Oral Fluid Therapy for Adult Dairy Cattle

Water is an essential nutrient for dairy cows. A healthy, non-lactating, 1500-pound Holstein cow has a minimum water requirement of approximately 8 to 10 gallons per 24-hour period, but environmental conditions, ration composition, and physical activity can all affect a cow’s water needs. Testing an animal’s skin elasticity and examining mucous membrane surfaces as well as the position of eyes in relation to sockets are effective ways to determine whether a cow may be dehydrated. Oral fluid therapy can be an effective treatment for dehydrated cows.

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Water is required for all bodily functions and is considered the most essential of all nutrients (1). A dairy cow’s ration that is perfectly balanced for all other nutrients, but ignores the quality, quantity, and accessibility to water, may result in decreased milk production, or even death. In fact, a loss of approximately 20% of the body’s water is usually fatal (1, 2).

About 56 to 81% of an adult dairy cow’s body weight is water. For a 1500-pound cow, the portion of her body weight that is water ranges from 840 to 1215 pounds (2). The rumen, besides having a digestive function, also serves as a water reservoir that can protect an animal against temporary water insufficiencies (lack of access to palatable, clean water), an increased loss of body water (diarrhea, respiratory or urinary tract disease), or an increased demand for water (fever, high environmental temperature, milk production, or pregnancy). However, this protection is short lived if water supplementa-
tion is not provided. Loss of body water leading to severe dehydration and possibly death can happen rapidly.

A healthy, non-lactating, 1500-pound Holstein cow has a minimum water requirement of approximately 8 to 10 gallons per 24-hour period. This is an adequate amount if environmental temperatures are ideal, that is between 40 and 77 degrees F (3), the mineral content of the water is not high, the ration is not unusually dry, and the cow is not experiencing a high level of activity or increased physiological demand such as milk production. Milk is about 87% water. A cow producing 80 pounds of milk per day will require an additional 8 to 10 gallons or more of water to replace the water used to produce milk. That is, for each 10 pounds of milk produced, a cow requires an additional gallon of water over her baseline requirements. As the temperature/humidity index increases above 72 degrees F, a cow’s normal water consumption may increase by 50% (3). A cow whose body temperature rises above the normal range of 101.5 to 102.5 degrees F, will require an additional 1.5 to 2 gallons of water above her 24-hour baseline requirement for each 1-degree increase in her temperature (4). Many conditions can cause an abnormal amount of body water loss through diarrhea, respiratory or urinary tract disease. Also, a sick cow often does not feel well enough to drink and will become dehydrated. This cow will need even more water above her normal requirements to meet her metabolic needs.

Assessment of Hydration

An assessment of hydration (or, conversely dehydration) can be made by testing an animal’s skin elasticity (skin tent test), assessing the position of the eyes in relationship to their sockets, and by examining a mucous membrane surface. The skin tent test is performed by pinching an area of skin, usually over the eyelids or neck, and estimating the time it takes to return to its normal position. In a well-hydrated animal, this should be instantaneous. With dehydration, the fluid content of the skin decreases and the pinched skin will “tent” (see Table 1). As an animal becomes more dehydrated, the eyeballs tend to recess into their sockets leaving a gap between the eye and eyelids. This is especially noticeable on the lower eyelids.

<table>
<thead>
<tr>
<th>Category</th>
<th>Skin Tent</th>
<th>Eye Position</th>
<th>Mucous Membranes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild(^1) (4-7%)</td>
<td>Slightly prolonged (2 to 3 seconds)</td>
<td>Slightly recessed</td>
<td>Moist, shiny, not tacky</td>
</tr>
<tr>
<td>Moderate(^1) (8-10%)</td>
<td>Prolonged (3 to 6 seconds)</td>
<td>Obviously sunken</td>
<td>Dull and tacky</td>
</tr>
<tr>
<td>Severe(^1)(^,)(^2) (&gt;10%)</td>
<td>Prolonged indefinitely (&gt;6 seconds)</td>
<td>Severely sunken</td>
<td>Dry surface</td>
</tr>
</tbody>
</table>

\(^1\) Estimated percent dehydration based on the Assessment Tests.
\(^2\) An animal with severe dehydration is often unable to stand, depressed and will have cool extremities (legs and ears), similar to a cow with milk fever.
Keep in mind that there is a fat pad behind the eyes that begins to disappear as an animal loses body condition. Cows with poor body condition, but otherwise well hydrated may have eyes that appear sunken from loss of the ocular fat pad.

Lastly, in a normally hydrated cow, the mucous membrane surfaces should look shiny and feel moist. With dehydration, the surface of the gums of the mouth, inside the eyelids, and inside the lips of the vulva (Figure 2) will appear dull and feel tacky or dry. Since the back end of the cow is usually more easily examined than the head region, the vulvar mucous membranes are commonly used for this assessment. If the gums are examined, because of saliva production in the mouth, mild to moderate signs of dehydration may be masked.

Table 1 provides information for assessing an animal’s hydration status and estimating the degree of dehydration. The following formula, along with Table 1, can be used to determine the amount of fluid needed to correct an animal’s water deficit based on an estimation of dehydration.

**Formula to determine the amount of fluid needed to correct an animal’s water deficit based on an estimation of dehydration**

\[
\text{Body weight in kg's} \times \text{Estimated % dehydration} = \text{Fluid deficit in liters}
\]

**EXAMPLE:**
Estimated percent dehydration from Assessment Test in Table 1 = 7%

- Body weight = 1500 pounds (1500 pounds/2.2 kg = 682 kg)
- 682 kg x 7% = 47.4 rounded to 48 liters
- 4 liters = 1 gallon
- Fluid to correct the deficit = 48 liters/4 = 12 gallons

**OR**

- 1500 lb cow x 7% = 105 lbs of water needed
- 105 lbs/8 lbs per gallon = 13 gallons

Cattle that are mildly to moderately dehydrated usually respond well to administration of fluids given orally either by placing a stomach tube through the mouth, or through the nose and into the rumen. Cattle that fall into the severely dehydrated category need more intense fluid therapy (intravenous) than can be achieved by oral therapy alone.

The commonly encountered diseases of adult cows such as severe mastitis, metritis and displaced abomasum usually are accompanied by decreased feed and water intake, which leads to dehydration and electrolyte imbalances. Typically, decreases occur in sodium, potassium, calcium and chloride concentrations, plus the body may become alkalemic (the...
blood pH increases). Occasionally, an adult cow may become acidemic (decreased blood pH), but this is a more likely occurrence with rumen acidosis (grain overload) than the other more commonly encountered conditions listed above. Mildly to moderately dehydrated cows will benefit from chloride, potassium and, possibly, calcium salts (especially important in older cows) added to water for oral fluid therapy administration. Alkalizing agents such as sodium bicarbonate, sodium acetate, or sodium propionate generally should be avoided because these products increase the blood pH above normal levels. Most of these cows already will be alkalemic. Pushing their blood pH even higher may cause additional problems.

Many commercial electrolyte solutions are available. These products, however, should be avoided if they contain the alkalizing agents discussed above. The following items may be added to tap water to create a nonalkalizing therapeutic solution for treatment of dehydrated adult cattle. Per 5 gallons of water add:

- 140 grams (approximately 5 ounces) of sodium chloride (NaCl)
- 25 grams (approximately 1 ounce) of potassium chloride (KCl)
- 10 grams (approximately 0.4 ounce) of calcium chloride

Each type of salt may be weighed and stored in plastic zip lock-type bags that are labeled with the type of salt, the amount, and the date. These salts will keep indefinitely, and if packaged individually, can be mixed to address each cow’s specific needs (5). For example, a base recipe for oral fluid therapy for first- and second- calf cows may include NaCl and KCl. If an older cow is being treated, it may be appropriate to add calcium chloride salts to the mixture if hypocalcemia (milk fever) is a concern.

The approximate amount of the above solution to administer may be determined by using the following example for a 1500-lb (682 kg) cow determined to be mildly dehydrated.

Example of amount of solution outlined above to administer to 1500-lb (682 kg) cow

Base 24-hour water requirement = 8 to 10 gallons
Milk production = 50 pounds/day = 5 gallons
Temperature = 103.5°F (1 degree increase over normal)
= 1.5 to 2 gallons
Estimated % dehydrated = 5
682 kg x 5% = 34 liters / 4 = 8.5 gallons

TOTAL estimated water requirement
= 23 to 25.5 gallons per 24 hours.

Assessing Hydration in a Holstein cow by examining the vulvar mucous membrane surface.

Photo courtesy Michelle Kopcha

Assume that the above-described cow will probably drink some water, and will also derive water from some of her feed if she is not completely off-feed. Therefore, administration of about one-half to two-thirds of her 24-hour requirement, using the larger figures for each category would require giving her about 13 to 17 gallons of electrolyte solution per 24-hour period. Most cows can tolerate treatment with about 10 gallons of water with or without electrolytes at a time. Therefore, if the target volume is 17 gallons, half can be given immediately with the remainder given 6 to 8 hours later. The administration of electrolyte solutions by mouth is very safe, provided that the stomach tube is properly placed into the rumen and not into the trachea. Before attempting administration of fluids via a stomach tube, it is recommended that a person be trained by their veterinarian or another experienced health technician. A stomach tube mistakenly passed into the trachea and fluid deposited in the lungs is usually fatal. Also, before initiating this type of treatment, it is recommended that a veterinarian examine the animal, establish a diagnosis and recommend a course of therapy, which may include oral fluids.

References

On-farm Mastitis Culturing: Is it Right for You?

