THE ACCURACY OF REGULATORY TESTS IN MAINTAINING QUALITY MILK

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There are many tests used to maintain quality in raw milk. These tests might be broken down into two categories; those for determining gross composition of milk and those for measuring indicators in milk which are of either public health or sanitary significance.

Gross composition of milk tests include those for fat, total solids, solids-not-fat, specific gravity and freezing point. Two of the most common tests for fat are the Babcock test and the Gerber test. The accuracy of these two tests is about the same. The test bottles of both tests have 0.1% as their smallest graduation. Electronic fat testing is just being introduced and approved. The advantages of these tests are speed and increased accuracy if they are properly calibrated but they have the disadvantage of being expensive. There are several electronic fat testers on the market at the present time.

The lactometer is used as a test for measuring specific gravity and as a screening test for total solids and solids-not-fat. The lactometer reading of whole milk should be about 32. Using the lactometer reading and the fat test in special formulas it is possible to calculate the solids-not-fat and total solids in mixed large herd milk with an accuracy of about 0.2%. Majonnier test is used to confirm low solids tests and the determination is calculated to the nearest hundredth of a percent. The official solids test is very accurate but requires several hours to run and is not practical for routine testing.

The freezing point determination is used to test milk for added water. When the freezing point is higher than $-0.525^{\circ}C$ milk is suspected of containing added water. To confirm this an authentic sample must be taken from the herd and if the freezing point of this sample is more than $0.01^{\circ}C$ lower than the previous test sample, the presence of water is confirmed. An authentic sample is obtained when the sampler is present during the entire milking operation and knows that the milk contains no added water. This test can detect 2% or less added water in milk. The equipment used to perform this test is called a cryoscope and the most common type in use today is an electronic machine using a thermistor for the actual temperature measurement.

The public health or sanitary indicators that are measured in milk include bacterial counts, somatic cell counts and the detection of microbial inhibitors. Two types of bacterial counts are run on raw milk samples; the coliform count and the standard plate count (SPC). The coliform count is used as an indicator of the sanitary precautions used in handling the milk and is not used in a regulatory way. There is a standard of 100,000 per ml on the SPC of individual producers of milk and a producer is degraded when three out of his last five samples exceed this standard. The distribution of bacteria in milk follows a distribution known as the

poisson and by the mathematical nature of this distribution bacterial counts have rather large errors associated with them. For this reason the counts are not averaged and the standard used is a three out of five standard.

The Wisconsin mastitis test (WMT) is used as a screening test for somatic cells in milk. The standard for these cells is not to exceed 1.5 million per ml. When this test indicates a high somatic cell count, the count is confirmed using the direct microscopic somatic cell count. Somatic cells like bacteria follow a poisson distribution in milk and again the three out of five standard is used in enforcement. Electronic counters are being developed for somatic cell counts and when perfected should increase the accuracy of this test because they can count a larger sample of milk than is used in the direct microscopic somatic cell count.

A paper disc method is used to detect the presence of bacterial inhibitors in milk. This test is designed to insure that the milk supply contains no antibiotics or similar material. A paper disc is dipped in a sample of milk and then placed on a petri dish containing bacteria which have not been allowed to grow. After the dish is incubated there will be no bacterial growth around the paper disc if the milk contained antibiotics. This is a very sensitive test and can detect less than 30 parts per billion of penicillin in milk. When a bacterial inhibitor is detected in milk, the producer's milk is withheld from the market until a negative test is obtained.