Johne’s Disease Herd Prevalence Study 2006

A 2006 survey that looked at the prevalence of Johne’s Disease (JD) in Michigan herds yielded interesting results for both dairy producers and those trying to gauge the prevalence of the disease. The study used environmental sampling to detect JD and found that JD affects almost half of Michigan herds. These results suggest JD remains a serious issue facing Michigan dairy producers and that implementation of environmental sampling could aid states in controlling JD.

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Johne’s Disease (JD) is a contagious and costly disease affecting many dairy and beef cattle herds in Michigan. It is caused by the bacterium Mycobacterium avium subspecies paratuberculosis (MAP). This bacterium grows in the small intestine of ruminants and causes the intestinal wall to thicken. This thickening makes it difficult to absorb nutrients, and the disease eventually can lead to diarrhea, weight loss and death. Johne’s Disease is transmitted primarily through manure, colostrum and milk from infected adult cows to calves less than 1 year of age. Following infection, there is a long incubation period and clinical signs do not typically occur until several years after infection. Adult cattle infected with MAP can shed large numbers of the bacterium in their feces, even when the animals show no clinical signs. Once shed into the environment, MAP has been shown to survive for more than 1

In this issue...

Perceptions of Lameness
Do Michigan dairy producers think lameness is a problem?
pg. 4

21st Century Energy Plans
How a responsible energy plan could benefit Michigan dairy producers.
pg. 6

Diets and Air Emissions
What cows eat has an effect on air quality.
pg. 9

Johne’s Advances
Research into Johne’s disease diagnosis and vaccination continues.
pg. 10

Partnerships
Craig Thomas and the Stamps tackle dairying in Michigan’s Thumb.
pg. 16

Table of Contents - Page 3
year. Methods to control JD have focused on minimizing the exposure of calves to MAP, thereby preventing new infections and identifying and managing infected cows.

The National Animal Health Monitoring System (NAHMS) study in 1996 estimated the prevalence of dairy herds infected with JD in the US was about 21.6%. Other estimates range from 21 to 93% depending on region and testing method used to classify infected herds. The most recent estimate of JD prevalence in Michigan suggested that 64% of dairy herds were infected with JD. This study was conducted in 1994 and used serology to identify infected herds.

Taking advantage of the large numbers of bacterium shed from infected cows and the long-term survivability of the bacterium in the environment, “targeted” environmental sampling and culturing of manure storage areas and high-traffic cow areas has been shown to be greater than 70% effective in identifying herds infected with MAP. This approach has been accepted as an approved method for entry-level testing into the USDA’s and Michigan Voluntary Bovine Johne’s Disease Control Program. Environmental sampling has the advantage over other herd screening methods in that it does not require the handling and testing of individual animals and is less expensive. This method of testing can be used easily to screen an individual herd for JD or to determine the prevalence of JD at the herd level in a geographical region of interest. Knowing what the herd prevalence of JD is in a state or region is useful information for monitoring large-scale disease control programs, such as the Michigan Voluntary Johne’s Disease Control Program.

The objective of the 2006 study reported here was to use targeted environmental sampling and culturing for MAP as a cost effective method for estimating the prevalence of JD at the herd level in Michigan. This method could then be repeated periodically to monitor the state level disease prevalence and progress in disease control programs.

**Sampling**

During the summer of 2006, the Johne’s Disease Herd Prevalence Study was conducted to estimate the number of Grade A dairy herds infected with Johne’s disease throughout Michigan. A subset comprising 120 Michigan Grade A dairy herds was selected randomly using statistical procedures. Herds were stratified according to herd size and agricultural district in order to give an accurate representation of the dairy herd population across the state. Out of these 120 herds, 94 agreed to participate in the study. From these farms, two environmental manure samples were collected. One sample was collected from the primary manure storage area (for example, lagoon, solid pile, or slatted floor pit), while the other was collected from a common area (for example, holding pen, return alley, or free stall alley) used frequently by a number of cows in the herd. In all cases, the sample was taken from areas primarily representing adult lactating cows. No individual cow samples were collected. These two samples were submitted to the Diagnostic Center for Population and Animal Health (DCPAH) at Michigan State University for culturing using the liquid culture system. If either of the samples was determined to be positive for MAP, the herd was classified as infected with Johne’s Disease. In addition to the sample collected, information was gathered about any previous history of JD in the herd.

**Study Results**

Results of the study are summarized in Table 1. Thirty-eight (40.4%) of 94 herds were classified as positive for JD. When adjusted for the less than 100% sensitivity of the screening test used, it was estimated that the true prevalence of JD at the herd level was 48.1%. There was no difference in the prevalence of JD based on geographical location within Michigan. MAP was found in all herds (n = 15) with greater than 200 lactating cows. Herds that were tested for JD (regardless

<table>
<thead>
<tr>
<th>Herd Size</th>
<th>Herds Tested</th>
<th>Herds Positive</th>
<th>Apparent Prevalence (%)</th>
<th>True Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-99 Cows</td>
<td>65</td>
<td>19</td>
<td>29.2</td>
<td>34.8</td>
</tr>
<tr>
<td>100-199 Cows</td>
<td>14</td>
<td>4</td>
<td>28.6</td>
<td>34.0</td>
</tr>
<tr>
<td>200-499 Cows</td>
<td>6</td>
<td>6</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>&gt;499 Cows</td>
<td>9</td>
<td>9</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total Herds Tested</td>
<td>94</td>
<td>38</td>
<td>40.4</td>
<td>48.1</td>
</tr>
</tbody>
</table>
of result) or farms that had purchased cattle in the previous 5 years were 6.2 and 4.6 times, respectively, more likely to be infected than herds that had not.

**Summary**

Johne’s disease remains a prevalent disease in Michigan Grade A dairy herds with nearly one-half of all herds being infected. Larger herds are more likely to be infected than smaller herds. Farms that purchased cattle within the last 5 years were nearly 5 times more likely to be infected with MAP. This supports other research that has identified purchasing cattle as a significant risk factor for the presence of JD in dairy herds. All of these findings support continued importance of JD in Michigan dairy herds and the need to implement JD prevention and control programs.

The environmental sampling protocol used in this study is an economically attractive alternative to individual cow testing for monitoring the progress of JD control programs at the state or national level, as well as the individual herd level. Implementation of such a program would aid states in monitoring JD control program progress and help to guide changes over time.

For more information on Johne’s disease and the Michigan Voluntary Johne’s Disease Control Program, please visit our web site at <http://cvm.msu.edu/extension/johnes>. Additional references also are available from the authors upon request.

