DAIRY RESEARCH

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A Miner Institute study demonstrates that lower-starch (23%) diets can support lactational performance following a high-fiber, controlled-energy dry diet

Feed Lower-Starch Diets to Fresh Cows?

High-fiber, controlled-energy dry diets are commonly recommended for use in the far-off dry period in a 2-group management system or in a 1-group management system. The high-fiber, controlled-energy dry diet approach has been successful in some but not all dairies. Some of the failures may be attributed to a transition to an inappropriate fresh cow diet. Unfortunately, research data with fresh diets, especially following a high-fiber, controlled-energy diet fed for a 60 or 40 day dry period, is limited.

To investigate an optimal transition feeding strategy from a high-fiber, controlled-enegy diet to a fresh cow diet, we used 72 multiparous Holstein cows at Miner Institute. Specifically, we evaluated the effect of dietary starch content in corn silage-based diets fed in early lactation on performance and blood metabolites following a shortened (40 day) dry period where a high-fiber, controlled-energy diet was fed. Typically, high-fiber, controlled-energy dry diets contain between 12 to 16% starch on a dry matter basis, which is much less than lactation diets (e.g. 23% starch). A phase feeding or step-up approach to feeding during the prepartum and postpartum periods is often recommended but the optimal increase in starch from a high-fiber, controlled-energy dry diet to a lactation diet is unknown.

Table 1. Ingredient and analyzed chemical composition of low, medium, and high starch diets fed to early lactation Holstein cows.

Item	Low	Medium	High
Ingredients, % of DM			
Corn silage	34.6	34.6	34.6
Haylage	11.4	11.7	11.4
Wheat straw	4.1	4.1	4.1
Corn meal	6.9	11.1	16.7
Soybean meal	11.4	11.9	11.9
Soybean hulls	9.7	6.5	3.2
Wheat middlings	6.1	3.9	1.8
Canola meal	3.1	6.1	6.1
Other	12.7	10.1	10.2
Chemical composition			
CP, %	17.3	17.0	16.7
NDF, %	35.7	33.9	31.9
Sugar, %	6.1	5.8	5.9
Starch, %	21.0	23.2	25.5
Digestibility			
24-h NDF, % NDF	58.4	57.3	54.0
7-h starch, % starch	76.5	76.7	74.5

Dietary treatments **(Table 1)** were 1) a low-starch diet (21.0%) for the first 91 days in milk (DIM; LL), 2) a medium-starch diet (23.2%) for first 21 DIM and a high-starch diet (25.5%) for the next 70 DIM (MH), and 3) a high-starch diet (25.5%) for the first 91 DIM (HH). Corn meal was replaced partially with soyhulls and wheat middlings in the low and medium diets. The use of the terms low, medium, and high starch are relative for this study and do not necessarily reflect the range of starch fed throughout the U.S.

Lactational performance is summarized in Table 2. During the first 91 DIM, dry matter intake tended to be higher for cows fed LL than cows fed HH; cows fed MH were intermediate. During the first 21 DIM, cows fed M consumed similar starch and rumen fermentable starch as cows fed L. However, when the MH cows were fed the higher starch diet after 21 DIM, they consumed more starch and rumen fermentable starch than LL cows. The cows fed MH had higher milk yield than cows fed HH, indicating the benefit of a step-up feeding approach for starch when a controlled-energy dry diet is used. Cows fed LL had higher milk urea nitrogen than cows fed MH and HH, indicating less efficient use of nitrogen presumably due to less rumen fermentable starch intake and (or) excess dietary crude protein intake. Milk nitrogen efficiency was highest for cows fed MH because of high milk true protein yield and intermediate crude protein intake relative to the other treatments. Lipid mobilization to support negative energy balance was not compromised based on acceptable loses of body

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FYI

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oral drench once daily until she tested < 1.2 mmol/L or the control group where she was not given propylene glycol. Most cows were treated for 5 days. The SCK positive cows treated with propylene glycol were almost half as likely to develop a DA, half as likely to be removed from the herd, and on some farms made more milk (3 pounds per cow per day) in early lactation than SCK cows not given propylene glycol. In addition, SCK cows treated with propylene glycol were more likely to conceive at first service. Based on this study and the expected duration of SCK, treatment of SCK positive cows with a 5 day course of daily propylene glycol drenching is suggested.

