

What Happens to Calcium Boluses in the Rumen: Did You Know that Not All Calcium Boluses are Created Equal?

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Why is this important?

The onset of lactation results in a sudden increased demand for calcium and cows that are unable to adapt to this change in calcium demand develop either clinical hypocalcemia (also referred to as “milk fever”) or subclinical hypocalcemia. Cows may be weak, not eating and unable to get up or they may show no symptoms (sub-clinical hypocalcemia), but hypocalcemia is also associated with mastitis, muscle/nerve damage, poor immunity, increased chances of infection and a reduced feed intake. It is estimated that clinical hypocalcemia occurs in less than 5% of dairy cows on well managed farms and as high as 10% on some farms. The subclinical form may be as high as 50% of mature fresh cows resulting in a substantial impact on the profitability of dairy operations. One strategy to enhance the ability of fresh dairy cows to meet the increased calcium demand is oral supplementation of calcium boluses at calving, to raise the cow’s blood calcium concentrations as quickly as possible. However, the true mechanism of these boluses is not well understood.

What did we do?

There are several commercial calcium boluses available, all with different calcium formulations (Figure 2), and we wanted to measure the rate at which they dissolve in the rumen. We tested Cal-Boost (Solvat Animal Health), Transition Bolus (Vetoquinol N.-A Inc) and RumiLife CAL24 Bolus (Genex Cooperative Inc.; Figure 1). Each bolus was put in a mesh net with a recovery cord and the net and bolus were weighed and placed into the rumen through a fistula (Figure 1). The rumen pH was determined before placing the bolus using pH strips and a pH meter. After 30, 60, 90, 120, 180 and 240 minutes, the bolus was recovered, weighed, described, photographed and then returned to the rumen. The rumen pH was also determined at each sampling time. If the entire bolus was dissolved at the sample collection, sampling was terminated. Animals only received one bolus each per day on the test days and each bolus type was tested three times over the course of the study.

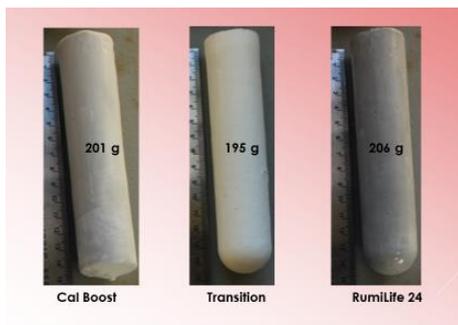


Figure 1. Original weight of 3 calcium boluses and a cow with a rumen fistula.

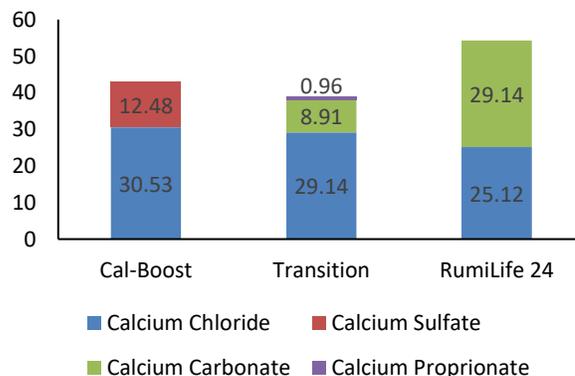


Figure 2. Calcium composition of all 3 commercial calcium boluses.

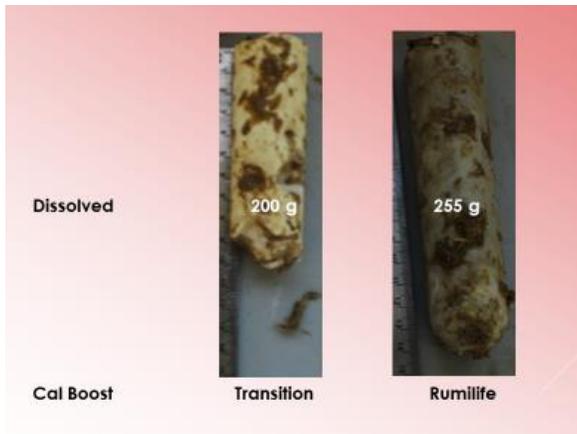


Figure 3. Calcium bolus dissolution after 90 minutes inside the rumen.

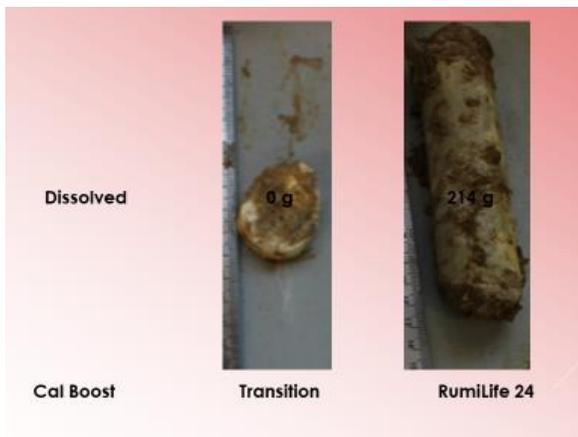


Figure 4. Calcium bolus dissolution after 180 minutes inside the rumen.



Figure 5. Calcium bolus dissolution after 240 minutes inside the rumen.

What did we find?

The Cal-Boost bolus dissolved the quickest of the three calcium boluses tested, with the entire bolus being dissolved before 90 minutes in all three trials (Figure 3). The Transition bolus was completely dissolved before 180 minutes in two trials (Figure 4) and 240 minutes in one trial. The Rumilife bolus remained after 240 minutes in the rumen with a minimum of 75% of the original bolus weight still intact (Figure 5). Rumen pH measured by strips remained relatively constant for all three boluses throughout the trials.

What does it mean?

According to our results, calcium is not available as quickly in some boluses as it is in others. In order to be used by the cows, calcium chloride and calcium sulphate are passively absorbed through the rumen wall, while calcium carbonate must be actively absorbed in the small intestine. However, for the calcium to be absorbed, it must first be dissolved. Calcium boluses are intended to supply calcium quickly within hours after parturition. The lowest concentration of blood calcium usually occurs within 12-24 hours of calving, therefore the faster an impact can be made on calcium blood levels the better. The ultimate goal of a calcium bolus treatment is to replace the calcium levels as soon as possible. Therefore, selecting a bolus that dissolves as quickly as possible is an important consideration.

Summary Points

- Not all boluses dissolved at the same rate, which may delay calcium delivery when it is needed most
- Calcium boluses did not affect rumen pH (in this study)
- Talk to your veterinarian about calcium bolus strategies

Special thanks to Dr. Gregory Penner of the University of Saskatchewan College of Agriculture and Bioresource for the use of his rumen pH probes, Dr. Vern Barons, Adele Ohama and Shane Sroka of Agriculture and Agri-Food Canada for the use of the cattle.