Manure is good stuff! Manure contains nitrogen (N), phosphorus (P), potassium (K), sulfur (S), and micronutrients. Manure applications over time improve soil quality (e.g., nutrient supplying capacity and soil tilth). Taking credit for manure nutrients may reduce your fertilizer bill. Also, proper crediting of manure nutrients will reduce the potential environmental impacts of excess nutrients on water quality.

Manure can adequately supply nutrients to crops. Thus, there should be no concern that crops will be under-fertilized if all or most of their nutrients come from manure. Let’s focus on how to take manure nutrient credits and examples of manure’s equivalence to fertilizer.

The first step to taking manure nutrient credits is to obtain representative manure samples as the manure is going to the field. These samples should be sent to a laboratory and analyzed. The analyzed nutrient concentrations on the laboratory report, in addition to information from your records such as application rate and method, are needed to take credit for manure nutrients.

Nitrogen Key Element for Crop Production

Nitrogen is a key element necessary for crop production found in manure. The total N in manure is made up of ammonium-N (NH$_4$-N, an inorganic form) and organic N (N associated with carbon). Nitrogen from manure is not 100% available to crops because a portion of it is in an organic form that is not immediately available, and NH$_4$-N is subject to losses through volatilization. Laboratory reports of N from manures may vary. Some may report only total N, while other reports may give total N and NH$_4$-N concentrations.

Ammonium-N is immediately available to crops. However, NH$_4$-N may be lost to the atmosphere depending upon application method and incorporation into soil. Thus, the concentration of NH$_4$-N on the laboratory report must be adjusted based on method of application and incorporation. Table 1 (page 2) shows the amount of NH$_4$-N retained. For example, if you broadcast your manure and incorporate it two days later, 40% of the NH$_4$-N would be retained and 60% will...
be lost. So, you multiply the NH$_4$-N concentration from your laboratory report by 0.40 to get the NH$_4$-N credit. Table 2 provides an example of how various spring pre-plant manure application methods impacted corn yield (4). In this study, manure was either from dairy or swine. Researchers found that the differences among treatments were a result of different amounts of available N in the soil as measured by a soil test. Injection of manures into soil resulted in greater yields because more NH$_4$-N was retained compared with broadcast applications.

Organic-N in manure is slowly available to crops over a 4-year period. The amount of organic-N that becomes available to crops (by mineralization) during the growing season varies with carbon-to-nitrogen ratio, soil moisture, and soil temperature among other things. Available N from organic-N is determined by multiplying the organic-N content by the mineralization factor given in Table 3. For example, if you have solid dairy manure containing bedding, the mineralization factor is 0.25. The amount of organic-N on your laboratory report would be multiplied by 0.25 to arrive at the amount of N that will become available to crops from manure during the first growing season after application. These mineralization factors are 50 %, 25 %, and 12.5 %, of that mineralized during the first year for 2nd, 3rd, and 4th years after initial application, respectively.

Total available N is the sum of available NH$_4$-N plus available organic-N (current year) plus available organic-N (previous years). Table 4 provides an example comparison of 4 tons/acre of dairy manure applied at planting to N fertilizer applied at planting (1). Actual values will differ depending upon the type of manure (e.g., liquid, with bedding, etc.) and the actual laboratory analysis. In all 3 years of this study, dairy manure treatments resulted in yields that were equivalent to fertilizer applied at rates of 100 to 150 lb N/acre.

**Phosphorus Recommendations**

When soils test above 60 lb P/acre for corn and soybeans or 80 lb P/acre for wheat and alfalfa, there is no agronomic need for P fertilizer. The fertilizer recommendations when soil tests are over 60 to 80 lb P/acre will be small to nil. On these soils, P from manure is considered to be 100% available. If the soil tests less than 60 lb P/acre, then using an availability factor of 80% will insure adequate P is supplied for crop growth – this is the *Laboski Rule of Thumb*. Remember though, this will tend to increase the soil test levels of P. In a Wisconsin study, dairy manure or fertilizer was applied in spring at approximately the same amounts of total P and total N (3). Table 5 shows the results of this study, which was done over
2 years at three locations each year. There were no differences in yield when all of the P was supplied by manure compared with fertilizer. Note that soil test P levels were above optimum at Fall River and Sun Prairie and were optimum at Baraboo.

Potassium from manure is 100% available to crops. Use the K concentrations directly from your manure analysis to determine how much K was applied to each field.

Use Computer Programs to Take Nutrient Credits
Taking nutrient credits can be time consuming, particularly for N. However, there are computer programs that can help you with this. One is Michigan State University’s MSUNM Nutrient Management Program and another is Purdue University’s Manure Management Planner. Contact your county extension agent if you are interested in obtaining one of these programs or visit Michigan Agriculture Environmental Assurance Program on the web at http://www.maeap.org/resources.htm. These programs will make the necessary calculations to determine nutrient credits based on information you provide regarding manure analyses and manure application practices.

They are a worthy investment for the amount of money that a farm could potentially save on its fertilizer bill by properly using and taking credit for manure N and P.

Summary
Manure can supply crop nutrient needs. Taking these credits for N, P and K will improve the environmental and economic sustainability of your farm.

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Table 4. Manure supplies crop N needs for corn grain production equal to fertilizer.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1986</th>
<th>1987</th>
<th>1988</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 lb N/acre</td>
<td>59a</td>
<td>45a</td>
<td>45a</td>
</tr>
<tr>
<td>50 lb N/acre</td>
<td>107b</td>
<td>97b</td>
<td>75b</td>
</tr>
<tr>
<td>100 lb N/acre</td>
<td>119c</td>
<td>108c</td>
<td>92c</td>
</tr>
<tr>
<td>150 lb N/acre</td>
<td>113c</td>
<td>113c</td>
<td>100c</td>
</tr>
<tr>
<td>Dairy manure 4 T/acre</td>
<td>110bc</td>
<td>103c</td>
<td>100c</td>
</tr>
</tbody>
</table>

* Yields within a year (column) with different superscript letters are significantly different from one another.

Table 5. Manure supplies crop P needs for corn grain production in Wisconsin equal to fertilizer.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fall River</th>
<th>Sun Prairie</th>
<th>Baraboo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer</td>
<td>110</td>
<td>132</td>
<td>119</td>
</tr>
<tr>
<td>Manure</td>
<td>113</td>
<td>130</td>
<td>103</td>
</tr>
</tbody>
</table>

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References
Nutrient Management

Making Manure Spreader Calibration Practical and Useful

Dann Bolinger
Extension Dairy Agent
Clinton, Gratiot, and Shiawassee Counties

Calibration of manure application equipment is a critical part of routine farm management as manure management is being examined closely in Michigan and across the country. Knowing and managing how much manure along with its nutrients is being applied to a particular field is paramount for several reasons.

1. Manure spreader calibration and the application records that depend on it are required of all dairy and livestock farms to be in compliance with Michigan Right to Farm guidelines. For farms having a Comprehensive Nutrient Management Plan (CNMP) calibration is no longer voluntary, but mandatory.

2. The inadvertent or advertent over-application of manure is considered a primary factor contributing to the risk of discharge of manure associated with field application into surface waters via surface runoff or field tile drainage.

3. Manure is a valuable source of nutrients for crop production; however, just like commercial fertilizer, manure needs to be applied and credited accurately and uniformly based on crop needs.

Although all three reasons for calibrating manure application equipment potentially can affect a farm’s profitability, the ability to confidently credit the fertilizer value of manure is the one reason that is absolutely certain to have a financial impact year after year.

Once a field has been identified as a potential recipient of manure, a desired application rate needs to be calculated based on a recent soil test (within the last 3 years), realistic yield goals, and the nutrient content of the manure as determined by laboratory analysis. Many crop consultants are proficient at recommending manure application rates, but accurately applying manure at the desired rates has at times been a guessing game. The resulting inaccurate application rates can result in inadequate nutrient levels available for maximum crop yields. More commonly, however, manure is applied in excess to insure adequate nutrients for crops, but the risk of build-up of soil phosphorus levels, direct discharge to surface water and contamination of ground water are increased under these conditions. Not only are there potential environmental costs associated with inaccurate application of manure, but the over- or under-application of manure results in inefficient use of nutrients. Under-application results in compromised crop yields, whereas over-application has an opportunity cost because the excess nutrients could have reduced purchased fertilizer costs in the cropping system.

Simple Calibration Method

Several manure application equipment calibration methods are accurate when practiced correctly. Unfortunately, many of the methods are inconvenient because of the physical and labor resources required. Therefore, few farmers actually conduct routine calibrations. Although a farmer should utilize the most comfortable calibration method(s) with which he/she is most comfortable, the following is a method requiring only a matter of minutes using equipment available on every farm. No method provides perfect accuracy, but calibration can reduce application rate errors from as high as 100 to 200 percent down to 10 to 20 percent.

The ground speed of the application equipment is often the ultimate determinate of application rate. In fact, the transmission ratio of the tractor is commonly the limiting factor in accurately matching desired application rates. Utilizing a Ground Speed - Application Rate Chart based on actual available ground speeds for a particular tractor or truck is often the most practical option for managing application rates. The following simple formula can be used to easily develop a user-friendly chart like the example provided in Table 1.

\[
\text{Rate/acre} = \frac{C}{W} \times \frac{T}{S} \times 29,700
\]

\( C = \text{capacity of spreader (tons or gallons minus unused volume)***} \)

\( W = \text{width of a pass with applicator (feet - consider overlap)} \)

\( T = \text{time required to empty spreader at the selected PTO RPM (seconds)***} \)

\( S = \text{ground speed of equipment in a particular gear and the selected PTO RPM (mph)} \)

Table 1. Example: Ground Speed - Application Rate Chart.

<table>
<thead>
<tr>
<th>Gear @ 1700 RPM</th>
<th>MPH</th>
<th>Application Rate (gallons/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.1</td>
<td>13,600</td>
</tr>
<tr>
<td>2</td>
<td>1.4</td>
<td>10,700</td>
</tr>
<tr>
<td>3</td>
<td>1.8</td>
<td>8,300</td>
</tr>
<tr>
<td>4</td>
<td>2.3</td>
<td>6,500</td>
</tr>
<tr>
<td>5</td>
<td>2.7</td>
<td>5,500</td>
</tr>
<tr>
<td>6</td>
<td>3.1</td>
<td>4,800</td>
</tr>
<tr>
<td>7</td>
<td>3.5</td>
<td>4,300</td>
</tr>
<tr>
<td>8</td>
<td>4.1</td>
<td>3,700</td>
</tr>
</tbody>
</table>
* If using a drag hose, enter gallons per minute pumped for C, and enter 60 for T.

