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DAIRY NUTRITION PLUS™

IN THIS **ISSUE**



# WHAT WE HAVE LEARNED FROM FEEDING LESS PROTEIN

Feed less protein and still maintain milk production. That's one of the many benefits of implementing precision feed management on your dairy. Other benefits include less nitrogen and phosphorus excretion, a decrease of purchased feeds, improved efficiency of nutrient use and even improved profitability.

Precision feed management (PFM) can help you achieve all of these benefits, explains Larry Chase, professor emeritus of dairy nutrition at Cornell University. What exactly is PFM? "The continual process of providing adequate, but not excess, nutrients to the animal and deriving a majority of nutrients from homegrown feeds through the integration of feeding and forage management for the purpose of maintaining environmental and economic sustainability."

PFM is a process. It doesn't happen overnight. It requires a team approach from the dairy producer, key dairy employees and feed and crop advisors with one goal: To provide a consistent ration with minimal variation in order to improve the efficiency of nutrient use, maintain or grow milk production and minimize the dairy's environmental impact. Ration formulation, feed purchasing decisions, feed and forage analysis, feeding management practices, forage production and even forage storage all play a role in achieving positive results.

So what is the potential impact? Chase uses the example of a lactating dairy cow that weighs 1,450 lbs, produces 70 lbs of milk per day and consumes 47 pounds of dry matter per day. If the percent of crude protein in her ration is reduced by one unit, it cuts the amount of nitrogen she excretes by 27.5 lbs/year. If the ration phosphorus is reduced by 0.05% the result is 8.5 lbs less phosphorus excreted by the cow each year, he explains. Multiply these results by 1,000 cows and the difference becomes 27,500 lbs less nitrogen and 8,500 lbs less phosphorus excreted as waste. Given the increasing pressure animal agriculture faces about environmental concerns and regulations, if you can reduce the amount of nutrients excreted as waste and still maintain or grow milk production, it's a win-win that should be considered.

## RESULTS SEEN

During the last decade the PFM Working Group has conducted multiple projects with commercial dairies of all sizes to understand how best to implement PFM, measure results and demonstrate its benefits.

Cerosaltetti (2012), in a report to the U.S. Army Corps of Engineers, reported results for 34 herds enrolled in the PFM program between 2008 and 2011 in Delaware County, N.Y. These herds decreased purchased grain by about 2 lbs/cow/day and increased forage in the ration from 59 to 65.4%. The amount of phosphorus and nitrogen excreted in manure decreased by 18.6% and 9.8%, respectively. In addition, milk income over purchased feed cost increased by 50 cents/cow/day.

A 2017 report by Cerosaletti and Dewing and submitted to the NYC Watershed Agricultural Program showed that by implementing PFM 8 dairies were able to decrease phosphorus and nitrogen in manure by 23% and 7% respectively and milk income over purchased feed cost increased by 46 cents/cow/day. In an eight-month study by Higgs et al. (2012) 2 western New York dairies were able to lower ration crude protein by 1.7 units, milk urea nitrogen decreased by 2 mg/dl and milk production was maintained in these herds. The amount of nitrogen excreted in manure decreased by 6% on one dairy and 17.8% on the other dairy. Total daily feed cost at the 2 dairies decreased by 21 and 72 cents/cow/day, and income over purchased feed cost increased by $0.27 and $1.27 dollars/cow/day.

Cornell Cooperative Extension conducted a three-year study with 8 dairies that fed concentrates and forages. During the project, each dairy was able to reduce the amount of crude protein in the diet and decrease the amount of nitrogen excreted in manure. Reduction in crude protein ranged from 0.7 to 4.5%, and the decrease in nitrogen in manure ranged from 5.2 to 29%. All dairies saw an increase in income over feed cost. The average income over total feed cost was $147/cow/year, and the average income over purchased feed cost was $158/cow/year.

