

Mastitis Control¹

David R. Bray and Jan K. Shearer²

Introduction

Definition

Mastitis is a bacterial infection of the udder and is still the most costly disease in the dairy industry, with losses estimated as high as \$300 per cow every year.

Except for mycoplasma, mastitis organisms enter the udder through the teat end and streak canal. Mycoplasma may also infect the respiratory system and may be transmitted in the blood or through the lymphatic system to the udder. The streak canal is held closed by a circular muscle that holds milk in and foreign matter out. Also, the streak canal is lined with keratin, which traps and kills organisms that attempt to invade through the teat end.

Mastitis-Causing Organisms

About 95% of all infections are caused by *Streptococcus agalactiae*, *Staphylococcus aureus*, *Streptococcus dysgalactiae*, *Streptococcus uberis*, and *Escherichia coli*. The remaining 5% are caused by other organisms.

Contagious Organisms

Contagious organisms are spread by hands, milking units, etc. They include *S. agalactiae*, *S. aureus*, *S. dysgalactiae*, and mycoplasma.

S. agalactiae lives in the udder and cannot exist outside the gland for long periods. It is susceptible to penicillin and, once eliminated, usually does not return to the herd unless infected cows are purchased.

S. aureus lives in the udder and on the skin surfaces of an infected cow. It can be controlled effectively with good management and is moderately susceptible to antibiotics when the infection first involves the gland. Older infections usually do not respond to treatment. Severe cases may cause death.

S. dysgalactiae may live almost anywhere: in the udder, rumen and feces and in the barn. It can be controlled with proper sanitization and is moderately susceptible to antibiotics. It is an indicator of teat end damage.

Mycoplasma is a unique organism. It does not fit the description of a bacterium, nor is it a virus; instead it is classified as a microbe. Mycoplasma

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2. David R. Bray, Extension Agent III; Jan Shearer, associate professor, dairy research, College of Veterinary Medicine, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville FL 32611.

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does not have cell walls, leaving the microbe unaffected by most antibiotics that interfere with cell-wall formation. Since no effective treatment for mycoplasma infection is available, the best way to control this disease is to avoid purchasing cattle from known positive-tested herds. In addition, if cattle are routinely purchased, the bulk tank and pot herd milk should be sampled monthly. Mycoplasma can be spread through the use of contaminated bottle mixes, syringes, and teat tubes during the treatment of mastitis cows. Other infected cows are major sources of infection, which can be transmitted by the milking machine components, hands of the operator, and common rags and sponges. Cows can also contract this disease directly from the environment. Post-milking teat dipping is essential for proper control. Mycoplasma organisms live in the soil of pastures and in cooling ponds. Because mycoplasma lives in the environment, eradication of the disease is often impossible. Another problem is that cows sometimes do and sometimes do not shed the organisms in the milk, so culture is not always a positive way to find mycoplasma. Positive cows become negative cows, negative cows become positive cows. The only way to control mycoplasma is to cull cows that become clinical with mastitis and do not cure with repeated treatment. (Routinely cull cows after five episodes of clinical mastitis in lactation.) Also cull any cows that become clinical in multiple quarters. Finally, cull cows that dramatically drop in milk production. This is good general practice, not only to eliminate mycoplasma, but to control other infections that are not going to cure. Pasteurizing calf milk will stop the spread of mycoplasma to calves who exhibit mycoplasma as tilt ear, joint infections and respiratory problems.

Control of Contagious Organisms

The spread of contagious organisms is controlled by post-milking teat dipping and, except for mycoplasma, eliminated by dry cow therapy. Herds with contagious mastitis problems must cover the whole teat to the base of the udder to control the spread.

Environmental Organisms

Environmental organisms live in the cows' environment and are always present. These organisms like high moisture and warm temperatures.

***E. coli* bacteria** are environmental pollution organisms; they live in feces, polluted water, and bedding material. Excellent sanitation is needed for their control. They are not susceptible to antibiotics. This is a major cause of clinical mastitis in dairy cattle.

***Klebsiella* bacteria** are in the Coliform family. They are often associated with green sawdust bedding, but can be found in our sand bedding. Like *e.coli*, they seem to multiply in any bedding with time; the bedding becomes seeded with bacteria from the cows' skin and from their feet, especially in barns that flush with recycled water.

S. uberis live most everywhere; in the rumen, in feces and even in the udder. This organism is becoming the most troublesome mastitis organism in the S.E. US. Many cows with *uberis* shed tremendous numbers of cells into their milk and a few cows can elevate somatic cell and standard plate counts. These cows often will continue to produce well over one hundred pounds of milk daily and not show clinical signs.

Control of Environmental Organisms

To reduce the bacterial load of environmental organisms, one must try to keep the environment as clean and dry as possible. This means scraping lots and removing old mud and replacing it with new dirt at least once a year. In addition, it is important to bed free stalls at least once every four days to keep bacterial numbers low. Milk only clean, dry udders to help offset the problem of a dirty environment.