**Example**
6200-gallon tanker (6,500 gallons minus unused volume)
30 ft application width (60 ft splash plate with full overlap)
410 sec to empty at 1700 RPM
JD 8300 tractor @ 1700 RPM: Gear #1 = 1.1 mph; Gear #2 = 1.4 mph; Gear #3 = 1.8 mph; etc.

**What is the application rate when in each gear at 1700 RPM?**
Gear #1 Rate/Acre = 6,200 ÷ 30 ÷ 410 ÷ 1.1 x 29,700 = 13,600 gal/acre
Gear #2 Rate/Acre = 6,200 ÷ 30 ÷ 410 ÷ 1.4 x 29,700 = 10,700 gal/acre
Gear #3 Rate/Acre = 6,200 ÷ 30 ÷ 410 ÷ 1.8 x 29,700 = 8,300 gal/acre

A completed chart can easily be developed and used by the equipment operator to achieve a desired application rate with reasonable accuracy (Table 1, page 4 is an example).

**Verify Actual Application Rate**
Routiney measuring actual application rates to verify the accuracy of the predicted rate is equally important. Variables such as manure consistency, wind, and operator differences make this essential. The following formula can be used to quickly calculate the actual rate in field:

\[
\text{Rate/acre} = \frac{C}{W \times L} \times 43,560
\]

\(C\) = capacity of spreader (tons or gallons minus unused volume)
\(W\) = width of a pass with applicator (feet - consider overlap)
\(L\) = length of pass to empty spreader (feet)

Alternatively, the number of gallons applied to a known number of acres also would serve as a check of calibration accuracy. For instance, if it took 25 loads of 6,800 gallons each (170,000 gallons total) to completely cover a 20-acre field, the application rate was 8,500 gallons per acre (170,000 gal ÷ 20 acres).

**Determining Spreader Capacity**
Knowing the actual capacity of manure application equipment in gallons or tons is critical to accurately calibrate and record field application rates. The following are some relatively simple methods for determining spreader capacity for calibration purposes.

**Liquid Tankers**
The gallon capacity of liquid manure tankers is generally known; however, it is important to recognize that there will be unused capacity. Filling a tanker all the way to the very top greatly increases the risk of manure splashing out during transport and spilling onto roads and driveways.

**Open Liquid Spreaders**
The gallon capacity of open spreaders such as box or V-bottom spreaders may be listed in the operator’s manual; however, most must be calculated. Capacity in gallons can be determined with a simple tape measure and the conversion factor of 7.48 gallons per cubic foot. Refer to Figures 1 and 2 for the spreader measurements needed to complete the calculations.

*For box spreaders with liquid manure (see Figure 1):*
\[\text{Volume (gallons)} = L \times W \times H \times 7.48\]

*For V-bottom spreaders with liquid manure (see Figure 2):*
\[\text{Volume (gallons)} = L \times W_{b+a} \times H \times 7.48\]

**Figure 1.** Box spreader measurements needed to calculate capacity; \(W\) = width, \(L\) = length, \(H\) = height, and \(H_m\) = height of mound.

**Figure 2.** V-bottom spreader measurements needed to calculate capacity; \(W_a\) = width of angled portion; \(L\) = length, \(W_b\) = width of bottom; \(H\) = height, \(W_{b+a}\) = \(W_b + W_a\); \(W_t\) = width of top; and, \(H_m\) = height of mound.
Solid Manure

For solid manure, capacity is expressed in tons. Ideally, a scale, fixed or portable, can be used to measure the actual weight of the spreader with and without its load for each specific type of manure. The difference would be the capacity. If a scale is not conveniently available, an alternative method, based on the volume of the spreader and the manure’s density can be used. The same formula as listed on page 5 for a level-full liquid spreader can be used with an additional volume added for mounding.

For box spreaders with solid manure (see Figure 1):

\[
\text{Volume (gallons)} = [(L \times W \times H) + \frac{1}{2} L \times W \times H_m] \times 7.48
\]

For V-bottom spreaders with solid manure (see Figure 2):

\[
\text{Volume (gallons)} = [(L \times W_{b+a} \times H) + \frac{1}{2} L \times W_t \times H_m] \times 7.48
\]

The density (pounds per gallon) of the manure being measured can be used to convert gallons into tons. A small scale such as a spring scale can be used to measure the net weight in pounds of a five gallon bucket of manure. When weighing a bucket of manure, attempt to duplicate the density (packing) of the manure in the actual spreader. Divide net weight of the bucket of manure by the volume (i.e., 5 gal) to get density (lb/gal). The solid capacity of the spreader in tons can then be calculated.

\[
\text{Weight (tons)} = \frac{\text{Volume (gallons as determined above) \times Density (lb/gal as determined with 5 gal bucket)}}{2,000}.
\]

Summary

Manure application equipment calibration has become so important to properly manage manure nutrients that it should be routine for every dairy and livestock farm. The small investment in developing simple tools such as Ground Speed – Application Rate Charts will be recovered readily in improved accuracy of nutrient crediting in the cropping system and reduced environmental risk. As with any tool, calibration is only valuable when put into practice. If you would like further guidance or assistance in manure application equipment calibration and the implementation of the results, contact your respective Michigan State University Extension Agent, Comprehensive Nutrient Management Plan (CNMP) provider, or other qualified professional.

On-Farm Mortality Management

Dale Rozeboom
Dept. of Animal Science

Michigan’s Bodies of Dead Animals Act (Act 239 of 1982, as amended) regulates the disposal of dead animals and provides for composting of dead poultry and livestock in Michigan. The intent of this law is to:

- protect human and animal health;
- reduce risk of disease transmission;
- control problems with flies, vermin, and scavenging animals; and,
- protect ground and surface water and air quality.

Conscientious management, as described in this act and accompanying regulations, is necessary for compliance with the Michigan Right-to-Farm Act and the 2002 Michigan/USEPA Regulatory Innovation Agreement (Option 1- NPDES General Permit or Option 2 – MAEAP). In addition, common sense and sound discretion are necessary as it may not be possible to abide by every specific practice, as stated, all of the time. In a time of increasing citizen complaints, it is critical to manage mortality disposal carefully, using art and science.

Under this act, there currently are five alternatives for disposal of dead animals in Michigan: burial; incineration; rendering; land-fill; or, composting.

Regardless of which method of disposal is used, all mortalities must be disposed of within 24 hours after death, unless stored secure at less than 40º F for no more than 7 days or at less than 0º F for no more than 30 days. Mortalities disposed of must only be those animals “intrinsic to an operation under common ownership or management.” Carcasses may originate from multiple farm sites and be a mixture of livestock species, if all are owned by the same person or firm. Lastly, all disposal methods described in the act are for “normal or natural” rates of mortality for a given farm or system of farms. Any sudden and unexpected increases in mortality rates should be reported immediately to the Director of the Michigan Department of Agriculture, with discussion to include appropriate disposal methods for this unusual mortality.

Burial

Burial sites must have no contact with bodies of water, either surface or ground water, and must be at least 200 feet from wells. Frozen ground makes burial difficult in winter.

Individual graves must be:

1. at least 2 feet beneath the natural surface;
2. limited to 100 graves/acre or 5 tons of tissue/acre;
3. separated by a minimum of 2.5 feet; and,
4. closed within 24 hours of opening.

Common graves must:

1. be limited to 2.5 tons of tissue per acre;
2. be separated by a minimum of 100 feet;
3. have each day’s mortality covered with a minimum of 1 foot of soil;
4. not remain open for longer than 30 days; and,  
5. have at least 2 feet of soil as final cover.

Incineration  
Michigan’s Act 451, Part 55 “sources of air pollution” states that incinerators must be permitted by Air Quality Division of Michigan Department of Environmental Quality. They may require local license as well. Residue from incinerators may be buried, applied to cropland at agronomic rates, or taken to a licensed landfill.

Rendering  
Traditionally, rendering services would travel from place to place collecting animal remains for free, being profitable by manufacturing animal tissues into feedstuffs for livestock and pets. In recent years, growing public concern about serious diseases in several parts of the world has decreased the use of these feedstuffs because of perceived health risks to humans (via the food chain) and directly to pets. Consequently, most renderers no longer collect animal tissue from farms, stockyards, or slaughter plants in some parts of Michigan, or they charge a substantial fee to do so (varying according to quantity, size, and condition of the carcasses). Renderers suggest that producers make arrangements for pick-up when animals are still alive or just after death. A biosecure building or trailer at the end of the lane or driveway is a way to prevent diseases from spreading from rendering vehicles coming onto the farm. Alternatively, deliveries of carcasses by the producer to the rendering plant are welcome.

Landfill  
Currently in Michigan, about 20 landfills are licensed to receive dead animals. Arrangements can be made for carcass pick-up by the waste management firms, but they must comply with provisions for transportation as written in the Bodies of Dead Animal Act. If farmers deliver to the landfill, it is done with some risk of transporting disease from the landfill site back to production facilities.

Composting  
This is the biological decomposition of organic material (i.e., bovine carcasses) under controlled conditions to a state where storage, handling, and land application can be achieved without adversely affecting the environment. It is the effective degradation of body tissue so that it is not recognizable and is aesthetically acceptable to other people. Following is a checklist of current, critical points for composting in Michigan.
• “Bulking agent” means any carbon source material added to compost to decrease its bulk density (lb per cubic ft), which provides aeration for the biological decomposition of carcasses. Acceptable materials must be unpainted and free from additives or preservatives, and include sawdust, chopped straw, spelt hulls, bean pods, grass clippings, leaves, shredded cardboard or newspaper, chopped cornstalks, and finished compost from a secondary compost pile.
• A composting structure is required and must be constructed according to provisions in the regulations.
1. The site for construction of a composting structure must be at least 200 feet from the nearest natural surface water and no closer to a water source than the distance between a septic drain field and a potable water well permitted by Public Act 399, the state of Michigan Safe Drinking Water Act of 1976 and Public Act 368, the Michigan Public Health Code of 1978, as amended.
2. The composting structure must be built with reinforced concrete floors impervious to moisture and adequate to bear the weight of equipment used to move composted material and capable of supporting static and dynamic frost loads.
3. The structure must consist of two or more bins, each constructed with at least three side walls built to at least the height of the highest point of any composting material contained within. A roof must cover any area used to compost dead livestock, thereby preventing seepage, runoff, and windblown movement of compost.
4. The structure must be constructed of a rot resistant material(s). The facility construction must be strong enough to resist mechanical forces generated when turning a pile.
5. The structure must be constructed large enough to handle the volume of material placed in the facility through the endpoint of the composting process.
6. The structure may be used to compost the normal and natural daily mortality associated with livestock production under common ownership or management.
• The livestock producer must manage the composting process.
1. The “primary compost pile or bin” means the first phase of composting during which the bulking agent, mortality, or afterbirth are combined to begin the process of decomposition.
2. A base of bulking agent 1 foot deep should be added before any livestock carcass is added for composting.
3. Carcasses and bulking agent must be added in layers so that the carbon-to-nitrogen ratio is between 15:1 and 35:1 (approximately 10 lb of tissue per cubic ft).
4. No livestock tissue should be placed in the pile closer than 6 inches to any bin wall.
5. Carcasses must be covered by at least 6 inches of bulking agent within 24 hours.
6. Total depth of the pile should not exceed 6 feet.
7. The “secondary compost pile” means compost material that has been turned or mixed after a minimum 60-day primary composting.
8. Primary and secondary composting are each for a minimum of 60 days. Turning aerates the material, enhancing the rate of decomposition. After the minimum 60 days, secondary piles may be turned frequently (i.e., every 30 days) until tissues are effectively decomposed.
9. A layer (3 inches minimum) of bulking agent that does not contain previously composted animal tissue (i.e., fresh
Dairy Health

Practice-based Veterinary Education at MSU

Michelle Kopcha and Faith Peterson
Dept. of Lg. Animal Clinical Sciences

Readers of the Michigan Dairy Review may have met veterinary students as they accompany local veterinarians making visits to their farms. Those of you who have, may or may not be aware of the important role you and your livestock play in training future veterinarians from the MSU College of Veterinary Medicine. Where do these students come from? What training do they have before coming onto your farm with your veterinarian? What do they learn about livestock, livestock owners, agriculture, and economics, besides learning about veterinary medicine?