A five-year trial on a commercial dairy was reported in The Professional Animal Scientist (Tylutki et al., 2004). The 500-cow dairy incorporated changes in the ration, feed management procedures, forage production and forage storage to meet the goals of the PFM program. During that time, total animal numbers increased by 23%, total milk shipped per day increased by 45%, daily feed cost decreased by 34% and the amount of phosphorus and nitrogen excreted in manure decreased by 28% and 17%, respectively.

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# WHAT WE HAVE LEARNED FROM FEEDING LESS PROTEIN

## SUCCESS DEFINED

The PFM Working Group has developed a set of benchmarks to evaluate dairies at the beginning of a project and to track their progress toward goals. These benchmarks are the foundation used to build precision feed management programs on dairies.

## NEW YORK PFM BENCHMARKS

| BENCHMARK | GOAL |
|---|---|
| Forage NDF intake, % of BW | ≥0.9 |
| Forage DM, % of total ration DM | ≥60 |
| Homegrown feed, % of total ration DM | ≥60 |
| Ration P, % of NRC requirement | <110 |
| Ration CP, % | <16.5 |
| Milk urea nitrogen, mg/dl | 8-12 |
| Cows dead or culled <60 days in milk, % | <8 |

Work to date indicates that the development and implementation of precision feed management plans on dairies is a win-win for the farm and for the environment, says Chase. The results from these studies, and from on farm use, consistently demonstrates that when dairies implement PFM practices it yields positive results. The dairies purchase less feed and therefore import less phosphorus and nitrogen, have improved nutrient efficiency, are able to at least maintain or increase milk production and reduce the amount of nitrogen and phosphorus excreted into the environment. All of these factors combined can help improve dairy profitability and sustainability.


# HAPPENINGS

## *NIR Instruments Add Additional Quality Testing*

SoyPlus quality and consistency starts with superior incoming soybeans. Landus Cooperative recently invested in adding two Near Infrared (NIR) instruments to the Ralston, Iowa, location where SoyPlus is manufactured. The investment in NIR technology provides the cooperative with rapid analysis of the incoming beans, delivering precise readings to help further elevate quality oversight standards at the location.

As a farmer-owned cooperative, Landus Cooperative's soybeans are grown locally by farmer-members in Iowa. Area farmers work year-round with Landus Cooperative agronomists to help grow high-quality crops while preserving the integrity of the soil. At harvest, incoming soybeans are handled with care by the cooperative's team of grain merchandisers. Those beans are then transformed into SoyPlus at the single manufacturing facility in Ralston, Iowa, where stringent quality assurance protocols are applied.

"Our farmers are growing some of the best soybeans on some of the best soils in the country. It is our responsibility to ensure the level of oversight and care they put into that crop is carried through the cooperative handling and manufacturing steps of our supply chain," said Mark Cullen, Chief Animal Nutrition Officer overseeing the Dairy Nutrition Plus product line manufactured by Landus Cooperative. Subjecting incoming soybeans to NIR analysis is just one more way the SoyPlus team can ensure quality and consistency from start to finish.

Want to learn more about the people growing the high-quality soybeans that become SoyPlus? Watch here at https://blog.dairynutritionplus.com/blog/the-cooperative-that-ties-it-all-together

# FROM THE MATERNITY PEN

## *Early-Lactation Diet Impacts Reproductive Success*

Researchers in Australia and Florida teamed up to examine the effects of early-lactation diets on fertility. They conducted a meta-analysis using 39 peer-reviewed experiments with 118 different treatments to identify the effects of diet on reproductive performance (Rodney et al., 2018).

Since few experiments provided details on prepartum diets, the researchers focused on early-lactation diets to try to identify which dietary factors impact calving interval and the proportion of cows pregnant to AI. The meta-analysis confirmed that nutritional management during the transition period can have substantial impacts on reproductive success. Results include:

- Excessive protein intake was associated with impaired fertility.
- A positive metabolizable protein balance is consistent with improved fertility.
- The amino acids threonine and lysine were associated with a longer calving to pregnancy interval.
- Increased metabolizable energy balance was associated with a shorter calving to pregnancy interval.
- Intake of many different fats was associated with increased proportion of cows pregnant and shorter calving to pregnancy intervals.
- Starch percentage and intake were positively associated with the proportion of cows pregnant.
- Soluble fiber and sugar percentage and intake were negatively associated with the proportion of cows pregnant.
- Physically effective NDF intake, as estimated by CPM-Dairy ration formulation software, was negatively associated with the proportion of cows pregnant.
- It may be necessary to increase protein intake when feeding fats.