Most farms currently treat clinical mastitis based on clinical signs, but in many mastitis cases treatments with common antibiotic mastitis products are inappropriate. On-farm mastitis culture results can be obtained in a timely manner that help in making treatment decisions. Additionally when the person responsible for culturing is also responsible for treatment, he or she becomes more familiar with the type of mastitis infections, the number of clinical cases and how treatment protocols are working in their herd. Get together with your veterinarian and discuss treatment protocols for your herd.

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Many dairy producers are using, or thinking about using, on-farm milk culturing to identify the cause of mastitis and to develop their treatment protocols. This topic has been discussed in meetings and presented in earlier MDR articles; “Rethinking Clinical Mastitis Therapy” (Hess, 2003) and “On-Farm Milk Culturing and Mastitis” (Sterner, 2007). Some Michigan dairies started culturing milk early while others have taken a wait-and-see approach. Other farms have selected local laboratories to culture milk samples for them and utilize the results in various protocols. But none have been more successful than those dairy farms that have decided to make on-farm culturing a routine tool to identify mastitis pathogens before starting treatment. I wanted to share some common questions asked and answered when establishing an on-farm culture-treatment protocol. These may be helpful if you are considering starting a similar program for your dairy farm.

Why should we have an on-farm culture program?

There are two major benefits. 1. Culture results are obtained in a timely manner that help in making treatment decisions. 2. When the person responsible for culturing is also responsible for treatment, he or she becomes more familiar with the type of mastitis infections, the number of clinical cases and how treatment protocols are working in their herd. All farms have mastitis, but until someone takes the responsibility for mastitis protocols, few farms will invest enough effort to reduce mastitis.

What mastitis pathogens are identified from on-farm culture?

When milk samples are cultured on the farm, we are first trying to identify those clinical cases where the infection has been eliminated by the cow’s immune system and as observed by no growth on culture. Secondly, we are trying to identify Gram-positive bacteria that can be managed with the help of antibiotic therapy and Gram-negative bacteria that are not responsive to antibiotic therapy and often self-limiting. These simple culture protocols can readily identify most bacterial pathogens and are useful in developing treatment protocols. However, this type of culture is not sufficient if mycoplasma is identified in the herd. Mycoplasma identification requires special culture media. If mycoplasma is suspected or identified on the farm, other diagnostic testing needs to be included in the farm’s mastitis protocol. (see “Dairy Programs” at <http://www.cvm.msu.edu/extension>.)

Why is culturing on-farm more effective than sending samples to laboratory?

Diagnostic laboratories have the advantage of highly trained laboratory personnel who can accurately identify bacteria from milk cultures, but they have disadvantage in the lapsed time it takes to return culture results when making treatment decisions. One of the most useful results for on-farm milk culture is identifying “negative” or “no growth” that indicates the cow has eliminated the bacteria by the time clinical mastitis is detected. This is common in herds where Gram-negative coliform bacteria are the primary cause of clinical mastitis. Using antibiotic therapy is no longer necessary because antibiotic treatment will only help eliminate bacteria. Negative cultures can make up 30-60% of clinical mastitis cases. In these cases, normal milk will return as the gland heals. Identifying negative cultures can reduce antibiotic treatments, while using antibiotics only when they are effective.

In cases where the culture results are negative, why do some of these cows still show clinical mastitis?

Bacteria cause damage to the gland that results in clots and abnormal secretion that is identified as clinical mastitis. The immune system is the cow’s defense against bacteria that clears the infection, however, the gland must heal before milk returns to normal. Some bacteria, especially the Gram-negative coliforms, cause serious damage to the gland that can require a longer time for recovery even after the bacteria has been eliminated from the gland. Some glands will continue to have a high SCC through the entire lactation and may not completely heal until the cow has gone through a dry period.

What are the most common errors made by farms that culture their own mastitis samples?

The most common problem is trying to culture milk samples that are not collected aseptically. If the sample is contaminated it will contain bacteria that are not responsible for the mastitis case. If a milk culture has more than one type of bacteria growing on the culture plate it is likely a contaminated...

CULTURING continues on page 17
Ration Fermentability: Key Factor for Inclusion Level of Distiller’s Grains in Lactation Rations

Opinions vary regarding how much distiller’s grains (DG) can be used effectively in lactation rations. In order to better understand conflicting reports and recommendations about the effect of DG on milk yield we examined 23 studies about DG in the dairy science literature. Inclusion of DG in treatment diets ranged from 4 to 42% of dietary DM across all studies. Our analysis of the entire database, shows that inclusion rate of DG per se did not affect FCMY, MY, MF%, or MP%. However, when the fermentability of rations is considered there were significant changes in milk yield responses to inclusion of DG.

Nutrient concentrations in DG are typically three to four times that of yellow corn because nutrients are concentrated as starch is removed. A typical profile of DG includes (DM basis): 30% crude protein (CP), 0.8% phosphorus (P), 0.4% sulfur (S), 39% neutral detergent fiber (NDF) and 10% fat (3). The fatty acids in DG, as in corn oil, are highly unsaturated, and can be altered by ruminal microbes during fermentation.

Rations with a large proportion of highly fermentable carbohydrates can reduce fat-corrected milk yield, most commonly by means of milk fat depression. Specifically, highly fermentable diets alter ruminal metabolism suppressing the complete saturation of unsaturated fatty acids. And so, more intermediates of fatty acid metabolism (e.g., certain conjugated linoleic acid isomers) flow from the rumen and are absorbed from the gut. These isomers inhibit milk fatty acid synthesis in the mammary gland causing milk fat depression (2). Besides being high in unsaturated fatty acids, DG contain about 39% NDF which is highly fermentable in the rumen.

Therefore, we evaluated the effects of ration fermentability on lactational performance when rations contained DG. For our analysis, categories of ration fermentability were based on well-accepted nutritional concepts that ruminal fermentability is greater for: 1) forage type --- corn silage vs. alfalfa; 2) grain concentration --- grain (starch) vs. other non-grain feedstuffs; and, 3) grain fermentability --- high-moisture grain vs. dry grain (1).

Method of Analysis

We developed a database from 23 peer-reviewed research articles published from 1982 to 2006. The database included changes (positive or negative responses) in: raw milk yield (MY; unadjusted for components content); 4% fat-corrected milk yield (FCMY); and, milk fat (MF%) and milk protein (MP%) percentages of cows consuming rations containing more than 4% DG (DM basis) compared with a control (ration without DG) within each study. In all cases, DG were substituted for portions of the concentrates in the control ration, not for forages. Initially, we evaluated the effects of increasing DG concentration of the diets on lactational performance using data across all studies (122 total treatment means). Secondly, we evaluated lactational responses to the three factors of ration fermentability --- forage type, grain concentration in the rations containing DG, and grain fermentability.

Overall ration fermentability must be a major criterion when setting the ration inclusion level of distiller’s grains for lactating cows.
grain source (e.g., corn grain and barley grain) were eliminated from the analysis.

Responses of lactational performance to DG were calculated as the difference or change in each response variable of cows fed the treatment diet containing DG minus that of cows fed the control diet within study. Therefore, a positive response (e.g., +1.0 lb) to inclusion of DG means a 1.0 lb increase with the DG diet compared with its control diet. Because not all studies were designed to examine the effects of feeding DG specifically, the control diet for comparison within some studies was the diet without DG formulated closest in ingredient and nutrient composition to the treatment diets with DG.

Results

Inclusion Level of DG. Change in yield of 4% fat-corrected milk was not affected by increasing inclusion rate of DG from 4 to 42% of ration DM (Figure 1, page 8). Schingoethe (4) cited an unpublished analysis by Kalscheur in South Dakota that found similar results. Additionally, in our analysis neither MY, MF%, nor MP% were affected by inclusion rate of DG in the ration, similar to the South Dakota study.

Table 1 shows changes in milk yields and composition as impacted by diet fermentability with inclusion of DG in rations. All three factors categorizing ration fermentability – forage type, grain concentration, and grain fermentability – significantly affected change in raw MY and FCMY. However, changes in MF% due to the three fermentability factors were not detected.

Forage Type. Among forage types, changes in MY and FCMY with added DG compared with control were positive and greatest for alfalfa-based rations, followed by rations with mixtures of alfalfa and corn silage. The changes in MY and FCMY were negative and numerically of greatest magnitude when corn silage was the sole forage in rations (Table 1). The magnitude of these changes due to ration forage type also is largest of the three fermentability factors studied (Table 1). Responses in FCMY differed overall by more than 10 lb/cow per day when the forage base of the ration was alfalfa compared with corn silage. Thus, ration forages with different ruminal fermentability resulted in very different milk yield responses when DG were included in the ration. Changes were not detected in MF% for cows fed rations with DG compared with control due to different ration forage type. However, response of MP% was markedly different by forage type when DG were included in rations with +0.06, -0.09, to -0.16 percentage units change when forage base was alfalfa, the mixture of alfalfa and corn silage, or only corn silage, respectively.

Grain Concentration. Raw MY and FCMY responses (changes) when DG were included in the ration compared with control were greater with low (less than or equal to 20% of ration DM) compared with high (greater than 20% of ration DM) grain concentrations (Table 1). The magnitude of these changes due to grain concentration when DG were included was on the order of +3 lb for FCMY with low grain concentration to -0.5 lb/cow per day with high grain concentration. The magnitude of the difference in FCMY response to grain concentration (almost 4 lb/cow per day) was considerably less compared with the effect of ration forage type as a fermentability factor (about 10 lb/cow per day). This likely is because the contribution of grain to the overall fermentability of the ration decreased as DG were substituted for grain. We did not detect changes in MF% or MP% due to ration grain concentration with DG included.

