7-1-1993

Mastitis Control: Reducing Somatic Cell Counts

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COOPERATIVE EXTENSION SERVICE SDSU

Extension Extra

ExEx 4004
July 1993
Dairy Science

SOUTH DAKOTA STATE UNIVERSITY / U.S. DEPARTMENT OF AGRICULTURE

Mastitis Control: Reducing Somatic Cell Counts

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Mastitis is the most costly disease of dairy cattle. The primary economic loss associated with mastitis is lost production due to subclinical mastitis. This loss accounts for nearly two-thirds the costs associated with mastitis or about $126 per cow per year. The remaining one-third of the dollar loss or about $62 per cow per year are costs associated with discarded milk, drug therapy, veterinarian costs, and culling.

Mastitis is prevented not treated in a dairy herd. A good mastitis control program will:

- Minimize milk production loss associated with subclinical mastitis.
- Reduce the incidence of clinical mastitis and discarded milk.
- Reduce treatment costs for both drugs and veterinary services.
- Reduce cow losses from death or premature culling.

All of these benefits lead to enhanced profitability of a farm operation. Regardless of milk prices, but particularly when milk prices are low and producers are looking for ways to improve profitability, a good mastitis control program is essential. Research indicates approximately a $5 return to the dairy operation for every $1 invested in a control program.

What is mastitis?

Mastitis is an inflammation of the udder. During the inflammation, leukocytes or somatic cells are shed into the udder in large numbers to neutralize toxins and kill bacteria. Depending on how rapidly a cow mobilizes somatic cells to the site of infection and the amount and type of pathogens involved, an udder infection may have five possible outcomes.

Self elimination - cow cures herself of the infection. This happens 20 to 40 percent of the time. Inflammation may or may not be visually detectable. If timing of the test is coincidental with infection, it may be detected with a CMT (California Mastitis Test) or an electronic SCC (Somatic Cell Counts) machine.

Subclinical mastitis -- no visual signs of the disease but inflammation and infection persists. This type of mastitis occurs in 30 to 35 percent of all cows. Detection methods include individual cow SCCs, CMTs, and/or bulk tank somatic cell count. This is the most costly type of mastitis because it reduces milk production and milk quality.

Clinical mastitis -- abnormality of the udder and/or milk is observed. Clinical mastitis is detected at milking time with foremilk stripping. Incidence at any one time is 3 to 4 percent of the milking herd and accounts for 5 to 10 percent of all mastitis cases.

Acute clinical mastitis -- cow may appear healthy and suddenly become sick. The infection usually is confined to one quarter. Cow may show signs of weakness, depression, fever, and loss of appetite, and may have a rapid pulse. These cases can be life threatening.

Chronic mastitis -- infection of long duration. Chronic mastitis may remain in a subclinical phase indefinitely, or it may alternate between the subclinical and clinical phases, or clinical signs may persist for long periods.

What causes mastitis?

Most mastitis is caused by **bacterial pathogens**. The probability of a cow acquiring an udder infection is directly related to the number of pathogens present on the teat skin surface. The two primary categories of mastitis pathogens are **contagious** and **environmental**.

Contagious pathogens -- primary source is an infected quarter. They are spread from quarter to quarter of the same cow or from one cow to another by contaminated hands, milking equipment, or poor milking hygiene. Examples of these pathogens:

- *Staphylococcus aureus*
- *Streptococcus agalactiae*

Environmental pathogens -- primary source is the environment in which the cow lives. They are spread to the cow by direct contact of the teats to contaminated bedding or mud, dirt, and manure. Examples of these pathogens:

- *Streptococcus uberis*
- *Streptococcus dysgalactiae*
- Coliform species, e.g., *E. Coli; Klebsiella*

A third category of organisms that cause udder infection is called **minor pathogens**. These organisms are considered normal teat flora and rarely cause clinical disease. Some laboratories do not report them on culture reports unless requested. These organisms primarily colonize the teat surface and teat duct. Examples of these organisms:

- *Staphylococcus hyicus*
- *Staphylococcus epidermidis*
- *Corynebacterium bovis*

How is mastitis prevented?

