



The Dairy FOCUS

Milk Quality



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Lancaster Dairy Herd Improvement
Association

Capital Region • Penn State Cooperative Extension Dairy Program

Allow Organic Bedding to Work with Good Management

Dan McFarland, Sr. Extension Educator - Agricultural Engineering, York County

Mammary infection by environmental bacteria is a major mastitis concern. Productive dairy cows may spend more than half of the day with their udder and teats in contact with the resting surface. Increased bacteria populations in bedding material can increase bacteria counts on the udder increasing the chance of infection. Managing common bedding materials, the resting surface, and surrounding space to minimize environmental pathogen populations can lead to cleaner cows, increased comfort, and better udder health.

Bacteria require nutrients, moisture, proper temperature and pH to grow. Organic bedding materials, such as sawdust, shavings, straw, paper, hulls, and dried manure solids provide food needed for bacteria to thrive. Inorganic materials will not support bacteria growth. However, this is only true for washed sand free of organic matter. Recycled sand and sand stalls tainted with manure and milk provides nutrients for bacteria to grow. Sand is an excellent bedding alternative, but not all housing and manure handling systems (or dairy producers) are able to adapt to the ‘challenges’ it can present.



Understanding the characteristics various organic bedding materials, and their ability to support bacteria growth, can provide clues to how much and how often bedding should be replaced. Softwood sawdust and shavings are preferred over hardwood since they contain resins that may inhibit bacteria growth. Paper is mostly cellulose and low in available nutrients bacteria may utilize. Straw and hulls (peanut, sunflower, oat) contain an abundance of sugars, starches and amino acids, so are potentially more able to support bacterial growth. While very high bacteria populations can be found in straw, hull, and dried manure solids samples, these materials can still be used satisfactorily with good stall bedding management and milking hygiene.

The most rapid period of bacteria growth in bedding materials seems to be 24 to 48 hours after being added to the stall. Studies suggest resting surface bacteria populations should be less than one million colony forming units per cubic centimeter (cfu/cc) to minimize udder infections. Most common organic bedding materials – even

In This Issue

Articles

Organic Bedding for Good Management	1
Dealing with Chronic Mastitis	3
Smart Tips for Preventing Mastitis	5
Lowering SCC with Records & Technology	7

Regular Features

Milk Market Watch	6
Quotable Quotes.....	7

Continued from page 1, “Organic Bedding”

dry manure solids – can have very low bacteria populations when applied to the stall surface, but given the right conditions can spike rapidly. Bedding mixed with manure tracked into the stall, leaked milk, and moisture from the stall surface, respiration, and surrounding air allow bacteria populations increase rapidly.

Particle size is another important characteristic to keep in mind. Finely ground or chopped organic material favors rapid bacteria growth. It also has a greater tendency to stick to the udder and teats more readily. Improper milking prep may cause this fine material to enter the teat canal causing infection.

How should stalls be bedded? Jeff Reneau, Professor of Dairy Management, University of Minnesota suggests the following:

- Remove all used bedding from the rear half of the stall each day and replace it with fresh bedding.
- **Don’t move bedding from the front of the stall to the back of the stall.**
- With stall mattresses and mats, use 1 to 2 pounds of fresh bedding, every day, making sure that the cleanest, driest bedding is beneath the udder.
- Once each week remove all bedding from the stall and replace it with fresh bedding.

A common bedding practice that should be avoided is to heap bedding at the stall front and rely on cow movement to move the material toward the rear. Studies indicate that by the time the bedding material finds its way to the rear of the stall – in the area of the teats and udder – it may contain tens of millions of bacteria.

Hydrated lime and other drying agents are often added to the bedding material and/or rear of the stall to control bacterial growth. One study indicated that adding approximately two pounds of hydrated lime to fresh sawdust at the rear one-third of the stall reduced bacteria growth for 24 hours. However, within 48 hours bacteria counts were similar to untreated sawdust.

The addition of manure to the stall surface promotes rapid bacteria growth. Therefore, anything that reduces contamination with manure (without affecting stall acceptance and use) will reduce bacteria populations. Other things to consider when developing a stall management strategy are:

- Crowding – Overcrowding increases the total amount of time stalls are used, manure, urine, and moisture in the animal space.
- Nutrition – **‘High’ group cows generally consume** higher amounts of a nutrient dense ration that places more nutrient-dense manure into their environment.
- Stall cleaning – Remove manure and wet spots from the stalls at least every milking. A minimum of 3 times per day is highly recommended.

