Babcock Institute for International Dairy Research and Development

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Dairy Essentials

24) MASTITIS: PREVENTION AND DETECTION

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INTRODUCTION

To control mastitis problems in a herd, **prevention** of new infection is of much greater benefit than attempting to cure clinical cases. Even if the rate of new infection is reduced, existing infections that are treated can be cured with only limited success. The fight against mastitis is a long-term effort that must be persistent because it is impossible to completely prevent the transmission of bacteria or other organisms that cause the disease (Figure 1).

DETECTION

Mastitis, somatic cell count and loss of production in a herd

More than 98% of the somatic cells found in the milk come from the white blood cells that entered the milk in response to bacterial invasion of the udder (see *Dairy Essential* "Mastitis: The Disease and its Transmission"). A high somatic cell count is associated with a loss of milk production. When the milk of all cows in a herd is mixed, as in a bulk tank, the somatic cell count in a composite sample is a good indicator of the prevalence of mastitis in the herd (Table 1). A somatic cell count greater than 200,000 cells / ml indicates the presence of subclinical mastitis. Somatic cell counts under 400,000 cells / ml are typical of herds that have good management practices, but no particular emphasis on mastitis control. Herds with an effective mastitis control program consistently have counts below 100,000 cells / ml. In contrast, somatic cell counts greater than 500,000 cells / ml indicates that one third of the mammary glands are infected and the loss of milk due to subclinical mastitis is at the least 10%.

The somatic cell count of a composite sample does not reveal the type of infection nor the identity of infected cows. However, it is a good tool to monitor prevalence of mastitis in the herd over time (month-by-month or year-by-year).

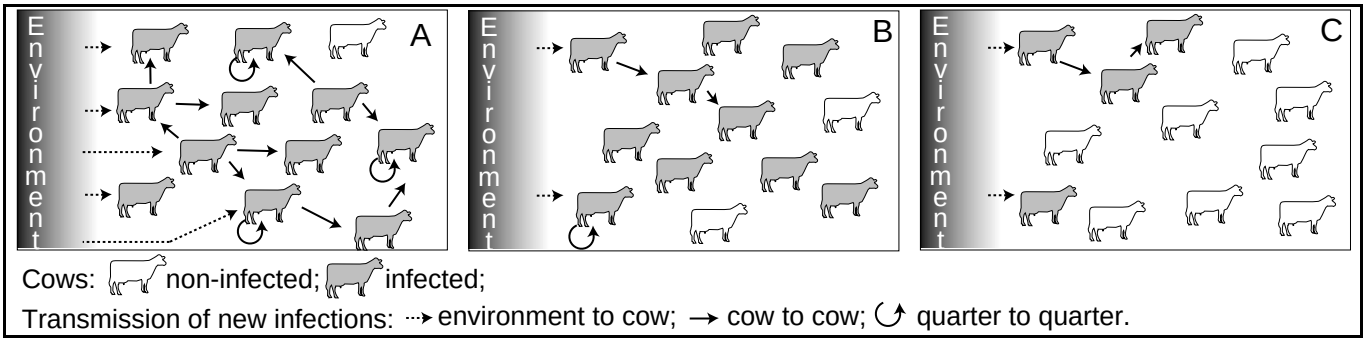

Figure 1: Improved hygiene and management practices are effective ways to reduce the rate of new infections (from A to B), but existing infections are difficult to cure and infected cows remain in the herd long after new infection rate drops (B). It is only after a continuous effort for a long time (years) that the number of infected cows in the herd decreases (from B to C).

Table 1: Relationship between somatic cell counts (SCC) measured in the pooled milk of a bulk tank, loss of production and prevalence of subclinical mastitis in the herd.

SCC	Quarter infected	Loss of milk production (%)	Subclinical mastitis
< 200,000	6%	0-5	Close to none
200,000 - 500,000	16%	6-9	A few cases
500,000 - 1,000,000	32%	10-18	Widespread
> 1,000,000	48%	19-29	Epidemic

Bacteria in the milk

Cultures of bacteria in the milk may be useful to quantify bacteria and identify the organisms causing mastitis and high somatic cell counts. Most often, a mixture of different types of bacteria are found, but at times, a bacterial species may predominate (e.g., *Strep. agalactiae*). If bacterial counts are elevated (>50,000 bacteria/ml), a culture may provide clues to the source(s) of contamination. The presence (or absence) of specific organisms help formulate recommendations to prevent the spread of organisms found in the herd. Well-managed herds have bacterial counts less than 1,000 per ml.

