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Jeffrey F. Keown
University of Nebraska at Lincoln, jkeown1@unl.edu

Paul J. Kononoff
University of Nebraska at Lincoln, pkononoff2@unl.edu

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Basic Principles of Mastitis Control

Jeffrey F. Keown, Extension Dairy Specialist
Paul J. Kononoff, Extension Dairy Specialist

Mastitis in dairy cows is a frustrating, costly, and complex infection. A good, workable, effective preventive control program is presented in this NebGuide.

General Characteristics of Mastitis

Mastitis is an inflammation of the mammary gland usually caused by bacterial infection of udder tissues. Except for rare injuries, infectious bacteria or other pathogens — e.g. yeast, fungi, etc. — enter the udder through the teat end. Mastitis in both clinical (obvious abnormality, visible to naked eye) and subclinical (unseen signs of abnormality, invisible to naked eye) stages is a frustrating, costly and complex disease that reduces the quality and quantity of milk.

The Cost of Mastitis

Milk losses due to mastitis exceed $1 billion yearly in the United States. Subclinical cases, in which the udder and milk appear normal, are responsible for approximately 70 percent of these dollar losses, due to reduced production. In an average dairy herd of 100 cows, for each known clinical case, there are generally 15 to 40 subclinical cases. Because of the subclinical form and other characteristics of this disease, control measures must be applied on a herd, rather than individual cow, basis. Treatment and involuntary culling costs increase annual losses to the U.S. dairy industry to nearly $2 billion per year. Milk quality losses are more difficult to measure but increase the losses even more. (Estimate of Nebraska losses, 2005 data, $45/cow/year).

Causes of Mastitis

The causes of mastitis are complex and varied, but a good control program can minimize problems and losses. Management of three broad areas of dairy production is key to mastitis control. These areas are the environment, cow susceptibility, and microorganisms that invade the teat end to establish mammary gland infection. A good control program will minimize the incidence of mastitis.

All dairy herds have a certain level of mastitis because complete eradication of udder inflammation is impossible. The herd level of mastitis is important as it reflects not only the rate of new infection, but also the duration or length of the time existing infections last. An effective control program will minimize the number of new cases and reduce the duration of existing infections.

Mastitis Control Program

An effective control program must be directed at reducing the level (rate and duration) of mastitis in the herd. Procedures to control the rate of new infection must focus on reducing teat end exposure to infective microorganisms. This is accomplished by strict attention to sanitary measures on the cow and in the cow environment. Duration of existing mastitis (infection already present) is controlled by the use of: 1) cowside rapid test (i.e. California Mastitis Test [CMT]) and 2) laboratory detection tests to identify subclinical cases. Then appropriate treatment or culling, as advised by the attending veterinarian, should be done. Prompt action should begin when the infected cow is first identified to reduce potential spread to other cows. At that time, apply control measures to prevent spreading the infection to other quarters or cows, regardless of the source. Appropriate management techniques applied to infected animals are very important to control spreading of infective organisms.

Milk Quality Tests and Related Regulations

State dairy regulatory agencies, due to food safety and quality factors, mandate that a milk quality test be conducted at least monthly by the milk market. Laboratory tests on tank milk, either via microscopic or electronic counters, determine milk somatic cell count and accurately indicate the herd mastitis level at that particular time. The Federal and State Pasteurized Milk Ordinance (PMO) specifies minimum quality standards for milk to be sold for human consumption. The PMO requires this milk to have a somatic cell count (SCC) of 750,000 per milliliter or less. High SCC scores affect milk quality, which often has “off flavors,” poor shelf life, and other undesirable characteristics.

Linear score, another term to indicate mastitis or SCC levels, is now being used by Dairy Herd Improvement Associations (DHIA). The linear score is represented by numbers from 0-10 that parallel an increase in SCC. As the SCC level doubles, the linear score increases by one. *Table I* shows the relationship and significance of somatic cell counts, linear score, and milk production loss.

Table I. Significance of somatic cell counts, linear score, and milk production loss.

	SCC range (in thousands)		*Estimated milk loss*	
Linear Score	*From*	*To*	*Pounds per day*	*Pounds per lactation*
0-2	0 -	7	0	0
3	7 -	14	1.5	400
4	14 -	28	3.0	800
5	28 -	56	4.5	1,200
6	56 -	112	6.0	1,600
7	112 -	224	7.5	2,000
8	224 -	448	9.0	2,400
9	448 -	896	10.5	2,800

The somatic cell count or linear scores are important tools to monitor the level of infection, indicate the possible type of infection, and to assess the control program progress. Several months – and up to a year in many instances – may be required before a sustained reduction of somatic cell counts is observed, as many existing infections respond very slowly. The speed of response will vary depending on which type of infection or infections is present. Abrupt changes in SCC are usually achievable only with extensive culling. However, proper use of a good comprehensive control program (see Mastitis Control Procedures below) can reduce losses up to 75 percent in one year and will maintain mastitis at a reasonable level if the program is properly continued. Per cow savings can be as much as $200 per year at current milk prices.

