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DAIRY NUTRITION PLUS™

IN THIS **ISSUE**

EARLY-LACTATION DISEASE CARRIES LONG-TERM EFFECTS

Every dairy producer has experienced the heartbreak of the cow that doesn't transition well. She has one problem after another and is culled or dies during that lactation. But what about cows that experience clinical disease in early lactation, receive appropriate treatment and recover?

Approximately one-third of dairy cows experience at least one clinical disease within the first three weeks of lactation, explains Eduardo de Souza-Ribeiro, assistant professor in reproductive physiology at the University of Guelph. And those early-lactation cases represent 60% to 80% of all clinical cases that occur in lactating cows throughout lactation.

In Ribeiro and Carvalho (2017) 40% of the 8,268 cows on eight large U.S. dairies included in the study experienced metritis, mastitis, digestive problems, lameness or respiratory problems during the first two months of lactation. And while reduced fertility at first postpartum breeding has been widely reported after early lactation clinical disease (Santos et al., 2010; Ribeiro et al., 2013; 2016; Ribeiro and Carvalho, 2017), the long term consequences of clinical disease after treatment and resolution remain unclear.

In most cases when cows with clinical disease in early lactation are treated with an appropriate therapy, health and metabolism appear to return to normal by the end of the first month postpartum, says Ribeiro. That makes any long-term consequences difficult to ascertain. In a new study reported in the December *Journal of Dairy Science* researchers used a holistic approach to evaluate postpartum clinical disease in order to better quantify the overall effect of postpartum health on long-term productivity and survival of dairy cows. The results clearly show that although these cows appear normal after treatment, clinical disease in the first 21 days in milk (DIM) does indeed have long-term consequences.

LONG-TERM IMPACTS

In Carvalho et al. (2019) University of Guelph and University of Florida researchers conducted two retrospective cohort studies from the management records of a large Florida dairy. In the first study, the health, production, reproduction and culling records of 5,085 Holstein cows (1,814 primiparous and 3,271 multiparous) were used to evaluate the effects of clinical disease diagnosed and treated during the first 21 DIM on milk production, reproduction and culling through 305 DIM. Diseases tracked include retained placenta, metritis, mastitis, digestive problems, lameness and respiratory problems. Results showed that 45.9% of all cows were diagnosed with at least one clinical disease between calving and 305 DIM. During the first 21 DIM 30.2% of cows developed clinical disease which represented 65.7% of all clinical disease diagnosed in cows through 305 DIM.

The long-term consequences of early-lactation disease were many. First, let's look at milk production. Cows that experienced clinical disease in the first 21 DIM produced less 305-day milk—767 lbs less with one clinical disease and 1,550 lbs less with two or more clinical diseases—when compared to healthy herd mates. In addition to overall milk production, milk yield at peak milk, and the interval from calving to reach peak milk, were both negatively impacted by early-lactation disease.zClinical disease within 21 DIM also negatively impacted cows' reproductive performance. The pregnancy rate in healthy cows was 88.4% compared to 82.6% and 72.6% for cows with one or with two or more cases of clinical disease within first 21 DIM respectively. The mean interval from calving to successful pregnancy was 159.3, 182.8 and 204.7 days for healthy cows, cows with one or cows with two or more cases of clinical disease within 21 DIM. Of all eligible cows, only 68.8% calved again. And there was a big difference between healthy cows and those with early-lactation disease—72.8% of healthy cows calved again compared to 59.6% and 47.3% for cows with one, or with two or more cases of clinical disease within 21 DIM.

The researchers also examined culling data. Of all cows enrolled in the study 27.4% left the herd before completing 305 DIM. Both the proportion of cows culled, and the rate of culling were influenced by clinical disease within 21 DIM. The culling rate for healthy cows through 305 DIM was

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22.6% compared to 35.7% and 53.8% for cows with one or with two or more cases of clinical disease within 21 DIM. There was also a big difference in mortality rates. Healthy cows had a death rate of 3.5% through 305 DIM compared to 8.1% and 16% for cows with one or with two or more cases of clinical disease within 21 DIM.