- Alley scraping – At least at every milking. Less manure in the cow alley = less manure tracked onto the stall surface.
- Moisture – Reduce the chance for moisture to accumulate on the alleys and stall surface. Adjust ventilation to keep floor and stall surfaces dry.
- Bedding storage – Keep bedding dry. Adding moisture to unused bedding increases bacteria growth before it even gets to the stall.
- Weather – Adjust bedding amount and frequency to weather conditions. Warm, moist periods require more frequent bedding removal and replacement.
- Bedding frequency – Change organic bedding at least every other day -- every day during summer.

A variety of organic bedding materials can– and are – used very successfully with dairy cows once the conditions that support the growth of environmental bacteria are understood and management adjustments are made to control them. The quote, “*No farm ever went broke buying bedding*”, still holds true. Some may challenge this statement given the recent shortage of good quality sawdust. However, it is hard to argue the importance of an adequate amount of clean bedding to the health and well-being of dairy cows. The benefits realized from increased comfort, improved cleanliness, reduced lameness and injuries, good udder health, and improved milk quality go a long way towards improving profitability.

Some laboratory options for bedding culture diagnostics

Pennsylvania Animal Health Diagnostic Lab (PADLS)
<http://www.padls.org/>
Animal Diagnostic Laboratory
Pennsylvania State University
Orchard Rd
University Park, PA 16802
814-863-0837

QMPS – Cornell University
<http://qmps.vet.cornell.edu/Services/services.htm>
22 Thornwood Drive
Ithaca, NY 14850
607-255-8202

Lancaster DHI
Lancaster Dairy Herd Improvement Association
1592 Old Line Rd.
Manheim, PA 17545
Culture & Mycoplasma Lab: 1-877-572-4115
Local: (717) 665-1274
Hannah Bomgardner: culture@lancasterdhia.com

Dealing with Chronic Mastitis - Definitions, Records, and Best Management Options

Sandy Costello, Ph.D. - Southeast Region Dairy Herd Health Extension Educator, Cumberland County

The Bottom Line

- ✓ Chronic cows are the result of new mastitis infections that do not cure.
- ✓ To reduce the number of chronic cows in your herd, new infections must be reduced through good mastitis control practices.
- ✓ Best management options to reduce chronics are costly and include treatment of cows with long term infections (typically not effective), “killing” quarters (leads to uneven milking and may continue spreading infection), diverting milk from mastitis quarters into the waste system, and early culling of otherwise profitable cows.

Have you ever looked at your DHI Somatic cell count (SCC) records and wondered why so many cows continue to have high SCC or repeat cases of mastitis? Why does this happen? What can you do differently to avoid these same cows from being infected again? What can you do differently to prevent the next cow from having mastitis repeatedly over her lactation? Do you have more chronics or repeat mastitis cows than you should?

This article discusses the definition of chronic mastitis, the importance of records to track when

chronic mastitis begins and how to determine the best management options to reduce the impact on your herd.

Definitions

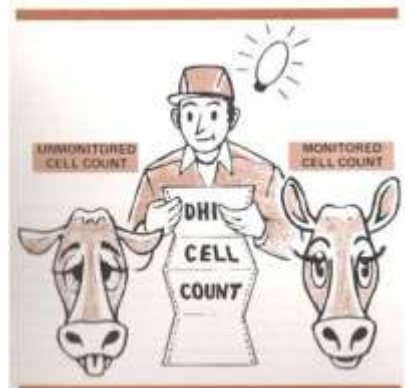
The term chronic mastitis is used to describe mastitis that has a high chance of being resistant to therapy, lasts for a long time, or occurs repeatedly in the same cow or quarter. Often, culling may be the best choice for a cow with chronic mastitis, especially when mastitis is present in more than one quarter, or occurs repeatedly or continually in early lactation. Culling is often the best management choice due to the economic impact -- production loss and treatment costs -- and the risk of spreading the mastitis to additional cows versus the cost of culling and replacing her with a non-infected first lactation heifer. For culling to work economically when dealing with chronic cows, there must be non-infected healthy heifers calving in a barn set up for excellent mastitis prevention. There is nothing more frustrating or costly than culling cows for mastitis and soon after having previously non-infected cows become infected and eventually chronic.

