

Handling a Herd Mastitis Problem

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A herd whose bulk tank somatic cell count exceeds 200,000 or DHI SCC score is above 2.5-3.0, or a herd where more than 3 cows per 100 cows show clinical mastitis over a month's time has a costly mastitis problem because of significant lost milk production and reduced economic returns. Herds with elevated SCC may not have many cows that are clinical, but subclinical mastitis infections may cause permanent destruction of milk secretory cells with permanently lower milk producing ability. In other herds, short duration environmental infections may not have great impact upon SCC, but these cows also have depressed milk yields, and considerable milk may be discarded because of antibiotic treatments. Consequently, dairy herds are losing money through greater culling, increased labor intensity, and greater risk of shipping milk that may be contaminated with antibiotic residues.

The question becomes, "What caused the problem and what must be done to correct the current situation and prevent similar problems in the future?"

Testing

Bulk tank. Culturing of bulk tank milk samples can be useful to determine the presence or absence of certain bacteria which gives you some guidance in directions to look for the source of the problem (<http://pubs.ext.vt.edu/404-405/>). The presence of *Staphylococcus aureus* or *Streptococcus agalactiae* almost always indicates the presence of these microbial infections in the herd. These mastitis-causing bacteria usually are spread from infected to uninfected cows during milking. Collect bulk tank samples over consecutive days or weeks to get a clearer picture of a herd's problem rather than taking only one bulk tank sample. Agitate the milk in

the tank for 5 minutes prior to collection (National Mastitis Council). Use a clean, sanitized dipper to collect the milk sample from the top of the tank (never the outlet). Pour the first sample back into the tank to rinse sanitizer off the dipper. Sample two consecutive bulk tanks and freeze the samples. Sample the third bulk tank load and refrigerate or freeze it until all three samples can be delivered to a laboratory. Ask the laboratory if they could plate 0.05-0.1 ml of milk rather than the customary 0.01 ml.

Environmental pathogens (streptococci other than *agalactiae* and coliforms, usually *E. coli*) indicate poor hygiene either during equipment cleaning and sanitation, during milking, or between milkings. Mastitis infections should be highly correlated to cases of clinical mastitis in the herd and bacteria counts may be high while SCC could be low.

Individual cows. Once results of bulk tank cultures are known, milk samples should be collected from individual cows and cultured. Collect aseptic samples from cows with DHI SCC scores of 5 and higher or actual SCC above 300,000 (<http://pubs.ext.vt.edu/404-228/>) on these cows to determine which quarters are positive. Also, collect samples from cows with clinical mastitis, and fresh cows, especially heifers (<http://pubs.ext.vt.edu/404-281/>). Sample and culture at least 15 cows. Samples can be stored in the freezer for as long as 6 weeks. Examine teat ends for abnormalities. Palpate udders to determine extent of scar tissue development. This gives a more complete picture of the type of infection in the herd and its origination. Request a sensitivity test which will indicate which antibiotics may not be appropriate for treating these infections.

Table 1. Major mastitis-causing pathogens and sources of infection

Pathogen	Source and Control
<i>Staphylococcus aureus</i> (<i>S. aureus</i>)	Lives in the udder or on wounds, milkers' hands. Transferred at milking time by milking machine or milking practices. Controlled by hygiene, milking procedures, and culling. Often resistant to treatment. See VCE Publication 404-229 (http://pubs.ext.vt.edu/dairy/404-229/)
<i>Streptococcus agalactiae</i>	Lives in the udder. Spread from cow to cow, usually by poor milking practices. Controlled by strict hygiene, teat dipping, and dry cow therapy. Can be treated successfully during lactation.
Environmental Streptococci (<i>Str. uberis</i> or <i>Str. dysgalactiae</i>)	Lives in the environment. Controlled by good sanitation and hygiene, clean stalls, and environmental management. Responds to lactation and dry cow treatment. See VCE Publication 404-234 (http://pubs.ext.vt.edu/dairy/404-234/)
Coliforms (<i>E. coli</i> , <i>Klebsiella</i>)	Lives in manure, or dirty, wet, and muddy areas; polluted water; dirty milking equipment. An environment problem. Good sanitation and stall management helpful. Infections can occur between milkings, but also caused by poor milking practices. See VCE Publication 404-234 listed under environmental strepto cocci.