Student Profile

As with most MSU students, few students enrolled in MSU’s Doctor of Veterinary Medicine (DVM) program come from farming backgrounds. Although not a requirement for admission to the CVM program, many of our DVM students have gained experience in agriculture by electing to take animal science courses as a part of their undergraduate studies. These courses provide excellent information concerning animal behavior, housing, nutrition, and management specific to livestock. These courses teach basic principles that also apply to non-livestock species.

Student Training

Classroom coursework during the 2.5 years of the preclinical veterinary curriculum provides important groundwork for the 18-month clinical phase of training prior to graduation. Veterinary education at MSU includes general and specific medical concepts of common domestic species including individual livestock and companion animals and populations (herds). During the clinical phase of training, 10 core clerkships (3-week clinical experiences) are required, which emphasize both livestock and small animals. In addition, 10 elective clerkships allow students to focus on areas that reflect the career path they wish to pursue. The majority of the clinical phase of training occurs in MSU’s Veterinary Teaching Hospital and Diagnostic Center for Population and Animal Health.

Practice-based Ambulatory Program (PBAP)

One of the required clerkships, the PBAP rotation, occurs off-campus in private, large animal veterinary practices. Currently, the PBAP has 68 participating practices, involving approximately 200 veterinarians, located throughout Michigan (Figure 1). Students are given the option to select either a food animal directed practice or an equine practice. Approximately 100 students per year are matched to practices, of which about one-half select a food animal experience. Each practice hosts one student at a time and usually train two to four students per year. About one-half of the veterinarians that participate in the PBAP are predominantly food animal practitioners whose primary area of expertise is dairy. During their 3-week clerkship, students focus on examination, diagnosis, treatment, and prevention of common medical and surgical conditions of individual animals, plus herd-based preventive medicine and reproductive management programs. Examples of commonly encountered conditions are ketosis,
hypocalcemia, retained placenta and metritis, lameness, abdominal surgery, pregnancy diagnosis, vaccinations, and castration/dehorning procedures. Also emphasized is practice management, including management of personnel, inventory, and finances.

Previous to PBAP, a campus-based ambulatory service provided field-based education for students. Because of the urbanization of rural areas in the proximity of MSU and the resulting loss of livestock, especially food animals, the PBAP was developed in 1995 to provide high quality training in field-based medicine and surgery. This program is an excellent compliment to in-hospital clinical training because it provides exposure to many common problems and preventive herd-based medicine practices that are not routinely encountered in a referral hospital such as MSU’s Veterinary Teaching Hospital.

Students track each farm call by keeping a journal of the animal or animals seen, the work-up used to make a diagnosis, plan for treatment, if warranted, and plans for prevention of future cases. In addition, the practitioner will conduct a mid and end of the rotation review to determine what procedures the student has performed (injections, stomach tubings, rectal examinations, vaccinations, etc.) or observed. At the end of each rotation, the practitioner provides a final evaluation reflective of the student’s progress in development of technical skills, knowledge base, and problem-solving abilities. Equally important is a critique of the student’s communication skills as evidenced by his/her interactions with office staff and clients.

Each year, 10 to 12% of MSU’s fourth-year students select elective clerkships that emphasize advanced training in food animal medicine and management. A number of advanced, elective rotations are available, including experiences in production medicine and the PBAP. Several of these students, interested in pursuing careers in dairy practice or related industries, choose to spend additional time working one on one with a dairy practitioner within the state. Advanced rotations require students to focus on specific objectives, including advanced rectal palpation for diagnosis of pregnancy, development of skills and knowledge needed to implement mastitis control programs, ration formulation and evaluation, and advanced diagnostic and surgical skills (e.g., correction of displaced abomasum). The wide range of skills and expertise provided by the practitioners involved in the PBAP make these training opportunities possible.

Despite the fact that many students will not be involved in agriculturally focused veterinary medicine, the experience and education that is provided by the PBAP is highly regarded by students. The 3-week snapshot into the daily lives of producers, the sophistication of farming and livestock production, and the opportunity to see many common conditions leaves long-lasting, and positive impressions. For those students who will become predominately or exclusively food animal practitioners, the basic and advanced rotations are very important career-shaping experiences. Many of the students in their written evaluations on the clerkship have commented that the producers on the farms they visited have been very welcoming and encouraging. They appreciate the time that owners take to provide information regarding their animals, and insights into animal handling and behavior. They especially appreciate the patience of owners as students learn new procedures and develop proficiencies in performing physical examinations, collecting blood samples, and giving injections.

**Summary**

In summary, students who graduate from MSU with a DVM degree have received broad exposure to a variety of animals that are cared for by the veterinary profession. The PBAP is an important component in providing basic training for non-livestock oriented students, as well as students whose career paths are directed toward animal agriculture. The success of the PBAP is driven directly by the expertise, enthusiasm, and dedication of the participating veterinarians. Equally important is the willingness of livestock producers to be involved with students, welcome them into their farms, and add to their understanding of agriculture.
Antimicrobial resistance is currently a major issue in the medical community. This is partly due to the realization that the efficacy for antibiotics, such as Penicillin G, is lower today than when first introduced. Today, newer generation drugs like Cefiofur, Enrofloxacin, Tilmicosin, and Doxycycline are being used predominantly in veterinary medicine. The emergence of antimicrobial resistance has caused doctors to realize that designing therapeutic regimens for their patients/clients is difficult without diagnostics. Therefore, cultures are becoming more of a necessity to determine which drug will be effective for a particular infection. Unlike human medicine, the veterinary medicine/animal agriculture communities do not have the available resources to diagnose and determine appropriate antibiotic use. Veterinarians and farmers have based their therapy solely from personal and past empirical experiences.

Pilot Program Assists Farmers, Veterinarians

The College of Veterinary Medicine at Michigan State University and the Michigan Department of Community Health have initiated a pilot project in Michigan to assist farmers and veterinarians in making sound decisions in their antimicrobial selection. The goal of this project is to devise empirical therapy guidelines and an intervention program to inform veterinarians and farmers on antimicrobial resistance.

The tool being developed to assist with empirical therapy guidelines for cattle is an antibiogram (a list of bacterial pathogens and their susceptibility to various antibiotics). The Diagnostic Center for Population and Animal Health (DCPAH) at Michigan State University is assumed to be the main source of data for the antibiogram. In order for this antibiogram to be an accurate representation of organisms in the Michigan cattle population, a survey was sent to veterinary clinics in Michigan to determine what type of cultures they were submitting and to which laboratories.

Using information from the Michigan Veterinary Medical Association and the American Veterinary Medical Association, a mailing list was compiled for Food Animal Veterinary practices in the state of Michigan. A one-page survey was sent to 86 clinics in the fall of 2002 and a reminder was sent to nonresponders 4 weeks later. Sixty-seven surveys were returned for a response rate of 78%. Fifty-nine were usable (69%). The eight discarded surveys were from practices that were no longer in food animal medicine or specialized in swine medicine.

Each clinic estimated the number of cultures performed annually for each body system (i.e., respiratory, digestive, mammary, etc.), and the percent done In-House (at the veterinary clinic), at DCPAH, or at Other (including in- and out-of-state) laboratories. Clinics were asked to list contact information for the ‘Other’ laboratories they used. Other questions asked included whether laboratories (DCPAH or Other) reported susceptibility tests and if so, did the clinic use them to determine therapeutic regimens. The final question determined the proportion of the practice that consisted of food animal work.

Results from the 59 surveys estimated that 15,339 cultures on food animal species were performed annually, with 89% of them being mastitis cultures (Table 1). Digestive, reproductive, and respiratory cultures were the other main categories: 4.0%, 3.0%, and 2.5%, respectively. Of the 15,339 total cultures 39%...
were performed In-house, 46% at DCPAH, and 15% at ‘Other’ laboratories (Table 1).

Investigation of the ‘Other’ laboratories found that only one laboratory received and performed a significant number of cultures. This laboratory, maintained by a milk-marketing cooperative for mastitis surveillance and quality milk assurance, did not perform susceptibility testing. This also is generally true for most In-House laboratories because the clinic laboratories just identify the pathogen without doing susceptibility testing.

A predominant number of the cultures was done outside of the veterinary clinic (61%). The MSU DCPAH accounted for 75% of the cultures performed outside of the clinic. With such a large number of the cultures being done at DCPAH, this reassured us that the DCPAH data would be the best available data and a good representation of cattle isolates in Michigan. With this information, an antibiogram for food animal species will be derived from DCPAH’s database.

Mastitis Pathogens Most Frequently Cultured

A few trends in Table 1 are noticeable. Mastitis pathogens are the most frequently cultured at 89%. Results in this table also illustrate that veterinarians in private practice are most comfortable doing cultures from mammary and reproductive specimens compared with cultures from respiratory and digestive systems. The DCPAH received 85 and 84% of the respiratory and digestive cultures, respectively. A plausible reason is that digestive and respiratory cultures require several media types to recover and identify the appropriate pathogen. Also, veterinary practitioners are not likely to maintain numerous media and equipment needed to perform the more complex bacteriology necessary for these specimens.

Clinics were divided into two groups, those with less than 40% food animal and more than 40% food animal practice, for comparison. Clinics with a higher proportion of food animal work are doing more cultures, primarily for mammary pathogens. The data from this survey were not a normally distributed bell-shaped curve; therefore, the mean and median are used in Tables 2 and 3 to show the range. The mean and median for the annual number of cultures performed in clinics, which rely on food animal work for less than 40 percent of their practice, were 58 and 14, respectively. Likewise, the practices that had a predominance of food animal cases had a mean of 481 and median of 94 cultures per year.