Table 1. Milk yield and composition changes as impacted by diet fermentability (forage type, grain concentration, or grain fermentability) to dietary inclusion of distiller’s grains compared with control

<table>
<thead>
<tr>
<th>Response</th>
<th>Forage Typea</th>
<th>Grain Concentrationc</th>
<th>Grain Fermentabilityd</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alfalfa</td>
<td>Mixture</td>
<td>Corn silage</td>
</tr>
<tr>
<td>Raw milk yield, lb/d</td>
<td>+4.2</td>
<td>+1.8</td>
<td>-5.7</td>
</tr>
<tr>
<td>FCM yield‡, lb/d</td>
<td>+5.8</td>
<td>+2.9</td>
<td>-4.6</td>
</tr>
<tr>
<td>Milk fat, %</td>
<td>+0.09</td>
<td>+0.07</td>
<td>+0.10</td>
</tr>
<tr>
<td>Milk protein, %</td>
<td>+0.06</td>
<td>-0.09</td>
<td>-0.16</td>
</tr>
</tbody>
</table>

---(Change in response to rations with distiller’s grains minus control)---

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw milk yield, lb/d</td>
<td>+1.4</td>
<td>-1.2</td>
</tr>
<tr>
<td>FCM yield‡, lb/d</td>
<td>+3.3</td>
<td>-0.5</td>
</tr>
<tr>
<td>Milk fat, %</td>
<td>+0.09</td>
<td>+0.08</td>
</tr>
<tr>
<td>Milk protein, %</td>
<td>-0.06</td>
<td>-0.07</td>
</tr>
</tbody>
</table>

---(Change in response to rations with distiller’s grains minus control)---

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>High</th>
</tr>
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<tbody>
<tr>
<td>Raw milk yield, lb/d</td>
<td>+2.2</td>
<td>-2.0</td>
</tr>
<tr>
<td>FCM yield‡, lb/d</td>
<td>+2.5</td>
<td>+0.3</td>
</tr>
<tr>
<td>Milk fat, %</td>
<td>+0.05</td>
<td>+0.12</td>
</tr>
<tr>
<td>Milk protein, %</td>
<td>-0.02</td>
<td>-0.11</td>
</tr>
</tbody>
</table>

a Control = ration without distiller’s grains within study.
b Forage type = Alfalfa (greater than 80% of forage DM); Mixture (alfalfa and more than 20%, but less than 100% corn silage in forage DM); and, Corn silage (sole forage in diet).
c Grain concentration = Low (grain content less than or equal to 20% of diet DM) and, High (grain content greater than 20% of diet DM).
d Grain fermentability = Low (high moisture corn as portion of dietary grain); and, High (dry corn sole grain in diet).

‡ 4% fat-corrected milk yield.
Grain Fermentability. When grain fermentability was low (with dry corn grain) in the ration with DG versus control, changes in MY and FCMY (2.2 to 2.5 lb/cow per day) were greater compared with rations in which high moisture corn (high grain fermentability) was the grain source (Table 1). The MY response was negative with high grain fermentability, but slightly positive for FCMY when DG were included in the ration. Of the three factors of fermentability, grain fermentability resulted in the least magnitude of overall difference (+2.2 lb/cow per day). Nonetheless, these results strongly support the idea that ration fermentability affects the lactational response to DG inclusion.

In our analysis, inclusion of DG did not affect MF%. This result was somewhat unexpected based on observations from field nutritionists and the potential for milk fat depression in rations with higher carbohydrate fermentability and unsaturated fat concentrations. Reasons for the lack of effect of DG on MF% in our analysis are unknown. This result is similar to that of a previous report (4). Overall average milk fat percentage across all experiments in our database was 3.44 ± 0.276% (average ± SD).

Conclusions and Implications

- Our analysis of the entire database (results of all studies combined), shows that inclusion rate of DG per se did not affect FCMY, raw MY, MF%, or MP%.
- However, when the fermentability of rations is considered there are significant changes in FCMY and raw MY responses to inclusion of DG.
- Greater fermentability of the ration forage base (ruminal fermentability of corn silage greater than alfalfa) resulted in lower and sizable negative FCMY and raw MY responses to DG inclusion.
- Greater amounts of grain in diets containing DG resulted in lower MY and FCMY responses to DG inclusion.
- Greater grain fermentability (high moisture corn greater than dry corn) resulted in lower FCMY and MY responses when DG were included in the ration.
- In our analysis, inclusion of DG did not affect change in MF% with any of the three fermentability factors evaluated.
- In more fermentable lactation rations with added DG, FCMY and raw MY are reduced significantly compared with the situation in which DG are included in less fermentable rations.
- No doubt, the overall fermentability of the ration must be a major consideration, among other criteria, when setting the inclusion level of DG in rations for lactating dairy cows.

References


Can You Afford to Cut Feed Costs?

When feed costs are high, it can be tempting to feed less or consider cheaper alternative feeds. Sometimes saving money on feeds can mean losing money on milk sold, though. Figuring out the true cost of feed involves considering dry matter content and how much protein and usable energy is in the feed. When milk prices are low, you can afford to lose a little milk production for a substantial savings in feed costs. However, when milk prices are high relative to feed costs, you are usually better off focusing on how to produce more milk rather than on how to cut feed costs. This article offers case examples for several different alternatives.

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What do you do when corn exceeds $5 per bushel? You might be tempted to feed less or decide that it’s time to look for cheaper alternative feeds. However, with alternative feeds, you must consider what you get for your money. Figuring out the true savings of such feeds is not always easy. This article addresses how to evaluate potential alternative feeds comparing their dry matter (DM), energy and protein contents, and Corn-Soy Values. Comparisons of some common feed alternatives are in Table 1.

The first thing to evaluate is the DM or moisture content of alternative feeds. There is no point in paying for water. Compare all feeds on a 100% dry matter (DM) basis. For example, corn distiller’s grains with 90% DM at $160/ton calculates to $178/ton of DM ($160/0.90) or 8.96¢/lb of DM. Wet corn distiller’s grain with 30% DM at $50/ton is $167/ton of DM or 8.3¢/lb of DM. Corn grain at $5/bu ($179/ton) and 88% DM is 10.1¢/lb of DM. At these prices, the distiller’s grains cost 12 to 18% less than corn grain.

The second consideration is how much useable energy is in the feed. For lactation rations in the U.S, Net Energy for Lactation (NEL) in mega-calories (Mcal) is used. The NEL values of feeds cannot be measured accurately, but there is no question that energy intake is a major determinant of the amount of milk a cow will produce. Thus, the feed cost per Mcal of NEL is a better way to compare feeds than simply the cost per pound of DM. If a new ration can be formulated that costs less per Mcal NEL than the ration currently being fed, and if cows eat the same amount of NEL per day and produce the same amount of milk with the new ration, then profit also should be greater with the new ration. Corn grain at $5/bu ($179/ton) and 0.88 Mcal NEL/lb costs 11.5¢/Mcal of NEL. Dried corn distiller’s grains at $160/ton and 0.82 Mcal NEL/lb cost 10.8¢ per Mcal of NEL. With these prices, the distiller’s grain is 6% cheaper than corn grain.

The third consideration is protein. This is where it gets complicated because feed protein supplies both energy and digestible protein for the cow, so we cannot simply consider the cost per pound of protein. One way nutritionists have evaluated the cost of feeds for both energy and protein is by asking “How much corn and soybean meal could be replaced by this feedstuff?” The resulting “Corn-Soy Value” of a feed is calculated based on the economic value of energy and protein using the current prices for corn and soybean meal. If you can purchase an alternative feed for considerably less than its calculated Corn-Soy Value, you probably should consider buying it. For example, using prices for corn at $5/bu and 48-soybean meal at $340/ton, the Corn-Soy Value for dried distiller’s grains is $242/ton (Table 1). If it can be purchased for $160/ton, then it costs only 66% (160/242) of its Corn-Soy Value. In other words, it is 34% less expensive than a corn and soy blend providing the same amount of energy and protein.

The limitation with using Corn-Soy Values is that we often choose feeds in ration formulations for several reasons other than just the economic value of energy and protein.

- How much feed must the cow eat to obtain the energy and protein?
- How much long fiber is in the feed?
- What is the source of the energy (starch, sugar, fiber, fat, or protein)?
- How much of the protein will be degraded in the rumen?
- How much will bypass?
- Does the feed contain valuable minerals or vitamins?
- Will the feedstuff alter appetite?

Most of these questions can be included in our assessment of the economic value of an alternative feed by including the new feed into the formulation of a new, well-balanced diet. This can be done using a computer ration evaluation program such as the MSU Spartan Dairy Ration program. However, even checking the value of feeds in a ration program is not a complete and accurate answer.

Because we cannot predict accurately the impact of most ration ingredient changes on feed intake and partitioning of nutrients to milk, it is often difficult to predict whether an alternative feed will be profitable. For example, if you feed a diet with less corn grain and more corn distiller’s grains, the diet will be cheaper per pound using the prices given in Table 1. If the cows produce the same amount of milk, you will make more profit. However, if the cows eat less and produce less milk, this potential profit...
### Table 1. The relative costs and values of selected energy and protein feeds.

