FARM REPORT

FROM THE PRESIDENT'S DESK: STATE OF THE INSTITUTE 2020

Each December I write a year-end report for our Institute Trustees that summarizes the accomplishments of our staff and the programs they've conducted. Although I've done this report now for 17 years, it never grows old and I'm always amazed at what our modest-sized staff of about 60 people is able to accomplish. As we begin 2020, I want to share just a few of the highlights with you.

Education Programs. In 2019 we had over 60 students enrolled in our educational programs – that includes undergraduate, graduate students, and interns. These students participated in our Advanced Dairy Management semester, Applied Environmental Science Program, year-long internships, and Summer Experiences in farm management, equine management, or agricultural research. At least half of the cows in the region are touched by a Miner graduate, and we take special pride in the leadership roles of our alumni.

Research Programs. In 2019 we brought in over $720,000 in research support through grants and contracts. While conducting the research, our staff made 61 presentations to various scientific and industry groups and wrote 43 papers. Of these, four were in peer-reviewed scientific journals such as the Journal of Dairy Science. Going forward, we will focus on these high priority needs of the dairy industry: forages and fiber nutrition, milk analysis as a herd management tool, nutrient management and water quality, and the relationships between management and nutrition.

This spring we will welcome a new researcher – Allen Wilder – to our group. Allen is currently finishing his graduate work in the Department of Plant Sciences at the University of Vermont. His thesis research has focused on management of alfalfa-grass mixtures. He has operated his own popcorn farm for some time now in Vermont, and so he knows quite a bit about corn crops as well. We can't wait to have him on board to round out our research team.

Demonstration and Outreach Programs. In 2019, 3672 people drove through our stone gates to attend a program or visit our Heritage Exhibit. In all, 36 events were held at the Institute. Dairy Day, Crop Congress, the Dairy Nutrition Short Course, and Equi-Day focused on our industry partners while other programs engaged the community such as Farm Days for Fifth Graders, Strides for James (a charity fun run), or Day on the Farm with Alice (a joint program between the Institute and The Alice Miner Museum in Chazy). We continue to engage with the dairy industry and the local community to educate and advocate for agriculture.

As always, the full story for any organization lies behind the year-end statistics.

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In This Issue:

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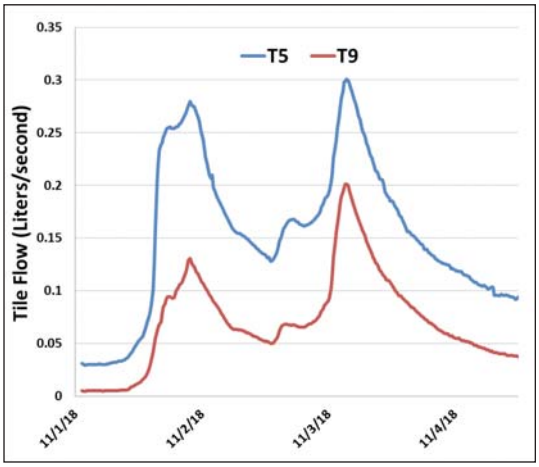
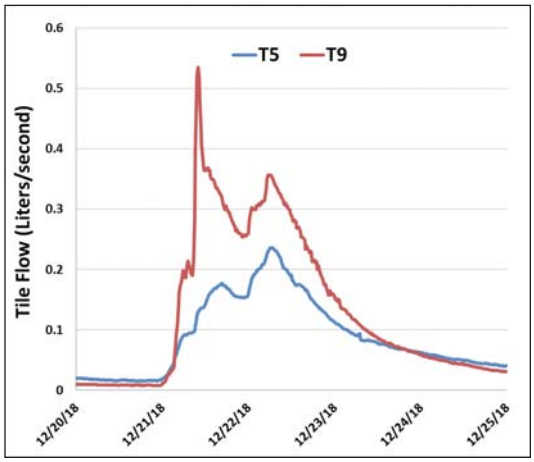
IMPACTS OF DRAINAGE WATER MANAGEMENT ON FIELD WATER BALANCES

Having just completed the fourth year of a USDA-NRCS funded edge-of-field monitoring project here at Miner Institute, I'd like to review the objectives of this project and some of the data we've been collecting. This project is investigating the impacts of drainage water management (DWM) on the water and nutrient balances in corn fields. The practice of DWM allows us to alter how much water leaves the tile drainage system in a field. If we allow free drainage (FD) of the tile system, the water table is managed at the depth at which the tiles are installed in the field. In our fields with tiles installed 4 feet deep this means that the water table will remain at that level or lower, except immediately following large rain or snowmelt events. With DWM, we can adjust the system in order to manage the water table at any level between the tiles and the soil surface.





