VOLUME 14, ISSUE 5
SEPTEMBER 2018

NUTRITION PLUS NEWSLETTER

DAIRY NUTRITION PLUS™

PREPARTUM NEGATIVE DCAD DIETS—BENEFITS BEYOND MILK FEVER

Negative DCAD diets do more than just prevent milk fever. Thanks to a recently completed meta-analysis of published research, new benefits of improved health and lactation performance have been documented.

"We knew well that acidogenic diets reduce milk fever and that hypocalcemia is linked to other disease during the transition period," explains José Santos, professor of animal sciences at the University of Florida. "But we did not know, or had not documented scientifically, whether acidogenic diets would reduce diseases other than milk fever. This meta-analysis shows that." Results showed reduced incidence of retained placenta and metritis in all cows and improved lactation performance in multiparous cows.

A total of 42 published experiments were included in the meta-analysis. Data from 1,803 cows (151 first-calf heifers or nulliparous) were included. The DCAD of prepartum diets ranged from -246 to 1,094 mEq/kg and concentrations of dietary calcium (0.16 to 1.98%), phosphorus (0.18 to 1.58%) and magnesium (0.09 to 0.68%) had wide ranges that allowed for evaluation of their associations with production and health. Diets were fed prepartum for an average of 21.9 days for nulliparous cows and 25.6 days for multiparous cows.

DRY MATTER INTAKE

In examining the effects of DCAD on dry matter intake prepartum, researchers found as DCAD decreased, so too did prepartum intake in both nulliparous and multiparous cows. Reducing the DCAD from 200 to -100 mEq/kg resulted in a 1.5 lb/day and 0.9 lb/day decline in prepartum DMI for nulliparous and multiparous cows. The concentration of calcium, phosphorus and magnesium in the diet did not influence DMI.

Researchers further analyzed the data to determine if feed intake depression prepartum resulted from the source of strong ions fed—acidogenic salts or commercial products. Results showed that the decline in DMI prepartum induced by diets supplemented with acidogenic products did not differ regardless of the source of strong ions fed. Research by Zimpel et al., 2018, showed that the mechanism that underlies the depression in DMI prepartum caused by acidogenic diets is the metabolic acidosis, and not the source of strong ions. If prepartum cows are metabolically acidified, dry matter intake declines a bit. If the acid-base status is not altered, DMI is not expected to decline.

However, in spite of the decline in DMI prepartum, feeding a prepartum diet with negative DCAD drives an increase in intake after calving for all cows. Both nulliparous and multiparous cows that were metabolically acidified prepartum increased postpartum feed intake by about 2 lbs/day compared to non-acidified herdmates. Likely, the improved postpartum intake is linked to the better postpartum health when cows are fed acidogenic diets.

MORE MILK FOR MULTIPAROUS COWS

Results from the meta-analysis clearly show that "multiparous cows respond positively to acidogenic diets with increased yields of milk and milk components," says Santos. The expected milk yield response in multiparous cows fed an acidogenic diet with -100 mEq/kg prepartum was 3.75 lbs/day compared with cows fed a diet with 200 mEq/kg.

However, nulliparous cows fed similar negative DCAD diets tended to have reduced yields of fat-corrected milk and protein, and reduced milk fat content. Milk yield was not influenced. Diet concentrations of calcium, phosphorus or magnesium prepartum did not affect yields of milk or milk components.

Only five studies reported data on nulliparous cows, so the data are quite limited. More research is needed to understand what level of DCAD in prepartum diets is best for nulliparous cows.

HEALTH BENEFITS

While most recognize the benefits of feeding prepartum cows negative DCAD diets to minimize milk fever, the meta-analysis clearly demonstrates that other health and production benefits also occur. With individual studies it can be difficult to demonstrate such effects because of the limitations in the number of cows one can enroll in an experiment with individual feeding, explains Santos. A meta-analysis provides a thorough examination of all of the research on a specific topic, and in this case, it found that feeding negative DCAD diets prepartum delivers additional health benefits—less retained placenta and less metritis in all cows.

In the analysis, when prepartum DCAD was reduced from 200 to -100 mEq/kg the predicted incidence of milk fever

continued on page 2

IN THIS **ISSUE**

continued from page 1

PREPARTUM NEGATIVE DCAD DIETS—BENEFITS BEYOND MILK FEVER

in multiparous cows dropped from 11.7% to 2.8%. The incidence of metritis dropped from 34.4% to 12% in nulliparous cows and from 16.3% to 9.9% in multiparous cows. The incidence of retained placenta declined from 12.7% to 3.5% in nulliparous cows and from 17% to 9% in multiparous cows. The number of disease events per cow declined by half in all cows.