The meta-analysis identified the need for more focused field experiments to better understand dietary interactions on reproduction. The role of specific metabolizable amino acids, sugar, starch and physically effective NDF all need additional research. Results emphasized the importance of improved nutrient balance, both energy and amino acids in early lactation for reduced period of anovulation and reduced days open. Finally, these results reinforce previous findings that supplementing moderate amounts of dietary fat in early lactation benefits reproduction in dairy cows.

To read the full study in the June 2018 issue of the *Journal of Dairy Science*, go to https://doi.org/10.3168/jds.2017-14064

# CONSULTANTS CORNER

## *Understanding Blood Calcium Dynamics*

***JESSICA MCART***
*Cornell University*

It's well documented that blood calcium concentration decreases after calving, but at what point does subclinical hypocalcemia increase the risk of disease or decrease milk production?

Researchers have started identifying specific thresholds or cutpoints for blood calcium concentration where a postpartum cow's risk for negative outcomes increases. For example, work by Martinez et al. (2012) showed that a blood calcium concentration of <2.14 mmol/L during one of the first three days after calving was associated with an increased risk for metritis. Research by Rodriguez et al. (2017) identified several different blood calcium thresholds that indicate negative outcomes: ≤1.93 mmol/L for ketosis, ≤2.05 mmol/L for retained placenta and metritis and ≤2.10 mmol/L for displaced abomasum.

However, blood calcium concentrations during the first few days in milk are quite dynamic, and it is often confusing that both the cutpoint used to diagnose subclinical hypocalcemia and the timing of testing after calving differ between studies. The importance of timing of testing after calving is supported by research by Neves et al. (2017), which showed that the risk factors associated with less than optimal blood calcium in early lactation differ depending on when blood was collected—within 4 hours of calving, or at 2 days in milk.

New research from Cornell University, Neves et al. (2018), published in the October 2018 *Journal of Dairy Science*, shows that it's not just the blood calcium concentration of subclinically hypocalcemic cows that indicates risk, but also time of collection and parity. A total of 396 cows from 2 New York dairy herds were enrolled in a prospective cohort study designed to detect increased risk for metritis, displaced abomasum (DA) or both, and to monitor milk production during the first 15 weeks of lactation. Blood samples were collected daily from each cow for 4 days.

Our results showed that blood calcium thresholds which indicate increased risk in the postpartum cow vary by days in milk, which was expected, but also by parity. For primiparous cows, blood calcium concentration at 1 day in milk (DIM) was not associated with increased risk for metritis. However, at 2 DIM the threshold for increased risk for metritis in primiparous cows was ≤2.15 mmol/L; at 3 DIM it was ≤2.10 mmol/L and at 4 DIM it was ≤2.15 mmol/L; and the risk of metritis increased with increasing DIM.

In multiparous cows, the blood calcium concentration at 1 DIM and at 3 DIM was not associated with increased risk. However, at 2 DIM a blood calcium concentration of ≤1.97 mmol/L was associated with increased risk for metritis, DA or both in second parity cows only. At 4 DIM, a blood calcium concentration of ≤2.20 mmol/L was associated with increased risk for metritis, DA or both in third or greater parity cows, but not in second parity cows.

In terms of milk production, results again varied by time and parity. In primiparous cows, a blood calcium concentration of ≤2.15 mmol/L at 1 DIM indicated increased milk production for the first 15 weeks of lactation (over 5 lbs/cow/day); no association with milk production and blood calcium concentration was found at 2-4 DIM. But in multiparous cows, blood calcium concentrations on 1 and 4 DIM both had associations with milk production. At 1 DIM, a blood calcium concentration of ≤1.77 mmol/L was associated with increased milk production (over 5 lbs/cow/day). At 4 DIM, a threshold of ≤2.20 mmol/L was associated with reduced milk production during the first 15 weeks of lactation (4 lbs/cow/day).

