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LANDUS

RIGHT MIX OF FATTY ACIDS CAN IMPROVE COW HEALTH, PRODUCTIVITY

Dairy producers have been feeding supplemental fat for years. So why get excited about new research with individual fatty acids? Because this new research has repeatedly demonstrated the ability of individual fatty acids to affect digestibility, metabolism, energy partitioning and milk production. In addition, the research shows that cow response varies by stage of lactation, the amount of milk produced and the amount of forage in the diet.

Individual fatty acids are a new tool that can be used to tailor dairy cows' diets to improve health and productivity. During the past decade researchers have been feeding different blends of individual fatty acids in order to identify the right mix of fatty acids needed to optimize cow health and productivity during different stages of lactation.

EARLY LACTATION BENEFITS

Two new studies in the March *Journal of Dairy Science* tracked fresh cows' response to 3 different ratios of palmitic and oleic fatty acids. Researchers at Michigan State University (MSU) used 2 commercially available products to create 3 specific fatty acid blends: 80% palmitic with 10% oleic, 70% palmitic with 20% oleic and 60% palmitic with 30% oleic, which were fed at 1.5% of diet dry matter. A control diet without supplemental fatty acids was fed also. As cows freshened, they were randomly assigned to 1 of 4 diet treatments for the first 24 days in milk.

During the treatment period (1-24 DIM), all 3 fatty acid blends increased milk yield, 3.5% fat corrected milk, energy corrected milk, milk fat content and milk fat yield compared to non-supplemented control cows ([de Souza et al., 2021a](#)). Milk yield per day was 102.7 lbs, 107.1 lbs, 107.6 lbs and 109.6 lbs for control cows, 80:10 cows, 70:20 cows and 60:30 cows, respectively. That's an increase of 4.4 to 6.9 lbs of milk per day from feeding fatty acids in early lactation.

The experiment also demonstrated that as the amount of oleic acid fed increased, so did cows' dry matter intake; 44.7 lbs, 45.6 lbs, 46 lbs and 48 lbs per day control cows, 80:10

cows, 70:20 cows and 60:30 cows, respectively. Increasing levels of oleic acid in the diet also decreased losses in body weight and in body condition score.

Next researchers looked at the carryover period. From 25 to 63 days in milk all cows were fed the same lactation diet. All cows supplemented with fatty acids during the first 24 DIM had greater component yields and produced more 3.5% fat corrected milk and more energy corrected milk in the carryover period than non-supplemented cows. The change in these production variables was statistically significant and consistent throughout the first 9 weeks of lactation and was directly related to the fatty acid blends fed, explains Adam Lock, professor of dairy cattle nutrition at Michigan State University. Milk yield during the carryover period also increased by 3.7 to 6.8 lbs/day.

In a companion paper ([de Souza et al., 2021b](#)), MSU researchers examined the impact of the same fatty acid blends on nutrient digestibility, metabolism and energy balance in early lactation. All of the fatty acid blends fed increased digestibility of dry matter, neutral detergent fiber (NDF), 18-carbon fatty acid and total fatty acid compared to the control diet. The fatty acid blends also increased intake of digestible energy, metabolizable energy and net energy of lactation compared to control cows.

However, two important differences were noted. As the amount of oleic acid in the diet increased intake of digestible energy, metabolizable energy and net energy of lactation also increased; but both plasma NEFA and BHB levels decreased. In contrast, as the amount of palmitic acid in the diet increased, energy intake and milk energy output of supplemented cows increased, but so did NEFA and BHB levels. Further research is needed to understand the mechanism by which palmitic acid increases milk energy output at the expense of body reserves in the immediate postpartum period, explains Lock. And to determine if greater body weight and body condition score losses that accompanied the increase in palmitic acid in the diet impact health and reproduction of dairy cows.

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RIGHT MIX OF FATTY ACIDS CAN IMPROVE COW HEALTH, PRODUCTIVITY

While these studies improve our understanding, several questions remain. At this point, it appears that oleic acid could be a dietary strategy to improve energy status and health without sacrificing production in early lactation. However, the goal remains to find the right balance of palmitic and oleic acids to maximize production and minimize body condition losses in early lactation.

MID-LACTATION COWS

Another study using mid-lactation cows, appeared in the December Journal of Dairy Science ([Western et al., 2020](#)). This study was designed to further investigate the difference in cow response to fatty acid blends in order to determine the optimal fatty acid blends that will best benefit high and low producing cows in mid-lactation.

Two fatty acid blends were fed: 80% palmitic with 10% oleic and 60% palmitic with 30% oleic, to 32 mid-lactation cows (144 days in milk). Daily milk production ranged from 70.5 lbs to 143.3 lbs. Results include:

- High producing cows had greater DMI and energy corrected milk when fed more oleic acid (60:30 blend).
- Low producing cows had greater DMI and energy corrected milk when fed more palmitic acid (80:10 blend).
- The 80:10 blend increased milk fat content, fat yield and protein yield in all cows.
- In low-producing cows the 60:30 blend decreased yields of de novo and mixed fatty acids in milk.
- In high-producing cows the 60:30 blend increased milk fat yield due to an increase in preformed fatty acid without affecting the yield of de novo and mixed fatty acids in milk.