<table>
<thead>
<tr>
<th>Feed</th>
<th>%DM</th>
<th>Mcal NEL /lb DM</th>
<th>% CP (DM basis)</th>
<th>Feed cost ($ / ton as fed)</th>
<th>$ per lb DM</th>
<th>$ per Mcal NEL</th>
<th>Corn-Soy Values ($/ton as fed)</th>
<th>Cost relative to Corn-Soy Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn grain, ground</td>
<td>88</td>
<td>0.88</td>
<td>10</td>
<td>179</td>
<td>0.101</td>
<td>0.115</td>
<td>179</td>
<td>100%</td>
</tr>
<tr>
<td>Soybean meal-48</td>
<td>90</td>
<td>0.92</td>
<td>54</td>
<td>340</td>
<td>0.189</td>
<td>0.206</td>
<td>340</td>
<td>100%</td>
</tr>
<tr>
<td>Barley malt sprouts</td>
<td>91</td>
<td>0.64</td>
<td>20</td>
<td>105</td>
<td>0.058</td>
<td>0.090</td>
<td>178</td>
<td>59%</td>
</tr>
<tr>
<td>Beet pulp, dried</td>
<td>88</td>
<td>0.64</td>
<td>10</td>
<td>280</td>
<td>0.159</td>
<td>0.247</td>
<td>139</td>
<td>201%</td>
</tr>
<tr>
<td>Corn gluten feed, dried</td>
<td>89</td>
<td>0.74</td>
<td>24</td>
<td>150</td>
<td>0.084</td>
<td>0.113</td>
<td>205</td>
<td>73%</td>
</tr>
<tr>
<td>Distiller’s grain with solubles, dry</td>
<td>90</td>
<td>0.82</td>
<td>30</td>
<td>160</td>
<td>0.089</td>
<td>0.108</td>
<td>242</td>
<td>66%</td>
</tr>
<tr>
<td>Distiller’s grain with solubles, wet</td>
<td>30</td>
<td>0.82</td>
<td>30</td>
<td>50</td>
<td>0.083</td>
<td>0.102</td>
<td>81</td>
<td>62%</td>
</tr>
<tr>
<td>Soybean hulls</td>
<td>91</td>
<td>0.63</td>
<td>14</td>
<td>190</td>
<td>0.104</td>
<td>0.166</td>
<td>156</td>
<td>122%</td>
</tr>
<tr>
<td>Wheat middlings</td>
<td>90</td>
<td>0.73</td>
<td>18</td>
<td>138</td>
<td>0.077</td>
<td>0.105</td>
<td>185</td>
<td>75%</td>
</tr>
<tr>
<td>Corn silage</td>
<td>35</td>
<td>0.64</td>
<td>9</td>
<td>40</td>
<td>0.057</td>
<td>0.089</td>
<td>54</td>
<td>74%</td>
</tr>
<tr>
<td>Alfalfa silage mid-bloom</td>
<td>35</td>
<td>0.54</td>
<td>20</td>
<td>60</td>
<td>0.086</td>
<td>0.157</td>
<td>62</td>
<td>96%</td>
</tr>
</tbody>
</table>

A Corn-Soy Value in the current comparisons based on corn at $5.00/bushel and 48-soybean meal at $340/ton. Corn at $5.00/bushel is $179/ton. Corn price per bushel / 56 times 2000 = corn price per ton. Costs for most feeds except forages are cost delivered based on Feedstuffs magazine in January, 2008. An approximate calculation for the Corn-Soy Value of a feed is: \[(1.5C - 0.25S) \times \text{NEL/lb} + 2.5x(S-C) \times \%\text{CP}\] \times \%\text{DM} (gets within 2% of CS value), where C is price per ton of corn grain and S is price per ton of 48-SBM (both on as-fed basis).

### Conclusions

So, what could happen when replacing expensive corn grain with an alternative feedstuff? It’s not easy to know for sure. Chances are that the cows will not eat more of a ration with the alternative feedstuff. It’s possible, though, that they might eat the same, or even eat less. The only way to know for sure is to monitor what happens before and after the ration change. Feeding a ration that is cheaper may lower feed costs, but if it lowers milk yield, that could be an expensive mistake! When milk prices are low, you can afford to lose a little milk production for a substantial savings in compared feed costs. However, when milk prices are high relative to feed costs, you are usually better off focusing attention on how to produce more milk rather than on how to cut feed costs.
### Table 2. Case example: Comparison of current diet with an alternative diet using cheaper feed ingredients.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Costs</th>
<th>Current diet</th>
<th>Alternative diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa silage, 40% NDF, 35% DM</td>
<td>$70/ton</td>
<td>20.9%</td>
<td>15.9%</td>
</tr>
<tr>
<td>Corn silage, 35% DM</td>
<td>$40/ton</td>
<td>36.4%</td>
<td>33.6%</td>
</tr>
<tr>
<td>Corn grain, ground, dry</td>
<td>$5.00/bu</td>
<td>27.3%</td>
<td>21.4%</td>
</tr>
<tr>
<td>Dried malt sprouts</td>
<td>$105/ton</td>
<td>0.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Dried distiller’s grains with solubles</td>
<td>$160/ton</td>
<td>0.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Soybean meal, 44% CP</td>
<td>$325/ton</td>
<td>10.5%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Soybean meal, expellers, 45% CP</td>
<td>$370/ton</td>
<td>3.6%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Supplements</td>
<td></td>
<td>1.4%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

**Diet Nutrient Composition & Cost**

| %NDF | 29.0 | 33.0 |
| Energy, Mcal NEL/lb DM | 0.744 | 0.730 |
| CP, % of DM | 17.5 | 17.4 |
| Feed cost, $/lb DM | 0.099 | 0.089 |
| Feed cost, $/Mcal NEL | 0.133 | 0.122 |

### Table 3. Case example: Possible outcomes with the cheaper alternative diet compared with the current diet.

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Alternative Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI, lb/day</td>
<td>48.0</td>
<td>48.9</td>
</tr>
<tr>
<td>Change in feed intake, lb DM/day</td>
<td>+0.9</td>
<td>+0.1</td>
</tr>
<tr>
<td>Energy supply, Mcal NEL/day</td>
<td>35.7</td>
<td>35.7</td>
</tr>
<tr>
<td>Energy allowable milk, lb/day</td>
<td>80.0</td>
<td>78.0</td>
</tr>
<tr>
<td>Change in milk yield, lb/day</td>
<td>0.0</td>
<td>-2.0</td>
</tr>
<tr>
<td>Change in milk yield</td>
<td>0.0%</td>
<td>-2.5%</td>
</tr>
<tr>
<td>Value of milk @$14/cwt, $/day</td>
<td>11.20</td>
<td>10.91</td>
</tr>
<tr>
<td>Value of milk @$18/cwt, $/day</td>
<td>14.40</td>
<td>14.03</td>
</tr>
<tr>
<td>Value of milk @$22/cwt, $/day</td>
<td>17.60</td>
<td>17.15</td>
</tr>
<tr>
<td>Feed cost, $/day</td>
<td>4.75</td>
<td>4.29</td>
</tr>
<tr>
<td>Return to diet change, $/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$14 milk</td>
<td>0.38</td>
<td>0.17</td>
</tr>
<tr>
<td>$18 milk</td>
<td>0.38</td>
<td>0.09</td>
</tr>
<tr>
<td>$22 milk</td>
<td>0.38</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Time to Regroup!

There are great differences in nutrient requirements and animal physiology between cows in early and late lactation. This, along with recent limitations in the use of rbST, high cost of feeds, current relatively high milk price, and the need to reduce nitrogen excretion, means potential profits can be realized by adding another ration to a single TMR system.

Mike Allen
Dept. of Animal Science

Many producers have abandoned feeding multiple totally mixed rations (TMRs) to milking cows after they leave the fresh group (or after calving) despite great differences in nutrient requirements and animal physiology between cows in early and late lactation. This has happened at an accelerated rate over the last 10 years for various reasons including convenience and labor savings and the availability of recombinant bovine somatotropin (rbST) to help prevent over-conditioned cows. Recent limitations in use of rbST, as well as recent changes in the long term forecast for cost of feeds, the growing importance of reducing nitrogen excretion, and the current relatively high milk price are reasons to reevaluate this management strategy. The purpose of this article is to identify and discuss factors that should be considered when evaluating grouping strategies on your farm.

Manage Body Condition

The most important reason to consider feeding more than one ration to lactating cows in your farm is to manage body condition without limiting milk yield. Over-conditioned cows are at high-risk for culling during the next lactation because of metabolic disorders, poor health and reproductive failure. When only one lactation ration is fed, it must be formulated to limit over-conditioning in late lactation. However, diets that prevent excessive body condition in late lactation, also limit milk yield of high-producing cows. Feeding one ration to all cows is a compromise between achieving higher peak milk yield and managing body condition.

Much of the success of the single TMR strategy is because of the use of rbST. As lactation proceeds, milk yield declines and energy is increasingly partitioned to body stores to restore condition. With a single TMR formulated for the higher yielding cows, other lower yielding cows gain condition more rapidly and become over-conditioned. Use of rbST limits over-conditioned cows by partitioning more energy to milk and away from body condition. Because many herds have abandoned use of rbST, managing body condition will be more challenging when a single TMR is fed. To effectively manage body condition of later lactation cows with a single TMR, the diet typically must be less fermentable and more filling, limiting milk yield of high-producing cows.

Benefits of Grouping

Potential effects of grouping on profitability increase with higher feed and milk prices. While recent relatively high milk prices are unlikely to be sustained, feed prices are likely to remain high for the foreseeable future because of increased export of crops due to the cheap US dollar and use of crops for biofuel production. Grouping cows by their physiological responses to diets can increase profitability by improving milk yield, increasing efficiency of milk production, and reducing culling of over-conditioned cows. Nutrient utilization increases as nutrients required for maintenance are diluted across more milk production. Less nitrogen (N) will be excreted as waste when lower producing cows are offered rations with a lower crude protein (CP) concentration that more closely matches their requirements. Decreasing CP concentration by 2 percentage units for 120 d per lactation (last trimester) will result in about 20 lb less N excreted/cow per year.