Because labeling a cow as chronic is often dire and leads to terminal management actions, it is best to use economics and multiple records before tagging a cow as chronic. Chronic mastitis is defined several ways. The definition used in the Pa Dairy Tool SCS Analyzer, classifies mature cows with three or more test day SCC over 300,000 and with at least one of those occurring in the most recent 3 tests. We know that cows with an SCC over 200,000 have a high probability of mastitis. However, cows with SCC consistently over 300,000 should be evaluated more closely, hence the reason for increasing the decision-threshold in the report. First calf heifers are classified as chronic if they have 3 or more DHI tests above 200,000 and with at least one of those high tests in the most recent 3 months. We expect heifers to have less mastitis and cure more quickly, so the threshold is lower (stricter) for this group to be tagged or labeled as chronic.

Using Records to Determine Best Management Options for Chronics

Mastitis quarters of chronic cows will likely not cure when treated; making these cows likely candidates for culling. If the chronic mastitis infection is only in one quarter and is caused by a non-contagious organism, there are management strategies to keep the cow in the herd, to reduce the chance of spreading the infection to clean or non-infected cows, and to reduce the impact on your ability to receive higher milk quality premiums. Options might include “killing” the quarter or diverting milk from the single quarter (short-term strategy) away from the bulk tank milk. The more quarters infected in a chronic cow, the greater the likelihood that antibiotics will not work to clear the infection. The more chronic cows you have in your herd, the tougher your choices. More information is needed to make good short and long-term cost-effective decisions.

Clinical mastitis and treatment records, when combined with SCC records, can help you make even better decisions about chronic cows. If a chronic cow -- based on SCC records -- has had several episodes of clinical mastitis



Use DHI SCC and Clinical Mastitis Records to determine causes of chronics

Continued from page 3, “Chronic Mastitis”

Dry Cow Transitions over the Last Year									
Time Period Relative to Current Month	Chronic		New Infection at Calving		Cleared Infection Thru Dry Period		Clean at Dry Off and Clean at Calving		No. Dry Cow Transitions
	%	#	Percent	#	%	#	%	#	
1 to 3 Months Since Calved	25%	7	36%	10	14%	4	25%	7	28
4 to 6 Months Since Calved	19%	5	38%	10	8%	2	35%	9	26
7 to 9 Months Since Calved	4%	1	28%	7	20%	5	48%	12	25
10 to 12 Months Since Calved	23%	6	35%	9	15%	4	27%	7	26
Annual Summary	18%	19	34%	36	14%	15	33%	35	105

despite quick diagnosis and strategic treatment, culling is likely the best management option. Of course, this assumes that treatment was targeted for the specific bacteria – identified by culture, that the best drug used – based on sensitivity, bacteria, cow history, and possibly DNA testing, and that the drug was used for the appropriate time period – according to label directions or extended-use instructions by your herd veterinarian. If a chronic cow has had a new infection in the current lactation, was clean in her previous lactation, and has not been treated with antibiotics, treatment may be the best management option. Early dry-off could also be a best management option if the cow is genetically superior to herd mates, late in lactation, pregnant, and close to dry-off. If the same cow was milking in only 3 quarters, has Staph aureus in a new quarter that doesn't respond to treatment, then culling for mastitis becomes a better management option. Combining DHI SCC and clinical events and treatment records will help you make more profitable decisions about chronic mastitis cows. Mastitis cost records for your herd and individual cows will lead to even better decisions.

Need for monitoring records to understand where/how chronics begin

When reviewing producer records, I classify cows as *multi-lactation chronics* if their SCC was high in the previous lactation – based on their last test SCC before dry-off or the previous lactation SCC was above 300,000 and if the SCC is still above 300,000 at the first test in the new lactation. These multi-lactation chronics should be watched carefully after freshening to determine best management option. Information from observing cow signs of mastitis, using the California Mastitis paddle – to identify subclinical severity and infected quarter, DHI SCC records at first test, and possibly new culture results can all help you to make the best decision. These cows likely did not respond to treatment or developed a new infection – either case classifies these cows as having chronic mastitis. Herd records and protocols should be reviewed to determine if overall dry period treatment management - - which is intended to cure chronics and prevent gram positive new infections -- is still effective.

