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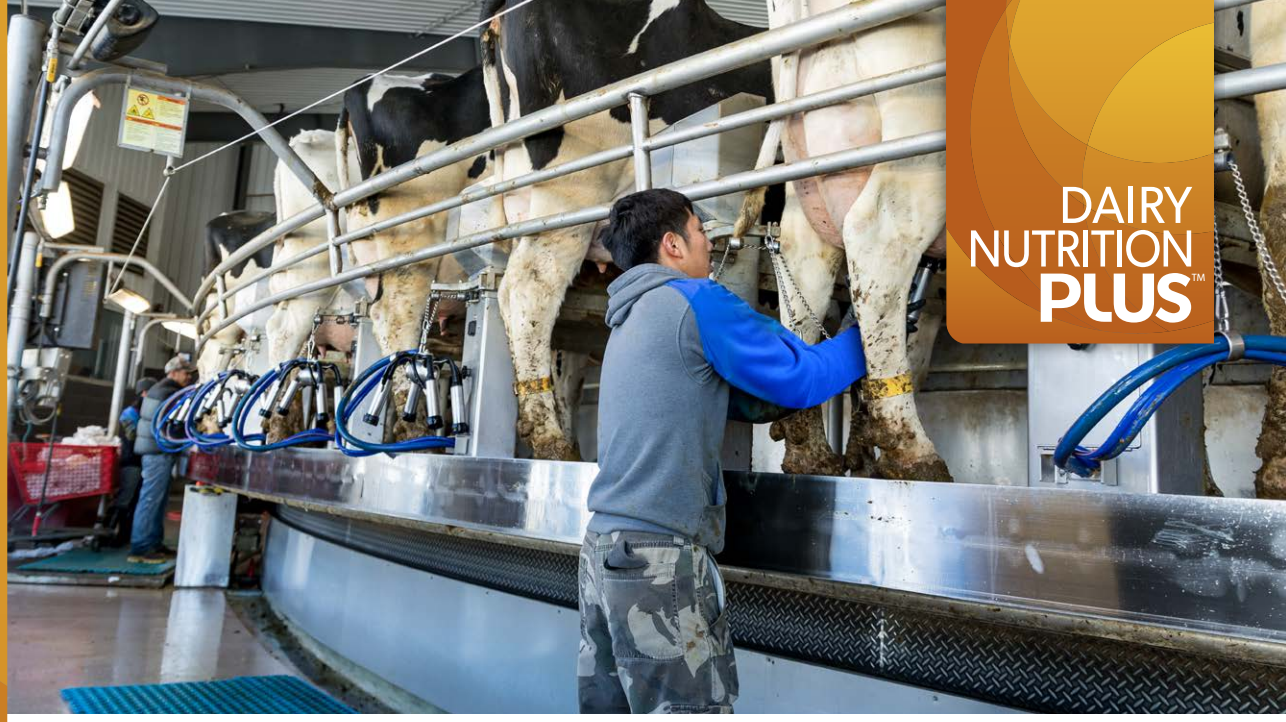

DAIRY NUTRITION PLUS™

FOUR POINTS ON SUBCLINICAL HYPOCALCEMIA

Dairy producers have done an excellent job of minimizing clinical cases of hypocalcemia on farm. In fact, farms that employ good nutritional and cow comfort management strategies routinely see incidence rates of 2 to 5% for milk fever. However, even when clinical cases are rare, subclinical hypocalcemia (SCH) still impacts up to 50% of transition cows.

Recent research has demonstrated that not all cases of subclinical hypocalcemia are the same. McArt & Neves (2020) identified three different types of subclinical hypocalcemia—persistent, delayed and transient. Their research builds on other recent research. Caixeta et al. (2017) provided the first indication that the persistence of hypocalcemia, and not the simple fact that cows became hypocalcemic, was detrimental to the cow. They also showed that persistent hypocalcemia occurred in all parity of cows. Additional work by Neves et al. (2018a) and (2018b) showed that cows with low blood calcium concentrations at calving and at 1 day in milk (DIM) were less likely to develop early lactation disease and produced more milk in early lactation than cows with normal blood calcium.

In the past decade research has helped clarify what is known—and what is not yet known—about subclinical hypocalcemia. Subclinical hypocalcemia can negatively impact reproduction, milk production, and increase cows' risk for early lactation disease and early herd removal, explains Jessica McArt, assistant professor, Department of Population Medicine and Diagnostic Sciences at Cornell University. Good nutritional management, including feeding negative DCAD diets to close-up cows, combined with good cow comfort are good prevention strategies for both clinical and subclinical hypocalcemia in your herd. But there is still more to learn. As you evaluate research and develop strategies to minimize the impact of all forms of hypocalcemia on your farm McArt suggests keeping these four points in mind:

1. Subclinical hypocalcemia should not be diagnosed at 1 DIM.
2. Research has yet to define an optimal test day and cut point for blood calcium concentration to indicate subclinical hypocalcemia.
3. Parity and DIM are important components in determining when to test blood calcium.
4. Hypocalcemia is a normal occurrence immediately postpartum. Cows that rebound quickly (transient SCH) are "rock stars of milk production."

