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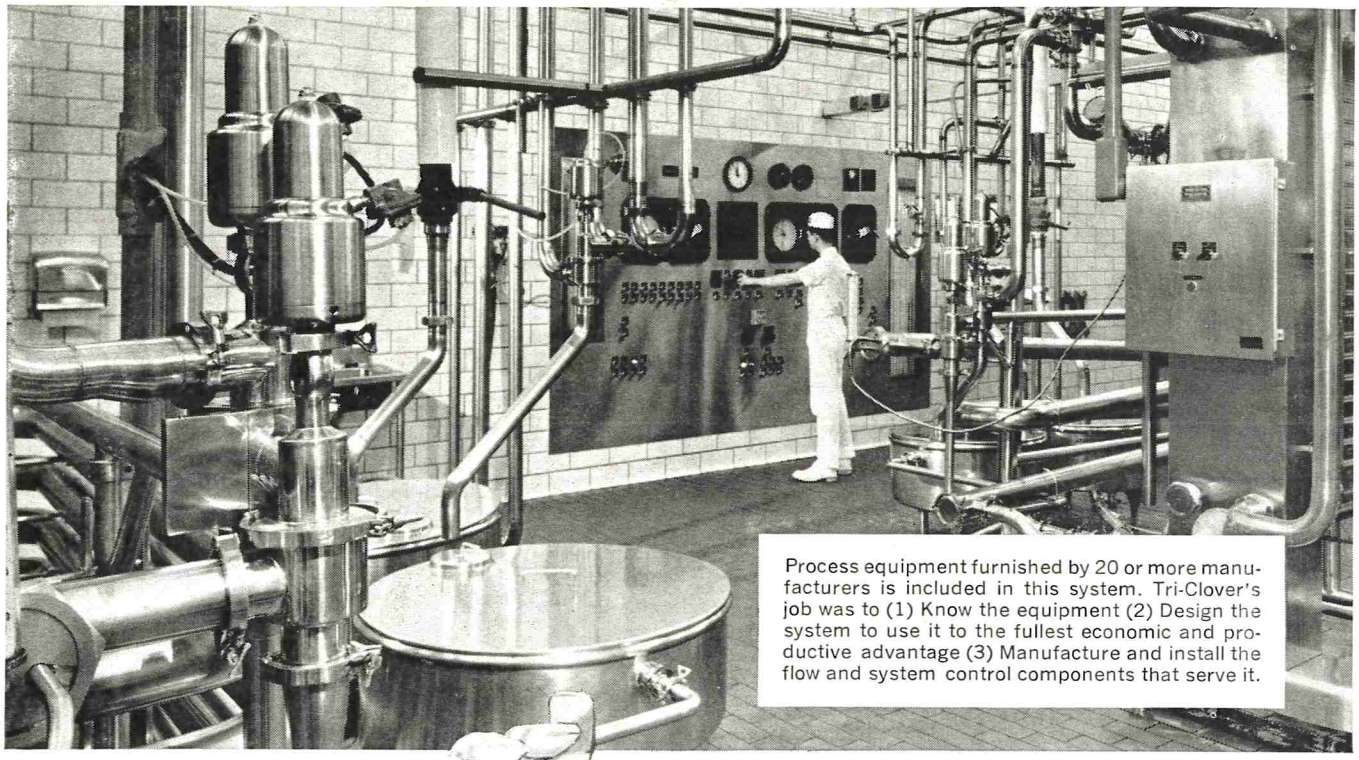

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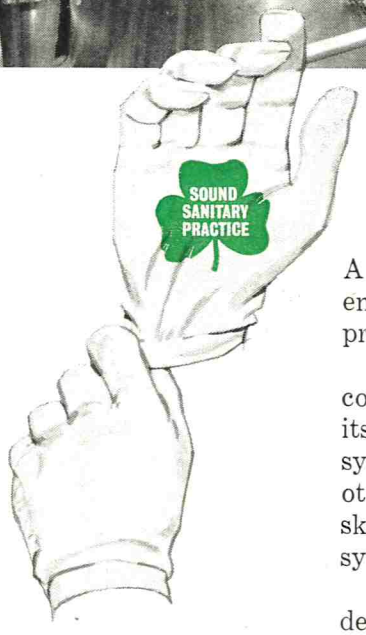

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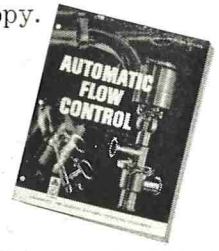