**References**


Survey of Michigan Dairy Farmers’ Perceptions about Lameness

The results of this survey indicate that Michigan dairy producers do not believe lameness is as prevalent a problem in their herds as research suggests it is. Because many producers do not record lameness events of individual cows, they may not realize the extent to which lameness is actually affecting their herds. By taking steps to and identify prevent lameness, dairy producers can increase animal welfare, milk production, and profitability.

Lameness is a major challenge in many dairy herds. However, the majority of Michigan farmers’ perceive lameness to be a smaller problem than indicated in research studies (1). Actual incidence rates (IR) of lameness have been recorded between 0 and 55% in controlled research studies (2,3), but 53% of Michigan dairy farmers thought that less than 10% of their herd had been lame during the 12 months prior to our survey. This finding was not surprising when considering most farmers do not have an established method for recording lameness occurrences and causes. Raising awareness about the potential risks and impacts of lameness could reduce IR in farms with subsequent benefits to herd health, animal welfare, milk production, and profit.

Why Focus on Lameness?

This survey focused on lameness for three reasons:

- **Economic Loss.** It is estimated that a single case of lameness costs dairy farm owners between $300 and $400. The estimate includes veterinary costs and medication, reduced fertility, culling, loss of milk production, and labor costs (4).
- **Animal Welfare.** With the increasing awareness about animal welfare, lameness has become a very important consideration because lameness is associated with pain and discomfort (5).
- **Incidence Rate:** There may be great difference in the actual IR versus what farm owners’ believe is the IR in their herd (1).

Survey Design
The survey was sent to 1,280 dairy producers in Michigan in July 2005 and 1,008 in December 2005. Together, these groups represent all Michigan Grade A dairy producers. A total of 748 producers responded anonymously to the survey, which resulted in a 32% return rate.

The survey consisted of 24 questions divided into the following categories:

1) Your dairy farm and management challenges
2) Your thoughts about lameness in dairy cattle
3) Managing lameness in your herd
4) Finding lame cows in your herd
5) Prevention and treatment of lameness
6) Background questions (to help us better understand our respondents)

Results
Sixty-four percent of the respondents had a herd size of 100 cows or less, 21% had herds between 101 and 200, and 16% had greater than 200 cows. This profile of herd size is similar to that found by Michigan Agriculture Statistics in 2004-2005 for all Michigan dairy herds (6). Thus, the sample obtained in our survey is representative of the profile of Michigan dairy herd sizes.

- Fifty-four percent of herds surveyed currently use free stalls for their milking cows (44% with sand bedding, plus 10% with mattress beds). Thirty-six percent use free stalls for dry cows (30% with sand bedding plus 6% with mattresses).
- Ninety-nine percent of respondents believed lame cows feel pain.
- Fifty percent of farm owners receive information about lameness through magazines and newsletters, while 19% receive information from their hoof trimmer and 18% from their veterinarian.
- Sixty-five percent of the herds responding to the survey had annual milk production between 17,001 and 25,000 pounds per cow.

The majority of respondents (53%) indicated that they believe less than 10% of their herd to be lame annually. This IR does not correspond with findings from scientific research. Therefore, we used information obtained in the survey to try to understand why farm owners perceive lower IR of lameness. Respondents were asked how often a professional hoof trimmer visits their farm each year. Thirty-eight percent of respondents...
indicated that they do not employ a professional hoof trimmer at all. Furthermore, 69% of farm owners do not use a specific recording method to track lameness problems though 20% use paper recording and 9% use a computer program.

**Discussion**

Owners were more concerned about lameness they perceived their IR to be higher. Also, farm owners believed hairy heel warts, foot abscesses, and foot rot to be the main contributors to lameness (Figure 1). Actually, these resulting disorders result from other primary environmental causes. Actual causes include infectious microorganisms, slipping on wet floor and rough flooring, poor design of free stalls, and hock/ankle injuries. These factors, however, are not perceived to be greatly significant factors causing lameness, according to the respondents.

**Conclusion**

The results of our survey suggest that dairy producers believe lameness is less of a problem in their herds than indicated in controlled studies. Because many producers either do not employ a professional hoof trimmer or are not recording lame cows, they may not realize the extent to which lameness is actually affecting their herd. This could result in a lower perceived IR. Benefits of increased record keeping, improved environment where cows live, and use of professional hoof trimmers may reduce IR. Moreover, animal welfare concerns will be decreased. Consequently, dairy producers may benefit from increased health, milk production, and profitability.

**References**


**Figure 1.** While poor floor surface, poorly designed free stalls and infectious microorganisms are leading environmental causes of lameness, many farm owners more often associate the resulting disorders such as hairy heel warts, foot abscesses and foot rot as the main causes for lame cows.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percent of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hairy Heel Warts</td>
<td>36%</td>
</tr>
<tr>
<td>Foot Abcesses</td>
<td>26%</td>
</tr>
<tr>
<td>Foot Rot</td>
<td>18%</td>
</tr>
<tr>
<td>Wet Floor</td>
<td>7%</td>
</tr>
<tr>
<td>Acidosis</td>
<td>7%</td>
</tr>
<tr>
<td>Sole Bruises</td>
<td>6%</td>
</tr>
<tr>
<td>Flooring Surface</td>
<td>6%</td>
</tr>
<tr>
<td>Hoof/Ankle Injuries</td>
<td>6%</td>
</tr>
<tr>
<td>Free Stalls</td>
<td>2%</td>
</tr>
<tr>
<td>White Line Disease</td>
<td>2%</td>
</tr>
<tr>
<td>Employees</td>
<td>1%</td>
</tr>
<tr>
<td>Hoof Trimmer</td>
<td>1%</td>
</tr>
</tbody>
</table>
Stepping into the 21st Century, Energy Options for Michigan Farms

Alternative energy has been a hot topic in 2007. Several different reports, including those from the Governor’s office, have tackled the issue of how to diversify renewable energy initiatives in Michigan. Many of the strategies outlined in the reports could impact dairy producers positively.

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Energy options for The 21st Century will not be like those of the past in Michigan, the U.S. or the World. World trends in human population, oil demand, climate change, and the gap between rich and poor are just a few major trends that will necessitate development and implementation of sustainable energy sources. Though this transformation may be difficult, it offers unsurpassed opportunities for the agricultural community. The problem for Michigan is that our political and financial situations have left us woefully behind other Midwestern states. Unless Michigan is willing to aggressively adopt new approaches, the $18 billion for fuels that we currently send to other states will become a much larger tab in the future (1).

