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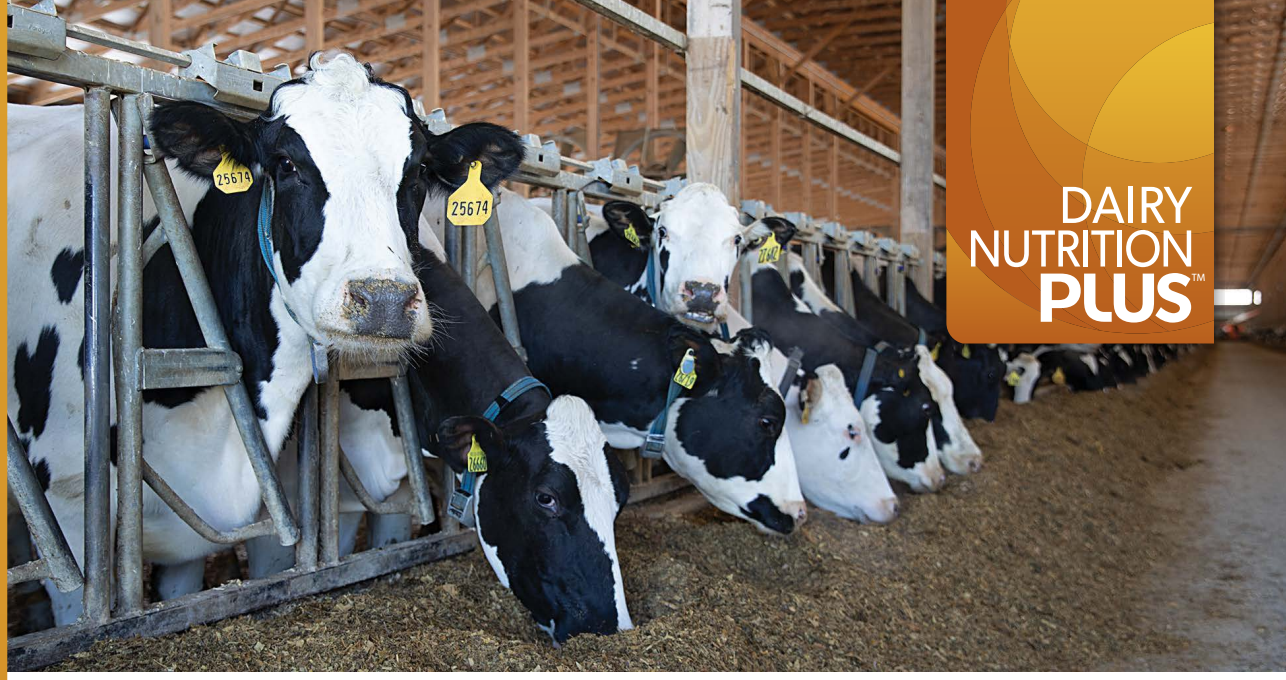
DAIRY NUTRITION PLUS™



IN THIS **ISSUE**

CALCIUM SUPPLEMENTS MAY INTERFERE WITH COWS' HOMEOSTATIC SYSTEMS

The questions about if and when to use calcium supplements in transition cows just got a little more complicated. New research indicates that calcium supplements at calving may interfere with cows' natural calcium homeostatic mechanisms making it more difficult for cows to restore normal blood calcium levels.

While clinical hypocalcemia has become a rarity on many dairies, subclinical hypocalcemia which can affect 40% to 50% of transition cows, still works as a gateway disease to other problems on dairies of all sizes. Because of this, some producers routinely use supplemental calcium after calving to boost blood calcium levels with the goal of helping cows return to normal blood calcium levels. However, several studies (Oetzel & Miller, 2012; Domino et al., 2017; Leno et al., 2018) have shown no benefit to blanket oral calcium supplementation at calving and some negative outcomes—increased risk to leave the herd in the first 30 days in milk and decreased milk production for lower-producing cows. But some cows do benefit—high-producers, lame, older and those that experience a difficult birth.

Currently there is not a cow-side test to measure blood calcium levels on farm. So there is no way to measure a cow's blood calcium content in a timely manner. And new research suggests that if cows already have adequate blood calcium, additional calcium from oral or injectable supplements may be harmful in some respects.
That's where new research can help answer the questions of when, how often and for which cows calcium supplementation should be used with transition cows.
If cows are fed a negative DCAD diet, with good cow comfort and feed management during the close-up period, they don't need anything more to prepare for and thrive after calving.