First calf heifers should enter the milking string without mastitis infections. If they develop or have mastitis at calving or continue to have a high SCC for the first 90 days, they can be another source of chronic mastitis. These chronics could be the result of trauma during the heifer rearing period leading to a persistent infection or could be the result of group bedding management or milking related issues -- milking management or machine related risks. Treatment philosophy may also lead to development of chronic mastitis. Use of dirty tools, poor hygiene, and delayed antibiotic treatment, and/or misuse of drugs may lead to chronic infections. Rare or occasional chronics in these young animals may be related to poor immune system response through genetics or teat end damage. All potential risk factors should be evaluated to enhance best management decisions.

Chronics that develop during lactation may be the result of bedding management choices or may be the result of milking machine malfunction. Treatment management is also a likely contributor to development of chronics in some herds. Poor choice of antibiotics, failure to treat cows early in the infection, poor sanitation during treatment, and poor choices for length of treatment are common contributors to the number of chronics in dairy herds.

The Bottom Line

Remember the following:

- To reduce the number of chronic cows in your herd, new infections must be reduced through good mastitis control practices.
- Chronic cows are the result of new mastitis infections that do not cure.
- Best management options to reduce chronics are costly and include:
 - ✓ Treatment of cows with long term infections (typically not effective)
 - ✓ “Killing” quarters
 - ✓ Diverting milk from mastitis quarters into the waste system
 - ✓ Early dry-off – to reduce impact on bulk milk quality and enhance cure rate for new chronics
 - ✓ Early culling of otherwise profitable cows.

Risk assessments can be helpful to distinguish between likely reasons for high herd levels of chronic mastitis.

Complete mastitis management risk assessments are a painless and cost-beneficial way to pinpoint causes of new infections and chronic mastitis and to achieve higher milk quality bonuses. Use of milk quality target teams can be a great way to establish protocols and monitor herd progress toward achieving higher milk quality premiums and reducing mastitis costs.

Some Smart Tips for Preventing and Controlling Mastitis

Sandy Costello, Ph.D. - Southeast Region Dairy Herd Health Extension Educator, Cumberland County



Monitor fresh bedding closely for changes in quality by looking for changes in particle size, moisture level, signs of organic material and musty smells

The following tips include ways to take your mastitis control program to the next level. If you are there, GREAT! If not, consider adapting additional ways to reduce new infections and ways to prevent the development and impact of chronic mastitis

Environmental Mastitis

✓ Take extra special care of dry cows and heifers:

- Re-bed more often than 'as needed'
- Spend extra time with

bedding management around calving time – it is a high risk time period for new infections

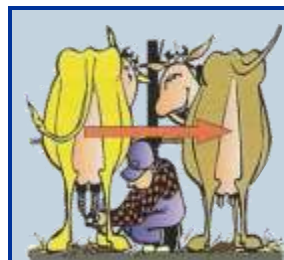
- Spend extra time with bedding at and for 2-weeks following dry off – it is a high risk time period for new infections
- ✓ Use lime to slow bacteria growth during the 12 to 24-hr period between applying fresh bedding and especially in the summer months
 - If using hydrated lime, thoroughly cover lime with clean bedding to protect teats and wounds
- ✓ If milking in a tie-stall barn, use a bedding cart and lime scoop and re-bed as you milk – preferably this should be done by a second person so milking is not disturbed
- ✓ Keep fresh bedding dry and covered before use - cats and dogs like to lie in and contaminate bedding – which then is not fresh
 - Remember - Not all bedding is created equally – Sand is not sand is not sand – sand can contain differing amounts of organic materials depending on how the fresh product is managed; the same is true of other types of bedding
 - If fresh bedding loads appear different – wetter, contains visible and non-typical organic matter, or are musty smelling – talk to your supplier and consider using bedding cultures to determine the level and types of bacteria in your fresh bedding
- ✓ Use a clean and different skid steer bucket and shovels than are used to scrape manure and to apply fresh bedding