Report Recommendations

Since the first of the year, several different reports have attempted to describe alternative directions that will provide Michigan with an electrical future that is secure and affordable. Over the last year, the 21st Century Energy Plan (CEP) requested by the Governor was completed with extensive public input and sent to the Governor the first of the year (2). On May 1, 2007, Consumers Energy Corp. released its Balanced Energy Initiative (BEI) to supply its 1.8 million customers (3). The Environment Michigan Research and Policy Center produced a report entitled “Energizing Michigan’s Economy” (EME) (1). The Next Energy Center produced a report titled “A Study of Economic Impacts from the Implementation of a Renewable Portfolio Standard and an Energy Efficiency Program in Michigan” (4). These recommendations provide some divergent perspectives on the directions that Michigan should take that are useful and are recommended reading. This article will not attempt to review all of the recommendations of these reports, but will comment on some of the recommendations.

Increased energy efficiency is recommended by all of the reports. The 21st CEP recommended that an independent third party manage a statewide public benefits fund that would raise some $68 million through a surcharge on your electricity bill (1). This money would be used for diverse activities for administration, implementation, and evaluation. The EME extends that investment to $225 million per year to reduce electricity demand and, therefore, the need for new generation capability (1). The cost of this effort would be about one-half the cost of new coal generation that would meet future environmental requirements. BEI agrees with the need for a “good” efficiency program, but calls it a very aggressive approach and advocates active participation by utilities companies (3). Projections of two efficiency computer modeling scenarios in the Next Energy Report suggests slight improvements in job availability and decreased cost per kilowatt (kW), increased disposable income and other benefits (4). This type of program along with a strong demand management effort from the utilities would be a progressive step into the 21st Century with minimal costs to Michigan consumers and industry.

The Renewable Portfolio Standard (RPS) recommendation would require 10% renewable generation by 2015. An expansion to 20% by 2025 is also a recommendation of the 21st CEP. That plan would include fulfillment of that requirement with Renewable Energy Credits (RECs) that could be purchased from out-of-state generation (2, 5). The EME pushes the RPS percentage to 25% by 2025 (1). BEI recommends expansion of their Green Generation program from its current 5% participation to 10% (3).

Twenty-one states and the District of Columbia use mandatory RPS to encourage development of renewable energy. This is usually a mandatory quantity-based standard. Over a phase-in period, utility companies will be required to draw a certain percentage of their electricity from renewable energy sources (three states have voluntary standards and others are developing RPS) (6). Typically, this means that a utility company puts out a request for proposal and then selects projects that have the best price and potential for actually coming on line. The contracts may be for 10 to 25 years depending on the program requirements providing a consistency that seems to foster investment opportunities. Wind generation and landfill methane extraction to run generators tend to be the least costly, but if the percentage is high enough and the contract period long enough more expensive projects become competitive.

There are some major criticisms of the RPS strategy. The lowest price strongly favors existing technologies at the best sites and usually that implies technologies, which have been
developed overseas. Because the bidding process favors the least expensive first, the bigger investor who can take the risk to a banker and utilize the production tax credit is selected (7). The small generator and diverse or new technologies are usually disfavored. In addition, RPS penetration levels of 5 to 15% over a decade or two will have a relatively small impact on climate change. Therefore, these criticisms suggest that recommendation and adoption of a RPS requirement will not accomplish what is needed in the time required and, therefore, will not move Michigan into a competitive position.

Investing in Energy

For development of renewable energy, several things need to occur in Michigan. First, a funding mechanism must be available to assist farms, communities, and farm-related businesses with the capital intensive startup funds necessary for these projects. Secondly, a reasonable return on the electricity that is fed into the grid, on an extended contract basis, must be available to foster diverse renewable source implementation. And finally, the utilities must encourage connection of this diverse generation system with reasonable costs and connection processes to the grid.

Most potential developers balk at the initial high capital investment required for renewable energy and energy efficiency conversions. Many individuals now are aware of the varied Federal Grant opportunities or matching funds from U.S. Department of Agriculture or Natural Resources Conservation Service, which are efforts to assist with the up-front capital requirements for projects. For continued generation returns, the “wins” for renewable energy in the 2005 Energy Policy Act were a 2-year extension of 1.5 cent/kWh for wind, solar, geothermal and closed-loop bioenergy. This is available for 10 years (3). Other renewable energy sources such as small irrigation, landfill gas, incremental hydro, and open-loop biomass have other support levels. Open-loop biomass facilities that use, for example, livestock manure may claim a credit of 0.9 cents per kWh during a 5-year period beginning on the date the facility is placed in service (9). Since planning for a renewable energy operation can take many years, these short funding time requirements can be problematic for producers when support disappears or funding sunsets spur rushed and inadequate planning.

Challenges in Michigan

Michigan currently has limited state support for development of renewable energy projects. The State Energy Office has small grants under very specific categories and the DEQ offers P2 Loans for small businesses at attractive interest rates that can be used for waste management and “a qualified agricultural energy production system”(8). Next Energy has some grant opportunities that may offer potential. Those living in the U.P. can obtain a rebate from Wisconsin Public Power Inc. if you live and obtain power from that company. The 21st CEP recommends that a generator not able to meet its RPS requirement make a payment into the energy efficiency fund, which would then be available for the support of new renewable energy projects.

Net Metering Enhancement

The 21st CEP recommends use of net metering up to 150 kW. The only fee requirement would be a monthly service charge for the use of the grid and administration of the plan. Currently, the return rate is 1.8 cents per kW, which is based on the cost of the generation from old coal generation facilities. Clearly, this price does not include the impact externalities such as mercury contamination or asthma costs. Nor does this return reflect the dramatically increasing price of new coal-base generation or with the cost of some form of carbon sequestration (a technology not operational at this time). So if we are going to encourage renewable energy in Michigan the net metering return must reflect the costs of meeting present (not historical) costs and attempt to anticipate what future costs might be. The level must be set high enough and long enough to encourage investment by Michigan agriculture.

As a part of the RPS requirement the 21st CEP is recommending that Renewable Energy Credits (RECs) be available to fulfill the percentage of renewable energy required. One credit represents 1 megawatt of energy produced from a renewable energy source. The World Wide Web now offers some very interesting data bases to monitor these types of programs which makes them less cumbersome and therefore a more reliable mechanism to meet program goals. Under there recommendations out-of-state generation could be used if they benefited Michigan directly (3). Depending on how the legislation is written, this may provide the opportunity for an anaerobic digester owner/operator to sell the electricity generation separately from credits that might be available through the Chicago Climate Exchange for greenhouse gas emissions and for sulfur dioxide emissions. There is now a very active market for the purchase of all three of these. The legislation is important because it can require all of these components to be in one credit (called bundling) or it can be written so that they can all be sold separately (called unbundled). States utilizing RECS have used both or are unclear as to what the requirement is. This provides an opportunity for other income streams to support the operation of generation projects needed to meet other environmental requirements.