A common DWM strategy is to manage the water table at 1 ft below the surface once all field activities in the fall have been completed. The goal is to reduce the amount of water that is drained during the nongrowing season when there is no crop production benefit to additional drainage. A week or two before field work begins in the spring, the tiles will once again be set to FD. By reducing the total amount of drainage, we hope to also reduce the amount of phosphorus (P) and nitrogen (N) that is lost from the field. This practice has shown a lot of success in the Midwest for reducing N losses, but there aren't many studies that have focused on P losses, particularly in the Northeastern U.S.

An additional option is to implement DWM at an intermediate height once the crop is established and the rainy season is past. At our site, this means that around mid-June, we use DWM to manage the water table no higher than 2.5 ft below the soil surface. This has shown potential to improve yields during dry summers due to the additional water that is retained in the soil earlier in the growing season, while still allowing enough of the root zone to drain to prevent crop stress.

Over the first two years of our project both fields were set to FD (i.e., no DWM) so that we could understand how runoff and nutrient losses compared between the two fields under normal conditions. In years three and four we implemented DWM in field T5 as described above and allowed field T9 to continue to drain freely year-round. The two graphs show the impact that DWM can have on the quantity of water draining from tile systems. The first graph shows the rate of tile flow (in liters/second) during a runoff event from the two fields when they are both FD, and the second is from a runoff event when DWM is in place at 1 ft below the soil surface in T5. The differences between the two fields across the two events is quite stark. Whereas in the FD event T5 tile flow is consistently greater, during the DWM event T9 has a substantially higher tile flow rate for the majority of the event. These differences are clearly reflected in the total water volume drained from each of the fields. In the FD event, T5 tiles generated 24% more runoff than T9 (on a per acre basis). By contrast, the T5 tiles generated 59% less runoff than T9 during the DWM event.

Over time we hope that this reduction in drainage volume results in reductions in the P and N lost from T5, but as we are only partway through the treatment period, we still need to collect more data to see if this will be the case. We do expect to see N reductions as the vast majority of N is lost through the tile drains, and so reducing their total outflow should result in a reduction relative to what we would see with FD. However, as it is possible to see substantial P losses in both surface runoff and tile drainage, we will have to collect more data before making any conclusions. Over the years we've seen that a large percentage of the total P losses from our research fields occurs in surface runoff. By reducing the amount of water drained through the tiles, we risk increasing the occurrence of surface runoff and by extension, P losses in that runoff. Should this happen, pairing DWM with cover crops has shown enhanced water quality benefits by reducing the potential for surface P losses from erosion, while maintaining the N reduction benefits of DWM.

To learn more about drainage water management visit:
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/?cid=nrcs144p2_027166

— Laura Klaiber
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THREE COLOSTRUM MYTHS DEBUNKED

Anyone who's worked with calves knows how critical it is for them to get that liquid gold, colostrum. Good quality colostrum providing greater than 50 mg/mL is vital for a newborn calf. Yet there are still questions on how to determine good quality colostrum and how to effectively get it into the calf for adequate absorption. Some of those questions include: Does colostrum volume determine quality? Should first calf heifer colostrum be discarded? Does the route of administration (i.e. bottle or tube) really matter?

1. Volume. How does volume influence quality of IgG? The short answer is that it's not a good indicator of quality. A study evaluating yield and quality (IgG concentration) of individual quarters of first colostrum found that there was no relation between yield and IgG concentration, and there was great variability in both characteristics between cows. However, some research involving over 900 cows found lower IgG concentration in first colostrum when the yield was over 18.5 lbs. This is not a black-and-white cut-point. This may be a good indicator to divert that higher yield of colostrum to second or third feedings, but the only way to actually determine quality is by testing the colostrum.

Myth busted #1: First colostrum yield is not a good indicator of quality.

2. First calf heifer colostrum should not be used. Several studies have found that parity status of the dam isn't a good indication of quality colostrum. A study compared IgG content from cows on 3 commercial herds and included first lactation cows in the analysis. There was no difference in average IgG content between lactations, and the average across lactations was well above the target of 50 mg/mL. Furthermore, the amount that each parity provided was almost double the target of 50 mg/mL, with a range of 83 to 113 mg/mL. The trend was that mean IgG content increased with later lactations but it would not warrant discarding colostrum based on lactation, as the mean IgG colostrum content was good quality for all lactations. First lactation cows produced concentrations of IgG equal to that of second lactation cows. Therefore, it's not necessary to discard colostrum from first calf heifers.