If the goal is to decrease the prevalence (level) of mastitis, then the new infection rate and/or the duration of infection must be reduced. The effectiveness of practices that reduce the new infection rate or duration depends largely on the type of mastitis pathogens in the herd. In general, the new infection rate is lowered by practices that reduce the bacterial load on the teat skin, and duration is lowered by elimination of existing infections.

Mastitis control goals

Clinical mastitis and somatic cell counts are the two main measures of mastitis. However, clinical mastitis constitutes only a small portion of the total mastitis picture.

Somatic cell count is a reliable indicator of udder health within individual cows or within a herd. As more and more research data becomes available, the critical role low SCCs play in production per cow, cheese yield, and product shelf life becomes more apparent.

Food safety and food quality are important issues facing the agricultural industry in the 1990s. Udder health or an effective mastitis control program plays a key role in the production of high quality milk. Not only will a good mastitis control program produce a quality product, it also will reduce the risk of drug residues in milk, milk products, and cull cows.

Table 1. Goals for clinical and subclinical mastitis.

Clinical Mastitis	Cows Per Month
Range	<1% to ?
Average Level	3 to 4%
Goal Level	1 to 2%

Subclinical Mastitis

Bulk Tank Somatic Cell Count (cells/ml)	Percent Infected Quarters	Rating
100,000	Minimal	Excellent
200,000	6	Good
350,000	11	Fair
500,000	16	Poor
750,000	22	Illegal

Table 2. Relationship of linear score to milk loss.

Linear Score	SCC Range From To (1,000's)	Estimated Milk Loss Lbs/Day	Lbs/Lactation
0 - 2	9 - 71	0	0
3	72 - 141	1.5	400
4	142 - 283	3.0	800
5	284 - 565	4.5	1,200
6	566 - 1130	6.0	1,600
7	1131 - 2262	7.5	2,000
8	2263 - 4523	9.0	2,400
9	4524 - 9045	10.5	2,800

Low somatic cell counts and a low incidence of clinical mastitis are attainable goals for every size and type dairy operation. Realistic control goals for a herd are shown in Table 1.

The greatest dollar loss associated with high somatic cell counts is lost milk production. These losses are illustrated in Table 2.

Using somatic cell count

To reduce confusion and enhance the understanding and use of somatic cell count information, the National DHI Policy Board adopted a uniform scoring method called linear score. The main advantage of linear score over raw counts is its direct relationship to milk yield. Research has demonstrated the relationship between actual SCC and milk yield is irregular or non-linear. When the same information is plotted against a linear score, the irregular line becomes

a straight line and each unit increase in linear score is associated with a constant loss of milk yield. This is why the data is presented as it is in Table 2. Milk production loss for first-calf heifers would be one-half the values presented in Table 2.

Detecting and diagnosing mastitis

The key detection and diagnostic tools in mastitis control are somatic cell counts and bacteriological culturing. Both are essential because, with only one or the other, short-term solutions may not cure a longer-term problem. A mastitis control program can be successful only when the causative agent(s) is correctly diagnosed and the appropriate management practices are adopted to correct the problem.

Individual cow somatic cell counts

An important principle to remember in using DHI SCC or other SCC information is that one SCC from a single animal does not reveal much information. However, SCC trends over time are revealing and useful management information can be extracted from these trends.

The best place to start in understanding how to use this information is to examine SCC histories of individual animals. The following examples give a good indication of how to interpret the SCC information. These examples assume monthly SCC testing via DHI or another type of testing program.

EXAMPLE 1 -- A cow entered her lactation with a low SCC, and it remained low throughout the lactation. When the milk was sampled, no infections were detected. A SCC history like this represents the ideal pattern.

EXAMPLE 2 -- A cow entered her lactation with a low cell count. But, on the second test (approximately equal to 30-60 days in milk), the cell count increased to the high category indicating that her udder now harbors an infection. The cause type of organism cannot be determined from this information. It is important to notice if the infection developed in early lactation and persisted until dry-off.