WHEN TO TEST BLOOD CALCIUM

Current research provides no consensus for the optimal time to test blood calcium to indicate subclinical hypocalcemia, explains McArt. Multiple studies have explored the categorization of blood calcium concentration in early lactation (Oetzel et al.,1988; Martinez et al., 2012;). And recent studies have used epidemiologic outcomes to further improve that categorization (Chapinal et al., 2011; Rodriguez et al., 2017; Wilhelm et al., 2017; Neves et al., 2018; Venjakob et al., 2018).

In McArt & Neves (2020), the categories for total blood calcium concentrations were defined as follows:

- Normocalcemic >2.15 mmol/L at 1 and 2 DIM.
- Persistent SCH ≤2.15 mmol/L at 1 and 2 DIM.
- Delayed SCH >2.15 mmol/L at 1 DIM, ≤2.15 mmol/L at 2 DIM.
- Transient SCH ≤2.15 mmol/L at 1 DIM and >2.15mmol/L at 2 DIM.

This study demonstrates that calcium dynamics of total blood calcium in transition cows changes during the early postpartum period. And that change is not the same for every cow. In the study, cows with persistent or delayed SCH had a much higher risk for early lactation disease and herd removal within the first 60 DIM. Delayed SCH cows produced the least amount of milk, and transient SCH cows produced the most milk—even more than normocalcemic cows.

Great strides have been made in explaining the calcium dynamics of transition cows and how blood calcium levels impact the cow. Current research indicates that "we need to stop diagnosing SCH at 1 DIM," says McArt. Perhaps 2 DIM is better, or maybe multiple tests are needed. The optimal time

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to test blood calcium has not been identified, nor has the exact cut point when negative impacts from low blood calcium begin.

PARITY IMPORTANT, TOO

Research indicates that parity and days in milk at time of testing are important factors when characterizing SCH. In McArt & Neves (2020) primiparous cows were about 1.75 times more likely to develop persistent SCH compared to multiparous cows (22.9 vs 12.9%). But when it comes to delayed SCH, the prevalence was reversed. Multiparous cows were almost twice as likely as primiparous cows to develop delayed SCH (25 vs 13.2%). Primiparous and multiparous cows had similar rates of normocalcemia and of transient SCH. And both primiparous and multiparous cows with transient SCH produced more milk than normocalcemic cows, and had health impacts similar to normocalcemic cows.

"We do not know what causes some cows to have persistent hypocalcemia when others rebound quickly, nor do we know why some cows are normocalcemic immediately after calving and then subsequently become hypocalcemic," explains McArt. "The cows I worry the most about are the ones that don't recover quickly, or are normal and then decline." According to this latest research primiparous cows with delayed or persistent SCH are 3 and 4 times more likely than normocalcemic cows to experience disease or leave the herd early. In comparison, multiparous cows with delayed or persistent SCH were almost twice as likely as normocalcemic cows to develop disease or leave the herd early.

"The more I look at the data, the more I am convinced that a slight drop in blood calcium with a quick rebound is needed, is important for calcium homeostasis," says McArt. In this latest study transient SCH cows were the "rock stars of milk production" out-producing normocalcemic cows by 7.5 lbs/day for primiparous cows and 10 lbs/day for multiparous cows.

There is still more to learn. Your goal should be to set transition cows up for success. Good nutritional management, including feeding negative DCAD diets to induce a mild metabolic acidosis for 21 days before calving, combined with management that emphasizes cow comfort and minimizes stress can help improve your cows' transition success.

References available online at www.dairynutritionplus.com/enewsletter/nutrition-plus/2020-March.asp

FROM THE MATERNITY PEN

Heat Stress Impacts Uterine Health

Uterine disease, both metritis and endometritis, leads to reduced milk production and reduced rates of fertility. On average, 30% of dairy cows develop metritis due to bacterial infection by 7 days in milk (DIM). And some cases persist beyond 21 DIM as endometritis. But does heat stress impact uterine health? That's the question that researchers at the University of Florida wanted to answer.

In the study, the incidence of uterine disease and the bacterial load of samples of vaginal mucus was assessed in 51 dairy cows that calved during the cool season (average temperature 73 F) and 51 dairy cows that calved during the hot season (average temperature 88 F). While heat stress did not impact the bacterial load in vaginal mucus samples, it did impact the incidence of uterine disease.

