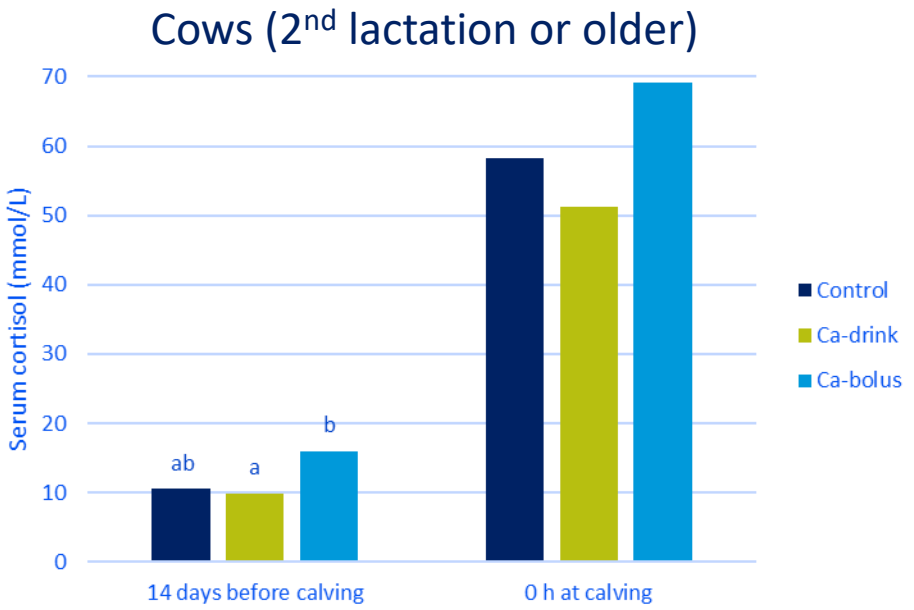
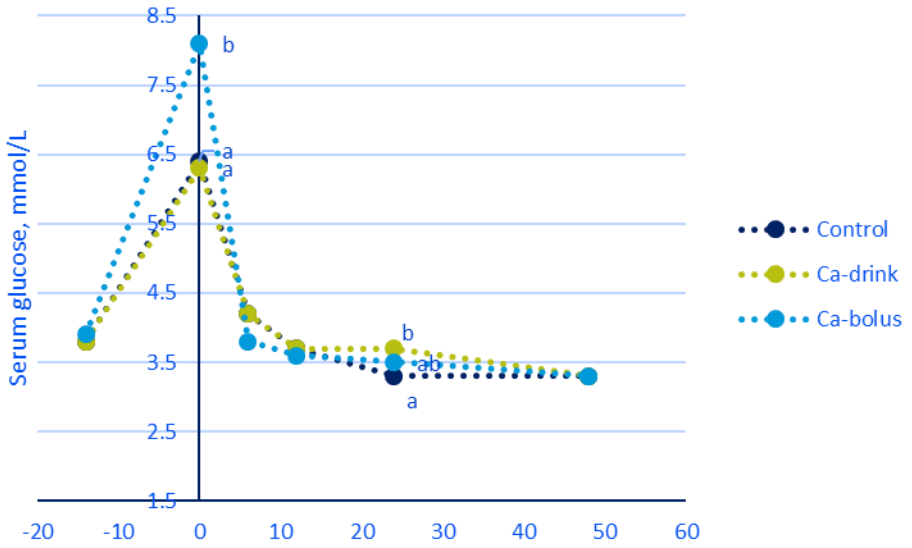
Results - Cortisol





- Difference before calving → no significant differences after calving.
- Cortisol levels are highly variable within and between animals

Glucose



- The bolus group had higher blood glucose at T=0 (= 15 min after product administration) compared to the other two groups.
- After 24h the blood glucose level was higher for the Ca-drink group compared to the control group

Conclusions

- **Administration of Ca via a drink is less stressful for the animals**
  - No difference in cortisol: differences before calving, and a high variation caused by calving itself. Numerically lower for the Ca-drink group.
  - The higher glucose level for the Ca-bolus group directly after calving and product administration could be the effect of more stress.
- **The Ca-drink does improve the Ca balance of the cow at least as much as a Ca-bolus compared to a control**
  - Higher serum Ca level after 24h in the Ca-drink group compared to the Ca-bolus group – especially in multiparous cows
- **Cows often do not drink (or eat) around calving → The Ca-drink may stimulate voluntary water and feed intake, which may be beneficial for welfare and production**
  - Tendency to a higher dry matter intake in the Ca-drink group

Thank you for your attention

A voluntary Ca-drink improved the Ca-balance of periparturient dairy cows, judged by the Ca status and appetite in the first 24h after calving.