Mastitis detection in individual cows

Physical examination of the udder

Signs of acute mastitis include quarters that are swollen, warm and painful to the touch. Changes in size and presence of scar tissue may be detected more easily after milking, when the udder is empty.

Appearance of the milk

Observation of the first streams of milk (foremilk) permits the detection of abnormal milk that should be withheld. Abnormal milk may show discoloration (wateriness), flakes, or clots. Caution should be exercised during the removal of foremilk to avoid splashing of contaminated milk on the cow's limbs, tail, or udder. In addition, the operator should not collect the foremilk in the palm of the hand because of the risk of transferring bacteria from one quarter to another and from one cow to the other. In a stanchion barn, foremilk is typically drawn into a "strip cup" or plate. In a milking parlor, however, it may be drawn directly onto the floor and flushed away immediately after observation.

The California mastitis test

For this test, the milk of each quarter is mixed with a detergent solution. Milk of infected quarters forms a gel; the consistency of this gel is evaluated visually. This reaction is related broadly to the number of somatic cells in the milk, and a positive reaction indicates mastitis.

Bacterial culture

Usually, this test is performed on selected cows for which somatic cell counts of composite samples reveal a serious and persistent problem. Cultures of an individual cow's milk identify the bacterial species, so this is the most reliable way to decide on the optimum antibiotic treatment for a particular cow.

PREVENTION

The prevention of mastitis can be achieved by following simple steps aimed at reducing the rate and duration of infection (Table 2).

Proper milking hygiene: Teats should be cleaned and dried before milking. If milk is filtered, the presence of particles (soiled material) in the filter indicates insufficient cleaning of the teat during udder preparation or a lack of hygiene during attachment and removal of the milking unit.

Milking machine should function and be operated properly: Vacuum level in the milking unit should be between 275 and 300 mm of mercury and should fluctuate as little as possible. Fluctuations may be reduced considerably by avoiding squawking or slipping of the milking unit during milking, and shutting off the vacuum to the unit before teatcups are

removed. The vacuum regulator should be kept clean and checked regularly for accuracy.

Dipping the teats after milking: Research indicates that the rate of new infection may be decreased by more than 50% when a suitable disinfectant is used to fully immerse or spray the teats. Post-milking teat dipping is most effective against *Staphylococcus aureus* and *Strep. agalactiae*, the two most contagious mastitis-causing bacteria. Teat dipping does not affect existing infections. This explains why, in the short term, many farmers do not see the positive effects of teat dipping. To achieve a rapid decline in the level of infection, it would be necessary to eliminate infected cows in the herd (Figure 1).

Treatment of all quarters of all cows at drying off: The effective use of a long term antibiotic infused in each quarter of the udder at the last milking of a lactation, reduces the incidence of new infections during the dry period. In addition, dry cow therapy is the best way to cure chronic and subclinical mastitis that can rarely be treated successfully during lactation.

Timely and proper treatment of all clinical cases: Adequate therapy must be decided by a veterinarian and the cow should be handled accordingly to avoid the risk of spreading the disease.

Culling chronically infected cows: Generally, this method is effective because in most herds, only 6 to 8% of all cows account for 40 to 50% of all clinical mastitis.

Good nutrition to maintain the cow's ability to fight infections: Deficiencies of selenium and vitamin E in the diet have been associated with an increased rate of new infection.

Other practical management practices: Some simple practices help reduce the spread of mastitis.

- Feed the cows immediately after milking so that they remain standing for at least one hour before they lie down.
- Milk infected cows last.

TREATMENT OF MASTITIS

Acute mastitis

Acute mastitis, such as that caused by coliform bacteria, endangers the cow's life. A veterinarian should be called immediately when the cow shows signs of generalized reaction to an udder infection (inability to stand, rapid pulse, fever, etc.). Milking the affected quarter every two to three hours helps to eliminate toxins.