Myth busted #2: First lactation colostrum does not mean poor quality.

3. Route of administration. Will activating the esophageal groove through suckling improve absorption of immunoglobulins? When a comparison was made of either sucking through a nipple bottle or tubing through an esophageal tube feeder there was a numerical but not a significant difference in IgG absorption, i.e. calves had adequate passive transfer by both methods. This means that although the preferred route of administration is probably through the bottle (nobody likes to tube a calf if it will drink from a bottle) it doesn't matter as long as the calf gets good quality colostrum. The critical aspect is that colostrum needs to get into the calf within the first hour or two after birth for it to be effective and the calf to get passive transfer. Good quality colostrum doesn't do any good going down the sink or sitting in a bottle because a calf will not drink in a timely manner.

Myth busted #3: Feeding colostrum through a bottle or tube does not make a difference for absorption.

Ultimately, testing colostrum quality is the only way to determine if it's of good quality to feed for the first feeding. There's too much variability between cows to easily determine which colostrum is good quality and which should be saved for later feedings. You should test all colostrum to have confidence in the colostrum that's being fed to your calves. Once you've determined that you have good quality colostrum, don't fret about how to get it into the calf – just get that liquid gold into her.

— Sarah Morrison
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INSTITUTE, Continued from Page 1

Nonetheless, our student programs, research activity, and outreach tell me that the Institute is on-track and our staff is doing an outstanding job. We have a lot planned for 2020 – so if you have questions about the range of Miner Institute programs – research, education, and demonstration – please feel free to contact us.

As in past years, I closed the books on 2019 with tremendous satisfaction, and I cannot wait to get started on 2020 – and another decade of carrying on William Miner's vision of science in the service of agriculture.

As January gets rolling, Happy New Year to all the readers of the *Farm Report*!

— Rick Grant
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BIOFILMS ARE NOT MOVIES FOR GEEKS

In my "master of none" repertoire of party tricks is the one where I performed clean-in-place (CIP) systems validation on stainless steel pharmaceutical equipment used to manufacture human vaccines. In doing so I learned a lot about what constitutes a "clean" surface, and it often has nothing to do with being visually free of debris. Regardless of this level of awareness, it still doesn't stop me from utilizing the proverbial "5-second rule" with regard to a snack dropped on the floor. Unless it's in the barn; then all bets are off. Contrary to popular belief, I do have limits.

A biofilm can be easily described as a residue comprised of live bacteria that has not been removed by an adequate cleaning process. Biofilms can be found anywhere from stainless steel and polymer surfaces to catheters, stents, and even your teeth (plaque is a biofilm courtesy of Streptococcus mutans bacteria). Bacteria left on a surface form a protein-based matrix that not only allows them to adhere to the surface, but also protects them from most cleaning processes and antimicrobials. As the biofilm continues to be exposed to cleaning solutions and antimicrobials, it develops resistance to these treatments. Over time, the biofilm can become large enough that pieces can break off and adhere somewhere else, creating yet another biofilm, or enter a product. Bacteria in biofilms also tend to mutate more rapidly, which contributes to their increased resistance. While not always visible to the naked eye, biofilms can be the culprit of many health and sanitation issues if not addressed.

When I was validating CIP cycles for fermenters at a brewery, the brewers were puzzled as to why some of the beers in one vessel were exhibiting a funny taste. It turned out that the culprit was a 90-degree bend in a pipe that was not being cleaned appropriately by the CIP cycle, and an ATP meter showed that a considerable biofilm was present in the bend. Because it was yeast residue and had the perfect environment in which to proliferate, it did so quickly. This biofilm was subsequently contaminating the batches of beer in that vessel, as the bacteria in the residue were making their way into the wort. Because of the way the bend was positioned, it didn't allow for the cleaning solution to pass through at a pressure adequate enough to have an effect on debris removal. A quick reconfiguration of the pipe and the recirculation pump fixed the problem. Most CIP systems are engineered to ensure the removal of live bacterial presence at the completion of a cleaning cycle, but if a CIP system's chemical concentrations are not at the appropriate level, if the wash water is not at the appropriate temperature, the pressure is too low, or the cycle's recirculation times are not long enough, biofilms are easily able to form. CIP systems are closely monitored and can often go the way of the old Crockpot slogan "set it and forget it", but a quick call to your milking system manufacturer can help you address any questions you may have.

