If you were asked who are the best dairy farmers in Michigan, who would you name? Many of us would think about those who have the highest milk production per cow. Some might name those with the best registered cattle. Some might answer with those that seem most profitable, for profitability is unquestionably essential for the sustainability of the farm. But most of us know that there is something else about being a good farmer—that being a good farmer means more than just profit. We are proud of the fact that we provide quality products to feed the world, and we admire a farmer who takes good care of his cows and his land.

Wendell Berry, the Kentucky farmer poet, wrote, “What is the measure of a good farmer? It is how he leaves the soil.” A good word to describe this concept is “stewardship.” And hopefully, for most of us, a major objective in farming is to practice good stewardship. Dictionaries define stewardship as the discipline of taking care of something for someone else. The “something” is that which is under your control, which for a dairy farmer would include land and the environment, feed and other resources, cows, and milk. And though you may own your land and your cows, in a sense they belong to someone else. Depending on your view of the world, we might consider that we each are temporary caretakers of our world for God, for future generations, for other creatures, and (or) for other people on the planet. My objectives in this article are to encourage you to consider how you might be a better steward in the dairy industry and to help you defend our industry when it is unfairly criticized.

I think that there are four major considerations in agricultural stewardship. A good steward in dairy farming is one who: 1) is environmentally friendly; 2) makes efficient use of the earth’s natural resources; 3) produces high quality milk and meat; and 4) practices good animal husbandry.
shall discuss each of these further and give my opinions about what constitutes good stewardship.

Environmental Sustainability

The concept of environmental sustainability has come to the forefront of agricultural issues in the last 50 years. From Rachel Carson’s “Silent Spring” to the Kyoto Treaty on Global Warming, our society is concerned about what humans are doing to our environment directly and indirectly. Agriculture is a major player in this issue because much of our land is used in agriculture. Many practices in dairy farming can contribute to good stewardship of the environment. We should strive to limit run-off of phosphorus, nitrogen, and organic materials from our farms. Phosphorus causes eutrophication (loss of dissolved oxygen in water, which then favors plant life over animal life) in surface waters, and nitrogen can contaminate ground water. Both of these nutrients are often over-fed in dairy rations. Ammonia losses from manure to the atmosphere are a growing concern without an easy solution. Soil erosion should be minimized in crop farming and grazing, and stream banks should be protected from grazing cattle. A good environmental steward also protects some areas of his farm as woodland, prairie, or wetland habitats for native plants and wildlife.

Efficiency

Another consideration in stewardship is efficient use of the earth’s resources. From the start, I think we should recognize that animal products are “luxury foods” in modern societies. We could survive and thrive without them. But if efficiency was modus operandum in all our food and lifestyle choices, we would eat grains and dried legumes supplemented with seasonal locally-grown garden produce, live in much smaller houses without air-conditioning, and get all of our exercise and entertainment without driving a car or using electricity. Such events are not likely to occur in the U.S. As long as people want dairy products, our goal should be to produce them as efficiently as possible so that more people across the globe can enjoy milk and dairy products with minimal environmental impact. Efficiency involves several considerations. Based on total feed inputs, the US dairy industry returns 20 to 30% of digestible feed energy and protein as milk and dairy products. However, dairy cattle can graze or eat forages from land not suited for row cropping and eat by-product feeds that humans do not want to eat. Whereas corn grain and soybean meal are edible by humans, most people would consider corn gluten feed, distillers grains, or corn stalks to be inedible. If we first feed these human-inedible materials to cows, people can be nourished by the by-products and love the resulting ice cream! So fortunately, in the process of making bluejeans, colors with corn sweeteners, alcohol, and beer, the resulting wastes need not be put into a landfill but can be used to produce milk. The fact is that we can get more human-edible protein from a cow than we put into her. We must also consider efficiency of land use—how much food can we get for people from an acre of land. Dairy cows can be very efficient here as well, producing nearly as much human nourishment from an acre as if that same acre was used to grow corn and soybeans (Table 1). Finally, efficiency could consider all inputs, including fuel and electricity, which may become more important in the future as fossil fuels are depleted.

High Quality Products, Animal Husbandry

Another aspect of stewardship is the quality of the animal and plant products that leave our farms. Dairy products generally are considered to be wholesome, nutritious, and tasty. We need to be sure that they keep that reputation. In addition, the milk and cull animals that leave our farms should be free of drug residues and microbial contamination.

Finally, stewardship involves good animal husbandry. Although most of us disagree with the animal rights movements, we do believe strongly in animal welfare. Most of us believe that animals are not just machines but fellow creatures, and that we should treat them with respect and promote their general well-being. As a nutritionist, I often recommend feeding high grain diets to promote maximum milk yield as a method of maximizing efficiency and profitability. But if that diet also increases the incidence of acidosis, displaced abomasums, and laminitis, then considerations of cow well-being may outweigh the competing interests of efficiency and profitability. In many cases, paying attention to cow comfort is one way to maximize milk yield. I recently visited one of our top milk production herds in the state. When I asked what the secret was to high production, the farmer told me straight away, “Cow comfort. You have to pay attention to the cows. And to do that, you have to demonstrate that yourself so that your employees do it too.”

Summary

There are other aspects that are involved in stewardship. A good farmer also treats people as he or she would wish to be treated—whether that be his or her family members, employees, neighbors, veterinarian, feed salesmen, or banker. A good farmer is an integral part and valued member of the community.

But most importantly, stewardship in dairy farming means 1) being environmentally friendly, 2) making efficient use of the earth’s resources, 3) producing high quality milk and meat, and 4) practicing good animal husbandry. The Michigan Dairy Review, like many other dairy and agriculture publications, is filled with articles to help you do these things better. For example, in the last year, MDR has had articles on balancing farm phosphorus, controlling silage leachate, managing manure, selecting forage alternatives, timing the harvest of corn silage, reducing TMR sorting, avoiding drug residues in meat, improving milk quality, recognizing foreign diseases, calming your cows, and rewarding your cows. (See Index page 26 of this issue). A good farmer does these things, not
just because of government regulations, and not just because they might increase long-term profits, but because they are the right things to do!

You have to make a profit to stay in business, and, in the short run, the business of keeping the farm financially afloat, especially when milk prices are low, can be overwhelming. But, in the long run, good stewardship must be part of a sustainable farm. So whether you have 50 cows or 1000 cows, I hope that you will consider good stewardship as a goal for your farm. In his best-selling Seven Habits of Highly Effective People, Steven Covey puts it this way, “How do you want to be remembered someday? … Well, start living that way now”. Hopefully, for those of us currently in agriculture, we shall be remembered as a generation of farmers, agriculturalists, and dairy-allied support personnel who practiced good stewardship!

Table 1. Effect of level of production and diet on efficiency of land use by dairy cows.

<table>
<thead>
<tr>
<th></th>
<th>Grazing system</th>
<th>Confined feeding without by-product feeds</th>
<th>Confined feeding with by-product feeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield1, lb/cow/yr</td>
<td>11,000</td>
<td>11,000</td>
<td>22,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22,000</td>
<td>33,000</td>
</tr>
<tr>
<td>Feed2, lb of dry matter/yr</td>
<td>13,300</td>
<td>12,900</td>
<td>17,900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12,000</td>
<td>23,200</td>
</tr>
<tr>
<td>Land required3, acres/yr</td>
<td>1.33</td>
<td>1.63</td>
<td>2.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.11</td>
<td>3.31</td>
</tr>
<tr>
<td>Protein production4, lb/acre</td>
<td>320</td>
<td>263</td>
<td>330</td>
</tr>
<tr>
<td></td>
<td></td>
<td>349</td>
<td>349</td>
</tr>
<tr>
<td>Efficiency of land use5, %</td>
<td>43</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>47</td>
<td>47</td>
</tr>
</tbody>
</table>

1The average lifetime of a cow is 4.83 yr and consists of 730 d as a heifer, three 305-d lactations, and two 60-d dry periods.
2Feed DM consumed/yr for an animal is the lifetime DM consumption divided by the 2.83 yr spent as a lactating or dry cow. Thus, the annual feed DM required per cow is similar to the predicted annual feed DM needs per cow in a dairy enterprise (cows plus replacement heifers) of similar annual milk production. Feed DM consumed during the lifetime of a confined cow fed no by-product feeds and producing 22,000 lb/yr consists of 34% alfalfa, 26% corn silage, 26% corn grain, 12% soybeans, and 2% minerals and vitamins. For both confined systems the percentage of soybeans fed is increased with higher milk production. Feed DM consumed during the lifetime of a confined cow fed by-product feeds and producing 22,000 lb/yr consists of 25% alfalfa, 25% corn silage, 13% corn grain, 2% soybeans, and 12% corn gluten feed, 10% cottonseeds, 10% wheat middlings, 1% blood meal, and 2% minerals and vitamins. The amount of soybeans fed is increased with higher milk production.
3Annual cropping yields (DM basis) are 5 tons/acre for alfalfa or pasture, 9 tons/acre for corn silage, 7300 lb/acre for corn grain, and 2400 lb/acre for soybeans.
4Protein production per acre is milk protein plus protein accretion of body and conceptus.
5Efficiency of land use is the protein production per acre from dairy farming relative to the amount of protein that could be produced from soybeans and corn grown for direct human consumption. Equal cropping of corn and soybeans would provide 878 lb protein/acre with the same protein-to-calorie ratio as whole milk at 3.5% fat. This calculation of efficiency assumes that milk protein, because of its greater digestibility and better amino acid profile, is 20% more valuable on a weight basis than is the protein of the mix of corn and soybeans. The efficiency of grazing could be increased with supplemental grain to increase milk yield and supplemental byproduct feeds. From VandeHaar, M.J., 1998 J Dairy Science 81:272-282.
Environmental Stewardship, Zero Discharge, Risks, and Costs

Bill Bickert
Dept. of Agricultural Engineering

Responsible environmental stewardship demands that release of pollutants to the environment be minimized or preferably be eliminated completely. Animal manure, as a potential pollutant to surface and ground water and ambient air is of increasing concern. But, in reducing pollution, just how far is enough?