NEGATIVE DCAD WORKS

Prepartum cows should be fed a negative DCAD diet (somewhere between -50 to -150 mEq/kg), says Santos. These diets reduce milk fever, subclinical hypocalcemia, retained placenta and metritis. These diets also increase yields of milk and fat-corrected milk in multiparous cows.

The metabolic acidosis induced by negative DCAD diets is expected to slightly depress DMI in prepartum cows. Feed intake declines because the cows have been metabolically acidified. But, these cows respond with increased feed intake after calving.

The ideal DCAD to optimize health and production has not yet been identified, but it is likely somewhere between -50 to -150 mEq/kg for multiparous cows. But there are still questions to be answered. "We do not know if dietary calcium content of prepartum diets when between 0.5 and 1.6% of the diet dry matter makes any difference for postpartum health and production," says Santos. "We also do not know if primiparous cows should be fed acidogenic diets to the same values as multiparous cows."

But negative DCAD diets do work extremely well in multiparous cows if you manage them. Analyze forages and by-products, select ingredients that are low in potassium and sodium, supplement with an acidogenic product or salts to reach your target value of DCAD and then monitor urine pH and incidence of milk fever. If producers and nutritionists do these steps, then negative DCAD is a recipe for transition success.

HAPPENINGS

USDA Secretary Perdue, IA Governor Kim Reynolds Host Farmer Roundtable at Landus Cooperative

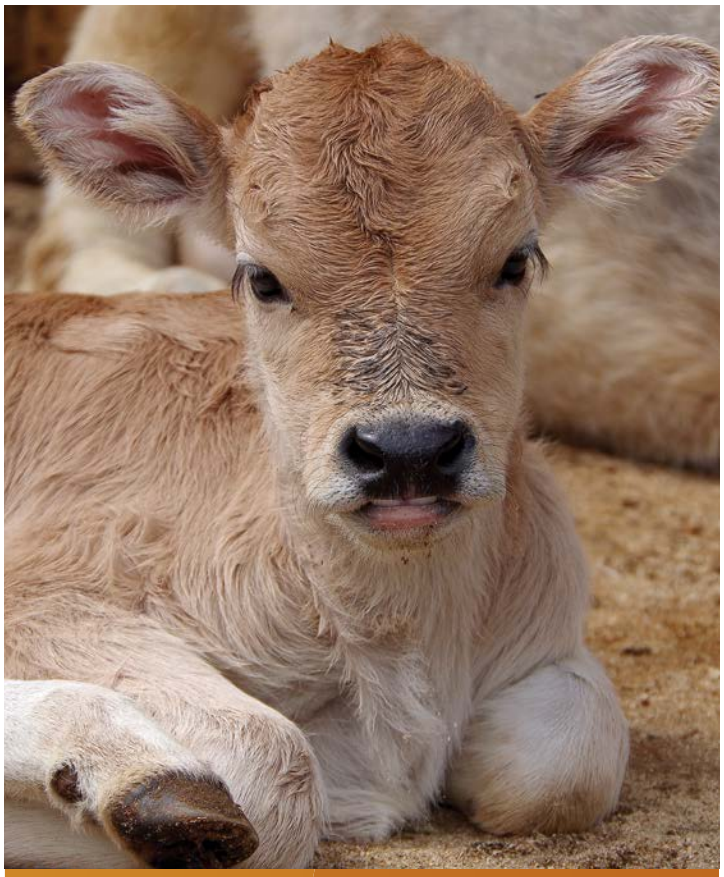
Farmer-members of Landus Cooperative posed questions to USDA Secretary Sonny Perdue in a roundtable hosted by Iowa Governor Kim Reynolds held at the cooperative's headquarters in Ames last month.

Leopoldo Orozco, the cooperative's Mexico-based Dairy Nutrition Plus product line international sales manager was also in attendance, representing the perspectives of international customers and dairy industry partners throughout the world.

"Iowa agriculture is so important to Mexico. I greatly appreciated the opportunity to ask questions of Secretary Perdue on behalf of my customers in both Mexico and around the globe," Orozco said.

Landus Cooperative CEO Milan Kucerak shared his appreciation for the farmers on the panel. "Our business is owned by our farmer-members. They are real people impacted by policy and trade issues. We thank Governor Reynolds and Secretary Perdue for their continued vigilance in moving our industry forward."

Nearly half of all soybeans purchased by Landus Cooperative from area farmers become SoyPlus. Additionally, another 10 percent of soybeans purchased during harvest are shipped directly to the Gulf for export.



FROM THE MATERNITY PEN

Risk Factors for Low Colostrum Yield in Jerseys

New research in the July *Journal of Dairy Science* indicates that inadequate colostrum production in some Jersey cows may be linked to several factors. Researchers worked with a 2,500-cow Jersey dairy with a multiyear history of periodic low colostrum yield to try and determine potential risk factors.