You may remember my article a few months ago about procedures and how a few shortcuts here and there may in the short run save time, but in the long run can result in problems. This is especially true when it comes to the cleaning and care of equipment. We often pay little mind to things that we cannot see, but in the case of biofilms attention to detail is critical, especially for items that are cleaned manually. Any surface that comes in contact with something that will either be consumed by a human or another animal should be monitored for biofilms to ensure that the product is of the highest quality. As an example, calves consuming milk replacer or colostrum fed from pails, bottles or a milk taxi that may contain biofilms are at risk of contracting antimicrobial-resistant bacteria that can re-emerge as a result of biofilm presence. Hard-to-clean locations in equipment or equipment with scratched, gouged, or rough surfaces are extremely susceptible to biofilms. A scratched pail will harbor bacteria the same as a cantaloupe's ridged rind easily harbors Listeria. When an unwashed cantaloupe is cut, the bacteria are introduced to the fruit's flesh via the knife, and is a source of frequent foodborne illness outbreaks. Bacteria attached to a properly unwashed piece of equipment will have the same effect, especially for equipment cleaned manually where proper technique may not always be followed. Maybe you're in a hurry, so those pails don't get scrubbed as well as they should be. You ran short of detergent, so you had to use a bit less than needed. To reduce the chances for biofilm formation, review your manual cleaning procedures with staff to make sure they are being properly followed. Inspect pails regularly and replace any that are deeply scratched or gouged. Review the concentrations and types of acidic and caustic solutions to ensure they are at levels appropriate for sufficient cleaning, as well as the duration of your cleaning cycles. Inspect hard-to-clean surfaces for residue, and identify locations in piping systems where stagnant liquid may collect. If you have access to an ATP meter or equivalent, check surfaces occasionally to make sure the existing cleaning methods are still effective. The beginning of the year is a great time to wipe the slate clean and start fresh with management strategies!

— Cari Reynolds
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WHAT'S HAPPENING ON THE FARM

Quality Milk Production

Part One: Economic Cost of Mastitis to the Dairy Industry

Over the past two months the transition from the corporate world to the day-to-day working of a dairy operation has gone relatively smoothly. I attribute this to the fine personnel I work with on a daily basis, and the systems and protocols implemented by the herdspersons who came before me.

One of my primary responsibilities is monitoring the day-to-day health and wellbeing of the 400+ lactating and non-lactating cows on the farm. I rely heavily on Dairy Comp 305 and the SCR activity and rumination monitors by Allflex to help maintain the cow's health and reproductive status. As with most dairies, I focus on the cows in the transition period or what Elanco Animal Health has termed the Vital 90 Days®. This includes 60 days of dry period which on most dairies is 40 days in far-off dry and 20 days in the pre-fresh or close-up group; the remainder is the first 30 days of lactation.

Although the first 30 days of lactation makeup only one-tenth of a cows 305-day lactation period, they are the most crucial for the cow and the profitability of the dairy. In the first 30 days the cow is challenged with the majority of diseases she'll face in her entire lactation. These include milk fever, retained placenta, metritis, ketosis, displaced abomasum and mastitis, all of which have a negative effect on milk production and reproduction in the current lactation and in some cases in future lactations. Knock on wood, in my first 60 days on the job I have experienced very few issues with these fresh cow disorders. I attribute this success to a very good dry cow management program.

The biggest disease challenge I have seen at the Miner Institute dairy over the past two months is clinical mastitis, one of the costliest diseases for the dairy industry. Mastitis is estimated to cost the global dairy industry $19.7 to $32 billion dollars annually. The U.S. dairy industry alone estimates annual losses to mastitis in excess of $2 billion and the Canadian dairy industry loses an estimated $310 million annually.

Mastitis is inflammation of the mammary gland tissue of the cow's udder, usually secondary to bacterial infections which in most cases enter the mammary gland through the teat canal. It's the job of the cow's somatic, or white blood cells (immune cells), to defend the cow from these bacterial invasions. White blood cells are the primary cells that account for the somatic cell count (SCC) in milk. SCC is reported as cells per milliliter (ml) of milk. The cow naturally maintains a low level of somatic cells, usually less than 100,000, in the mammary gland for quick response to invading bacteria. In most cases, invading bacteria are cleared from the mammary gland without any visual signs of mastitis. In other words, the somatic cell count rises for a short period of time and eliminates the bacteria then falls back to normal levels. This entire process can occur within minutes of the bacterial invasion. Mastitis is divided into two categories, subclinical and clinical. With either category, the greatest economic loss to the producer is a decrease in milk production from the infected quarter or udder. Unfortunately, damage to the milk-producing cells of the mammary gland secondary to clinical mastitis can be permanent, which means milk production loss from infected quarters can be permanent as well.

