

Oral calcium boluses benefit mature cows

by Pedro Melendez, D.V.M.

HYPOCALCEMIA develops as a result of the sudden drain of calcium to colostrum at the onset of lactation. Its subclinical presentation is characterized by a blood total calcium concentration less than 2.15 mmol/L (8.6 mg/dL).

About 50% to 70% of mature cows may develop it in a subclinical state during the first 10 days postpartum. In addition, cows with subclinical hypocalcemia are more likely to experience dystocia, uterine prolapse, retained fetal membranes, puerperal metritis, displacement of the abomasum, mastitis, ketosis, and fatty liver. They are also more likely to have low milk production, early culling, and reduced fertility. Prevention is essential to succeed during the production cycle of dairy cows.

The right pH

As we discussed in a previous article (page 680 in the November 2020 issue), an effective preventive strategy for hypocalcemia is the use of anionic products to induce a mild acidification of the body. This may reduce the risk of milk fever by improving the mechanisms of controlling calcium concentrations in the blood, via greater release of calcium from the bones, less excretion of calcium via urine, and better absorption of calcium from the digestive tract through an enhanced action of vitamin D.

Consequently, the use of chloride-based products during the prepartum period has proven to be more efficient in triggering a mild metabolic acidosis with an optimal urinary pH between 6 and 7 for Holstein cows.

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We must remember that the overacidification with urine pH less than 6 is not good for the cow or the calf.

Worse for mature cows

Unfortunately, older cows (three or more parturitions) are more susceptible to developing hypocalcemia. This is due to an intrinsic negative effect of aging on the control mechanisms of blood calcium, and also because of their higher milk production when compared to first and second lactation cows. Therefore, even with adequate management of the anionic program, older cows are still likely to develop milk fever.

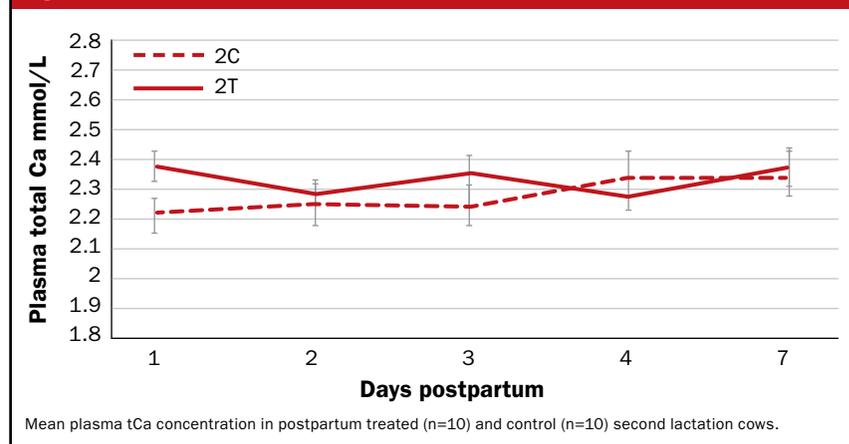
The use of oral calcium boluses in higher risk cows may be a strategy to complement the anionic program. In fact, in a study published in the *Journal of Dairy Science* in 2015, it was mathematically modeled that a herd with 1,000 parturitions per year and supplemented with oral calcium at parturition in multiparous cows may realize an economic net benefit between \$3,000 and \$8,000.

Studies from Cornell University (published in the *Journal of Dairy Science* in 2018 and 2020) reinforced the concept that low calcium concentrations during the early postpartum period play an important role as a risk factor for other diseases and reduced milk yield. In this sense, those studies concluded that “calcium levels were highly dependent on the lactation number of the cows and the days in milk where calcium was assessed.”

They defined three groups based on parity number and days postpartum:

1. Cows with “transient hypocalcemia,” affecting the animal only during the first two days postpartum.
2. Cows with “persistent hypocalcemia,” experiencing low levels of cal-

Figure 1. Plasma total calcium in second lactation cows



cium the first four days postpartum.

3. Cows with “delayed hypocalcemia” that have low levels of calcium beyond two days postpartum.

Within these definitions, each group had different risk levels for disease occurrence and milk yield when compared to cows without hypocalcemia.

Consider a bolus strategy

Based on those findings, we decided to assess the effect of oral calcium boluses at parturition. Cows were given two boluses of calcium chloride, 24 hours apart, or no calcium supplementation. Plasma total calcium (tCa), phosphorus (P), total magnesium (tMg), beta-hydroxybutyrate (BHB), and milk yield were measured during the early postpartum period in grazing Holstein cows fed prepartum anionic diets. The study was published in the *Livestock Science* journal.

Cows receiving a partial mixed ration with access to pasture had greater variability in urine pH, and it was more difficult to reach the desired urine pH between 6 and 7.

During the entire study, urine pH ranged from 6.25 to 8.

Both treated and control second lactation cows had normal calcium concentrations during the first week postpartum (Figure 1); however, supplemented cows produced less milk than the controls (Figure 2). This unexpected finding could be explained by a potential down regulation effect of extra calcium supplementation at parturition in cows with normal calcium levels.

