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IN THIS **ISSUE**



# FEEDING A NEGATIVE DCAD DIET PREPARTUM PAYS

The results of a year-long, large-scale study feeding negative DCAD diets to prepartum cows on commercial dairy farms in Canada are in. Feeding a negative DCAD diet for 21 days prepartum significantly improves cow health and boosts milk production. These benefits more than pay for the cost of feeding the anionic supplement.

University of Guelph researchers (Serrenho et al., 2021 a&b) completed the study on 4 commercial dairy farms. Each had one dry cow pen enrolled in the study. Cows were moved to the close-up pen about 21 days before calving. Using a pen-level randomized design, pens switched every 3 months between control and treatment diets. Farm personnel were blind to which protocol the cows were on. Dry cows on treatment received a negative DCAD diet (-108 mEq/kg of DM) using SoyChlor. Cows on the control diet received a positive DCAD diet (+105 mEq/kg of DM).

"The goal of the negative DCAD diet was to create a slight compensated metabolic acidosis with a urine pH between 6.0 to 6.5," explains Stephen LeBlanc, senior project leader, veterinarian and professor at the Ontario Veterinary College at the University of Guelph. "This slight acidosis allows cows to respond more quickly to the drop in blood calcium that occurs at calving."

Research has shown that this drop in blood calcium is not bad for the cow as long as it is not excessive or prolonged. A quick return to normal calcium homeostasis is important for cow health and productivity, which is how negative DCAD diets help give cows a smoother transition.

A total of 1,086 cows were included in the final analysis of clinical outcomes and milk production. Urine pH averaged 6.3 for cows on treatment and 8.1 for cows on the control diet. Both multiparous cows and first-calf heifers were used in the study, and possible effects of parity and body condition on treatment were checked. The majority of effects from feeding a negative DCAD diet prepartum were seen in multiparous cows. Significant effects include:

- Greater milk production (7.0 and 5.5 lbs/day, respectively) by multiparous cows on their first and second monthly test days. Energy-corrected milk was 5 lbs/day greater on the first test day.
- Less milk fever in over-conditioned (≥ 3.75 BCS) multiparous cows: 1.8% vs. 13%.
- Fewer multiparous cows with 2 or more disease events during the transition period: 13.9% vs. 22.5%.
- Greater pregnancy rate. The percentage of multiparous cows pregnant at first A.I. increased: 42% vs. 32%.
- Less culling. Percentage of multiparous cows removed from the herd by 305 DIM was reduced: 21.3% vs. 31.7%.
- Displaced abomasum incidence was reduced in all cows: 1.7% vs. 3.6%.
- Increased the number of days for first-lactation cows to become pregnant by 21 days.

In terms of practical application, LeBlanc and team recommend a targeted approach to feeding negative DCAD diets to multiparous cows whenever possible.

## A 3:1 RETURN

Decades of research and on-farm use have proven the biological benefits of negative DCAD diets, but some still question the economics of feeding an anionic supplement. The cost/benefit of using any anionic supplement will vary by farm, region and country, explains Tim Brown, director of technical support for SoyChlor. By using the data from this recent large-scale study, combined with a reasonable estimate of milk prices in the U.S. and the cost of health events as modeled by Liang et al. (2017), Brown calculated a conservative cost-benefit relationship for feeding the negative DCAD diet used in the research. Only results that were statistically significant ($P \leq 0.05$) were considered in the economic evaluation.

During the study, SoyChlor was fed at a rate of approximately 2 lbs/cow/day to achieve a target urine

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## FEEDING A NEGATIVE DCAD DIET PREPARTUM PAYS

pH between 6.0 and 6.5. In the U.S., SoyChlor was estimated to cost about $0.40/lb. For the 21-day prepartum period, the purchase cost of SoyChlor was about $17/cow. However, since SoyChlor also contains 20% true protein from canola meal and bypass soybean meal (SoyPlus), the true cost of feeding it is less than its purchase cost because you can reduce the amount of other protein and energy supplements needed in the diet. So, when the value of the protein and energy supplied by SoyChlor are accounted for, the actual cost of feeding the anionic supplement for 21 days prepartum would be closer to $12/cow.

