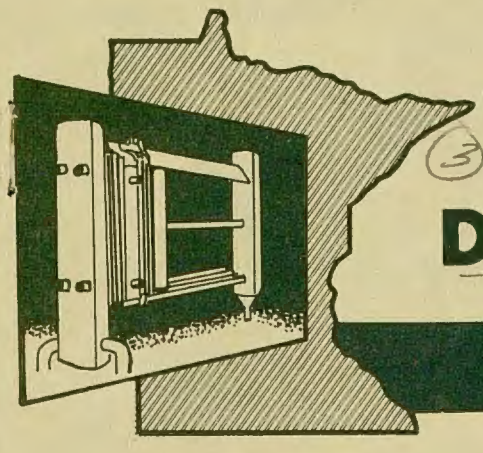

Minnesota Dairy Products Processor

AGRICULTURAL EXTENSION SERVICE • INSTITUTE OF AGRICULTURE
UNIVERSITY OF MINNESOTA • ST. PAUL 1, MINNESOTA

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With some interstate milk shipments being checked for presence of mastitic milk, a renewed interest in this problem is evident. Much confusion exists. Conflicting reports on results and reliability of tests can be found. It seems desirable to devote an issue of the newsletter to a few pertinent aspects of the mastitis question.

CHANGES IN MILK COMPOSITION

A mastitic condition usually causes a decrease in lactose and potassium. This is paralleled generally by an increase in sodium chloride content.

Because chloride content increases, a chloride determination has been suggested as a method of detecting mastitis. In one test using 0.14 percent chloride as maximum permissible level, 1,646 of 9,086 milk samples tested were found to be above this level. But only 19 percent of the high-chloride samples showed positive mastitis by more specific tests. Also, cows with "normal" chloride content have frequently been noted suffering from mastitis. A chloride determination is not a very reliable method of diagnosing mastitis.

Mastitis causes an increase in some whey proteins and a decrease in casein. Casein level seldom varies until blood cell counts approach 1,000,000/ml. Normally the count runs less than 100,000/ml.

Fat tests may vary during a case of mastitis but the change is not consistent.

Solids-not-fat may decrease, but the extent of decrease is dependent upon the degree to which increases in whey protein compensate for decreases in casein.

In general, it is difficult, if not impossible, to relate mastitis to a change in milk composition. Some pathogens cause very little udder damage.

TESTS FOR MASTITIS

Tests for mastitis can be grouped in two categories -- those that may be used routinely and offer presumptive evidence of mastitis and those which are used to isolate causative organisms. The latter involve culturing techniques and rather sophisticated procedures. They account for the high cost of detailed mastitis diagnosis and treatment. Several methods have been developed for routine testing.

WHITESIDE TEST

The Whiteside Test involves mixing one drop of normal sodium hydroxcide with five drops of milk on a glass plate, stirring for 20 seconds and noting the degree of coagulation. Negative samples appear similar to normal milk. Positive samples vary from a slight precipitate to a thick viscous mass and are graded 1, 2, or 3 depending upon the extent of coagulation.

Whiteside Test reaction is thought to be due to the combined effects of calcium and white blood cells.

The Whiteside Test has been suggested for use on bulk milk for cheese making. Renneting time for negative Whiteside milk is about 7 minutes 40 seconds; for weakly positive milk, 8 minutes 40 seconds; and for strong positive, 10 minutes 20 seconds.

The Whiteside Test has been compared with the California Mastitis Test (CMT) on can milk. Whiteside Test showed a larger number of negative results on milk with a high cell count. CMT yielded a larger number of positive tests on milk of low cell count.

Percent agreement between Whiteside results and actual bacterial examination has been found by one investigation to be: 89.2 percent for individual quarters, 82.0 percent for individual cows, and 65.2 percent for can samples.

A comparison of the cell count with Whiteside Test indicates the following general relationships:

1. Less than 80,000 cells/ml. -- 88 percent of Whiteside examinations can be expected to be negative.

2. 300,000 to 1,000,000 cells/ml. -- 38 percent of Whiteside Tests will be negative.