- ✓ Flame hair or clip the hair from udders at least every 3 to 6-months and to reduce the amount of bedding and manure on teats and the udder between milkings
- ✓ Use a pre-dip labeled as a pre-dip and for its' ability to kill bacteria quickly and within 30-seconds of contact with the teat sides and teat end. Leave the pre-dip on the teats for a minimum of 30-seconds so it can work to kill bacteria before milking
- ✓ Use a good post dip and apply it well and to at least two-thirds of each teat and immediately after the milking unit comes off
- ✓ Strip cows during the prep procedure for lots of reasons, including good milk let-down, to remove high bacteria milk, and to find new cases of mastitis
 - If milking in a stall barn, DO NOT STRIP MILK ONTO COW BEDS!! Use a strip cup on every quarter and at every milking
- ✓ BE IN THE MOMENT when you check cows for clinical mastitis at every pre-milking prep
 - Communicate and label cows that require further attention for treatment or other strategic management action
 - Think of this as your major plan to prevent and control chronic cows in your herd

BE IN THE MOMENT when stripping cows during the prep procedure and checking cows for mastitis.

Contagious Mastitis

1. Every herd has contagious mastitis and so everything should be done with the thought that unless good prevention strategies are in place all the time and followed by everyone, mastitis will be transferred to the next cow during and between milkings.
2. Regardless of herd size, have your milking equipment serviced at least every 6-months by a knowledgeable service person – vacuum pump, vacuum regulator, milk pump, automatic take-offs/ milk flow sensors, check all hoses – length and wear, check pulsators, and rebuild and clean as needed



Consider that every herd has some contagious and establish a plan to reduce spread of mastitis from contagious or chronic cows to non-infected cows during and a between milkings

Continued from page 5, "Mastitis Prevention"

3. Change inflations at the low end of manufacturer recommendations. Frequent changing of inflations is the best money you can spend to control and limit mastitis
4. Use and have all employees and family members use new nitrile gloves at every milking – please do it - regardless of whether too hot, too uncomfortable, not the right size – which are all poor excuses
5. Milk chronic and known contagious cows last or with separate milking units. If possible, limit exposure of non-infected and fresh cows to infected cows through combined special needs pens, maternity pens, and bedded packs
6. Use a disinfectant spray bottle to clean gloves and then dry gloves between handling infected and non-infected cows
7. Strategically cull contagious and chronic mastitis cows



Read about SMART Tips for Controlling Mastitis

Records and Diagnostics

1. Monitor plant milk plant quality measures on a weekly basis and make quick management adjustments when needed to acquire higher premiums and to sell higher quality milk
2. Use and monitor DHI SCC records to track new and chronic infections at calving --heifers and dry cows-- and throughout lactation

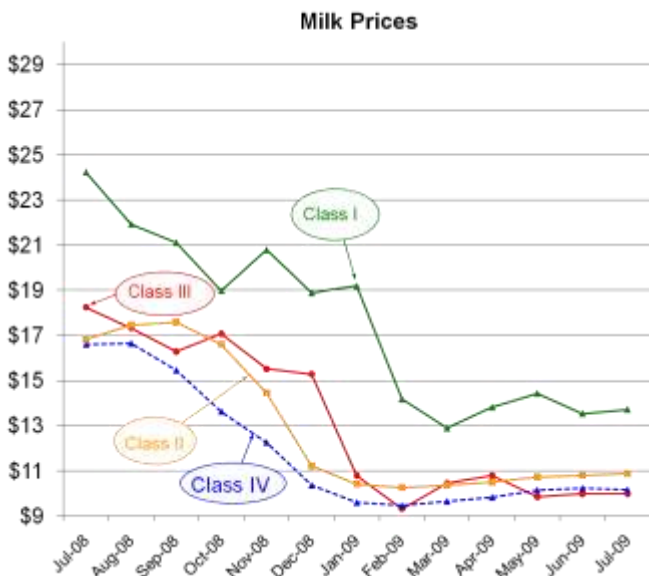
3. Record and track clinical mastitis records, including antibiotic use on an individual cow and herd basis
4. Treat new cases of mastitis promptly using a veterinarian guided procedure for antibiotic use
5. Regularly use bacterial culture, antibiotic sensitivity analysis, and rapid diagnostic tests – like the CMT paddle -- to determine the cause and source of mastitis, find new infections early, identify the quarter of a high SCC cow that is infected, and to determine the best drugs to cure infections. This information is SO VALUABLE!!
6. Use advisors to provide the external review of mastitis risks – you may be too close to the issue at times
7. Use target teams to improve communications between your milk quality advisors and to make more rapid progress toward meeting milk quality and udder health goals