Results indicate that cow response to fatty acid supplementation varies based on milk production. Lock and his research team recommend producers consider milk production of mid-lactation cows when evaluating different fatty acid supplements and nutritional management strategies to maximize cow health and production.

HAPPENINGS

Strategy Helps Preserve, Strengthen Local Businesses

Landus has launched a new strategy to strengthen, preserve and optimize performance of local agricultural cooperatives and independent businesses. This innovative alternative to traditional mergers and acquisitions focuses on improving service and competitiveness to drive more value for both members and customers, while maintaining local influence and identity. NuWay-K&H is the first cooperative to collaborate in this new model.

Using this model, each entity can maintain its autonomy, preserve its local community presence and enhance farmer relationships while participating in a shared platform of strength. It also provides the opportunity to maximize capital investments, infrastructure capacity and employee talent.

"Locally-based agricultural cooperatives and independent businesses have long played an important role in contributing to farmer livelihoods and rural vitality," said Matt Carstens, President and CEO, Landus. "This strategy of local ag companies collaborating together is designed to modernize and protect the viability of these vital business offerings and services."

NuWay-K&H, which serves about 5,500 customers in southern Minnesota and northern Iowa, will become an optimization account with Landus while maintaining a separate Board of Directors, employees and operations.

As additional cooperatives and businesses join this new optimization model, agreements will be tailored to the strengths of each party. This new model is designed for collaboration and optimization of grain, feed, soybean processing, agronomy, data, technology, logistics and back-office functions.



FROM THE MATERNITY PEN

Prepartum Lying Time Impacts Calf Survival

New research from the Ohio State University shows just how important lying time for prepartum cows is for calf survival. In [Menichetti et al., \(2020\)](#) prepartum cows with reduced lying time, or with increased day-to-day variation in the amount of time spent lying the week before calving, had increased serum NEFA concentrations and reduced calf survival.

An observational study was conducted at 3 Ohio dairy herds with 1,044 cows used for analysis. At 14 days before expected calving date, pregnant Holstein cows (multiparous and primiparous) were fitted with electronic data loggers to track behavioral activity. Blood was drawn at 14 and 7 days prepartum to check non-esterified fatty acid levels and a third time within 48 hours of calving for total blood calcium.

Throughout the study 4.8% of all calves were stillborn—either born dead or died within 24 hours of birth. Comparing dams with stillborn calves to those with live calves revealed the following:

- Dams of stillborn calves spent less time lying each day compared to dams of live calves. The difference for primiparous cows was 55 minutes/day, and in multiparous cows the difference was 46 minutes/day less lying time than cows with calves born alive.
- In multiparous cows, dams of stillborn calves had significantly higher NEFA concentrations than dams of live calves, 416 vs 313 $\mu\text{Eq/L}$. There was no difference in NEFA for first-calf heifers.
- Regardless of parity, the proportion of cows with hypocalcemia (≤ 2.0 mmol/L) within 48 hours of calving was greater in dams of stillborn calves than for those with a live calf.
- A coefficient of variation (CV) for lying time was calculated for each cow within 7 days prior to calving. This measures the change in lying time from day to day. The greater the variation in lying time, the higher the CV ratio. All cows with stillborn calves had higher CV ratios than cows with a live calf.

These findings demonstrate that dams with increased CV ratio of lying time within 7 days prepartum also have increased NEFA concentrations and more stillborn calves. When investigating poor calf survival, the researchers suggest that the consistency of lying time, and the management factors that may impede it, be investigated.

[Menichetti et al., 2020. J. Dairy Sci. 103:11782-11794.](#)

CONSULTANTS CORNER

IV Dextrose Doesn't Help Cows with Ketosis

BY JESSICA MCART, Cornell University



In early lactation when milk production outpaces nutrient intake, cows go through a period of energy deficit. Approximately 40% of cows don't adapt to this period appropriately and develop excess ketone bodies, which results in ketosis. Also called hyperketonemia, this disorder carries an estimated total cost of \$289 per case.

New research from Cornell University ([Capel et al., 2021](#)) investigated the efficacy of 3 different treatment protocols for ketosis commonly used on farms. The

trial was conducted on 4 New York dairy farms using 1,249 cows with no previous history of ketosis, retained placenta or metritis. Cows between 3 and 16 days in milk were screened weekly for ketosis, defined by blood β -hydroxybutyrate (BHB) of ≥ 1.2 mmol/L. Cows identified as positive for ketosis were assigned to 1 of 3 treatment groups: (1) 300 mL of oral 100% propylene glycol daily for 3 days; (2) oral propylene glycol plus 500mL of 50% dextrose delivered intravenously on the first day of treatment; or (3) oral propylene glycol plus 500 mL of 50% dextrose delivered intravenously for 3 days. Each treatment's effect on the resolution of ketosis, risk of adverse health events during the first 60 days in milk and milk yield in early lactation was evaluated.