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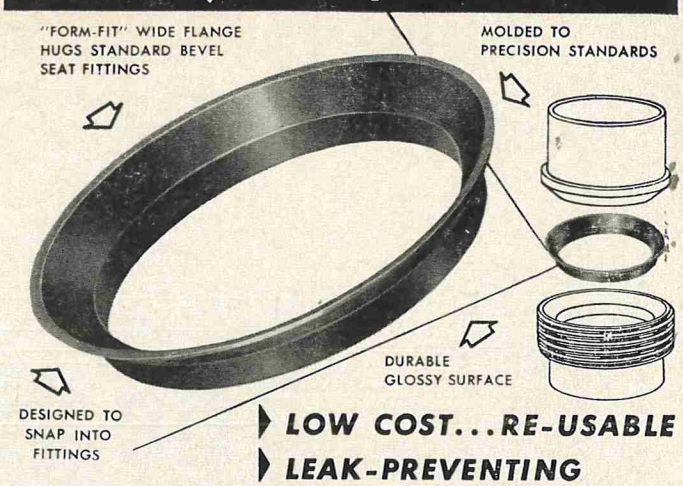

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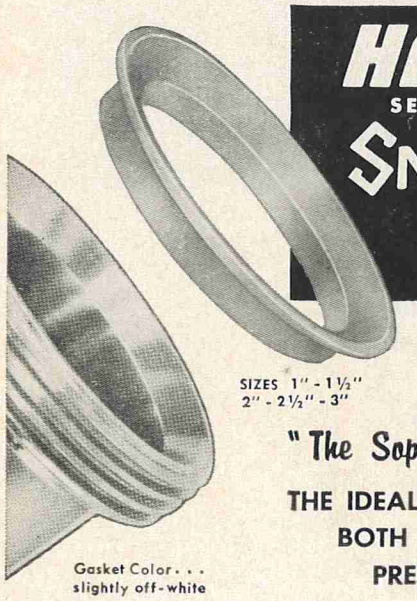

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EFFECTS OF TIME AND TEMPERATURE OF GRADE-A RAW MILK SAMPLE STORAGE ON BACTERIAL TEST RESULTS[1]

J. C. Hartley, E. R. Vedamuthu, G. W. Reinbold and W. S. Clark, Jr.[2]

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(Received for publication July 18, 1968)

Abstract

Milk produced on 30 grade-A farms was analyzed bacteriologically after the following storage treatments: less than 2 hr, 3.3 and 7.2 C for 1, 2, and 3 days, and 3.3 C for 54 hr followed by preliminary incubation at 12.8 C for 18 hr. The effects of these storage treatments were determined with the following bacterial tests: Standard Plate, thermoduric, coliform, total, psychrophilic, and enterococcus counts.

The Standard Plate and total counts showed essentially the same response to sample storage. Preincubation and storage at 7.2 C for 3 days were the only storage treatments that caused a marked change in the counts; with these treatments, the numbers more than doubled. The coliform count response to storage was similar to that of the Standard Plate and total counts, except coliforms decreased when the sample was stored at 3.3 C. The psychrophilic count showed the most marked increase, of any of the tests, to sample treatments. After storage for 1 day, the psychrophiles increased, especially at 7.2 C; there was more than a 10-fold increase during storage at 7.2 C for 3 days and during preliminary incubation. The thermoduric and enterococcus counts did not change a statistically significant amount during sample storage.

These results emphasize the importance of maintaining milk at temperatures of 3.3 C or below and not attempting to hold milk too long. The potential spoilage problem that psychrophiles may present is shown.

At present, milk is handled almost exclusively in bulk tanks. This practice has introduced important parameters (temperature and time of bulk tank storage) that affect bacterial populations. Several tests are described in *Standard Methods for the Examination of Dairy Products (1)* for estimating the bacteriological quality of raw milk. There is no information, however, regarding the effect of storage temperature or age of sample on results. This study was undertaken to discern the ability of different groups of microorganisms, as determined by plating procedures, to multiply during storage. Such information would provide guide lines in fixing the best temperature and length of milk storage.

Methods

Collection of samples

Milk produced on 30 grade-A farms was sampled after milking, as described in a previous paper *(8)*. After immediate refrigerated transportation to the laboratory, each sample was promptly dispensed by using a 10-ml manual continuous syringe, into 8 sets of sterile tests tubes (Fig. 1). After all 8 series of test tubes were filled, 4 sets were placed in a 3.3 C air incubator, and three others were placed in a 7.2 C air incubator. The remaining set was analyzed immediately. As shown in Fig. 1, one set of test tubes was removed for analysis from each incubator after 1, 2, and 3 days of storage. The series of test tubes intended for preliminary incubation (PI) was removed from the 3.3 C incubator after 54 hr and placed in a 12.8 C air incubator for 18 hr before being analyzed.