When Do Infections Occur?

The rates of new infections are the highest during the first two weeks of the dry period and the last two weeks of the dry period. New infection rates are also high in early lactation and diminish as the lactation proceeds.

Infection Dynamics

To understand mastitis infection, you must realize how its level changes within the entire herd. New infections can be brought into the herd in four general ways: 1) new infections during lactation; 2) new infections during the dry period; 3) infected heifers entering the herds; and 4) infected cow purchases.

Infections are eliminated in four general ways: 1) spontaneous recovery, elimination by the animal's own defense mechanism, 20% effective; 2) lactation therapy, usually 30-90% effective; 3) dry period therapy, usually 80-90% effective; and 4) culling animals, very effective (100%).

Proper Milking Procedures

Proper milking procedures are important for the prevention of mastitis and for insuring complete milk removal from the udder.

Mastitis can decrease total milk production by 15 to 20%. To minimize loss and achieve maximum milk yield, follow a practical milking management scheme.

The term "milking management" includes care for the environment in which cows are housed or pastured. The dairy cow should have a clean, dry environment. This helps reduce the potential for mastitis and increases milking efficiency by reducing time and labor to clean udders before the milking process.

Moving Cows

Cows should be moved quietly and gently. If cows are frightened or hurried, the milk letdown process may be disturbed. Therefore, rough handling of dairy cattle should be avoided.

Milking Procedures

The essential rule is always to milk clean dry udders. How you get the udders clean and dry is your choice. One way is to sanitize the udders in the wash pen, fore-strip to check for mastitis, apply units, then post dip before the cows leave the parlor.

At the other end of the milking procedures scale is the full prep method, with organized routines of pre-dipping, stripping and wiping and application of units within specific times. This method is by far the most expensive to carry out. It requires more labor, more training and more supervision on all shifts to keep consistent milking procedures. This method may be the only way to keep order in the parlor on dairies that can't get a handle on mastitis due to poor milking procedures, like not detecting clinical mastitis, or milking wet and or dirty udders.

Mastitis Detection

Milking may begin with a check of all quarters for mastitis. Any cows that show clinical mastitis should be examined and appropriate action taken. If fore-milking is not done, visual checking for inflamed quarters is done by milkers and herd health people in the barns or lots. In herds with high somatic counts, fore-stripping is needed. Conductivity meters also may be used if they are part of your milking system.

Attachment and Detachment of the Milking Unit

To attach the milking unit to the teats, apply the cluster, allowing a minimum of air admission. Adjust to prevent liner slip. Air entering the unit may cause the propulsion of mastitis organisms from one infected teat into an adjacent non-infected teat. This also may happen when one teat cup is removed before the others.

Following milk-out, the machine should be removed only after the vacuum to the teat is shut off. This is accomplished most commonly by use of the Automatic Take Off Device. If no ATO is present, a vacuum shut off valve or milk hose clamp, either of which will prevent the back-jetting of bacteria from one teat to another, should be used.

Back Flushing

Research has demonstrated that back flushers do reduce the number of bacteria on the liners between cows, but do not reduce the number of bacteria on teats. Back flushers also may stop the spread of contagious organisms, but this can be accomplished at a much lower cost by teat dipping. Back flushing

has no effect on environmental pathogens that cows encounter between milkings.

Back flushers may be effective in stopping the spread of contagious mastitis; however, there is limited research to support this view. Because of the high initial cost, the need for daily maintenance, and limited efficacy, back flushers are not routinely recommended.

Milking Machine Factors

Research has demonstrated that "liner slip" is one area in which the milking machine may increase mastitis. Liner slip is when air is admitted through the top of the teat cup. Milk and bacteria, if present, may be propelled into the teat end of an adjacent teat, thus causing a new bacterial infection. Also, the use of malfunctioning pulsators can cause teat end damage and increase the rate of new infection.

The milking machine has little effect on mastitis if properly operated and functioning according to the manufacturer's specifications. Clearly, though, when operated improperly, milking machines can have a role, and malfunctioning equipment can cause mastitis in several ways. If the pulsator is dirty and does not function properly, this will cause the massage phase to be eliminated and damage the teat end. A vacuum controller that is dirty also will not function properly, and, again, will damage the teat end. Damage to this entry area for organisms increases the risk of mastitis.

Post-Milking Teat Dipping

There is only one way to effectively stop the spread of mastitis in the dairy herd, and that is by applying teat dip to every quarter of every cow after every milking. Teat dips are used to remove milk residue left on the teat and kill organisms on the teat at the time of dipping. They also leave a residual film of sanitizer between milkings.

Types of Teat Dips

Many teat dips on the market are effective in preventing new infections. Thorough coverage of the teat is more important than the type of dip used.

Dip or Spray?

