

Some Problems in Sediment Testing

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FOR many years public health officials, plant operators and other persons interested in the production of clean milk have used the sediment test as one factor in basing their judgment on quality milk supplies. In spite of the importance of this test, there is a wide variety of methods of procedure in taking the test and in measuring the results.

There is only one procedure fully recommended by Standard Methods for taking this test. This consists of taking a pint sample of milk from a can or vat after the contents have been thoroughly stirred. As for the unstirred off-the-bottom sample, Standard Methods recommends: "While the use of sediment testers that draw milk from the bottom of the can is not approved as a standard procedure because of evident sources of error in measurement, these testers can be used with excellent results."*

The City Health Department of Louisville has long used the results of sediment tests as one factor in judging the quality of milk supplies coming into the city. Recently trials with various types of testers have been conducted in an effort to determine the type of tester and method of procedure best suited to the needs of our health work. It is the object of this article to point out some of the conclusions reached in these trials.

In the beginning it may be well to discuss some of the many factors that we believe enter into the interpretation of results secured by any method of procedure:

1. The total amount or volume of milk in each shipment.
2. The amount or volume of milk in each can in the shipment.
3. The variance in amount and kind of sediment in each can.
4. The variance in weight and size of sediment particles.

Volumes of milk are different in every shipment. Because it is necessary to compare the amount of sediment between shipments this presents a problem, especially where two or three representative cans are chosen from the shipment for the sample. With the use of the off-the-bottom types of testers, care must be taken to make comparisons between volumes as accurately as possible. The variance in volumes between cans of the same shipment makes it absolutely essential that cans chosen from the shipment, for samples must be of the same volume. It is obvious, therefore, that a sediment taken from a full 10-gallon can cannot be justly compared with the sediment taken from another can of 5 gallons content.

There is a decided difference between cans of the same shipment in regard to the amount and kind of sediment contained in each. We have found many cases where it was possible to secure several different results from the same shipment by taking sediment tests from individual cans. From the health standpoint we have assumed that a dirty sediment from any portion of the milk has been reason enough to base our judgment on the entire shipment.

Close examination of any sediment test will reveal a variety of sediment

* *Standard Methods for the Examination of Dairy Products*, Seventh Edition, 1939, page 66.

particles ranging in weight and size from fine dust and chaff to coarser particles of manure and dirt. It is at this point that the question of procedure of technique may be introduced. There is some controversy as to the stirring of the milk before the sample is taken. In working on this problem we began taking sediments with three types of testers: (a) the small vacuum type requiring a pint extraction of milk, (b) the Hinman off-the-bottom type, and (c) the L and W off-the-bottom type. All three types of testers were used both with and without stirring the milk. Results obtained from 250 sediment tests were somewhat confusing, first the stirred then the unstirred sample showing the best result. But after careful comparisons of the entire lot, we were inclined to favor the unstirred sample, especially with the off-the-bottom types of testers. With the small, hand vacuum type tester it was difficult to get a sample without some slight stirring of the milk. The unstirred off-the-bottom sample usually showed more of the heavier particles found near the bottom of the can. When a sample of milk is stirred, these particles are taken from the bottom layers of the milk and diffused throughout the entire can and mixed with the lighter particles floating about on the top layers of the milk in the can. It may be contended that the stirred sample shows a truer picture as to type of particle found in the milk, but as to total quantity of sediment this may not be true.

This point is especially important from the health standpoint since we are not so much interested from the standpoint of type of particles as we are the amount or kind of sediment making the milk supply undesirable. It must be stated that comparative results were difficult to obtain because both the stirred and the unstirred sample had to be taken from the same can.

The amount of butterfat caught on the pad when the milk is stirred some-

times makes it far more difficult to read. The pads will not keep as long and the process of taking the sample is retarded. In the Hinman type of tester there is no form of pressure to force the milk through the butterfat on the pad. In the L and W tester more pressure is required than with the unstirred sample.

