TECHNICAL TOPICS

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SUBCLINICAL HYPOCALCEMIA

RETHINKING AN OLD PROBLEM

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KEY TAKEAWAYS

- A reduction of blood calcium after calving is needed to provide negative feedback for the animal and allow for the metabolic changes that will maintain blood calcium levels during lactation.
- Measuring blood calcium at calving or within the first 24 hours is an unreliable method for determining Subclinical Hypocalcemia.
- Cows that have reduced blood calcium at 1 DIM but return to normal levels quickly produce more milk and have fewer health events than those who had normal levels at 1 DIM or those who were chronically low through 2-4 DIM.
- Aggressive or prophylactic calcium treatment may be counterproductive by slowing the normal mechanisms needed to return to normal calcium levels.
- Routine treatment with oral calcium is most beneficial in lame and high producing cows, while treatment of all 2nd+ Lactation cows may or may not have a positive return on investment, and treatment of 1st lactation cows can have some negative consequences.

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SUBCLINICAL HYPOCALCEMIA

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Milk Fever, or hypocalcemia, has thankfully become a much rarer occurrence on dairy farms than it was in decades past, however, our calcium related problems have not been eliminated. Subclinical hypocalcemia (SCH) has been estimated to affect 25-40% of 1st Lactation and 45-80% of 2nd+ Lactation animals. We have many programs, treatments, and products aimed at alleviating this problem, but with new information becoming available, it is important to take a step back and evaluate the evidence.

Understanding and Identifying SCH

The most common way that SCH has been defined, as well as how the success or failure of experiments have been measured, is by using a total calcium concentration of <8.0 mg/dL as a cut off measured within 24 hours of calving. Utilizing this metric, we know that cows that have low calcium have reduced muscle function, increased stress, reduced immune function, higher rates of displaced abomasum, ketosis, metritis, etc. It is clear that there is a negative effect of having a reduced calcium level after calving, and there has been much effort to alleviate that by nutritional intervention pre-calving, or calcium supplementation post-calving. While nutritional strategies pre-calving such as reduced Ca and negative DCAD diets have very good data and support for their use, this article will focus primarily on the post-calving interventions as well as re-evaluating what our metrics for treatment and prevention are.

To understand how we can help reduced SCH we must understand why it occurs. Just prior to and following calving the process of making colostrum and milk begins and a tremendous amount of calcium is needed to support this process. The dairy cow is unable to absorb enough calcium from her diet to support milk formation, therefore the calcium stored in her bones must be released to maintain adequate plasma calcium concentrations. As calcium is reduced, the body responds by releasing parathyroid hormone (PTH) from the parathyroid gland and parathyroid hormone related protein (PTHrp) from the mammary gland, which in turn causes calcium to be released from bone, increased resorption of calcium in the kidney, and activation of Vitamin D to increase intestinal absorption of calcium. For this cascade to begin it is necessary that calcium in the blood be decreased due to the need for a negative feedback process to be started, otherwise she will be unable to successfully mobilize enough calcium to support milk production. In fact, cows which have had a mastectomy do not have decreased calcium levels at calving.

New Research

So, we know that cows need to have a reduction in calcium to physiologically transition to pulling enough calcium from their bones to support lactation, yet we measure blood calcium very soon after calving. Could the timing for measuring calcium levels to determine SCH be at the incorrect time? Is the level of calcium at a given time point the metric we need to look at, or is how quickly a cow returns to normocalcemia a better indicator? Luckily researchers are asking just these questions and are beginning to find some interesting answers. A large study in New York was conducted by Dr. Jessica McArt at Cornell University where blood samples taken within 12 hours of calving showed calcium was non-informative for 1st lactation cows and that lower Calcium (<7.82 mg/dL) resulted in more milk for 2+ Lactation cows (through the entire lactation), but was associated with higher risk of DA when <7.41 mg/dL. Retained placenta, Metritis, Mastitis, and Pregnancy risk were not associated with calcium status. Surprisingly, in 2+ Lactation cows, for every 0.8 mg/dL increase in calcium the risk of culling was increased by 3.4X. Following this study, the same group looked at how calcium changed in the 4 days post-calving and showed that diagnosis of SCH at 1 DIM is not appropriate. In both 1st and 2+ Lactation cows, reduced calcium on day 1 resulted in more milk, but was not associated with disease incidence. However, chronic SCH on days 2-4 varied by parity and was associated with both less milk and an increase in health events.

