When To Harvest My Alfalfa?

Kathy Lee, Mike Allen¹, Rich Leep², Dennis Pennington and Stan Moore
MSU Extension, Dept. of Animal Science¹, Dept. of Crop and Soil Sciences²

Alfalfa is an important forage for dairy cows because it provides fiber that effectively stimulates chewing while also providing energy and protein for milk production. The measure of fiber most commonly used to balance rations of lactating dairy cows is neutral detergent fiber (NDF). The optimum concentration of NDF for alfalfa is 40%. Alfalfa containing 40% NDF allows reasonable grain concentrations in the ration while maintaining adequate dietary NDF concentrations. The protein concentration of alfalfa with 40% NDF is usually moderate (approximately 20% of DM) and additions of low protein grains such as corn allow flexibility in diet formulation for ruminally-undegraded protein while avoiding excessive protein concentrations (1).

Delaying alfalfa harvest increases NDF percentage and reduces protein concentration. More grain will be required to increase energy density and decrease the NDF concentration (and filling effect) of the diet. In addition, more supplemental protein will be required to meet the cows’ protein requirements and dry matter intake and milk production likely will be reduced.

Methods of Predicting NDF

Several methods have been proposed recently to predict timing of first cutting alfalfa harvest based on NDF concentration:

$\text{ }$
$\text{ }$

\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
$\text{ }$
PEAQ

The PEAQ method (3) is based on an equation that uses the length of the tallest alfalfa stem and the stage of the most mature alfalfa plant (will likely be two different plants) in the area sampled. The current modified PEAQ method uses a scale of three stages of maturity (late vegetative, bud, and flower). Measuring sticks, calibrated for the three plant maturity stages, are used to obtain estimates of NDF.

While obtaining PEAQ estimates of NDF, producers can scout their alfalfa fields for winter injury, disease development, insect damage, and weed encroachment (4). Good sampling technique is critical to ensure reliable NDF estimates. It is important to obtain NDF estimates using the PEAQ method at five or more locations across the field.

As with GDD, the PEAQ method was developed for pure stands of alfalfa. NDF estimates from PEAQ will not account for weeds or grasses in the stands. PEAQ is not reliable for estimating NDF when alfalfa is very short (longest stem less than 16 inches) or very tall (longest stem more than 40 inches).

Scissors-cut Samples

Scissors-cut samples provide a direct measurement of NDF in the collected plant material. Sampling technique is critical. A representative sample must be obtained from across the field. Sample handling also is important to minimize respiration losses prior to the sample arriving in the laboratory. In addition, errors can occur with near infrared reflective spectroscopy (NIRS) analysis of scissors-cut samples because equations for fresh alfalfa are not generally available (4).

Field Project in Michigan

In the year 2000, we conducted a field research project in Michigan to compare different methods of predicting alfalfa NDF concentrations over first, second, and third cuttings. The methods compared included GDD (base 41°F), PEAQ, and scissors-cut.

The project consisted of samples and data collected from alfalfa fields in 35 locations throughout Michigan, including five locations in the Upper Peninsula. Daily maximum and minimum temperatures were collected with electronic data loggers in each field.

We compared the NDF predicted from these samples with the NDF of chopped alfalfa both before and after ensiling in laboratory silos. Immediately prior to cutting the alfalfa field, the PEAQ stick was used to predict NDF and the scissors-cut sample was taken. The field-wilted alfalfa was sampled immediately prior to chopping. This sample was manually “chopped”, and either dried within 24 hours or immediately ensiled in laboratory silos. The scissors-cut, chopped, and ensiled samples were analyzed for NDF concentrations by wet chemistry procedures at the Michigan State University, Department of Animal Science.

Summary of Results

$ NDF concentrations of the ensiled alfalfa ranged from 35 to 46% for first and second cuttings. Third cutting NDF was from 35 to 52%, dry basis.

$ NDF concentrations of ensiled alfalfa samples were predicted adequately by all three methods for first and second cutting. Although there was little difference between GDD and PEAQ for first and second cutting alfalfa, we do not recommend using GDD for predicting NDF concentration of second cutting alfalfa due to the potential of inadequate soil moisture during second cutting growth.

$ The scissors-cut method was the only method that adequately predicted NDF for third cutting.

$ The error associated with the methods was slightly lower for PEAQ compared with GDD and scissors cut for first and second cutting. When PEAQ was used to predict NDF, about 2/3 of the samples were predicted within +2.3 units of NDF for first cutting and within +2.8 units of NDF for second cutting. When GDD was used, about 2/3 of the samples were predicted within +2.6 units of NDF for first cutting and within +3.1 units for second cutting.

$ There was good agreement between NDF concentrations of the fresh chopped and ensiled samples harvested from the same fields at the same time. Please note, though, that these samples were handled under ideal conditions. It is likely you would see greater differences in NDF between fresh and ensiled samples with standard ensiling procedures on the farm.

What We Recommend

Based on the results of this project and previous research, we recommend the following.

$ Use PEAQ or GDD to predict NDF for first cutting alfalfa and only PEAQ for second cutting alfalfa. These methods are not recommended for third cutting alfalfa.

$ Begin cutting alfalfa at 40% NDF (750 GDD, base 41°F) for upright silos and 38% NDF (680 GDD, base 41°F) for horizontal silos. Start even earlier for horizontal silos if it takes more than a week to finish harvesting.

$ The GDD and PEAQ methods cannot be used for fields containing grass.

$ Fields containing grass should be harvested first. Start with the fields with the most grass first and finish with the purest alfalfa fields.
Consider using the scissors-cut method for fields containing grass and for third cutting alfalfa. Shipping samples to the forage testing laboratory by next-day delivery will help to minimize deterioration in sample quality. Wet chemistry analysis is most appropriate for scissors-cut samples.

Acknowledgments

We express our appreciation to the 19 MSU Extension Agents and research associates who diligently collected data and alfalfa samples. We also acknowledge the efforts of Dave Main who conducted the laboratory analyses. Lastly, we thank the 35 dairy producers in Michigan who allowed us to collect alfalfa samples and temperature data from their fields.

References


Business and Finance

April 2002:
Michigan Milk Market Update

Christopher Wolf
Dept. of Agricultural Economics

National milk production has recovered somewhat from 2001. Last year production levels were down slightly relative to 2000 production due to lower milk production per cow. Several potential explanations for the lower production per cow include weather related forage quality and lack of heifer replacements requiring sub-par cows be kept in milking herds rather than being culled.

Price Ratio

Since 1998, the national milk price-to-feed price ratio basically has remained above 3.0 and even exceeded 4.0 a couple of times (Figure 1). Values above 2.5 are considered conducive to encouraging increased milk production. After many years of declining milk cow numbers, the number of milk cows in the top 20 dairy states increased from October 1998 through October 2000 (Figure 1). This increase in numbers of milk cows was driven, at least in part, by the potential for profits with low feed prices and excellent milk prices in 1998 and 1999.