During the one-year study (June 1, 2016 to May 31, 2017), 3,070 cows calved, and 2,988 calvings were used in the study. Average colostrum yield was 9.4 lbs. Overall, average colostrum yield was 14.5 lbs/cow in June, 5.5 lbs/cow in December and 10.6 lbs/cow in May. On average, primiparous cows produced more colostrum than multiparous cows. Colostrum yield in multiparous cows showed the largest drop—from 14.5 lbs/cow in June to 2.9 lbs/cow in December. In comparison, colostrum yield for first-calf heifers declined from 14.3 to 9.3 lbs/cow during the same time period. In December, when colostrum yield was the lowest, 35% of multiparous cows produced no colostrum at first milking compared to 1% of primiparous cows.

Through data analysis, researchers discovered that calving month, photoperiod one month prior to calving, sire line and even dry period length all affected colostrum production. Month of calving had the greatest influence on the odds of low colostrum production with December being the worst month. A pedigree analysis revealed that some cow families and sire lines were associated with low colostrum production in cows. Even though researchers were able to identify some strong correlations, more research is needed to determine how best to minimize this problem in Jersey herds.

Jersey calves need about 6.0 lbs of colostrum at birth. When cows do not produce enough colostrum, higher morbidity and mortality can occur. Colostrum banking and/or commercial colostrum supplements can help fill the gap. To learn more about the study go to: https://doi.org/10.3168/jds.2017-14308.

CONSULTANTS CORNER

DCAD Benefits Start at Urine pH of 7.5

JESSE GOFF
Iowa State University

It's scientifically proven that feeding close-up cows a negative DCAD diet that induces metabolic acidosis improves calcium homeostasis at calving. But research has not zeroed in on the exact amount of anions or the level of calcium to feed in order to provide optimal benefit to transition cows.

New research from Iowa State University, reported in the June *Journal of Dairy Science*, sought to answer those questions. Our team conducted two experiments with multiparous cows to better define the nutrients needed by close-up cows to minimize all forms of hypocalcemia.

In experiment 1, we used a low calcium diet of 0.46% with and without anion supplementation to determine if it would stimulate calcium homeostatic mechanisms before calving. We also evaluated if anion supplementation, where urine pH remains above 7.0 but below 7.5, would benefit periparturient calcium status. All cows received the same base diet with different amounts of calcium, and the quantity of anion supplementation used was the same in both anion groups (SoyChlor and PasturChlor, Landus Cooperative, Ames, IA). The three diets were: low calcium without anions (LC), 0.46% calcium and +167 mEq/kg of DCAD; low calcium plus anions (LC+A), 0.46% calcium and -15 mEq/kg of DCAD; and high calcium plus anions (HC+A), 0.72% calcium and -17mEq/kg of DCAD.

Dry matter intake for all three groups before calving was similar at 29.5 lbs/day. All cows showed a decline in DMI beginning the day before calving. Body condition scores were similar. Average urine pH was as follows: LC cows, 8.27; LC+A cows, 7.07; and HC+A cows, 7.41. While the addition of calcium caused urine pH to be numerically higher, this difference was not statistically significant (P=0.16). Plasma calcium levels decreased in all three groups on the day of calving. However, plasma calcium levels were significantly lower in cows fed the LC diet (7.17 ± 0.31 mg/dl) compared to cows fed the LC+A diet (7.95 ± 0.24 mg/dl) and cows fed HC+A diet (8.05 ± 0.27 mg/dl).

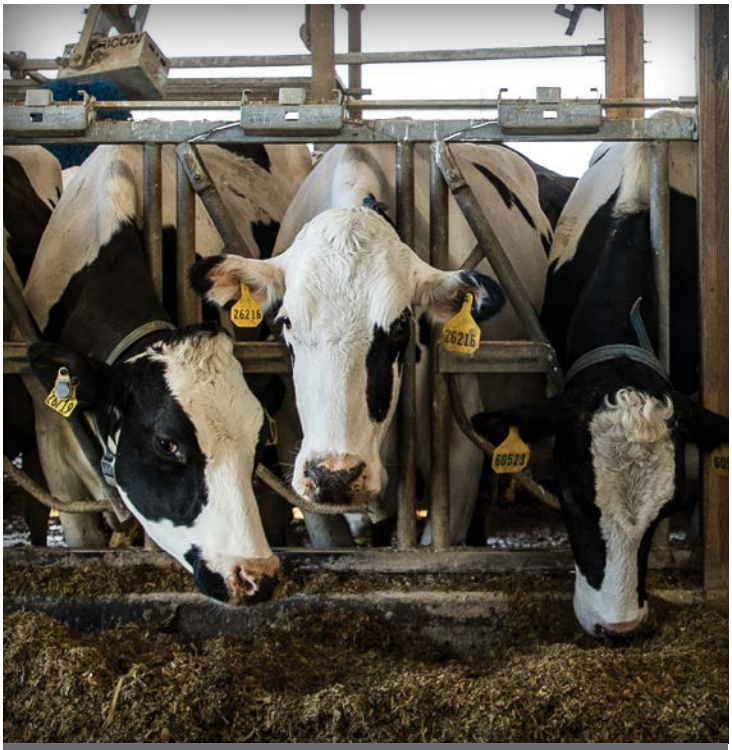
In experiment 2 the same three calcium and anion diets were used with 225 grams of added potassium carbonate (creating a positive DCAD value in each diet) to see if additional potassium would affect calcium homeostatic mechanisms before calving. The three diets were 0.46% calcium, no anions resulting in +327 mEq/kg of DCAD (high-K LC), 0.46% calcium with anions +141 mEq/kg of DCAD (high-K LC+A), and 0.72% calcium with anions and +140 mEq/kg of DCAD (high-K HC+A).