Our industrial society has long depended on the ability of our environment to treat waste discharges that might otherwise negatively impact human comfort, safety, and health. In agriculture, applying animal manure to the land has long been an endpoint in the manure management process. Beneficial nutrients are supplied to crops, pathogen levels are reduced as a result of positive air and water relationships in the soil and bio-solids are decomposed to essential soil components. The waste is treated and utilized to advantage with no harmful effects to the environment. Or the discharge that does occur is so minor that impacts on waters of the State or quality of the air surrounding the animal operation go unnoticed (or, at least, are tolerated).

Now we are hearing about the negative effects of animal operations on the environment. Some individuals in society view animal manure as a threat to quality of life, a pollutant to ground and surface waters, and a source of odors. Zoning laws are enacted in direct opposition to a proposed animal facility, not as a result of seeking a land use plan that is in the best interest of the community. Some people are so concerned about clean air and water and their quality of life that they outright oppose both existing and proposed animal operations.

Whether we agree with the trend or not, it’s sufficient to say the increased size of animal operations, the resultant concentrations of animals, and the lack of sufficient nearby land acreage for utilizing manure are notable changes that have contributed to the increasing controversy. Economic factors primarily have been responsible for increases in size of animal operations. In any case, the unspoken and unwritten contract between animal agriculture and society has been changed forever.

In the Past

Agriculture has not received the same regulatory attention that has been paid to municipalities and industries in this country with respect to the need to reduce their waste streams to the environment. In 1972, when Congress passed the Clean Water Act (a broad plan to clean up lakes, rivers and streams in this country), industries and municipalities were targeted for improvements. Over the years, substantial progress has been made. Municipalities and industries have been permitted, over a period of several years, to implement treatment technologies in order to reduce the negative impact of their waste streams on the environment. The process occurred gradually, one step at a time.

In the meantime, discharge standards have been gradually tightened in an effort to reduce risk. As well, the ability to detect the levels of contaminants has improved substantially (parts per million, to parts per billion, to parts per trillion). In some cases, enforcement discretion has given firms some leeway as they have strived to keep pace with tighter controls.

Now Animal Ag

Now animal agriculture is being asked to conform to the same level of performance from a discharge standpoint as has evolved gradually over time in other sectors. This expectation is not unreasonable from the standpoint of reducing the risks to the environment that might be associated with discharges of animal manure. But, unfortunately, science has not kept pace with policy. Affordable treatment technologies (affordable is the key word), educational programs and monitoring protocols are not in place that will permit agriculture to be brought into compliance in one fell swoop. Means of satisfying targets are not clearly defined nor easily understood. Producers are reluctant to invest in manure management systems when they feel that clear answers and clear guidance are lacking.

Zero Discharge

Furthermore, even though the term “zero discharge” has been used to summarize standards for agricultural operations in Michigan, “zero discharge” is not the law at all. The term “zero discharge” is merely a loose generalization of the standards that do apply; i.e., the Water Quality Standards of Michigan. Part 4 of the Michigan Natural Resource Environmental Act, 1994 PA 451 provides these standards and can be found at: http://www.state.mi.us/orr/emi/admincode.asp?AdminCode=Single&Admin_Num=32301041&Dpt=EQ&RngHigh=.

Whether or not the standard for a discharge is “zero” or “nearly zero” is probably not important as it relates to our efforts to protect the environment. We must always strive to
do the best job possible. Minimizing risk is part of that goal. But the distinction between zero and almost zero is very important when it comes to prescribing facilities and practices in the interest of reducing the risks of pollution from animal manure. Reducing risk (almost zero discharge) and eliminating risk (absolutely zero discharge) are very different goals.

Risk vs. Cost

The curve in Figure 1 represents the relationship between the risk to the environment resulting from discharges of some waste stream and the investments that might be made to reduce that risk. Figure 1 might apply to an animal operation. Four combinations are depicted, represented by Points 1, 2, 3 and 4. Note that, according to this depiction, to reduce the level of risk by a given amount requires investing increasing amounts of money as the level of risk itself is reduced. For example, reducing relative risk from 10 to 5 on the relative risk scale (5 units from Point 1 to Point 2) requires an investment of about ½ of a money unit (on the horizontal scale). However, a reduction in risk from 5 to approximately 2.5 (2.5 from Point 2 to Point 3) entails an investment of one full money unit—twice the investment for one-half as much risk reduction.

The nature of the mathematical relationship describing the curve is asymptotic, i.e., the curve moves closer and closer to the axis, but will never reach the axis even upon approaching infinity, in either direction. Accordingly, reducing the risk to zero is theoretically impossible—physically, monetarily, or by any other measure. Even though the representation is hypothetical, most likely it is a reasonable approximation of reality.

A statement of zero discharge or zero risk clearly represents our desire to eliminate the discharge of a pollutant to the environment. But zero risk is impossible. Risk is associated with everything, be it space travel, electrical distribution systems, financial investments, even life itself. In general, we strive for zero risk, recognizing that risk is actually a matter of the probability of an adverse outcome. We deal with risk everyday in the decisions we make—the amount of insurance that we carry, the design snow load of an agricultural building, the types of investments that we make, and even the speed at which we drive.

But, recognizing that zero risk is not possible, we actually are striving to reduce risk to near zero. How close we get to zero becomes a matter of choice. On the one hand is the seriousness of the consequences of an adverse outcome. On the other hand are considerations of practicality and affordability. In the end, we must always accept some risk. As demonstrated in Figure 1, reducing the probability of risk to near zero most likely involves immense amounts of money.

Two Main Questions

Therefore, two questions arise from Figure 1. The first question is, “What is the current situation with respect to risk versus investment for any particular situation where a discharge may occur?” For example, what is the current situation for animal agriculture in Michigan? Certainly, we would believe that we have gone beyond Point 1. But, have we progressed beyond Point 2, or Point 3, or Point 4?

This question is likely interesting only for purposes of academic discussion. Most would agree that those involved in animal agriculture have expended substantial resources, both in facilities and management practices, to reduce the risk of pollution by animal operations. On the other hand, is the current situation acceptable; i.e., has enough been done to reduce the risk of discharge from animal operations to an acceptable level? The answer to that question is undeniably no. However, this does not mean that those in animal agriculture have been negligent or that they have not acted in good faith. It means only that much more is yet to be done.

The second question is, “As corrective measures are implemented in an effort to reduce the risk of a discharge from a source of pollution, what level of risk will be deemed acceptable?” How much is enough? What is the target? Who decides? At issue is the risk presented by a particular animal operation to pollution of the environment. If no risk were involved, zero discharge would be the rule.

Information Resources

For concentrated animal feeding operations (CAFOs) that fall under the General Permit for CAFOs that took effect in Michigan January 1, 2003, the second question has been answered, at least for surface waters. Permit description is available at http://www.deq.state.mi.us/documents/deq-water-generalpermit-npdes-MIG440000.pdf. The basic requirements of the General Permit regarding authorized discharges are clear. A CAFO’s certificate of coverage allows for discharges that do not cause or contribute to a violation of Michigan’s Water
Quality Standards. Less clear is the practicality of implementing some of the prescriptive requirements for manure and wastewater storage structures, silage leachate, and runoff control facilities that must be met for these discharges to be authorized.

But most animal operations are not CAFOs and are not subject to the conditions of the General Permit. Even so, these animal operations are obliged to meet Michigan’s Water Quality Standards. The standards apply to “surface waters of the State” which include the Great Lakes and their connecting waters, inland lakes, streams, rivers, impoundments, open drains, and other surface bodies of water within the confines of the state. Unfortunately, the document that describes Michigan’s Water Quality Standards is not that easy to read and interpret, especially as related to agriculture. The document is long (greater than 50 pages), specific limits for many contaminants are not given and the protocol for monitoring contaminants of surface waters of the state follows a determination of “mixing zones”. The standards document is useful and meaningful for personnel of the Department of Environmental Quality doing the monitoring. But, the document is of little use to the layperson.

In Conclusion

In the end, there is a need for clearer direction for farmers that are expected to participate in programs leading to an improved environment. A guidebook on the regulation process, existing standards, and monitoring protocol would be useful. A stepwise approach to meeting regulatory requirements, as used in earlier times for other industries, would be friendlier, more affordable, and more effective than the current approach. Overall, a progressive approach to compliance will require a meeting of the minds of all involved, beginning with development of the science, implementation of the technology and, finally, formation of policy. We must remember that environmental protection is not a size issue; i.e., it is not just about CAFOs. It is not even an issue for only animal agriculture. For all of agriculture, existing in harmony with the environment and society must be our goal. We must find solutions that are both affordable and sustainable.

Recycling: Composting Livestock Manure

Bill Robb and Charles Gould
Extension Dairy and Nutrient Management Agents

Dairy farmers may consider composting manure to reduce volume and concentrate nutrients for transport to distant fields, produce a soil amendment for sale, or to dispose of livestock mortalities. Composting may be a component of a complete manure management system that utilizes bedded pack manure or sludge.

Composting is a controlled aerobic degradation process of organic [carbon-containing] compounds and nitrogen sources that produces a high quality soil-like product. Livestock manure is nitrogen-rich while sawdust, straw or leaves are carbon-rich feed stocks for the compost mix. Under a high quality composting process, volume can be cut in half, helping to manage manure nutrients; pathogens and weed seeds are destroyed; and, odors can be minimized or eliminated. Composting can offer disposal of other by-products, like udder prep papers. In addition, composting can be used when weather or cropping conditions are unfavorable and, it can complement a daily haul system.

Compost is a source of slow release nutrients, which is a water quality benefit. It also contains many beneficial microorganisms that stimulate plant growth and are antagonistic to certain plant diseases. It can be used to build depleted soils, renovate lawns, control but not kill plant diseases, and as a soil amendment in vegetable and flower gardens and potting mixtures. Compost can help concentrate manure nutrients for ease in transportation to distant agronomic fields or horticulture crops.