As Figure 1 shows, numbers of milk cows and the milk price-to-feed price ratio generally have moved counter to each other. However, milk prices in 2000 were low enough to turn the total cow numbers back to a declining trend. Good milk prices in 2001 resulted in more retained cows towards the end of the year. Total cow numbers and the milk price-to-feed price ratio indicate the potential for a large supply of milk in 2002 depending on weather effects and the replacement heifer market. California had 60,000 more milk cows and 20,000 more replacement heifers on January 1, 2002 than on the same date in 2001. Similarly, Idaho had 23,000 more milk cows and New Mexico 29,000 more. Michigan was down 3,000 milk cows to 297,000 but replacement heifer numbers increased from 130,000 to 135,000. The other major dairy states generally had fewer cows than the previous year, but several had more replacement heifers, indicating the potential to increase the size of the national herd in the future.

Table 1. Michigan dairy herd size and production distribution.

<table>
<thead>
<tr>
<th>Year</th>
<th>Category</th>
<th>Total</th>
<th>1-29</th>
<th>30-49</th>
<th>50-99</th>
<th>100-199</th>
<th>200+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>Farms</td>
<td>5,000</td>
<td>26</td>
<td>24</td>
<td>30</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Milk Production</td>
<td>5.435 billion lb</td>
<td>3.5</td>
<td>11.2</td>
<td>31.2</td>
<td>32.9</td>
<td>21.2</td>
</tr>
<tr>
<td>1997</td>
<td>Farms</td>
<td>4,200</td>
<td>26.2</td>
<td>21.4</td>
<td>26.2</td>
<td>20.4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Milk Production</td>
<td>5.410 billion lb</td>
<td>3</td>
<td>8</td>
<td>23</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>2001</td>
<td>Farms</td>
<td>3,300</td>
<td>31.8</td>
<td>16.7</td>
<td>24.2</td>
<td>18.8</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td>Milk Production</td>
<td>5.730 billion lb</td>
<td>3</td>
<td>5.5</td>
<td>15.5</td>
<td>27</td>
<td>49</td>
</tr>
</tbody>
</table>

Figure 1. Milk cows and milk price-to-feed price ratio, top 20 states.
Prices to Follow National Lead

Michigan milk prices in 2002, with the majority of milk used for fluid and cheese products, will follow the national market lead and depend heavily on changes in supply and demand. For 2001, Michigan milk production increased 1.8 percent to a total of 5.73 billion pounds (Table 1). The U.S. Department of Agriculture tracks “operations (farms) with milk cows” and publishes the size distribution with accompanying production values (Table 1). For the smallest herd size category (1 to 29 cows), many farms that would not be considered commercial dairy farms, are included. However, for the larger sizes, these values are a measure of dairy farm numbers. The smallest herd size category has increased in percentage of farms from 1993 to 2001 simply because the total number has declined—not because there are more than 1 to 29 cow herds. The 30 to 49 cow and 50 to 99 cow herds have had the majority of the losses with 650 and 700 herds lost, respectively, from 1993 to 2001. Of course some of the smaller herds have moved to a different size category through expansion. The largest category displayed, 200 or more cows, had 280 herds with 49 percent of the milk production in 2001. In fact, 65 herds with 500 or more cows produced 26 percent of the milk production from Michigan. The national situation is similar. Of the 97,560 operations nationally in 2001, 325 operations had 2,000 or more cows and produced 12.7 percent of the total milk.

Family Business – Family or Business?

There is a German saying referring to family businesses. It goes like this: “The first generation struggles to build it from scratch. The second generation improves it and expands it. The third generation spends it.”

Although this saying does not apply to all family businesses, there is a lot of truth to it. Many families struggle to overcome these tendencies. Many businesses get in trouble over family issues. However, both family and business can benefit from working and growing together. Most dairy farms are family businesses. Understanding different perspectives of your family business can help you avoid the potholes along the way and contribute to making the best out of future opportunities. In their book “Generation to Generation,” Gersick and colleagues developed a model of looking at family businesses that offers helpful insights for the family farm (1).

Three Perspectives

Of course, there are many different ways to evaluate a family farm. Three perspectives are crucial to meeting the challenges of family enterprises: business, ownership, and family. Family businesses differ in how they are organized around these three perspectives. Although they overlap, they should be viewed as separate subsystems.

Persons involved in your family business, whether family or employees, can be viewed from ownership, business or family perspectives. Figure 1 shows where different people are in relation to each perspective. Everybody who is family is in circle 1. Everybody who is working in or for the business is in circle 2. Everybody who is a shareholder is in circle 3. If everyone in your family business would be only part of one circle and be nothing else to the enterprise, then the three circles would not overlap. But then we would not be talking about a family business. That’s what is special about family businesses: people involved are part of different circles.
On the other hand, family members who are not part of the business nor owners, might not understand how you can spend so much of your quality time working on business issues. A family crisis might be caused when there is a lack of understanding about levels of involvement. The classical in-law scenario is based on such a conflict: a son or daughter who is not yet an owner of the parents’ farm is spending every weekend working. Long hours and the number of times he or she misses the joint dinner or the long awaited theater evening result in hurt feelings. An outside working spouse often won’t tolerate this situation for very long.

Potential conflicts can be prevented or solved more easily when you clarify everybody’s position in the overlapping circles. Take two brothers who have inherited the farm from their deceased father. One has never worked on the farm but is now a 50%-owner. He is in sector 4. His brother is the manager and also has become 50%-owner. He is in sector 7. The non-employee brother wants to get some dividend out of his ownership. The managing brother wants to invest in a new milking parlor. Both have difficulties understanding why it is so hard for them to agree on the right course of action because they have always been very close. Seeing the rationale behind their different interests makes it easier for them to find a solution that did not hurt their relationship.

**Family as Employees**

Another area of challenges for the family farm is sector 5, the overlap between family and business. Facing the decision as to which family members should work on the farm and who will seek employment somewhere else can create a difficult situation for the farming family. Employee owners (sector 6) can be rather resentful about family members being drawn into the business with what they perceive as minimal qualifications. They like to see the best person hired for the job. They have concerns when someone enters the business with special privileges but lacking needed skills.

On the other hand, for many families it is part of their culture and philosophy as a family farm to have as many family members as possible working together in the same business. One of the benefits of all the hard work on the family farm is the opportunity to work together as a team with the people you trust and love. A son or daughter growing up on the farm is not just another employee. Ideally, they have been part of the business and contributed since an early age. They know the farm from youth and have learned the trade very thoroughly, in a way that cannot often be achieved by someone from the outside.

Certainly the ideal is not always realized, and sometimes the employees’ fears of another family member stirring things up are justified. Therefore, if you want your children to grow up to become employees, managers, and at some point owners of your dairy farm, you will have to prepare for this early on. Start by sharing with them at an early age what is going on. Let them participate in farming decisions at increasing levels.

If you keep the right to make final decisions until the very end, they won’t grow up to be the managers and owners you want them to be. Family farm succession is a long-term project. It starts when your family is still young and control of the business might still be with the older generation. While your parents plan to relinquish control to the next generation, you might already begin to share it with your children. Often this is a difficult step to take.

For the sake of the family, the employees, and the business, aspire to define everybody’s role on the family farm. As long as the family member is an employee, the “chain of command” has to apply to him or her, the same as to other employees. The wages have to be fair, depending on work done. No extra dollars should be paid for family membership. If someone in the family needs more money, look for other ways to do this: a loan, dividends based on ownership, or a different higher paying job if the person is qualified. However, it can hurt your dairy farm to base promotion on family membership. You might lose your best employees if they feel they will not be promoted or they are doing the less interesting jobs because there is always someone outranking them.

