

THE PERFORMANCE OF A DETERGENT-SANITIZER FOR MILK UTENSIL SANITATION IN UNSUPERVISED FIELD TESTS^{1 2}

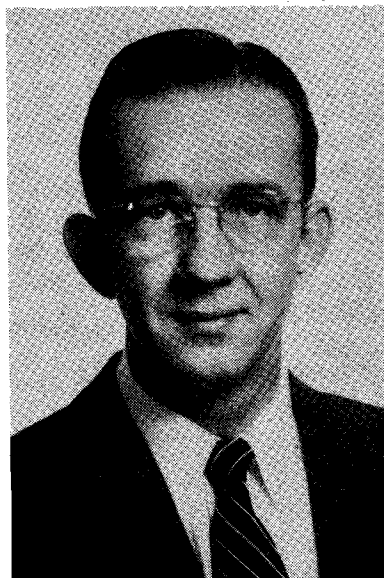
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In a field study covering 15-16 months and which involved 155 Grade A milk producers in three widely separated areas, a detergent-sanitizer was compared with customary methods of milk utensil sanitization. No supervision was made of the producers other than that normally given by the sanitarian and fieldman. Bacterial counts, thermoduric and total, tended to be lower in the milk from producers using the detergent-sanitizer sanitization procedure. Milking utensils appeared cleaner and, milk-stone deposits were absent from the utensils of those producers who used the detergent-sanitizer method. Since this study covered an extended period of time with only normal supervision of the producers, the detergent-sanitizer method appears to be one that can be used routinely over an indefinite period of time with entirely satisfactory results.

The main purpose in conducting a field experiment with a product, such as a detergent-sanitizer, is to determine the performance of the test material with normal usage. Such an evaluation procedure is intended to subject a product to its most critical test. There is one factor in field trials which may deserve consideration regarding its impact on the performance of the product; this factor is supervision. It is natural that a dairyman should feel certain pressures during a controlled field trial which otherwise would not exist. These pressures would arise from: (a) the performance of a task in a manner different from the usual one; (b) the supervision naturally resulting from the interest of the sanitarian, fieldman, and others concerned with the study; (c) knowledge by the dairyman that his milk was being tested more frequently than usual. There is, therefore, some possibility that a product might perform better under these circumstances than it would if the dairyman, after receiving complete instructions on the procedure for its effective use, were allowed to use it with no more supervision than that normally given by the sanitarian and fieldman.

Speck *et al.* (3) reported on a field trial study of a detergent sanitizer used for sanitization of producer milking utensils. In this study two comparable groups of producers were placed on a double-reversal trial which covered a period of about 4 months. The re-



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sults of the study showed that the use of the detergent-sanitizer resulted in cleaner utensils and that by other measures of performance, the detergent-sanitizer and more conventional methods of cleaning and sanitizing were comparable. This study indicated quite satisfactory performance of the detergent sanitizer during the trial. There existed, however, a question on the performance that could be expected of it during a more extended period during which only normal supervision was given to the dairyman. The present study, therefore, was made in order to obtain an answer to this question.

EXPERIMENTAL

Before proceeding with the study, consultations with the State Board of Health and Department of Agricul-

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ture were held and then their approval to proceed with the study was obtained. The same procedure was used with the local health departments and sanitarians in the areas in which the field trial was to occur.

A total of 155 producers in three areas of the state representing the mountain, piedmont and coastal plain sections participated in the study. The groups of producers were selected with no reference to past performance; they were representative of the producers in each milk shed. In each area 25 - 30 producers voluntarily used the detergent-sanitizer method. A comparable group of producers was used for control; this group used conventional cleaning and sanitizing methods. At the beginning of the study the test group used conventional cleaning and sanitizing methods. They were given a 30 day trial period to become accustomed to the new method and to decide if they wanted to participate further. Those who continued on test thereafter purchased the detergent-sanitizer from the dairy at regular retail price; this was considered necessary in order to avoid any bias for the new method based on economics. The study was initiated in September and October 1954 and continued until December 31, 1955. Since the actual use of the detergent-sanitizer was begun at different times by the participating producers, the data only for the calendar year 1955 were used for analysis. This also provided data on the performance of the detergent-sanitizer after its use became a routine operation.