Contagious Infections

Contagious infections are caused by *S. aureus*, *Str. agalactiae*, or mycoplasma and are usually spread from infected to non-infected cows during milking. *S. aureus* organisms colonize abnormal teat ends or teat lesions. Milkers' hands, wash cloths, teat cup liners, and flies are ways in which the infection can be spread from cow to cow. The organisms probably penetrate the teat canal during milking. Irregular vacuum fluctuations impact milk droplets and bacteria against the teat end with sufficient force to cause teat canal penetration and possible development of new infection (<http://pubs.ext.vt.edu/404-742/>). Milking practices should be reviewed (<http://pubs.ext.vt.edu/dairy/404-227/>). Attention should be given to the following:

1. Milk with clean hands and wear nitrile gloves.
2. Optimize milk let-down which requires 25 to 30 seconds of stimulation per cow, followed by attaching milkers 60-90 seconds after preparation started. This can be done by stripping 4-5 squirts of milk from each quarter.
3. Examine fore-milk for clinical mastitis (flakes, clots, watery milk).
4. Wash teats with only as much water as necessary to get clean; using paper or cloth towels to scrub teats when dirty. (This step may be eliminated if teats are reasonably clean).

5. Pre-dip and allow 30 seconds contact time.
6. Dry teats thoroughly, using single service paper or cloth towels .
7. Attach milking units within 60-90 seconds. Milking units must be properly aligned on the udder to prevent liner slips or squawking.
8. Avoid over-milking. Remove milking units by shutting off the vacuum.
9. Dip teats covering at least the bottom half of teat.
10. Backflush units or segregate cows with contagious infections.

Mastitis caused by *S. aureus* or mycoplasma bacteria is extremely difficult to control by treatment alone. Successful control is gained only through prevention of new infections and cow culling.

Cows infected with contagious mastitis must either be culled, segregated from the milking herd and milked last, milked with separate milking units, or teat cup liners must be rinsed and sanitized after milking infected cows (backflushed). Treated cows should be milked last to avoid antibiotic contamination of the bulk tank, even when a special milking unit is used. Overflows into the bulk tank occur too frequently (<http://pubs.ext.vt.edu/dairy/404-403/>).

Milking Equipment

The major factor influencing new intramammary infection is exposure of the teat orifice and duct to pathogenic organisms. Machine milking can influence teat end contamination by modifying conditions at the teat end so that bacterial colonization occurs more readily. These conditions are often referred to as teat orifice “eversion,” or “hyperkeratosis.” The development of lesions, hemorrhagic blisters on teat ends, and teat chapping has been associated with improperly operating milking machines. Such skin abnormalities are readily colonized by pathogenic bacteria and may lead to intramammary infections. Abrupt reduction in milking vacuum can cause backward movement of air toward the teat end, propelling droplets of milk containing bacteria directly from the exterior of the teat into the teat sinus. This “impact mechanism” results from vacuum fluctuations. Liner slip is an important event in the generation of vacuum fluctuations. The impact mechanism is the only known means by which vacuum fluctuations are capable of increasing infection rates. Milking equipment may cause trauma to the teat, rendering it more susceptible to colonization and infection. Trauma to the mucous membranes lining the teat sinus may provide an environment favoring bacterial colonization or multiplication. Local pain may lead to neurohormonal responses which suppress immune function and increase the likelihood of disease as well as interfering with milk ejection or “letdown.” Milking system tests should be conducted on a regular basis by a trained serviceman using procedures outlined by the National Mastitis Council. These tests should include: Operating vacuum level; Vacuum pump capacity; System leakage; System and effective reserve and unit consumption; Manual reserve; Cluster fall-off requirement; Regulator load test; Regulator loss and Regulator response; and Individual pulsators should be graphed.

Environmental Mastitis

Environmental streptococci and *E. coli* are able to survive outside the udder indefinitely, although infected quarters may be a reservoir of infection resulting in mammary gland infections developing as a result of milking. The main factor in controlling infection from the environment is to keep cows clean and dry between milkings, minimizing opportunity for teats to become exposed to environmental pathogens (<http://pubs.ext.vt.edu/404-234/>). Dirty teats and udders are difficult to properly clean and dry without upsetting the milking routine. Attention should be given to the following:

1. Provide an environment that will minimize exposure to dirty, wet conditions.
2. Properly design and maintain free stalls in clean and dry condition. Eliminate build-up of wet packs under cows and remove manure from stalls once or even twice a day.
3. Don't let cows have access to ponds, drainage ditches, or swampy areas.
4. Keep calving lots clean and dry. Rotational loafing lots are preferred.
5. Enhance prevention of new infections by using dry cow therapy.
6. Immunize during dry period and early lactation.
7. Keep accurate treatment records.
8. Use milking procedures that stimulate milk ejection and result in clean and dry teats, such as avoiding excessive water and use of pre-dipping.
9. Control flies.
10. Remember that new infections can be found in many first lactation cows, either at calving or in early lactation.
11. Supplement the diet with vitamin E and selenium especially three weeks before calving; also supplement with vitamin A and beta-carotene; and balance dietary copper and zinc content to meet requirements.

Summary

Preventive measures include attention to detail, cleanliness and sanitation, good milking practices, a properly operating milking system, good housing and environment, and dry cow management. Preventive measures also include monitoring the herd somatic cell count and incidence of new clinical cases from month to month and culling when necessary.

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