The survey showed that when pure culture results were available, susceptibility reports were provided 93% of the time. Thus, clinics have the ability to base therapeutic regimens upon microbiology reports. Clinics also were asked how often they based therapeutic decisions on antimicrobial susceptibility reports, when available. The results indicated: “Always”, 42%; “Often”, 47%; and, “Occasionally, 11%. This indicates that veterinarians generally are using tools to make decisions about which antibiotics to use when available.

Summary

This survey confirmed our prior assumptions that DCPAH data would offer the best representation of Michigan data to develop an antibiogram. A large proportion of digestive and respiratory cultures are sent to DCPAH. Veterinary practitioners are doing a sizable proportion of mammary cultures in their clinic laboratories. Veterinarians are using susceptibility results when they are reported, and 89% of the clinics are using the reports often in developing a therapeutic regimen.

Results of this recent survey raised additional questions for future investigations. In addition to development of the antibiogram, future work will include development of a forum to disseminate the information to veterinarians and farmers, all in hopes of ensuring that animal agriculture will be using antibiotics appropriately.
Functional Genomics

From Genes to Dairy Farms

Jeanne Burton, Paul Coussens, Mike VandeHaar, Mike Allen, George Smith, and Jim Ireland
Dept. of Animal Science

All living things share the basic biological principle that tens of thousands of genes encoded in the DNA (deoxyribonucleic acid) are used at specific developmental stages in response to hormones, nutrients, infections, and other important physiological stimuli to make proteins that determine an animal’s functional status. This genomic response (i.e., gene-use response) of relevant cells to such stimuli thus underlies an animal’s overall physiology and significantly influences economically important traits (phenotypes) of interest in dairy cattle. Thus, individual cells’ usage of various genes at any point in time determines the physiological responses of each dairy cow.

Some of the most important phenotypes that affect dairy farm performance are disease resistance, feed intake, mammary development and milk production, and reproductive efficiency. Great strides have been made by producers to enhance these performance phenotypes through management strategies that presumably optimize immunity, rations, pregnancies, and genetic improvement. However, we have almost no understanding of what the various cells of a cow’s body really need for optimal performance. We also have no idea of what genes are influenced by our management practices, or how we can regulate expression of the most important genes in relevant cell types for improved performance. To change this lack of understanding we need to study all genes potentially expressed in bovine cells under scenarios that are important to dairy production. This new line of study is called animal functional genomics.

The function of given cell types are examined according to the variety of genes they express in response to their blood and tissue environments.

The Center for Animal Functional Genomics (CAFG) at Michigan State University is comprised of researchers in the Department of Animal Science. They have collaborated with other laboratories on campus, nationally, and internationally to create bovine-specific functional genomics tools. These tools are used to identify patterns of expressed genes in key cells exposed to relevant stimuli that underlie some of the best and worst phenotypes in dairy cows. Examples are immune defense responses of white blood cells during stress and infection, responses of mammary and liver cells to nutrients and growth hormones, and responses of ovarian cells to estrous synchronization and aging. The goals of this article are to introduce readers to functional genomics tools and to show how researchers are beginning to use these tools to identify key phenotype-changing genes in the immune system, digestive system, mammary glands, and ovaries of dairy cows.

cDNA Microarrays (Gene Chips)

The principal tenant of functional genomics research is that a cell’s phenotype is determined by the pattern of genes expressed as messenger ribonucleic acid (mRNA) molecules when the cell responds to various stimuli (top part of Figure 1). To detect these mRNA pattern changes requires access to all possible genes used by the cells of interest. In the laboratory, these genes are attached to a solid material so they can bind complementary mRNA molecules in test cells

![Figure 1. As cells grow or respond to changing hormones, infections, nutrients, etc., the pattern of different messenger RNA (mRNA) molecules transcribed from various genes in the cells also changes. These changes in mRNA expression lead to specific changes in cell function because mRNA molecules are translated into proteins that determine a cell’s functional status and, ultimately, an animal’s performance (phenotype). In functional genomics studies, changes in mRNA expression patterns in mammary cells, immune cells, digestive tract tissues, and ovarian cells are tracked using “gene chips” (called cDNA microarrays) to help understand how various management practices, hormonal factors, and infectious stimuli influence the basic molecular mechanisms.](image-url)
and be easily visualized. The material of choice in animal science work is a specially treated glass microscope slide spotted with thousands of copied DNA (cDNA) sequences that represent most or all genes potentially used by the cell under various scenarios. The cDNA collections used to spot these so called cDNA microarrays, or gene chips, are derived from “libraries” of all mRNA molecules present in the cells of interest (see lower part of Figure 1).

To date, the CAFG has created cDNA libraries and microarrays for studies using bovine immune cells, mammary cells, ovarian cells, and cells from all other organ systems. Also, CAFG is the hub for activities of the National Bovine Functional Genomics Consortium (NBFGC) comprised of over 20 researchers from seven US institutions. Recently, CAFG and the NBFGC developed the largest bovine cDNA microarray ever made, containing approximately one third of all genes (over 18,000) present in the bovine genome. The genes included on this and other cDNA microarrays can be viewed at the CAFG web site (http://nbfgc.msu.edu) under the “Search Libraries” bullet, and the cDNA libraries used to create them are described on the Department of Animal Science web site (http://www.ans.msu.edu/research/genomics.html) and elsewhere (1-5).

**Faculty and Students Study Physiological Systems**

**Disease Susceptibility in Newly Calved Dairy Cows** - Figure 2 shows an example of how Dr. Jeanne Burton’s laboratory is using CAFG’s microarrays to study gene expression patterns in white blood cells of disease-susceptible cows during the transition from the dry period into early lactation. The cells were purified from blood of cows collected before, at, and after calving and their mRNA molecules were converted to cDNA and stained with red or green fluorescent dyes. The stained cDNA molecules were then mixed together and allowed to compete for binding to their complementary gene sequences spotted on immune cell microarrays. In the example shown in Figure 2, spots with red fluorescence (shown as solid black spots) highlighted genes that were expressed in the cells at but not before calving, and were thus “turned on” by calving. Green spots (shown as solid gray spots) highlighted genes that were expressed before but not at calving, and were thus “turned off” by calving. When red and green fluorescent dyes are in equal amounts on a gene spot they fluoresce yellow (shown as black and white speckled spots in Figure 2). Thus, yellow spots on the microarray represented genes that were not changed in expression before versus at calving. While these unchanged genes are undoubtedly important to the cells’ disease fighting function they are not as interesting as the affected red and green fluorescing genes because these differentially expressed genes may underlie susceptibility to mastitis and other important peripartum diseases.

Dr. Burton’s group has identified about 300 immune cell genes with changed expression during calving, and has determined that fluctuations in the hormones that regulate calving are responsible for expression changes in approximately 25% of these genes. Cow, nutritional, and management factors responsible for the changed expression of remaining genes are still unknown but are being investigated. The ultimate goal of this work is to use the identified immune cell genes as targets for development of new nutritional supplements, drug therapies, and management practices that producers could use to sustain critical infection-fighting functions of the cells during calving stress. Two management practices that have been identified by this work as potentially

Figure 2. cDNA microarrays spotted with thousands of immune cell genes were used to study effects of calving stress on gene expression in white blood cells of dairy cows. The mRNA molecules from immune cells of test cows collected before and at calving were stained differentially with fluorescent dyes [shown as Green cDNA (gray above) or Red cDNA (black above) squiggle lines], mixed, and allowed to bind competitively to their complementary gene spots on the microarrays. After a specialized fluorescence detection system was used to read the microarray a final microarray image was produced. From the color of the spots on this image it was easy to see that expressions of over 300 genes were either turned on (solid black spots) or turned off (solid gray spots) by calving. Black and white speckled spots indicated genes that were unchanged by calving stress; these spots bound equal amounts of both fluorescently stained cDNA molecules.
deleterious to disease resistance in newly calved cows are the early pulling and surgical removal of calves before cows are fully ready to give birth. These practices do not allow the normal changes in blood steroid hormones to occur and as such negatively affect gene expression patterns in immune cells normally needed to protect the cow’s reproductive tract and mammary glands from infection. As a result, affected cows often come down with metritis and (or) mastitis. Ultimately, Dr. Burton’s group also will explore these genes for DNA mutations that may help explain an animal’s inherent ability to resist metritis and mastitis. Such mutations could then serve as molecular genetic markers to guide producers’ selection of bulls used to produce daughters with superior disease-fighting capacity during the transition period.

**Pathogenesis of Johne’s Disease** – Johne’s disease is of paramount concern to US dairy producers. Johne’s disease is caused by the bacterium, *Mycobacterium paratuberculosis* (*M. paratuberculosis*). How the bovine immune system responds to *M. paratuberculosis* has a profound effect on the outcome of infection and expression of clinical disease. In fact, infected animals begin to exhibit clinical signs of disease when the bacterium causes a detrimental shift in the cow’s immune response away from a protective “killer cell” response to a non-protective antibody response. It is this antibody response that is used in the field to diagnose sick animals. The underlying mechanisms of how *M. paratuberculosis* inhibits the cow’s killer cell response over time are poorly understood, a fact that limits early diagnosis and control of this fastidious pathogen. In an effort to understand these interactions, Dr. Paul Coussens’ laboratory recently used CAFG’s immune cell cDNA microarrays to study white blood cells, infected gut tissues, and affected lymph nodes from Johne’s disease negative and positive cows. The goal of this work is to identify which genes (and subsequently what proteins) are operating properly and improperly during infection and subsequent tissue damage. Results from these studies have led to the development of a logical model that describes how *M. paratuberculosis* and the bovine immune system become locked in battle of defense versus disease, a battle that the cow all too often loses. This model opens the door for continued research into mechanisms responsible for the symptoms of Johne’s disease and the shifting immune response to this pathogen. Hopefully, this will lead to better diagnostics, vaccines, and therapies to help fight and control the spread of Johne’s disease in dairy farms.

**Mammary Development** - Dairy heifers account for 20% of the expenses associated with dairy farming. One way to decrease the cost of raising heifers is to feed them for faster growth and earlier breeding and calving. However, rapid body growth can impair mammary development and reduce future milk production. Dr. Mike VandeHaar and co-workers are using traditional nutritional and endocrinology studies combined with functional genomics to understand the mechanisms whereby high energy intake depresses mammary development. Researchers in his laboratory have shown that the hormone, leptin, produced by fat cells, decreases creation of bovine mammary epithelial cells in culture and in heifers after infusion of leptin into the teat canal. Ongoing studies utilizing mammary and immune cell cDNA microarrays indicate that leptin alters expression of genes that encode key intracellular proteins governing cell creation and thus may be important in reduced mammary development of rapidly growing heifers. Understanding the basic mechanisms governing growth of the mammary gland prior to puberty will provide the foundation for development of novel nutritional, pharmacological, or transgenic approaches to increase the lifetime productivity and efficiency of dairy cows.