The BEI proposes an expansion of their Green Generation program. They are looking to increase the 5% participation rate to 10% (3). This approach, though laudable, functions much like an RPS in that the process would include a request for proposal. Consumers Energy Corp. would then select the generation scheme that has the least cost. So this process is open to the same criticisms mentioned earlier on the RPS effort.

Michigan Behind

The RPS is the method of choice for most states to encourage development of renewable energy. But Michigan is well
behind other states, such that playing “follow the leader” will still leave us behind over the next decade. The other mechanism that has proven to foster new technology implementation but at a much higher cost is called Feed In or Advanced Renewable Tariffs. They have been particularly successful in Germany and in diverse forms throughout the European Union (10). On our continent, they are being used in California and Canada. The big difference is that a guaranteed, minimum price per kWh is paid by the utility to the power producer for some extended period of time either at a fixed or variable rate. The price paid per kW may be uniform, but at a much higher rate then what is called “old coal”. Other countries may even differentiate the price based on the technology involved and the cost to generate that technology. So, for example, wind may receive less per kWh, wood–based generation might receive slightly more and photovoltaic generation significantly more. Though more costly, Germany has proven that the result is the implementation of more diverse array of renewable generation.

**Interconnection Problem**

The interconnection problem continues to be a major issue for renewable energy generators connecting to the grid throughout the U.S. The 21st CEP has stimulated discussion and action on the part of the Michigan Public Service Commission (MPSC). To facilitate the process, regulated utilities must file interconnection reports every 6 months on any size project. Workshops, publications, and websites are strongly recommended as tools to minimize interconnection issues. MPSC meetings are open to the public and those with interest are encouraged to attend. If these meetings result in a higher net metering return and a forthright methodology for interconnection, Michigan will have made significant progress.

Michigan lags behind other states in the implementation of efficiency and renewable energy programming. If Michigan is to catch up with other states it must at least require the small percentage electricity bill required to support the 21st CEP benefits fund request. However, if the state is to step over our competitors, a policy approach similar to a feed-in-tariff will be necessary. The citizens and, in particular, the farm community must be forceful in communicating their wishes to their representatives. If we do not, Michigan will continue to languish, while other states forge ahead.

**References**


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**The Capitol Area Under Forty Dairy Gathering**

July 23, 2007. 7-9 p.m. MSU Extension Office. Hilliard Building. 121 E. Maple St, Mason

A monthly opportunity for the younger generation of the Ingham County dairy industry to meet. To share ideas, experiences, and a couple of laughs. Whether you are working toward future farm ownership or some other type of employment in the dairy industry, participating in this program will be helpful in preparing for your the future. This month’s featured “guest” will be Dr. Richard Pursley, MSU Dairy Reproduction Specialist. The nationally recognized developer of the Ov-Synch Protocol will be there to explore the latest MSU dairy reproduction research and answer your questions. Questions concerning this gathering can be directed to Dean Ross, MSU Extension Dairy Educator (517-819-8933).

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Do Dietary Changes Reduce Air Emissions from Animal Feeding Operations?

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Animal feeding operations (AFOs) and their air emissions have come under increasing scrutiny. As part of a U.S. EPA and livestock industry joint National Air Emissions Monitoring Study, efforts are underway to collect baseline emission data from AFOs around the country. With new air quality regulations for AFOs likely in the near future, in addition to baseline data, there is urgent need to identify ways to reduce or mitigate air emissions. Strategies to reduce air emissions from AFOs must be found.

Identified strategies must be able to effectively control or reduce air emissions in a manner that is affordable without compromising animal performance, such as the amount of feed needed to produce a unit of milk, meat, or eggs. Livestock receipts are an important part of Michigan’s economy so providing solutions is a critical need to ensuring that this sector of the economy remains viable and that it does so in an environmentally-friendly way.

The MSU Departments of Animal Science and Biosystems and Agricultural Engineering are exploring ways to change animal diets as one option for livestock producers. Dietary strategies offer the opportunity to reduce or control the formation of undesirable emissions (source control) as opposed to treating or capturing emissions after they have formed.

The approaches include reducing nutrient excesses in the diet by changing diet ingredients or nutrient concentrations, re-formulation of diets to better meet the needs of animals as they grow and lactate, and using dietary additives to prevent the formation of emissions in the digestive tract or from excreta.

Results of work conducted at Iowa State University have been promising, particularly for ammonia emissions. Observed reductions have been as high as 50 percent in swine, 40 percent, for laying hens, and 30 percent in broiler chickens without any negative impacts on animal performance. In addition to ammonia emissions, some strategies have demonstrated reduction of emissions of other gases (such as methane). This may eventually lead to opportunities for producers to receive payments for carbon credits they can generate via reduced emissions. This aspect of the work is in the early stages and programs for carbon payments as a result of diet strategies do not currently exist. But with promising results, there is merit to pursue this as a potential income opportunity for producers.

Work will begin soon with lactating and growing dairy cattle and turkeys in the MSU Animal Air Quality Research Facility currently under construction across from the MSU Dairy Teaching and Research Center on south campus. This work funded by USDA and the MSU Animal Industry Coalition is expected to begin in Fall 2007 following the completion of construction of the laboratory facility specifically designed to address this prominent issue facing the Michigan and U.S. livestock industries.

The MSU Animal Air Quality Research Facility is currently under construction across from the MSU Dairy Teaching and Research Center on south campus. The facility is scheduled to open Fall 2007. One of the first projects to be tackled is a study of the effects of diet on emissions from lactating dairy cows.

Photo by  
Jacob McCarthy
Herd Health

Advances in the Fight Against Johne’s Disease

Johne’s Disease is considered one of the most serious diseases affecting dairy cattle with an enormous economic impact on the dairy industry. Control of Johne’s disease still requires first and foremost effective herd biosecurity management protocols and judicious use of a combination of diagnostic tests. There recently have been advances in diagnosis, vaccination and herd management techniques to combat Johne’s Disease.

More than a century ago, Johne and Frothingham discovered *Mycobacterium avium* subspecies *paratuberculosis* (MAP) in cattle, the causative agent of Johne’s Disease (Paratuberculosis), a chronic, debilitating intestinal infection. Johne’s Disease is found most often among domestic and wild ruminants but also has been reported in non-ruminants (1, 15). What’s more, the suggestion that MAP may play a role in human Crohn’s Disease has led to increased awareness in the medical community and the public (2, 13).