The Composting Process

The composting process begins when materials are mixed together to create conditions conducive for active aerobic fermentation. Active composting occurs when the carbon (C)-to-nitrogen (N) ratio is between 20:1 to 40:1 and moisture content is between 40-65 percent. In most cases, mixing two parts brown material (or carbon material) to one part green material (or nitrogen material) will result in a C:N ratio of 30:1. Examples of brown materials are sawdust, corn stalks, wood shavings, and straw. Examples of green materials are manure, grass clippings, coffee grounds and commercial nitrogen fertilizer. Manures generally have a C:N ratio of 15:1 depending on the bedding used and brown, carbon source, materials can range from 100-500 : 1 for sawdust and 60:1 for straw, corn stalks, or leaves. Liquid livestock manure can require large volumes of dry bulking carbon materials. Establishing a mixing recipe is a flexible process taking into account the variables of C, N and moisture content of each material making up the compost. Lists of sample C and N materials and composting formulas as well as a more detailed description of composting can be found in Extension publication NRAES-54 On Farm Composting Handbook.

There are four stages in the composting process. During the first stage of composting, bacteria are active in breaking down organic matter until the temperature in the compost pile reaches 55°F. They then go dormant and other bacteria begin breaking organic matter down through the second and third stages of composting. During these stages, temperatures increase, the fastest organic matter breakdown occurs, the C:N ratio decreases due to carbon loss, and the pH rises above neutral. Volume is reduced 50-60% and weight is reduced 40-
Management Methods

The simplest composting method is a static pile. It may be passive or a system that is turned with a front-end loader to speed up the composting process. This method can take up to a year before usable compost is produced. Because it is a slow process, it requires a large area. However, it does not require special equipment.

The windrow composting method requires tractor-drawn or self-propelled turners. The turner aerates, adds moisture (if necessary), fractures organic matter, and mixes the material as it moves through the windrow. Turners allow more management of the composting process, which can reduce the overall time to final product as compared with the static pile method. The annual cost of composting can be similar to manure storage systems, which require capital investment in structures or equipment. Most livestock farms utilize windrows with active turning due to continuous manure production.

In-vessel composting can offer a continuous flow through an insulated rotating drum that provides aeration, temperature control, and, therefore, much faster composting. These systems typically operate under roof and are ideal for composting in cold climates. A curing pad may be required for the compost to cure and become stable.

Vermicomposting, or the use of red worms (Eisenia fetida) in the degradation process, is often used for vegetable and other wastes, but will work well for manures low in salts. The resultant worm castings are a high quality soil amendment. This method requires raising worms under controlled temperatures, is labor intensive, and does not destroy pathogens or weed seeds. Therefore, it would require a two stage process involving heat to be a viable method for most livestock manures.

Composting as a Component of a Manure System

For larger livestock farms composting can be incorporated into a complete manure management system that may include solid-liquid separation or methane digestion. Composting bedded pack manure and digester solids can result in a marketable product. Composting liquid manure requires large volumes of dry carbon materials to formulate an active compost mixture.

Pads,Treating Runoff and Blankets

Manures and carbon materials can be composted on sod, packed gravel and clay, asphalt or concrete. Sod is the least expensive; however, turning is subject to weather conditions. Concrete is the most expensive but is also the most durable. The size of the pad is contingent on the space needed to operate equipment, volumes of materials to be composted and windrow shape and length. When designing a pad, runoff should be managed either by collection in a settling basin or treated in a grassed waterway. Contact your local Natural Resource Conservation Service office or a nutrient management professional for more details on pad design and runoff management for Michigan conditions. Compost blankets are geotextile fabrics that are laid over the top of a windrow to shed water, yet allow the pile to breath. Compost blankets help maintain the proper moisture level in a pile during dry weather and higher temperatures during the winter.

Regulations

Presently there are no specific regulations for composting livestock manures produced on the farm, other than those that meet the Michigan Department of Agriculture (MDA), Right to Farm Generally Accepted Agricultural and Management Practices for Manure Management and Utilization. If you should chose to use off-farm waste streams, like wood chips from a manufacturing plant, the site must meet regulations set by the Michigan Department of Environmental Quality (MDEQ)/Waste Management Division. When selling a product with a guaranteed minimum nutrient content the product must meet the regulations of the Fertilizer Act and must be registered with MDA.

Mortalities Composting

Utilizing the composting process for disposal of livestock mortalities is a cost-effective method. Specific facilities and management of the compost are required by law in Bodies of Dead Animals Act 239 of 1982 as amended. Please refer to other references such as Extension Publication E-2827, Mortality Management or Composting Animal Mortalities, Minn. Dept. Agriculture July-2001, which can be obtained by contacting your Extension Dairy Agent.

Summary

Composting can be used to concentrate nutrients and reduce volume. Composting produces a humus-like soil amendment that can be sold in niche markets to supplement farm income. Livestock farms close to urban centers may consider composting as an option to control odors, reduce flies, and provide an additional income stream. Sourcing large volumes of carbon materials to mix with manure and building a market for finished compost can be challenges to a successful
livestock composting program.

Composting References, Resources and Web Sites

Contact your local Extension office for ordering information.

Reproductive Management

Success with Intensive Reproductive Management

Richard Pursley
Dept. of Animal Science

The ration is tweaked, once again. The cows are transitioning well through calving time. Cows are peaking in milk production better than ever. It’s fall and the weather is beautiful. So why is it so darn hard to get cows pregnant? Aside from the cows with health problems, i.e., severe lameness, uterine disorders, mastitis, rumen disorders, etc., all the rest have no excuse. Right? Unfortunately, chances are even the majority of healthy cows will not become pregnant following a 1st service artificial insemination (AI). Fertility of dairy cattle is on the decline and is the most important reproductive problem facing dairy producers. Since 1970, yearly average 1st service conception rates (probability of a pregnancy to one AI) decreased from about 60% to a current value of about 37% (1, 2). The physiological reason(s) for the decrease in fertility is not well understood.

The second most important problem affecting pregnancy success is low estrus (heat) detection rate, i.e., not allowing cows enough chances to become pregnant. Recent DHIA data from Michigan herds indicate that in each 21-day period following a voluntary waiting period only 35% of cows were given the chance to become pregnant. Only 6% of herds had an average service rate of more than 60%. What is the secret to their success? Most of these herds are using a timed-AI program to improve service rate. They understand that in order to improve pregnancy success, it is imperative to have control over first and subsequent AI. The alternative is letting the cow control time of 1st AI and as DHIA data indicate, but this is not very efficient. Currently, the only way to attack this problem and maintain a reasonable percentage of the herd being pregnant without severe culling and costly purchases of replacements, is intensive management of timed-AI.

What is intensive timed-AI management? It is making sure that: 1) all cows receive an AI during the 1st week following the voluntary waiting period; 2) all cows that received an AI are diagnosed for pregnancy no later than 33 to 39 days later; 3) all cows diagnosed not-pregnant receive a subsequent AI within the next 10 days; and, 4) all cows diagnosed pregnant are re-checked 1 month later to find cows that have lost their pregnancy.

Intensifying Management of First Services

Current synchronization of ovulation technologies are based on the Ovsynch protocol (3, 4, 5, 6). Figure 1. The original Ovsynch protocol still appears to be the most effective timed-AI program. Ovsynch allows for similar conception rates compared with AI following a detected estrus, and Ovsynch substantially increases numbers of cows pregnant by 60 and 100 days in lactation (Table 1). Ovsynch also gives producers the opportunity to AI all cows during the first week following the voluntary waiting period. Here’s how Ovsynch works. First, a list of eligible cows for breeding should be generated every week. Eligible cows for first service are defined by the voluntary waiting period. Currently, the only way to attack this problem and maintain a reasonable percentage of the herd being pregnant without severe culling and costly purchases of replacements, is intensive management of timed-AI.
Table 1. Median days to 1st and 2nd AI, conception rates (CR) at 1st and 2nd AI, percent pregnant at 60 and 100 days postpartum (PP), and median days to conception in lactating dairy cows inseminated after a detected estrus (control) vs. timed insemination after synchronization of ovulation (Ovsynch).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1st AI (n=298)</th>
<th>2nd AI (n=163)</th>
<th>% Pregnant 60d PP</th>
<th>Median days to conception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>83 PP 39 CR (%)</td>
<td>128 PP 45 CR (%)</td>
<td>5 PP 35 CR (%)</td>
<td>118</td>
</tr>
<tr>
<td>Ovsynch</td>
<td>54 PP 37 CR (%)</td>
<td>96 PP 42 CR (%)</td>
<td>37 PP 53 CR (%)</td>
<td>99</td>
</tr>
</tbody>
</table>

Table 2. Measures of fertility in lactating Holstein cows inseminated at specific times in relation to a synchronized ovulation (Ovsynch) and pregnancy diagnosed 28 days post-AI (n=732).

<table>
<thead>
<tr>
<th>Treatment Groups (hours from 2nd GnRH)</th>
<th>0 8 16 24 32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conception rate (%)</td>
<td>37 41 45 41 32 a</td>
</tr>
<tr>
<td>Pregnancy loss (%) a</td>
<td>14 21 21 21 32 a</td>
</tr>
<tr>
<td>Calving rate (%)</td>
<td>32 34 36 32 23 a</td>
</tr>
</tbody>
</table>

a Different (P < 0.05) when compared to other groups within row.

Early Diagnosis

Early diagnosis of pregnancy is critical in an intensive AI management program. The sooner that cows can be confirmed “open” the sooner further action can be taken to re-inseminate. Instead of thinking about herd health day as primarily pregnancy checks, think about them as “open” checks. Cows that are identified “open” must be re-synchronized as soon as possible. In fact, several studies are in progress to test the effectiveness of early re-synchronization of cows beginning 1 week before “open” check. An injection of GnRH is given to all cows 1 week prior to “open” check. Cows diagnosed “open” (1 week later) would receive the PGF" on that day, GnRH 2 days later, followed by AI. In this scenario, “open” cows could be re-inseminated 2 days after being diagnosed “open.” It is important to note that careful handling of hormones is essential. GnRH (Cystorelin, Factrel, Fertagyl, and OvaCyst) is okay to give to pregnant cows. PGF" (Lutalyse, Estrumate, and Prostatae) is not! These PGF" products will abort an early pregnancy.