The producers using the detergent-sanitizer³ were instructed to use the product in the following manner: (a) rinse milk from the utensils immediately after use with cool water; (b) brush wash the utensils in a warm (about 110°F) solution of the detergent-sanitizer; (c) allow the utensils to drain and store dry until the next milking; (d) immediately before use, rinse the utensils with hot (110° - 120°F) water. This procedure also was used on rubber inflations and tubes.

Further contact with all producers was that normally provided by local sanitarians and fieldmen who made the usual inspections of the participating farms.

Bacterial counts were obtained on the milk shipped by each producer. These usually were obtained at monthly intervals. This provided about 2,600 individual samples for bacteriological testing. Samples

³This product, under the label of D-S, was obtained from the Yale Chemical Co., Nashville, Tenn.; active ingredients listed were sodium carbonate 35%; methyl dodecyl benzyl trimethyl ammonium chloride 5%; inert ingredients 60%, composed of non-ionic detergent, sequestering and chelating compounds. The manufacturer's instructions specify that this product be used in a concentration of 1½ oz. to 10 qt. water.

were collected at the weigh vat. The bacterial counts were obtained by the dairy laboratory and the local health department on separate samples. In one area (C) the public health and dairy laboratory have a cooperative arrangement and therefore, in this area only one set of counts was available. In this area the laboratory makes direct microscopic clump counts on raw milk and has a microscope working factor of 20,000. Since many counts were reported as "less than 20,000", the counts were analyzed by determining the per cent of counts greater than 20,000 for the two groups of producers. Also, the log average of those counts greater than 20,000 was determined. Two of the dairy laboratories also obtained counts on laboratory pasteurized samples of each producer's milk at each sampling period. The counts obtained by the various laboratories were sent to N. C. State College for analysis.

RESULTS

All bacterial counts were converted to logarithms and then subjected to analysis of variance. The variance sources were as follows:

- Between methods (detergent-sanitizer vs. regular)
- Between farms within methods
- Between months
- Month by method interaction
- Month by farm interaction

Analyses were made separately for thermoduric and raw counts, for each area and for the dairy and health department laboratories.

The month by method interactions were found to be non-significant; hence the monthly averages are not shown. The over-all mean log counts for the two methods are presented for each group of data in Table 1. The variation between farms within methods was used as experimental error when computing the least significant difference.

In two of the areas thermoduric counts were obtained on the samples from producers in those areas. In area A the milk from producers using the detergent-sanitizer method had a significantly lower thermoduric count than did the milk from producers using regular methods of utensil cleaning and sanitization. In area B the thermoduric count of milk was also lower for the producers using the detergent-sanitizer method, but the difference was not statistically significant. Since the thermoduric count of milk reflects the degree of milking utensil sanitation, these data indicate that the utensils were maintained in as good as or better sanitary condition by those producers who

TABLE 1 — SUMMARY OF BACTERIOLOGICAL RESULTS COMPARING DETERGENT-SANITIZER AND REGULAR METHODS OF TREATING MILKING EQUIPMENT

Area	Laboratory	Geometric mean count		Mean log count		Difference ^a (log)	L.S.D. ^b (log)
		Regular	D-S	Regular	D-S		
Laboratory Pasteurized Milk Samples							
A	Dairy	760	270	2.8822	2.4334	-0.4488	0.2465
B	Dairy	390	350	2.5892	2.5492	-0.0400	0.2066
Raw Milk Samples							
A	Dairy	58,000	50,000	4.7665	4.6992	-0.0673	0.1589
A	Health Dept. ^c	52,000	35,000	4.7195	4.5550	-0.1645	0.1845
B	Dairy	22,000	25,000	4.3328	4.4034	+0.0706	0.2125
B	Health Dept.	96,000	82,000	4.9837	4.9140	-0.0697	0.2134
C	Dairy and Health Dept.	15.29 ^d	17.09 ^d				
		87,000 ^e	72,000 ^e	4.9373 ^e	4.8583 ^e	-0.0790	—

^a Difference = count with detergent-sanitizer minus count with regular.

^b Least difference required for significance at the 0.05 level.

^c Direct microscopic counts.

^d Per cent of counts greater than 20,000 per ml.

^e Means of counts 20,000 or greater per ml.

used the detergent-sanitizer instead of the regular method of sanitization.