Johne’s Disease is a frustrating disease for both livestock producers and veterinarians and is associated with large economic losses in dairy cattle (14, 17). Losses are primarily due to decreased milk production and reproduction (5), and reduced salvage value of clinically affected animals. A national study of US dairies found that approx 22 % of farms have at least 10 % of the herd infected with MAP (12). In Michigan, recent estimates suggest that 54% of herds are test positive for Johne’s disease (8). The average loss ranges from $40 per cow (low clinical cull rate) to $227 per cow (high clinical cull rate).

In this report, we focus on new developments in diagnosis, vaccines, and control measures in the fight against Johne’s Disease. Through on-going national and international research programs, our ability to detect infected cattle is constantly improving and new vaccines are ready for testing.

Signs and Transmission

Calves under 6 months of age are most susceptible to MAP infection. Although many animals in a herd may be infected, usually less than 5 % of these will develop clinical disease, which is always fatal. Healthy, but MAP-infected animals (carriers) can actively shed the organism in their feces, thereby heavily contaminating the environment on the farm, without being recognized as infectious. The fact that MAP is able to survive in stagnant water, manure, and deep soil for up to a year makes the control of Johne’s Disease even more complicated (9, 10). Contaminated feed, milk and colostrum are thought to be the most important means of transmission (9, 10, 11).

Diagnosis

Numerous diagnostic tools have been developed for MAP detection with several new tests on the horizon. Diagnosis of Johne’s Disease in individual suspect animals can be accomplished by fecal culture, serology, DNA probes, necropsy and histology. Here, we focus on current methods used to diagnose healthy carrier animals and to determine true herd prevalence. Knowledge of true herd prevalence helps to decide which control measures should be instituted. It is important to note that there is no single, infallible test for Johne’s Disease and a combination of tests is often required.

Serological tests. Three tests to detect antibodies against MAP are available. The enzyme-linked immunosorbent assay (ELISA) is used for screening herds. Although relatively inexpensive (Table 1), ELISA sensitivity is correlated with stage of disease; cows in early stages of infection are often ELISA negative. The same is true for agar gel immunosorbent assay (AGID) (Rapid Johne’s test, ImmunoCell, Portland, ME). The third method, complement fixation test (CF), is not recommended for routine diagnostics, but is still required by some countries for export and import.

When used in conjunction with other confirmatory tests such as polymerase chain reaction assay, the milk ELISA can provide an estimate of herd prevalence.

What’s new. The milk ELISA assay has been introduced as a rapid and easy screening tool (Antel BioSystems Inc., Lansing, MI). While this test is subject to the same drawbacks as other ELISA-based methods, it can be easily applied on a whole herd basis. When used in conjunction with other confirmatory tests such as polymerase chain reaction (PCR) assay (see below),
the milk ELISA can provide an estimate of herd prevalence. In efforts to improve ELISA test sensitivity, scientists are exploring the use of new antigens and detection systems. Initial evaluations of these improvements show good promise and may dramatically improve ELISA assay sensitivity, while maintaining specificity. In contrast to detection of antibodies, the gamma interferon test measures responsiveness of blood lymphocytes to MAP antigens. Recent research suggests that this test may be more sensitive for detecting subclinical infections than ELISA-based tests, but samples must be handled more carefully and assayed within a few hours after collection. The gamma interferon test is not yet commercially available in the U.S.

Identification of MAP. Animals in early stages of infection typically do not have a detectable antibody response to MAP. Therefore, serologic tests are unable to provide evidence of infection. To compound matters, these animals might not excrete bacteria yet or excrete MAP only intermittently and in low numbers. In this case, bacterial culture of feces does not establish infection (Table 1). Bacterial culture of tissue is more sensitive (90 ± 5%), but it requires a surgical procedure, which is in most cases not practical and not cost-effective.

Vaccination

An approved heat-killed MAP vaccine is available (Mycopar, Ft. Dodge Animal Health). However, vaccination only reduces clinical symptoms and does not prevent infection. Although vaccination is not considered part of control programs for Johne’s Disease in the U.S., there is ongoing research to develop safer and more efficacious vaccines to reduce the risk of infection within the herd.

What’s new. Recently, there have been promising approaches to develop DNA vaccines that might be safer, elicit more protective responses and would be less expensive (6). However, their ability to protect against MAP infection in cattle has not been tested yet. Recent developments in genetics have allowed scientists to construct defined and random mutants of MAP. Scientists are now targeting genes in MAP that have a role in survival and virulence. By deleting these genes, it is hoped that an effective modified-live vaccine might be developed that has little chance of reverting to a virulent strain. In addition, since genes that encode proteins recognized by the host immune system can now be selectively deleted, it specificity and sensitivity of new diagnostic reagents, and to establish the most effective times for diagnostic testing in early phases of disease. While the PCR assay examines samples for MAP DNA, other new molecular based tests are looking for changes in host cell gene expression that could serve as indicators of infection. These studies are based on findings that gene expression profiles of bovine white blood cells from MAP-infected cattle are very different from those of healthy cows (4, 16).

### Table 1. Summary of Diagnostic Test Accuracy (Subclinical Infection).\(^1\)

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Time (d)</th>
<th>No. of Laboratories Offering the Test</th>
<th>Cost/test ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Culture</td>
<td>60 ± 5%</td>
<td>100%</td>
<td>112</td>
<td>18</td>
<td>17.00</td>
</tr>
<tr>
<td>Solid-based</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid-based</td>
<td></td>
<td></td>
<td>42</td>
<td>12(I)(^3)</td>
<td>19.00(I)(^3)</td>
</tr>
<tr>
<td>PCR assay</td>
<td>30 ± 5%</td>
<td>100%</td>
<td>7</td>
<td>9</td>
<td>25.00</td>
</tr>
<tr>
<td>ELISA</td>
<td>30 ± 5%</td>
<td>99%</td>
<td>7</td>
<td>29</td>
<td>5.00</td>
</tr>
<tr>
<td>Serum</td>
<td></td>
<td></td>
<td>7</td>
<td>29</td>
<td>5.00</td>
</tr>
<tr>
<td>Milk</td>
<td></td>
<td></td>
<td>7</td>
<td>1</td>
<td>6.00</td>
</tr>
<tr>
<td>AGID</td>
<td>25%</td>
<td>100%</td>
<td>7</td>
<td>n.r.(^3)</td>
<td>8.03</td>
</tr>
<tr>
<td>CF</td>
<td>25%</td>
<td>99%</td>
<td>7</td>
<td>n.r.(^3)</td>
<td>6.00</td>
</tr>
</tbody>
</table>

\(^1\) Adapted from Collins et al. (3).
\(^2\) Cost/test is listed as a median for laboratory charges (30 laboratories offer the test).
\(^3\) I = bacterial culture from individual sample, P = bacterial culture from pooled samples [5 fecal samples/pool], n.r. = not reported.
should be possible to construct vaccine strains that are readily distinguishable from natural strains, allowing them to be used in control and eradication programs.