Clinical mastitis is more acute in nature, and the cow shows visible signs of inflammation. These range from mild, which are flakes or clots in the milk with or without swelling of the infected quarter, to severe, which includes visible changes to the milk, swelling of the infected mammary tissue and systemic signs such as fever, rapid pulse, loss of appetite, dehydration and depression. Severe cases of mastitis if gone undetected or untreated most often results in death of the cow. In the case of clinical mastitis, the cow mounts an immune response to the invading bacteria, but the number of bacteria is to numerous for the cow's immune system to clear on its own. Damage to the secretory cells of infected mammary gland tissue is rarely caused by the bacterial organism itself, but from toxins released by the bacteria as they are killed or toxins secreted from cows' own white blood cells. The cost of a case of clinical mastitis ranges from $179 to $444 per case, with the difference in cost mostly depending on stage of lactation when mastitis occurs. If clinical mastitis occurs in the first 30 days of lactation, clinical trials by the University of Georgia College of Veterinary Medicine show the cost of clinical mastitis at $444 per case, with 71% of that cost being indirect which includes future milk loss and premature culling and replacement loss.

Subclinical mastitis is usually a result of a chronic bacterial infection of the mammary tissue. There are no visible changes to the milk, but the cow's SCC remains greater than 200,000. Contagious mastitis pathogens, such as Staphylococcus aureus, are most often associated with subclinical mastitis. The cow mounts an immune response to fight the bacteria, but the bacteria has the ability to evade the immune cells to maintain a low level of infection without

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CROP CONGRESS AT MINER INSTITUTE

Wednesday, January 22, 2020

10:00 AM-3:00 PM

Agenda

- **Herbicide Resistance Management**
  Mike Hunter, Cornell University Cooperative Extension
- **Soil Compaction Management**
  Warren Schneckenberger, Cedar Lodge Farms, Morrisburg, Ontario
- **Field Crop Disease Updates**
  Dr. Gary Bergstrom, Cornell University
- **Corn Silage Variety Trial 2019 Report**
  Joe Lawrence, PRODAIRY, Cornell University
- **Dicamba Applicator Training**
  Dan Digiacomandrea, Bayer
- **Conservation Tillage Practices**
  Farmer panel moderated by Dr. Kitty O'Neil, Cornell University Cooperative Extension

Cornell Cooperative Extension
North Country Regional Ag Team

NYS DEC Pesticide and CCA credits are approved.
You must arrive on time and stay for the entire program to receive these credits.

- 2.0 NYS DEC Pesticide Credits (categories 1A, 10, 21, 23) approved
- 2.0 Vermont Pesticide Applicator Credits approved

Free Admission!
Lunch is available for $5 per person.

Crop Congress is organized in collaboration with Cornell Cooperative Extension.
Pre-registration is encouraged.
For more information, contact Wanda Emerich at 518-846-7121, ext. 117 or emerich@whminer.com

Miner Institute is located in Chazy, NY on Miner Farm Road, Route 191 — 1 mile west of Interstate 87, exit 41.
Travel time is approximately 1 hour south of Montreal; 20 minutes north of Plattsburgh, NY; 1.5 hours from Burlington, VT or 3 hours north of Albany, NY.

QUESTIONS AND ANSWERS

Isidor Rabi, who won the 1944 Nobel Prize in Physics, was asked why he became a scientist. He replied that every day when he came home from school his mother would ask him about his day. Instead of asking "What did you learn?" she would ask, "Did you ask a good question today?" "Asking good questions made me become a scientist," Rabi said.

There must be a bunch of farmers who had (or have) moms similar to Rabi's, because I've been getting some dandy questions, mostly via email, requiring rather lengthy replies. One farmer said that I could charge him for the advice; another said that he appreciated that I didn't. I told both that I've never charged for advice provided by phone or email, and I never will. Questions from farmers help keep me "grounded" by letting me know what's on our readers' minds and the situations they're facing. That's why my email address is included in every issue of the *Farm Report*; my cell phone number is 518-570-7408.

— *Ev Thomas*
ethomas@oakpointny.com

TO B(MR) OR NOT TO B(MR): WHERE ARE WE NOW?