**Regulation of Feed Intake** - Energy intake is a primary limitation on milk yield, reproduction, and health for genetically superior dairy cows. Dr. Mike Allen and co-workers are using functional genomics to understand how propionate oxidation in the liver regulates feed intake. Propionate, produced from fermentation of feeds by microbes in the rumen, can reduce energy intake compared with other absorbed fuels. Propionate production increases when more starch is fermented in the rumen. Although highly fermentable diets can decrease feed intake, the response is not consistent among cows. In addition, increased diet fermentability can sometimes improve energy intake by increasing energy density in the diet. Two groups of cows that differ markedly in feed intake response to increased diet fermentability have been identified. Liver mRNA from these cows is being used along with CAFG’s large bovine cDNA microarray to compare expression of over 18,000 genes in the test samples. The goal is to detect potential pathways within individual cells related to satisfaction of hunger and feed intake regulation during propionate metabolism. Identification of the key genes related to the regulation of feed intake by propionate is important for development of feeding and grouping strategies to increase energy intake of dairy cows, improving their health and productivity.

**Oocyte Development and Reproduction** - Reproductive efficiency is a major factor in the economic success of the dairy industry. The ovarian cycle is central to the reproductive process because only mature ovarian follicles release eggs (oocytes) to be fertilized. Functional studies indicate that the oocyte itself plays a key regulatory role in control of ovarian follicle development and the early stages of embryonic development after the oocyte is fertilized. Furthermore, the unique content of the oocyte’s internal fluid (cytoplasm) is absolutely required for successful nuclear transfer (cloning) procedures. Ongoing functional genomics studies in Dr. George Smith’s laboratory are using CAFG’s ovarian cell cDNA microarrays to characterize bovine oocyte expressed genes and identify the as yet unknown genes that regulate folliculogenesis and early embryonic development in cattle. This cDNA microarray technology also is being used to identify molecular markers that are predictive of oocyte quality/
comprehend and ultimately potential for successful pregnancy. Identification of oocyte-expressed genes with important regulatory roles and reliable markers of oocyte competence will be important for development of future technologies to improve reproductive efficiency in dairy cows.

Reproductive Ageing and Fertility in Cows – Decline in fertility as dairy cows age contributes to costs associated with reproductive management and culling for reproductive problems. The decline in fertility as cows age is associated with a rapid loss of ovarian follicles and oocytes within each follicle. Over 90% of the original number of follicles and oocytes present in heifers at birth have degenerated before animals reach 2 to 3 years of age. Whether this rapid loss in number of follicles and oocytes after birth explains the decline in fertility of dairy cows is currently unknown, but suspected. The research program of Dr. Jim Ireland’s laboratory is using CAFG’s ovarian cell and immune cell cDNA microarrays to identify expressed genes in ovaries that regulate the rapid degeneration of ovarian follicles during ageing. Once these death genes are identified and it is understood how they are regulated by factors such as hormones, nutrition, and the ageing process, new therapeutic methods could be developed to improve reproductive life span, and thus fertility, of dairy cows.

Summary
The bovine cDNA libraries and microarrays developed in Michigan State University’s CAFG have enabled animal science researchers to gain a more sophisticated view of the molecules responsible for orchestrating development and function of organs and cells critical to optimal immune defense, mammary development, feed intake, and reproductive performance in dairy cows. There potentially are great practical consequences of applying microarray information to production animal agriculture.

References and Web Resources

Herd Management

Benefiting From Cow Talk

Ben Bartlett
Extension Dairy Agent
Upper Peninsula

Cows don’t talk but we all know they can communicate. They don’t need to say “my left front quarter is a little tender” for you to get the message. Getting kicked is similar to being hollered at and everyone can get that message. However, it is surprising how many people miss a message like: “you make me real nervous, and if you get any closer I am going to attempt to jump over this gate and smash it into kindling wood”. The number of new gates being offered at the local farm store offers ample evidence of man – cow mis-communication.

Non-verbal communication or body language is a method of communication between people and animals. It is also a communication system between people. If you walk into the house late for dinner or if you open a much anticipated letter, people can tell without a word said what is happening. The challenge with non-verbal communication is the same as verbal communication. If the listener is not listening, then the shouting starts and “quality” of communication quickly ends.

Learn Your Cows’ Body Language
Cows may not have a lot to say to you or their bovine buddies but if you “listen”, they actually do “talk” quite a lot and have some important things to say. One of the basic requirements to understanding “body language” is to know what “not talking” looks like. A contented cow in a barn will spend about 3 to 5 hours eating, 8 hours ruminating, and if possible, about 12 hours resting (1). She needs access to water, feed, a desirable place to lie down and personal space. When you have a group of cows that have been together, you have to “listen” very close to see the cow to cow communication. It might be the stare down or the slight swing of the head by the boss cow telling the first-calf cow it’s not yet her time at the feed bunk or water trough. Cows will sometimes arch their neck or shake their heads as a threat to
other cows. Head butting and pushing contests are usually only seen with new arrivals that are similar in size. A smaller heifer does not need to fight it out with every other animal to know that she is on the bottom of the pecking order. Cattle will also butt another animal in the side when it wants that space, for example at a feeder. It doesn’t take many “surprise hits to ribs” to make a timid animal reluctant to feed when the boss cow is near.

**How Important is “Personal Space”?**

How Important is “Personal Space”? Just think about the chaos in a pen when new animals are mixed in. Everyone is getting re-organized on the hierarchy chart, deciding who will be boss and who is farther down on the “pecking” order. Cattle can recognize about 50 to 70 herd mates (2). A dominate cow will be the one with the most experience, older or greater physical size, with size being the most important. The more dominate cattle have a bigger space between them and other cows. However, the more dominate cattle will take a place in the center of a group to keep their distance from you (3). Dominance is important because if you only have one waterer, the dominate cow can prevent other cows from getting a drink. Some research has shown that round bale feeders may be better than straight sided feeders because the round feeders give each cow more body space (4).

How do cows talk to people? Let’s divide this into two categories; first, messages from cows when you are not around and, then cow talk when you are working with cattle.

When cows deviate from their “contented” cow routine or their expected level of production, they are sending you a message. For example, some cows are “alley rats” but when a lot of cows lay in the alley instead of the freestalls, it is a negative commentary on the comfort of the free stalls. It is amazing how long it has taken us to “ask” cows what kind of surface they prefer to rest on (5). Rest time is very important for milk production, and if cows are standing around, you have a cow that is missing her rest time. Dr. Rick Grant of Miner Research Institute, Chazy NY., reports one farm had cows spending 7 hours a day in the holding area. When the milking group was split into two groups to decrease time in the holding area, resting time went up from 36% to 49% of the day and milk production increased over 8 lb per day (5). Cows have a full day getting in their rest, rumination, and eating, besides being milked. Ideally you should have no cows “standing around”. You can often see these effects on milk production but it may be worth your time to go “listen” to the cows. There are many examples of how “listening” to your cows can be beneficial for both you and your cows. Larger farms are managing the first lactation cows in a separate group because they are smaller, less experienced, and more timid. If this is not a possibility on your farm, make sure the group with first lactation cows has adequate water and feeder space.

‘The Fastest Way to Work Cattle is to Go Slow’

When working cattle, the golden rule is: *the fastest way to work cattle is to go slow*. Because dairy cattle are hand-reared and in most cases always around people, we forget that cows are prey animals, and we are predators. Cows still have a fear or distrust of people (2). While a lot of the instinct is lost, many of the basic physical characteristics remain. Cattle see differently. They see more laterally, less vertically and with poor depth perception. They hear differently. They hear better than people but can’t tell where the sound is coming from. They just don’t think like people do. Cows don’t go to school to learn about things but rather base their responses on prior experiences. This is why anything new in a cow’s environment is given a complete but cautious examination. For a first lactation cow experiencing her first time in the milking parlor and her first milking, it is especially important to be patient and make it the best experience possible. Once cattle adapt to something, coming in on a particular side of the parlor for example, they will tolerate or cope with aversion rather than switch sides (2). If a cow has a good milking experience the first few times, she can tolerate more unpleasant happenings as her number of good experiences increases.

**Summary**

Let’s put some of these characteristics into what might happen on a dairy farm. A new employee is told to put the next group into the parlor holding pen. Thinking like a person and wanting to please his new boss, he runs out to the barn, hollers at the cows to get up and get moving. As they approach the holding pen and a smooth part of the floor, he hollers some more at the timid, first lactation cows at the back of the group to push on the big dominate cows in the middle of the pack to hurry into the poorly lighted holding area. Three young cows slip and fall, one nervous cow runs back past the new employee and smashes the crowd gate, the boss hollers from the milking pit and all the cows in the parlor defecate. The cows are stressed, the new employee is stressed, and the boss is thinking this is just the way things are working with “dumb” cows and “dumb” employees.

High quality communication, be it with your cows or co-workers is critical for a smooth running dairy. Talking with cows requires additional skills but like talking with people, good communication is learning how to be a good listener.

**References**

Is Management Intensive Grazing In Your Future?

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

Dairy farms faced with making a major decision about the future management strategies of their operation should be taking a good look at Management Intensive Grazing (MIG) for dairy cows and replacements. The past 10 to 15 years have shown a significant evolution in the use of pasture for managing dairy cows. This article will document the increasing interest in MIG, provide some reasons why producers select MIG systems, and offer leads to information resources about MIG.

Management Intensive Grazing, sometimes referred to as rotational grazing or management intensive rotational grazing, is the practice of moving groups of animals through a series of pasture paddocks. Intensively managing this movement suggests that groups are moved at least once every week, or perhaps every 2 to 3 days, or even at every milking. It also is characterized as a system that supplies cows with the majority of their forage requirements via pasture crops during the grazing season. The use of MIG has increased considerably during the 1990s and into the new century. Ostrom and Jackson-Smith observed an increase in the number of dairy farms utilizing Management Intensive Rotational Grazing in Wisconsin (7). Their report estimated a 115% increase in the number of MIG grazing herds in Wisconsin from 1993 through 1999. This increase was based on the response rates of MIG grazing herds in the 1993 summary with 524 respondents and the 1999 summary of 804 respondents. Table 1 shows details of the survey summary comparing herd changes with three management types.