Clinical mastitis

Prompt treatment of clinical mastitis limits the duration and possible spread of the disease. A veterinarian familiar with the history of the disease in the herd should prescribe the best therapeutic treatment. When antibiotic treatment is recommended, it is critical to follow instructions, especially regarding the duration of treatment. Often treatments are discontinued too soon, preventing the antibiotics from reaching and destroying organisms in parts of the udder that are difficult to reach (the "deep-seated" infections).

Only mastitis caused by *Streptococcus agalactiae* can be treated successfully with antibiotics during lactation (more than 90% cure). However, when mastitis is caused by *Staphylococcus aureus*, bacterial coliforms and many other organisms, the success rate of antibiotic treatment rarely exceeds 40 to 50% and sometimes is as low as 10%.

Subclinical mastitis

High somatic cell counts in the milk indicate subclinical mastitis, but this should not be used as a criteria to treat cows with antibiotics because, as indicated in previous

Table 2: Questionnaire to help identify the source of transmission and evaluate prevention practices in a dairy herd (when applicable, the preferred answer is indicated by the square: ❑)

		Yes	No
THE COWS			
1.	Which cows have the most clinical mastitis? dry cows__ ; recently calved__ ; first calf heifers_ ; high producing cows__; always the same cows__ ; combination__ .		
THE ENVIRONMENT (HOUSING)			
2.	What is the type of stall/bedding on which the cows lies? concrete__ ; sand__ ; soil__ ; straw __ ; sawdust__ ; shavings__ ; other_____ .		
3.	Is the bedding clean (free of manure) and dry?	❑	—
4.	Is feed provided after milking to encourage cows to stand for at least an hour?	❑	—
5.	Are slow-release antibiotics used on all quarters of all cows at drying off?	❑	—
THE MILKING MACHINE			
6.	Has the milking equipment been installed properly?	❑	—
7.	Are vacuum pump, vacuum distribution tank, and pipelines of adequate size for the number of milking units?	❑	—
8.	Are pulsators and vacuum regulators* clean and working properly?	❑	—
9.	Is milking equipment cleaned adequately?	❑	—
10.	Are liners and other rubber parts free of cracks or holes and replaced regularly?	❑	—
THE MILKING PROCEDURE			
11.	Are teats washed with minimum water and **dried thoroughly** with individual paper towel or clean individual cloths?	❑	—
12.	Is foremilk examined regularly for abnormalities?	❑	—
13.	If predipping, is contact time adequate and all predip removed by drying?	❑	—
14.	Does water accumulate at the mouth of the teatcup liner during milking?	—	❑
15.	Is slipping and squawking of the liners prevented?	❑	—
16.	Is machine stripping avoided?	❑	—
17.	Do most cows milk out and is the milking unit removed in 3 to 6 minutes?	❑	—
18.	Are teats disinfected after milking?	❑	—
19.	Is at least the bottom 2/3 of the length of the teat disinfected?	❑	—

* To test the vacuum regulator and vacuum reserve, do the following test: After turning the milking machine on, let air into one unit for 5 seconds. Check the vacuum gauge. Place your thumb in the liner and count the number of seconds needed to feel the normal pulsation. If the gauge needle has gone past the set point and it takes more than 3 seconds for the pulsation to return to normal, either the regulator is malfunctioning or the vacuum reserve is insufficient. Both problems may cause major vacuum fluctuation during milking.

paragraphs, the rate of cure is generally very low. Cases of subclinical mastitis cases are better treated at the time of drying off.

Antibiotic treatment of mastitis during lactation is ineffective for the most part. Generally, treatment at drying off is the most effective way to cure existing subclinical mastitis.

Antibiotic therapy at drying off

Intramammary infusion of slow-release antibiotics at the time of drying off (dry cow treatment) is an essential component of a mastitis control program on the farm. Dry cow therapy helps cure about 50% of the mastitis caused by *Staphylococcus aureus* and 80% of environmental streptococci (*Strep uberis* and *Strep. dysgalactiae*, etc.). One infected quarter treated and cured at drying off will produce about 90% of its potential during the next lactation. However, if a quarter remains infected or becomes infected during the dry period, that quarter will produce only 60 to 70% of its potential.