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IN THIS **ISSUE**

PREPARTUM COWS DON'T NEED EXTRA DIETARY CALCIUM

If you ask several nutritionists how much dietary calcium to feed prepartum cows on a negative DCAD diet, you'd probably get a wide range of answers. That's because the topic is still actively debated and recommendations range from a diet with 0.5 to 0.6% (no additional dietary calcium) to as much as 2.4% of diet dry matter (DM), which requires a lot of supplemental calcium.

There have been very few controlled experiments that provide answers to the calcium question, explains José Santos, professor of dairy cattle nutrition and reproduction at the University of Florida. Some research had limited numbers of cows, and results were not conclusive to demonstrate evidence of a benefit from supplemental calcium in prepartum diets. In order to identify the amount of dietary calcium needed with a negative DCAD diet, experiments with large numbers of cows with titrated levels of calcium are necessary. Unfortunately, only a few experiments using titrated levels of calcium have been conducted. Funding for such experiments and the ability to individually feed 120 to 150 cows are two of the reasons why.

But there are some association studies and results from some key experiments that provide direction. Research by Goff & Horst (1997) clearly showed that manipulating dietary calcium prepartum did not significantly affect the incidence of milk fever or the degree of hypocalcemia experienced by multiparous Jersey cows. Another study by Gelfert & Staufenbiel (2008) concluded that when acidogenic products were fed there was no need to increase the dietary calcium concentration above the needs of the prepartum cow (9 to 12 grams/kg DM or about 100 grams/day).

A recent experiment by Glosson et al. (2020) compared a positive DCAD diet (60 mEq/kg of DM) with low dietary calcium (0.4% DM) with two negative DCAD diets (both -240 mEq/kg of DM) with either low (0.4% DM) or high (2% DM) dietary calcium. Results showed that both acidogenic diets, with or without additional dietary calcium, improved cows' postpartum calcium status. Milk yield and milk components did not differ between treatments.

Meta-analysis provides a powerful tool to analyze data from multiple experiments and studies. It combines data from smaller experiments and studies into one large pool of data to create stronger statistical analytical capabilities and better understanding of how interventions behave under different conditions. In Santos et al. (2019), researchers examined the mineral composition and level of DCAD of prepartum diets and used meta-analytical methods to look for effects of DCAD on performance and health and how dietary calcium affected those responses. "For cows fed acidogenic diets, we observed that as the level of dietary calcium increased, so did the risk for milk fever," explains Santos. In cows fed a diet with −100 mEq/kg, increasing dietary calcium from 0.6 to 1.6% increased the risk of milk fever from 2.0 to 7.7% in multiparous cows—that's a 3.85-fold increase. Dietary calcium also influenced urine pH. As the level of calcium fed increased so did urine pH.

COW BIOLOGY

In the past, the recommended target for dietary calcium for prepartum cows fed a negative DCAD diet was 1 to 1.2% of diet DM (about 120 grams of calcium), says Santos. However, the gestating cow only needs 20 to 25 grams of absorbable calcium per day to meet maintenance and the needs of the growing fetus. Calcium bioavailability from different dietary sources typically ranges from 30 to 80%. Using a bioavailability of 50%, the cow only needs to consume 40 to 50 grams of dietary calcium daily to meet those needs (50 x 0.5 = 25 grams/day). A cow with a DMI of 22 to 24 lbs/day of a diet containing 0.6 to 0.7% calcium takes in 70 to 80 grams of calcium per day. In fact, recent work by Santos' group (Vieira-Neto et al., 2021) showed that cows fed diets with negative DCAD and 0.70% calcium had calcium retention of 15 to 20 grams per day, which is 1.5 to 2

continued on page 2

continued from page 1

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times the amount needed for fetal growth in a Holstein cow delivering an 88 lb calf. Increasing the dietary calcium concentration to 2.0% or greater, an intake of about 200 grams per day, is unnecessary.

Calcium carbonate, or limestone, is 40% calcium. To increase the dietary calcium from 0.7 to 2.4%, you must add 1.7 percentage points more calcium to the diet. That means adding 400 grams of calcium carbonate to yield the 170 grams of calcium intended for the cow. When every bite counts, why waste dietary space with rock?