Control and Herd Management

Johne’s Disease is usually introduced into a herd when healthy but MAP-infected animals (carriers) are purchased by herd owners. Therefore, herds that are not infected should attempt to maintain a disease-free status by rearing their own heifer replacements. Otherwise test negative herds should serve as a source of low Johne’s Disease risk replacement animals. Collins et al. (3) have recently published a recommended test regimen for the detection of Johne’s Disease based on reason for testing (for example, herd status). Once MAP infection has been diagnosed in a herd, most control programs are aimed at breaking the cow to calf transmission of MAP, along with identification of infected animals for separation and culling from herds where needed (7, 18).

What’s new. A recent study from Dorshorst et al. (12) strengthened and updated a previous economic test-and-cull decision analysis model with current epidemiologic information. This novel ‘JD-Tree’ model incorporates costs and benefits of herd management changes, diagnostic testing, and different management actions based on test results to control Johne’s disease in commercial dairy herds. The model demonstrated that improving herd management practices to control infection spread is often more cost-effective than routine testing; the recommendation was that not all herds should be routinely tested as part of a Johne’s Disease control program, but rather strict management controls put in place once the herd prevalence was known.

Conclusion

Johne’s Disease is considered to be one of the most serious diseases affecting dairy cattle it has an enormous economic impact on the dairy industry. Based on clinical reports, diagnostic records, historical reports and animal movements, the known prevalence of Johne’s Disease appears to be increasing worldwide. Although the causative agent of the disease, MAP, was discovered more than a century ago, there is no effective treatment or vaccine available. Therefore, control of Johne’s Disease still requires first and foremost effective herd biosecurity management protocols and judicious use of a combination of diagnostic tests. The novel consensus recommendations on diagnostic testing and the ‘JD-Tree’ model seem to be useful instructional tools helping farmers and veterinarians to make cost effective decisions about the control of Johne’s Disease in any individual herd. While the difficulties of working with a slow growing organism such as MAP have hampered research efforts, scientists are now making exciting progress and new vaccines and improved diagnostics are on the horizon. These new research efforts have been fueled by large well-funded programs on both sides of the Atlantic Ocean, Johne’s Disease Integrated Program (JDIP) in the U.S. and ParaTBTools in the European Union.

References

Cows in New Zealand Produce Low-Fat Milk Naturally

Scientists in New Zealand have identified a low-fat producing cow they have named Marge. The Friesian cow’s milk contains about 1 percent fat and is the result of a naturally occurring genetic mutation, according to Vialactia, the biotechnology company that discovered Marge’s unique trait.

"Marge is unique because a natural variation in her genetic makeup reduces the amount of fat in her milk," explained Vialactia chief scientist Russell Snell.

"Her milk is also reduced in saturated fatty acids and higher in omega 3 fatty acids, while butter made from her milk is spreadable straight from the fridge."

Snell said Marge is a normal cow in every way, except for her low-fat milk production.

Snell told the New York Times in May that scientists do not yet know which chemical pathway causes the low-fat milk, but offspring from the cow also produce low-fat milk, showing the genetic trait is dominant. He also said Marge was purchased by Vialactia, a subsidiary of the Fronterra Cooperative group, for 300 New Zealand dollars ($218 U.S.).

Vialactia said any commercial development is a long way off, but the company is breeding a herd of naturally low-fat producing cows that could be supplying milk and butter by 2011.

University and Industry

National Dairy Scholarships to Two MSU Graduate Students

The National Milk Producers Federation (NMPF) Scholarship Committee recently awarded scholarships to four deserving Ph.D. and master’s students pursuing research in the dairy industry as part of the 2007 NMPF National Dairy Leadership Scholarship Program.

The four scholarship recipients are all conducting research in areas that will benefit dairy cooperatives and producers.

This year the Murray Hintz Memorial Scholarship, which is given to the top candidate, was awarded to Marcus Hollmann. Hollmann is pursuing his Ph.D. in animal science at Michigan State University. His research addresses the mitigation of methane and ammonia emissions for both pre- and post-excretion in the cow. This timely research will provide feed management strategies to reduce and quantify the reduction of emissions from dairy animals.

The Hintz Memorial Scholarship was established in 2006 to honor the late Murray Hintz, former Chairman of the Board for Cass-Clay Creamery, Inc., one of the cooperatives which played a key role in establishing the NMPF Scholarship Program.

Additionally, Nicole Olynk, who is pursuing her master’s degree in agriculture economics at Michigan State University was a scholarship recipient for her research that aims to help producers make reproductive management decisions by developing a user-friendly computer program.

Other NMPF scholarships were awarded to graduate students (Gregory Golombeski) from the University of Minnesota for Ph.D. research on enhancing the trace mineral status of replacement heifers through transition cow management and (Jessica Wheelock) from the University of Arizona, for research on the effects of heat stress on liver glucose production in lactating Holstein cows.

Each year the NMPF Scholarship Committee awards scholarships to Ph.D. and master’s graduate students pursuing research in the areas of animal health, dairy product development, agriculture economics, environmental science, and dairy food science.
Becky Larson climbs to the top of a large blue cylinder serviced by a maze of pipes and valves so she can unleash the large lid that conceals another complicated system of pipes and valves.

“It all looks a little intimidating at first,” she explains. “But it’s really just basic plumbing.”

Larson, a graduate student in the Michigan State University Department of Biosystems and Agricultural Engineering, honed her plumbing skills to help researchers come up with effective strategies for recycling milking parlor washwater, a challenge that has plagued dairy farmers for years.

The MSU Dairy Teaching and Research Center, the site of Larson’s project, is home to 150 dairy cows and uses 250 to 500 gallons of water in the milking parlor each day.

“That’s a lot less than most dairies, but still a notable amount. Traditionally, that water has been stored in manure lagoons or land applied,” Larson explains. “Current disposal methods are costly and pose environmental risks. We’re trying to come up with an economical way for farmers to reuse washwater and reduce the potential for negative environmental impacts associated with spills and runoff. There also is the additional benefit of reducing water use in the daily milking cycle.”

Larson’s project and a host of others will be featured during an open house from 1 to 4 p.m. on October 13 at the MSU Dairy Teaching and Research Farm.

“Throwing open the doors and inviting farmers in enables them to see firsthand some of the interesting projects going on here on the farms,” says Ben Darling, assistant director of the MSU Office of Land Management.