Milk production in this study was measured at monthly DHIA tests. Prepartum nutrition did not affect milk production of first-lactation cows. However, multiparous cows fed SoyChlor prepartum produced 7.0 lbs/day and 5.5 lbs/day more actual milk on the first and second test days, respectively. Using the median days of milk production of 27 days and 38 days for first and second test days, respectively, each treated multiparous cow produced an additional 398 lbs of milk.

There was also a difference in milk components. While milk protein percentage was the same for all cows; milk fat percentage on the first test day was lower (3.7% vs. 3.9%) and tended to be lower at the second test (3.3% vs. 3.4%) for all treated cows. But greater milk production resulted in an additional 0.09 lbs/day of milk fat on both test days and an additional 0.22 and 0.16 lbs/day of milk protein on the first and second test days, respectively. However, since treated first-lactation cows did not have increased milk production, they produced less milk fat, 0.12 and 0.08 lbs/day on the first and second test days, respectively. Using milk component pricing from Dairy Farmers of America for December 2020 of $0.35/cwt, $1.54/pound and $3.03/pound for milk volume, fat and protein, respectively, the net extra value of milk resulting from the negative DCAD prepartum nutrition becomes $28.99. In this study, the increase in milk production from multiparous cows generates a return that is twice the cost of feeding SoyChlor to all close-up cows.

Now let's look at health events. In the Serrenho research, milk fever incidence for over-conditioned multiparous cows was reduced (1.8% vs. 13%) by treatment. With 30% of multiparous cows with BCS ≥ 3.75 as in the study, the benefit in this subset of the herd equals 2 fewer milk fever cases for every 100 cows and heifers that calved. Using Liang's modeled milk fever cost (minus milk loss) of $240 per case, a savings of $480 can be attributed to the negative DCAD diet.

Feeding a negative DCAD ration prepartum also cut the incidence of displaced abomasum by nearly half. Again, using Liang's modeled disease cost (minus milk loss), that's an additional benefit of $620 per 100 cows and heifers that calved.

For heifers, feeding a negative DCAD diet prepartum had another negative; an additional 21 days to become pregnant during their first lactation. First-parity cows comprised 33% of the study. Using an estimated cost of $1 per additional day open, this would require a subtraction of $693 from the values in this 100-cow example. Despite the negative results for first parity cows, the benefits of feeding SoyChlor to multiparous cows prepartum are compelling.

Take a moment to think about the cost and benefits of feeding SoyChlor. Just the extra milk produced by multiparous cows was enough to pay for the negative DCAD diet for all cows and heifers in the close-up pen by a 2 to 1 margin. Add in the value of fewer milk fevers and fewer displaced abomasa, and the return from feeding SoyChlor rises to nearly 3 to 1. When you put any kind of value on the additional benefits of keeping 10% more mature cows for another lactation, treating fewer cows for multiple health issues and having a higher percentage of mature cows becoming pregnant on the first insemination, the economic benefits of feeding SoyChlor cannot be denied.

To learn more on this topic, please see the webinar "Economics of negative DCAD prepartum diets on milk production, reproductive performance, culling and postpartum health of dairy cows," available at https://youtu.be/HoyIsnLtWhw

## FROM THE MATERNITY PEN

### *Blood Calcium Concentration Associated with DMI, Milk Yield*

New research from Cornell University demonstrates that blood calcium concentration the first few days after calving is associated with dry matter intake and milk yield.