Calcium carbonate also has an alkalizing effect on the cow. Goff and Koszewski (2018) found that increasing dietary calcium from 0.46 to 0.72% with diets with the same DCAD increased urine pH from 7.0 to 7.4. The additional calcium fed mitigated the acidifying effect of the acidogenic supplement. And research from Kansas State University revealed a linear increase in urine pH as intake of calcium carbonate increased (ADSA Abstract M135, J. Dairy Sci 103 Suppl.1, p207). Therefore, to reach your target urine pH, more anions must be fed with higher calcium diets.

Bottom line: "Cows don't develop hypocalcemia due to a lack of calcium in the diet," explains Santos. It develops from the cows' inability to optimize gastrointestinal calcium absorption or bone resorption promptly once colostrum production begins. Feeding an acidogenic diet that creates a mild metabolic acidosis helps "prime the pump" so that the cows' own natural regulating mechanisms are already functioning by calving.

USE COMMON SENSE

More does not equal better. This is especially true when it comes to the degree of metabolic acidosis as well as the amount of dietary calcium for prepartum cows. While the ideal level of negative DCAD and the ideal amount of dietary calcium to feed prepartum cows has not been identified, research has demonstrated what is safe and delivers beneficial results for the cows. A negative DCAD of -100 mEq/kg of DM meets both criteria. So, too, does a dietary calcium level of 0.6 to 1% of diet DM.

"We need to use common sense when feeding cows," stresses Santos. When formulating a prepartum ration, you choose the level of DCAD, the amount of magnesium, phosphorus, energy and protein, to name a few nutrient variables. If the forages and feedstuffs included in the ration already contribute 0.8% of DM as dietary calcium, there is no need to add more calcium because the cow's biological need has already been met.

"Until someone does the research with diets with negative DCAD using titrated levels of calcium with 120 to 150 cows in an experiment and shows benefits to cows with incremental calcium, I don't see the value of extra calcium in the diet," he says. "Current research provides no evidence that extra dietary calcium is beneficial to the prepartum cow."

Your cows' health and productivity should always be top of mind. Be prudent in your use of calcium in prepartum acidogenic diets. Don't get led off track from one small study. And always look for evidence of benefits from the intervention based on sound interpretation of the results.

"Until I see solid data that I can quantify and clearly see better health and production, then I can't justify feeding more calcium than 0.6 to 1.0% in the diet," says Santos.

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FROM THE MATERNITY PEN

Calving Alarm Can Generate Positive Net Return

Italian researchers evaluated whether the use of a remote calving alarm, in conjunction with timely assistance and newborn calf care, on a dairy farm could improve herd profitability. Working with an Italian dairy that averaged 110 deliveries per year, the researchers evaluated 680 deliveries over a 7-year period. Both primiparous and multiparous cows were included. Monitored cows received an intravaginal device which, when expelled from the vagina at the onset of stage 2 labor, sent a calving alert by text message and phone call to a preselected mobile. Control cows received care according to the dairy's protocols.

In monitored cows, dairy staff responded to the calving alert, on average, within 21 minutes of receiving it. Cows were assessed, and assistance provided if needed. Calves received colostrum within 2 hours of birth. For control cows, since the dairy did not have a night shift, cows did not always receive timely assistance and the time from birth to colostrum delivery varied. Therefore, calf death loss was used for comparison instead of dystocia rates. Calf death loss was 11.1% in primiparous and 10.7% in multiparous control cows. In comparison, monitored primiparous cows had 0 calves lost, and monitored multiparous cows had a calf death loss of just 1.7%.

Researchers also examined the risk of early culling, milk production and days to conception between control and monitored cows. Researchers used a partial budget analysis to compare several simulations. The results showed a return of $42.55 to $103.50 per cow per year when calving alarms were used for all cows in a herd. The benefit comes from reduced calf death loss, reduced risk of early culling, fewer days open and increased milk production in multiparous cows. However, researchers cautioned that the calving alarm can only provide such benefits when used in conjunction with a trained staff that can provide a timely response and appropriate care for the cow and calf.

