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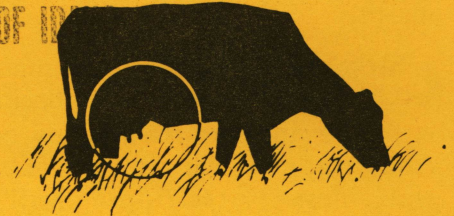
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Current Information Series No. 624

JUN 17 1983

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Mastitis and Somatic Cells in Milk

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Mastitis is defined as an inflammation of the mammary glands. In dairy cows, mastitis is a disease of the udder caused by microorganisms which gain entry into the udder and multiply because of irritation or injury. The cow's udder responds to this injury by producing an inflammation. This inflammatory reaction is meant to neutralize or destroy the irritant and to repair any damaged tissue.

Of the diseases affecting dairy animals, mastitis is the most important because of the economic loss it causes dairymen. Most of the economic loss results from subclinical infection, although discarded milk, culling, treatment expense and death losses are important with the clinical forms. Subclinical mastitis takes its toll because losses in milk production are frequently not attributed to the infection. Unless the dairyman is using mastitis tests for subclinical mastitis, he sees no evidence of disease and continues undesirable practices until increasing clinical symptoms alert him to the problem.

Types of Mastitis

Severe Clinical Mastitis (Acute Mastitis) — A sudden onset swells the infected quarter, leaving it hot, hard and sensitive. The milk appears abnormal and production drops. In addition, the cow is sick with high fever, weakness and loss of appetite. Acute mastitis affects not only the udder but the whole cow.

Clinical Mastitis — Observed by abnormal milk. Changes in the milk appear such as flakes, clots or a watery consistency. Swelling of the udder may or may not be apparent. High temperature or pain in the udder are usually slight or absent.

Chronic Mastitis — Caused by a persistent udder infection that exists most of the time in the sub-

clinical form but occasionally develops into an active, clinical form. During the clinical stage, the milk is abnormal; the rest of the time the milk may be high in somatic cells. This type of mastitis is difficult to treat.

Subclinical Mastitis — Causes no swelling of the glands or observable abnormality of the milk. The udder and the milk appear normal, but changes in the milk can be detected by special tests. This type of mastitis is by far the most prevalent in dairy herds and causes the greatest economic loss.

Somatic Cells

The dairy cow fights inflammation with white blood cells or leucocytes. Leucocytes are an important defense mechanism in the mammary gland. They have the ability to sense a bacterial invasion in the udder's secretory tissue and move to the area of infection in great numbers. Leucocytes and cast off epithelial cells from the secretory tissue are called somatic (body) cells. These cells serve a twofold purpose — fighting infection and assisting in the initiation of repairing damaged tissue.

High levels of somatic cells in milk are an indication of an udder infection or mastitis. A high mastitis level in a herd results in a temporary loss of milk production and a permanent loss of milk producing potential. Idaho milk processors use the somatic cell count as a common measure of milk quality.

Mastitis Detection

Mastitis in the clinical form is easy to recognize because of abnormal milk and cow distress. However, most of the mastitis found in dairy herds

is subclinical or hidden and not detected by abnormal milk. Methods available to detect changes in milk caused by mastitis are:

Cow Side Test — Physical examination of an empty udder immediately after milking which shows swelling, hardness or scar tissue indicating permanent udder damage. Cows with a history of chronic mastitis can be identified this way and would be candidates for eventual culling. (Physical examination of the udder will not detect subclinical mastitis.)

Strip Test — You can detect abnormal milk by observing the first streams of milk either in a strip cup or by allowing the stream to flow over a clean floor. Abnormal milk will show flakes, shreds, clots and wateriness. Forestripping will help you keep abnormal milk out of the bulk tank and identify cows with clinical mastitis needing immediate attention. Removal of the first milk also stimulates milk letdown.

California Mastitis Test (CMT) — Estimates the somatic cell content of milk. It is probably one of the most efficient screening tests for subclinical mastitis you can do in your parlor. The CMT reaction relates broadly to the number of leucocytes in milk. The reactions vary in degree from a slight precipitation to an immediate development of a visual gel. A strong gel formation indicates mastitis. The CMT

can be performed at the cow side on each quarter, a composite sample from four quarters or on bulk tank samples.

Wisconsin Mastitis Test (WMT) — Used to determine, indirectly, the somatic cells in milk. The WMT measures the viscosity of a detergent-milk mixture. The reagent reacts with the somatic cells to form a gel similar to the CMT. This WMT results in a quantitative measure of viscosity rather than a qualitative (eyeball) estimate used in the CMT. The WMT is commonly performed in a laboratory on composite quarter samples or bulk tank samples.

