

A randomized clinical trial assessing the effect of the timing of the administration of oral calcium supplementation on blood calcium and magnesium concentrations after calving in dairy cows

C. Florentino¹, DVM; L. Caixeta¹, DVM, PhD; E. Shepley¹, MSc, PhD; M. Ruch¹, BS; J. Silva¹, BS; B. Crooker², MS, PhD

¹Department of Veterinary Population Medicine, University of Minnesota, St. Paul, MN, 55108;

²Department of Animal Sciences, University of Minnesota, St. Paul, MN, 55108

Introduction

Subclinical hypocalcemia (SCH) is an important metabolic disease of dairy cattle affecting up to 70% of multiparous cows. Blanket administration of oral calcium boluses to multiparous cows immediately postpartum is a popular management strategy to treat SCH. Recent studies, however, report that more than 60% of cows with low total blood calcium concentrations at calving have normal calcium concentrations on the second day postpartum and are high-producing animals. In contrast, SCH that persists for several days is associated with impaired health and performance. Developing management strategies that delay the administration of oral Ca concentration until the second day postpartum and targeting cows with inadequate Ca homeostasis is of interest to the dairy industry. The first step in developing such strategies is to understand the differences in the dynamics of calcium (Ca) and magnesium (Mg) when oral Ca supplementation is administered at different days postpartum. Thus, our study aim was to determine the dynamics of Ca and Mg concentrations during the first 5 days in milk (DIM) following the administration of an oral Ca supplement at calving or on the second day postpartum.

Materials and methods

On the day of calving, 14 dairy cows (parity ≥ 3) at the University of Minnesota Dairy Cattle Teaching and Research Facility were randomly assigned to 1 of 2 groups: conventional treatment (D1, oral Ca supplementation at calving; $n = 7$) or delayed treatment (D2, oral Ca supplementation on the second day postpartum; $n = 7$). All cows received two boluses (RumiLife CAL24, Genex), as per manufacturer's recommendations. Blood samples were collected from a coccygeal vessel using an evacuated tube with lithium heparin. First blood samples were collected within 12 h after calving, immediately before Ca administration on d 1 or 2 postpartum, and daily thereafter through 5 DIM. Blood samples were centrifuged within 2 h of collection for 10 min at $800 \times g$ to isolate plasma. Urine samples were collected weekly during the 3 weeks prior to expected calving date for the measurement of urine pH (Oakton EcoTestr pH 2+ pocket pH meter, Oakton Instruments). Total Ca and Mg were measured using a small-scale chemistry analyzer (CataChemWell-T, Catachem Inc.) and the Arsenazo III and Xylidyl blue methods, respectively. Total Ca and Mg plasma concentrations during the first 5 DIM were analyzed by multivariable linear mixed models accounting for repeated measures. Parity and baseline Ca and Mg concentrations were offered to the models as covariates.

Results

Only interim results are reported in this abstract. Parity ($P = 0.37$), prepartum urine pH ($P = 0.28$) and baseline Ca ($P = 0.23$) and Mg ($P = 0.29$) concentrations did not differ between D1 and D2. Mean time \pm SD after calving of calcium bolus administration was 8.6 ± 7.8 h for D1 and 20.3 ± 3.6 h for D2. Although baseline total Ca ($P = 0.04$) and DIM ($P < 0.001$) were associated with Ca concentration throughout the first 5 DIM, treatment ($P = 0.86$) and treatment by time interaction ($P = 0.70$) were not. In D1 and D2, total Ca concentrations increased over the first 5 DIM for both D1 and D2. Plasma Mg concentration decreased ($P < 0.001$) from calving through 5 DIM but was not affected by treatment ($P = 0.41$), baseline Mg concentration ($P = 0.06$), or the treatment by time interaction ($P = 0.39$).

Significance

Our results indicate that blood Ca and Mg dynamics during the first 5 DIM did not differ when oral calcium supplementation was administered at 1 or 2 DIM. Further investigation is needed to determine if Ca and Mg dynamics would follow similar patterns when treating only animals with low blood Ca on d 2 postpartum.