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CONSULTANTS CORNER

How to Interpret Research Results and P-Values

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If you have ever questioned the research results touted in an advertisement, magazine article, presented at a meeting or by a salesperson, you are not alone. As a dairy producer or nutritionist, you are probably not a researcher by training. But you do make decisions every day that impact the health, productivity and longevity of your cows. A little bit of healthy skepticism can help you do your due diligence before purchasing a new feed additive, medication or adopting a new management protocol.

Ask to see the original research paper to see how data was collected and analyzed, don't just take results in a chart at face value. Moreover, the simple step of examining P-values helps determine statistical significance of the findings. This is a good first step to help separate the wheat from the chaff when it comes to research.

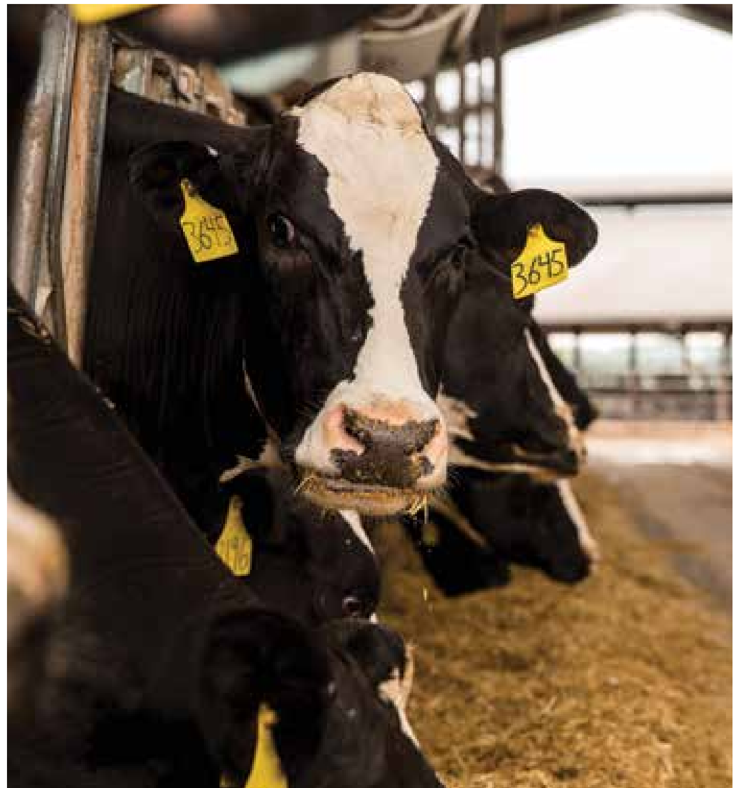
At the 2020 ADSA Discover Conference last fall, Nora Bello, professor of statistics at Kansas State University and an animal scientist and veterinarian by training, addressed the issue of interpretation of P-values as one component of the statistical toolbox for reproducible research in the animal sciences. Bello explained that a key tenet of research is repeatability; that is, that the major conclusions should withstand both close interrogation and independent validation. If the results cannot be replicated, or several studies show a wide range of results, that means that the problem has not yet been fully understood and solutions are still to be found. "We have to remember that research is a journey of scientific discovery," she explained.

An important number to look at when interpreting research results is the P-value. A P-value of 0.05 or below is generally considered the threshold to declare statistical significance. However, one has to be careful when interpreting P-values because misinterpretations are all too common. Despite popular hear-say, a P-value is NOT the probability of having made a mistake. Instead, P-values should be interpreted as "a measure of surprise of the results obtained relative to a set of assumptions," says Bello. These assumptions are critical in the interpretation of P-values. A P-value assumes that the experiment will be repeated an infinite number of times; and that the treatment studied is truly ineffective. A small P-value ≤ 0.05 provides evidence to cast doubt on the latter assumption leading to the conclusion that the treatment did cause a change in outcome. By contrast, large P-values ($P > 0.05$) do not allow one to differentiate between potentially real treatment effects for which data might be insufficiently informative and a chance numerical difference that is, by definition, not repeatable. For this reason, "claiming 'practical significance' or 'numerical differences' in the absence of statistical significance is bogus," explained Bello. When it comes to interpreting nonsignificant P-values, results are inconclusive at best and should be reported as "no evidence of treatment differences."