Effects on Milk Production

The limitation on milk yield from a single TMR system varies from farm to farm and is dependent primarily upon variation in milk yield among cows. This is because response to diet change varies greatly among cows varying in milk yield. We found that cows ranging from about 50 to 120 lb/d of 3.5% fat-corrected milk responded very differently to a reduction in ration forage content from 67% to 44% of ration DM. Milk yield was not affected by change to the lower forage ration for cows producing less than about 90 lb/d, but milk yield was limited by the higher forage ration for cows producing more than 90 lb/d. For cows with milk yield above 90 lb/d, the high forage diet limited milk yield to an increasingly greater extent with greater milk yield with up to 20 lb/d lower 3.5% fat-corrected milk for the highest producing cows. Dry matter (DM) intake was greater for cows fed the low-forage diet, so income over feed costs decreased for cows producing less than 90 lb/d, but improved greatly for cows producing over 90 lb/d of milk.

Milking cows vary in nutrient requirements according to milk yield and growth but factors affecting feed intake and partitioning of energy also change as lactation proceeds. Because of this, quite different diets are required to optimize production for high producing cows in early lactation compared to cows in late lactation. High producing cows have a great drive to eat and feed intake is limited primarily by gut fill. Because lactose, which is produced from glucose in the mammary gland, drives milk yield, high-producing cows require greater glucose production by the liver. The liver can produce much more glucose as the starch content of diets increase (primarily from cereal grains) and high-producing cows thrive on highly fermentable diets. In high-producing cows little energy is partitioned to body condition and most is used for milk production because both insulin concentration in the blood and insulin sensitivity of tissues are low.
In contrast, highly fermentable diets can depress feed intake, cause excessive weight and condition gain, and result in milk fat depression for lower producing cows. As production declines throughout lactation, gut fill becomes less of a limitation on feed intake and cows can be fed higher forage rations without limiting milk yield. Feed intake becomes increasingly limited by the fermentability of the diet; highly fermentable diets that are necessary to attain high milk yield can depress feed intake as milk yield declines. Glucose demand declines because less is needed to produce milk lactose, and blood glucose concentration increases, stimulating greater secretion of insulin. Insulin signals body tissues to produce fat, partitioning energy to body condition at the expense of milk yield. Tissue sensitivity to insulin increases as growth hormone; and, consequently, milk yield, declines. Because insulin concentration and insulin sensitivity increase as lactation progresses, more energy is partitioned to body tissues at the expense of milk. Highly fermentable diets increase plasma glucose and insulin to a greater extent as milk production declines. Therefore, while highly fermentable diets are necessary to achieve high milk yield in early lactation, they depress milk yield and result in more rapid body fattening in late lactation.

Lower producing cows also are more prone to milk fat depression when fed highly fermentable diets. We evaluated production response to a change in diet fermentability by comparing highly fermentable high-moisture corn and less fermentable dry corn and found that the effect of diet on milk fat response was opposite for high-producing and low-producing cows. When ration fermentability was increased, milk fat concentration decreased up to 1 percentage unit for the lower producing cows but increased up to 1 percentage unit for the higher producing cows. Milk fat depression can result in more rapid gain in body condition as energy spared by reduced milk fat production is available to body tissues.

**Optimal Forage**

The filling effect of diets is determined almost entirely by the concentration and digestion characteristics of forage fiber. Other diet ingredients (e.g., grains, protein and fat supplements, and high fiber byproduct feeds) digest and pass from the rumen much more quickly than forage fiber. It is important to note that it is the concentration of forage fiber in the ration, not the fiber concentration of the forage that is important because high-fiber forages can be supplemented with more concentrate. While forage fiber is very filling compared to other components of rations, the filling effect of forage fiber varies greatly because of great differences in digestion characteristics among sources. Across many experiments, a one-unit increase in digestibility of forage fiber (measured in vitro or in situ) corresponded to an increase of 0.55 lb of 3.5% fat-corrected milk yield within forage family. However, feed intake and milk yield response to enhanced fiber digestibility benefits higher yielding cows to a greater extent than low producing cows. We found that fat-corrected milk yield response varied from 0 to nearly 2 lb/d for each percentage increase in forage in vitro fiber digestibility as milk yield of cows increased from 70 to 120 lb/d. In addition, fiber from a perennial grass such as orchardgrass is much more filling than fiber from an annual grass such as corn silage or a legume such as alfalfa, despite its greater digestibility, because of its slower passage rate from the rumen. Because of this, perennial grasses and mixed legume-grass forages should be limited in rations of high producing cows with intake limited by gut fill. Forages containing significant concentrations of perennial grass would be better targeted to lower producing cows whose feed intake is less limited by gut fill.

**Feed Costs**

Ration cost might be greater when a single TMR is fed to all cows because more expensive ingredients that benefit high producing cows are fed to all cows for the entire lactation. While forages now cost more to grow than in the recent past because of higher input costs (e.g., fuel and fertilizer), even when purchased they cost less than most other ration ingredients averaging $0.05 to $0.07 per lb of DM. Corn grain at $5.00 a bushel equates to $0.10 per lb of DM, soybean meal at $340 per ton is almost twice as much at $0.19 per lb of DM, and bypass protein sources and most fat sources are more expensive yet. Some fat sources now cost as much as $0.60 per lb of DM! In addition, expensive feed additives that may enhance production in early lactation might be less effective in later lactation. Because energy and protein requirements decline with milk yield and feed intake is less limited by gut fill, lower cost forages and other feeds can be fed to lower producing cows if at least two TMRs are fed to lactating cows. This decreases feed costs for up to one-third of each lactation.

**Benefits of a Single TMR**

Feeding a single TMR to all milking cows allows grouping by reproductive status (possibly requiring self-locking stanchions in fewer pens), one less ration to be formulated, possible labor savings, and elimination of cows getting fed the wrong diet. Labor savings depend upon how mixer capacity is matched to pen and (or) herd size. In some situations, there will be little or no savings in labor for one vs. two TMRs because the same number of batches must be mixed per day. However, when partial capacity mixes must be made to feed
more than one TMR, labor will be saved with a single TMR. Additionally, topping off feed bunks might require more labor if partial batches must be mixed. Milk yield and health might be compromised for cows inadvertently ending up in the wrong pen when more than one TMR is fed requiring additional management for prevention. Another perceived benefit of a single TMR is eliminating the drop in milk yield when cows change diets. However, proper ration formulation can minimize the reduction or even increase production after switching rations as discussed below.

**Decreased Milk Yield when Changing Groups**

Movement to a different group might decrease milk yield because of social adjustment, diet change, or both. Movement according to reproductive status with a single TMR system can result in a temporary decrease in milk yield until cows are socially adjusted, which is normally of short duration, lasting only a few days. However, many producers recall more sustained reductions in milk yield following a group change because of the diet and this is one of the main reasons they prefer a single TMR system. Although the diet might be formulated to provide adequate energy, protein, minerals and vitamins according to recommendations, ration formulation programs do not account for effects of feeds on energy intake and partitioning. If the diet is too fermentable, feed intake and milk fat production might be depressed and insulin will increase partitioning more energy to body condition at the expense of milk yield. Careful consideration of diet ingredients is necessary to prevent decreased milk yield following a ration change. Increasing energy intake with highly digestible fiber from grass or low-lignin corn silage (e.g., BMR) and more slowly fermented starch (dry ground corn) will allow more energy to be partitioned to milk rather than body condition allowing higher energy diets while limiting over-conditioned cows.

**How Many Groups and when to Switch?**

Our understanding of how cows vary in their response to diet changes is just beginning and more information will be available to help devise grouping strategies as time progresses. However, for two different lactation groups, body condition score should be used to prevent “train wrecks” from over-conditioned cows in the early part of the next lactation. Cows should be fed a low-fill, highly fermentable diet until they reach a body condition score of 3 to 3.25. This will allow for a slight further increase in body condition in late lactation. Cows with signs of low ruminal pH (e.g., low milk fat and very loose manure) should be switched sooner to improve ruminal and total tract digestibility by increasing ruminal pH. The later lactation diet should be formulated to maintain body condition while maximizing milk yield using highly digestible fiber from forage and byproduct feeds and more slowly fermenting grain sources.

**Other Considerations**

Several factors must be considered when determining the optimal grouping strategy on your farm. The extent of compromise between milk yield and management of body condition when feeding a single TMR depends primarily on variation of milk yield within the group but also upon age of cows. The extent of variation is dependent upon reproductive success because milk yield generally will be lower for cows with extended lactations. Because peak milk yield increases and persistence of milk yield declines with increased parity, there is greater variation in milk yield among older cows. Herds using a single TMR that will benefit the most from adding one or more groups are those that don’t use rbST, have a wide range in milk yield and age among cows, and those with mixer capacity matched to group size.

**Conclusions**

- Potential profits from increased milk yield, production efficiency, and nutrient utilization as well as decreased feed costs and culling can be realized by adding another ration to a single TMR system.
- Some of the real and perceived benefits of feeding a single TMR are relatively minor compared to the lost opportunity of not grouping cows according to their production response to diets.
- Increased feed cost and higher milk price, combined with not using rbST in many herd currently merits careful consideration of the benefits and costs of grouping systems.
Utilizing Forage Legumes as Nitrogen Sink and Source

With nitrogen and chemical fertilizer prices high, legumes such as alfalfa and clovers are an attractive crop because they provide free nitrogen to grasses and pasture and some nitrogen credit to following crops such as corn and small grains. In addition to being an integral part of sustainable agricultural systems, forage legumes have potential to increase forage quality and reduce summer slump, susceptibility to pests and disease, and lower unwanted toxicity. Used effectively, legume plants can make your farming more sustainable economically and environmentally.