How do our treatments affect calcium status?

Most veterinarians and nutritionists will agree that IV calcium should be reserved for true clinical Milk Fever cows because the dramatic increase in blood calcium will shut down the body's process of mobilizing calcium from bone tissue, lowering PTH and leading to a rebound hypocalcemia mere hours later. Subcutaneous calcium works similarly but without as dramatic of a peak, while oral calcium is the most slowly absorbed. All of the treatments have an effect on the process of calcium mobilization and absorption in the cow. In a recent experiment done at UW-Madison by Dr. Laura Hernandez

CONSIDERATIONS FOR HIGH-CHOP CORN SILAGE THIS YEAR

Many farmers over the past few years have experimented or moved to high-chop during their corn silage harvest. High-chop is defined as moving the typical cutting height of 6 to 7 inches (in the Midwest) to 12 or even 18 inches. Most people think you improve the fiber digestibility (NDF-d) via implementing the high-chop strategy. While NDF-d may improve slightly, the biggest advantage comes from increasing the starch level per ton of silage. However, these improvements in quality have a cost in yield, as you are leaving stubble tonnage in the field.

In the latest William H. Miner Agricultural Research Institute Farm Report, they report a summary of 11 trials comparing 7" to 19" chop heights. High-chop corn silage had 7% lower yield, but was 5% higher in predicted milk per ton of silage (based on an equation using NDF-d). Milk per acre was about 2% less with high chop. Farms that have ample acreage can afford to do this, while farms that are short on forage acres cannot.

In the Miner article they suggest to NOT high-chop:

- BMR corn, as it is already higher in digestibility.
- Immature corn, as stalk digestibility is higher and starch levels are low. We could have plenty of this type of corn around this fall.
- Corn that is over 35% Dry Matter (DM) at the 6 to 8" height, as high-chop would increase the DM enough to make it difficult to ferment properly.

Full Article: http://whminer.org/pdfs/08-19.pdf

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and her group, calcium was slowly infused for 24 hours after calving to precisely maintain a "normal" calcium level, and then removed her from the exogenous calcium. The blood calcium concentration dropped lower and rebounded more slowly than animals that never received calcium at all. The other fascinating part of the experiment was that this occurred in both groups that had a negative DCAD diet prefresh and those that did not. This indicates that calcium treatment post-calving, if not targeted appropriately, may completely undo the benefits of feeding anionic salts pre-fresh.

Be selective in post-calving treatment of SCH

While some products available recommend aggressive treatment of all animals at calving and shortly thereafter, there is limited evidence of its effectiveness. Initial and subsequent research have confirmed the benefit of treating select groups (lame cows & higher than average production cows) with a return on investment of: 0-2.4 for High ME milk cows, 2-11.4 for lame cows, and 0.5-3.4 for both lame and high ME milk cows, however only -0.4 to 1.2 for treating all cows. Research consistently shows very small to no positive gains when treating all multiparous cows, more positive (but still small) results when targeting high producing and lame cows, and generally negative results when treating 1st lactation cows.

As with any treatment or management decision, we must understand what we are targeting as well as the best way to manage and evaluate efficacy. As our understanding of physiology and management evolve, it is important to re-evaluate and revise our decisions to become better at reaching our goals.

References are available upon request

LAW SCHOOLS FOCUS IN ANIMAL LAW & POLICY

Animal protection is one of the fastest developing areas of public interest law in the U.S. The number of law schools offering Animal Law courses increased from nine in 2000 to 167 today. These Animal Law & Policy programs are meant to help law students gain hands-on experience litigating and legislating animal rights and animal welfare issues. The focus has been farm animals, wildlife, animals in captivity, and the threat of climate change on all forms of life. Expect to see more activity from this area of law going forward!

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