The incidence of ketosis in the 4 study herds ranged from 20.3% to 47.6%. Overall ketosis incidence for all cows screened in the study was 30.1%. (As a comparison, research by Duffield, 2000; and McCart et al., 2012a identified an average incidence of ketosis in North American dairy herds of 40%). Of the cows identified as positive for ketosis, 64% were diagnosed between 3 and 9 days in milk and 36% were diagnosed between 10 and 16 days in milk.

Contrary to what was expected, our study found no benefit from using IV dextrose as an additional therapy to oral propylene glycol for the treatment of ketosis. We saw no benefit in terms of faster resolution of ketosis and no reduction in the risk of adverse events in the first 60 DIM. Average daily milk yield through the first 10 weeks of lactation was similar for all treatments, 94 lbs/day, 93.5 lbs/day and 94 lbs/day for propylene glycol only, propylene glycol plus 1 day of IV dextrose and propylene glycol plus 3 days of IV dextrose, respectively. More research is needed, especially with cows that have more severe ketosis (blood BHB concentration ≥ 3.0 mmol/L). Less than 10% of cows in our study met that criteria, and therefore our results must be interpreted with caution for this subset of cows.

Oral propylene glycol once daily has been well established by research as beneficial for the treatment of ketosis (McArt et al., 2011; McCart et al., 2012b; Gordon et al., 2013). And research by Mann et al., (2017) clearly demonstrated a faster and sustained reduction in BHB concentrations when IV dextrose was used with oral propylene glycol for the treatment of ketosis. However, the study size was small and not designed to evaluate disease and production outcomes. Our trial sought to build on that study to provide producers with solid evidence of an effective, safe and practical treatment protocol for ketosis. However, our results did not identify any benefit from the use of IV dextrose as an additional therapy to oral propylene glycol for the treatment of ketosis in dairy cows.

Based on what we currently know from research, and since administering dextrose intravenously is labor intensive and has some potential risk, we encourage producers to reconsider their use of IV dextrose for the treatment of ketosis.

[Capel et al., 2021. J. Dairy Sci. 104:2185-2194](#)



BEYOND BYPASS

Protein Level, Methionine Boost DMI in Transition

New research in the *Journal of Dairy Science*, shows that increasing the supply of metabolizable protein and adding rumen protected methionine to the transition diet boosts dry matter intake before and after calving.

Cardoso et al. (2021) evaluated 3 diet strategies for transition cows: (1) 14% crude protein, (2) 16% crude protein and (3) 16% crude protein plus rumen protected methionine (RPM). To create the 16% protein diets, a high RUP soybean meal was used, which resulted in greater levels of metabolizable protein in the high protein diets. The high protein plus RPM diet was formulated to deliver a 3:1 ratio of lysine to methionine.

Cows were assigned to 1 of 3 diets 18 days before the expected calving date. After calving, the cows were switched to a lactation diet that maintained the difference in protein levels. The treatment period extended through 45 days in milk.

During the prepartum period, all cows fed the higher protein diets ate more feed than cows fed the low protein diet, 29.1 lbs, 25.6 lbs and 22.9 lbs per day for high protein plus RPM, high protein and low protein diets, respectively. Postpartum intake was greater for cows fed the high protein diets, too; 40.3 lbs, 38.6 lbs and 36.6 lbs per day for high protein plus RPM, high protein and low protein diets, respectively. Both greater protein supply and RPM supplementation had a positive effect on DMI.

While there was a slight increase in milk yield, 74.3 lbs, 70.9 lbs and 68.8 lbs per day for cows fed the high protein, high protein plus RPM and low protein diets, it lacked statistical significance ($P = 0.10$). RPM supplementation did increase milk fat and total solids concentrations of milk and improve cows' insulin concentration prepartum. Cows fed high protein diets also had decreased IL-1 at calving (inflammatory cytokines) compared to cows fed the low protein diet.

[Cardoso et al., 2021. J. Dairy Sci. 104:5467-5478.](#)



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QUALITY CORNER

Use Total Nutrient Content to Compare Feeds

Have you noticed the cost of feed ingredients lately? Surprisingly, it is not just protein supplements that carry a high cost, but energy from feed-grade fats and oils does too. Whether that fat is of animal origin, a manufactured source of rumen protected fat, whole oil seeds and oil seed products or corn milling products, the cost of energy is high. But, if you consider the energy that oil contained in SoyPlus contributes to the diet, you'll find it to be very favorably priced compared to other sources.

When comparing feed ingredients, some folks fail to account for the value of the superior energy content of SoyPlus. Feed ingredients should be evaluated on their total nutrient profile, not just one or two nutrients. For an ingredient like SoyPlus, which contains about 6% oil, which is roughly 5% more oil than solvent extracted soybean meal products, that means SoyPlus has more metabolizable energy than solvent extracted products. Although the protein content of SoyPlus is slightly lower than some other bypass soy products, its superior energy content more than offsets that difference in cost per unit of protein when you consider all the nutrients SoyPlus delivers.

When you evaluate the whole nutrient package in this manner, the total value of nutrients delivered by SoyPlus allows you to meet the cows' protein and energy requirements at a lower total cost than with other, individual sources of protein and energy.