Vol. 16 No. 2 April 2011

Michigan Dairy Review

... connecting research & education with the dairy industry

www.msu.edu/user/mdr/

California Mastitis Test and Milk Quality

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Introduction

Mastitis continues to be one of the most costly problems in many dairy farms. Mastitis can manifest itself in either clinical or subclinical form. Clinical mastitis is when milk appears abnormal with the presence of flakes, clots, strings or watery. The mammary gland also may be warm or hard to the touch and may exhibit increased sensitivity. In severe cases, systemic signs may be apparent, such as, fever, cow off feed, and in shock.

Subclinical mastitis occurs when both milk and mammary gland appear normal but Somatic Cell Counts (SCC) are elevated to a level above 200,000 cells/mL. It is estimated that production losses (see Table 1) due to subclinical mastitis cost the U.S. dairy industry $1 billion/yr. Additionally, subclinical mastitis contributes to culling, death losses, and increased risk of antibiotic residues in milk.

Table 1: Association of somatic cell count (SCC), linear score (LS) and loss in daily milk yield on a cow basis.

LS	SCC Range (cells/mL)			Milk loss, ld
0	0	to	18,999	0
1	19,000	to	35,999	0
2	36,000	to	71,999	0
3	72,000	to	141,999	1.5
4	142,000	to	283,999	3
5	284,000	to	565,999	4.5
6	566,000	to	1,130,999	6
7	1,131,000	to	2,262,999	7.5
8	2,263,000	to	4,523,999	9
9	4,524,000	to	>9,999,999 =>	10.5

Somatic cells are basically white blood cells (leukocytes) that migrate to the mammary gland in response to infection in both clinical and subclinical cases. This cell migration to the mammary gland is part of the inflammatory response to bacterial infection in the udder. Cows that do not have mammary infections normally have SCC less than 142,000 cells/mL.

The California Mastitis Test (CMT) is a cow-side test that allows dairy producers to assess the SCC of each quarter of a cow's mammary gland.

The CMT Procedure

The test is very simple, can be performed at milking time, gives instant results and is economical. It is a four-compartment paddle with one compartment used per quarter (see picture on page 18). One or two squirts of milk per quarter are collected in each paddle compartment after foremilk is removed. The paddle is tilted to allow most of the milk to run out leaving about 1 to 2 teaspoons (5 to 10 mL) in each compartment.

CMT reagent is added to each compartment in volume equal to the retained milk. The milk reagent mixture is swirled in a circular motion with presence of gel or slime being recorded for each quarter. It is the CMT reagent reacting with the DNA of the leukocytes that produces the measurable response in the paddle. Reaction score results are shown in Table 2 on page 18.

Identifying quarters with higher CMT scores increase the probability of getting a positive culture. Quarters with a CMT of "3" are three times more likely to yield a positive culture than a CMT of 1. Conversely, CMT tests that result in "trace" (200,000 to 400,00 cells/mL) are quarters that are likely to be infected, but may be difficult to detect. Thus, the accuracy of CMT or somatic cell counts to predict infection is not perfect.

Studies have suggested that a single CMT or somatic cell count may only detect 60 to 80% of infected quarters. Multiple tests increase the sensitivity of detecting infections, and may be most accurate several days after calving. Thus, decisions for treatment or mastitis management programs should be made with a combination of somatic cell testing, cultures, and cow and herd history.

Potential Uses for CMT

1. Immediate determination of potential infection status of purchased lactating cows. Because the sensitivity of the CMT is not 100%, multiple screenings are suggested.

2. Testing fresh cows on the fourth day of lactation is 80% accurate for predicting infection status. Thus, fresh-cow CMT scores, in conjunction with CMT scores prior to dry off, may help to evaluate the effectiveness of dry cow therapy and the rate of new infections during the dry cow period. Quarters from fresh cows with high CMT can be selected for milk culture. Depending on bacteriology results and cow history, these animals should be treated or segregated.

3. CMT also could be used to evaluate the success or failure of mastitis treatment during lactation. A negative CMT score at 3 weeks post-treatment with subsequent confirmatory negative tests would suggest that treatment was successful. However, continued monitoring, especially for relapsed clinical cases, should be done.

4. Dry cow CMT scores also can be useful in the administration of dry cow treatments on a selective basis. However, new infection rates during the dry period, and clinical mastitis rates

in early lactation, should be monitored carefully if selective dry cow therapy is practiced. In addition, selecting infected cows for therapy with CMT is not foolproof; some infected cows may have low CMT scores, and likewise some non-infected cows may have high CMT scores.

Table 2: California Mastitis Test scores: correlation of CMT score with somatic cell count.

CMT Score	Somatic Cell Range			Gelling
None	0	to	200,000	None
Trace	200,000	to	400,000	Very Mild
1	400,000	to	1,200,000	Mild
2	1,200,000	to	5,000,000	Moderate
3	Over 5,000,000			Heavy, almost solidifies

In summary, if the limitations are considered, CMT testing has potential for use in dairy farms. It is a quick, economical method of screening cows, and particularly quarters with elevated SCC, especially over 400,000 cells/mL. This information can be part of a program to determine infection status of mammary glands on a quarterly basis. Implementing CMT testing as a standard operating procedure on your farm may help fine-tune a mastitis therapy program, reduce the risk of antibiotic residues in milk, and increase both quality and quantity of milk produced.

Samples from four quarters on a paddle. One quarter showed CMT-positive and thus needs additional evaluation.

References

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