In the second study, the records of 2,415 primiparous Holstein cows with genomic testing information were evaluated by the same criteria as cows in study 1. But then researchers took the additional step to see if the decrease in milk production was caused by genetic merit or by disease. Milk production in healthy cows was similar to their genetically predicted milk production. The reduced lactation performance was not associated with the differences in genetic potential; instead the difference in milk production was the result of early-lactation disease.

The results of this study clearly show that clinical disease within the first 21 DIM carries long-term negative consequences even when it is quickly diagnosed, treated and appears to resolve, says Ribeiro. The decrease in milk production and reproduction performance and the increase in culling and mortality were substantial. And cows with two or more cases of clinical disease experienced additive detrimental effects and therefore fared the worst in all categories.

While this study was conducted on one large dairy and needs to be replicated it serves as a wake-up call to the long-term impacts of early-lactation disease and the need to deliver top-notch transition cow care in order to minimize disease in early lactation. You can find the full study at https://doi.org/10.3168/jds.2019-17025

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

HAPPENINGS

Exclusive Transition Cow Webinar: Register Today

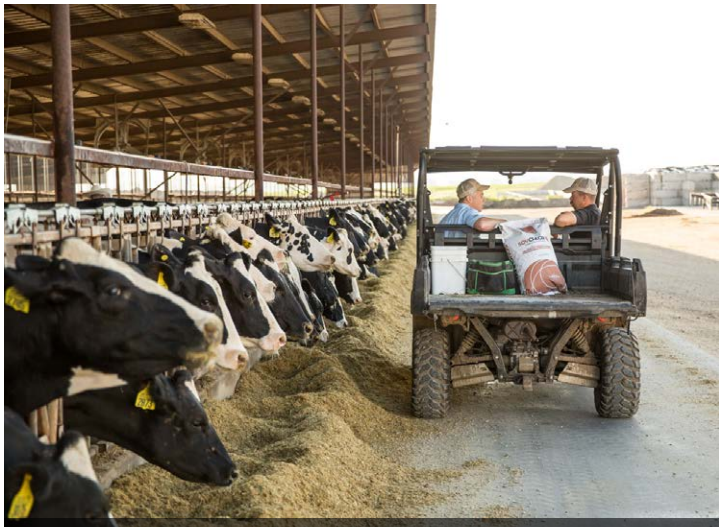
One of the most common questions our team hears on farm is, Where should my pre-fresh DCAD level be?

Join us Wednesday, August 5, as SoyChlor Regional Sales Manager Brandi Gednalske offers answers to that question. This live presentation will showcase the latest research relevant to optimal DCAD levels and offer actionable recommendations to help determine the best negative DCAD program for your herd.

Register Today to Learn:

- What current research reveals about the best DCAD level.
- Unexpected nutrient interactions that impact DCAD level goals.
- The critical influence of dry matter intake.
- The influence of multiple management strategies on DCAD.
- Ideal benchmarks for transition cow success.

Visit: https://attendee.gotowebinar.com/register/4557615742862470155



FROM THE MATERNITY PEN

More Benefits From Feeding Negative DCAD Diets

It is well established that feeding a negative DCAD diet prepartum improves postpartum calcium status, minimizes hypocalcemia and improves health and production of dairy cows (Lean et al., 2019; Santos et al., 2019). Hypocalcemia in transition cows also has been shown to have a negative effect on immune cell activation (Kimura et al., 2006; Martinez et al., 2014). With these two points in mind, researchers at the University of Florida and in Australia teamed up to determine if feeding negative DCAD diets would improve immune response through an increased expression of neutrophil β-defensin.

