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Reducing Somatic Cell Count in Dairy Cattle

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Somatic cell count (SCC) is the total number of cells per milliliter in milk. Primarily, SCC is composed of leukocytes, or white blood cells, that are produced by the cow's immune system to fight an inflammation in the mammary gland, or mastitis. Since leukocytes in the udder increase as the inflammation worsens, SCC provides an indication of the degree of mastitis in an individual cow or in the herd if bulk tank milk is monitored.

An inflammation of the mammary gland may result in clinical mastitis with varying degrees of visible signs of the disease or subclinical mastitis where no visible symptoms occur. Pathogenic bacteria entering the udder via the teat orifice move into the teat canal and cause an infectious response. Contagious bacteria (*Streptococcus agalactiae* and *Staphylococcus aureus*) are more difficult to control than environmental pathogens such as coliform. The goal of a sound mastitis control program is to minimize bacteria that enter the udder plus minimize the growth of bacteria in the udder.

Monitoring SCC is especially critical in diagnosing cows with subclinical mastitis since no visible signs of an inflammation are observed by the dairy producer. Culturing bacteria in the milk of an individual cow may be used to determine bacteria causing mastitis if a more specific diagnosis is needed. Bacteria are sensitive to specific antibiotics, which also may be indicated by the culture.

Methods to Monitor SCC

The most common methods of monitoring SCC in bulk tank milk are actual SCC from the health department or milk plant and the Wisconsin Mastitis Test (WMT). In an individual cow, the actual SCC or linear SCC score from Dairy Herd Improvement (DHI) records and cow-side tests such as the California Mastitis Test (CMT) indicate SCC. Also, some milk processing plants will measure SCC on samples of milk from individual cows. Table 1 shows that all methods can indicate SCC. However, the CMT is a subjective measure and may vary from dairy producer to dairy producer.

Importance of Decreasing SCC

Federal law allows milk to be sold only if the bulk tank has a SCC of less than 750,000/ml. The primary reason for dairy producers to reduce SCC is because SCC relates to milk losses due to mastitis (see Table 1). If they can reduce their SCC from 600,000 to 200,000 cells/ml, they can decrease milk production losses by 600 pounds per cow per year. In a 100-cow herd, these losses amount to $7,500/year if milk is valued at $12.50/cwt.

Milk processors want a decreased SCC because it reflects increased cheese yield and keeping quality of the milk. Marketing agencies now pay premiums for milk with low SCC. If a premium of $0.25/cwt is paid for decreasing SCC from 600,000 to

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Table 1. Somatic Cell Counts as They Relate to Estimated Milk Losses					
CMT (Score)	WMT (mm)	Somatic Cell Count (cells/ml)	DHIA SCC (linear score)	Milk Loss (%)	Estimated Milk Production Loss Per Cow/Year* (lb)
Negative or Zero	2 5	100,000 200,000	3 4	3 6	400 800
Trace or Slight Gelling	8 10 12	300,000 400,000 500,000	5	7 8 9	1,000 1,200 1,300
1 or	14 16 18 20 22	600,000 700,000 800,000 900,000 1,000,000	6	10 11 12	1,400 1,500 1,600 1,650 1,700
2	29	≥1,600,000	≥7	≥12	≥1,700
*Based on 14,000-15,000 lb average/cow/year. Source: Mastitis: Counter Attack, Philpot and Nickerson (1991).					

below 300,000 cells/ml, this premium totals 15 cents per cow per day for a herd averaging 60 pounds milk/day or $5,475/year in a 100-cow herd.

Methods to Reduce SCC

There are two methods of reducing SCC. The first method, culling cows, is a short-term solution which can quickly reduce SCC in the bulk tank. The second method, controlling mastitis, is a long-term solution which should be the basis of a sound management program. The most economical method to determine SCC is testing monthly milk samples from each cow.

Culling Cows

Cows with a very high SCC that do not respond to antibiotic therapy or that have chronic mastitis may have to be culled from the herd. Usually, cows with high SCC have mastitis that is caused by contagious bacteria, primarily *Staphylococcus aureus* but also *Streptococcus agalactiae*. The most common source of contagious bacteria is other infected cows; whereas, environmental pathogens are most commonly isolated from recently calved and dry cows. These bacteria, especially *Staphylococcus aureus*, often do not respond to routine antibiotics and should be cultured to determine a more appropriate antibiotic. If the cow then does not decrease in SCC after more extensive treatment, she should be culled.

Culling 5 percent or fewer of the cows in your herd can markedly decrease SCC in the bulk tank if these cows have very high SCC. For example, if the bulk tank average is 1,000,000 cells/ml and one average-producing cow with a SCC of 10,000,000 cells/ml is culled from a 100-cow herd, the bulk tank average decreases to 909,000 cells/ml. If five cows with an average SCC of 7,500,000 cells/ml are culled from a 100-cow herd, the SCC in the bulk tank decreases to 658,000 cells/ml.

The critical decision in culling cows to reduce SCC in the bulk tank is to determine the individual cows that have the high SCC. For most producers, DHI records can provide this information in the most efficient and economical manner.

