

Subclinical hypocalcemia is a costly proposition

by Alvaro Garcia

SECOND lactation and older high-producing cows are prone to suffer blood calcium deficiency. This situation occurs due to the high calcium demands for the quickly growing calf in utero, and colostrum and milk production during the transition period and into early lactation.

Overall, low blood calcium is the single nutrient deficiency with the widest range of negative effects on a cow's productivity and well-being. Despite U.S. milk production per cow increasing steadily over time, the percentage of cows affected with milk fever has continuously dropped (Table 1). This has been the result of our improved understanding of its pathogenesis. While milk fever affects less than 3% of cows, subclinical hypocalcemia (SCH) is far more common, creating health and production problems at the herd level.

A critical element

Calcium has an active role in muscle, endocrine, and immune functions, and its deficiency can lead to health problems. In a recent study with 796 cows from five different herds, 32 cows had milk fever. Of the remaining 764 cows, 78% incurred SCH (Rodriguez et al.). In other words, when one cow had milk fever, another 24 cows had SCH. The occurrence of displaced abomasum, ketosis, retained placenta, and metritis was 3.7, 5.5, 3.4, and 4.3 times more likely, respectively, in cows with SCH.

Additional findings during this decade show that SCH remains as a hidden, costly imbalance in dairy cows. Recent research shows cows with SCH had reduced chewing activity, limited feed intakes, reduced insulin concentration, and a 70% reduction of conceiving at first service.

How to minimize SCH

The two most common interventions to reduce the incidence of postpartum subclinical hypocalcemia are using low calcium prepartum diets and dietary cation-anion difference (DCAD).

1. Low calcium prepartum diets. This historically has been the first approach to control milk fever. It's based on the principle to stimulate the secretion of parathyroid hormone (PTH) to mobilize calcium

from bone and enhance its level in the bloodstream. In the field, however, supplying less than 20 grams per day of dietary calcium is often-times difficult.

Zeolite, a natural calcium binder, added to the diet reduces bioavailable calcium. While there are promising results, there is currently not enough research to assess the long-term benefits from a production standpoint.

2. Dietary cation-anion difference. This is a frequent approach used by almost one-third of U.S. dairies. It has been the most impactful milk fever control strategy implemented since its development in 1984. The approach is to supply more negatively charged (anions) than positively charged (cations) minerals in the diet of prepartum cows to create a metabolic acidosis. The sum of milliequivalents of dietary cations (sodium plus potassium) subtracted from the sum of the milliequivalents of dietary anions (chloride plus sulfur) must be a negative number.

In practice, obtaining a negative DCAD of -150 mEq/kg of dry matter (DM) is oftentimes enough. Among the effects observed in multiparous cows is a reduction in the incidence of milk fever (12% to 3%) and an improvement in fat-corrected milk (FCM) yield of up to 2.2 pounds per day. In both multiparous and primiparous cows, it reduces the incidence of retained placenta and metritis.

Other approaches explored are supplementing dietary or injectable vitamin D3 and/or calcium. Dietary

Table 1. Milk yield and milk fever evolution in the U.S. in selected years

	2002	2007	2014
Milk yield, lbs.	18,608	20,204	22,259
Milk fever, %	5.2	4.9	2.8

National Animal Health Monitoring System (NAHMS)

Table 2. Costs per case of hypocalcemia and other associated ailments

	HC	MA	ME	LDA	RP	KE
Primiparous		\$377.3 82.4	\$198.9 55.5	\$500.9 118.0	\$177.7 59.5	\$89.2 27.8
Multiparous	\$285.2 60.6	\$494.0 93.0	\$304.1 65.1	\$740.6 132.2	\$363.1 74.9	\$209.5 73.8

HC = hypocalcemia, MA = mastitis, ME = metritis, LDA = left displaced abomasum, RP = retained placenta, KE = ketosis. Modified from Liang et al. (2017) and corrected by 2% year-over-year inflation except for 2021 (7%).

recommendations of D3 are 25,000 international units (IU) per day for prepartum large-breed, close-up cows (NRC). Injectable vitamin D3 results in rapid short-term gain in blood calcium, albeit followed by an inhibition of the parathyroid hormone that is contraindicated.

Giving the body a chance

The objective of calcium supplementation is to maintain blood calcium while allowing time for the physiological regulation mechanisms to start. For SCH control, subcutaneous is better than intravenous. There has not been a significant reduction observed in the development of other metabolic problems, enhanced production, or improved reproduction. In addition, there is the potential to interfere with normal calcium homeostasis.

To minimize the incidence of sub-

clinical hypocalcemia in a herd, it is important to think in terms of the calcium flux in the cows. Calcium intakes of the close-up group must be low, and it pays to include anionic salts to help cows get ready for the calcium losses during the transition period and lactation.

Just keep in mind that each milk fever case represents dozens of cows with SCH and its possible associated ailments. At the present time, and because of its pathogenesis, it is unreasonable to attempt eliminating subclinical hypocalcemia completely. It must be, however, maintained within levels that minimize the appearance of other costly metabolic problems. 🐄

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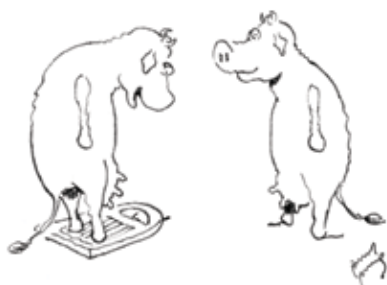


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- Alex Prins,
Double P Dairy



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