THE RESEARCH

Jessica McArt, assistant professor, Department of Population Medicine and Diagnostic Sciences at Cornell University, evaluated several different oral calcium boluses. The analysis shows that the salts in each bolus, and the bioavailability and absorption of those calcium salts, vary greatly. In addition, some boluses do not taste good, and they can be irritating to the mucous membranes so they must be administered swiftly and correctly. And finally, the duration of the increase in blood calcium after treatment ranges from 1 to 24 hours. One to 3 boluses may be needed at calving to deliver the expected amount of calcium, plus some products recommend a second dose 12 hours later.

Given the differences among products, it's really important to read and follow label directions and understand what type of product you are using. While calcium supplements do provide a short-term boost to blood calcium levels, it also appears that this short-term change can have negative effects on some cows, too. Similar to how intravenous calcium has been shown to interfere with cows' return to normal calcium homeostasis (Blanc et al., 2014; Braun et al., 2009), boluses also may interfere in some cows as well. Anything that interferes with the cows' own natural calcium homeostasis mechanisms can lead to cows that are subclinically hypocalcemic for a longer period of time. More research is needed. Until then, if producers choose to use calcium boluses, it is important that the one used complements the progression of, but does not interfere with, the cows' natural calcium homeostasis mechanisms. This seminar was presented at the ADSA meeting in July (ADSA Abstract #277).

Another study presented at ADSA by Meghan Connelly, doctorate student at the University of Wisconsin, Department of Dairy Science, looked at how the decline in calcium at the onset of lactation in cows fed negative or positive DCAD diets alters calcium metabolism postpartum. Two DCAD diets were used, -120 mEq/kg or +120 mEq/kg of dry matter. Immediately after calving cows were continuously infused for 24 hours with either an intravenous solution of 10% dextrose or of calcium gluconate to maintain a blood ionized calcium concentration of 1.2 mM (normal calcemic). This created 4 treatment groups. Results showed that treatment with calcium gluconate during the 24 hours after calving negatively affected the immediate postpartum calcium homeostasis, regardless of which prepartum diet cows received. However, cows fed a negative DCAD diet prepartum were better equipped to respond to the calcium requirements at the start of lactation as shown by higher ionized calcium levels after treatments stopped (ADSA Abstract #215).

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CALCIUM SUPPLEMENTS MAY INTERFERE WITH COWS' HOMEOSTATIC SYSTEMS

Another study from the July *Journal of Dairy Science* compared the effects of either an intravenous calcium infusion or a voluntary oral calcium solution on postpartum calcium metabolism. All cows received the same prepartum diet of +172 mEq/kg of dry matter with 4.1 grams of calcium/kg of dry matter. The oral calcium used was a commercial calcium suspension containing 48 grams of calcium that was mixed with 20 L of warm water and offered voluntarily. The IV solution was a 450 mL intravenous calcium solution containing 13 grams of calcium. Both treatments were given about 30 minutes after calving. All cows offered the oral solution drank it voluntarily within about 5 minutes. Cows that received the IV calcium saw a rapid increase in ionized calcium (iCa) and total calcium (tCa) at 1 and 3 hours after treatment. Then, blood calcium dropped to a low point 24 hours postpartum. In comparison, cows that drank the oral calcium solution had higher iCa at 18 hours and higher iCa and tCa at 24 and 36 hours after calving. Researchers concluded that the IV calcium solution disrupted cows' normal calcium homeostasis mechanisms (Wilms et al., 2019).

THE TAKE AWAY

Intravenous calcium should only be used for cows that are clinically hypocalcemic. It should not be used on a standing, subclinically hypocalcemic cow immediately after calving. "The minute we give IV calcium, we totally shut off parathyroid hormone (PTH)," explains McArt. "It then takes 8 to 24 hours for normal hormonal regulation to be back up and running." Without PTH, cows can't pull stored calcium from body reserves to restore normal blood calcium.

This new research indicates that in addition to IV calcium, other forms of postpartum calcium supplementation are not always beneficial and sometimes are detrimental to the cow. "I do think there is a place for calcium supplementation," says McArt. "But more research is needed to determine the timing that would be most beneficial without negatively impacting the cow's natural calcium homeostatic mechanisms."

HAPPENINGS

This fall our Landus Cooperative team has a lot to be thankful for: a safe harvest, time with family and meals shared with loved ones. But most of all, this Thanksgiving we are thankful for the farmers who make those meals possible. It is our privilege to witness firsthand the work and compassion that goes into caring for animals and the land, growing quality crops and producing the nutritious dairy products that so many families count on. We are grateful for you and mindful of your hand in producing our meals on Thanksgiving Day and every day after.

From our Landus Cooperative family to yours, thank you for the work you do to feed this world.

FROM THE MATERNITY PEN

What Cows Want at Calving

Traditionally maternity pens have been designed with ease of management in mind. The thought was to place the maternity pen in a high visibility, high traffic area so that everyone who passed by could check on the cows as they went about their daily routine. While that may mean more eyes on the cows, it also means more disruptions for cows getting ready to calve.