Prevention Through Nutrition

Increasing a cow's resistance to mastitis pathogens on the teat-end is an important component of immunity in the dairy cow. Nutrition is involved in maintaining immunity. Inadequate energy or deficiencies affect resistance. Diets may be deficient in nutrients that are related to immunocompetence. A balanced ration with proper amounts of minerals and vitamins improves the ability of a cow to ward off bacterial challenges. Recent research does show selenium and vitamin E are related to healthy tissue in the mammary gland.

Prevention Through Sanitation and Management

Improving sanitation to decrease mastitis is simply keeping the udder clean and free of pathogenic bacteria that cause mastitis. Major teat contamination can be avoided by eliminating mud and preventing wading in ponds.

Bedding must be dry at all times. Straw and sand are the beddings of choice. Avoid green wood sawdust. Clean sod or new bedding is essential for all springing heifers and dry cows as well as milk cows. The grass sod in the pasture or drylot should be free of mud and objects such as sticks that damage the udder.

Special care must be exercised with heifer management. Calves should be reared in separate pens to avoid nursing. The fly population must be controlled to decrease the spread of mastitis-causing bacteria. Springing heifers should be separated from cows.

Dry Cows and Springing Heifers

Risk of intra-mammary infections is greatest during the early and late dry period when pathogens are not flushed out on a day-to-day basis. Infection rate in dry cows is directly related to the bacterial population on the teat-end. Protective sealant dips are beneficial for teat protection and should be used after treating dry cows. Extreme care must be taken to prevent contamination before sealing teats. Dry cow treatment of all quarters of all cows is recommended, but the largest danger with any intra-mammary infusion is recontamination. The teat-end must be cleaned and sterilized with a pre-dip before insertion of the dry-treatment tube. Insertion of the tube through a drop of pre-dip to a maximum depth of 3/8 inch reduces bacterial contamination entering the teat canal and minimizes damage to the keratin teat plug at the end of the teat.

Dry cow treatment helps eliminate and prevent new infection during the dry period. During the late dry period, be careful to guard against new infection. This springing period is a vulnerable time as dry cow therapy has dissipated and mammary tissue is in a growing phase without antibiotic protection. Colostrum is an ideal medium for growth of pathogenic bacteria.

Springing cows may be retreated if needed, but caution must be taken to prevent contamination. Monitoring dry cows for inflammation after treatment is necessary. Regenerating udder tissue must be monitored for swelling and inflammation. Prior to calving, dry cow teats may be cleaned and dipped as needed. The seal at the end of the teat should not be broken during the teat cleaning.

Lactating Cows

Monitor each cow monthly with SCC from DHI records for a mastitis prevention program. Follow proper and sanitary milking procedure with proper equipment. The procedure is:

1. Wash teats and dry.
2. Pre-dip for 30 seconds to kill bacteria on the teats.
3. Dry teats.
4. Squirt first milk which is highest in bacterial count.
5. Check and record abnormal milk.
6. Apply milking units.
7. Remove units at completion of milking.
8. Post-dip.
9. Allow teats to dry in cold weather.
10. Feed immediately after milking to keep cows standing to allow the sphincter muscle to close the opening at the end of the teat.
11. Separate cows in heat from the herd so that udders of cows are not injured while mounting other cows.

To minimize contamination of milk with drug residue, use only legal medication. Properly mark all cows treated with any medication for milk withholding. Follow withdrawal time required. Test treated and fresh cows before allowing milk into tank. Call the milk fieldman to test milk for antibiotics if you may have accidentally put contaminated milk in the bulk tank.

Stray Voltage

Stray voltage is damaging electricity from many sources in milking parlors that can be grounded through a cow. A small voltage can cause production of epinephrine, which blocks the effect of oxytocin that is required for milk letdown. Normal mechanism of milk letdown allows most of the milk to be removed. Incomplete removal of milk causes mastitis due to rapid bacterial growth. Frequent milking has

been used to wash out pathogenic bacteria. When abnormal bacteria are observed, stray voltage should be checked by an electrician and the power-company representative. Common causes are 120-volt motors, static electricity, off-farm voltage leak and ungrounded motors. New construction should have a grid installed beneath the floor to prevent stray voltage from grounding through the cow. Use well-grounded 220-volt motors in all areas where possible to keep both 110 legs of the incoming service balanced and reduce the likelihood of voltage drift. Sheet iron roofing generates more static electricity during windy conditions.

Summary

Producing milk with low somatic cell counts is a necessary and profitable management tool. Maintaining healthy cows through proper nutrition is the first requirement. Practices contributing the most to decreasing SCC are controlling mastitis and culling cows with a high SCC count. Records maintained by DHI with SCC contribute to profit by monitoring results of management procedures that decrease exposure of teat-ends to pathogens.

Proper milking practices including teat dipping, sanitary management and dry cow therapy based on cultures of individual quarters are the most important components of a mastitis control program. Lowering somatic cell count from 600,000 to 300,000 increases milk sales by $50 per cow per year, which is a small fraction of the total benefit. Some milk processors have incentive payments for lowering SCC in milk.

Always use legal medication to treat cows with mastitis and then withdraw the milk from market for the required time.

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