Veterinarian Jessica McArt's research team conducted a retrospective analysis of 3 previously reported studies (Leno et al., 2017 a&b; and Kerwin et al., 2019) to determine the association between blood calcium concentration/subclinical hypocalcemia status on postpartum dry matter intake and milk yield. Cows were classified by blood total calcium into 1 of 4 subclinical hypocalcemia (SCH) groups based on mean calcium concentrations of cows in the study: Normocalcemic >1.95 mmol/L at 1 DIM and >2.2 mmol/L at 4 DIM; transient SCH ≤1.95 mmol/L at 1 DIM and >2.2 mmol/L at 4 DIM; delayed SCH >1.95 mmol/L at 1 DIM and ≤2.2 mmol/L at 4 DIM; and persistent SCH ≤1.95 mmol/L at 1 DIM and ≤ 2.2 mmol/L at 4 DIM. Of the 78 multiparous Holstein cows used in the analysis, 36% were classified as normocalcemic, 34% as transient SCH, 22% as persistent SCH and 8% as delayed SCH. Results include:

- All cows classified as persistent SCH were fed a positive DCAD ration prepartum.
- In the 2 weeks leading up to calving DMI steadily decreased but did not differ by SCH group.
- At 1 DIM feed intake for persistent SCH cows was already lower than the other 3 groups. At 2 DIM intakes began to increase for normocalcemic and transient SCH cows but intake of delayed SCH cows declined.
- Average daily feed intake during the first 21 DIM was as follows: transient SCH, 46.7 lbs; normocalcemic, 45.8 lbs; delayed SCH, 41.0 lbs; and persistent SCH 38.8 lbs.
- Transient SCH cows produced the most milk during the first 6 weeks of lactation, averaging 108.0 lbs; normocalcemic cows, 105.4 lbs; persistent SCH, 98.8 lbs; and delayed SCH 92.2 lbs.
- Cows that experienced prolonged episodes of SCH also had reduced concentrations of blood magnesium and phosphorus.

The higher levels of DMI for normocalcemic and transient SCH cows combined with greater milk yield and elevated concentrations of blood calcium, magnesium and phosphorus suggest that these cows were able to successfully adapt to the metabolic challenges of lactation.

Seely et al., 2021. J. Dairy Sci. 104:4692-4702.

# CONSULTANTS CORNER

## *Cooling Pays, Even in First-Calf Heifers*

***BY GEOFFREY DAHL,*** University of Florida

The pay back from cooling dry cows is well known, more milk in the next lactation. But what about first-calf heifers during late gestation? According to new research the answer is yes.

In fact, three new studies in the *Journal of Dairy Science*, all from the University of Florida, demonstrate that cooling dry cows and first-calf heifers provides benefits to the cows and to their offspring.

Davidson et al. (2021), was the first of its kind study to examine if cooling first-calf heifers during the last 60 days of gestation was beneficial. All 31 heifers were housed in a sand-bedded freestall barn. Cooled heifers also had soakers over the feedline and fans. Cooled heifers had significantly lower respiration rates; rectal, skin and vaginal temperatures; and sweating rates. In addition, during the first 15 weeks of lactation cooled heifers produced 8.6 lbs/day more milk than their non-cooled counterparts. Overall, our study demonstrated a strong and positive response of dairy heifers to active cooling with fans and soakers in late gestation.

Laporta et al. (2020), examined 10 consecutive years of late gestation heat stress research. We selected 156 daughters and 45 granddaughters with 3 years of lactation data to determine the impact of in utero heat stress during their dams' dry period. Management and environmental conditions for daughters and granddaughters were the same from birth through their third lactation.

Results show that daughters and granddaughters of heat-stressed dams all had reduced milk production through 3 lactations compared to their counterparts born from dams cooled during the dry period. Milk production losses per day for daughters of heat-stressed cows was 4.8 lbs, first lactation; 5.1 lbs, second lactation; and 14.3 lbs, third lactation. In granddaughters the milk production loss per day was 2.9 lbs in the first lactation. Losses were greater in the second and third lactations, but granddaughter numbers were too small for statistical significance. We also evaluated the lifespan and productive life of daughters. Daughters born from heat-stressed cows had an 11.7-month shorter life span and a 4.9-month shorter productive life than heifers born from cooled cows. This study clearly shows that maternal heat stress during late gestation reduces daughter survivability and milk production for up to 3 lactations.