High benefits, high challenges, hard work and great fun are the different aspects of a family business. Meeting the challenges and having fun together after hard work is rewarding. People and businesses change over time, and new challenges are just around the corner. But different generations working and growing together is a way of life.

**Clarifying Interests**

Sometimes family and business issues get mixed up and ongoing misunderstandings have led to deep wounds that keep the family and the business from prospering. In these cases an outside mediator can support the family. If the main issues are related to the business, a consultant might be the best choice. But where the problem exactly lies is difficult to see for those involved when tensions are high. Your local Extension Agent may be able to help you sort out the issues and decide how to proceed. Defining everyone’s position and the use of management tools can prevent or reduce unnecessary tension.

Each person can live up to their potential and develop his or her role in the family business, once individual situations are clarified. Interests coming from the different perspectives will be obvious to anyone involved. Developing joint decisions will become less painful, and solutions can be found more easily. Possible conflicts may even be avoided. Clarifying where everybody stands will contribute to smoother relationships and better business decisions.

Herd Replacement Management

Raising Dairy Heifers: Fit or Fat

Luis F.P. Silva and Michael J. VandeHaar
Dept. of Animal Science

Level of milk production of a cow is determined by: 1) the ability of the mammary gland to produce milk; 2) the ability of the cow to provide the mammary gland with nutrients; and, 3) the ability of the farmer to manage and care for the cow. The ability of the mammary gland to produce milk is largely dependent on its content of milk-secreting cells. The number of milk-secreting cells is determined by genetics and by the management during mammary development, especially during the rapid mammary growth that occurs before and during the time of puberty, between 3 and 10 months of age.

An effective heifer rearing program is critical to produce animals at first calving that have well-developed mammary glands capable of producing to the animal’s genetic potential, and that have sufficient body size and body condition capable of high feed intake and delivery of nutrients to the mammary gland. All available data suggest strongly that if heifers are grown too fast, have too much body fat, or are too small or too thin at calving, future production of milk will be compromised.

The goal of this article is to review the effects of nutrition on mammary development and growth of heifers. While we recognize that nutrition of the young calf and of the pregnant heifer, especially during late pregnancy, are critical for maximizing health and productivity, this review will focus on rearing heifers from 3 months of age to breeding.

Heifer Growth, Future Milk Yield

For minimal calving problems and acceptable milk production, heifers should weigh 1200 to 1300 lb after calving. Current data suggest that first-lactation milk yield will be 700 lb less for every 100 lb body weight below 1250 lb. To achieve a body weight of 1250 lb after calving, heifers must weigh about 1400 lb before calving, and they must gain an average of 1.8 lb/day from birth to calving if they are to calve at 24 months. Because daily body weight gains often are slower in the first 3 months of life, gains thereafter must approach 2.0 lb/day.

Growth and Mammary Development

The period between 3 and 10 months of age is a critical time in mammary development. During this time, mammary growth is rapid and “allometric”; in other words, mammary tissues grow at a faster rate than that of most other body tissues. Growth of the mammary gland once again becomes isometric (same growth rate as other body tissues) shortly after puberty (first heat). High energy intake and rapid body weight gain before puberty impair mammary development and subsequent milk production. However, high energy intake and rapid body weight gains after breeding have little effect on subsequent milk production if calving occurs at optimal body size and body condition. Although rapid body growth after puberty does not impair mammary development, it may cause some heifers to get too fat. Those heifers are more likely to have calving problems (dystocia) and metabolic disorders.

The udder of a cow contains two major types of tissue, parenchyma and fat. The parenchyma contains the cells that will one day produce milk. During the prepubertal period of mammary development, the parenchyma extends into the mammary fat pad in a “broccoli-like” fashion and forms the foundation for later mammary development. The amount of parenchymal tissue present at puberty is related closely to the amount of milk the udder will one day produce. The most accurate method to measure the amount of parenchyma in a young heifer is to slaughter the animal, dissect out parenchyma, and quantify the number of mammary parenchymal cells.

Multiple studies have shown that mammary development and future milk production are impaired when heifers are fed diets that promote body weight gains greater than 2.2 lb/day during the critical prepubertal phase of mammary growth. For example, Sejrsen et al. (1982) fed heifers at high or low intake of an energy-dense diet to gain 2.8 or 1.4 lb/day from 7 months of age to 700 lb body weight, and they found that heifers fed high energy had 32% less mammary parenchymal DNA than those grown slowly. Recently, we showed that feeding a high energy, high protein diet for a prepubertal growth rate of 2.6 lb/day, compared with 1.8 lb/day, decreased milk production 12% in the first lactation (Radcliff et al., 2000). In addition, there are at least three other published studies with prepubertal growth rates greater than 2.2 lb/day. All

All available data suggest strongly that if heifers are grown too fast, have too much body fat, or are too small or too thin at calving, future production of milk will be compromised.
three demonstrated that heifers fed high energy to promote rapid growth before puberty produced less milk as cows.

This decrease in mammary development is difficult to demonstrate on commercial farms because there is no apparent reduction in udder size in the live animal (the parenchyma is only part of the udder). Moreover, milk production occurs at least 1 year later, and it is affected by several other factors, including genetics, environment, feeding, and management during the time around calving and lactation.

The relationship between prepubertal body growth rates and mammary development is complicated by the fact that heifers will grow fast for one of two reasons. When heifers are fed ad libitum and grown in a good environment, feeding a diet high in energy density will result in faster body weight gains. Along with faster gains, the heifers also will become fatter, and as research has shown, average gains greater than 2.2 lb/day will reduce subsequent milk production at least 10%. However, within a group of heifers fed the same diet, some will grow faster than others, and we found that these faster growing heifers are actually the leanest in the group. Moreover, they do not have less mammary parenchyma or produce less milk once they become cows. Instead, the animals within a group that were the fattest around the time of puberty had the least mammary parenchymal tissue.

The idea that the heifers that grow fastest within a group might have less body fat and produce as much or more milk than herdmates was not unexpected. Fat accretion takes more feed per pound of gain than does lean gain because fat contains no water and is calorically more dense than lean gain. So if two heifers eat the same amount of feed, the one that partitions more feed energy to lean tissue would gain more body weight. The same metabolic controls that enable rapid lean gain in a heifer might stimulate greater milk yield once she is a cow. For example, if an animal naturally produced more growth hormone, she would grow faster and leaner as a heifer and produce more milk as a cow. Perhaps some heifers grow faster because they have better immune systems or greater appetites—these traits also might increase production of milk once heifers become cows. We suggest that if a heifer has the potential to grow fast without accumulating excessive body fat, she will likely produce as much milk, if not more, than her herdmates.

### Body Fat and Mammary Development

The fact that feeding for rapid growth decreases subsequent milk production has been known for 85 years. At one time, the theory for this relationship was that rapid growth was associated with too much fat deposition in the udder. Later, the predominant view was that the fat itself was not the problem, but rather that feeding for rapid growth caused hormonal changes, such as lower growth hormone concentrations, that reduced mammary development. We suggest that both of these ideas are true. Perhaps the extra fat in the udder or other body tissues causes hormonal changes that inhibit growth of the parenchymal tissue.