In all of the areas total bacterial counts were obtained on the raw milk samples. Although it was recognized that factors other than the sanitary condition of the milking utensils would have effects on the bacterial count of the milk, it was considered that such counts would at least partially reflect the condition of the utensils. The mean log counts in all areas, excepting those by Dairy Laboratory B, showed lower counts by the groups of producers who had used the detergent-sanitizer method. Although the differences between the mean log counts of the milk from producers using the two sanitization methods were not statistically significant, those using the detergent-sanitizer method showed a consistent trend to lower mean log counts. In the single exception (Dairy Laboratory B) to this trend the mean counts were unusually low for raw milk. In area C the producers using the regular cleaning methods showed a slightly lower per cent of counts greater than 20,000 per ml. However, the mean log counts of those counts greater than 20,000 was lower for the producers using the detergent-sanitizer method.

Reports from sanitarians and fieldmen were obtained regarding the cleanliness of the milking utensils treated by the different methods. There was general agreement that the utensils cleaned and sanitized with the detergent-sanitizer were maintained in an entirely

satisfactory condition. Particularly noticeable was the absence of milk-stone and the need for a special milk-stone remover was, therefore, eliminated. General satisfaction also was expressed by the producers who used the detergent-sanitizer method.

The three dairy plants involved in this study reported no instance of buttermilk or cottage cheese culture failure which could be attributable to the presence in milk of quaternary ammonium chloride from the detergent-sanitizer. This agrees with an earlier study (3) which showed that only occasionally was a trace of this germicide present in milk from producers who used the detergent-sanitizer for treating milking utensils.

DISCUSSION

In determining the performance of a detergent-sanitizer several factors must be evaluated, such as the bacterial count of the milk, the physical appearance of the equipment after treatment, and the adaptability of the method to a routine cleaning operation.

The present study has shown that the use of the detergent-sanitizer resulted in counts in milk that were as low as, or lower than, those obtained with the use of regular methods. This situation held for the thermoduric and total bacterial counts. The lower mean thermoduric count of milk that was produced on farms using the detergent-sanitizer method was associated

with the clean condition of the milk utensils on these farms. It was interesting that the total bacterial counts of milk also tended to be lower from the producers using the detergent-sanitizer. From the standpoint of bacterial content in the milk, therefore, the detergent-sanitizer method appears to be as good as, and under some conditions, better than conventional methods of sanitization.

This study covered a continuous period of 15-16 months which, therefore, included all seasons and varying climatic conditions. During this entire period the effectiveness of the detergent-sanitizer was maintained. This was evidenced by the nonsignificance of the months by method interaction obtained in the analysis of variance. Since there was no unusual supervision of the producers during this period there is no reason to suspect that the detergent-sanitizer method would not perform satisfactorily over an indefinite period of time. This has been the situation on two farms where the product has been used continuously for three years. The data of this long-term field trial agree with a previous study from this station (3); actually in the present study the detergent-sanitizer showed better performance with respect to bacterial counts of the milk.

The adaptability of the detergent-sanitizer method to a routine cleaning procedure has been well demonstrated. The manipulations involved in its use are simple and are easier to perform than sanitization by conventional methods. Furthermore, less time is required for completing the cleaning and sanitizing operations. Since the participants in the present study were representative of milk producers throughout the state, the data showed that the detergent-sanitizer method could be used equally as well by producers with records of varying farm sanitation.

The economics of farm operations is now receiving the attention formerly reserved primarily for industry. On the basis of the present study and others (1, 2, 3), it appears that the detergent-sanitizer method offers advantages consistent with efforts to simplify and lessen the cost of farm operations and simultaneously to do a job in an equally or more effective manner.

SUMMARY

In a field study covering 15-16 months and which involved 155 Grade A milk producers in three widely separated areas, a detergent-sanitizer was compared with customary methods of milk utensil sanitization. Producers were divided into two comparable groups, one using the detergent-sanitizer method continuously and the other using regular methods. No supervision was made of the producers other than that normally given by the sanitarian and fieldman.

In one area the thermoduric count of milk was significantly lower when the detergent-sanitizer was used. This was the case for another area, except that the lower thermoduric count was not statistically significant. Raw milk counts also were lower when the detergent-sanitizer was used, although the difference between the counts of milk produced under the different methods of utensil sanitization was not statistically significant.

Milking utensils appeared cleaner and milk-stone deposits were absent from the utensils of those producers who used the detergent-sanitizer method.

Since this study covered an extended period of time with only normal supervision of the procedures, the detergent-sanitizer method appears to be one that can be used routinely over an indefinite period of time with entirely satisfactory results.

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