Doo-Hong Min
Richard Leep
Dept. of Crop and Soil Sciences

Nitrogen prices as well as other chemical fertilizers are at historic highs. This can be a huge financial burden for dairy producers in their forage-based farming across the country. Legumes have been playing an integral role in sustainable agricultural systems by providing high quality animal feed, nectar, seed, green manure, and wildlife habitat. Forage legumes such as alfalfa and clovers can provide free nitrogen to grasses on pasture and some nitrogen credit to following crops such as corn and small grains. That’s why the importance of legumes as a way of lowering the nitrogen fertilizer cost can’t be emphasized enough. Legume plants can play a role as a nitrogen fixer as well as a nitrogen provider. Legume plants fix their own nitrogen using rhizobium bacteria and make ammonia by combining nitrogen with hydrogen in the air and eventually the ammonia is converted to nitrates. This nitrate nitrogen is a plant available form. Legume plants can utilize nitrogen from two sources and there is a mutual relationship happening between nitrogen fixation and manure nitrogen. If dairy manure is applied to alfalfa fields, alfalfa prefers to utilize the free nitrogen from manure first and then fixes its own nitrogen. Therefore, applying dairy manure to alfalfa is an option to increase the acreage of manure application; otherwise, excessive manure might be applied to corn fields. This could result in environmental impacts to ground- and surface water.

In legume-grass mixture, nitrogen fixed by legumes is naturally free nitrogen that can be transferred to the grasses such as orchardgrass, timothy, tall fescue, and even subsequent crops such as corn or small grains. Think about the dollar value of legumes. For example, alfalfa fixes 150 – 250 lb N/acre/yr which is equivalent to $90 – $150 (@ 60 cents per pound of nitrogen) and red clover and white clover fix 75 – 200 and 75 - 150 lb N/acre/yr, respectively. Nitrogen fixation rate in legumes varies with age of stand, soil pH, soil macro-/micro nutrient levels, and degree of pest resistance. As a rule of thumb, if there is more than 40 – 50% of legumes, no nitrogen is required in legume-grass mixtures. That’s why the legume-grass mixture is one of the most efficient systems in terms of utilizing fixed nitrogen. Although there is concern about the possibility of bloat from legumes, bloat is very rare on legume-grass pasture when legumes represent 50% or less. Legumes with high potential of bloat are alfalfa and clovers whereas birdsfoot trefoil and crownvetch are non-bloating legume species.

Legumes generally contain about five times the calcium, 30-50% more phosphorus, and twice the magnesium of grasses. Calcium, phosphorus, and magnesium are very important minerals that are involved in physiological and biochemical processes in the animal’s body because these minerals help maintain milk production, growth, reproduction, and activation of enzymes.

Besides this, including legumes in your pasture will have the following impacts: 1) less summer slump, 2) higher forage quality and animal performance, 3) less plant disease/insect susceptibility, and 4) lower tall fescue endophyte toxicity by diluting ergot alkaloids. Therefore, revisiting the value of legumes and strategies of using legumes will help make your forage-based farming systems more sustainable and profitable.

In summary, legumes are very important forages in terms of nitrogen source and sink in forage-based dairy systems. If legume plants are utilized efficiently, this would make your farming more sustainable economically and environmentally.

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Growing Low Potassium Grass Hay for Close-up Dry Cows

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Extension Dairy Educator
Central Michigan

Early lactation cows often experience low blood calcium due to the demands of the onset of lactation. The resulting hypocalcemia can result in milk fever, retained placenta and mastitis as well as other metabolic disorders (1). High concentrations of potassium (K) in forages fed to dry cows can have a large influence on the incidence of hypocalcemia in early lactation cows.

Implementation of a separate management group, for dry cows that are from 3 to 4 weeks before calving, enables the feeding of a special transition diet. A primary goal is to reduce the concentration of K consumed by the cows before calving (1). The purpose of this article is to provide information on managing K concentrations in the diet of close-up dry cows.

Low K Rations

There are several methods for managing dietary K concentrations in transition cow diets. Inclusion of significant amounts of low K corn silage and (or) straw can lower ration K. A second approach utilizes the addition of blood acidifying anionic supplements to the ration. Low K grains or other feedstuffs also may be employed to dilute and reduce the K concentrations in transition rations. A fourth method is to produce and feed low-K hay forage specifically for the close-up dry cows on the farm.

Production of Low-K Hay

Several factors play important roles in the production of low-K hay forages. The first factor is selection of forage to be grown. Grasses generally are lower in K than legumes. Among the species of grass, there are differences in both K content and cultural characteristics. Research has shown that timothy is the grass specie that has the lowest K content as well as acceptable persistence over a wide range of agronomic conditions (2). For wetter soils, a second choice could be reed canarygrass.

Fields where soil tests low in K are the best choices for growing dry cow forages. Fine textured soils with higher clay contents tend to be soils that test higher in K content. Application of fertilizers is also critical to production of low K forages. Nitrogen applied at spring green-up at 100 lb actual N per acre and another 100 lb actual N after first cutting can result in yields that approach 6 tons of dry hay per acre. Potassium fertilizer applications as well as manures should not be done in order to maintain low soil K. First year forage may have high K content as excess soil K is removed by the crop. Forage production in subsequent years should be lower in K and well suited for feeding programs for transition cows. Forage content less than 0.8% K may be indicative of soil K concentrations that are too low to permit optimal forage yields. Additional small amounts of K may be needed for these soils to allow reasonable forage yields.

Research has shown that second cuttings of grass will have lower K concentrations than first cuttings from the same field. Harvesting grasses with greater maturity also will result in lower plant K concentrations. For this reason grasses that are intended for close-up dry cows should not be cut early in the season. It also is worth noting that K concentrations are lower when a forage is harvested as dry hay versus harvested as silage.

Keys to Producing Low-K Dry Cow Grass Hay

- Choose timothy or reed canary grass and avoid orchardgrass
- Soil test to select and monitor low K fields for growing close-up dry cow hay
- Apply 100 lb actual N at spring green up and after first cutting
- Avoid K fertilizers and manures until demonstrated as needed
- Take two cuttings per year harvested as dry hay if possible
- Store low K hay separately for feeding to close-up dry cows
- Utilize wet chemistry feed analysis to balance rations and monitor forage K concentrations
- Table 1 shows tons of low-K hay needed for close-up dry cows annually.

References


Table 1. Minimum low-K grass hay requirements for dry cows fed 10 lb per cow/day for a 60-day dry period.

<table>
<thead>
<tr>
<th>Tons Required per Year</th>
<th>100-Cow Dairy</th>
<th>500-Cow Dairy</th>
<th>1000-Cow Dairy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres Needed</td>
<td>10</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Tons Required per Year</td>
<td>30</td>
<td>150</td>
<td>300</td>
</tr>
</tbody>
</table>
Culturing from page 5

sample. A new sample should be collected before making a diagnostic or treatment decision. The only exception is if either *Streptococcus agalactiae* or *Staphylococcus aureus* is found in the sample. These bacterial pathogens come from infected cows and should be considered positive until recultured for confirmation. With the exception of *Strep ag* or *Staph aureus*, treatment decisions should only be made from a pure single colony type that is grown in large numbers. With the exception of these two contagious bacteria, one or two colonies on culture plate are not usually important.

Can’t I just treat cows based on clinical signs and get the same results?

Most farms currently treat clinical mastitis based on clinical signs. Because most of the products are selected to treat Gram-positive bacteria, they are effective in many clinical cases. However, on our farm investigations and in clinical mastitis trials, Gram-positive bacteria were not the major cause of clinical mastitis. Therefore, in many mastitis cases treatments with common antibiotic mastitis products are inappropriate. When milk from clinical cases is cultured before treatment, antibiotic treatment can be selected for mastitis cases that are likely to benefit from antibiotic therapy. This can substantially reduce the use of antibiotics in most dairies, get the cows back into the milking string earlier and reduce the cost of mastitis treatment.

How do I know when to use antibiotics and what antibiotic to use?

By culturing clinical mastitis cases, the bacteria can be identified and the best treatment can be chosen to eliminate the infection. In clinical cases where the bacterial infection has been eliminated before treatment, antibiotics are of little use. By culturing clinical cases, farm personnel can identify the major bacteria involved and use antibiotic sensitivity testing to choose the best mastitis treatments. Not all bacteria respond the same and monitoring the herd’s response to treatment is also important. When farm personnel culture their own clinical cases before treating, the most appropriate antibiotic can be selected for the type of infection. Studies on commercial dairies have shown that waiting an additional day before starting antibiotic treatment did not affect the outcome of the infection or jeopardize the health of the animal. (Hess, et al., 2003) In most farms, half of the clinical cases do not need antibiotic therapy. However in severe clinical mastitis, supportive therapy that includes fluids (see page 1 of this issue) and fever reducing drugs should be initiated until culture results are available. These therapy protocols should be designed with the help of the herd veterinarian.

Why do some cows respond to antibiotic treatment and others do not?

Most of the antibiotics used in mastitis preparations (primarily, beta lactams) are effective against Gram-positive bacteria. *Streptococcus agalactiae* are very susceptible to these drugs whereas Gram-negative *coli-forms* are not. Treating early in the infection can improve the drug efficacy by getting the drug to the bacteria in a higher concentration to help eliminate the bacteria, but as the infection becomes chronic it is difficult to obtain high enough concentrations to be effective. This is a common problem with *Staph aureus* that makes it difficult to eliminate these mastitis infections.