In December, Cornell University published the results of its corn silage hybrid trials. 80-95 Relative Maturity (RM) trials were planted at three sites: Willsboro, NY, Albion, NY and Alburgh, VT. Since no BMR hybrids were included in the early trials I'd like to focus on the later-maturity trials planted at three sites: Madrid, NY, Aurora, NY and Alburgh, VT. We appreciate the efforts of Joe Lawrence (Cornell Pro-Dairy), Heather Darby (UVM) and several others from Cornell University and the University of Vermont in doing this research. Silage hybrid trials are a lot of work!

There were two trials planted at each site, one with hybrids rated at 96-103 Relative Maturity (RM) and the other with hybrids rated at 104-110 RM. Each hybrid was replicated three times, permitting statistical analysis of the results. Two Mycogen BMR hybrids were included in both early and late RM trials--a total of four BMRs.

For at least 20 years I've been saying that BMR corn hybrids are consistently higher in NDF digestibility but consistently lower in yield. Furthermore, that the increased NDF-d leads to higher dry matter intake and therefore results in higher milk production. (Perhaps an oversimplification but I'm a crops dude, not a dairy nutritionist.)

The 2019 results generally support what I've been saying. Generally, but not completely. The sellers of BMR hybrids (Mycogen and DuPont-Pioneer) have been contending that the yields of their BMR hybrids have been increasing. True, but so has the yield of conventional hybrids, so I think that there's still a BMR yield drag of 10% or so. A BMR hybrid actually yielded above the trial mean in two trials (a different hybrid in each of the trials), but the average yield for the four BMR hybrids across all trials was about 9% below the composite trial average.

All four BMR hybrids were clear winners for predicted milk yield based on the Cornell Net Carbohydrate and Protein System (CNCPS) — this includes each of the four hybrids in every trial in which they were entered. In fact, in every case they ranked #1 and #2 of 26 hybrids in the 96-103 RM trial and 23 hybrids in the 104-110 RM trial. Six comparisons, Six winners. In most cases it wasn't even close: Average milk yield for the six trials was 102 lbs. while for the four BMR hybrids it was 128 lbs., a difference of 26%. BMR corn has its challenges including yield and foliar disease resistance, but it puts milk in the tank!

On a side note, funding from the Northern New York Agricultural Development Program (NNYADP) paid for in vitro starch digestibility analysis (1 mm, 4 hrs.) for all hybrids at the Madrid site, also for the hybrids in the two 80-95 RM trials planted in Willsboro. These analyses found NO statistically significant differences (90% confidence level) in starch digestibility for ANY of the hybrids. Which is what we (along with most university agronomists) have been saying all along, contrary to the claims made by some seed companies.

— *Ev Thomas*
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MASTITIS, Continued from Page 5

systemically affecting the cow. As there are no visible changes to the milk or mammary gland tissue, the only way to identify subclinical mastitis is to directly measure the somatic cell level in the milk. Cows with high SCC can then be cultured to determine the cause of subclinical infections. Unfortunately, a high percentage of subclinical mastitis cows will be culture negative. When the herds bulk tank SCC rises and remains above 200,000, the herd is considered to have a significant problem with subclinical mastitis. The University of Wisconsin estimates the cost of subclinical mastitis at $110 per cow. As subclinical mastitis is harder to detect then clinical mastitis, it's estimated that for every case of clinical mastitis in the herd there are 15 to 40 cases of subclinical mastitis. Although the cost per case of subclinical mastitis is lower than the cost per case of clinical mastitis, the overall economic loss to the dairy tends to be much greater with subclinical mastitis.

As with any disease process, an ounce of prevention is worth a pound of cure. It's clearly much less expensive to implement measures to prevent mastitis than it is to treat it since most cases are subclinical in nature so the cow goes undetected and untreated. Consistent hygienic milking procedures and environmental hygiene are the backbone of mastitis control and production of wholesome quality milk. CLEAN and DRY are the two most important words when it comes to producing quality milk. The goal is to milk a CLEAN, DRY udder with a CLEAN milking machine and provide the CLEAN, DRY environment for the cow to live. In my opinion, the employees working in the milking parlor are the most important personnel on the far, because without the production of high-quality milk, dairy farms are not going to survive the tough economic environment of the dairy industry in today's world.

Tune in next month, as I review the procedures we implement at the Miner Institute Dairy to prevent subclinical and clinical mastitis in order to produce high quality salable milk.

— *Kevin Tobey, DVM*
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Closing Comment

The difference between getting married and getting a dog is that after a year the dog is still excited to see you.

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