High on Darling’s list of accomplishments is the comprehensive nutrient management plan (CNMP) that he helped develop for the MSU South Campus Farms. He will be on hand during the open house to show people how he and his group accomplished this monumental task.

“Completing the CNMP was a challenge because, unlike other farms, we have nine livestock species farms in one,” Darling explains. “It was also a worthwhile learning experience and we want to share the process with farmers.”

In addition to the farm tour, visitors will get their first glimpse of the new MSU Animal Air Quality Research Facility, a state-of-the-art lab that will be home to numerous projects designed to determine the effects of animal agriculture on air quality.

Wendy Powers, MSU’s director of environmental stewardship in animal agriculture, heads up the facility.

“Livestock manure odor can cause tension between farmers and their non-farm neighbors,” Powers says. “This lab will help us measure air emissions and determine how we can modify animal diets to reduce those emissions and manure nutrients. We’re eager to show producers the types of valuable information we’ll be generating.”

Powers encourages farm families to make a day of it by also attending the College of Agriculture and Natural Resources tailgate party and the MSU Homecoming football game against the University of Indiana Hoosiers.

“It’s a great opportunity to see what’s going on at the farms and the new lab,” she says. “And it’s a double bonus for those who can combine it with other Homecoming activities.”

Where to go
MSU Dairy Cattle Teaching and Research Center and Animal Air Quality Research Facility (South of the MSU campus along the west side of College Rd. between Forest and Jolly roads.)

What you’ll see
The new state-of-the-art Animal Air Quality Research Facility. How MSU created a first-rate Comprehensive Nutrient Management Plan (CNMP) for their South Campus Farms. MSU research projects specific to environmental quality and the dairy industry, including storm water runoff management using intensive management practices and treatment and an innovative method of biological and physical treatment strategies for milking parlor washwater.

When to be there
Bring the family and make a day of it. The MSU farms open house is being held October 13 in conjunction with MSU Homecoming festivities. Organizers are encouraging farmers to bring their families and enjoy a full day of Spartan fun.

The open house will be held from 1 to 4 p.m. at the MSU dairy farm and Animal Air Quality Research Facility. The CANR tailgate party will follow from 5 to 7 p.m. at Demonstration Hall Practice Field, prior to the 7 p.m. Indiana Hoosiers vs. MSU Spartans football game at Spartan Stadium.

No reservations are required for the farm open house. For information about the CANR tailgate party, contact Kathryn Reed at kreed@msu.edu or (517) 355-0284.
MSU Dairy Challenge Team Takes Gold at National Contest

Miriam Weber Nielsen  
Dept. of Animal Science

Michigan State University undergraduates with an interest in dairy competed in three Dairy Challenge contests during the winter and spring, culminating in the 6th annual North American Intercollegiate Dairy Challenge (NAIDC) in Sioux Falls, South Dakota. The students from freshman through senior levels combined their skills, knowledge and passion for dairy to work together to evaluate dairy farm management.

All undergraduates with an interest in dairy are invited and encouraged to participate in the MSU Dairy Challenge. Participants in the MSU Dairy Challenge are invited to attend the Midwest Regional Dairy Challenge, with approximately half of the available positions reserved for students in the Ag Tech Dairy Management Program. The team to compete in the NAIDC is selected by the judges of the MSU Dairy Challenge.

The innovative competition tests students’ skills and knowledge of all aspects of a dairy business in an interactive, educational and challenging event. It encourages students to apply theory and learning to a real-world dairy farm, while working as part of a team.

Day one of the Dairy Challenge begins with each team receiving selected farm records and then walking through the farm operation. After the farm visit, each team has the opportunity to interview the farm manager. Then, each team completes a farm analysis and develops a presentation with recommendations for herd management. Day two is presentation day, when teams present their recommendations to a panel of judges. Students field questions from the judges, and then receive oral feedback from the judges on their presentation. Presentations are evaluated by the judges, and the day concludes with placing of the teams and presentation of awards.

Twenty MSU undergraduates participated in the MSU Dairy Challenge last fall. The contest farm was Cole’s Apple Dairy Farm, managed by Kevin Cole. The winning undergraduate team received a $900 cash scholarship and consisted of Ted Costigan (Lansing), Baylee Drown (Cedar Springs), Elizabeth Marvel (Fowler), and Courtney Huff (North Branch). The runner-up team, which received a $400 cash scholarship, consisted of Nicole Beeching (Lawrence), Lindsey First (Caledonia), Tim Gamble (New Carlisle, IN), Michael Schrader (St. Johns), Johnny Verhaar (Bad Axe), and Laura Zeldenrust (Fremont).

Joann Greenfield, Elizabeth Marvel, Jenny Nurenberg and Matthew Oesch were selected by the judges to represent MSU in the North American Intercollegiate Dairy Challenge (NAIDC). After working together each week during spring semester to prepare, the team traveled to the NAIDC in Sioux Falls, South Dakota on March 30-31. Four-person teams from 29 four-year college programs in the U.S. and Canada each evaluated one of three dairy farms in the vicinity of Twin Falls. The MSU team earned a Gold ranking, placing behind the two Platinum-winning universities in their division.

Cargill Animal Nutrition and the Halbert Family’s Frederick Pierce Halbert Memorial Endowed Scholarship Fund provide major financial support for MSU’s Dairy Challenge activities. Appreciation is extended to Cole’s Apple Dairy Farm near Byron, managed by Kevin Cole, and to Bryan Wischmeyer and Dr. Kevin Dill of Land O’Lakes/Purina Feeds for working with Cole’s Apple Dairy Farm to host the MSU Dairy Challenge. The generous donation of time and effort by the MSU Dairy Challenge judges is sincerely appreciated: Brent Beeker, NorthStar Cooperative; Dr. Bonnie Dansby, Fowlerville Veterinary Clinic; Dr. Dave Beede, MSU Animal Science; and Bill Earley, ADM Alliance Nutrition. Special thanks go to Dr. Herb Bucholtz and Marcus Hollman, MSU Animal Science; Dean Ross, MSU Extension Dairy Educator; Dr. Kevin Dill and Bryan Wischmeyer, and Doug Brook of NorthStar Cooperative for help in coordinating the MSU Dairy Challenge and preparing the team for the NAIDC.

Generous support from corporate sponsors makes the regional and national Dairy Challenge events possible. More information on the national Dairy Challenge and a listing of corporate sponsors is available at <http://www.dairychallenge.org>.
Tom and Deanna Stamp grew up on dairy farms. After marrying, they began a crop farm together, but before long found themselves returning to dairy. They turned to Michigan State University Extension when they began building their lives around their Marlette dairy farm in 1976, and continue to use Extension to strengthen their business today.