Research results reported in the December 2019 *Journal of Dairy Science* strengthens the evidence that mitigation of hypocalcemia improves the ability of neutrophils to respond to bacterial pathogens. At three days postpartum, neutrophils from cows that experienced subclinical hypocalcemia (SCH), defined as blood Ca < 2.0 mmol/L, had decreased β-defensin expression when neutrophils were challenged with lipopolysaccharide from bacteria. Decreased neutrophil β-defensin expression in SCH cows was also associated with metritis and retained placenta.

In addition, serum blood calcium levels on the day of calving consistently correlated to β-defensin expression at three days postpartum (Merriman et al., 2019). Cows fed a negative DCAD diet prepartum that maintained normal blood calcium had higher levels of β-defensin expression which indicates a stronger immune response. These results suggest that increased neutrophil β-defensin expression is part of the positive health and production benefits routinely seen from feeding negative DCAD diets prepartum.

You can find the full study at:
https://doi.org/10.3168/jds.2019-17216

CONSULTANTS CORNER

Keep Up the Good Work Minimizing Hypocalcemia

JESSICA MCART
Cornell University

On the rare occasion when you have to vein a cow down from milk fever it may not feel like you've made a lot of progress minimizing hypocalcemia, but as an industry we have. Thanks to mitigation strategies developed to help minimize hypocalcemia, such as negative DCAD diets, dairy producers treat a lot fewer cows for milk fever these days, says Jessica McArt, assistant professor, Department of Population Medicine and Diagnostic Sciences at Cornell University.

An incidence rate of 10% or more for milk fever in transition cows used to be fairly common. By using nutritional and management strategies developed through research to minimize the incidence of hypocalcemia, the dairy industry has greatly reduced the number of cows with clinical milk fever. According to survey data from the National Animal Health Monitoring Service about 2.8% of cows were affected by milk fever in 2014. That's down from 4.9% in 2007 and 5.2% in 2002. What makes this decline even more impressive is that it occurred at the same time milk production per cow was increasing. In 1990, the average milk production per cow per year was just 14,782 lbs. Compare that to 2019 when milk per cow per year averaged 23,391 lbs. "We have made great strides in minimizing clinical cases of hypocalcemia while significantly increasing milk production per cow and as an industry we should be proud of that," says McArt.

Despite this success, high incidence rates of subclinical hypocalcemia still persist which also negatively impacts cows' health and productivity. Recent research has sought to improve our understanding of cows' internal regulation systems and calcium transport mechanisms. In addition, three types of subclinical hypocalcemia have been identified—persistent, delayed and transient (McArt & Neves 2020). This study demonstrated that calcium dynamics of total blood calcium in transition cows changes during the early postpartum period and that change is unique to each cow. Cows classified with delayed, or persistent subclinical hypocalcemia (SCH), had a much higher risk for early lactation disease and herd removal by 60 days in milk (DIM). However, cows with transient SCH, defined as ≤2.15 mmol/L at 1 DIM and >2.15 mmol/L at 2 DIM, actually produced the most milk and had health outcomes similar to normocalcemic cows. So it may be that a slight dip in blood calcium at calving followed by a quick rebound is actually beneficial to the cow, explains McArt. Research also has revealed that some post-partum supportive treatments can interfere with cows' natural homeostatic mechanisms and delay their return to normocalcemia.

But based on what is currently known feeding a negative DCAD diet prepartum improves cows' calcium status, health and productivity. A recent meta-analysis showed that in addition to minimizing milk fever, negative DCAD diets also reduced the incidence of subclinical hypocalcemia, retained placenta and metritis in all cows and improved lactation performance in multiparous cows (Lean et al., 2019; Santos et al., 2019).

Negative DCAD diets are not a silver bullet. For good results, you must analyze forages and by-product feeds for mineral content, select feed ingredients that are low in potassium and sodium, and monitor urine pH to make sure cows have become metabolically acidified. In addition, cow comfort in close-up pens must be a priority. Aim for a stocking density of about 80%, use heat abatement strategies and minimize pen movements as these will help encourage dry matter intake.