EXAMPLE 3 -- A cow entered her lactation with a cell count in the medium category. This could mean one of two things: the cow carried an infection from the dry period, or udder edema was present and the swelling was not yet gone. If the SCC drops on the next test (approximately 30-60 days in milk) and remains low for the remainder of her lactation, either the cow eliminated the infection (if one was present) or loss of edema cured the problem.

EXAMPLE 4 -- A cow entered her lactation with a high cell count and it remained high throughout lactation. One interpretation could be that this cow picked up an infection during the dry period or in the maternity area and carried it into lactation. The other is that she is a chronic mastitic cow simply harboring an infection from a previous lactation.

EXAMPLE 5 -- A cow entered her lactation with a low cell count and it remained low until the fifth test. At that point the cell was high and then receded to a low count again next month. The cow may have been infected and cured herself, or she was treated and responded to therapy.

This pattern is characteristic of an environmental pathogen infection. For example, 60 percent of environmental streptococci lasts less than 30 days and 57 percent of coliform infection lasts less than 10 days. Obviously, with a 30-day test interval most of these infections will only show up once.

Bacteriological culturing

To make a definitive mastitis diagnosis, culturing results from milk are essential. There are two approaches to culturing. One is to sample milk from the bulk tank as a screening procedure. The other approach is to sample quarter or composite milk samples from individual cows.

SCCs can be used to determine which cows to culture. For example, some producers routinely culture all cows with a linear score of four or more. All cows with a linear score of four or more could be sampled one month prior to dry-off to determine not only the bacteria responsible for the infection, but also the most effective dry-cow therapy. Information from dry-off samples could be compared to information taken after calving to determine the effectiveness of the dry-cow therapy, dry-cow housing, and/or calving pen sanitation.

These are the specific mastitis-causing bacteria and the type of sample needed for monitoring:

Contagious	Herd Monitoring
Strep agalactiae *Staph aureus*	Bacteriologic culture of bulk tank milk or herd survey of individual cows.
Environmental	
Non-ag Streptococci *Streptococcus uberis*	Culture of milk of fresh, drying-off, and clinical cases of mastitis.
Coliforms *E. Coli* *Klebsiella* Enterobacter	Culture of clinically infected quarters is the only accurate measure of this type of mastitis.

Use the SCC information to monitor trends and decide which cows to culture. Then use the culture results, plus the information in the above table, to develop an effective mastitis control program for your herd. It is essential to work with your veterinarian throughout this process; your veterinarian is a key component for measurable success.

Table 3. Management practices with proven efficacy against contagious and environmental pathogens.

	CONTAGIOUS MASTITIS	
Priority Level	Reduces New Infection Rate	Reduces Duration of Infection
Very important	1. Post milking dipping 2. Milking hygiene 3. Minimal milking machine air slips a. Vacuum level low line 13-14 inches high high line 14-15 inches high	Dry-cow therapy
Important	4. Segregating infected cows	Culling
Moderately important	5. Backflush	
Minor importance	6. New claw design 7. Vaccination	

	ENVIRONMENTAL MASTITIS	
Priority Level	Reduces New Infection Rate	Reduces Duration of Infection
Very Important	1. Environmental hygiene (i.e. clean and dry) 2. Milking hygiene 3. Predipping 4. Minimal milking machine air slips a. Vacuum level low line 13-14 inches high high line 14-15 inches high	
Important	5. Post teat dipping (germicide and barrier) 6. Dry cow therapy	
Moderately Important	7. Vitamin E and selenium supplementation	
Minor Importance	8. New claw design	

Summary

An accurate management diagnosis of mastitis includes three types of information:

- Somatic cell counts on individual cows.
- Culture results.
- Knowledge or observations of management and herd hygiene.

Because nearly all dairy producers practice some recommended mastitis management procedures, the diagnostic information will be helpful in pinpointing more specifically the areas that need improvement. More effective control may be as simple as improving an existing practice or starting a new management procedure.

Once improvements are implemented, a sound management practice is to continue to monitor the herd's udder health status with somatic cell counts and culturing. This will help determine whether the management change was effective and detect new problems before they become serious.

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150 copies printed by CES at a cost of 12.5 cents each. July 1993.