While these Wisconsin statistics are not directly transferable to the situation in Michigan, they do indicate a large increase in the application of MIG in at least one state in the upper Midwest. In a 1999 survey of Michigan dairy farms conducted by Dr. Christopher Wolf, 62% of respondents (185 of 298) reported using pasture as a category of land operated by the farm (8). There was no indication whether these pasture acres were intensively managed, but it does indicate a large number of Michigan dairy producers utilize at least some pasture.

Why Resurgence of Interest in Grazing?

So, why has there been such a resurgence of interest in grazing? MIG is proving to be a profitable alternative to other dairy herd management strategies such as total confinement or farms with limited or “non-intensive” grazing. A study completed in 2000 compared financial data of 65 intensive grazing farms to 133 non-grazing farms in New York through the Dairy Farm Business Summary (2). The non-grazing farms were similar in size to the grazing farms. Table 2 (page 18) shows some of the financial indicators that were examined in the project. Differences between farm types was not remarkable.

Dr. Sherrill Nott, professor of Agricultural Economics, now retired, gathered and summarized Michigan Dairy Farm financial information for many years including 2001 when he...

| Table 1. Wisconsin dairy farms categorized by grazing management from 1993 to 1999a. |
|---------------------------------|--------------|-----------------|-----------------|-----------------|
|                                 | MIGb         | Grazing non-MIG | Confinement     | All dairy       |
|                                 |              |                 | operations      | farms           |
| 1993 Wisconsin Farm Survey     |              |                 |                 |                 |
| Number of respondents           | 38           | 155             | 331             | 524             |
| (Percent of Sample)             | 7            | 30              | 63              | 100             |
| Estimated size of population    | 2,191        | 8,939           | 19,088          | 30,218          |
| 1999 Wisconsin Dairy Farm Survey|              |                 |                 |                 |
| Number of respondents           | 171          | 173             | 440             | 804             |
| (Percent of Sample)             | 22           | 22              | 56              | 100             |
| Estimated size of population    | 4,714        | 4,779           | 12,131          | 21,624          |
| Percent change from 1993 to 1999| 115          | -47             | -36             | -28             |

aFrom: Ostrom & Jackson-Smith (7).
bMIG = management intensive grazing.
prepared a grazing summary as well as a broad summary of dairy herds. His summaries allowed for comparisons among the average herd in the summary for 2001 and the average for the grazing herds in 2001. These comparisons are shown in Table 3. When comparing all grazing herds (n = 14) to all herds in the summary (n = 158), grazing herds had about half as many cows, 77% as much milk sold, and about half as much total net farm income (NFI). In addition, NFI per cwt of milk sold and return on assets were greater for all herds. However, NFI per cow was similar for both groups of herds.

When grazing herds were compared with herds in the overall summary of similar herd size, NFI, NFI per cow, and return on assets were similar.

Great Lakes Grazing Network Collects Data

The Great Lakes Grazing Network (GLGN), through an USDA grant, has been gathering data from dairy farms where grazing is practiced in the Great Lakes Region for 3 years. Dairy Grazing Farm Financial Summaries are available online at http://cdp.wisc.edu/ for the first 2 years of the project. There were 92 farms the first year (2000) and 126 farms in the second year (2001). The GLGN is looking for more farms to participate in the study for 2003. Dairy producers using grazing who are interested in participating in the project can contact Phil Taylor (517-543-2310).

There are other reasons for the increased interest in MIG. Dr. Ben Bartlett included these in a previous Michigan Dairy Review (MDR) article on the “Hows and Whys of Dairy Grazing” (1). The entire article can be viewed at the MDR website (http://www.mdr.msu.edu). Dr. Bartlett lists the desire for increased profitability, the desire for time off, and the desire to contribute to a community as reasons for grazing. Also, he suggests that grazing is a good way to get started in the dairy business as it is generally lower in start-up investment. Finally, he makes the point that grazing is an alternative for mid-career dairy producers who desire a change in management systems rather than making large investments that may not be reclaimed before retirement.

One additional reason for increased interest in grazing is increasing pressure from environmental regulation mandates. Grazing offers an alternative to large scale dairy operations with their feed and manure management challenges. One must be mindful, however, that grazing does not dismiss a farm from its responsibilities to those same environmental regulations creating challenges for all dairy farms.

Is your farm a grazing candidate? Tom Kriegl at the Center for Dairy Profitability in Wisconsin has identified some characteristics that make an existing dairy farm a good candidate to try grazing or to switch to grazing (3).

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1. A desire to achieve economic viability and remain small enough to be handled by one family’s labor.
2. Average or better management ability. MIG is a different management system, not a reduced management system.
3. A willingness to change and try new things.
4. The absence of much unproductive debt.
5. The desire to avoid a new major investment.
6. Can be happy with a farming system that minimizes the use of equipment.
7. Income generation is not the weakest link in your current conventional operation.
8. You would like to farm for more than a couple more years. There is a learning curve to MIG that often will require at least a couple of years to complete.

More Information Available

A vast amount of information is available from MSU Extension offices and the Internet. A good resource to begin researching MIG is a paper written by Dr. Nott. His paper “Evolution of Dairy Grazing in the 1990s” summarizes MIG through the 1990s and lists 79 references to grazing information in the bibliography for further information (4). The paper is
available on the web at www.msu.edu/user/nott/ or through any county Extension office.

The 2004 Michigan Grazing Conference will offer opportunities for dairy producers to increase their knowledge of grazing practices and visit with others about their management systems. The conference also allows producers and prospective dairy producers using grazing the chance to meet people who supply equipment for grazing dairies and to learn about various programs that can cost share a transition to grazing.

Dairy producers contemplating a switch to MIG have many information resources available to help smooth a transition from a current management strategy. Utilizing these information opportunities can improve success when changing systems or starting a dairy grazing system.

References

Managing Your Time for Success in Business and Life: Part I - Why Time Management Is Important

Ted Ferris
Dept. of Animal Science

Time is a resource, your time is valuable, your employees’ time is money and good time management results in increased productivity and self-esteem. Good time management is a major component of business success. On dairy farms time management influences labor efficiency, employee attitude and performance, which in turn influence cow performance. So, improving time management skills can result in greater success for you, your employees, and your business. The goals of this article are to stress the importance of time management, to help you assess your time management skill level, and to encourage you to learn more about the subject. If you struggle like most (me included) with managing your time, read on. Some of the concepts described in this three-article series may be useful to you and your employees.

Time Management Defined

Time management is planning and organizing your time and as a manager, organizing the roles and time of those who work for you. Being organized means knowing who is responsible and what and when things should happen.

Why Is Time Management Important

Firstly, since time is a valuable resource, effective use of time translates into labor efficiency, greater business profit and more time for family, friends, leisure, community, and other activities. Secondly, several factors are influenced by time management. These are illustrated in Figure 1 (page 20), adapted from by Hyrum Smith (8) who created the Franklin Planner, one of the original day-timers. There are three components to his diagram: Event Control, Productivity, and Self-esteem. He refers to Event Control in general as time management. Let’s discuss the components of Figure 1 going clockwise starting with event control:

1. Event control affects productivity. We know that productivity in turn affects success and business profitability. At day’s end we tend to think about how productive our day was, whether this relates to business, recreation, a family activity, or other personal endeavors. Event control is influenced by goals, goal setting, time management skills, and time management habits. Event Control can relate to all areas of our life, e.g., business, family, and recreation. The main point is that Event Control is influenced significantly by our ability to manage time. You might ask yourself, does your time reflect what is important to you and does it reflect your
values? Do you have time to “manage” your business, time for family, friends, recreation, and community? Or is too much of your time controlled by the small things, details, and dealing with urgent items not allowing you time to plan, organize, and work on the important items? Covey (5) states that stress is often a result of not doing what is important to us.

2. Productivity. When we feel that our day has been productive, our self-esteem and attitude tend to be higher and our level of frustration and stress is lower. There are ways we can increase productivity directly; i.e., things that don’t have to do with event control or self-esteem. These may include upgrading facilities to improve labor efficiency and the work environment, changing routines, or eliminating unnecessary tasks.

3. Self-esteem. With higher self-esteem and a good attitude we tend to do better controlling events or managing our time. We are more enthused and willing to take time to plan and organize ourselves.

Self-esteem is like energy to an individual. Developing confidence and self-esteem in oneself and employees is similar to increasing the energy level of your herd’s ration. If self-esteem leads to increased productivity and event control, then improving self-esteem can have a real impact on a business. Consider that only 10% of high school graduates and only 30% of the U.S. population have high self-esteem (4). This suggests that there is a great deal to be done to enhance self-esteem in ourselves and employees. We can do a number of things to improve self-esteem in others. One key is to communicate to others in a non-critical, non-confrontational manner. Baile (1) and Bolton (3) discuss ways to communicate in a non-confrontational manner. Another key is to establish in employees a sense of belonging to the business and to recognize others for their efforts.

This completes the clockwise cycle. Going counter clockwise in the diagram, we recognize that when our self-esteem is high, we tend to be more productive. Blanchard and Johnson in The One Minute Manager (2) state “People who feel good about themselves produce good results”. I doubt there is much to argue here. This is part of the reason why we need to consider self-esteem. Further, productivity affects the time we have to spend on event control. Good event control increases our sense of control over our time and positively impacts our self-esteem.

Smith’s approach was to work on event control using his Franklin Planner to help individuals manage their time (8). In reality, we can work on all three of the components in Figure 1. I shall focus on event control in a second article (Part II) and productivity and self-esteem in a third article (Part III) in subsequent issues of the Michigan Dairy Review.

Managing your time and that of employees involves planning and organizing. What are planning and organizing? Planning in the broad sense involves developing a vision for your business, the big picture, and a mission statement that states how you plan to accomplish the vision. Planning in the narrow sense involves problem identification, decision making, establishing long- and short-term goals and determining what needs to be done, or mapping out the tactics, which include the who, what, when, where, and how of the short-term goals. Long-term goals are eventual and short-term goals are timed; i.e., they have definite dates established.

Organizing in the broad sense involves establishing an employee management structure (sometimes called an organizational structure or organizational chart), establishing staff functions, job descriptions, daily routines, standard operating procedures (SOPs), and designing work areas. Daily routines and SOPs help employees organize their time and do each job properly and consistently.

Organizing in the narrow sense refers to taking a plan, a set of short-term goals, or a set of tasks and implementing them, often through employees. This involves coordinating activities and duties by organizing your time and employees’ time and responsibilities and then following up to make sure tasks are completed. These are tactical activities.