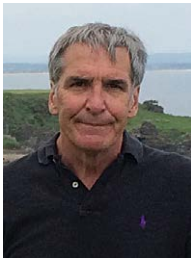
Recent research shows that when given the opportunity—in pasture or in a group maternity pen with secluded areas on the side—cows choose to seclude themselves, to hide from view, to give birth. When given the option to seclude or hide for calving, cows' natural maternal pre-calving behaviors kick in, and 81% of cows separate themselves from the group to calve in private (Proudfoot et al., 2014a).

Some farms have opted for individual maternity pens. But that may not be enough. Research by Proudfoot et al. (2014b) showed that when a secluded corner was created in an individual maternity pen 79% of cows chose to calve in seclusion. So what can be done to facilitate cows' natural maternal pre-calving behaviors without negatively impacting cow or calf health? Katy Proudfoot, extension animal welfare and behavior specialist at The Ohio State University recommends the following:

- Locate maternity pens in a quiet area of the barn with minimal activity.
- Use hay bales, shade cloth, curtains or plywood to create a space where cows can feel isolated to calve.
- Move cows to individual maternity pens, if available, during early labor—raised tail, restless behavior, relaxed pelvic ligaments. Research by Nordlund et al. (2006) shows that too much time in an individual maternity pen increases the risk of ketosis and displaced abomasum.
- Train maternity pen employees on "just in time" protocols for moving cows to individual maternity pens.
- Provide clean, dry, well-bedded areas for cows to calve.
- Don't overstock maternity pens. Even in group pens, cows seek to move away from the group to give birth alone.

CONSULTANTS CORNER

Protein and Energy Interactions in Lactating Cow Diets



BILL WEISS
The Ohio State University

Each and every person who formulates rations for lactating dairy cows has experienced making a dietary change where the result from the cows was not exactly what was expected. The first thought is often that the diet formulated is not what the cows received or what they ate. But as dairy nutritionists there is another source of variation you should consider—the interactions between protein and energy in lactating dairy cows.

An interaction between two nutrients can be defined as a non-additive response when the supply of two nutrients is altered. For example, if you add 1 unit of protein to the cows' diet milk protein yield increases by 1 unit. If you add 1 unit of energy to the cows' diet the milk protein yield increases by 1 unit also. But when you add 1 unit of protein and 1 unit of energy the resulting increase is 3 units of milk protein instead of the 2 units expected. Interactions can be positive, greater than expected or negative, less than expected.

Energy is required for cows to convert amino acids into milk protein. Crude protein is needed by cows to efficiently convert gross energy into net energy for lactation. Therefore interactions between protein and energy would be expected in lactating cow diets. But the interaction between protein and energy is not constant; it changes based on stage of lactation.

As we formulate lactating cow diets with lower levels of crude protein, for both economic and environmental reasons, we must understand the interactions between protein and energy. Use the following rules on protein and energy interactions to help formulate diets that can better deliver intended results.

EARLY LACTATION

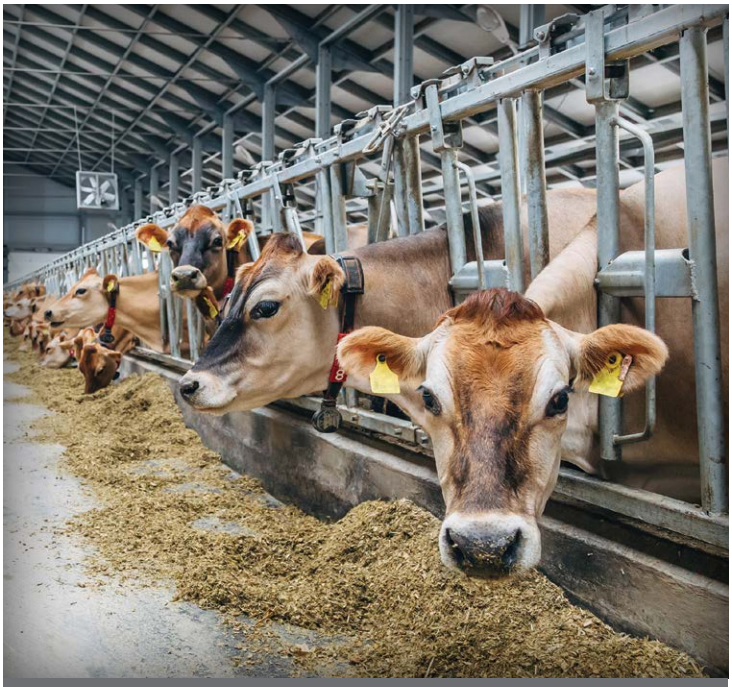
During early lactation diet is not the only source of energy used to support lactation. Cows routinely mobilize body energy reserves, and to a much smaller degree body protein, to meet the rapid ramp up in milk production at a time when they are not yet eating enough dietary energy to meet that need. During this time, protein, not energy, is generally the first limiting factor in early lactation. Increasing the amino acid supply during early lactation can increase milk protein yield independent of any change in dietary energy. That's because cows will mobilize body energy to convert the extra amino acids into milk protein which can decrease body condition score.