How can a farm get started culturing milk? What culture procedure should be used?

The equipment necessary for on-farm culture can be purchased from several vendors. A list of products and vendors are available on the author’s CVM Dairy website, <http://user.cvm.msu.edu/~sears/>. On-farm culturing requires sterile collection vials for aseptic milk sampling, culture plates to grow the bacteria, an incubator to hold a constant temperature while bacteria are growing, and loops or swabs to transfer milk from the vials to the culture plates. Other diagnostic agents including hydrogen peroxide (catalase test) and specific diagnostic tests can be used depending on the skill of the farm personnel. Several culture systems are available but many farms use the Bi-plate (Blood agar/MacConkey agar) culture method as described on our website and published in earlier MDR articles. You also can find a training module presentation at <http://user.cvm.msu.edu/~sears/Web-employee-training.htm>.

Who should culture the milk and how do they get the right kind of training?

Certainly microbiology training is very useful, but we all had to learn at some point. It needs to be a person interested and willing to take the time to learn the procedures.

The person responsible for culturing milk samples should be the same person treating cows and working with the veterinarian at the regular herd visit. This routine feedback provides good training and engages the employee (or owner/manager) in mastitis control. Fewer treatments and a reduction in antibiotic use can be good motivating factors for the employee. However, someone of authority should monitor progress and evaluate the herd’s mastitis response. This may be someone on the farm (owner, manager) or the veterinarian working with the farm.

How do I get started?

Get together with your veterinarian and discuss treatment protocols for your herd. Your veterinarian also can help identify the equipment and products needed to start your on-farm culture. But more importantly, your veterinarian is trained to identify bacterial pathogens that cause mastitis. As you start culturing milk samples your veterinarian can review culture
Can we identify Mycoplasma with on-farm culturing?

Mycoplasma culture requires a special culture media and environment for growing these organisms. Few dairy farms have the media, equipment and personnel that can culture mycoplasma. Dairy farms should select an appropriate laboratory for culturing this pathogen. Culturing bulk tanks for the presence of mycoplasma is a good way to start and monitor control programs. Mycoplasma bovis is a contagious pathogen and when cultured in the bulk tank milk indicates an infected herd. As with other contagious pathogens, management protocols should be developed to deal with cows with mycoplasma infections. The National Mastitis Council has a useful brochure on their website www.maconline.com. Other articles can be found in MDR or on our CVM Dairy Website.

If you are considering an on-farm milk culture program, you should read earlier MDR articles “On-farm Milk Culturing and Mastitis” and “Rethinking Clinical Mastitis Therapy” or go to the CVM Dairy Website before starting. Establishing an on-farm culturing program can help focus your attention on farm deficiencies that are responsible for new mastitis cases affecting milk quality. It is far better to work with professionals in the dairy industry to identify the causes and correct deficiencies than to try to treat cows after they are infected. Diagnosis and treatment is only one tool in eliminating these infections. Our primary objective should be mastitis prevention. Treating mastitis is always an economic loss that should be avoided whenever possible.

References

University and Industry

MSU Dairy Judging in National Contests, Invited to International Competitions

Joe Domecq
Dept. of Animal Science

The Michigan State University Collegiate, Ag Tech, and several Michigan 4-H Dairy Judging Teams spent many summer and fall weekends visiting farms and judging cows in preparation for the 2007 judging season. The teams visited dairy farms in Michigan and across the Midwest. A weekend practice trip included farms in Ohio and a trip to the main offices of Select Sires near Columbus. The hard work resulted in outstanding results at three national dairy judging contests.

The 2007 MSU Collegiate Dairy Judging Team members were Lindsey Bowerman (Quincy), a junior in Elementary Education, Lindsey First (Ionia), a junior in Animal Science, Kayla Stomack (Minden City), a junior in Animal Science, and Laura Zeldenrust (Fremont), an Animal Science junior. The MSU Ag Tech Dairy Management Program was represented by Andre Bruinsma (Morenci), Becky Hale (Brown City), Bill Shuler (Baroda), and Greg Thon (Kingsley).

The first contest of the year was at the Pennsylvania All-American Dairy Show in Harrisburg, PA on September 17. The MSU Collegiate Team and two Michigan 4-H teams participated in the contest. Michigan 4-H was represented by JW Hart (North Adams), Bill Huisjen (Fremont), Nicole Smith (Shepard), and Brittanay Westendorp (Nashville). A second 4-H team, whose members were all also in FFA, competed in the FFA division of the contest to gain additional experience. Team members included Andrew Holloway (Clayton), Sarah Micalek (Deckerville), Liz Reed (Owosso), and Wyatt Shuler (Baroda).

The Collegiate Team placed 4th in Ayrshires, 6th in Guernseys, 10th in Brown Swiss and 10th overall in the contest. Individually, Lindsey First was 10th in Holsteins. Laura was 2nd in Ayrshires and Brown Swiss, 8th in reasons and placed 2nd overall. The Michigan 4-H Team placed 8th in Guernseys, 6th in Jerseys, 10th in reasons, and 12th overall. Bill placed 8th in Guernseys and 9th in Jerseys. In the FFA division, the Michigan team had an outstanding day and placed second
overall in the contest. The team placed 1st in Ayrshires and Brown Swiss, 5th in Guernseys, and 2nd in Holsteins and oral reasons. Andy placed 9th in Jerseys and Wyatt placed 4th in Ayrshires. Liz was 1st in Brown Swiss, 3rd in Guernseys, 7th in Holsteins and oral reasons, and 8th in Ayrshires. Sarah was 1st in Ayrshires and oral reasons, 6th in Holsteins, 10th in Brown Swiss, and 3rd overall.

In early October, the Collegiate, Ag Tech, and 4-H Teams traveled to Madison, WI for the national contests at World Dairy Expo. Michigan 4-H Team members included Heather Fry (Blanchard), Bill Huisjen (Fremont), Nicole Smith (Shepard), and Amanda Solloman (Brown City). The Michigan 4-H Team placed 1st in Brown Swiss and Guernseys, 2nd in Holsteins, 5th in Jerseys, 4th in oral reasons, and 3rd overall in an extremely close contest. By placing 3rd in the contest, this team earned an invitation to participate in the International Livestock Judging Tour in Europe next summer. They will join the 2006 Michigan 4-H team that also placed 3rd overall and will be going on the trip to Europe. Individually, Amanda was 3rd in Jerseys, 13th in oral reasons, and 22nd overall. Bill was 2nd in Guernseys, 8th in Brown Swiss, 9th in oral reasons, and 11th overall. Heather was 2nd in Holsteins, 4th in Brown Swiss and 2nd overall.

The Collegiate Team placed 4th in Brown Swiss, 13th in oral reasons, and 15th overall. Lindsey First was 10th in Holsteins and Laura was 4th in Jerseys. The Ag Tech Team placed 3rd in Ayrshires, 5th in Brown Swiss, 2nd in Guernseys, 7th in Holsteins, 8th in Jerseys, 5th in Milking Shorthorns, 1st in Red and Whites, 6th in oral reasons and 4th overall. Bill was 2nd in Guernseys and 10th in Ayrshires. Becky was 3rd in Red and Whites, 14th in oral reasons and 13th overall. Greg was 12th overall.

The Ag Tech Team also participated in the Practical Contest at World Dairy Expo. This contest offers students an opportunity to utilize practical knowledge and experience and consists of three sections. The first section is evaluating and selecting commercially bred heifers based on price, health status, and production records. Team members evaluate body condition, feet and legs, udder promise, and estimate heifer weights and heights. The second part of the practical contest involves evaluating a group of registered heifers (including pedigrees and genetic values) and determining economic values of the heifers. Linear evaluation of six cows is the third part of the contest. The Ag Tech Team placed 6th in commercial heifer evaluation, 3rd in registered heifers, 5th in linear evaluation, and 4th overall.

The final contest of the year was held at the North American International Livestock Exposition in Louisville, KY. The Collegiate Team placed 4th Brown Swiss, 8th in Jerseys, and 10th overall. Laura was 3rd in Brown Swiss. Lindsey Bowerman placed 4th in Brown Swiss, 3rd in Jerseys, and 12th overall.

The Ag Tech Team placed 3rd in Ayrshires, 5th in Brown Swiss and Holsteins, 1st in Jerseys, 4th in oral reasons, and 4th overall. Andre was 10th in Jerseys and Becky was 8th in Brown Swiss and 2nd in Jerseys. Bill was 4th in Ayrshires, 3rd in Jerseys, and 8th in oral reasons. Greg was 2nd in Ayrshires, 10th in Brown Swiss, 7th in Guernseys, 9th in Jerseys, and 4th overall.

Michigan 4-H was represented in this contest by Katie Arndt (Ovid), Chris Elder (Evart), Sarah Mann (Hillsdale), and Sarah Mowry (Burlington). This team placed 2nd in Holsteins and Jerseys, 8th in oral reasons and 7th overall. Sarah Mann was 6th in Jerseys and 10th in Holsteins. Katie was 9th overall.

The Michigan 4-H teams are selected from the top 25 individuals at the state judging contest held during Michigan Dairy Expo in July. These individuals are invited to participate in several workouts during August, and the teams for each contest are selected at the end of August. All 4-H youth are invited and encouraged to participate in the contest at Michigan Dairy Expo and try-out for one of the national teams. The Collegiate and Ag Tech team members are selected from students at Michigan State University who have completed a judging course and have been part of the judging program during their education at MSU.