“Tom and I were crop farmers before we came back to the dairy and we were using Extension at that time but it probably intensified when we came back to dairy because there were a lot of new things we needed to get back up-to-speed on,” said Deanna. “Any class that was available we worked with.”

Today, the Stamps milk 200 cows and farm 3800 acres. They’ve consulted with Extension Educator Craig Thomas on many issues since he came to the area in 1995, and, with more questions surrounding dairying than ever, they’re unlikely to stop any time soon.

One of the areas the Stamps and Thomas have collaborated on is cost of production analysis. Each year they sit down and work to attach a price tag to each aspect of dairy farming.

“Because we’ve got a fairly large cash crop along with the dairy it’s really hard to weed out all the numbers into any sensible bookkeeping” Deanna said. “But I think we come up with a pretty accurate picture of what our costs are.

“This is a business, it takes a lot of equity and margins are often not as wide as you’d like them to be. Craig gives us a sounding board to help us look in depth at our financial situation. The bottom line is you’ve got to know your cost of production.”

Deanna said it has also been helpful to have Tom involved in a milk marketing group organized by Thomas that meets monthly in Sandusky.

“That’s been a valuable tool for farmers groups and it’s really grown,” she said. “The ability to [use the futures] market is fairly new to dairy farmers and so there’s a big learning curve. You’ve got the experience there that understands what’s happening in the market.”

Beyond simply being a source of knowledgeable information provided by Thomas and MSU Extension Director in Ogemaw County Fred Hinkley, though, Deanna said the meeting also creates a sense of solidarity and support among participants, valuable commodities when trying to make markets work for farmers.

“If you’re going to get into the futures market it’s a lot easier to make a decision if you’ve got a group around you that thinks the same way. People to bounce your ideas off of and then if you make the decision to place a position you’re
either not alone in it or you’re sure of it from discussing it so much.”

As Deanna and Tom watch two of their children and three nephews get started in dairying, they know they likely won’t be milking cows forever. Two years ago they bought a nearby dairy that a younger generation will soon take ownership of, and Deanna said when that happens, she and Tom might refine their practice.

“Our thought is we’ll work out of milking cows and while they milk cows we’ll take care of the heifers and dry cows here,” she said. “That’s our long-range plan.”

Specializing in just a few aspects of dairying is a strategy Deanna said she has seen modeled by successful immigrant farms in the area, especially those run by producers from The Netherlands. Likewise, Craig said it’s a tactic he’s seeing other producers employ in an effort to streamline their businesses.

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There have been a ton of former dairy farmers that were at an age of investing a lot into the dairy business and didn’t want the grind of the 7 day work week and started raising heifers and forages,” he said.

Thomas said one thing he’s learned is that every farm is different, and that decisions like how to address changing regulations or other capital-intensive improvements can only be made by those immediately affected.

“You provide people with the best information and say, ‘these are your options,’” he said. “If they face a less than economical situation I let them know what it’s costing them and then let them make the decision.”

The Stamps say that process has worked for them. “A lot of times if we were making decisions that were based only on economics we’d be doing things a lot differently than we are now,” said Deanna. “Craig’s been good about helping us with the things we can change and accepting the things we can’t.”

With all of the advice he has coming in from nutritionists and crop specialists, Tom said it’s reassuring to be able to tap Thomas, too.

“We’ve got a lot of confidence in Craig. We make decisions that amount to $20,000, so it gives us somebody to pick on their expertise. Somebody on the outside we have a lot of

Martha Draper, Herdperson at Deanna and Tom Stamp’s farm in Marlette, administers Posilac to a cow. Deanna said bST increases production approximately 15% and she has concerns that the increased costs to consumers of bST-free milk may not always be passed on to farmers.
June Class III price is $20.11/cwt. That is an increase of $8.82/cwt over a year earlier. It is also the second time that the Class III price has topped $20/cwt. Meanwhile, Class IV is $20.76/cwt which is an all time high for either Class. The first six months of 2007 averaged $16.11/cwt for Class III which puts it on pace to set a price record. The previous high annual Class III price was $15.39/cwt in 2004.

The high milk prices are driven by the increase in corn prices and high world dairy product prices. Over the previous 10 or so years, the corn and soybean prices have essentially been flat. There have been temporary blips (think $4/bu corn in fall 1996) but grain prices have quickly returned to low levels primarily driven by a policy that encouraged large amounts of grain production. Increases in hay prices have been the main source of a changing feed cost for the past 10 years. The new subsidies for ethanol have upset this long-run equilibrium and sent the price of corn to $3.50/bu or more. This change has pulled acres out of soybeans and hay which sends their prices higher. We have gone from cheap energy feed and expensive protein to expensive energy (competing with ethanol) and likely relatively cheaper protein feed ingredients.

In the longer term, the question is whether we are looking at a permanent change to higher feed prices– and thus a new equilibrium level in farm milk price. Figure 1 illustrates the longer term relationship between milk and feed prices. Since 1985, the milk-to-feed price ratio has averaged 2.9 and the farm milk price has changed in reaction to the feed prices to maintain this relationship. From 1985 through 1994 all milk price averaged $12.83/cwt while the period from 1995 through 2006 all milk price averaged $13.90/cwt. In the latter period, the milk price was much more volatile but for both periods the milk-to-feed price ratio averaged 2.9. If that same relationship holds, and feed prices stay where they are, the all milk price will be about $18/cwt post-2007.

Figure 1. Milk price 1985-2006 with projections on the impact of the growth of ethanol production post-2007.
Calendar of Events
July - November

27th Annual Ag Expo
July 17-20
Michigan State University
East Lansing
www.agexpo.msu.edu
Contact: 1-800-366-7055

Michigan Dairy Expo
July 16-20
Livestock Pavilion
Michigan State University
East Lansing
Contact: Joe Domecq, domecqjo@msu.edu, 517-353-7855.

The Capitol Area Under Forty Dairy Gathering
July 23, 7 p.m. to 9 p.m.
MSU Extension Office
Mason
Contact: Dean Ross, 517-819-8933.

Michigan Bio-Economy Summit
September 12-13
Lansing Center
Lansing
Contact: <http://www.miagbiz.org>, maba@miagbiz.org,
1-800-333-3333.

The Dairy Practices Council Annual Conference
November 7-9
Four Points Sheraton Hotel
Harrisburg, Pennsylvania
Contact: <http://www.dairypc.org>, dairypc@dairypc.org,

MSU Farms Open House
Homecoming Weekend
October 13, 1 p.m. to 4 p.m.
MSU Dairy Farm and Air Quality Research Facility
East Lansing
Contact: Kathryn Reed, kreed@msu.edu, 517-355-0284.

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