In support of the idea that accumulation of fat is detrimental to optimal mammary development, McFadden and Cockrell (1993) observed a decrease in growth of mammary parenchymal tissue when it was incubated with adipose tissue. This suggested that the fat tissue was secreting a compound that inhibited growth of mammary cells. We suggest that leptin, a hormone produced by adipose tissue is at least partly responsible for this effect. Fat animals have more leptin in their blood. We found that when bovine leptin was added to the media of proliferating mammary cells in culture, growth of the cells was suppressed 25%. Furthermore, we found that bovine mammary cells express the leptin receptor, confirming that leptin could suppress mammary cell growth.

### The Bottomline

The picture that emerges from these studies is that it is not necessarily body weight gain of heifers that reduces mammary development, but rather it is accumulation of fat during the prepubertal period. If so, trying to feed heifers to maximize lean growth while minimizing fat growth would benefit lifetime production of milk. However, until new studies prove that excess fat is in fact the reason that rapidly-grown heifers produce less milk, we discourage rates of gain faster than 2.0 lb per day even if the heifers do not gain excessive body fat. Growth that is too fast and associated with too much body fat gain most commonly occurs on farms when heifers are fed diets high in corn silage, especially if protein supplementation is inadequate.

### Recommendations

We recommend the following targets for typical Holstein heifers grown in intensive management conditions: age at first calving = 22 to 24 months; body weight after calving = 1250 lb; height at calving = 56 inches at the withers; body condition score at calving = 3.0 to 3.5; growth rate from 3 to 10 months of age = 1.7 to 2.0 lb/day.

### References


### Upcoming MSU Heifer Research

What growth rates and body condition scores are best? What size should heifers be at breeding and calving? We recently received a USDA grant to answer these questions on commercial farms, so funds are available to reimburse expenses. If you are interested in cooperating, please contact Dr. Mike VandeHaar, Dept. Animal Science, (mikevh@msu.edu; 517/355-8489).
Feedborne Pathogens Can Affect Cattle: Part 2

Dan Grooms
Dept. of Large Animal Clinical Sciences

This is the second in a two-part series reviewing pathogens of cattle that may originate from contaminated feedstuffs. In Part I, cattle pathogens that commonly originate from fecal contamination of feedstuffs were reviewed. In this article, feedborne pathogens that originate from other sources will be reviewed.

**Listeriosis.** Listeriosis is caused by the bacterium *Listeria monocytogenes*. This bacterium is common in soil and on vegetation. It can survive in silage at low pH (< 4.0) and multiply in poorly fermented silages where the pH is greater than 5.0 (2). The development of disease associated with *Listeria* is often associated with feeding of silage (4). Isolation of *L. monocytogenes* is greatest in silages that are poorly fermented and spoiled (3). Infection in cattle can result in several clinical outcomes including encephalitis, abortion, keratitis, and mastitis. Encephalitis results in a neurological syndrome that is commonly referred to as “circling disease” because of the often-demented circling behavior of affected animals. Abortions caused by *Listeria* are sporadic and may occur at any stage of gestation. Exposure to *Listeria* through diet and the environment is common and unavoidable. Under normal conditions, the bacteria can replicate in the gastrointestinal tract with no adverse effects. It is theorized that breaks in the mucosal surfaces of the gastrointestinal tract allow the bacteria to penetrate the mucosal surface and invade the central nervous system (2). Conditions that increase concentrations of the bacteria would increase the odds of this occurring. In addition, immuno-suppressive conditions may be contributory in allowing the bacteria to replicate once they have gained entry into the body. The widespread presence of *Listeria* in the environment precludes complete avoidance of the bacteria. However, precautions to reduce exposure should be taken. Efforts should be made to limit soil and fecal contamination of forages harvested for silage. Care should be taken to ensure proper fermentation of ensiled feeds. *Listeria* is more likely to be found in silage with a pH greater than 5.6 as well as silage that is moldy.

**Botulism.** Botulism is a rare disease of cattle caused by ingestion of a neurotoxin released by the bacterium *Clostridium botulinum*. The disease is rapidly fatal and is characterized by paralysis. *Clostridium botulinum* is a spore-forming bacterium that can survive in the environment for long periods. It replicates in decaying animals and plant material. Botulism invariably occurs following ingestion of feedstuffs that contain the toxin. The source of the toxin may include dead rodents or cats in feed or water sources and rotting vegetation. Outbreaks also have been traced to the feeding of poultry waste, brewer’s grain, and improperly fermented grass silages (1). A recent report of the death of 11 Holstein cows in Tennessee was linked to feeding of round bale barley haylage (6). In a review of Eastern US outbreaks of botulism, feeding of ensiled small grain grasses and use of plastic fermentation systems (ag bags, plastic silage tubes, silage bales) were found to be most commonly associated with botulism (10). Prevention of botulism includes avoiding contamination of feedstuffs with dead animals and proper fermentation and storage of silages and haylages. Special care should be taken when harvesting small-grain forages and when using plastic fermentation systems. Feeding of any spoiled material is not recommended.

**Anthrax.** Anthrax is caused by the bacterium *Bacillus anthracis*. Similar to *Cl. botulinum*, *B. anthracis* is a spore-forming bacterium that survives for long periods in the environment. It is a rapidly fatal disease that can affect most mammals, but cattle appear most susceptible. The occurrence of the disease is sporadic although there are regions of the country and world where the disease is much more common than others. The most common route of infection is ingestion of feedstuffs contaminated with the bacteria (5). Bone meal historically has been implicated as a source of the bacteria. Contamination of forages during harvest by soil containing the bacteria spores may also be an important source of the disease. Reduction of feeding high risk feeds, such as bone meal, has reduced the incidence of anthrax in some countries. Harvesting of feedstuffs from areas known to be at risk for containing anthrax spores should be limited. Vaccines are available for immunization of cattle in high-risk areas. See article on page 10 of this issue for a more detailed description of anthrax.

**Bovine Spongiform Encephalopathy.** Bovine spongiform encephalopathy (BSE), also known as “mad cow
disease", was first recognized in the United Kingdom in 1986 and has since been found in several European countries. Ongoing surveillance has not found the disease in the United States. BSE is caused by a prion, an agent that is similar to that which causes scrapie in sheep. The disease is characterized by degeneration of the neurological system that is invariably fatal. A similar disease, called Creutzfeldt-Jakob Disease (CJD), is found in humans. A form of CJD, called new variant Creutzfeldt-Jakob Disease (nvCJD), was first described in Great Britain in 1996 (11) and has been associated with the consumption of foods contaminated with central-nervous system tissue of BSE-infected cattle (7). Transmission to cattle is believed to have occurred initially through diets containing sheep-derived protein sources contaminated with scrapie and then subsequently through diets containing bovine-derived protein sources contaminated with BSE (9). It also is believed that changes in the rendering process in the United Kingdom might have added to the amplification of the disease. As a precautionary measure, feeding of mammalian protein from at-risk species (sheep, cattle) has been banned in the United States since 1997. Although no BSE is known to exist in the United States, this action is necessary to reduce the risk of this disease from entering the U.S. cattle population.