The MSU Dairy Judging Program would like to extend appreciation to all of the individuals, farms, and agricultural businesses that support the program by providing cattle, expertise, and financial support. Special thanks to Sarah Black and Renee McCauley who coached and traveled with the teams to various contests and workouts this fall. The MSU Dairy Judging Program is coordinated by Dr. Joe Domecq.
Attention to Details Gets Cows Pregnant at Ladine Farms

J. Richard Pursley
Dept. of Animal Science

Phil Taylor
Extension Dairy Educator
Barry, Calhoun, Eaton, and Ionia Counties

Dave and Sally Bivens, co-owners of Ladine Farms, get a lot of milk out of their cows. Their herd ranked fifth in Michigan in 2007 for DHI rolling herd average for milk (31,796 lbs) and most of that time they milked 2X. But, look out, the herd is back on 3X milking and the herd average continues to climb. One would think that their cows would have a hard time getting pregnant giving that much milk. It seems there is a common belief that the more milk cows give the less likely they are to conceive. But amazingly enough, Bivens’ November 2007 DHI summary showed that conception rate (the measure of fertility of the herd) was running 53% for the previous 12 months. Yes, 53%! How do they do it? On a cold snowy winter morning Dave took time from his busy schedule to discuss with us all the things he thought contributed to such a high level of herd fertility. According to Dave it is all about attention to details from cow comfort to depositing the semen. Here is how Ladine Farms accomplishes such a feat.

Intensive Heat Detection Program

Dave and his crew check for heats eight times per day. Since Dave keeps impeccable records and he knows his 100 milking cows about as well as his kids, he knows which cows are due in heat. Checking that often allows Dave to detect cows in heat that are most likely at the very start of their period of estrus behavior. This is the critical time to find cows in heat because the clock towards ovulation starts ticking at the onset of heat. In fact, Dave knows that ovulation will occur about 28 hours following the start of estrus behavior. He also knows the ideal time to inseminate cows is about 12 hours before ovulation. So what does Dave do? Regardless of when he first detects cows in heat, he makes sure he breeds those cows 16 hours after that first sign of standing estrus. Yes, through rain, sleet, snow and dark of night, Dave is out there making sure the semen is deposited at the most ideal time to maximize chances of a pregnancy. In the fall of 2007, the Michigan State University Advanced Dairy Management Class taught by Drs. Miriam Weber-Nielsen and Herb Bucholtz visited Ladine Farms focusing on reproductive management. After Dave described his standard operating procedure (SOP) for timing of insemination, one student asked the question “If a cow is first detected at 10 a.m., does this mean that you are out here at 2 a.m. to breed this cow?” Dave’s answer, “yes I am!” underscored his tenacity when it comes to complying with his SOP. He also emphatically used this example to point out the myriad of “details” that he has to focus on daily to stay competitive as a small operation in the dairy business.

Deep Horn Deposition of Semen

Besides paying close attention to detail when thawing, loading and handling the AI gun so that semen remains thermal-neutral until deposition, Dave carefully deposits one-half of the straw as far into each horn as possible without encountering any obstruction and without any manipulation of the horns. Dave believes that part of his success with fertility is due to his careful and deliberate deep uterine horn deposition. Previous research results from our laboratory and from Dr. Michael Diskin’s laboratory in Ireland demonstrate that deep uterine horn deposition may enhance conception rate. In these two studies, it was apparent that some technicians can use the deep uterine horn technique to improve fertility and some cannot. We are not sure why there are such differences in inseminators, but some of our results would argue that too much manipulation of the horns is detrimental to the success of this technique.

Healthier Cows = Greater Fertility

In our opinion, Dave and his crew do a fantastic job of managing cows. One of the aspects of management that stands out is how clean and comfortable his cows are no matter when you show up at the farm. The sand bedded free stalls are always immaculate. They are always clean and free of manure and are raked so that they slope perfectly from front to back. Free stalls are cleaned and raked after every milking. It is no wonder his cows always look like they have just been washed and ready to lead into the show ring. You might say that every day is a day at the beach for these cows. Well, almost!
Another important aspect of management as it relates to reproduction that is quite noticeable at Ladine is that there are very few - if any - lame cows. Dave keeps a hoof trimming chute in the return alley from the parlor to the free-stall barn and uses it frequently. There is no question that feet and leg health are critical to the estrus detection program at Ladine Farms.

In 2002, we published a paper that evaluated the impact of level of individual cow milk production on fertility. Results from that study, like a number of our studies, were collected at Nobis Dairy, St. Johns, MI. One of the interesting aspects of this study was that the greater the milk production the greater the fertility. This was quite contrary to a number of previous studies. Since that time, two other large studies found very similar results when looking at cow fertility within herds. A simple explanation of this phenomenon would be that the healthier the cows, the more milk they produce and the more fertile the cows will be. This certainly would fit the profile of the cows at Ladine Farms.

Final Thoughts

We’ve touched on a few key aspects of management at Ladine Farms that likely make a big difference in the fertility level of their cows. Dave also credits a voluntary waiting period of 80 days, his high quality forage, and the use of some high fertility bulls for some of his success (more attention to the details!). He said it is very important for him to work very closely with his veterinarian to know exactly what is going on reproductively with each of his cows. Congratulations to Dave and Sally and their crew for a job well done! We look forward to watching the progress of reproduction at Ladine Farms as their milk production continues to climb!
Michigan Milk Market Update

Chris Wolf
Dept. of Agricultural, Food and Resource Economics

The story continues to be high commodity prices, especially feed crop prices for dairy farms. The first “planting intentions” report was released recently and predicted an 8% decline in corn acreage, with soybeans (+18%) and wheat (+6%) up over last year. The result, as you probably noticed, was an increase in corn price and limit moves down in soybeans and wheat. It is clear that feed prices will be high in 2008—and that occurs even if there is no weather event that affects crop yields. The longer-term forecast, 5 to 10 years out, from several sources is for continued high prices in the neighborhood of $4/bushel or more for corn and $9/bushel for soybeans. There likely will be a great deal of volatility in these prices, but everyone agrees that the days of $2.25/bu corn average prices are gone for the foreseeable future.

The expected strong corn, soybeans and hay prices have had a bullish effect on the milk price for 2008 because milk supply growth is expected to slow. That is, even if you are growing all your own corn, you still have large increases in cost of production and the opportunity cost is the price for which you could have sold the corn.

Historically, we have used the milk-to-feed price (MF) ratio as the measure of the profitability of milk production. There are reasons to think, however, that the ratio is not the best measure when we get to very high milk prices. Using the milk and feed prices, we can calculate income over feed costs (IOFC) as the dollar value difference between the two. IOFC is the margin over feed costs that is available to pay for all other costs including unpaid labor, management and capital. Figure 1 displays the US MF and IOFC from January 2005 through March 2008. Over this period, the MF ratio averaged 2.73 which historically would have been considered low. Meanwhile, the IOFC averaged $10.38/cwt which is above the historical average. The high IOFC average was largely produced by the second half of 2007 where it hit $14.75/cwt. Prior to 2007, the milk price was almost exclusively driving volatility in the MF ratio and IOFC. Since 2007 feed prices are the major volatility driver.

With continued high feed costs, the projection is currently for milk production to slow down from trend growth in the second half of 2008. The current Class III milk futures are indicating an average price of $18.55/cwt which is much stronger than a couple of months ago. The weather this summer, potential CWT buyouts, the Farm Bill, exchange rates, and many other factors will affect the milk price as we move through 2008.

Figure 1. US MF and IOFC from January 2005 through March 2008.
Dairy Educator
Cullens Makes New Addition to MSU Dairy Team

Jacob McCarthy
Dept. Animal Science

The Michigan State University Extension Dairy Team has a new member, Faith M. Cullens. Cullens will serve dairy producers in Clinton, Gratiot, and Shiawassee Counties beginning May 1.

“I think Faith brings a tremendous amount of private industry experience coupled with a sincere commitment to Michigan’s dairy industry that will allow us to build upon our past success in providing educational programs to our local farmers,” said David Ivan, Clinton County Extension Director.

Cullens comes to MSU Extension from Cargill, Inc., where she has worked as a sales advisor, formulating rations and performing on-farm trouble-shooting and other duties since 2005. Cullens earned a Bachelors degree in Zoology and Animal Science at MSU, researching dairy nutrition issues with Dairy Team member Dr. Michael Allen as her advisor. For her masters degree in Animal Science, Cullens went on the University of Florida, where she continued to study dairy cattle feeding practices.

“We’re very excited about her experience in dairy nutrition and her passion of working with producers of all sizes helping everyone be successful,” said Gratiot Country Extension Director Dan Rossman. “Our dairy industry is strong here in our area and we’re pleased to have someone of her caliber to work with the producers and the industry to make our dairy industry even stronger.”

Calendar of Events
April - July

New Horizons in Johne’s Disease Control
April 18
Michigan State University
Henry Center
Contact: Dan Grooms at 517-432-1494 or groomsd@cvm.msu.edu

Biennial Clean-in-Place (CIP) Workshop
June 10-11
MSU Dairy Foods Complex (South Anthony Hall)
http://fshn.msu.edu/CIPShortCourseBrochure.pdf
Contact: John Partridge at partridg@msu.edu or 517-355-7713 x179

Great Lakes Manure Handling Expo
July 9
Molly Caren Agricultural Center
London, OH.
Contact: Tami Combs at 614-292-6625 or combs.155@osu.edu

2008 Ag Expo
July 15-17
Michigan State University
Contact: 1-800-366-7055
<http://www.agexpo.msu.edu/>

Michigan Dairy Expo & 4-H Dairy Days
July 21-25
MSU Pavilion
Contact: Joe Domecq at 517-353-7855 or domecqjo@msu.edu

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