**Self Assessment, Are You a Good Time Manager?**

To help determine your time management abilities, questions relating to planning and organizing skills are listed on pages 21-22 under Self-Assessment of Planning and Organizational Skills. They are reproduced from the Michigan Dairy Review article “Managing Cows Through People” (6). These questions are part of a self-test on five management skill areas (Planning, Organizing, Staffing, Directing, and Monitoring) (7). If you score less than 20 points in either planning or organizing, you may want to consider devoting some time to learning and practicing some goal setting and

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**Additional Resources and Workshops**

- Power of People. MSU Extension.
- DEEP - Dairy Employee Education Program. MSU Extension.
- Dairy On-Time. www.dairystrategies.com
- Fred Pryor-Career Track Seminars. www.pryor.com

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**Figure 1. Factors that influence and are influenced by time management. Diagram modified from Hyrum Smith (8).**
time management skills. A number of books, tapes, videos, and seminars are available on the subject. Some are listed at the bottom of page 20.

Summary

Time management is important because it influences productivity and self-esteem, which in turn influence our desire to manage our time and that of employees. In Smith’s book (8) the first of his 10 Natural Laws of Time and Life Management is “You control your life by controlling your time.” To control our time there are some very basic steps we can take and many tips we can use. Many of us know some of these practices but do not use on a daily basis.

Time management involves planning and organizing. These two management skills can be evaluated using the short self-test at the end of this article. I encourage you to take a moment to do the self-assessment test.

We should work to improve event control, productivity, and self-esteem. Consider reading additional materials and (or) take a time or project management workshop. Work on one or two time management skills at a time because new habits take time and practice. As we improve our time management skills we shall gain a greater sense of control and be more successful at work and at home.

References and Web Resources


Self-Assessment of Planning and Organizational Skills

The following questions relate to the management skills of planning and organizing and are extracted from the 30 question Management Inventory printed in the April 2001 Michigan Dairy Review in the article Managing Cows Through People. Taking the Management Inventory can help you become more aware of the strengths and weaknesses you have as a manager.

For the following questions, indicate the extent to which you agree or disagree with the statements, answering 1 (strongly disagree) through 5 (strongly agree).

1. The goals and objectives of my business are clear and frequently written. 1 2 3 4 5
2. Everyone working with me has very clear responsibilities, and I frequently write down those responsibilities. 1 2 3 4 5
6. Given several things to choose from, I find it is difficult for me to make the right choice. 1 2 3 4 5
7. Major problems within the business are the owner’s responsibility. 1 2 3 4 5
11. The big picture and the details are very clear to me. I know where I’m going and how to get there. 1 2 3 4 5
12. I have clear procedures for routine chores. 1 2 3 4 5
16. I think on my feet and plan as I go along rather than figure out the details first. 1 2 3 4 5
17. When I am in charge, I like to make all the decisions. 1 2 3 4 5
21. I am very creative and can easily come up with 10 ideas to solve any problem. 1 2 3 4 5
22. People working with me are responsible and accountable for what they do. 1 2 3 4 5
26. I’m not good with details and often miss the little things when making a plan. 1 2 3 4 5
27. Good workers in my business don’t need to have clearly defined roles and responsibilities.

Scoring Instructions: In column A below, put the number you circled (1 through 5) for that question on the line next to the question number. Add up those numbers, and put the total on the line next to Total A. In column B, add these numbers together and put the answer on the Total line for B. To the Total value for A, add 18, then subtract B in each section.

Example

| Question # 1. | A | 4 | B   | 3 |
| Question # 11. | 3 | + | Question # 16. | 1 |
| Question # 21. | 5 | + | Question # 26. | 2 |
| Total A | 12 | Total B | 6 |

Total A + 18 - Total B = Total Planning

(Reminder: This is an example; your answers and totals will be different.)

Michigan Milk Market Update

Christopher Wolf
Dept. of Agricultural Economics

The milk price recovery arrived in full in the autumn months. According to USDA, the Michigan mailbox price peaked at $15.20/cwt in October. Cow numbers continued to decline (Figure 1). Commercial slaughter peaked in October at 281,000. This represented the largest single-month slaughter value since the same month in 1996. A large portion of these cows were culled as part of the Cooperatives Working Together (CWT) voluntary supply control program.

In Michigan, the milk-to-feed price ratio climbed above 3.0 in September and reached 3.28 in October (Figure 2). Seasonally strong Class III prices meant no Milk Income Loss Contract (MILC) payments for August through December.

Reasons for optimism about milk prices outweigh those for pessimism at the current time. Butter stocks have been drawn down to “normal” levels, and the cash butter market has been strong. The CWT program is planning to subsidize the export of cheese at $1.30/lb and butter at $1.10/lb, which should lend support to both markets. As of this writing (December 15, 2003) the futures market was offering an average of $12.05/cwt Class III price for calendar year 2004. Adding in your basis, which includes premiums, this price should be a welcome sight in light of the previous 2 years. Finally, if you are still looking for months to take the MILC payment, the best single month appears to be March. Recall that the payment is 45 percent of the difference between the Class III price and $13.69/cwt. The payment will begin again in January and continue at least through the first half of 2004.

Figure 1. Milk cows and cows to commercial slaughter, 2003

Figure 2. Michigan milk-to-feed price ratio, 2003.
Michigan Dairy Judging Teams Complete a Successful Fall

Joe Domecq
Dept. of Animal Science

Members of the Michigan State University Collegiate and Ag Tech Dairy Judging Teams and over 25 Michigan 4-H members spent many summer and fall weekends visiting farms and judging cows in preparation for the 2003 fall judging season. The teams visited dairy farms in Michigan, Ohio, Indiana, Wisconsin, and Ontario, Canada. Practices were held at the Shiawassee County Fair, the community fair in Hudsonville, MI and the Michigan State Fair. All of the practice and preparation paid off as the state of Michigan was successfully represented in several contests.

The 2003 MSU Collegiate Dairy Judging Team members were Lindsay Kirk (St. Johns), Kristin Kramer (Harbor Beach), Ashley Liddy (Gladwin), and Beth Munsell (Fowlerville). The MSU Ag Tech Dairy Management Program was represented by Josh Gamble (New Carlisle, IN), Mike Hertsel (Napanee, IN), Jim Nienhuis (Zeeland), and David VanWanzele (New Carlisle, IN).

The first contest of the year was the Pennsylvania All-American Dairy Show in Harrisburg, PA. The Collegiate team placed 5th in Ayrshires, 2nd in Brown Swiss, 3rd in both Holsteins and Jerseys, and 5th overall. Individually, Ashley was 2nd in Brown Swiss, Kristin was 4th in Holsteins, and Lindsay was 5th in Holsteins and 4th overall. Michigan 4-H was represented by Allen and Arthur Gust (Manitou Beach), Adam Preston (Quincy), and Matt Smeller (Sebewaing). This team placed 4th in Ayrshires, 1st in both Brown Swiss and Guernseys, and 4th overall. Adam was 4th in Guernseys, Art was 5th in Jerseys, and Matt was 3rd in both Ayrshires and Brown Swiss, 1st in Holsteins, 4th in Linear Evaluation, and 1st overall.

In late September, the Collegiate, Ag Tech, and 4-H teams traveled to Madison, WI for the national contests at World Dairy Expo. Each team did very well in their respective contests. The collegiate team placed 12th in Ayrshires, 2nd in Brown Swiss, 4th in Guernseys, 5th in Milking Shorthorns, 7th in Red and Whites, 7th in Linear Evaluation, 6th in oral reasons, and 7th overall. Individually, Lindsay was 4th in Jerseys, Beth was 12th in Brown Swiss, and Kristin was 7th in Ayrshires, 15th in Brown Swiss, and 24th overall. Ashley had an outstanding day placing 3rd in Guernseys and Milking Shorthorns, 4th in Brown Swiss, 11th in reasons, and 7th overall. Over 25 universities participated in the contest.

The Ag Tech team placed 2nd in Ayrshires, 3rd in Guernseys, 4th in Jerseys, 5th in Brown Swiss, 5th in reasons, and 4th overall among the 17 teams that participated. Individually, Jim was 4th in Guernseys and Mike was 9th in Holsteins, 10th in reasons and 11th overall. Josh was 2nd in Ayrshires and Jerseys, 8th in Brown Swiss, 8th in reasons, and 8th overall.

The Michigan 4-H team had a tremendous day in the National 4-H contest at World Dairy Expo and achieved the highest ranking for a Michigan team in over 20 years. Team members included Diana Feenstra (Jenison), Jessica Geurink (Allendale), Greta Koebel (Three Oaks), and Mary Tenbrink (Coopersville). 4-H teams from over 30 states participated in the contest and the team from Michigan placed 4th overall. The team was 3rd in Ayrshires and Jerseys, 10th in Brown Swiss, Guernseys, and Holsteins, and 3rd in oral reasons. Individually, Diana was 9th in Ayrshires and Jerseys, and Mary was 3rd in reasons. Jessica was 1st in Guernseys, 1st in oral reasons, and 2nd overall.

The Collegiate, Ag Tech and 4-H teams also participated in a practical contest at World Dairy Expo. Nineteen teams participated in this contest which consists of three sections. The first section is evaluating and selecting commercially bred heifers based on price, health status, and production records. Team members evaluate body condition, feet and legs, udder promise, and estimate heifer weights and heights. The second part of the practical contest involves evaluating a group of registered heifers (including pedigrees and genetic values) and determining economic values of the heifers. Linear evaluation of six cows was the third part of the contest. The practical contest offers students an opportunity to utilize practical knowledge and experience. The Collegiate team placed 7th in both the commercial bred heifer evaluation and in linear evaluation. The Ag Tech team was 9th in linear evaluation, 2nd in commercial heifer evaluation, and 11th overall. The 4-H team was 4th in registered heifers and 10th in commercial heifer evaluation.

The final contest of the year was held at the North American International Livestock Exposition in Louisville, KY. The Collegiate team was 4th in reasons, 9th in Jerseys, 10th in Holsteins, and 15th overall. Beth was 5th in Ayrshires, Kristin was 7th in Brown Swiss, Ashley was 5th in Guernseys, and Lindsay was 8th in oral reasons. The Ag Tech team placed 5th in Ayrshires 7th in Brown Swiss, 4th in both Guernseys and Jerseys, 3rd in both Holsteins and oral reasons, and 6th overall. Dave was 9th in Ayrshires. Josie was 4th in Brown Swiss, 10th in Guernseys, 8th in oral reasons, and 6th overall. Mike was 2nd in...
Jerseys, 9th in oral reasons, and 7th overall. At this contest, Michigan 4-H was represented by Baylee Drown (Cedar Springs), Heather and Jessica Fry (Blanchard), and Adam Preston (Quincy). This team placed 6th in Ayrshires, 7th in Brown Swiss, 6th in Guernseys, 3rd in both Holsteins and Jerseys, 8th in oral reasons, and 2nd overall. Individually, Baylee was 4th in Jerseys and 9th overall, Jessica was 9th in Brown Swiss and 7th overall, and Adam was 2nd in Holsteins and 5th overall.