LATER LACTATION

After the first 4 weeks of lactation the relationship between dietary energy and protein changes. During mid- and late-lactation milk protein yield will only respond to an increase in amino acid supply when adequate dietary energy is available. That means maximum response to amino acid supplementation or increased dietary metabolizable protein requires that energy must be fed at rates equal to or greater than requirement. As supplies of both metabolizable protein and energy are increased, milk protein yield increases, but the response follows the law of diminishing returns.

PROTEIN EFFECTS

Equations used to formulate diets today do not capture all of the effects protein has on energy concentration in diets which means that estimated dietary energy values may be incorrect. Protein has about 1.3 times more gross energy per pound that carbohydrates but some of this extra energy will be lost in urine. In addition to increasing gross energy, increased protein levels can improve neutral detergent fiber (NDF) and dry matter (DM) digestibility which will lead to an increase in net energy of lactation. But in order to see an increase in digestibility of NDF and DM adequate rumen degradable protein (RDP) is needed to maximize ruminal bacterial growth. Otherwise, if RDP is deficient fiber digestibility will not be increased and can decrease.



BEYOND BYPASS

New Research on Fatty Acids

New research on fatty acid supplementation in lactating cow diets was presented at the ADSA meeting in July. Adam Lock, associate professor of dairy nutrition at Michigan State University, and his research team have continued to delineate fatty acids' effects on lactating dairy cows in order to determine the ideal combinations that cows need.

In one study they blended 60% palmitic acid with either 30% stearic or 30% oleic acid to determine its effect on nutrient digestibility and the milk production response of low- and high-producing cows. Each blend was fed at 1.5% dry matter. Control cows did not receive any fatty acid supplementation.

Results showed that both fatty acid blends increased neutral detergent fiber (NDF) digestibility and total fatty acid intake compared to control cows. However, in terms of 3.5% fat corrected milk, milk fat yield and energy-corrected milk, high-producing cows responded better to the 60% palmitic and 30% oleic acid blend but low-producing cows responded better to the 60% palmitic and 30% stearic acid blend (ADSA Abstract #422).

A second study evaluated different ratios of palmitic and oleic acid supplementation on nutrient digestibility and energy intake in early lactation cows. Three blends of palmitic to oleic acids—80:10, 70:20 and 60:30—were fed to cows from 1 to 24 days in milk.

Compared to control cows that did not receive a fatty acid supplement, all of the cows that were fed supplemental fatty acids had increased digestibility of dry matter, NDF, 18-carbon and total fatty acid. In addition, all fatty acid supplemented diets increased the intake of digestible energy, metabolizable energy and net energy of lactation. For each of the factors studied, as the amount of oleic acid in the diet increased, there was a linear increase in the result for each factor (ADSA Abstract #423).

LANDUS COOPERATIVE

PO Box 68 · 406 1st Street
Ralston, IA 51459

QUALITY CORNER

Leading Quality and Food Safety

At Landus Cooperative a commitment to quality and safety drives what employees do each day. Leading the way is Cassidy Brincks, Quality Systems Manager. Brincks manages a team devoted to maintaining quality through every step in our supply chain: from the agronomists helping local farmers grow healthy soybeans, to the grain handling processes, to the manufacturing of consistent dairy feed ingredients.

"Our teams understand that what we do affects not just the animals we feed, but ultimately the food we eat. We are always thinking about our role in providing quality every step of the way, from our local farms to kitchen tables around the world," Brincks says.

Brincks works with the SoyPlus and SoyChlor manufacturing teams routinely to ensure adherence to ISO 9001, HACCP guidelines and to verify compliance with Food Safety and Modernization Act (FSMA) regulations. Brincks also works with the teams to evaluate suppliers, audit the manufacturing processes and food safety practices and coach a commitment to high quality processes no matter how small the task.

She loves coming to work each day because of the team of people she gets to serve, coach and collaborate with. Every day she gets to witness SoyPlus and SoyChlor employees demonstrate what's right, not only because it's a requirement but it's something they believe in. "Quality, food safety and consistency have become part of who we are. We don't question it."

LANDUS COOPERATIVE QUALITY CERTIFICATIONS

SOYPLUS®
ISO 9001, HACCP, NON-GMO PROJECT VERIFIED, FSMA COMPLIANT

SOYCHLOR®
ISO 9001, HACCP, QS WITH GMP+ RECOGNITION, FSMA COMPLIANT