Fabris et al. (2020), evaluated the effect of heat stress or cooling on the involution of and the creation of mammary secretory cells during the dry period. By measuring gene expression and cellular microstructure we were able to determine that heat stress during the early dry period down regulates several genes which slows involution. And heat stress during the late dry period slowed the creation of new secretory cells. These two factors combined, provide evidence that heat stress impairs mammary gland turnover and subsequent milk production.

In Laporta et al. (2020), we also estimated the annual economic loss of heat stress on heifers born from heat-stressed cows. In the United States, we estimated the additional cost of rearing heifers born from heat-stressed dry cows at $134 million ($157.49/heifer); the loss from a shortened productive life at $90 million ($9.61/cow/year); and $371 million in lost milk production (264.5 lbs/daughter/year). We estimated the total loss from reduced milk production, survivability through first calving and reduced productive life of daughters at $595 million year. This is just losses from daughters born to heat stressed dry cows. Previous research by Ferreira et al. (2016), estimated total annual milk production losses in multiparous cows not cooled in the dry period at $810 million in the U.S. These results show that cooling dry cows and heifers can enhance profitability.

# BEYOND BYPASS

## *Fatty Acid Supplementation Benefits Early Lactation Cows*

It's well-known that mid-lactation cows benefit from fatty acid supplementation with palmitic acid. But what about early lactation cows?

University of Wisconsin researchers evaluated early lactation cows' response to increasing amounts of supplemental palmitic acid in the diet. All cows were fed a TMR with 35% corn silage, 19% alfalfa, 15.8% crude protein, 27.7% NDF and 28.4% starch once daily. Fat content of the basal diet was 2.6% total fatty acids, of which 0.5% was from palmitic acid. Twelve multiparous Holstein cows averaging 53 days in milk were enrolled in the study. Four levels of fatty acid supplementation (0, 0.5%, 1.0% or 1.5% of ration dry matter) were added to the basal diet, and cow response was tracked. Over the course of the study each cow was fed each of the 4 different fatty acid supplementation levels for 14 days with the final 5 days used for data collection. Results were as follows:

- Milk yield increased with palmitic acid supplementation, 132.5 lbs, 132 lbs, 135.4 lbs and 135.8 lbs/day with 0, 0.5%, 1% and 1.5% palmitic acid added to the diet, respectfully.
- Milk fat concentration was highest with 1% palmitic acid added to the diet, 3.59% vs. 3.52% for non-supplemented cows.
- Milk protein concentration was not affected by additional palmitic acid in the diet.
- Total milk protein yield increased due to the increase in milk production.
- Dry matter intake was highest with 0.5% or 1% palmitic acid supplementation. Both resulted in 69.7 lbs of DMI per day compared to 66.4 lbs per day for non-supplemented cows—a difference of 3.3 lbs per day.

Researchers concluded that high-producing Holstein cows had the best overall response to 1% palmitic acid supplementation in early lactation.

French et al., 2020. J. Dairy Sci. 103 (Suppl.1) 68. Abstract 178

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## HAPPENINGS

### *Introducing Hackfort as Animal Nutrition Lead*

*Landus, the manufacturer of SoyPlus and SoyChlor, recently announced Matt Hackfort as the new Animal Nutrition and Feed Lead. He will oversee the Animal Nutrition and Feed divisions of Landus. Hackfort has been with Landus for one and a half years, working previously as a Landus Business Unit Leader and the Feed Products and Services Lead.*

*Hackfort has a background in agriculture and food supply chain management at the domestic and international level. This has prepared him well for his new role, guiding the team that continuously delivers the quality and consistency of SoyPlus and SoyChlor that Landus customers have come to know and depend on. "I am looking forward to leading the Animal Nutrition team into the future and continuing to provide the highest level of products and services to our dairy customers," said Hackfort.*


***MATT HACKFORT***

*Animal Nutrition Lead, Landus Cooperative*

*The Landus Animal Nutrition team focuses on delivering quality, consistency and supply chain reliability to producers and placing farmer-owners at the center of Landus's business by elevating the value of their commodities. Hackfort's sales team markets SoyPlus and SoyChlor in the U.S., Canada, Mexico and countries around the globe.*