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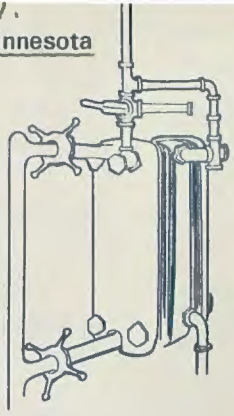
3. MINNESOTA DAIRY PRODUCTS PROCESSOR



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SOME OBSERVATIONS ON IMPROVED LAB TECHNIQUES

In cooperation with the Dairy Quality Control Institute, we have recently taken a look at a couple of ways of speeding up laboratory work. Space demands will not allow detailed coverage of each, but we'll provide some of the pertinent findings and, on request, send you a reprint of the original articles. Both appeared in the August 1974 Journal of Milk and Food Technology.

COUNTING SOMATIC CELLS--AN EASIER WAY

If by chance you use the "strip" method of confirming somatic cell counts under the microscope, you know that it is now necessary to count four strips, two strips (one horizontal and one vertical) on each of two separate milk films. The labor involved is both costly and tedious. With that in mind, and with some talented assistance from University of Minnesota statisticians, a scheme was devised to determine, after each strip counted, whether or not it was necessary to continue counting. From 50 to 90 percent of the time we found that counting a single strip would suffice--just about as accurately as when four strips were counted. In fact it was so reliable that of 675 observations only six discrepancies were noted. In other words, the final count after counting fewer than four strip would have been the same as a four-strip count 669 times out of 675. And in over half the samples studied, counting could have been ended after looking at only one strip.

HOW THE METHOD WORKS

All you do, using a chart we've developed, is determine three sets of count ranges. For example, assume the following sets:

Strip no.	Ranges in cell count
1	83-116
2	183-216
3	283-316

In the above, counting would be terminated after the first strip if the count observed exceeded 116; or after strip two if the count exceeded 216 and so on. If

counts fell between the range (83-116, 183-216, 283-316), it would be necessary to continue on to the next strip. Ultimately you might end up counting four strips, but our data tell us that this would happen only rarely. You could and should save time--and your eyes!

SUMMARY OF OUR FINDINGS

We evaluated samples from Minnesota and from Louisiana to Virginia in the southeast. Four large centralized laboratories were involved and samples varied significantly in quality and count. Overall, we figure that samples were fairly representative of milk supplies nationwide and that the test could be used nationally. Table 1 summarizes findings within each of the four laboratories involved. Keep in mind that these are confirmatory tests, thus the unusually high average counts.

Table 1. Summary characteristics of somatic cell "Strip" count data secured from four different commercial laboratories

Laboratory	Strip factor	No. of samples	Avg. no. of cells[1] (X_4)	As cell count/ml	Standard deviation (S_x)	As number of cells
1	15,000	207	471.0	(1.8×10^6)	121.4	(455,250)
2	21,620	115	289.7	(1.6×10^6)	92.0	(497,260)
3	15,000	122	353.9	(1.3×10^6)	122.1	(457,875)
4	15,400	231	228.6	(0.9×10^6)	85.1	(327,635)

[1] The X_4 count is the average number of somatic cells observed per sample, counting four strips on two milk films. All samples were previously screened by the Wisconsin Mastitis Test and only "confirmable" samples analyzed. To convert X_4 to a sample cell count, divide the strip factor by four and multiply the X_4 by the resulting value. Use the same procedure for converting S_x to cell count.

AUTOMATIC COLONY COUNTERS

Other time and labor-saving devices are on the market and we expect to see them in the laboratory before long. One of the more intriguing devices, not to say helpful ones, is the electronic colony counter. A number of units are now available which allow a bacterial culture plate to be counted (in colony numbers ranging from 30 to 300 or more) in a matter of a second or two. That fast, and you have a count of 75 or 133 or 241 or whatever. To say the least, it saves a good deal of time and strain.

We took a look at one such device (the only one yet to be objectively evaluated) and determined its acceptability for counting raw milk Standard Plate cultures. We simply grabbed plates from the on-going laboratory operations at Dairy Quality Control Institute, had them read by three persons, then read them three times at three different orientations, on a colony counter. The counts made in a fraction of a second were the equivalent of those read by technicians. And who's to say a technician is always right! Perhaps the automatic counts were the true counts. But let's not quibble over a few colonies in a procedure that is, at best, only an estimate of bacterial numbers. Too often we place far more reliance on absolute numbers of bacteria than the test method is capable of distinguishing. So when we say that the automatic counter gave readings within ± three colonies of technician counts at a count of 30, and within ± 3.6 colonies at a count of 72, that's good! At higher counts, all the way up to 300 colonies, the automatic counter held its own and was probably more accurate than technicians, although we won't say that!

HOW THE DEVICE STACKED UP

Range of counts	Average technician counts	Average electronic counts
0-49	29.9	29.4
50-99	73.8	73.7
100-149	126.6	125.3
150-199	175.9	170.3
200-249	223.2	223.0
250-300	275.5	274.5

We feel we have opened the door to official recognition of automatic colony counters as appropriate for raw milk culture plates. A nationwide study of several such devices is now getting underway, which should cap off the work and raise these devices to official status (assuming similar findings) in a couple of years. Gone will be the tedium so long a part of our quality control program. At the same time, further centralization of laboratory facilities will make use of such equipment practical, if not essential.

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