Foot and Mouth Disease. Foot and mouth disease is a highly infectious disease that primarily affects cloven-hoofed animals including cattle, sheep, and swine. It has been eradicated from the United States since the early 1900’s. The disease is endemic in many regions of the world and recent outbreaks in the United Kingdom have emphasized the potential economic devastation that this disease could have if introduced into the United States. The virus that causes foot and mouth disease can survive in products made from infected animals and the disease can be transmitted readily by the feeding of animal proteins contaminated with the virus. Of 627 outbreaks of foot and mouth disease worldwide between 1870-1993 in which a source of virus was reported, 66% were attributed to contaminated meat, meat products, or garbage (8). It is believed that the recent outbreak in the UK was introduced by feeding of meat scraps illegally imported into the country. The importation of animals and animal products into the United States from countries known to have foot and mouth disease is strictly regulated and covered under Title 9 of the Code of Federal Regulations, Parts 94-98 (http://www.access.gpo.gov/nara/cfr/index.html).

Summary

Feed can serve as a source of pathogens known to cause disease in cattle. The occurrence of feedborne disease in cattle is not great but it should not be overlooked. Precautions to reduce the risk of feed contamination with cattle pathogens should be part of normal biosecurity protocols. In addition, protocols put in place to improve the safety of feedstuffs ingested by cattle also help to insure the safety of human food products produced by cattle.

References:


Subscribe Now - It’s Free

If you can subscribe and view MDR online and discontinue receiving the hard copy, please notify us by e-mail at mdr@msu.edu, or click on “e-mail us” on the MDR web site at http://www.mdr.msu.edu. Just include your complete e-mail address and the address that appears on the back of your MDR. You will be notified at your e-mail address immediately when each new issue of MDR goes on-line.
Anthrax in Animals

Dan Grooms
Dept. of Large Animal Clinical Sciences

Anthrax is a highly fatal bacterial disease that can affect many species of domestic and wild animals. It also can cause severe disease and death in humans. The bacterium causing anthrax is found worldwide and is a reported bioterrorism agent.

The Bacterium

Anthrax is caused by the bacterium *Bacillus anthracis*. The bacterium is found in two forms: vegetative and spore. The vegetative state is the form that causes the actual disease anthrax. In the vegetative state, the bacteria grow, multiply and release toxins that damage infected tissues. If untreated, the disease generally is fatal. When the vegetative form of the bacteria is exposed to oxygen in the air, it changes into a protected state called a spore. Spores are highly resistant to disinfectants and natural environmental conditions. They can remain viable for years and are found in the soil of many states. Spores also may survive in dry feeds and animal by-products (wool, bone meal). When spores enter another animal, usually through eating contaminated vegetation or inhaling spores, the bacteria revert to the disease causing vegetative form.

Anthrax in Animals

Following exposure, the incubation period in animals is typically 3 to 7 days, and the course of the disease is usually as short as 1 to 3 days. The most common initial sign of anthrax is sudden death. Animals may be seen with fever, lack of rumination, excitement followed by depression, difficulty breathing, uncoordinated movements, convulsions, and death. Bloody discharges from natural body openings as well as edema in different parts of the body are sometimes observed. Some animals may be saved if treated very early with penicillin or tetracycline.

In animals that die, dark bloody discharges from body openings (mouth, nose, anus, vulva) are commonly found. The carcass decomposes very rapidly and becomes grossly bloated with gases. Rigor mortis or stiffening of the body is absent or incomplete. If necropsied, hemorrhages are found in the internal organs. Enlargement of the spleen is almost always present. Discharges and secretions from the carcass of dying animals will contaminate the ground with bacteria that will then form resistant spores. Scavenger animals may carry the infection to distant locations.

Most outbreaks occur in areas where animals previously have died of anthrax and contaminated the surrounding soil with spores. Anthrax has been reproduced with spores over 35 years old. Often, an outbreak occurs after climatic changes such as heavy rain, flooding, or drought. Floods may bring previously buried spores to the surface while drought may result in dusty conditions and close grazing behavior that increase the risk of spore ingestion. Working of soil also may bring the spores up to the soil surface. Once animals eat the spores, the vegetative form develops, multiplies, and is ready to cause anthrax again.

When anthrax is suspected, dead animals should not be opened, as the discharges and blood are highly infectious to humans and other animals. Opened carcasses can deposit large quantities of bacteria on the ground that will then form highly resistant spores. Veterinarians can confirm anthrax by taking blood from a peripheral vein (ear or tail) and submitting it to a diagnostic laboratory. The bacteria can be seen in the blood when properly smeared and stained on a glass slide.

In most states, anthrax is a reportable disease. Quarantine of the premises and animals may be necessary. To prevent spread of the disease, dead animals should be burned where they are found dead. An alternative is to bury them at a depth of 10 feet and cover the carcass with lime. Your state animal health agency can provide helpful advice on disposal of carcasses. Proper carcass disposal is important to prevent
surface soil contamination. In areas where anthrax is known to have occurred, grazing of animals should be done with caution.

Vaccines are available to protect animals in endemic areas or when outbreaks occur.

Anthrax in Humans

Anthrax can cause serious disease in humans as well as animals. Three forms of anthrax are recognized in man. The cutaneous form is the most common form of anthrax and is usually seen in people who work with animal carcasses, wool, hides, or fur. The bacterium enters a cut or abrasion on the skin. Skin infection begins as a raised itchy bump that resembles an insect bite but within 1 to 2 days develops into a vesicle and then a painless ulcer with a characteristic black necrotic (dying) area in the center. About 20% of untreated cases of cutaneous anthrax will result in death.

Inhaling the bacteria causes the pulmonary form of anthrax, a highly fatal form of the disease. Initial symptoms may resemble a common cold. After several days, the symptoms may progress to severe breathing problems, shock, and death.

The intestinal disease form of anthrax may follow the consumption of contaminated meat and is characterized by an acute inflammation of the intestinal tract. Initial signs of nausea, loss of appetite, vomiting, and fever are followed by abdominal pain, vomiting of blood, and severe diarrhea. Intestinal anthrax results in death in up to 60% of infected people.

For more information about anthrax visit the following websites:
$Center for Disease Control www.cdc.gov/ncidod/dbmd/diseaseinfo/anthrax_g.htm$
$Michigan State University cvm.msu.edu/extension/menu.htm$

Why Are Dairy Cows Susceptible to Mastitis Around Calving?

Jeanne L. Burton, Sally A. Madsen, and Patty S.D. Weber
Dept. of Animal Science

Dairy cows undergo numerous physiological changes around calving, including altered functions of a type of white blood cell called a neutrophil (3). These changes are important because neutrophils are the cow’s main immunological defense against intramammary infections that cause clinical mastitis (4). Neutrophils normally perform five functions to successfully clear intramammary pathogens that cause mastitis (Figure 1, see page 12). These functions are called margination, migration, phagocytosis, respiratory burst, and bacterial killing.

First, circulating blood neutrophils continuously roll along blood vessel walls to search underlying tissues for signs of infection (Figure 1, Step 1). This is called margination. If infection is detected in underlying tissues, migrating neutrophils rapidly pass through the blood vessel wall and migrate to the site of infection (Figure 1, Step 2). Neutrophil migration causes the somatic cell counts to increase in mastitic milk. During migration, neutrophils change into activated killer cells ready to engulf pathogens such as bacteria (Figure 1, Step 3). The engulfing of pathogens is called phagocytosis and is accomplished through specialized receptors on the surface of neutrophils that recognize bacteria. Receptor-mediated phagocytosis stimulates the neutrophils to consume massive amounts of oxygen, enabling the cells to unleash a battery of toxic substances called free radicals onto the phagocytosed bacteria, to initiate their destruction (Figure 1, Step 4). This is called the respiratory burst. Finally, enzyme-filled vesicles inside the neutrophils dump their contents onto the dying bacteria, finishing the bacterial killing through enzymatic digestion (Figure 1, Step 5).