After using the three types of sediment testers previously mentioned and comparing the results obtained from each, we reached the following conclusions.

1. The small hand vacuum tester is the least satisfactory of the sediment testers under average plant conditions. The amount of time necessary to stir the milk and fill the tester is a disadvantage. Its main use should be in the laboratory where more careful attention may be given the sample and where a few pint samples may be brought from the plant to the laboratory.

2. The Hinman type of tester takes the milk off the bottom of the can and is most efficient if the milk is not stirred. Results are not satisfactory if the milk is cold or stirred because there is no form of pressure to force the milk through the foam or butterfat on the pad. Advantages of the tester may be listed as follows: simple to operate, easy to clean and sterilize, and pads are kept in good condition. There is a disadvantage in the amount of equipment necessary to assemble when using this tester.

3. The L and W vacuum tube type also takes the sample of milk off the bottom of the can and should be used with unstirred milk. Milk is drawn up through the bottom of the tube by a vacuum created by a rubber plunger inside the tube. When the plunger is pushed down the tube the milk is forced through the sediment disc. With this tester no equipment is necessary other than pads and a can of chlorine solution. The actual taking of the sediment is accomplished with ease. However, there is some diffi-

culty in sterilizing the tube before each test is taken. Unlike the Hinman tester, the L and W tester must be handled with the hands when pads are removed and changed. This tester also requires attention in keeping the plunger clean and in good condition.

The following are results obtained from the three testers. The Hinman and L and W are off-the-bottom samples and the small vacuum pad represents a pint sample after stirring.

SUMMARY

1. Sediment tests at best show only the undissolved dirt in milk. Although little correlation has been found between the amount of sediment and number of bacteria,* from the standpoint of public health, sediment tests may be used as one factor in judging the quality of a milk supply.

2. The results of sediment testing should probably be worked out on a comparative basis and interpreted in light of existing conditions. From a purely scientific standpoint, perhaps the most accurate comparison procedure should be based upon degree of sediment times the total volume of shipment rather than the comparison of individual cans. Under average plant conditions this would be impractical due to the amount of detailed work involved. The Louisville Health Department has taken the viewpoint that sediment from any portion of the milk

* Ruehle, G. L. A., and Kulp, W. L. Germ Content of Stable Air and Its Effect on Germ Content of Milk. *New York Agr. Exp. Sta. Bul.* 409 (1915).

shipment is undesirable. In making comparisons of sediment tests, some effort is made to keep in mind the volume from which each sediment came. To minimize any differences between cans of the same shipment, two or three cans of the same volume are selected from the entire shipment for the test. If the results from these cans show a clean test, the entire shipment is assumed to be clean. If the test shows any appreciable amount of sediment, the shipment is excluded until the condition causing the sediment is corrected. Then additional tests are run until one or more clean sediments are obtained.

3. For average plant conditions, in our opinion, the off-the-bottom testers are best suited, especially where a large number of shippers are to be tested. Milk should not be stirred if the sample is to be taken from the bottom of the can. Off-the-bottom samples yield a test accurate enough to base judgment from a health standpoint. In efficiency there is little difference between the L and W and the Hinman tester, the latter being slightly easier to operate and sterilize.

4. There are a few factors entering into the technique of taking samples that could be standardized without much difficulty, such as type of testers to be used and kind of pads.

The interpretation of results regardless of the method used in taking the samples, will in our opinion be the biggest problem in standardizing sediment testing.

MEMPHIS MEETINGS OF DAIRY INDUSTRY CANCELLED

The annual meetings at Memphis, scheduled for the week of October 18 to 24, have been cancelled. The participating organizations are: International Association of Milk Dealers, International Association of Ice Cream Manufacturers, Milk Industry Foundation, Ice Cream Merchandising Institute, National Dairy Council, Certified Milk Producers' Association of America, and milk and ice cream state associations. The Dairy Industry Supplies Association previously discontinued the machinery exposition.