DMI was similar, 26.5 lbs/day, across all groups until seven days prior to calving; then DMI slowly declined until calving. BCS and average lactation number were similar across all feeding groups. Average urine pH for all groups was above 8.0. Plasma calcium concentrations around calving day significantly decreased, dropping to at or below 7.5 mg/dl, for all treatment groups.

In our studies, we found no evidence that a diet with 0.46% calcium concentration was low enough to increase parathyroid hormone secretion and upregulate calcium homeostatic mechanisms in transition cows. Diets with DCAD close to 0 mEq/kg, which reduced urine pH to 7.5 or less, improved plasma calcium concentration more than a diet with no added anions.

We have, in several studies our group has done, found no benefits and no disadvantages to adding calcium to anionic diets when diet calcium is kept between 0.42 and 1.3%. But anionic diets are not one dose fits all. When adding anions to the diet you must take into account the amount of cations in the diet and adjust the amount of anions fed. Cows must become metabolically acidified for beneficial changes to occur. And the easiest and least expensive way to know that cows are metabolically acidified is to test urine pH.

Bottom line: The amount of calcium in the diet did not appear to affect calcium status at calving. Partial acidification must result in a urine pH of 7.5 or less to get some improvement in calcium homeostasis and facilitate healthy, productive transitions.



BEYOND BYPASS

Uncovering the Health Benefits of Methionine in Dairy Cows

When it comes to feeding rumen-protected methionine to dairy cows, the benefits of increased milk yield, milk components and dry matter intake are well documented. But new research shows that methionine also plays a role in metabolism, inflammation and gene regulation in transition cows.

The liver is the primary organ responsible for the removal of non-esterified fatty acids soon after calving, but during the transition period liver function is depressed. Researchers have found that methionine, which is a limiting amino acid, also impacts protein synthesis in the liver which may improve liver function, and therefore improve the assembly and secretion of very-low density lipoproteins.

During the transition from pregnancy to lactation, inflammation and oxidative stress commonly increase. Research has shown that glutathione (an antioxidant) is commonly depleted after calving, and that methionine supplementation to transition cows has consistently increased the concentration of glutathione in the liver (Osorio et al., 2014b; Zhou et al., 2016a; Batistel et al., 2018). Improved availability of this antioxidant and other proteins synthesized in the liver could potentially help prepare cows for a smoother transition with fewer health problems.

New research indicates that methionine also plays a key role in gene regulation. DNA contains the genetic information to create all proteins in the body. But to do so, the information must first be transcribed into a different language which is RNA; this process is known as gene expression, and the RNA information is used for the assembly of a specific protein. That's where methionine has been shown to be beneficial. Nutrigenomics—the interaction between nutrients and genes—is a new area of study. While more research is needed, research so far has shown that transition cows supplemented with methionine have fundamental changes at the molecular level in the liver that can lead to a more favorable metabolic status and performance.

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

QUALITY CORNER

True Nutrition with HEINS FAMILY DAIRY

For generations Heins Family Dairy has let one value drive their success: do what's best for the cows.

"My dad taught me that if we take care of the cows, they take care of us," said Chris Heins, the sixth generation to farm in Lafayette County, Missouri.

That's why more than a decade ago his family implemented a DCAD program with SoyChlor. Their cows had been suffering milk fevers and displaced abomasums, and they wanted better for their herd and for their family.

The Heins family added SoyChlor to their pre-fresh cow diets when a nutritionist recommended it as the "gold standard" anionic supplement. Sure enough, the issues disappeared, as did the time spent treating them.

"Now that I have children of my own, the last thing I need is to be missing out on supper with my family to treat down cows."

Read more about the Heins' journey to simplified DCAD success with SoyChlor at: blog.dairynutritionplus.com.