Neutrophils of dairy cows do not work properly around calving (2). In fact, blood neutrophils cannot marginate or migrate into tissues, resulting in high numbers of circulating cells that have no ability to detect or respond to intramammary infection (8). Reduced margination and migration of neutrophils means that intramammary bacteria can readily proliferate in milk, potentially damaging milk-producing tissues. Neutrophil respiratory burst and enzymatic killing also are reduced around calving (6). Therefore, even if some neutrophils do manage to migrate into infected mammary glands, these cells do not effectively kill the bacteria they engulf. Thus, it is not surprising that cows suffer increased rates of clinical mastitis around the first weeks of lactation (4,

Care should be taken to protect anyone handling the carcass or live animals suspected of having anthrax. Meat obtained from animals dying of unknown causes, or suspected of having anthrax, or another infectious disease, should not be consumed.

Summary

Anthrax is a highly fatal disease of animals and man. It is caused by bacteria that can exist in a vegetative or spore form. The vegetative form is the disease-causing form of the bacteria. Upon exposure to oxygen, the vegetative form produces highly resistant spores that can survive years in the soil. Carcasses of animals dying with anthrax should not be opened because the vegetative form turns to spores when exposed to air. Suspected cases of anthrax should be reported immediately to your veterinarian first and then to state animal health agencies. Use caution when handling dead animals suspected of having anthrax.

For more information about anthrax visit the following websites:
$Center for Disease Control www.cdc.gov/ncidod/dbmd/diseaseinfo/anthrax_g.htm$
$Michigan State University cvm.msu.edu/extension/menu.htm$
The question we have asked is “why do neutrophil functions become deficient around calving?”

Physiological Changes

Some of the physiological changes that occur around calving include tremendous fluctuations in blood concentrations of reproductive hormones, including dramatic increases in cortisol and estradiol and a decrease in progesterone (Figure 2). Steroid hormones such as these may have negative effects on cow neutrophils (7, 8). Steroids act rapidly on cells by influencing the activities of genes that code for proteins normally used for cell survival and function. Changes in gene activity can be monitored in the laboratory using genomic techniques that measure the content of messenger RNA (mRNA) in cells. These mRNA molecules are copies of active genes that cells use as templates for protein production. In trying to answer the question of why neutrophil functions become deficient around calving, we have initiated experiments to monitor changes around calving in all types of mRNA molecules present in neutrophils of dairy cows.

To date we have found three neutrophil genes whose activities are decreased around calving (Figure 3). One gene codes for a protein called L-selectin, which is normally present on the surface of blood neutrophils. L-selectin acts like Velcro®, allowing blood neutrophils to attach and let go of blood vessel walls during margination. If neutrophils do not produce L-selectin they cannot marginate on blood vessels and are thus oblivious to tissue infections, including intramammary infections (1, 5).
We also found that the decreased activity of the L-selectin gene was strongly related to the changing blood concentrations of cortisol and progesterone at calving (8). The other two genes affected in neutrophils around calving code for two proteins called mitochondrial cytochrome b and ribosomal protein S15 (Figure 3; 10). Mitochondrial cytochrome b is necessary for production of energy by all cells. Lack of energy production because of decreased activity of the mitochondrial cytochrome b gene would have detrimental effects on a cell’s ability to perform energy-requiring functions. For neutrophils, this includes all key functions: margination, migration, phagocytosis, respiratory burst, and bacterial killing. Ribosomal protein S15 is a molecule that helps build ribosomes, the component of all cells that is responsible for turning mRNA into protein. Therefore, reduced activity of the neutrophil ribosomal protein S15 gene around calving may mean that these cells are unable to produce many of the proteins they need for margination, migration, phagocytosis, respiratory burst, and bacterial kill. The reduced activities of both mitochondrial cytochrome b and ribosomal protein S15 gene was related strongly to fluctuations in blood progesterone and estradiol concentrations (Figure 2; 10). Thus, steroid-mediated inhibition of gene activity in neutrophils of calving cows could explain why these cells do not function properly at this time, and why cows are so susceptible to mastitis at calving and in early lactation.

**Future Genomic Studies**

We hope that our future genomics studies will yield information that will lead to development of novel management tools aimed at bolstering neutrophil functions in cows whose blood steroid concentrations are in flux. Knowledge of neutrophil genes that are depressed in activity around calving is the first step to developing such tools. In the meantime, we recommend that dairy producers be extra nice to their cows during and after calving, knowing that the neutrophils of these animals are being bombarded by steroid hormones that affect the ability of these cells to perform specialized functions required for defense against mastitis-causing pathogens.

**References**

How to Deal With An Employee Not Meeting Job Expectations

Kurt Anderson
Extension Dairy Agent
Huron and Tuscola Counties

If you are a farm manager, no doubt from time to time you have encountered an employee performing below your expectations. How have you handled these situations? Unfortunately, the first reaction to a poor job performance may be yelling at the employee. While you might feel better in the short term, some important points are not addressed by this response and your relationship with the employee has not improved. After you calm down, you will realize that you’ve not addressed some very key issues. Figure 1 refers to four potential causes of unsatisfactory job performance. See if any of these fit a job performance problem on your farm. The left-hand side of the figure shows what you observe as unsatisfactory performance, while the right side shows potential causes for job problems and how you may go about correcting them.

Why is There a Problem?

At some point during your tirade, you’ve probably told the employee to straighten up or hit the highway! This does not address the issue of progressive discipline nor help the employee develop a plan of improvement. You really need to determine if the employee’s problem represents a lack of aptitude or skill, the need for more training, or is just an attitude problem.

Having an employee handbook could prevent many of these potential problems. Job performance expectations should be clearly spelled out within the handbook. Some farmers are concerned that by having an employee handbook their workers will use it against them. They fear employees may read the fine print looking for loopholes in their policy! There are some useful software programs to assist in preparation of employee handbooks. These handbooks give details about vacation time, holidays, and insurance information if you offer this benefit to your employees. A handbook can prevent misunderstandings about these issues. As a final step, you might have an attorney look over the handbook to point out potential trouble spots. Having an employee handbook can clearly spell out your expectations, thereby reducing misunderstandings with employees. Having an employee handbook will not prevent all problems but will help minimize them. Ask yourself if you would hold your best employee to this standard so you do not paint yourself into a corner with your own policies.

Knowledge and Expectations

Did you find out if the employee knew what was expected of him/her? Did this employee know how to perform these tasks properly? Did you offer the employee additional explanation or training if he/she did not perform tasks properly?

Figure 1. There are four potential causes of unsatisfactory job performance (1).
Did you inform the employee of the potential consequences of not meeting the goals that are laid out for him/her? It is very important that each step you take be properly documented and recorded in the employee’s personnel file. This can help prevent any wrongful discharge complaints. This will let the employee know you are very serious about job performance and did not just have a bad day when you yelled at him or her!

Did you present the employee with a plan of action and a timetable to accomplish these goals?

