



Proof is in the numbers

Evaluating research that has been conducted over long periods of time on a large number of cows can help tease out a real impact over a one-time result.

by Michael F. Hutjens

KANSAS City was the place to be in July, as it hosted the joint meeting of the American Dairy Science Association and American Society of Animal Sciences. After reviewing all abstracts, 88 dairy specific and applied feeding abstracts were "musts" to read and review. Several of the dairy abstracts are summarized below.



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The author is a professor of animal sciences at the University of Illinois, Urbana.

Effect of starch levels on dairy cows

Research summary: A meta-analysis of 56 peer-reviewed trials (131 treatments) conducted over the past decade were split into low-starch rations (21.5 percent, +/- 4.8 percent) and high-starch diets (28.9 percent, +/- 5.0 percent). When low-starch diets were fed, starch was replaced by nonfiber sources, forage and/or sugar. Dry matter intake averaged 53.5 pounds per cow per day. The following changes and comparisons, expressed as a per-unit decrease in starch, were seen:

- Dry matter intake was reduced 0.22 pound per 1 percent decline in starch.
- Milk yield dropped 0.44 pound per 1 percent reduction in starch.
- Milkfat dropped 0.01 pound per 1 percent decline in starch.
- Milk protein dropped 0.02 pound per 1 percent drop in starch.
- Total rumen volatile fatty acid (VFA) production declined 0.4 millimolar per 1 percent reduction in starch. Rumen propionate production was reduced, leading to a higher acetate: propionate ratio.

Take-home message: Starch levels can impact milk production, milk components and rumen fermentation. When starch prices are

high (such as high corn grain prices), dairy managers must be careful when lowering dietary starch to maintain rumen fermentable carbohydrate levels which includes starch, sugars and rumen fermentable fiber. Excessive starch levels can also lead to rumen acidosis.

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Lactating dairy cows respond to DCAD

Research summary: A total of 44 journal articles from 1965 to 2011 were summarized to evaluate lactating cows' response to dietary cation-anion difference (DCAD). Buffers such as sodium bicarbonate and potassium carbonate have been used to adjust DCAD. The 196 dietary treatments and 89 comparisons were evaluated using Dairy 2001 NRC software. For every 100 meq per kilogram rise in DCAD, milkfat test was elevated by 0.10 on a percentage basis and 0.08 pound of milkfat. NDF digestibility was improved by 1.5 percent. Using nonlinear analysis, dry matter intake improved by 6.7 pounds and milk by 6.3 pounds. The maximum DCAD response values were 456 meq per kilogram for feed intake and 617 meq per kilogram for 3.5 percent fat-corrected milk.

Take-home message: DCAD can have a significant effect on dairy cattle production responses and should be evaluated, especially under heat stress conditions.

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Ration composition impacts fertility

Research summary: Dairy rations from 49 freestall herds in Wisconsin were summarized using Dairy Comp 305 software. The average herd size was 720 cows producing 84 pounds of milk and averaging 55 pounds of dry matter intake per cow per day. Of these, 43 herds milked 3x. Ration nutrient levels varied with crude protein ranging from 16.0 percent to 18.7 percent and NDF between 24.9 percent to 35.1 percent. Meanwhile, starch was in the range of 20.1 percent to 30.8 percent and fat went from 3.1 percent

AS CAN BE SEEN WITH THE ABSTRACTS on this page, nutrition is a complex topic that interacts with other cow variables, including health and fertility.

to 6.7 percent. Milk production levels were not associated with conception rate at first A.I., conception rate or calving interval.

Greater dry matter intake lowered conception rate at first A.I. and overall conception rate values. Crude protein and fat levels did not impact fertility. The percent NDF was positively associated with conception rate at first A.I. Greater energy content as measured by NFC, starch or calculated net energy were detrimental to conception rate at first A.I. and conception rate.

Take-home message: Rations need to be balanced to optimize nutrient levels. Optimizing fiber sources and avoiding excessive energy levels may positively impact fertility.

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Impact of water quality

Research summary: Different water sources in South Dakota were used to compare their impact on rumen fermentation. Water sources included distilled water, municipal water used at the South Dakota State's dairy farm, local South Dakota dairy farm water that was untreated and water from the same dairy farm treated with hydrogen peroxide. Water was added to rumen fluid from a donor cow in an in vitro fermentation system for 30 hours with feed in a Dacron bag. The rate of gas production (index of fermentation) was greatest for distilled water compared to other treatments. Digestibility of the NDF was similar for all water sources. Dry matter digestibility tended to be lower for the dairy farm water treated with peroxide.

Take-home message: Water quality can have an impact on the rate of rumen fermentation, while water treatment in this study had minimal impact. Water quality can also impact water consumption and total dry matter intake which can reduce milk yield and performance.

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Short research summaries:

Fecal starch analysis: Fecal starch analysis is a useful tool to evaluate starch utilization by dairy cows. Samples should be refrigerated and shipped to commercial labs to avoid additional fermentation of starch before analysis. Starch levels dropped from 5.4 to 3.7 percent over five days.

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Fatty acids affect milkfat test: Dietary fatty acids can impact milkfat synthesis leading to milkfat depression. Safflower oil (linoleic fatty acid), sunflower oil (oleic fatty acid) and palm oil (palmitic fatty acid) were fed to 60 Holstein cows. Linoleic acid depressed fatty acid synthesis leading to a lower milkfat test at levels below 3 percent.

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Grazing hybrid corn silage: A corn silage hybrid that can be used for grazing saved 9 cents per heifer per day compared to a traditional corn silage hybrid when fed to growing heifers. The crop was harvested before grain development leading to silage that is higher in sugar and protein. Heifer average daily gain was similar with both corn silage hybrids with a trend for lower dry matter intake for the grazing hybrid.

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