Can Calcium Propionate Help Maintain Calcium Concentrations and Prevent Metritis in Dairy Cows with Dystocia?[1]

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Introduction

Uterine diseases are highly prevalent in high-producing dairy cows. Metritis affects an average of 20% of lactating dairy cows, with the incidence ranging from 8% to > 40% at some farms. The major risk factors for metritis are dystocia, twins, stillbirth, and retained placenta (RP) (Markusfeld 1984; Curtis et al. 1985; Markusfeld 1985).

Hypocalcemia has been consistently associated with RP (Curtis et al. 1985); cows with any of these risk factors had lower calcium three days after calving (Martinez et al. 2012). Calcium is a key mediator in several cell processes, including activation of immune cells. In two recent studies, naturally occurring or induced hypocalcemia led to impaired immune function, which is probably the reason for increased incidence of metritis in cows with hypocalcemia (Martinez et al. 2012; Martinez et al. 2014). Interestingly, the ability to maintain calcium concentration in blood in the first three days after calving was more important than the absolute calcium concentration; the greater the drop in calcium concentration in the first three days postpartum, the greater the probability of developing metritis later in lactation (Martinez et al. 2012).

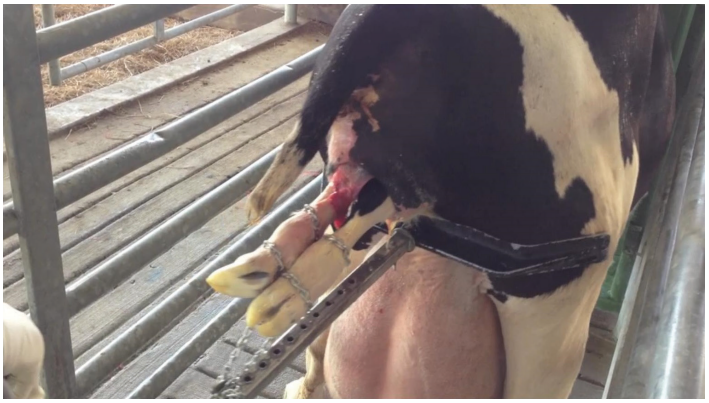

Figure 1. Cow with dystocia. Calf is being delivered by applying traction using a calf extractor.
Credits: Achilles Vieira-Neto, UF/IFAS

Therefore, it would make sense that giving supplemental calcium to cows at risk for metritis would help maintain calcium concentrations in blood and help prevent metritis. In this article, we will present the main findings of a Benzaquen et al. (2015) study that gave supplemental calcium propionate to cows with dystocia.

Material and Methods

The study was conducted at the University of Florida Dairy Unit. Multiparous Holstein cows with dystocia were randomly assigned into two groups (treated or not), and a third

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reference group of cows without dystocia were randomly selected and left untreated. Treated dystocic cows (DCP; n=18) were treated orally with 516 g of calcium propionate (NutroCAL 100; Kemin AgriFoods North America) within 6 hours of calving and again 3 days postpartum. Untreated dystocic cows (DNT; n=22) were not given calcium. This was also the case for the selected cows that had a normal calving (NNT; n=25). Plasma concentrations of calcium were measured at calving (day 0) and at 1, 2, 3, 6, and 12 days postpartum. Common postpartum diseases—such as retained fetal membranes (RFM), metritis, mastitis, and displaced abomasum (DA)—were diagnosed by trained farm personnel within 30 days postpartum.

Results

Figure 2 shows the plasma mean ± SE total calcium concentrations from calving until 12 days postpartum according to dystocia group. Surprisingly, mean plasma total calcium concentration was lower in cows in DCP compared with those in NNT (2.04 ± 0.03 vs. 2.17 ± 0.02 mmol/L; P = 0.001), and mean plasma total calcium concentration tended to be decreased for DCP compared with DNT (2.04 ± 0.03 vs. 2.11 ± 0.03 mmol/L, respectively; P = 0.08). Mean plasma total calcium concentration also tended to be decreased for DNT compared with NNT (2.11 ± 0.03 vs. 2.17 ± 0.02 mmol/L; P = 0.09). Mean plasma total calcium concentration was particularly decreased (P ≤ 0.02) for DCP compared with DNT and NNT 2 days postpartum (1.92 ± 0.04 vs. 2.05 ± 0.04 vs. 2.17 ± 0.04 mmol/L, respectively) and 3 days postpartum (1.99 ± 0.04 vs. 2.12 ± 0.04 vs. 2.18 ± 0.04 mmol/L, respectively). Plasma total Ca concentration was also decreased for DNT compared with NNT on 2 days postpartum (2.05 ± 0.04 vs. 2.17 ± 0.04 mmol/L; P = 0.02).