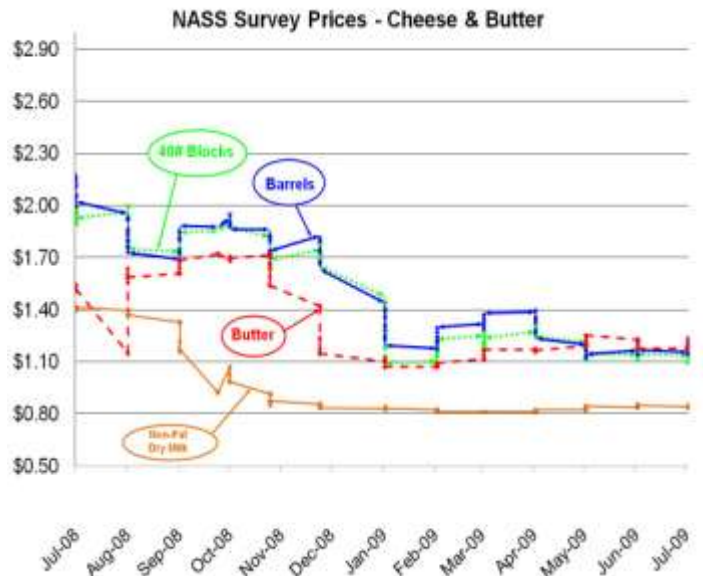
Strip Cup for use in stall barns hooks on pants after use for accessibility. Milk streams into handle following stripping for short-term storage between cows. Black plate makes signs of mastitis easy to see

*In the next issue:
Business
Management*

"Milk Market Watch"



Source: USDA Dairy Program, Northeast Milk Marketing Order, <http://www.fmmone.com/>



Source: USDA - National Agricultural Statistics Service <http://usda.mannlib.cornell.edu/reports/nassr/price/dairy/>

Lowering SCC with Records and Emerging Technology

Jere High, Lancaster Dairy Herd Improvement Association

Lancaster DHIA

For decades, the dairy industry has strived to produce and supply higher quality milk. Dairy Herd Improvement programs have aided in the production of quality milk through testing for individual somatic cell count from cow milk samples. Today, producers and milk quality advisors want to have more information about mastitis cows; want to identify the source of infection, and want to identify factors contributing to a high SCC. In order to satisfy this need, independent and local laboratories, like the one at Lancaster DHIA, have been established to provide bacterial identification of mastitis organisms in the bulk tank (overview of herd mastitis), cow (cause of high SCC), and individual quarters (cause of mastitis and high SCC). In addition, bacterial culturing of bedding samples and towel samples is another service provided by culture laboratories and can be used to further troubleshoot and identify cause of high SCC.

Producers are increasingly aware of management practices, and have used new resources like culture laboratories to decrease their herd average SCC. The average rolling herd SCC for herds tested through Lancaster DHIA was 306,000 in 2008 and has decreased to date in 2009 to 269,000. Producers have discovered that by lowering their SCC they have not only increased milk income through higher milk quality bonuses, but can also increase milk production. Research has demonstrated that lowering the Somatic Cell Score by 1 point will result in an average 1.5 pound increase in milk per cow per day. With an increase in milk production of this magnitude, the potential increase in milk revenue, independent of milk quality bonuses, could be as much as \$5,000 annually.