**Attitude**

Figure 2 refers to various causes of attitude problems. Notice that some attitude problems are rooted in the individual, while the workplace environment causes others. It is important to determine whether the problem is linked to the employee or the workplace. In reality, attitude problems can be much harder to solve than those needing additional training.

Another important question is how to motivate employees to perform well. At first glance many employers may feel it is only a matter of increasing salaries. However, research shows that although pay is necessary to meet basic human needs, once this need is met other things become more important. The reverse pyramid shown in Figure 3 on page 20 demonstrates performance motivators. Each slice of the pyramid represents the importance of the issue by the size of the slice. The pyramid shows compensation is a small factor in motivation, with other things being more important. However, this does not give permission to pay a subsistence wage. Basic human needs of food, shelter, security, and transportation must be provided. Once these basic needs are met, it is important for employees to feel their jobs are important and to have goals that are clear and obtainable. It also is important for employees to receive feedback on job performance. When you fail to give someone a chance to increase their performance you have robbed them of the chance to improve and to enhance their self-esteem.

**Don’t Get Personal**

An important consideration when addressing a job performance issue is how it is done. You will want to meet in private with the employee to address these issues without outside interruptions. It is very important to focus on the job performance and not the individual. Keep your conversation focused on the job and not personal issues, ascertaining if the employee has adequate tools to perform the task, needs something additional, or needs additional training.

**Summary**

It is important to remember that most employees want to do their jobs well. Work is very important to most individuals, to do well will give one a sense of pride. It is important to recognize those individuals who are doing well in their jobs and to consider some type of reward. When you notice someone performing below standards make every effort to help them get back on track. If you find your employee has no desire to

Figure 2. There are various causes of attitude problems among employees either relating to themselves or to their environment (1).
The phone rings and a dairy farmer “new to grazing” asks the extension agent when his cows will “learn” to graze grass. If you have barn-raised cows, explained the extension person, it might take a bit of time before the cows really begin to graze. The farmer replies that it has been 4 days, and the cows still come to the gate and bellow. The agent is puzzled and asked, “then what happens”? The farmer says, “I take them out a load of feed”. It seems that the hurdle was not getting the cows to eat grass, but to change the farmer’s perspective. Grazing dairy cows is taking the “cows to the feed”, whereas confinement feeding is “bringing the feed to the cows”. This is a simple definition and generally only refers to the forage part of the ration, but does explain the most important part of the concept.

Starting a Grazing Program

Here are some general recommendations if you want to start an improved grazing program for your dairy herd.

1. Be Patient / Be a Learner. In a grazing operation you have to balance the needs and goals of three living elements, the cows, the plants, and you, at the same time. The cows only want to eat the best parts of the plant, the plants want to grow to maturity and produce seeds, and you want the cows to give lots of milk, the plants to grow thick and lush, to make a profit, and have a quality life style. Balancing all three elements and making a win-win situation takes time and experience. Many agronomists say it takes at least 3 years to develop dense, high quality grazing swards. Most graziers (persons) will tell you it takes from 3 to 5 years to make the transition from barn-feeding to grazing. Looking over a pasture and deciding when to move the cattle is a lot like checking feed bunks to adjust the amounts fed, and it takes time and experience to become proficient. Almost all cows will want and know how to graze even if they have been barn-raised, but it will take time to sort out cows that do not perform well in a grazing-based dairy operation. The good news is that while this learning takes time, the investments and mistakes that will be made during this transition are not very expensive. Those people who do a good job managing a confinement dairy can do a good job of grazing.

2. Start Slow and Be Conservative. If you already milk cows, consider starting with a group of cows in later lactation. Use an old hayfield that has been invaded with grass and is due for a reseeding. A field with 30 to 40% legume and the rest as grass (to reduce bloat risk and to provide a thicker, denser forage) is ideal. Do put up a good effective perimeter fence so that your cows don’t visit the neighbor’s garden. Use single wire and temporary fences only to divide your daily grazing paddocks. Keep it simple until you sort out the best place for lanes, the best size for paddocks, and the preferred locations to improve their performance, perhaps they are in the wrong line of work.

Utilize some of the ideas presented in this article when you have to redirect an employee who is performing poorly. It is important to keep in mind that most employees do not want to perform poorly and just need direction and guidance. A plan to take care of this poor performance and some feedback in a positive manner will be appreciated by most employees.

References


Figure 3. There are many performance motivators in an employee’s job besides compensation (2).
for gates. Do place water in the paddocks, but use only above ground low cost plastic lines. New-to-dairy farming and many other producers have started grazing with the entire herd and that will work fine. The trade-off is that all cows in one group simplify the work, but any mistakes will be bigger mistakes. Re-seeding with the new high-powered pasture species and varieties of plants should come after your grazing skills can match these plants’ increased demands and outputs.

3. Find a Mentor. You can re-invent the wheel and make all the same mistakes every other new grazier person has made or you can find an experienced grazier to guide you through this learning process. The ideal mentor is a grazier from your local area who has at least 5 years of experience and is successful in the ways you want to be successful. In addition to this mentor, you need to participate in local pasture walks, ask for the advice of fence, watering, and equipment suppliers, and check out the interest and experience of your local Natural Resource Conservation Service (NRCS) and Michigan State University Extension (MSUE) advisors. Many NRCS and MSUE personnel are interested in grazing and have attended various workshops and training sessions about grazing. Success in grazing hinges on daily decisions that will factor in temperature, rainfall, and mud, all conditions that are mostly uncontrollable in a grazing operation. The reward for this managerial effort is reduced operating cost and investment in facilities. A mentor or mentors can help you cut the cost, but not cut into your maximizing gross revenue of the grazing system.

4. Have Goals and Don’t Sweat the Small Stuff. You need to make decisions on size of paddocks, when to turn cows into a paddock, how close to the ground to graze forages, is your pasture growth getting ahead of your cows’ grazing, are you going to run out of grass, what kind and how much supplemental feed should be used, and many other decisions on a daily basis. You will never get them all right. Do your best, learn as you go but keep your focus on your long-term goals. Why did you decide to start a grazing system? Are you getting closer to that goal? Don’t let benchmarks like “no grain feeding” or “no new investments” or a given level of milk production cloud your focus on your goal. Your goals should probably include something about level of profit, the quality of your life style, and maybe something about the environment you and your farm exist in. You don’t need to write it down; however, writing it down will make it easier to share with family and co-workers. Having your goals written down and visible also is useful when you have to slog through the mud, rain, and cold wind on a dark fall morning looking for cows to milk when they have taken shelter in the farthest corner of the paddock.

The Benefits to Grazing
Why do people consider grazing? The interest in grazing is stimulated by the same forces that have increased the number of cows in large dairies. These forces include: the desire for increased profitability, the desire for time off, and the desire to be a contributing member of the community. The difference between grazing and the large confinement operations is the lower investment and lower operating costs because you take the cow to the feed instead of bringing the feed to the cow. Grazing, therefore, is an excellent way for people to get started in the dairy business. Grazing is also an alternative for mid-career farmers who need to change their operations but don’t want to make major investments that may not be able to reclaim before retirement. Grazing also offers some farmers a different work environment for themselves and their cows. Graziers will spend less time on a tractor or fixing machinery and more time walking cows to and from a fresh paddock of grass. The cows will spend less time on concrete. Grazing is not without stress for man and cow, but the challenges will be different.