To push the envelope even further, some veterinarians are now using ultrasound to determine pregnancy status between 24 and 28 days post-AI. Ultrasound technology is becoming more user friendly every day. Lightweight, portable machines with battery packs and with good resolution are now on the market. However, they are not cheap. Even though veterinarians would most likely require greater fees using ultrasound, it is certainly something to consider in the future.

Re-checking Pregnant Cows

It is very important to re-check all cows diagnosed pregnant at the “open” check. Our first study of this kind indicated significant pregnancy losses occurred following an early pregnancy diagnosis at 28d post AI, Table 2 (4). In a subsequent study, percentage pregnancy losses were similar to the first study and the greatest percentage loss was between 28 and 56 days post-AI. Therefore, in order to identify these “open” cows, it is critically important to re-determine pregnancy status approximately 1 month following the first check.

Summary

In summary, intensive timed-AI management allows complete control over time of 1st and subsequent inseminations. Conception rates using Ovsynch are similar
Managing People – Risks and Opportunities

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Dept. of Agricultural Economics

Growing the size of your dairy farm often means crossing the line between a business with the labor predominately supplied by the family to one that relies heavily on hired employees. In the process, your farm becomes more complex, and labor can be a source of concern, requiring new knowledge and skills. Research with non-agricultural businesses suggests that employees are indeed a considerable risk for profitability. On the other hand, employees are also a means of addressing risk and achieving superior performance. Excellent employee management practices can make a farm successful, even in times of low milk prices.

Michigan Focus Groups
In 2002 the U.S. Department of Agriculture through the Northcentral Risk Management Education Center at University of Nebraska sponsored a project to address personnel management risks of Michigan dairy farms. At different locations in Michigan, dairy producers were invited to be part of a focus group facilitated by their dairy extension agents. Four meetings were held where dairy farmers discussed their labor management practices, opportunities, and risks in managing people. In addition to the immediate exchange of ideas and sharing of practices among the participants, the researchers analyzed the discussions to determine the most important and challenging labor issues facing dairy producers. The following remarks are based on labor practices, risks, and experiences of the focus group participants.

Profile of Participants
Twenty-two farmers attended the meetings, representing a cross-section of the dairy industry. The average participant, a dairy farm owner or co-owner, had held their current position for 15 years, the minimum being 6 years and the maximum 40 years. Twenty-one percent of the participating farmers held a college degree or had studied for an advance degree, 32% took some college courses, and 47% had a high school diploma or less. Representing the breadth of dairy farming in Michigan, annual milk sales ranged between less than $400,000 to several million. The largest participating dairy employed over 50 people with a very large herd. The smallest farm had 125 cows and employed four people, but none of them full-time other than the operator.

Labor Availability and Recruiting
Dairy farmers in the focus groups hire a diverse workforce: full-time and part-time, adults and youth, male and female, and different ethnicities. Over the last decade most farmers have seen a decrease in local labor and high school students seeking employment. In response they have hired a greater number of Hispanic employees, either out of the migrant stream or locally. However, some farmers are concerned about the legal eligibility of their workforce for work in the U.S. Although applications by the local workers are increasing due to the current economic downturn, the participating farmers are pleased with their Hispanic workforce and do not expect to replace them with local workers.

The most common recruitment method is using current employees for referrals when a job opening becomes available. Employees tend to recommend dependable and hard working individuals. They do not want to risk damaging their reputation by bringing in a troublesome employee. Referrals seem to work particularly well for Hispanic employees. Additional hiring occurs through word of mouth in the community and walk-ins. In rare cases advertising is used to recruit employees for supervisory or specialized positions (e.g., truck drivers).

Hiring for Success
Successful dairy farmers typically do not hire everyone knocking at their door, but have a selection process in place. They take several factors into consideration, including the applicant’s work history, reasons for leaving prior

References
Employment, prior work experience on a dairy farm, expectations of the applicant, impression of the applicant during the job interview, and in some cases references.

In a few cases, managers indicated that they consider other qualities in the selection process that might not reliably predict the success of a farm employee or therefore constitute legal risks. These characteristics include age, ethnicity, or valid driver license for a job that does not require driving. Employers should be reminded that equal employment opportunity laws mandate employers to consider only job-related characteristics in any employment decision. If you are unsure of what can and cannot be legally considered in selecting an employee, the following web sites might be useful: www.eeoc.gov; or, www.michigan.gov/mdcr.

Employee Training
Training ensures a safe work environment and work quality that meets the expected norm. On large dairy farms, supervisors tend to be responsible for training; on smaller farms the managers and co-workers do the training. Training quality varies depending on the skills and ability of the trainer. Some dairy managers reported problems when co-workers did the training. Being fearful of losing their own job, co-workers might train poorly, in hopes of making their own performance appear better. Milkers are likely to also receive some outside training to make sure they understand and follow procedures. Other training approaches include self-instruction based on standard operating procedures (SOPs) and using an outside consultant to train employees. In some cases the SOPs have been refined, but the SOP manual has not been updated to reflect the improved procedures.

Weeding Out Employees
Although job performance itself was rarely mentioned as a problem, tardiness and absenteeism are areas of concern. Participating farmers reported that these problems have diminished greatly with the hiring of more Hispanic employees. On a dairy farm, most jobs are seen as a long-term relationship; therefore extensive efforts are made in developing an employee before an individual is discharged for poor performance. Few of the 22 farmers had a formal discipline process in place, including sufficient documentation to guard against a wrongful discharge suit by an employee. Because Michigan is an at-will employment state, some participants assumed they would not need a formal process until they actually had to deal with a problem situation. A discipline process, which includes notes in a personnel file of a first, second, and final warning, helps ensure a fair process and also keeps legal expenses to a minimum.

Managing labor competently will lead to success of both the business and the employee.

Keeping Good Employees
Farm managers care about their employees’ loyalty, but most of them do not want to become too closely involved with their employees’ personal problems. They want to avoid “parenting” their employees and strive for a professional relationship. On the other hand, they also try to understand their employees’ situation and help out when the need arises.

Dairy farmers in Michigan compare themselves to other employers and other states with respect to wages, and they consider themselves as paying on a competitive level. Wages reported during the group discussions ranged from $7/hour to $14/hour for general labor. However, actual entry-level wages, especially for high school students, are often lower. Wage rates at the high end are often associated with a marginal benefit package. Benefits offered to employees on dairy farms include paid vacation based on job tenure, health insurance based on job tenure and position, housing and, in rare cases, retirement plans. In addition, bonuses for milk quality, milk production level, reproduction rates, and other measurable factors are common. Dairy farmers often pay a premium for hours beyond 50 or 60 per week, although, technically, agricultural employers do not need to pay overtime. Some farms allow their employees to work as many hours as they choose.

Conflict in the Workplace
Three types of conflict were alluded to by dairy farmers: 1) conflict between co-owners regarding responsibilities and work load of family members involved in the operation; 2) conflict between employer and employee (e.g., regarding fairness of compensation); and, 3) conflicts between employees regarding differences in work attitude or pace, or challenging the authority structure on the farm. In addition, some farm managers reported substance abuse by employees as a reason for conflicts. Managing workplace conflicts is a challenge for many managers, and they try to avoid it, often resulting in the problem becoming more severe.

Positive Experiences
Dairy farmers typically perceive their employees as necessary to ensure the long-term success of the farm and as critical and important resources. Managers derive satisfaction from training entry-level employees to become competent and reliable workers. They see their employees grow into responsible community members, and they provide a sustainable source of income for them and their families. The social interaction with employees makes the farm a better working environment and the added cultural diversity from immigrant employees is often perceived as enriching. Dependable employees allow managers to take family vacations and be away from the business, which
Strategic Deworming

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Dept. of Lg. Animal Clinical Sciences

G enerally, animals that have been pastured this summer should be dewormed before the winter season. Nematode parasites (commonly called “worms”) can cause lost productivity in dairy cattle, especially in younger pastured animals. However, it might be time to plan now for next year’s pasture season as well. To most effectively and economically use nemacidal drugs, reduce the detrimental effects of parasitic nematode infections in cattle, and reduce the population of parasitic nematodes in pasture, a program of strategic deworming may be indicated. The purpose of strategic deworming is to provide an effective treatment regimen that effectively prevents infestation. Before starting such a program, advice from a veterinarian as to available products, and perhaps some diagnostic information (for example fecal flotation tests) to determine both the extent and type of infestation present on the farm are useful.

Background

Strategic deworming is based on lining up the use of nemacidal drugs with the reproductive biology of the parasites. The most common intestinal nematode parasites of cattle are the *Trichostrongylus spp.*, and include *Haemonchus*, *Cooperia*, and *Ostertagia*. Their life cycle starts when eggs are passed in feces from the infected digestive tract of adult cattle to plants in the pasture. Under optimal conditions (warm, humid weather) the eggs may develop in about 2 weeks to an infective larval stage, and when ingested by grazing animals, eventually migrate to the inside (lumen) of the digestive tract and can become egg laying adults in 15 to 20 days. It is important to realize that although eggs can survive the winter and hot, dry conditions, they will not readily develop under these adverse conditions. Likewise, infective larva can reside on vegetation for relatively long periods of time, but do not withstand periods of drought, or winter. It also is important to note that cattle that are housed and fed in systems that do not allow fecal contamination of feeds are not significantly exposed to infective worms. Thus, animals that are housed in confinement and are fed in bunks or clean feed alleys, have very low, if any, worm loads. Older animals develop resistance against worms; thus, it is usually most important to have a deworming program for young stock than older cows. The animals to be targeted for deworming are young animals, particularly those on pasture for the first time.

