

"PROBLEMS ASSOCIATED IN MAINTAINING QUALITY
MILK ON THE FARM - ANTIBIOTIC RESIDUALS"

by

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In the course of the past years observations and experiences, one of the items of current interest and concern is the problem of antibiotic residuals in raw milk, both farm samples and commingled tanker samples. This arises because of changes in approved testing methods which result in increased sensitivity in detecting antibiotic residuals.

The present situation as summarized in Table 1 (1978 PMO, p. 45) shows that individual producer samples are tested by the Bacillus subtilis disc assay (about 0.05 units minimal detection) whereas commingled milk and pasteurized milk products are tested by the Sarcina lutea Cylinder Plate Method (about 0.01 units minimal detection). This indicates that individual producer milk is tested for antibiotics by a less sensitive test than is commingled milk or finished dairy products. Therefore it is possible to have no producers on a load show a positive test and yet have the load show the presence of a detectable residual and be rejected.

Furthermore, the B. subtilis test while readily adapted to routine laboratory screening testing for quality control purposes is relatively slow (about 4 hours incubation time). And the Sarcina lutea test is quite involved and somewhat complicated for routine laboratory usage and takes as long, if not more so.

With these limitations in mind, as the new Pasteurized Milk Ordinance (approved in 1978; to go into effect July 1, 1980) was being negotiated by the National Conference on Interstate Milk Shipments, the need was recognized for one or more tests of sensitivity equal to the Sarcina lutea test, but readily adaptable to routine laboratory procedures, and which would yield results in a substantially shorter time.

And, there are tests available and being developed which appear to be more sensitive and/or quicker and are readily adaptable to routine lab testing. These include the Charm test and the Swaisgood test which are not conventional bacteriological assays and several other more conventional procedures that use Bacillus stearothermophilus as the test organism.

The characteristics of the two tests using B. stearothermophilus for assay are compared with the standard B. subtilis test in Table 2. The

latter uses an incubation temperature of 37°C, requires 3 to 4 hours for reading and is sensitive at 0.05 units (down to 0.02 in certain situations). The modified AOAC test uses B. stearothermophilus as the assay organism with an incubation temperature of 55°C and a reading time of 3 hours-30 minutes to 3 hours-50 minutes. The sensitivity is considered to be 0.005 units (and down to 0.003 under some circumstances). The accelerated modified AOAC disc assay (Difco) uses B. stearothermophilus with an incubation temperature of 65°C. The reading time is reduced to from 2 hours-40 minutes to 2 hours-50 minutes. The higher incubation temperature results in a shorter reading time but with a slight decrease in sensitivity (about 0.008 units).

The consequence of FDA considering that the disc assay test using B. stearothermophilus is equivalent to the B. subtilis test and the Sarcina lutea test is that producer milk samples will be tested at the same level of sensitivity as commingled milk or finished products. Experience to date indicates that increased numbers and incidence of positive samples will be detected.

The increased incidence of positive samples can be due to 2 possible causes:

1. Even if every precaution is taken to "do things by the book" or exactly as the directions read on the label, the withdrawal times for the antibiotic preparations used may not be based on testing methods of equivalent sensitivity. To say it in another way, the withdrawal times as presently stated on the label may not be applicable with the more sensitive B. stearothermophilus test to be approved for farm sample testing.
2. The procedures and strategies of handling antibiotic-treated cows and milk on the farm (where there may be some even minor deviation from label instructions and other faulty practices) must be reevaluated. While the solution for pollution may be dilution, more sensitive detection tests mean more dilution is necessary to avoid detection (about 10 times more). Thus any possible ways that antibiotic contaminated milk can reach the bulk tank must be eliminated.

In any event, the producer must be constantly aware that his chances of being involved with a positive antibiotic test are greatly increased with the proposed and anticipated shift from the B. subtilis disc assay method to a method using B. stearothermophilus as the test organism. It will be necessary to go exactly by the label directions with recommended and approved antibiotic preparations in regard to withdrawal times; and to scrupulously avoid any inadvertent exposures of milking animals to sources of antibiotics which could contaminate the milk.

TABLE 1 Chemical, Bacteriological, and Temperature Standards

Grade A raw milk for pasteurization	Temperature	Cooled to 45° F (7° C) or less within two hours after milking, provided that the blend temperature after the first and subsequent milkings does not exceed 50° F (10° C).
	Bacterial	Individual producer milk not to exceed 100,000 per ml. prior to commingling with other producer milk. Not to exceed 300,000 per ml. as commingled milk prior to pasteurization.
	Antibiotics	Individual producer milk: No detectable zone with the <i>Bacillus subtilis</i> method or equivalent. Commingled milk: No detectable zone by the <i>Sarcina lutea</i> Cylinder Plate Method or equivalent.
	Somatic cell count	Individual producer milk: Not to exceed 1,500,000 per ml.
Grade A pasteurized milk and milk products	Temperature	Cooled to 45° F (7° C) or less and maintained thereat.
	Bacterial	20,000 per ml. limits*
	Coliform	Not to exceed 10 per ml.; Provided that, in the case of bulk milk transport tank shipments, shall not exceed 100 per ml.
	Phosphatase	Less than 1 microgram per ml. by the Scharer Rapid Method or equivalent.
	Antibiotics	No detectable zone by the <i>Sarcina lutea</i> Cylinder Plate Method or equivalent.

***Not applicable to cultured products.**

Table 2.

Characteristics of Tests
For Detecting Antibiotics

Method	Test Organism	Incub. Temp.	Detection Time	Sensitivity
Disc Assay	B. Subtilis	37°C	3-4 hrs	0.05 (to 0.02)†
Modified AOAC	B. Stearotherophilus	55°C	3.5-3.83 hrs	0.005(to 0.003)†
Modified AOAC High Temp. (DIFCO)	B. Stearotherophilus	65°C	2.67-2.83 hrs	0.008(to 0.005)†

- * - Stipulated in PMO (1978) for producer milk.
- ** - Can be used on producer milk (after July 1,
- *** - Collaborative study not yet finished.