Tom Kriegl from the University of Wisconsin is providing leadership to the Great Lakes Dairy Grazing Network Economic Study; consisting of grazing dairy herds in nine states and Ontario. Some farms have been on this study for 5 years, and the total number of grazing dairy herds that are contributing information is over 130. Here are a few of Tom’s anecdotal observations. Grazing can be economically successful as seasonal, semi-seasonal, or year-around calving operations. Many graziers are economically competitive with standard barn-oriented operations although milk production levels may be lower in grazing operations. He does note emphatically that while many graziers are financially successful in spite of low production they are not successful because they have sacrificed production. Tom has found that the graziers who are most successful financially are those who focus on optimizing the three factors of profit. These three factors are: income generation, control of operating expense, and investment control. The difference between the high profit grazier and the low profit grazier is the ability to generate income. Low input is not the same as low cost.

Consider the Grazing Alternative
Michigan has lost 31% of its dairy farmers in the last 9 years. Our cow numbers and milk production have held up but production in some other states is growing faster. A healthy dairy industry needs cows and milk but also service people and processing capacity. We need milk production and cows, but we also need farmers. Grazing can be an environment - and investment-friendly way to produce milk. As a way to get started in the dairy business or before you make major changes to your operation or before you get out of milking cows, consider dairy grazing as an alternative.
The souvenirs from my visit to India and Thailand tell a story. Besides the usual tourist-type souvenirs like Thai silk and elephant T-shirts, I brought home 10 more milk packages to add to my collection. In them is a story of the dairy industries in India and Thailand.

The trip was the culminating session of the MSU International Extension Training Program. Michigan State University is a leader in providing opportunities and encouragement for its faculty, staff and students to obtain international experience. Our group of a dozen Extension Agents and related staff had the opportunity to learn about the world with an emphasis on agricultural and community development, and then to visit India and Thailand in late October to mid-November, 2001. We visited with the India Rubber Board and its Producer Societies in the southern state of Kerala. We then spent two weeks in Thailand, talking with Extension personnel at the Ministry of Agriculture and Kasetsart University in Bangkok and with farmers, school children and officials in villages and cities in the northern area.

The trip’s focus was not on dairy, but being a dairy guy with a passion to learn, I was able to learn a few things about the dairy industry that I’d like to share. These are my observations with some information added from reading. The story of dairy in these countries certainly has more chapters than I gleaned in my short visit.

Milk in India

The southern tropical part of India is a major rubber and spice area, not necessarily a dairy area. Yet, we saw many cows, grazing roadsides, the undergrowth in rubber groves, and around the lowlands of the tea plantations. It is my impression that those who milked cows had two or three cows.

From India, I have only a single plastic milk pouch that held 500 milliliters of “Pasteurized, Toned Milk”. I believe “toned” is a reference to standardization of the product, in this case at 3 percent milk fat. The search for milk was not easy. After asking at various streetside storefronts, I finally found milk at a mobile stand marked in English “Dairy”. Nowhere did I find milk in refrigerated cases with other drinks.

At this stand the vendor sold hot tea and coffee served from a Nescafe automatic machine. The coffee and tea were always made with milk, reconstituted in the machine from powdered milk. He also had a refrigerated unit with bags of milk. It cost me 6.5 rupees, which is about 16 cents US, for the half-liter bag. It was a product of the Kerala Cooperative Milk Marketing Federation. The vendor said that some people take the bags home and boil them first. I didn’t, I cut it open and drank it!

Later, I saw milk cans in the covered bed of a truck going down a narrow street. I followed the truck on foot. When I finally caught up with it and was able to talk, haltingly, with the driver’s helper, I found out that they were carrying cans of milk picked up from farmers on their route, and they were delivering crates of cooled pouches of milk to businesses. Apparently, getting either product to its destination fast was not the main concern.

The last impression I got of dairy in India was a startling story in the Hindu newspaper dated November 3, 2001. Maybe it was typical media overplay, but the headline was a grabber: “Your milk is poisoned!”. The article reported on a nationwide survey of food and dairy products and said that 80% of milk samples contained pesticides including DDT. More than 40% of these samples showed the residues to be above the tolerance levels.

News like that not only does much to discourage consumption, but it exposes a dark underside to the dairy business that needs to be addressed.

Thai Dairy

The dairy industry in Thailand shows a greater availability of milk and dairy products than I was able to find in southern India. As a result, my collection of milk packages expanded greatly with attractive plastic, ready-to-drink bottles. Most often, the bottles were covered with a foil seal over the top. Straws were provided at the checkout.

There was great variety of products available in refrigerated cases in many stores, with usually two or three flavors of milk in addition to sweetened and unsweetened white milk. Bottles of drinking yogurt, in citrus and pineapple flavors, were right next to milk in most displays.

Government’s Active Role

The Thai government has been active in promoting dairy consumption and production. Although the consumption of milk has not been a tradition with the Thai people, milk use has risen dramatically due in part to a school milk program put into place several years ago. In 1984, per capita milk consumption was just 2 liters per year and dairy farmers marched to Bangkok to protest that they could not sell their produce. By 1997, per capita consumption was up to 17 liters and a year later shot up to 27 liters per year. For comparison, however, per capita milk consumption in the US is around 350 liters per year and in Japan consumption is 300 liters.

The Thai government, through the Dairy Farming Promotion Organization, also has been very active in trying to develop the production side of the industry. The primary reason is that Thailand now produces only around 20% of its...
The trip was a great experience, and I was reminded that agricultural producers share similar concerns no matter what their product or location.
Michigan Dairy Review

Volume 7  Number 2
The Michigan Dairy Review is published in January, April, July and October by the Dairy Programs Group at Michigan State University. Its objective is to provide useful information to the dairy producers and dairy-allied industries of Michigan to enhance the potential success of their businesses. The Michigan Dairy Review can be located on the World Wide Web at http://www.mdr.msu.edu.

Editor ............................................................................................................................................................ Dr. H. Allen Tucker
Final Copy Editor ................................................................................................................................................. Dr. Kathy Lee
Publisher and Webmaster .................................................................................................................................... Pam Jahnke
Managing Publisher ......................................................................................................................................... Dr. David K. Beede
Circulation ........................................................................................................................................................... 6,900

Permission to reprint or translate and reprint from Michigan Dairy Review is granted provided that the intended meaning is not changed and that explicit credit is given to the authors and publication source. If the original article is adapted, paraphrased, or changed in any other way please send facsimile (517-432-0147) of the new version to the Managing Publisher for verification of meaning and approval. As a courtesy, please send a copy of the reprinted article to the Managing Publisher (Dr. David Beede, Michigan State University, Department of Animal Science, 2265K Anthony Hall, East Lansing, MI 48824-1225). Product and service names are used only for the sake of clarity and in no way imply endorsement over similar products or services which may be just as effective. MSU is an Affirmative-Action Equal-Opportunity Institution. MSU programs are open to all without regard to race, color, national origin, sex, disability, age, or religion.

Department of Animal Science
Michigan State University
2265L Anthony Hall
East Lansing, MI 48824-1225

Non-Profit Org.
U.S. POSTAGE
PAID
E. Lansing, MI
Permit No. 21