In addition, wording of "trend" or "tendency toward significance" are sometimes used incorrectly to describe P-values just above 0.05. This is misleading, as the wording inappropriately implies directionality based on a single point, says Bello.

Using this understanding of P-values, let's make an example of lactating cows fed diets A and B, for which milk production averaged 85 and 89 pounds, respectively. If the P-value associated with the corresponding test statistic was, say 0.15, the findings are not statistically significant and therefore, one cannot claim that cows fed diet B produced more milk than cows fed diet A. Instead, if a P-value of 0.05 or below was found for the same example, one could conclude on proof-beyond-a-reasonable-doubt that diet B did cause an increase in milk production.

To learn more on this topic please see the open access invited review by Bello and collaborators in the *Journal of Dairy Science* at https://doi.org/10.3168/jds.2017-13978



BEYOND BYPASS

Pass the Sugar Please

Rations for today's lactating dairy cows contain a lot of fermented forages and processed feeds. Unless supplemental sugar is fed, the ration only contains about 1.5 to 3% sugar. That's because a lot of the natural sugars found in feeds have been removed during processing or by fermentation. But does the lactating cow need more sugar in the diet?

The answer is yes, says Mary Beth de Ondarza, Paradox Nutrition, West Chazy, N.Y. The question is how much. Sugar plays a role in microbial protein synthesis, rumen pH, milk fat percentage and fiber digestion. In a study using 21 scientific papers with 85 observation data sets, researchers examined the impact of dietary sugar on lactating cow responses (de Ondarza et al., 2017). To be included in the analysis, individual feed ingredients had to be specified so that sugar, starch and soluble fiber content of the diet could be estimated. The data sets selected were representative of rations typically fed on commercial dairy farms in the United States.

Results showed that additional dietary sugar increased milk yield, 3.5% fat-corrected milk and milk true protein. The response was even greater in cows producing 73 lbs milk/day or more. Additional dietary sugar also impacted the concentration of volatile fatty acids in the rumen. It did not impact dry matter intake or feed efficiency.

Researchers also sought to identify the optimal levels of starch, soluble fiber and rumen degradable protein that should be fed with added sugar. Based on research and field experience, de Ondarza suggests the following nutrient ranges for lactating dairy cows: Sugar 6 to 8% of diet DM, starch 22 to 27% DM, soluble fiber 6 to 8% DM and rumen degradable protein 10 to 11% DM.

To learn more on this topic, please see "Dietary Sugars for Optimizing Rumen Function and Dairy Cow Performance," Mary Beth de Ondarza, Cornell Nutrition Conference 2020.

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Demystify DCAD Monitoring

Monitoring pre-fresh cows on a negative DCAD diet with urine pH testing doesn't have to be difficult. Combining a moderate DCAD management approach with the consistency of SoyChlor can simplify your DCAD management plan.

Don't let the questions you may have about urine pH testing and how to manage cows on a negative DCAD diet prevent your cows from having healthy transitions. Instead, let us show you how to have success with a moderate DCAD diet. By taking a more moderate approach to DCAD management and understanding both the benefits and limitations of urine pH testing you can achieve simplified DCAD success.

We've created a blog post to answer your questions about urine pH testing protocols and explain how moderate DCAD can deliver results in your herd. Visit the Landus Cooperative blog (www.landuscooperative.com) to get answers to:

- What should you look for when testing urine pH?
- What limits does pH testing have?
- How can a moderate DCAD program deliver optimal results?
- Understand what urine pH can and can't tell you about your negative DCAD diet.

DCAD management done right is not extra work. It's an investment in the health and productivity of your cows.

For More Information Visit:
https://www.landuscooperative.com/news-events/blog/what-urine-ph-can-and-cant-tell-you-about-your-negative-dcad-diet