Mastitis Control Procedures

Procedures to establish a workable and effective mastitis control program are:

1. Work with your attending herd veterinarian — in conjunction with your fieldman, milking equipment dealer, and university extension personnel, if necessary — to develop a mastitis control program for your herd. A "team" effort is frequently necessary.
   a. Treat all clinical cases promptly. Follow your veterinarian's directions. Consider possible antibiotic residue implications. Use proper administration procedures and comply with all withhold times.
   b. Consult your veterinarian with regard to the use of the newly developed "J-5" *E. coli* vaccine that is helpful in preventing coliform mastitis. This vaccine is not a replacement for good mastitis control measures, but does offer some protection for herds that are experiencing very high rates of environmental mastitis caused by coliform infections. Veterinary advice is necessary due to possible adverse endotoxic reactions.
   c. Use cowside tests (CMT) to detect subclinical cases and to monitor herd status.
   d. Use laboratory cultures to identify infective organisms.
   e. Keep complete individual cow records and use them to identify and recall important data concerning overall health, drug residues, response to antibiotics, infective pathogens, and other production factors.
2. Environmental factors — maintain strict sanitation.
   a. Keep cows clean, dry and sheltered from harsh cold.
   b. Provide proper ventilation, dry bedding, and facilities that minimize the risk of teat freezing or udder injury, while maximizing cow comfort.
   c. Provide easy access to good quality water and have fresh feed in bunks as cows exit the milking area, to keep the cow on her feet for one hour following milking. This allows time for the teat orifice to close tightly.
3. Milking machine — maintain strict sanitation and proper function.
   a. Have your equipment dealer conduct maintenance checkups at least twice a year.
   b. Eliminate erratic vacuum fluctuations and milkline flooding by maintaining adequate vacuum pump airflow capacity, proper piping system design, and use of a properly located, responsive vacuum regulator.
   c. Change inflations at least as frequently as recommended by the inflation manufacturer.
4. Establish proper milking habits.
   a. Strive to ensure cows are clean and dry as they enter the milking area before milking.
   b. Wash the lower part of the udder with warm (100-105°F) running water and the bare hand, and massage teats to stimulate milk letdown. Use a hose nozzle with controllable flow.
   c. Dry udder with single-use paper towels.
   d. Remove 2-3 strips of foremilk and observe for any sign of abnormality.
   e. Use of pre-milking teat dip (optional).
      1. Pre-dipping is the commonly used term.
      2. Use only products labeled for pre-dipping.
      3. May help prevent infections due to environmental organisms. Not effective in controlling existing infections due to contagious pathogens harbored in the udder.
      4. Teats must be free of visible soiling and dirt before pre-dipping or process is of limited or no value and will not succeed in helping control infections.
      5. Pre-dips should have contact time of 20-30 seconds, then remove excess and dry with clean, single-use paper towels.

6. Pre-dip sequence procedure: Clean teats, forestrip, pre-dip teats (20-30 seconds contact time), dry teats with paper towel to remove residues, attach milking units.

f. Attach milking machine within one minute after the beginning of prepping to get full benefit of the letdown hormone, oxytocin. With pre-dipping, attaching unit within one minute is very difficult but worthwhile doing. Minimize air admission during unit attachment. Do not attempt to prep more cows than you can effectively handle within stated time constraints. Clean cows entering the milking area greatly enhance the ability to use proper procedures.

g. Complete the milking promptly. Turn off the vacuum before removing unit. Complete milkout aids the cow in recovering from existing mastitis and enhances production.

5. Dip the teats with an effective, non-irritating, approved teat dip following milking.
   a. During bitter cold weather (windchill of 20°F or lower), dip the teats and after 15-20 seconds, blot away excess dip with a clean paper towel before allowing the cows to exit the milking area. If cows exit to an open, unprotected area, be sure teats are dry before cows exit.
   b. Use only commercially prepared products listed and approved for use as a teat dip.
6. Dry cow treatment — use an approved, commercially prepared, dry cow product.
   a. Treat all cows — all quarters.
   b. Adhere to strict sanitation practices during infusion of the dry cow treatment.
   c. Dispense/administer treatment using only single-dose syringes.
   d. Dip teats after infusion.
   e. Watch cows carefully (closely) for at least one week for any evidence of udder abnormality.
7. Cull or segregate.
   a. Cull chronically infected cows, unless the infection is curable. Only a few specific types of infections respond well to treatment. That makes accurate diagnosis very important.
   b. Segregate infected cows into a separate group, as infections frequently spread from these cows to clean cows during the milking process. Infections can also be spread by some free-stall surfaces or bedding practices.
8. Monitor somatic cell and bacterial counts. This practice helps:
   a. determine level of mastitis in the herd,
   b. identify hygiene breakdown or weakness — helps distinguish possible types of infection and identify areas requiring improvement,
   c. determine clinical and dry cow treatment efficacy, and
   d. monitor sanitation practices.

Summary

Mastitis results from a complex interrelationship between the environment, the cow, and a host of bacterial or other pathogenic organisms. Mastitis severity is defined as clinical or subclinical in individual cases. The disease exists at different levels in all herds. The level can be measured by somatic cell count interpretation.

The benefits of a good mastitis control program are well documented. Failure to use an effective control program is costly. Losses include reduced milk production, elevated culling losses, added veterinary expense, milk discarded due to drug residues, and extra labor to handle or treat infected cows. Any dairy producer not using a good mastitis control program is either unaware of the losses being incurred — or has chosen to ignore them!

The control program outlined herein, if carried out properly, will effectively minimize losses in most situations. However, there are a few types of udder infections that may require special diagnostic procedures and corrective measures.

For further information on mastitis control and other dairy topics please refer to: *www.nebraskadairy.unl.edu.*

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