

Effect of oral calcium bolus supplementation on rumination and activity patterns in early lactation dairy cows

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Introduction

Subclinical hypocalcemia occurs frequently in multiparous dairy cattle during early lactation. Calcium supplements are widely used in an attempt to mitigate the substantial negative effects of subclinical hypocalcemia on health and production. Cows with subclinical hypocalcemia spend less time ruminating than normocalcemic cows. The objective of this study was to determine whether oral supplementation of calcium at calving and 12 h after calving was associated with changes in rumination or activity patterns in multiparous Holstein cows. Our hypothesis was that cows supplemented with oral calcium at calving would spend more time ruminating and have altered activity compared with unsupplemented cows during early lactation.

Materials and Methods

Multiparous Holstein cows (n=76) at the University of Florida Dairy Unit were fitted with rumination and activity-monitoring collars (SCR Engineers, Netanya, Israel) 21 days prior to expected calving date. Cows were fed pre- and postpartum TMR diets formulated to meet or exceed NRC requirements; the prepartum TMR was supplemented with anionic salts to attain a negative DCAD. Cows were randomly assigned to a treatment or control group at calving. Treatment consisted of an oral calcium bolus containing 43 g of available calcium (BoviKalc, Boehringer-Ingelheim Vetmedica, St. Joseph, MO) administered within 2 h after calving and repeated 12 ± 2 h after calving. Cows assigned to the control group did not receive any treatment. Blood samples were collected prior to and 30 min after each treatment or at equivalent times for control cows, and at 24 h after calving to determine serum total calcium (tCa), non-esterified fatty acid (NEFA) and beta-hydroxybutyrate (BHBA) concentrations. Raw data for time spent ruminating and steps taken were recorded in 2 h blocks for the first 24 h after calving and as a daily average from 21 days prepartum to 30 days after calving. Body condition and locomotion scores were recorded pre- and post-partum, and lactation number, calving ease scores, health data and production data for the first 30 days in milk were obtained

from herd records. Rumination and activity baseline variables (average values for -21 to -5 days prepartum) were calculated for each cow. Cows were excluded from analyses if they were treated for clinical hypocalcemia after enrollment or if they left the herd prior to the end of the study period. Appropriate models for each of the variables of interest were fitted using PROC MIXED in SAS (v.9.4, 2012).

Results

Seventy-four cows were included in the analyses. Calcium supplementation at calving and 12 h after calving had no effect on the time spent ruminating during the first 24 h after calving, when adjusted for pre-partum rumination status and tCa at calving (12.2 ± 2.2 and 12.3 ± 2.2 min/2h for treated and control groups, respectively). Similarly, there was no effect of treatment on daily rumination time for the first 30 days of lactation (330.9 ± 18 and 330.6 ± 18 min/day for treated and control cows, respectively). There was also no effect of treatment on activity (steps/day) and milk production during the first 30 days of lactation. At the time of enrollment, the average tCa was 7.95 ± 0.85 mg/dl, with 82% of cows classified as subclinically hypocalcemic (< 8.6 mg/dl). Serum tCa, NEFA or BHBA did not differ significantly between groups over the 24 h after calving. The proportion of cows with an average tCa of <8.6 mg/dl in the 24 h after enrollment was 50% in the treated group and 64% in the control group; this difference was not statistically significant.

Significance

Oral supplementation of calcium at calving using a commercially-available product had no effect on the amount of time spent ruminating or on activity levels in multiparous Holstein cows with a high prevalence of subclinical hypocalcemia. Further work would be needed to determine whether calcium supplementation increases the time spent ruminating or dry matter intake in certain subsets of cows that have benefited from oral calcium supplementation in other studies, such as lame cows.