

# Strategic Use of a Bolus Containing Calcium Chloride and Calcium Sulfate as a Supplemental Source of Calcium in Periparturient Dairy Cows

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## Introduction

The onset of lactation results in a physiologically significant loss of calcium. The loss of blood calcium requires increased mobilization of skeletal stores and a concurrent increase in the absorption of dietary calcium. The inability of the animal to maintain calcium homeostasis can result in hypocalcemia. Hypocalcemia can manifest itself as a clinical disease which limits mobility. In less severe cases of hypocalcemia, the animal maintains normal mobility and locomotion, but other muscle functions such as GI tract mobility can be altered. Strategies to enhance the periparturient dairy cow's ability to maintain calcium homeostasis includes limiting total calcium intake, modifying the dietary cation – anion difference, injecting cows with calcium immediately after calving, and/or administering an oral calcium supplement immediately after calving. A project has been designed to investigate the strategic use of a mineral supplement dosed as an oral bolus at calving to increase free ionized calcium immediately post-partum.

## Materials and Methods

Mature dairy cows (second lactation or higher) were housed in a freestall barn located at the University of Missouri Foremost Dairy Research Center. All cows had ad libitum access to the close-up dry cow diet. The diet was fed as a total mixed diet once per day. The diet included corn silage, grass hay, ground corn, soy hulls, soybean meal, roasted soybean meal, and appropriate vitamins and minerals. The close-up diet did not contain anionic salts and had a DCAD of +19 meq/100g. Crude protein, ADF, NE-lactation, calcium and phosphorus were 15.3%, 31.1%, 0.73 Mcal/lb, 0.50% and 0.27% (on a dry matter basis), respectively. Cows had free access to water and pasture exercise paddocks. Approximately 24 and 48 hours prior to expected calving, blood samples were collected by venipuncture of the coccygeal vein. Free ionized calcium was measured immediately after collection using an IDEXX Laboratories VetStat Analyzer. Cows with a free ionized calcium of

less than or equal to 1.1 mmol/L were enrolled in the study. Eligible cows were assigned to the study and randomly allocated to treatments (n=10 per treatment group). Treatments included Control and Bolus. Cows assigned to Bolus treatment were dosed with a bolus (Bovicalc) at 1 hour and 12 hours after calving. Blood and urine samples were collected at 0,1,6,12,13 and 24 hours post calving. Blood pH, ionized Ca, total serum Ca, urine pH and urine Ca were measured. Data were analyzed using PROC GLM and PROC CORR of SAS. Repeated measurements were analyzed using PROC MIXED of SAS. Statistical differences were determined at  $P < 0.05$  and statistical trends were defined at 0.05

## Results

There was no difference in total serum Ca due to treatments. Bolus treatment did tend to increase total serum Ca over time after calving compared to Control ( $P=0.09$ ). Bolus treatment increased free ionized Ca after calving compared to Control (trt\*time,  $P=0.023$ ). Urine pH was also lower for cows given the oral supplement ( $p=0.05$ ). Total serum Ca was significantly correlated with free ionized Ca ( $p=0.001$ ) for all cows. Urinary pH was strongly correlated with the ratio of free ionized Ca to total serum Ca ( $P=0.04$ ).

## Significance

An oral nutritional bolus supplying supplemental Ca as calcium chloride and calcium sulfate shifted urine pH immediately after dosing. Urine pH remained lower for supplemented cows during the first 24 hours post-partum compared to control cows. The change in urine pH was associated with a trend towards increased total serum Ca and a significant increase over time in free ionized Ca. All control cows had free ionized Ca below 1.0 mmol/L throughout the first 24 hours post calving. However, only one cow in the study exhibited clinical signs of hypocalcemia. Cows given the oral supplement maintained ionized Ca above 1.0 after the initial bolus was administered.