The only way to apply post-milking dip is by dipping. Spray is fine for pre-treating, but your milkers must not post-dip with it.

Dry Cow Therapy

Dry cow treatment is administered after the last milking of the cow before the dry period. Care must be taken to scrub the teat end with cotton and alcohol before infusion and to use teat dip after infusion.

There are many antibiotics available for dry cow therapy. Use the one that works for you. The idea of dry period therapy has been accepted because antibiotics can be put into a slow-release base that allows them to stay in the udder longer. They are not constantly being milked out of the udder, as is the case with lactation therapy. Antibiotics can be administered in high quantities because there is no concern for milk levels and antibiotic residues.

While dry treatment is very effective, it must be administered properly, and you must ensure favorable environmental conditions for your dry cows. Teat ends must be scrubbed clean with cotton alcohol pads before you inject the dry treatment. If you do not take care to clean the teat ends properly, you risk injecting very high numbers of bacteria into the udder. This would overwhelm the antibiotic just administered. Unsanitary treatment procedures cause, rather than eliminate, mastitis. The use of the internal teat sealant Orbeseal,[®] which forms a physical seal, has been shown to be effective in conjunction with dry cow therapy.

Management of dry cows also is very important in mastitis control. If dry cows are exposed to muddy or dirty conditions, risks of mastitis will increase. This is especially true at the time of calving; cows are under much stress during this period, and if an udder is exposed to wet dirty conditions, mastitis will increase. If you believe that your dry cow therapy program is ineffective, it may be because of poor treatment procedures and/or improper management of the cows during the dry period and at calving.

Solving a Mastitis Problem

First, determine what kind of mastitis you have: contagious or environmental? You can do this by taking bulk tank samples to a mastitis laboratory. In Florida, use the All Florida Vet Lab in Archer. If you have contagious bacteria, you need to concentrate on post-milking teat dipping to stop the spread from quarter to quarter and from cow to cow. Environmental organisms live in the stalls, lots, and pastures. They can be transmitted to cows during milking if udders are left wet and/or dirty, so you must clean up where the cows lie down and, once again, ensure that you always milk clean, dry udders.

How To Reduce Your High Somatic Cell Count (SCC)

1. Cows with a high somatic cell count (SCC) indicate a problem with environmental organisms. To control this problem, identify your high-SCC cows. You have been doing this with the Dairy Herd Improvement Association (DHIA) "hot list;" you should complete the DHIA SCC "hot list" every month. Conscientiously completing the DHIA SCC "hot list" every month will help prevent mastitis problems in the future. Management should go through the herd and fore-strip all cows to find clinical quarters. It is important to ensure that someone responsible and competent does this job because it must be done thoroughly and well—the future of your dairy may depend upon it. Find your clinical cows; also check for all non-functioning quarters, and put a leg band on all symptomatic cows. Keep a list and add to it as you get new quarters.

2. Once you have identified these high-SCC cows, take some action on them, treat them, and dry them off if they are pregnant, or cull them. You can treat these chronic strep *uberis* cows every day of their lives and they will still test positive for strep *uberis*. Sell the chronic cows.

3. For chronic cows, ask your veterinarian to recommend a treatment regime, and make sure to follow instructions. Abide by the veterinarian's withholding recommendations and test milk for residues before adding it to the bulk tank.

4. If you have treated a cow more than five times in one lactation period, it is time to cull the cow. Cows with multiple episodes below 5 should either be culled or dried off to keep their milk out of the tank. (Drying cows off early, of course will enable you to administer dry cow treatment.)

5. In cows with some healthy and some affected quarters, one option is to have your veterinarian kill the chronic quarters and milk the other three. Make sure there is no withholding time on the milk for the solution used to kill the chronic quarters.

6. Administer the California mastitis test (CMT) to all fresh cows. Quarters that show heavy gelling can be treated with lactation tubes--you'll have to withhold their milk anyway for the dry treatment to clear. You can also administer CMT to other cows that just "don't seem right."

How to Reduce High SCC (Contagious Organisms)

1. Find your high-SCC cows (see procedure above).

2. Because these bacteria spread easily, treat all four quarters of each cow.

3. If the cow is clear of clinical mastitis and the CMT is clear, the problem is probably strep agalactiae and if you do a good job of teat dipping, it should resolve quickly.

4. If the quarter does not clear after treatment or has been treated multiple times, the problem may be staph *aureus*, which is contagious and will never clear up, or it may be an environmental bacteria like strep *uberis*. The cow probably should leave the herd.

Summary

Mastitis is a very complicated and expensive disease. The best way to combat it is to keep your cows as clean as possible; have a proper nutrition program; keep your equipment in proper milking order; milk clean, dry udders and teats; post-milk dip; and dry treat all cows going dry. The basic rules are three: keep cows and facilities clean, treat clinical mastitis as you find it, and cull chronic cows after five episodes per lactation.