Therapeutic Regimen

Considering the biology, the concept of treating animals at the end of winter, just as they go out to pasture is essentially a waste of time and money. Even if the animals were exposed to eggs because of fecal contamination of the bunk, the ambient conditions would not allow their development to infective larva. Eggs that survived the winter or pasture would take time to develop into infective larva, and then reproducing adults. Thus, the best time to apply the first dose of therapy is not at the onset of pasturing, but rather 30 days after initial pasturing, just as the nematodes are ready to reproduce. Likewise, a second dose should be applied after another 30 days (60 days after initial pasturing). This is adequate to dramatically diminish the reproductive capacity and pasture population of the nematodes, thus placing the cattle in an essentially worm-free status for the rest of the summer. This can be further accentuated if the later part of summer is dry, as this will cause more survival hardship for the few remaining larva. A final deworming dose should be administered during the fall, preferably when the pasture season ends. It is important to administer a drug at this time that has efficacy for flies as well, including *Hypoderma bovis* (warbles).

Summary

Studies indicate that mixed breed groups of dairy heifers placed on pasture after their first winter grew an average of 90 lb more by fall when dewormed twice in the summer compared with herd mates that were not treated.
Animal Initiative Project: Michigan Lameness Study

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Recognizing the importance of lameness in dairy cattle, Michigan State University’s Animal Industry Coalition and the State of Michigan’s Animal Initiative supported a project to evaluate lameness in Michigan dairy cows. As the information from this study has been analyzed, updates were provided in the Michigan Dairy Review (1, 2, 3, 4). This article describes the final phase of the project, which focused on the relationships among types of foot lesions, lameness scores (LS), body condition scores (BCS), and milk production.

Study Methods

Dairy lameness studies have often concentrated on identifying lame cattle and describing their hoof lesions. In this study, we were interested in looking at a herd level picture of both lame and non-lame cows, and how lameness might influence body condition and milk production. Also, we were interested in determining if lame and non-lame cows had similar or different claw abnormalities. Ninety-five farms milking at least 50, but not more than 300 cows were visited. On each of these farms, lactating cows were scored for body condition and lameness. A standard 1 to 5 scale for BCS was used. For lameness scoring, the cattle were observed at rest and while walking. A 1 to 5 scale was used with 1 indicating no lameness, 2 indicating mild lameness (arched back while standing and walking; normal gait), 3 indicating moderate lameness (abnormal stance and gait), 4 indicating obvious lameness in one or more limbs, and 5 indicating an extreme reluctance or inability to bear weight on one or more limbs. Thirty of the 95 farms were selected for a second evaluation visit, during which up to 20 individual cows per herd were examined. Most cows in this subset were selected for physical examinations by the owners/managers because they were lame and or needed a foot trim. A lameness score was assigned to each cow and they were then put onto a hoof-trimming table so that each claw could be examined, trimmed, and any abnormalities recorded.

During the initial farm visits, 13,144 cows were scored for body condition and lameness. During the second visit, 452 cows, both lame and non-lame, were selected and scored for lameness and then placed on a hoof-trimming table for claw examination and hoof trimming.

Results

Almost 50% of the 13,144 lactating cows that were scored for lameness initially did not show any signs of being lame (LS = 1; Figure 1). Approximately 12% of this group were mildly lame (LS = 2), about 37% were moderately lame (LS = 3), and less than 5% were severely lame (LS = 4). There were no cows that scored in the 5 category. This proportion of lameness was much higher than expected. The proportion expected was based on a survey of dairy producers that was conducted before the farm visits. We asked producers to estimate the percent of milking cows in their herd that were lame (1). The range reported was 0 to 60%, with an overall average of 4.5%. In our study, approximately 52% of all 13,144 examined cattle showed mild to severe lameness. This suggests that producers may not perceive lameness to be as extensive a problem as the study found, and may explain why some of the causes of lameness go uncorrected.

Most of the cows examined during the second visit were selected by owners because they were lame and (or) in need of a foot trim. Therefore, many more of these cows showed obvious signs of lameness (Figure 2). The claw lesions reported and described in previous issues of the Michigan Dairy Review (2, 4) included abscess, corn, digital dermatitis (heel warts), foot rot, hemorrhage*, heel horn erosions*, interdigital dermatitis, overgrown hoof, sole ulcer, undermined sole, and white line disease*. The lesions indicated by an asterisk above were found most often regardless of whether or not an animal was lame, and most cows had more than one type of lesion that affected several if not all of her claws.
Cows that were moderately to severely lame (LS = 3 or greater) had lower BCS (poor body condition) and lower milk production than cows that were not lame or showed only mild signs of lameness (LS = 2 or less). This finding reinforces the fact that lame cows are uncomfortable. They are not inclined to get up and eat, which leads to weight loss, which leads to a decrease in milk production.

An interesting finding of this study is that some cows do not appear lame although they have some of the same types of foot problems (hemorrhage, heel horn erosions and white line disease) as lame cows. This is relatively new information, which, as with most new information, leaves more questions to be answered. What happens to these cows over time? Do they become lame? Do their foot problems become worse or do they improve? What factors contribute to the healing or decline in health status of cows that have foot problems? This study was not intended to follow cows over time. Rather it provided a snapshot of herd lameness. Therefore, at present, we cannot answer these questions.

Summary
In this project there was a much higher proportion of lame cows than expected. Other major findings were that non-lame cows had some of the same types of foot abnormalities as their lame herd mates, and that most cattle had more than one type of lesion. These animals would not be discovered unless they had their feet trimmed. Many professional hoof trimmers will report the types of lesions found while trimming both the lame and non-lame cows, and this can provide a producer with a more complete picture of foot health than concentrating only on the lame cattle. In fact, finding and correcting problems early may prevent more severe disease.

Foot disease can arise from environment and management problems, nutritional imbalances, and (or) infectious agents. Facilities that require cows to walk long distances or stand for lengthy periods on cement flooring are stressful to a cow’s feet and legs. Free stalls that are poorly designed or do not provide comfortable bedding contribute to discomfort. Imbalances in rations can lead to digestive upsets that may contribute to laminitis. Foot disease can be introduced into a herd from purchased replacements and contaminated trailers. Recognizing that lame-free cows are not necessarily free from foot problems reinforces the importance of paying attention to well-established management principles that target cow comfort, balanced nutrition, and biosecurity.

References
Herdlife and survival or culling rates influence dairy farm business profitability. During the past decade there have been significant changes in survival rates, culling patterns and how long cows stay in the herd. Furthermore, the genetic component of herdlife can be predicted with the Predicted Transmitting Ability for productive life (PTA PL).

Culling and Survival Rates - Historical View

Table 1 includes the turnover rate and percentage of cows that died annually for selected years from 1959 to 2001. (Turnover rate is calculated as number of cows left herd ÷ average number of cows in herd for the year. This value is reported in Dairy Records Management Systems (DRMS) DHI-202 reports as “percent left”.) The percentage of the herd that is culled annually has increased from 29 to 41%. A significant increase in the percentage that died in the early 1990s, in part, is likely a result of restrictions on sending downer or potential downer cows to slaughter. Additional increases in percent died since 1995 (from 4.2 to 6.9) may, in part, be a result of reduced options for removal via rendering. Producers may have previously coded cows culled if they were shipped to auction or rendering as long as they left the farm alive. Furthermore, managers likely have modified management of sick and treated cows because of reduced options for disposal resulting in more cows dying on farm than in previous years.

Survival Rates Decreased Nationally

A recent study (1) using national DHIA records showed the trend in survival rates (Figure 1). The fraction of cows in the herd surviving from one lactation to the next decreased from 0.65 to 0.60 during the 1990s. Survival of 0.60 with a 14-month calving interval translates to an annual culling rate of 34%.

Culling Rates Influenced by Replacements

The number of replacements calving annually per 100 cows grew from 27 to 32 between 1975 and 1985 (USDA Economic Research Service statistics) and has remained around 32 heifers calving per 100 cows. In general, if replacements are available they are moved into herds replacing cows that might not otherwise be culled. Therefore, some of the increase in culling or decrease in survival rates is caused by improvements in calf and heifer rearing programs implemented since the 1970s. Calf hutches get part of the credit. When we compare the 32 heifers to calve per 100 cows and the cull rate of 34 to as high as 41%, this may reveal part of the reason for increased market prices for replacements in recent years. What we don’t know is how herd expansion and herd sell-outs have influenced pressure on the replacement market nationally. Expanding herds have to purchase replacements for several years and may have higher culling rates. Herds selling out, supply replacements to existing and expanding operations.

Why Cows Leave Home?

The reasons cows leave the herd have changed. Figure 2 (page 16) shows trends in reasons cows left Michigan herds from 1985 to 2001 for categories with the greatest change. Starting in 1998 our DHI records were processed at DRMS with
fewer possible codes, which may have resulted in some changes in how cow-events are recorded or coded. Voluntary culls due to low production decreased from 13 to 6% in the last 15 years. More cow-events are coded for Died, Mastitis, Not reported, Disease, and Feet and Legs. The “Other” category is included under “Injury” with the DRMS record system and is reflected in the increase in Injury/Other category and the decline to zero for Other in 2001.

**Herdlife**

Predicted Transmitting Ability for productive life (PTA PL) predicts the time a cow stays in the herd. This is the genetic component of herdlife and is moderately heritable at 8.5% (heritability of milk yield is 20% to 30%). However, productive life does not equate to actual herdlife because many environmental and management factors influence herdlife. These sum to the other 91.5% of variability in productive life. We do know that estimates for PTA PL have been increasing over time based upon type and production data from as far back as the late 1960s (2). This means that cows are genetically better equipped today to stay in the herd. However, actual time in the herd decreased from 1967 to 1989 (2).

Since the early 1990s, however, surviving cows are staying longer (1). This is primarily due to calving intervals increasing (Figure 3) and cows staying longer in their terminal lactation, i.e., days in milk (DIM) when cows left the herd (Figure 4). Calving interval has increased from 13.3 to 14 months between 1983 and 1999. Calving interval and length of the last lactation are independent of percentage of cows culled.