During the hot season, 58.8% of cows that calved developed a persistent uterine disease that was detected at both 7 and 21 DIM. In contrast, during the cool season, only 29.4% of cows that calved developed a persistent uterine disease. That's a difference of 29.4 percentage points or an increase of 50% in summer. That means cows that calved during the hot season had twice the risk of having a persistent uterine disease.

Heat stress also impacted metritis recovery rates. During the hot season, only 21.1% of cows recovered from metritis compared to a recovery rate of 50% for cows that calved during the cool season. The incidence of endometritis at 21 DIM was impacted by heat stress, too—64.7% vs. 43.1% for cows that calved during the hot season compared to cows that calved during the cool season. That's a difference of 21.6% percentage points or a 50.1% increase in summer.

Researchers concluded that heat stress negatively impacts the uterine health of cows after calving. This is yet another reason why dry cows should be cooled to minimize the negative health, production and reproductive consequences for them and their offspring. This research was presented at the ADSA meeting in July 2019. (ADSA Abstract #403).

HAPPENINGS

Landus Cooperative Introduces Matt Carstens as CEO

Following a nationwide search, the Landus Cooperative Board of Directors introduced Matt Carstens as Chief Executive Officer for the farmer-owned cooperative that manufactures SoyPlus and SoyChlor. The Board unanimously selected Carstens, who has nearly 25 years of experience in the industry spanning every step in the supply chain from agronomy retail to end-user grain customers, food manufacturers, grocery stores and consumers.

MATT CARSTENS
CEO, Landus Cooperative

"Whether you are an owner of this cooperative, or you are feeding our value-added feed ingredients to dairy cows across the globe, your success will be the nucleus of our business," said Carstens of his focus for his new role. "Our farmer-members and customers demand a trusted advisor, a partner who can advocate on their behalf, help them find value and find new ways to make their operation better."

Carstens most recently served as Senior Vice President of Truterra, a division of Land O'Lakes. While there, he collaborated closely with progressive dairy operations and provided leadership for farmer-driven sustainability collaborations with food manufacturers and consumers by focusing on technology, data and precision offerings. Previously, he served at United Suppliers, where he was responsible for the crop nutrient business, including sales, marketing, supply chain logistics, financial performance and commodity procurement. He has also held various sales, marketing and management positions at several other agronomy businesses.

Visit blog.dairynutritionplus.com to watch a brief video introduction from Carstens.

CONSULTANTS CORNER

Urine pH Can Predict Urinary Calcium Excretion, Too

New research shows that urine pH can accurately predict the amount of calcium being excreted in cows' urine. Why is that important you ask? It gives us another measure of what is going on in the cow during the critical transition period when feeding negative DCAD diets. Urine pH is easy and inexpensive to test on farm, but currently, there are no on-farm methods to measure calcium in the urine.

Non-acidified cows generally have a urine calcium output of <1 gram/day. But when cows are fed a negative DCAD diet to induce a mild metabolic acidosis the amount of calcium excreted in urine increases—this is a sign of calcium flux. Previous research has provided a couple of recommendations on the amount of calcium output needed for effective control of hypocalcemia. Grünberg et al. (2011) and Megahed et al. (2018a) suggested a goal of at least 4 grams/day of calcium excreted in urine to control hypocalcemia in multiparous cows.

Research has not yet identified an optimal urine pH that prevents hypocalcemia and allows cows to avoid the dangers of over-acidification. But it does show that cows must become metabolically acidified in order for their calcium homeostasis mechanism to be engaged and ready to go when they calve. However, producers often receive conflicting recommendations on urine pH target levels.

A study published in the December issue of the *Journal of Dairy Science*, Constable et al. (2019), characterized the relationship between urine pH and urinary calcium indices. Results showed that urine pH can be used as a guide to the degree of systemic acidification and the amount of calcium being excreted in urine. But once a cow's urine pH is 6.11 or less, urine pH can no longer accurately predict the magnitude of nutritionally-induced metabolic acidosis, although it can predict the magnitude of daily urinary calcium losses. Therefore, a urine pH of 6.11 becomes the lower limit where urine pH can be used as an accurate index of systemic acidification. An upper limit for urine pH was previously established by Goff & Kozewski (2018). When feeding a negative DCAD ration, they found that urine pH must be 7.5 or less to get any improvement in calcium homeostasis and thereby start to minimize hypocalcemia.

Constable's research group also was able to predict the amount of calcium excreted in urine based on the level of pH. Results showed that a urine pH of 6.11 was sufficient to provide the 4 grams/day or greater of calcium excretion to control periparturient hypocalcemia in multiparous cows that was suggested by Grünberg et al. (2011) and Megahed et al. (2018a).