Third lactation control cows experienced “persistent hypocalcemia” (low calcium up to Day 4 postpartum), but they recovered by Day 7 postpartum (Figure 3). However, supplemented cows were hypocalcemic only at parturition, but calcium levels were recovered by Day 2 postpartum. In addition, they produced more milk than the control cows (Figure 4).

Fourth lactation or greater cows were “transient hypocalcemic,” recovering calcium concentrations by Day 3 postpartum. Oral calcium supplementation improved hypocalcemia by Day 2 postpartum, while the

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Figure 2. Milk yield in second lactation cows

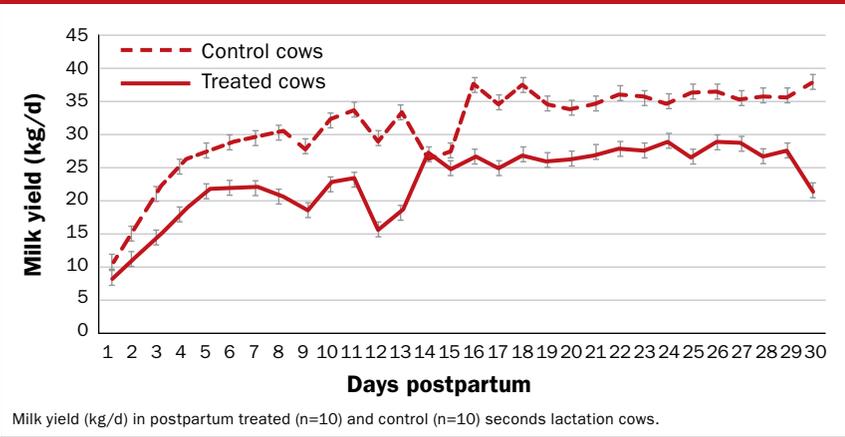
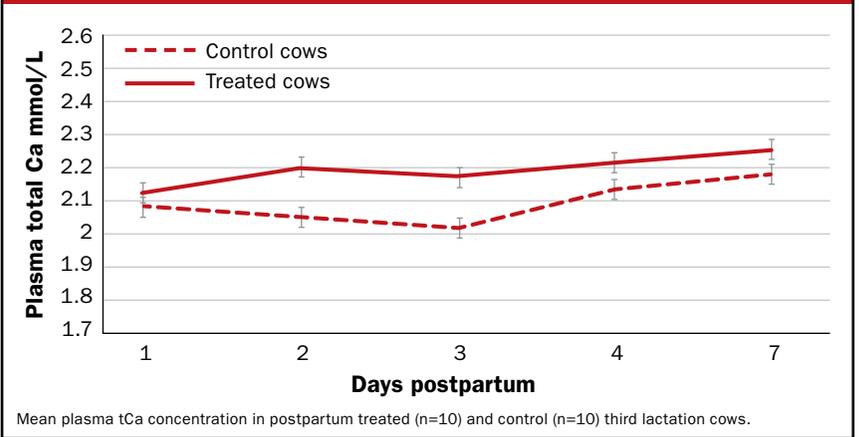


Figure 3. Plasma total calcium in third lactation cows



condition worsened in control cows. Treated cows produced more milk.

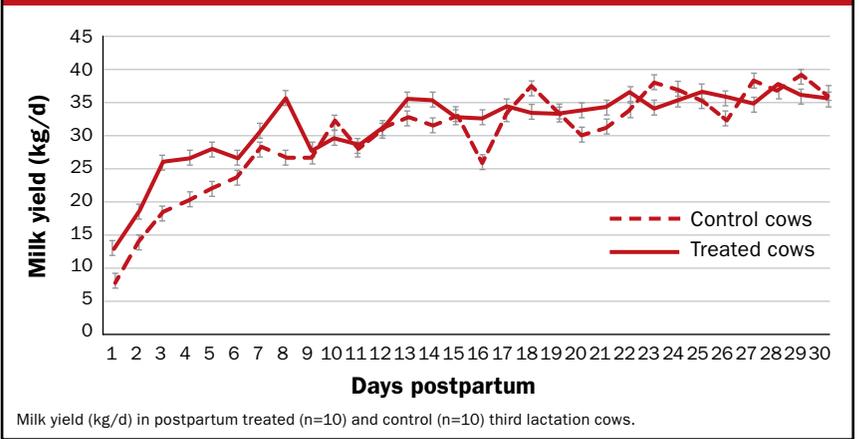
Plasma concentrations of P and tMg were not affected by treatment. In addition, cows supplemented with calcium boluses had higher concentrations of plasma hydroxybutyrate (a ketone body) by Day 4 postpartum. This is likely explained by the higher milk yield in supplemented cows.

We concluded that the supplementation of two oral calcium chloride (CaCl₂) boluses at parturition, 24 hours apart, in Holstein cattle under grazing conditions and fed partial anionic prepartum diets, improved

calcium status during the first week postpartum. It also boosted milk yield during the first month of lactation in cows with three or more lactations.

It did not affect plasma calcium concentrations of second lactation cows, and it reduced their milk production during the first month of lactation. These findings suggest that regardless of properly fed anionic diets, oral calcium boluses should be considered an effective complementary strategy to reduce the impact of hypocalcemia and improve milking performance of cows in the third lactation or older. 🐄

Figure 4. Milk yield in third lactation cows



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