Use of bST in some herds and higher milk prices in the later part of the 1990s likely influenced calving interval and terminal record length. The use of bST increases the number of days into a lactation in which a profitable level of milk production is maintained. This allows managers to keep cows in the herd longer prior to culling or to keep more late bred cows for another lactation.

**Summary**

_Culling and Survival_. Survival rates of lactating dairy cows have decreased nationally, thus culling rates are increasing. Culling rates are influenced by number of available replacements, which have increased since the early 1970s. Fewer cows leave because of low production while involuntary reasons for culling indicate there are more cows with physical and (or) health problems. The percentage of cows dying annually increased in the 1990s and is at least partly due to changes in disposal options and regulations.

_Herdlife_. Genetically, cows are equipped to stay longer but the length of time surviving cows remain in the herd decreased until the mid-1990s. Today, surviving cows stay longer because reproductive performance is declining resulting in increased calving interval and because terminal lactations are longer. Use of bST and higher milk price likely increase calving interval and length of terminal lactations. Environment also is an important part of cow survival.

What can management do? The information presented in this article reflects the AVERAGE. As dairy herd managers, you can evaluate the current status of your operation by using
Breeding and Genetics

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The Net Merit (NM$) index was revised in August 2003 to include cow fertility and calving ease traits. With the addition of these traits, the economic values of the other traits were updated. NM$ is defined as the expected lifetime profit expressed relative to the base population for the breed. Currently, the base population for each breed is cows born in 1995.

**NM$ Calculation**

NM$ is a selection index, which combines genetic estimates for production, type, and fitness traits into a single value. The weights for the traits are based on known or estimated economic values. Selection of service sires is simplified by incorporating a combination of traits into a selection index. NM$ can be a useful tool for many dairy producers whose goals are to improve functional type, health and fitness traits, and lifetime profit.

The traits included in the recently revised NM$ and their relative economic weights are in Table 1. Fat and protein yields are the only milk production traits used because they are the key traits in the multiple component pricing systems. Calving ease evaluations are not available for the non-Holstein breeds.

Note that the total of the relative weights for each breed (ignoring the negative signs) is 100%. Negative weights for somatic cell score, body size, and both calving ease evaluations indicate that lower genetic values for these traits are more desirable and are associated with greater lifetime profit.

Traits included in the three type composites for Holsteins include the following.
- **Udder composite**: fore udder, rear udder height, rear udder width, udder cleft, udder depth, and teat placement.
- **Feet and legs composite**: rear legs (side view), rear legs (rear view), foot angle, and feet and legs score.
- **Body size composite**: stature, strength, body depth and rump width.

For the non-Holstein breeds, teat length also is included in the udder composite, and rear legs (rear view) and feet and legs score are excluded from the feet and legs composite. Body depth is not included in the body size composite for Jerseys. For more information on the weightings of the traits in each type composite index, please refer to the article, *Net Merit: August 2003*, at http://www.naab-css.org/education/

**NM$ Changes**

Three traits were added to the NM$ index.
- **Service sire calving ease (SCE)**: sire’s ability to produce a calf that is born easily.
- **Daughter calving ease (DCE)**: cow’s ability to deliver a calf easily and cow’s tendency to produce a calf that is born easily. The cow can influence the ease of delivery by her own physical conformation, particularly in the pelvic area, and by the size of the calf that she produces. Daughter calving ease evaluations have been calculated for Holsteins.

**References**


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**Table 1. Relative weights for traits in NM$**.

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<tr>
<th>Trait</th>
<th>Relative Weight (%)</th>
<th>Relative Weight (%)</th>
</tr>
</thead>
<tbody>
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<td>Fat yield</td>
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<td>23</td>
</tr>
<tr>
<td>Protein yield</td>
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<td>35</td>
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<tr>
<td>Productive life</td>
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<tr>
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</tr>
<tr>
<td>Feet and legs composite</td>
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<td>-3</td>
</tr>
<tr>
<td>Daughter pregnancy rate</td>
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<td>Service sire calving ease</td>
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<td>--</td>
</tr>
<tr>
<td>Daughter calving ease</td>
<td>-2</td>
<td>--</td>
</tr>
</tbody>
</table>
Holsteins since August 2002.


With the addition of these three traits in NMS, the relative weights of several traits were reduced. For Holsteins, the emphasis on production traits was reduced from 62% to 55%. Genetic progress will still occur in yield, but at a slightly slower rate. Emphasis on productive life (PL) declined from 14% to 11%. Although direct emphasis on genetic evaluations for PL will decline, genetic progress in PL is expected to increase because improvement in calving ease and daughter pregnancy rate will increase longevity. PL is the trait used to estimate genetic merit for longevity and is based on a cow’s months-in-milk by 7 years of age.

The revisions to NMS will cause only minor changes in the rankings of most bulls. The most significant ranking changes likely will occur for bulls that have extreme values for DPR, SCE, and (or) DCE. The correlation between the previous NMS (NMS2000) and the revised NMS (NMS 2003) is extremely high (0.98).

### Expected Genetic Change

The impact of selection based on NMS over a 10-year period was estimated for the traits included in the revised NMS. The expected genetic change per decade for several traits in Holsteins are the following.

- Somatic cell score (SCS) is expected to change by -0.44 linear score units due to reduced emphasis on production and increased emphasis on udder health traits. For the Holstein breed, the average SCS is expected to decline from a linear score of 3.10 to 2.66, with a likely corresponding reduction in mastitis incidence.
- The inclusion of DPR in NMS will counteract the reduction in cow fertility that results from selection for greater yield. The genetic correlation between yield and DPR is negative. Selection based on NMS over 10 years will result in a 1% improvement in DPR, which corresponds to 4 fewer days open on average. In addition to the genetic antagonism with yield, DPR has a relatively low heritability (4%), resulting in slower genetic progress.
- Productive life will increase by 4.8 months with the revised NMS compared to 3.6 months with the former NMS.
- Body size composite has a negative weighting in the NMS index. However, the expected genetic change per decade is relatively insignificant. Over a 10-year period selection based on NMS would result in a -0.6 change in body size composite or the equivalent of 14 lb in average cow size.
- About 10% less progress per year will be made for production traits under the revised index compared to 3.6 months with the former NMS. Genetic evaluations are used to rank animals based on genetic merit. A specific selection index value (or predicted transmitting ability of an individual trait) is more meaningful when you know where that value ranks among the animals from which you are selecting.

### Sire Selection Goals

Selection indexes such as NMS are useful tools in making sire selection decisions. They incorporate genetic evaluations for a combination of traits into a single value, while considering each trait based on its relative economic importance or desired emphasis. NMS is calculated based on each trait’s contribution to lifetime profit.

Percentile rankings are available for NMS to help you determine the relative superiority of service sires. To maximize genetic improvement in your herd, it is important to select sires that have high percentile rankings across multiple traits, indicating a strong genetic foundation for your herd.
Pasta Filata? Cheese Not Spaghetti!!

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recommended that you select a group of service sires to average at or above the 80th percentile. See Table 2 for NMS levels of top percentiles of AI sires.

The genetic merit of your cows and replacement heifers is an important foundation of your herd. Ensure that your future replacement heifers will contribute significantly to the genetic improvement of your herd. Use NMS or other appropriate genetic values based on your herd goals to select genetically superior service sires.

References

Dairy Foods

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Many of us think of a nice plate of spaghetti and meatballs or a cool summer salad when we hear someone talking about pasta. However, “pasta filata” has nothing to do with wheat-based noodles and marinara sauce. Pasta filata (spun curd) cheeses make-up a group of semi-soft cheeses that have traditional roots in southern Italy, widespread appeal, and newfound popularity. The common characteristic of pasta filata cheeses is the stretching and kneading of the curd in hot whey or water to give the finished product a smooth, close textured body in a wide variety of shapes and sizes. The stretching process aligns the proteins in the curd so stringiness similar to chicken breast meat is exhibited.

The Fastest Growing Cheese

As a member of this class of cheeses, Mozzarella has distinguished itself as the fastest growing cheese variety over the last 40-50 years. One does not have to look very far around town or the local grocery store to realize that the pizza business has become a major component of the food industry over that same time. Of course, one of the most important ingredients on most pizza is Mozzarella cheese. Another Mozzarella cheese product showing growth in recent years is string cheese used in snack sticks and pizza crusts.

The Mozzarella cheese that is used on most pizza and as string cheese fits the US Food and Drug Administration standards for low moisture or low moisture, part-skim Mozzarella. The 45-52 percent moisture content provides a cheese that is easier to slice, dice, and shred than traditional Mozzarella. The fat content of low moisture Mozzarella has similar standards for fat but has a moisture content within the range of 52-60 percent. The higher moisture content leads to a cheese that is softer and more pliable. Traditional Mozzarella is becoming more popular with consumers as the types of foods consumed have broadened. No longer is traditional Mozzarella only consumed in ethnically Italian homes but is finding favor as an ingredient in cooking and as a compliment to salads and other cold dishes. All varieties of Mozzarella are considered un-ripened cheeses and will have the mild flavors associated with concentrated milk. For a really traditional experience, one may use Mozzarella made from water buffalo milk, which is the original source of milk for Mozzarella in the southern part of Italy.

Provolone Proves Its Acceptance

Another pasta filata cheese that has gained widespread acceptance is Provolone. Traditionally, Provolone will be made in the same manner as low moisture Mozzarella; however, the resulting cheeses will then be aged to develop a mild to sharp flavor typical of Italian style cheeses. If a sharper, piquant flavor is desired enzymes will be added during manufacture to accelerate the development of flavor components from the milkfat. Provolone cheese also may be smoked and will appear in a wide variety of shapes and sizes from 1 to 200 pounds. Provolone cheese slices are a popular ingredient in sandwiches, compliment a variety of other foods, such as fresh fruit, or work well as a stand-alone snack item.