In the current economic landscape, maximizing milk production and quality is of utmost importance for success. Enhanced culturing systems to identify not only mastitis pathogen, but molecular characteristics of pathogens can be beneficial to further troubleshoot cause of high SCC. Molecular techniques can be used to identify and quantify the DNA (molecular characteristics) of bacteria. This allows for more in depth descriptions of mastitis-causing bacteria in a dairy herd. For example, *Staph. aureus* bacteria may or may not carry the β -lactamase gene. If *Staph aureus* have this characteristic, beta-lactam antibiotics, like Penicillin, will not generally work to cure the infection. If a cow has a mastitis infection – caused by *Staph. aureus* carrying the β -lactamase gene, the cow will be less likely to respond to treatment if treated with a beta-lactam antibiotic. Conventional culture and susceptibility testing systems would not identify

presence or absence of this characteristic. DNA or molecular techniques can also be used to better identify bacteria – potentially resulting in fewer ‘No Growths’.



Laboratories and research finds that typically 25 to 40% of conventional milk cultures result in no bacterial growth. Paying for a ‘no growth’ result when you know the cow or quarter has a mastitis infection can be very frustrating. Molecular techniques can be used to more clearly define similar or dissimilar DNA patterns to better identify mastitis-causing bacteria in milk samples. This can result in fewer ‘no growth’ results. Rapid turn-around of information for quick decision-making and reduced cost of enhanced milk diagnostic testing is making it possible for commercial laboratories to offer these new services.

Lancaster DHI, like other microbiology laboratories is working to explore enhanced molecular technologies to provide better diagnostics for improved producer decision-making, and improved milk quality. A system for identification of molecular characteristics of mastitis-causing bacteria is being launched by Lancaster DHI later this year. More information will be available in the near future.

Please contact Lancaster DHIA directly if you have questions about any of the services we offer.

Jere High
Lancaster DHIA
General Manager
1-888-202-3442

“Quotable Quotes”

“Efficiency is doing things right, effectiveness is doing the right things.”

~ Peter Drucker, Writer, 1909-2005

“Divide each difficulty into as many parts as is feasible and necessary to resolve it.”

~ Rene Descarte, French Philosopher, 1596-1650

“Common sense is the knack of seeing things as they are, and doing things as they ought to be done”

~ Harriet Beecher Stowe, American abolitionist, 1811-1896

Upcoming Southeast Region Dairy Educational Programs

For more information on these workshops contact:

<http://www.das.psu.edu/dairy-alliance/education/dairy-profits> or call 888-373-7232

Dairy Profit/Target Team Training

September 14, 2009; October 20, 2009; November 16, 2009;
December 15, 2009

Web-based training for new Profit/Target Teams supported by the Center for Dairy Excellence

Fee: Offered free of charge to CDE Profit and Target Teams

Tools to Improve On-Farm Profitability for Team Advisers

October 1, 2009

Cumberland County Extension Office, Carlisle, PA

Time: 9 a.m. to 3:30 p.m.; Fee: \$30.00 per person

Cash Flow Planning: How to plan a cash flow (Class #1)

October 22, 2009

Shady Maple Smorgasbord, East Earl, PA

Time: 9:30 a.m. to 2:30 p.m.; Fee: \$30 per person.

Friday Facilitator Forum

Series starts October 16, 2009

These one-hour online topical discussions are specifically for Profit/Target Team facilitators. No fee to participate.

Understanding & Implementing Basic Accounting Principles & Practices

December 2, 2009

Lebanon County Cooperative Extension Office, Lebanon, PA

Time: 9:00 a.m. to 3:30 p.m.

Fee: \$45 per class for first person from farm/ business; \$25 per class each additional person.

Feed Management Planner Certification Program

November 10, 2009

Holiday Inn Harrisburg-Hershey, Grantville, PA

Time: Noon to 5:00 p.m.; Fee: \$30.00 per person.

Advanced Accounting – Understanding and Implementing a Managerial Cost Accounting Program

November 16-17, 2009

Penn State Harrisburg campus, Middletown, PA

Time: 9:30 a.m. to 3:30 p.m.

Fee: \$85 for first person from farm/business; \$55 for each additional person.

Middle Manager's Conference

November 19, 2009

Four Points Sheraton, Harrisburg, PA

Time: 9:00 a.m. to 4:00 p.m.

Fee: \$95 prior to October 31; \$125 after October 31

Reproductive Drill-Down Workshop

December 4 & 11, 2009

Ickesburg Firehall, Ickesburg, PA (Perry County)

Hours: Day 1 - 9:30 a.m. to 3:30 p.m.; Day 2 - 9:30 a.m. to 2:30 p.m.