3. Over 1,000,000 cells/ml. -- 83 percent of Whiteside Tests show positive for mastitis.

CALIFORNIA MASTITIS TEST

This test is performed by mixing equal amounts of CMT reagent and milk on a plastic paddle. Formation of a gel (thought to be a white blood cell-protein complex) is considered a positive reaction. The test reagent is a detergent. Several different detergents have been used with somewhat varying results.

CMT has been correlated with changes in milk yield of Holstein cows. Those having CMT's of trace, 1, 2, and 3 showed 6-, 10-, 16-, and 24.59-percent loss in milk yield respectively compared with cows having negative CMT's.

The following table indicates the relationship between CMT, catalase and chlorides on quarter milk samples. This relationship likely would be different on individual cow or herd milk samples:

CMT	Percent samples with reading over 40 by catalase test	Percent chlorides less than 0.11 percent
-	1.6	78.7
±	13.5	43.0
1	52.5	41.6
2	64.5	20.0
3	86.8	0

CMT is generally considered slightly more sensitive than catalase test on quarter milk samples. Catalase test, however, has been found to be somewhat better than CMT for quality control tests of mixed herd milk.

It should be noted that any attempt to correlate results of two or more different tests must take into account the kind of samples, whether quarter or individual cow, or herd milk, can or bulk. Relationships may vary between different types of samples.

In one experiment 2,428 can milk samples from 943 farms were analyzed by CMT, microscopic examination, and cultural tests. CMT detected 86.4 percent of samples showing positive by the latter two procedures. CMT also gave 29.8 percent false positive readings.

CMT may give false positive readings on milk from cows up to 3 or 4 days after calving. Also cows that are being milked once per day during late lactation will commonly show false positive reactions.

Some question concerning CMT reliability exists. Stability of milk to CMT possibly is influenced by bacterial action on milk. Factors associated with bacteria growth, therefore, may be the cause of false readings.

CMT is a helpful diagnostic tool, but may indicate positive reactions weeks after successful treatment because the cell count remains high.

A CMT reading of 2 or 3 on bulk milk generally is indicative of a serious mastitis problem.

CATALASE TEST

Catalases are enzymes that have the ability to break down hydrogen peroxide to water and oxygen. In the catalase test hydrogen peroxide is added to milk and the volume of oxygen released is measured. Because catalase content of milk tends to parallel cell count, a measure of its activity can be used to detect mastitis.

It should be noted that catalase content of milk varies to some extent with type of feed and among individual cows. It is high in colostrum milk (higher than normal milk even after 1 week) and increases with multiplication of bacteria. Approximately 33 percent of catalase activity of normal milk is caused by bacteria. About 80 percent of the activity in mastitic milk is due to white blood cells.

Because white blood cells may persist after an infection has been successfully treated, false positive catalase tests do occur.

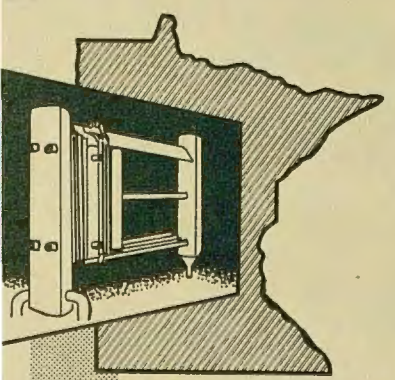
In one investigation involving 217 herds, catalase test failed to detect over 30 percent of herd milks shown to be mastitic by more definitive tests.

NOVOBIOCIN RESIDUAL

Novobiocin is a drug commonly used in treatment of staphylococcus mastitis. A zero tolerance has been established for this compound in milk, effective July 20, 1963.

MILK FLAVOR CLINIC?

If you would like to hold a milk flavor clinic, please contact me at 136 Dairy Industries Building. I'd be happy to prepare samples with various off-flavors for judging purposes and discuss cause and control of these off-flavors at a meeting of haulers, graders, or others interested in this topic.



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