

Technical Bulletin

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Managing Calcium Status and Preventing Hypocalcemia in Fresh Cows

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for Progressive Dairyman*

In hockey, the term “goal differential” is the difference between the number of goals a team scores and the number of goals the team allows. Goal differential is one of the best predictors of a team’s success, and the Stanley Cup winner almost always has one of the best. Interestingly, the differences among the teams are relatively small, and minor improvements have a huge impact on a team’s success

Much like goal differentials in hockey, calcium status in fresh cows can be greatly influenced by small adjustments in management, mineral content of the diet and lowering the dietary cation-anion difference (DCAD). These small changes can ultimately result in significant positive benefits in cow health and lactation performance. Researchers have shown a link between serum calcium levels in fresh cows and milk yield, metabolic diseases, reproductive performance and the risk of being culled early in lactation.

Calcium Requirements

Late in gestation, a cow’s requirement for calcium increases as she begins to make colostrum. Her demand for calcium continues to increase after she calves and starts to produce greater volumes of milk. Unfortunately, in late gestation and early lactation, cows tend to have low dry matter intakes which compound the calcium balance differential during early lactation. As a result, when a cow’s requirement for calcium is increasing, the amount of calcium she is consuming is typically lower than her requirement.

To compensate for the difference between her requirement for calcium and her dietary calcium intake, a cow can utilize some of the calcium stored in her bones. Still, there is a period of time around calving when the amount of calcium a cow consumes and the calcium she removes from her bone is less than her requirement. When this occurs, she experiences a condition called hypocalcemia, which is defined as a serum calcium concentration below 2.13 millimoles per litre (mmol/L). If the difference between a cow’s supply of calcium and her requirement for calcium is great enough, she will experience clinical hypocalcemia (milk fever) which generally occurs when serum calcium concentrations drop below 1.50 mmol/L. The goal is for cows to return to normal serum calcium levels (2.13 to 2.60 mmol/L in the first 48 hours after calving).

Consequences of Low Serum Calcium Concentrations

One common way to evaluate a cow’s calcium status is to measure the concentration of calcium in blood serum. Researchers from the University of Guelph assessed the relationship between serum calcium concentrations in the first week of lactation and several health, production and reproductive measures (Table 1). In addition, researchers have linked low serum calcium concentrations post-partum to an increased incidence of metritis and ketosis. For these reasons, subclinical hypocalcemia is considered a gateway disease because cows that experience subclinical hypocalcemia are at risk for other metabolic diseases.

Table 1. Impact of postpartum serum calcium levels on performance

Parameter	Serum calcium, mmol/L	Impact
Milk production	≤ 2.1	2.6 kg less milk on first test day
Displaced abomasum	≤ 2.2	Increased odds of a displaced abomasum by 3.0 times
Reproduction	≥ 2.2	Increased odds of conception on first A.I. by 1.5 times
Cutting in first 60 days of lactation	≤ 2.2	Increased odds of removal from the herd by 1.5 times

Source: University of Guelph.

Compounding Costs of Low Serum Calcium Concentrations

The estimated cost of clinical hypocalcemia is \$300 per case, which includes the cost of treatment, milk loss and replacement of cows that do not recover from treatment. The estimated cost of subclinical hypocalcemia is \$125 per case, which includes to cost of lost milk and the direct costs associated with the increased risk of ketosis and displaced abomasum.

The incidence of clinical hypocalcemia in North America is less than 4 percent, but the incidence of subclinical milk fever is more than 50 percent. Table 2 shows the potential cost of clinical and subclinical milk fever in a 100-cow herd. In this example, the estimated cost of clinical milk fever is \$600 per year, the cost of the subclinical disease is more that \$6,000 and the total lost income per cow in the herd is \$69 per year.

Table 2. Economic impact of hypocalcemia

	Clinical milk fever	Subclinical hypocalcemia
Incidence of disease	2%	50%
Cost per case	\$300	\$125
Total cost	\$600	\$6,250
Calvings per year		100
Annual lost income per cow in the herd		\$69

Source: University of Wisconsin

Tips for Enhancing Fresh Cow Serum Calcium Status

Top managers recognize that improving calcium status in their herds can result in improved profitability. These managers make feeding and management strategies designed to reduce the impact of hypocalcemia a priority. Consider these three key strategies for improving serum calcium status of fresh cows, which may enhance transition cow health and performance:

1. Encourage dry matter intake in late gestation and early lactation.
 - a. Avoid overcrowding close-up dry cow and fresh cow pens by not exceeding an 80-percent stocking density (eight cows for every 10 freestalls).
 - b. Provide a minimum of 30 inches of feedbunk space per cow.
 - c. Avoid excess pen moves. Dry matter intake drops for up to three days each time a cow moves to a new pen.
 - d. When possible, keep springing heifers and mature cows in separate pens.

- e. Feed a palatable ration that encourages cows to consume more than 12 kg of dry matter per day.
 - f. Minimize the time cows spend in maternity pens, ideally moving them to these pens just in time for calving.
 - g. When cows are moved to maternity pens, provide feed and water.
2. Feed dry cows a ration balanced to meet their nutritional needs and increase the likelihood of a successful transition to their next lactation. See Table 3.

Table 3. Dry cow target nutrient levels

Nutrient	Far-off dry cows	Close-up dry cows fed a negative DCAD diet
Metabolizable protein, g	800	1,200–1,300
NeL, Mcal/kg	1.30-1.39	1.40–1.45
Forage NDF, % DM	> 27	> 27
Starch, % DM	< 15	15–18
Calcium, % DM	0.45-0.55	1.46–1.6
Phosphorus, % DM	0.30-0.35	0.36–0.42
Magnesium, % DM	0.20-0.22	0.45–0.51
Potassium, % DM	< 1.50	< 1.30
Sulfur, % DM	0.19-0.21	0.43–0.47
Chloride, % DM	0.20-0.24	0.80–1.0
Sodium, % DM	0.10-0.12	0.10–0.12
DCAD, mEq/100 g	< 20	-10--15

Source: Penn State Extension and Cornell University

3. Feed a negative DCAD diet using a palatable source of anions for a minimum of 21 days prior to calving. Research shows that cows fed a diet with a negative DCAD diet that drops urine pH below 6.0 have an improved calcium status after calving.

Dairy producers, like NHL teams, may also create an impressive goal differential as they contend for improvements in bottom line profits by improving the calcium status of their fresh cows. For more information about calcium management of your transition cows, contact your nutritionist or visit Animate-Dairy.com/Resources.

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