Fee: \$50 per person. Attendance is limited to 20 per location.

Advanced Accounting for QuickBooks Users

December 9, 2009

Lebanon County Cooperative Extension Office, Lebanon, PA

Time: 9:00 a.m. to 3:30 p.m.;

Fee: \$45 per class for first person from farm/ business; \$25 per class each additional person.

Local Extension Offices:

Adams County Extension Office
670 Old Harrisburg Rd. Suite 204,
Gettysburg, PA 17325
AdamsExt@psu.edu, 717-334-6271

Berks County Extension Office
1238 County Welfare Road, Suite 110
Leesport, PA 19533-9709
BerksExt@psu.edu, 610-378-1327

Bucks County Extension Office
Neshaminy Manor Center
1282 Almshouse Road
Doylestown, PA 18901-2896
BucksExt@psu.edu, 215-345-3283

Chester County Extension Office
PO Box 2747
West Chester, PA 19380-0990
ChesterExt@psu.edu, 610-696-3500

Cumberland County Extension Office
310 Allen Road, Suite 601
Carlisle, PA 17013
CumberlandExt@psu.edu, 717-240-6500

Dauphin County Extension Office
1451 Peters Mountain Road
Dauphin, PA 17018-9504
DauphinExt@psu.edu, 717-921-8803

Delaware County Extension Office
20 Paper Mill Road
Springfield, PA 19064
DelawareExt@psu.edu, 610-690-2655

Franklin County Extension Office
181 Franklin Farm Lane,
Chambersburg, PA 17020
FranklinExt@psu.edu, 717-263-9226

Lancaster County Extension Office
1383 Arcadia Road, Room 140
Lancaster, PA 17601-3184
LancasterExt@psu.edu, 717-394-6851

Lebanon County Extension Office
2120 Cornwall Rd., Suite 1
Lebanon, PA 17042
LebanonExt@psu.edu, 717-270-4391

Lehigh County Extension Office
4184 Dorney Park Road, room 104
Allentown, PA 18104
LehighExt@psu.edu, 610-391-9840

Montgomery County Extension Office
1015 Bridge Road, Suite H
Collegeville, PA 19426
MontgomeryExt@psu.edu, 610-489-4315

Northampton County Extension Office
14 Gracedale Avenue
Nazareth, PA 18064
NorthamptonExt@psu.edu, 610-746-1970

Perry County Extension Office
P.O. Box 129,
New Bloomfield, PA 17068
PerryExt@psu.edu, 717-582-2131

Philadelphia County Extension Office
111 North 49th Street, Suite KN3-100
3rd Floor North
Philadelphia, PA 19139
PhiladelphiaExt@psu.edu, 215-471-2200

York County Extension Office
112 Pleasant Acres Road,
York, PA 17402-9041
YorkExt@psu.edu, 717-840-7408

Penn State Regional Dairy Team

PERRY & CUMBERLAND COUNTIES

Dave Swartz, CED & Dairy Educator
dswartz@psu.edu, 717-582-2131

CUMBERLAND COUNTY

Sandy Costello, Dairy Herd Health Educator
ssc10@psu.edu, 717-240-6500
Tim Beck, Dairy Business Management Educator

FRANKLIN COUNTY

Philip Wagner, Dairy Educator
pew1@psu.edu, 717-263-9226

YORK COUNTY

Dan McFarland, Ag Engineering Educator
dim6@psu.edu, 717-840-7408
Jeff Myers, CED & Dairy Educator
jdm30@psu.edu, 717-840-7408

BERKS & SCHUYLKILL COUNTIES

Morgan Firestone, Dairy Livestock Educator
maf5002@psu.edu, 610-378-1327

LEBANON & BERKS COUNTIES

Rob Goodling, Dairy Educator
rcg133@psu.edu, 717-270-4391

LANCASTER COUNTY

Ken Griswold, Dairy Educator
drgriz@psu.edu, 717-394-6851
Sara K. Dinh, Dairy/Environmental Educator
skd16@psu.edu, 717-394-6852

CHESTER COUNTY

Keith Dickinson, Agricultural Business Management Educator
krd16@psu.edu, 610-696-3500

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