Blood calcium concentration varies during the first 4 DIM, and suggests that low blood calcium may not be detrimental until 2-4 DIM. Our results also demonstrate that parity must additionally be considered when determining blood calcium concentrations as thresholds for disease. While we have taken a big step forward, more research is needed to fully understand the epidemiology of subclinical hypocalcemia on the individual cow and herd levels as well as the negative health and production outcomes that can be associated with it.

You can read the full paper at https://doi.org/10.3168/jds.2018-14587

# BEYOND BYPASS

## *Improve the Nitrogen Efficiency of Lactating Cow Diets*

How efficiently cows convert the nitrogen in protein into milk determines how much nitrogen is excreted into the environment as waste. And since protein is often the most expensive purchased ingredient, improving nitrogen efficiency can help improve profitability.

Typically on farm nitrogen efficiency (milkN:feedN) ranges from 20 to 32%. And while the theoretical efficiency limit in lactating dairy cows is 40 to 45% (Van Vuuren and Meijs, 1987; Hvelplund and Madsen, 1995), the highest producing cows on top-notch dairies can and do achieve a nitrogen efficiency of 38 to 40%, says Mike Van Amburgh, dairy nutritionist at Cornell University. That means many producers have an opportunity to fine-tune the lactating cow diet to improve nitrogen efficiency, enhance milk protein yield and reduce the amount of nitrogen excreted as waste.

Work with your nutritionist, and follow these steps. First, determine what the most limiting nutrient is in the diet—energy or protein. Always compare what the nutrition model says with what the cows are telling you. If they don't match, listen to the cows and work to understand the missing information that doesn't allow you to predict their current production.

Next, evaluate the rumen N balance and urinary N excretion. If the level of nitrogen excretion is high, reduce the amount of soluble protein in the diet. If the grams of metabolizable protein (MP) are in excess, decrease MP in small increments and monitor results. Once the level of metabolizable energy (ME) and metabolizable protein are in balance, the next step is to formulate for amino acids. Always calculate methionine first, then lysine. Otherwise the ratio will provide incorrect values. Aim for a lysine to methionine ratio of ~2.7:1. Monitor results using energy corrected milk (ECM) as this measure allows you to capture small changes in milk volume, protein and fat yield.

To view Van Amburgh's presentation "Formulating Diets to Enhance Milk Protein Yield in Lactating Dairy Cattle" go to http://www.dairynutritionplus.com/FileCS.ashx?Id=398

LANDUS COOPERATIVE

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## QUALITY CORNER

*Consistency Looks Like This*

A healthy transition is easier with a high-quality, consistent anionic supplement. The SoyChlor manufacturing process is designed to deliver industry-leading consistency and confidence in every single batch. Here's what consistent manufacturing looks like:

**Quality Inputs:** Quality standards are upheld at procurement when suppliers undergo an approval process. Incoming ingredients are sampled and analyzed, and only ingredients that meet our specifications are considered for inclusion.

**Testing at Every Step:** Chloride is the most important nutrient in an anionic supplement like SoyChlor. As part of our process controls, the chloride content of SoyChlor is tested daily during production by a rapid, sensitive and accurate silver chloride titration method. This results in 6-8 tests every working day. SoyChlor is also subjected to weekly third-party analyses by an independent laboratory, Cumberland Valley Analytical Services.

**Certifications Ensure Consistency:** The SoyChlor manufacturing process continually meets the internationally recognized standard set by ISO 9001 and maintains HACCP certification. A QS compound feed production certificate extends similar quality guarantees worldwide. The German standard is mutually recognized by GMP+, a requirement for most European feed and food companies.

All of these processes are enacted by a team of people who truly believe in them. Learn about the cooperative team manufacturing SoyChlor here https://www.youtube.com/watch?v=rZoOJVS-P90