Direct Microscopic Somatic Cell Count (DMSCC) — A quantitative laboratory test in which stained films are examined under the microscope and a somatic cell count is taken. The DMSCC is normally performed only on bulk tank samples. This method is accurate but is time consuming and requires expensive equipment.

Electronic Somatic Cell Counting (ESCC) — Several electronic instruments have been developed for counting somatic cells in milk. Electronic cell counting has a high repeatability and is objective because the machine decides what to count. DHI programs across the nation are using electronic cell counting on composite quarter samples. In addition, many milk processing plants use ESCC as a means of assessing abnormal milk on bulk tank samples.

Mastitis and Production Losses

Even though a dairy cow's milk appears normal, subclinical mastitis can be detected with the special tests described. More importantly to the dairyman, however, subclinical mastitis can be causing significant losses in milk production. The most common tests for detecting subclinical mastitis levels of infection are the California Mastitis Test (CMT), the Wisconsin Mastitis Test (WMT) and the Direct Microscopic Somatic Cell Count (DMSCC). See Table 1 for comparisons.

Table 2 shows the relationship between somatic cell numbers and the expected loss of production per quarter.

For each quarter that tested CMT 2 or 3, you could expect 4 to 6 pounds of production loss in a herd producing an average of 50 pounds of milk per cow.

Table 1. Correlation between types of screening tests.

CMT score	DMSCC range	WMT (mm)
Negative	0 to 300,000	0 to 14
Trace	150,000 to 500,000	10 to 19
1	400,000 to 1,500,000	17 to 30
2	800,000 to 5,000,000	25 to 38
3	5,000,000 and up	35 to 38

Table 2. Somatic cell count and production loss.

CMT score	Avg. somatic cell count	% production loss per quarter	lb per quarter per day
Negative	100,000	0	0.0
Trace	300,000	6	1.0
1	900,000	19	2.4
2	2,700,000	30	3.8
3	8,100,000	42	5.3

All milk processing plants routinely screen bulk tank samples for somatic cells. Table 3 shows the expected production loss on a herd basis as measured by the WMT and DMSCC methods.

The loss of production from a high somatic cell count is the dairyman's and the processor's problem. The dairyman loses production, milk producing potential, discarded milk and treatment expense. The processor loses because of lower yields of products and a less desirable consumer product. Ultimately, however, the dairyman is responsible for producing milk from healthy udders.

Dairyman need to recognize mastitis as a major disease problem in the dairy industry. However, many do not realize the severe economic losses because they do not recognize the level of subclinical mastitis in their herds. Few dairyman realize that somatic cell counts need to be below 300,000 cells per milliliter for cows to be producing to their full potential.

Dairyman need to be constantly alert to the somatic cell level of their herds as reported by the milk processing plant. Corrective action needs to be taken whenever somatic cell levels exceed 500,000 cells for a herd.

Controlling Somatic Cell Counts

If the bulk tank sample indicates your herd has a high somatic cell count, use these practices:

1. Follow approved milking procedures. Be especially concerned about stimulation, udder drying and teat dipping.

Table 3. Estimated production loss by the WMT and DMSCC methods.

WMT	DMSCC	% production loss per herd	Significance of results
1-14mm	up to 500,000	5	Good
15-18mm	500,000 to 1 million	12	May contain some detectable abnormal milk.
19-21mm	1 million to 1.5 million	20	Detectable abnormal milk. Mastitis in your herd.
over 21mm	over 1.5 million	30	Detectable abnormal milk was included in the supply. Mastitis control is urgently needed.

2. Milk in a properly designed, operated and maintained parlor.

3. Use screening tests such as the CMT or the WMT to aid in detecting problem cows, equipment and management failures.

4. Treat all clinical mastitis infections and dry cows with approved drugs as recommended by your veterinarian. Be sure to read the drug labels. Observe milk discard times and preslaughter and withholding times.

5. Cull cows with chronic mastitis.

Mastitis can be beaten if existing infections are cured and new infections are prevented. A sound prevention program will save you money.

This College of Agriculture publication is one in a series on dairy herd management to reduce mastitis incidence and improve milk quality. Other titles you will want to get are:

- CIS 621 Milking Equipment Design, Operation and Maintenance
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- CIS 623 Milk Quality Reports 10 cents
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- CIS 626 Preventing Milk Adulteration and Contamination
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- CIS 627 Heritability, Mastitis Incidence and Milk Production
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