The study also evaluated some on-farm pH test products for accuracy by comparing Hydrion pH paper and Multistix-SG urine strips for accuracy against a rapid-response glass-electrode pH meter. Performance and accuracy of each test were excellent and clinically accurate. No matter what product you select to test urine pH on farm, it remains important to confirm its accuracy against something of known accuracy.

The results of this study are exciting as it provides another way to determine the acid-base status of cows with an on-farm test. Using urine pH tests to predict the amount of calcium excreted in urine can help improve management of negative DCAD rations and further minimize the incidence of hypocalcemia. Just remember, urine pH is an excellent indicator of systemic acid-base balance when the urine pH is above 6.11. When urine pH is below 6.11, it no longer provides an accurate index of the degree of systemic acidification. In these circumstances, producers should monitor feed intake, as decreased feed intake can indicate over-acidification.

You can read the full research paper at http://doi.org/10.3168/jds.2019-16805

BEYOND BYPASS

Meta-Analysis Confirms Benefits of RPC

Feed rumen-protected choline; get a bump in milk production. While that point is pretty well accepted, questions still remain.

Researchers at the University of Florida conducted a meta-analysis with data from 21 experiments, with 66 treatments using 1,313 parous cows. All results are for parous cows only because researchers found insufficient data to include nulliparous cows in the analysis. All studies had a control group that received no choline supplementation. Several different commercial products containing rumen-protected choline chloride (RPC) were fed. Amounts supplemented were expressed as grams of choline ion (choline chloride contains approximately 74.6% choline ion). Supplementation ranged from 5.6 to 25.2 grams of choline ion/day. The mean days cows received supplemental choline were 22 (7 to 40) prepartum and 57.5 (15 to 140) postpartum. Here's what they found.

As choline supplementation was increased from 0 to 25.2 grams/day there was a linear increase in dry matter intake (DMI) in prepartum and postpartum cows. The median amount of choline ion supplemented was 12.9 grams/day which increased DMI by 0.44 lbs/day in prepartum cows and 1.10 lbs/day in postpartum cows.

Yields of milk, energy-corrected milk (ECM), fat and protein all increased with choline supplementation. When feeding the median of 12.9 grams/day of choline ion the increase was 3.5 lbs/day milk, 3.75 lbs/day ECM, and 0.1 lbs/day of fat and 0.5 lbs/day of protein in milk. The observed increase in DMI accounts for about 50% of the increase in production parameters. Production responses to choline were linear up to 25.2 grams/day which was the upper limit fed in the database investigated. The optimum amount of choline ion to be supplemented to transition cows was not identified, but is likely to be more than 12.9 grams/day and perhaps 25.2 grams/day.

On the health side, feeding RPC to transition cows only tended to reduce the risk of retained placenta and mastitis. There was no effect on metritis, milk fever, displaced abomasum or ketosis.

Researchers also observed an interaction between choline and the postpartum intake of metabolizable methionine as a percentage of metabolizable protein (MP) for yields of milk, ECM and protein. Although benefits in production performance to supplemental choline were observed at all levels of postpartum methionine fed, they were greater in diets with low to moderate methionine content. This suggests that the responses to choline are also influenced by the concentration of methionine in the MP supplied in the postpartum diet.

Results were published in the January issue of the *Journal of Dairy Science*. Available at: https://doi.org/10.3168/jds.2019-16842

LANDUS COOPERATIVE

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QUALITY CORNER

Total Value of SoyChlor

Metabolizable protein (MP) is crucial to the health and performance of pre-fresh dairy cows but delivering enough MP to high-producing dairy cows can feel challenging. And, delivering enough MP is often overlooked in the pre-fresh diet. When selecting a quality anionic supplement for the pre-fresh ration, consider how that feed ingredient may also help meet critical MP needs. Are you analyzing your anionic supplement for all of its benefits?

Feeding SoyChlor in the pre-fresh diet is another way to ensure that cows receive a quality source of true protein. When considering the true value of SoyChlor, it's important to not just focus on the source and amount of anions the ingredient supplements. Recognize and account for the contributions of all of its nutrients when formulating diets. Commercial anionic supplements vary greatly in their crude protein content, and for most, non-protein nitrogen (NPN) constitutes a substantial portion of their crude protein. But SoyChlor has no added NPN. Almost all of its crude protein is true protein, making a direct contribution to MP supply.

The type of protein that individual feed ingredients contribute to your pre-fresh diet matters. Contact the Dairy Nutrition Plus team to learn more about how SoyChlor can add value to the diet.