A partial budget was developed to assess the benefit:cost ratio of different SCK testing scenarios and treatment with propylene glycol. On a herd level, the most cost-effective method depends on the herd SCK incidence. This analysis evaluated four different testing and treatment strategies at varying herd SCK incidences. Results indicate that at herd SCK incidences above 50%, blanket treatment of all fresh cows with 5 days of oral propylene glycol starting at 5 DIM is the most cost-effective strategy. At incidences between 15 and 50%, testing cows that are 3 through 9 DIM two days per week (e.g. Mondays and Thursdays) and treating SCK positive cows with 5 days of oral propylene glycol is the most cost-effective strategy; although testing all cows that are 3 through 16 DIM one day per week (e.g. Mondays) will also provide a positive return on investment. For a herd with a 40% incidence of SCK that freshens 1,000 cows per year, choosing to test cows two days per week and treat the positives will benefit $10,000 to $25,000 per year.

It may be easier to first conduct a SCK prevalence test (sample 15 to 20 cows) on a herd to approximate the herd incidence and determine the best test and treatment plan. For those herds with an estimated incidence greater than 50%, where blanket treatment with PG is initiated, repeated prevalence testing may be necessary after management changes to determine if treating all fresh cows remains the best option. For herds with an incidence from 15 to 50%, either the one day per week or two day per week testing strategies will allow for repeated monitoring of herd incidence. It is important to remember that herds where cows are tested from 3 to 9 DIM should assume that only 80% of the cows that will develop SCK between 3 and 16 DIM are identified. Repeated incidence or prevalence testing is recommended to evaluate changes in transition cow management and to allow appropriate adjustment of farm SCK testing and treatment protocols. Remember the goal is to not treat many, if any, cows with propylene glycol, but rather have transition cow management strategies in place to lower the prevalence of SCK to less than 15%.

SCK is a condition not recognized clinically until it predisposes cows and herds to higher incidences of transition cow diseases, lower milk production, and lower milk production. Thus it is costly. Work with your management team to develop a testing strategy to assess your level.

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weight and body condition, and concentrations of serum nonesterified fatty acids (NEFA) and hydroxybutyrate (BHBA). Serum NEFA tended to be higher for cows fed MH than cows fed LL or HH.

This study demonstrated that lower-starch (23%) diets can support lactational performance following a high-fiber, controlled-energy dry diet. Some keys to making lower-starch lactation diets work include use of high quality forages and nonforage fiber sources and increasing the sugar content. The step-up diet approach (MH) may be preferred over the 1-group lactation diet approach (LL and HH) because of improvements in nutrient use (i.e. milk nitrogen efficiency). However, the 1-group lactation diet approach (LL) may be preferred when energy from corn starch is expensive relative to energy from nonforage fiber sources or when a facility does not have the ability to have 2 groups in early lactation.

Item	Dietary Treatment			
	LL	MH	HH	P - value
DMI, lb/d	55.4^{x}	54.8^{xy}	52.1^{y}	0.06
Starch intake, lb/d	11.7^{b}	13.9^{a}	13.4^{a}	<0.01
Rumen fermentable starch, lb/d	9.7^{b}	11.4^{a}	11.0^{a}	<0.01
Neutral detergent fiber intake, lb/d	19.8^{a}	17.8^{b}	16.7^{b}	<0.01
Milk, lb/d	105.4a^{b}	109.8^{a}	97.2^{b}	0.04
3.5% Fat-corrected milk, lb/d	114.2	114.8	104.3	0.09
Solids-corrected milk, lb/d	104.3	105.4	95.7	0.09
Fat, %	3.88^{x}	3.64^{y}	3.79^{xy}	0.08
True protein, %	2.90	2.92	2.97	0.52
Milk urea nitrogen, mg/dL	15.2^{a}	12.7^{b}	11.9^{b}	<0.01
Milk/DMI, lb/lb	1.92	2.02	1.87	0.18
Milk nitrogen efficiency, %	34.2^{b}	37.6^{a}	35.6^{ab}	0.005
Serum NEFA, μEq/L (1-21 DIM)	452^{aby}	577^{ax}	431^{by}	0.03
Serum BHBA, mg/dL (1-21 DIM)	9.3	8.8	7.8	0.15

^{ab} Least squares means within a row without a common superscript differ (P 0.05).
^{xy} Least squares means within a row without a common superscript differ (P 0.10).