To learn more on this topic, please see "Symposium review: Transition cow calcium homeostasis—Health effects of hypocalcemia and strategies for prevention" in the *Journal of Dairy Science*. You can find it online at https://doi.org/10.3168/jds.2019-17268

BEYOND BYPASS

Particle Size and Fiber Digestibility

New research from the Miner Institute is shedding more light on the relationship between particle size and fiber digestibility and how it may be used to better predict cow performance. In the research, particle size was measured as physically effective NDF (peNDF), and fiber digestibility was measured by undigested NDF at 240 hours in vitro fermentation (uNDF240).

Researchers fed four different diets using a combination of uNDF240 and peNDF. Two diets were lower in uNDF240 (8.9% of ration dry matter) with either lower or higher peNDF (19-20% of ration DM vs. about 22% of ration DM). The other two diets fed had higher levels of uNDF240 (11.5% of ration DM) with either lower or higher peNDF. To explore the relationship between physical effectiveness and uNDF240 among these four diets researchers also calculated the physically effective uNDF240 (peuNDF = pef x uNDF240). Highlights of the research results include:

- High uNDF240 + high peNDF limited cows' dry matter intake (DMI).
- When lower uNDF240 diets were fed the amount of peNDF in the diet did NOT affect DMI.
- A shorter chop length combined with the higher uNDF240 diet boosted DMI by 5.5 lbs/day.
- NDF and uNDF240 intakes were highest when cows were fed the high uNDF240 diet with smaller particle size.
- Cows had similar feed intakes when fed a diet that contained either low uNDF with coarser particles or high uNDF with finer particles.
- Milk yield and energy corrected milk were highest in diets that utilized low uNDF240 with high peNDF or high uNDF 240 with low peNDF.
- Milk fat percentage appeared to be more related to dietary uNDF240 than to peNDF content.
- Milk true protein appeared to be boosted by lower peNDF.

Cows fed high uNDF with high peNDF spent 45 minutes more time eating and 22 minutes more time ruminating each day yet consumed about 6 lbs/day less of dry matter than cows fed low uNDF240 and low peNDF diet.

If future research confirms these initial results it suggests that when forage fiber digestibility is lower than desired, a finer chop length may boost feed intake and production response. More research is needed to confirm these findings and with other forages.

You can read the full paper at https://tinyurl.com/yaet4lhy

LANDUS COOPERATIVE

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QUALITY CORNER

New and Improved SoyChlor & PasturChlor: Better Flowability, Better Protein, Same Consistency & Chloride

Our team is excited to offer you the same trusted consistency and chloride content, now with improved flowability and protein content. While the industry renown SoyPlus will continue to be one of the protein sources in SoyChlor and PasturChlor, this month we will transition away from the inclusion of single-sourced DDGs.

For years we have sourced DDGs from a single supplier to help ensure industry-leading consistency in every batch of our products. As nutritionists have become more aware of the importance of supplying adequate metabolizable protein to close-up dry cows, we have taken a step toward improving the quality of the protein component of SoyChlor and PasturChlor. Removing DDGs and replacing it with more canola meal will not only ensure more consistent quality of the protein, but also improve its physical handling characteristics.

"We are always looking for opportunities to add more value to these premium ingredients. I am excited for customers to experience the same trusted cow performance, but now with easier product handling and improved total protein value," said Tim Brown, SoyChlor and PasturChlor Technical Director.

This change will not impact DCAD strength or its ability to improve the calcium status of cows at calving. For more information about this product evolution we invite you to contact a member of our team directly, or to watch the webinar at blog.dairynutritionplus.com.

**This ingredient change does not apply to Non-GMO SoyChlor. All international SoyChlor customers will continue to receive the unchanged formula until permits, registrations, labels and other necesarry documents are finalized on a country-by-country basis.*