Other pasta filata cheeses, such as Scamorza and Caciocavallo, also may be found in grocery and specialty shops. Pasta filata cheeses are only the tip of the “boot” when considering Italian cheeses. In subsequent issues of the Michigan Dairy Review, a trip up the Italian peninsula will provide a wide variety of different and flavorful cheese experiences.

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Of course, one of the most important ingredients on most pizza is Mozzarella cheese.
Accurate and precise provision of phosphorus (P) in dairy rations is required both to meet cows’ requirements and to achieve effective on-farm nutrient management and environmental sustainability.

Most recent research has addressed requirements and feeding of P to lactating cows because that is where the largest flow of P occurs in the dairy herd (Beede, 2003). Less attention has focused on the optimal ration P concentration for close-up (last 3 to 4 weeks before calving) Holstein cows with high genetic potential for milk production. Phosphorus nutrition of these particular cows is especially critical because they are less able than younger cows to mobilize P from bone around the time of calving.

For multiparous (second and greater lactation), late-pregnant (270 days of gestation) Holstein cows (average body weight (BW) 1500 to 1600 lb) the daily dietary P requirement is 30 to 33 grams/cow (NRC, 2001). Based on the NRC feed intake model these cows are predicted to consume about 30.1 pounds of ration dry matter/cow per day. Therefore, the recommended dietary P concentration in the close-up ration would be 0.24%, dry basis.

However, close-up rations in Michigan dairy farms typically contain higher P concentrations. This results from: 1) over-supplementation of inorganic P in pre-fresh mineral mixes; or, 2) the often high “background” P content of the base feed ingredients selected for the close-up ration (Beede, 2003). Both of these issues are addressed later in this article.

Also, in some cases, dietary P is supplemented in the close-up ration in excess of the NRC requirement because of recent herd problems with hypophosphatemias (clinical cases) around the time of calving and (or) concerns about low blood P discovered when assessing transition cow problems.

In fact, it is common to observe close-up ration formulations with 0.35 to 0.45% P, or more, dry basis. We hypothesize that these high P concentrations, higher than NRC recommendations, actually are bad for close-up and transition (3 weeks before through 3 weeks after calving) cows. We hypothesize that 0.24% P in the close-up ration is adequate and most efficacious for a normal transition into early lactation.

Therefore, we conducted an experiment to determine the optimal dietary P concentration and to characterize health and performance from 4 weeks before calving through 4 weeks after calving for multiparous Holstein cows with high milk yield potential.

Cows and Dietary Treatments

During a standardization period (60 to 28 days before expected calving) 45 multiparous Holstein cows all were fed the same far-off dry cow diet (0.31%P, dry basis). Beginning 28 days pre-calving, cows were assigned randomly to one of three totally mixed experimental rations that differed in P content. The three different P concentrations were: 0.21, 0.31 and 0.44%, dry basis. After calving, all cows were fed the same ration balanced for 120 pounds of milk/cow per day for 28 days.

Results before Calving

Table 1 shows average responses of cows during the last 28 days before calving. Feed dry matter intake (DMI; lb/cow per day or as a percentage of BW) was not affected by P content of the close-up ration. Average DMI of experimental cows was about 13% greater than that predicted by NRC (2001). As anticipated, P intake was different among the three experimental treatments because the dietary P% differed. Daily P intake averaged 34 grams/cow for cows fed the close-up diet with 0.21% P, very similar to the dietary requirement (NRC, 2001). Cows fed rations with 0.31 and 0.44%P consumed about 42 and 98% more P than those fed near requirement. Body weight and body condition score changes during the close-up period did not differ among treatment groups.

Responses around Calving

Blood serum P concentrations from samples taken during the close-up period (28 days) differed for cows fed rations with different P% (Table 1). However, blood serum P concentrations of cows fed 0.21% dietary P were still within the normal range (4 to 6 mg/dl) for dairy cattle. Serum P of cows fed 0.31 and 0.44% dietary P slightly exceeded the normal range. Cows fed 0.21% P had the lowest serum P concentrations through calving. However, by day 3 after calving their serum P concentrations rose above those of cows fed the close-up diets with 0.31 or 0.44% P. Serum P concentrations of cows fed 0.31 or 0.44% P were similar and within the normal range before and after calving or in the early days after calving.

On dairy farms, it is often surmised that if blood serum P concentrations are below the normal range around the time of calving that cows are deficient in dietary P. However, our results show that this is a false assumption. Note that cows in all three treatment groups had serum P concentrations below the “normal” range during the day of calving (day 0, Figure 1). None of these cows presented clinical hypophosphatemias.
During the day of calving or in the early days after calving.

During assessment of transition cow problems, it is sometimes noted that blood serum P concentrations are below the normal range (4 to 6 mg/dl). Cows are presumed to be experiencing a dietary P deficiency. Often the action taken to correct the presumed problem is to increase P in the close-up diet. Based on our new research results this appears to be exactly the wrong action to take. Several cows in this experiment had P concentrations below 4 mg/dl the day of calving. However, all of these cows were able to naturally correct the low serum P concentrations within a day or two after calving, and no cows in the experiment presented clinical hypophosphatemia. Only one cow in the experiment (fed 0.31% P) presented clinical milk fever; she was treated and promptly recovered.

Serum Ca and Mg concentrations during the 28 days before calving were not affected by P% in the ration (Table 1). However, Figure 2 (page 22) illustrates a potentially important risk factor related to Ca homeostasis of transition cows. Cows fed the ration with 0.44% P had lower blood serum Ca concentrations the last few days before calving and especially the day of calving than cows fed 0.21 or 0.31% P. This suggests that these cows may be at greater risk of periparturient hypocalcemia if higher than needed P (0.44 vs. 0.21 to 0.24%, dry basis) is fed in the close-up ration.

**After Calving**

Table 2 (page 22) presents responses during the first 28 days after calving for cows fed their respective close-up rations differing in P concentrations. All cows were fed the same ration after calving. None of the measurements (DMI, body weight or body condition score change, or milk yield or composition) were affected by the P% of the close-up ration. The overall average energy-corrected milk yield of all cows in the experiment was about 116 lb/cow per day during the first 28 days of lactation.

**Discussion**

Results of this experiment do not support feeding P in greater concentrations or amounts than recommended by NRC (2001). In fact, these results demonstrate that providing about 30 grams/cow per day or 0.21 to 0.24% P, dry basis in the close-up ration was optimal in meeting the multiparous Holstein cow’s dietary requirement. Results also provide evidence that feeding more than the requirement (e.g., 67 grams per day or 0.44% P) may be deleterious to Ca status during the periparturient period.

**Over-supplementation or excess background P.** Very few of the close-up rations fed to Michigan Holstein dairy cows require any P supplementation to achieve 0.24% P, dry basis. Commonly, the problem is that the P% of the close-up ration is too high (e.g., 0.35 to 0.5%). This may be due to over-supplementation via a pre-fresh mineral mix; this supplementation error can and should be corrected immediately. Excess ration P also may be due to the fact that the base feed ingredients used in the close-up ration contain P concentrations well in excess of that needed to provide the close-up cow’s P requirement (see Table 2, page 4, January, 2003 issue of Michigan Dairy Review). The thought then might be, “I’ve gotten the P% as low as I can with the ingredients I am using, there’s nothing else I can do”. However, selection of other special feedstuffs with lower P content for close-up cows may be effective to improve transition cow health and
Performance. Results of the current experiment indicate that if the P% of the close-up ration is too high (e.g., 0.44%) then there is risk to cow health during the transition period.

Conclusions, Recommendations

Feeding dietary P to meet the NRC (2001) dietary requirement resulted in normal health and transition performance for multiparous Holstein cows with potential for high milk production. Based on the amount of feed DM consumed prepartum by cows in this experiment (average 34.2 lb/cow per day) or that predicted (30.1 lb/cow per day) by NRC (2001) for cows of similar body weight, P concentrations of the close-up ration in the range of 0.21 to 0.24% provided 30 to 35 grams of P per cow per day. Feeding higher concentrations (e.g., 0.44%P) may put cows at risk for periparturient hypocalcemia.

Several of the cows in the current experiment had serum P concentrations near the time of calving that were below the “normal” range. None of these multiparous cows exhibited any signs of clinical hypophosphatemia; and, lactational performance was normal during the first month after calving.

Close-up rations for multiparous Holstein cows consuming close to NRC-predicted amounts of feed during the last 3 to 4 weeks before calving should contain about 0.21 to 0.24% P and provide 30 to 35 grams of P per cow per day.

(More detailed information about the experiment is available from the authors upon request.)

References


Table 2. Post-calving responses of multiparous Holstein cows (averages of data from the first 28 days of lactation).

<table>
<thead>
<tr>
<th>Close-up ration P, %</th>
<th>0.21</th>
<th>0.31</th>
<th>0.44</th>
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<tr>
<td>Dry matter intake, lb/d</td>
<td>40.5</td>
<td>43.3</td>
<td>43.8</td>
</tr>
<tr>
<td>Dry matter intake, % of BW</td>
<td>2.88</td>
<td>3.05</td>
<td>3.00</td>
</tr>
<tr>
<td>Body condition score change (1 to 5 scale)d</td>
<td>-0.48</td>
<td>-0.47</td>
<td>-0.48</td>
</tr>
<tr>
<td>BW change, lb</td>
<td>-107.6</td>
<td>-125.8</td>
<td>-104.3</td>
</tr>
<tr>
<td>Blood serum P, mg/dl</td>
<td>6.33</td>
<td>6.09</td>
<td>6.13</td>
</tr>
<tr>
<td>Energy-corrected milk yieldb, lb/d</td>
<td>117.5</td>
<td>117.0</td>
<td>114.9</td>
</tr>
<tr>
<td>Milk true protein, %</td>
<td>3.06</td>
<td>3.11</td>
<td>2.99</td>
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<tr>
<td>Milk fat, %</td>
<td>5.44</td>
<td>5.32</td>
<td>5.04</td>
</tr>
<tr>
<td>Milk lactose, %</td>
<td>4.65</td>
<td>4.76</td>
<td>4.70</td>
</tr>
<tr>
<td>Milk solids-not-fat, %</td>
<td>8.61</td>
<td>8.77</td>
<td>8.63</td>
</tr>
</tbody>
</table>

a Patton et al. (1988).
b ECM yield, lb/day = 0.3246 x milk yield, lb/day + 12.86 x fat yield, lb/day + 7.04 x protein yield, lb/day; (Dairy Records Management Systems, 1999).