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

ABS Global, Michigan Dairy Memorial Foundation, Michigan FFA Alumni Association, Michigan Holstein Association, Northstar Cooperative, Inc., and the United Dairy Industry of Michigan provide major financial support for the MSU Dairy Judging Program. Team members also participate in fund raisers throughout the year, including the Spartan Spectacular Calf Sale held every March.

The MSU Dairy Judging Program extends appreciation to all of the individuals, farms, and agricultural businesses that support the program by providing cattle, expertise, and financial support. Special thanks to Mrs. Sara Long and Mrs. Sarah Black, who traveled with the teams to various contests and workouts this fall, and to Ms. Laurie Davis and Ms. Karolyn Terpstra, graduate students in the College of Agriculture and Natural Resources, who also provided coaching assistance. The MSU Dairy Judging Program is coordinated by Dr. Joe Domecq.

Michigan Dairy Heifer Replacement Project

Joe Domecq
Dept. of Animal Science

The Michigan Dairy Heifer Replacement Project is an innovative new way to allow 4-H and FFA youth to participate directly in the dairy industry. This project allows youth to select, raise, breed, exhibit, and market a heifer of their choice.

The primary goal of this project is to enhance knowledge of the dairy industry by adding a new dimension of hands-on learning. In addition to gaining experience, youth also will have the opportunity to earn money through the sale of their project heifer. This allows dairy producers from across the state to purchase top quality replacements. The sale is hosted by Michigan Dairy Expo, after the All MI Dairy Youth Show. A 10% commission from the sale of each animal is used to support Michigan Dairy Expo.

The first annual sale was held at the 2003 Michigan Dairy Expo. D. J. Trefil of Clinton County sold his heifer for $1750. The heifer was purchased by The Preston Farm of Quincy, MI. The contending bidder was Hood Dairy of Paw Paw, MI. Congratulations to D.J. and thank you Preston Farm and Hood Dairy for your support of this sale. Also thanks to Chad Kreeger, Paul Warner, and United Producers, Inc. for donating their services to the sale.

Official entry forms and more information for the 2004 MI Dairy Heifer Replacement Project can be obtained from county Extension offices or the State 4-H Dairy Office. Entry deadline is April 15, 2004.

Heifer eligibility requirements are as follows.

• Must be born between June and October 2002.

• Must be exhibited at the All MI Dairy Youth Show.

• May be grade or registered.

• May be of any dairy breed.

• Sire must be registered.

• Dam must meet minimum levels for lactation production records.

• Must be bred by artificial insemination.

• Must be due to calve between September 1 and December 1, 2004.

• All animal health requirements to exhibit cattle at MI Dairy Expo must be met.

Request MDR Online

You can request and view MDR online and discontinue receiving the hard copy. Please notify us by e-mail at mdr@msu.edu, or click on “e-mail us” at the MDR web site, http://mdr.msu.edu. Just include your complete e-mail address and the address that appears on the back of your paper copy of MDR.
Michigan Dairy Expo Cheese Sale

Joe Domecq
Dept. of Animal Science

Have you ever wondered how you could help support Michigan Dairy Expo? This year there is a new way to support Michigan Dairy Expo through the purchase of 1-pound blocks of cheddar cheese.

This summer, a portion of the milk that was produced during the Michigan Dairy Expo was shipped the short 1-mile drive from the Pavilion to the Michigan State University Dairy Processing Plant on the campus of MSU. The milk was then processed into 100% pure Michigan Dairy Expo Cheddar Cheese. This cheddar has been aged and is now available for purchase.

All blocks carry the Michigan Dairy Expo logo and make wonderful treats and holiday gifts. Cheese will be available at limited 4-H dairy events throughout the year but can be ordered while supplies last.

Proceeds from the sale of this cheese go directly to fund the activities at Michigan Dairy Expo on July 19-23, 2004 and other State 4-H Dairy Youth Activities.

Each block weighs approximately 1 pound and can be picked up at 1250F Anthony Hall on MSU’s campus or blocks can be shipped. The cheese cost $5.00 per 1-pound block for pick-up orders. Up to four blocks of cheese can be shipped at one time directly to your home for an additional shipping and handling fee of $6.00. For ordering information please see the form above or contact the State 4-H Dairy Office.

MICHIGAN DAIRY EXPO AND 4-H DAIRY YOUTH PROGRAMS

Say Cheese!!

Introducing....

Michigan Dairy Expo Cheddar Cheese
Made with milk produced at Michigan Dairy Expo and processed by the Michigan State University Dairy Plant. Sold in 1 lb blocks and can be picked up directly or shipped to your home!
See right for ordering and contact information.

Proceeds Support Michigan Dairy Expo and 4-H Dairy Youth Activities.

Limited Supply!! Limited Supply!!

Michigan Dairy Expo Cheese Order Form

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Please make checks payable to: Michigan P.D.C.A.

*Please include $6.00 shipping costs for every 4 lb of cheese ordered for mailing.
*For instance, if 5 lb of cheese are ordered include $12.00 shipping.

For Pick-Up Orders
Please Fill-In:
Date: 
Time: 

Limited Supply!! Limited Supply!!

Michigan Dairy Expo Cheese Sale
Dairy Programs Early 2004

Introduction

Michigan State University dairy faculty and Extension Dairy Agents have developed a number of programs that will be provided to producers and agri-business professionals in 2004. Pages 26 and 27 describe the major programs that will occur at multiple locations in Michigan. You may contact your local MSUE Dairy Agent for further information on costs, program content and other questions. To register for a meeting or workshop, please call the contact person for the program and location you wish to attend. The Dairy Team has developed these programs as a result of team discussions and input from producers, agri-business professionals and industry leaders. Your input to your local Dairy Agent on educational needs is an important way that we determine our efforts.

Positioning Your Dairy Business for the Future

This intensive strategic workshop will help you evaluate and direct your business. Understanding the strengths and limitations of the farm’s management team plus evaluations of external and internal risks and financial analysis will lead to the development of short and long term goals and tactical plans of action for each participating operation.

Dairy Marketing 101

Dairy Marketing 101 is a 2-day dairy marketing shortcourse designed to help dairy producers, lenders and others learn the basics of dairy marketing. The goals of the shortcourse are to help individuals understand how Class III milk futures, options, and forward contracting can be used to manage milk price risk in a dairy operation. Milk price risk management using appropriate marketing tools can assist dairy producers to remain competitive.

Dairy Manure and Wastewater Management Conferences

The Michigan State University Extension Dairy and Manure Management Teams are presenting six regional conferences across Michigan to focus on the latest best management of dairy manure and wastewater. As Michigan dairy producers look for practical, profitable methods of managing manure nutrients, these conferences offer an opportunity to explore some of the most progressive practices in manure handling, treatment, and utilization. Michigan State University researchers and Extension specialists will share their expertise in:
- Managing manure phosphorus through dairy nutrition,
- Milking center wastewater management,
- Fly control strategies,
- Surface water risks associated with field application of manure, and
- Latest technologies in the treatment of manure and wastewater.

Advancements in Reproductive Management

In 1997 Dolly the sheep was the first animal cloned from an adult. In 1998, Dr. Jose Cibelli, now a professor at MSU, worked with a group that cloned cattle for the first time. What kind of influence will these breakthroughs have on our farms? Are we ever going to be able to use cloning to enhance our production capabilities? It is likely that the US government will allow the commercialization of non-genetically modified clones for human consumption in the very near future. Dr. Cibelli will discuss this possibility and address the impact this new technology may have on dairy farms.

Fertility of lactating dairy cows continues to be a major problem affecting profit of dairy farms. Dr. Richard Pursley will discuss strategies dairy producers and veterinarians can employ to enhance reproductive performance. Recent data indicated that bull fertility may influence conception rates more than previously thought. In addition, recent work of Dr. Pursley shows that more heifer calves can be generated than normal when cows are inseminated at a specific time before ovulation.

PCDART Advanced Training Two-session workshops

PCDART Advanced Training is a 2-day hands-on computer workshop developed to assist producers in learning to more effectively use the report and graphing capabilities of PCDART Dairy Management Software. The learning objectives include:
- 1- to update producers on new PCDART features and reports including the timed AI management tool;
- 2- to demonstrate herd analysis tools and analysis reports; and,
- 3- to help producers design specific reports and graphs for their dairy herd. Participants will have 2 weeks between sessions to work on developing their own herd reports. Help will be given to complete reports in the second session.
Dairy Employee Education Programs

The Dairy Employee Education Program (DEEP) consists of 1-day or 2-day workshops taught with both classroom instruction and hands-on application for anyone who is involved in the daily care and/or management of dairy animals.

Time for training employees is hard to find. Time constraints and assumptions of what employees already know frequently inhibit the effective communication of many extremely important concepts and details of good dairy practices. DEEP offers the opportunity to educate employees and others about not only the what’s and how’s but also the why's of effective, profitable dairy cattle management. Satisfied participants in DEEP workshops have included farm owner/operators, family members, industry representatives as well as dairy farm employees with the goal to improve animal performance and profitability.

DEEP workshops are available in these topics areas: feeder training, calf care, herd health skills, hoof health, transition cow, and power of people.

MEETING LOCATIONS and DATES
NOTE: REGISTRATION is through the local contact person listed with each meeting location (except for PCDART workshops).

Dairy Marketing 101
BURNIPS. March 10 & 17. Contact Bill Robb 800-792-7175.

Dairy Manure and Wastewater Management Conferences

UBLY. January 27. Contact Craig Thomas 810-648-2515.
ST. JOHNS. February 3. Contact Dann Bolinger 989-224-5240.
ESCANABA. March 31. Contact Ben Bartlett 906-439-5880.

Advancements in Reproductive Management

CASS CITY. February 17. Contact Craig Thomas 810-648-2515.
EAST LANSING. February 18. Contact Dean Ross 517-546-3950, Dann Bolinger, Phil Taylor
ALPENA. February 24. Contact Phil Durst 989-826-1160.
WEST BRANCH. February 25. Contact Phil Durst 989-826-1160.

PCDART Advanced Training
Note: Register with NorthStar Cooperative, Inc. 800-631-3510.
IONIA. January 13 & 27. Contact Phil Taylor 517-543-2310.
LAKE CITY. February 3 & 17. Contact Kathy Lee 231-839-4667.

Positioning Your Dairy Business
ALLEGAN. February 24, March 2, & March 9. Contact Bill Robb 800-792-7175.

DEEP Modules for Employees
Spanish Language Feeder Training School.
ALLEGAN. Feb. 12 & 26 Contact Bill Robb 800-792-7175.

Other Meetings

Many other programs are being developed locally. Please review your local dairy newsletter or contact your area Dairy Agent for a complete list of programs being offered nearby.

DAIRY TEAM Website http://www.canr.msu.edu/msue_thumb/pages/dairy_team/dairy_team.htm

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

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