Table 1 shows the prevalence of clinical diseases from days 1 to 30 postpartum according to dystocia group. Cows in the DCP group had increased prevalence of RFM compared with cows in NNT (27.8% vs. 0.0%; *P* = 0.009), whereas prevalence of RFM was similar between DCP and DNT (27.8 vs. 9.1%; *P* = 0.11) and between DNT and NNT (9.1% vs. 0.0; *P* = 0.21). Cows in the DCP group had increased prevalence of metritis compared with cows in NNT (33.3 vs. 8.0%; *P* = 0.04), whereas prevalence of metritis was similar between DCP and DNT (33.3 vs. 22.7%; *P* = 0.45) and between DNT and NNT (23.8 vs. 8.7%; *P* = 0.13). Cows in the DCP group tended to have increased prevalence of mastitis compared with cows in NNT (16.7% vs. 0.0%; *P* = 0.07), whereas prevalence of mastitis was similar between DCP and DNT (16.7 vs. 4.6%; *P* = 0.20) and between DNT and NNT (4.6% vs. 0.0%; *P* = 0.47). Incidence of DA was not affected by group. Overall prevalence of clinical diseases was increased (P < 0.05) for DCP and DNT compared with NNT (50.0 vs. 36.4 vs. 8.0%) whereas prevalence was similar for DCP compared with DNT (*P* = 0.39).

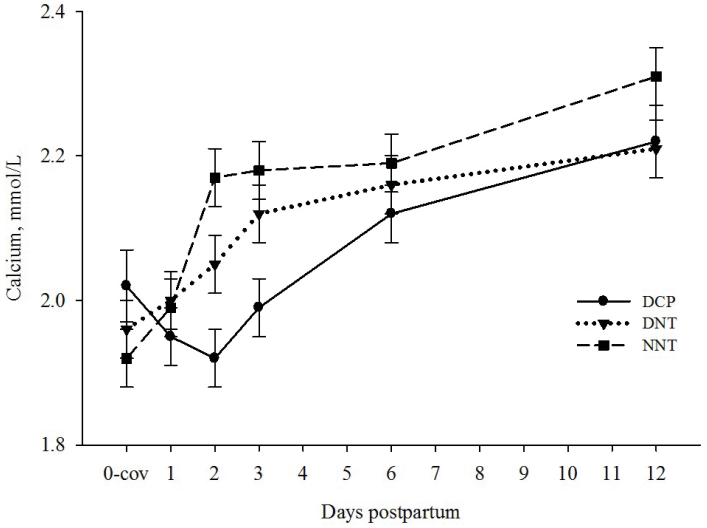

Figure 2. Least square means ± SEM for plasma calcium concentrations for cows in DCP (solid line; *n*=18), DNT (dotted line; *n*=22), and NNT (dashed line; *n*=25) from days 0, 1, 2, 3, 6, and 12 postpartum.

Table 1. Effect of dystocia group on clinical diseases from days 1 to 60 postpartum

Variable	DCP	DNT	NNT
RFM, % (n/n)	27.8 (5/18)[a]	9.1 (2/22)[a,b]	0.0 (0/25)[b]
Metritis, % (n/n)	33.3 (6/18)[a]	22.7 (5/22)[a,b]	8.0 (2/25)[b]
Mastitis, % (n/n)	16.7 (3/18)[A]	4.6 (1/22)[A,B]	0.0 (0/25)[B]
DA, % (n/n)	5.6 (1/18)[a]	4.6 (1/22)[a]	0.0 (0/25)[a]
Overall, % (n/n)	47.4 (9/17)[a]	36.4 (8/22)[a]	8.0 (2/25)[b]

[a,b] Data within a row are significantly different (*P* < 0.05).
[A,B] Data within a row tend to differ (*P* < 0.10).
RFM = retained fetal membranes diagnosed 24 hours postpartum
Metritis = presence of watery, red-brownish fetid uterine discharge within 21 days postpartum with or without a fever
Mastitis = presence of abnormal milk or mammary gland within 30 days postpartum
DA = displacement of the abomasum within 30 days postpartum
Overall = presence of any of the above described conditions

Summary

In summary, dystocia is detrimental to calcium homeostasis postpartum and to overall health; however, calcium propionate supplementation as performed in the study by Benzaquen et al. (2015) is not recommended, because it led to lower blood calcium concentration postpartum and led to no benefit in postpartum health.

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