Figure 2. Blood serum Ca concentrations of multiparous Holstein cows from 7 days before through 7 days after calving.

Acknowledgements

Partial support for this research from the United States Environmental Protection Agency (US-EPA), the C.E. Meadows Chair Endowment, the Michigan Animal Agriculture Initiative and Agricultural Experiment Station, USDA/CSREES Project:MAES#1800; NC-1119 Regional Research Project, West Central Soy (Ralston, IA), and Moorman’s Manufacturing Company (Quincy, IL) is appreciated. The technical assistance of Bob Kreft and co-workers in feeding and care of the cows at MSU Dairy Teaching and Research Center also is appreciated.
Milk cow numbers began to fall from March to April this year. Dairy cow numbers in the 20 major dairy producing states are down 52,000 head from the peak of 7.811 million head in March (Figure 1). The trend of increasing dairy cow numbers that began in October 2001 finally ended with this down-turn. Milk production levels tend to correspond to changes in milk cow numbers. However, in July 2003 milk production, surprisingly, was up 0.5 percent above July 2002 levels. The recent August milk production report confirmed that milk production per cow was headed down with a decrease of 0.8 percent from a year earlier. This represented a 7 lb per cow decrease with 26,000 fewer cows.

Milk Prices Going Up

Coincidentally, milk prices turned up with the decline in milk production. The August Class III price was announced at $13.80/hundred weight, which was $2.02/hundred weight above the July value and $4.05/hundred weight above June. This large increase in Class III price led to a negative producer price differential (PPD). Recall that the PPD is defined as the difference between the average pool value and the Class III price. Since August Class I prices were set using the July Class III price, Class I milk actually was priced below Class III that month leading to a negative PPD. The price recovery has helped the milk-to-feed price ratio recover to some extent (Figure 2). A value of 3.0 is considered respectable, and with the MILC payments hovering around $1.75/hundred weight in spring and early summer, the ratio surpassed 3.0 in August. Of course it is the case that many farms used up all MILC payments (2.4 million lb of annual production) before summer on the government fiscal year (October 1 – September 30). The Class I mover was announced at $13.71/hundred weight for September meaning that there will be no MILC payment. October may be the same situation.

National Milk Producers Federation announced that 2,552 bids were submitted for the Cooperatives Working Together program (CWT). Eighty percent of the bids were to retire whole herds with the remainder to reduce production. About one-third of the bids came from the Midwest region (where Michigan resides). The program will sort through bids and begin notifying farms with accepted bids. The goal is to remove 1.2 billion lb of milk from production by culling 33,000 cows (580 million lb of milk) and paying farmers to reduce production another 88 million lb over the next year. The remaining 532 million lb will be removed by subsidizing exports of cheddar cheese and butter. The program is funded by a 5 cent per hundredweight checkoff from participating producers. More information is available at the CWT website www.cwt.coop.
Two Animal Science seniors with a dairy interest were the first to complete MSU’s new Dairy Associates Program this spring. In addition to taking courses in dairy science and management, Dairy Associates attend dairy industry conferences, take part in a dairy-related internship or employment, participate in the MSU Dairy Challenge, and complete a senior thesis project during their junior and senior years. Last fall, Kristy Daniels from Sterling and Jessica Dorr from Saline conducted senior thesis projects on pasteurization of colostrum and regulation of mammary gland growth, with guidance from faculty in the Department of Animal Science. Their research was supported by funding from the G.C. and Gwendolyn Graf Memorial Student Enhancement Program, the initial endowment that established the Dairy Associates Program.

An Accelerated Growth Program

Investigating the effects of an accelerated growth program for pre-weaned calves on mammary development was the focus of Kristy Daniels’ work with Miriam Weber Nielsen, Mike VandeHaar, and Paul Coussens. A recent experiment completed at MSU with Kristy’s assistance showed that body growth rates of calves can be increased through higher protein and energy intake, and calves on the increased protein and energy intake also had more mammary development than control calves. Using mammary tissue from calves on this experiment, Kristy evaluated the effect of the accelerated growth program versus the control diet on gene expression in mammary tissue of insulin-like growth factor-I (IGF-I), a factor known to be stimulatory to growth of mammary cells. Kristy presented her results to the Department of Animal Science in December, before moving to Virginia Tech to pursue a Master of Science degree in Dairy Science.

Testing Effects of Pasteurization

Jessica Dorr tested the effects of pasteurization on concentrations of immunoglobulins (Ig) in colostrum from mature Holstein cows at the MSU Dairy Teaching and Research Center. Although colostrum is important for a calf’s health and future performance, colostrum also can transmit diseases such as Johne’s and bovine leukemia from dam to offspring. Pasteurization can reduce the risk of calves consuming viable bacteria in colostrum. However, the heat treatment associated with pasteurization has the potential to reduce the effective Ig present in colostrum and subsequently the ability of the calf to absorb useful Ig, especially IgG. With guidance from Jeanne Burton and Miriam Weber Nielsen in Animal Science and assistance from Bob Kreft, manager of the MSU Dairy, Jessica determined the effect of batch pasteurization using the farm’s pasteurizer on quality and concentration of IgG in pasteurized colostrum. Results from Jessica’s work indicated that the pasteurizer did not significantly affect the quality or concentration of IgG in colostrum.

Another student currently in the Dairy Associates Program is following up on Jessica’s results to evaluate if pasteurization affects absorption of colostral IgG by calves. Jessica presented her work to the Department of Animal Science prior to graduation last December, and has returned to MSU this fall to begin veterinary school.

The Dairy Associates Program was created to encourage students to pursue dairy-related careers by becoming active partners with producers, industry representatives, and faculty. Participation in these extracurricular dairy-related experiences will allow tomorrow’s leaders to develop an integrated perspective on the dairy industry.
The MSU College of Veterinary Medicine is proud to announce that Dr. Lorraine Sordillo has accepted the position as the first holder of the Meadow Brook Endowed Chair in Farm Animal Health and Well Being.

Sordillo received her PhD degree in bovine immunology from Louisiana State University. Following that, she was a postdoctoral fellow in the Animal Science Department at the University of Tennessee. From there she joined the immunology group of the Veterinary Infectious Disease Organization at the University of Saskatchewan.

Thereafter, she has spent most of her professional career at Pennsylvania State University in the Veterinary Science Department.

**Specialty is Bovine Mastitis**

Sordillo’s broad area of research is bovine mastitis. This is a common and devastating disease of cows, and a costly problem to the dairy industry. The specific focus of Sordillo’s research is to better understand the interaction between the bovine mammary gland and infectious agents that cause mastitis. Her goal is to find ways to enhance the natural immunity of the mammary gland during times of increased susceptibility to mastitis.

Sordillo has been a productive scientist having authored or co-authored more than 70 papers in the refereed scientific literature. She has written numerous chapters in books and monographs and has served as the primary advisor to 17 graduate students and served on the advisory committees of many more.

**Holds Five Patents for Products**

Sordillo holds five patents for products related to bovine immunology or immunology research and has been awarded well over $2,000,000 in support of her research efforts.

She serves on several national committees and has received five national awards for her research, including the Agway Inc. Young Scientist Award and the West Agro Award, each presented by the American Dairy Science Association.

Sordillo has a reputation for innovation. Her research skills include many cellular and molecular techniques, and she has the ability to apply the rapidly expanding technologies of molecular biology and genomics to disease problems of farm animals.

In addition, she has the reputation of seeking and building strong collaborative teams of research scientists and is already involved in active collaboration with other scientists at Michigan State University. Sordillo will be joining the faculty at Michigan State University in January 2004.

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**Calendar of Events**

**October 22, Fluid Milk Processing; February 4, 2004, Cleaning and Sanitation in Dairy Plants; March 9-10, 2004, Pasteurization.** These three workshops are planned for this academic year by the Michigan Dairy Education Partnership (MDEP), which is made up of the Michigan Department of Agriculture, Michigan Dairy Foods Association, and Michigan State University Extension. All are introductory level workshops and will be located in Room 1135 South Anthony Hall (Dairy Foods Complex). The MDEP Fluid Milk Workshop is intended to provide participants with an overview of raw milk standards and testing, good fluid milk handling practices and standard processing technologies. Participants will practice the basics of dairy arithmetic needed for standardization of milk and milk products. For more information, contact John Partridge at partridg@msu.edu. The cost for the first workshop, which will be from 8 a.m. to 5 p.m., is $40.00. Register at Michigan Dairy Foods Association, telephone: 517-485-1450 or fax: 517-485-4926.

**October 29-30. Mastering the Art of Grazing,** an advanced grazing workshop for dairy producers and consultants will be held from 8:00 a.m. to 4:00 p.m. each day. The workshop will be conducted at the Isabella County Building in Mt. Pleasant. Conference fee is $150.00, however the residents of the Saginaw Bay Watershed do not have to pay courtesy of a grant from the Saginaw Bay Watershed Initiative Network. For information, contact Paul Gross at the Isabella County Extension Office, 989-772-0911, ext. 302.

**December 7-10. The Second National Conference on Grazing Lands** will take place at the Nashville Convention Center in Nashville, TN. For more information go to http://www.glc.org/2NCGLindex.htm. Sponsors include Grazing Lands Conservation Initiative and the Society for Range Management.

**March 8, 2004. The Michigan Grazing Conference** will take place during ANR Week from 8:00 a.m. to 6:00 p.m. at the Michigan State University Livestock Pavilion. More information will be in the January 2004 issue of the Michigan Dairy Review. For information, contact Betsy Dierberger at 517-676-7207 or Mike Metzger at 517-788-4292.
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