Analysis of samples

After appropriate storage, the following bacterial tests were

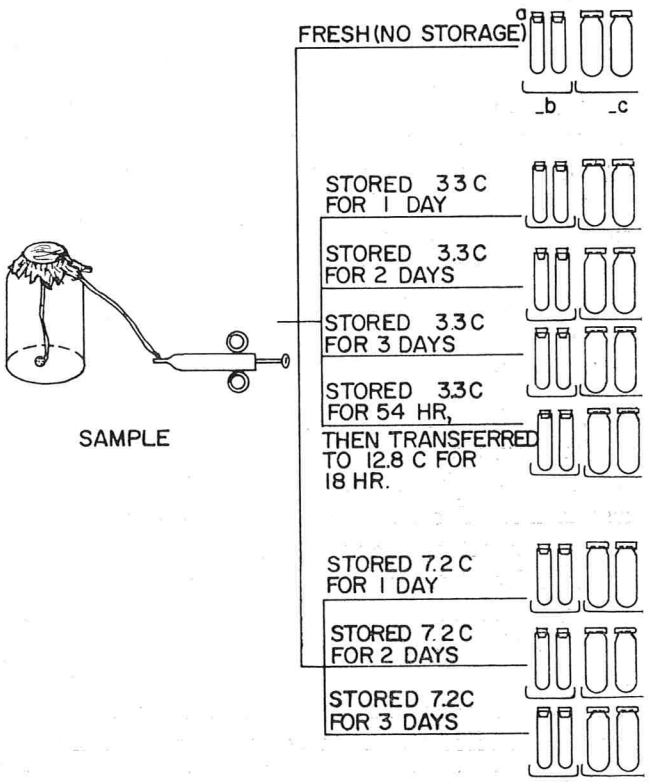

Figure 1. Distribution of sample into test tubes. [a]Samples were analyzed within 2 hr of milking. [b]15 x 125 rubber-stoppered culture tubes for thermoduric bacterial counts. [c]20 x 125 mm screw-capped test tubes for bacterial counts and resazurin tests.

[1]Journal Paper No. J-6021 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project 1050.
[2]Present address: American Dry Milk Institute, Inc., 130 N. Franklin St., Chicago, Ill. 60606.

performed: Standard Plate (SPC), thermoduric (TdBC), coliform (CC), total (TC), psychrophilic (PBC), and enterococcus (EC) counts. The procedures used, which conformed to the recommendations in *Standard Methods for the Examination of Dairy Products (1)* unless otherwise noted, are described in a previous paper *(8)*. The bacterial tests were performed on duplicate tubes of milk. Milk in the two 15 x 125 mm rubber-stoppered test tubes was laboratory pasteurized for the TdBC. Milk in the two 20 x 125 mm screw-capped test tubes was used for the remaining bacterial tests.

Statistical analysis

For statistical analysis, counts of <1 were recorded as 0. Counts were transformed by taking the $\log_{10}$ (count + 1). Because of changes in procedure after the experiment was started, the statistical treatment of PI test results does not include the first 6 samples. A complete least-square analysis of the data, however, adjusted the effects of the slightly unequal subclass numbers.

TABLE 1. SIGNIFICANCE OF SAMPLE-STORAGE COMPARISONS ON BACTERIAL TEST RESULTS OF 30 GRADE-A RAW MILK SAMPLES

Treatment comparison	SPC	TdBC	CC	TC	PBC	EC
Low temp vs. high temp	**	NS[a]	**	**	**	NS
Linear effect of time	**	*	**	**	**	NS
Time x temp interaction	**	NS	**	**	**	NS

[a]Not significant.
*Significant at P <0.05.
**Significant at P <0.01.

RESULTS AND DISCUSSION

The bacterial counts that would be expected when a "typical" sample of milk is subjected to the 8 storage treatments are presented graphically in Fig. 2 and 3. These results were computed with regression coefficients calculated from the data. The "typical" sample represents the average of the 30 farms surveyed in this experiment. Table 1 lists the statistical significance of three of the comparisons included in the regression analysis.

Standard Plate Count

There was a statistically significant difference in the SPCs of the aliquots subjected to the storage treatments. There also was a statistically significant interaction between temperature and time of sample storage; Fig. 2 shows the response to sample storage. When an aliquot was stored at 3.3 C, the SPC declined slightly. When stored at 7.2 C, however, it declined slightly the first 2 days, and then more than doubled between the second and third day. The significant effects of both temperature and time resulted from growth at 7.2 C between the second and third day of storage. The SPC on the PI aliquot was almost as high as on the portion stored at 7.2 C for 3 days. Although the SPC on the aliquot stored at 7.2 C did not change appreciably after 1 or 2 days of storage, it increased rapidly after 2-days storage, which emphasizes that 7.2 C is too high for prolonged holding of milk. During storage at 7.2 C, psychrophiles were undoubtedly increasing fast

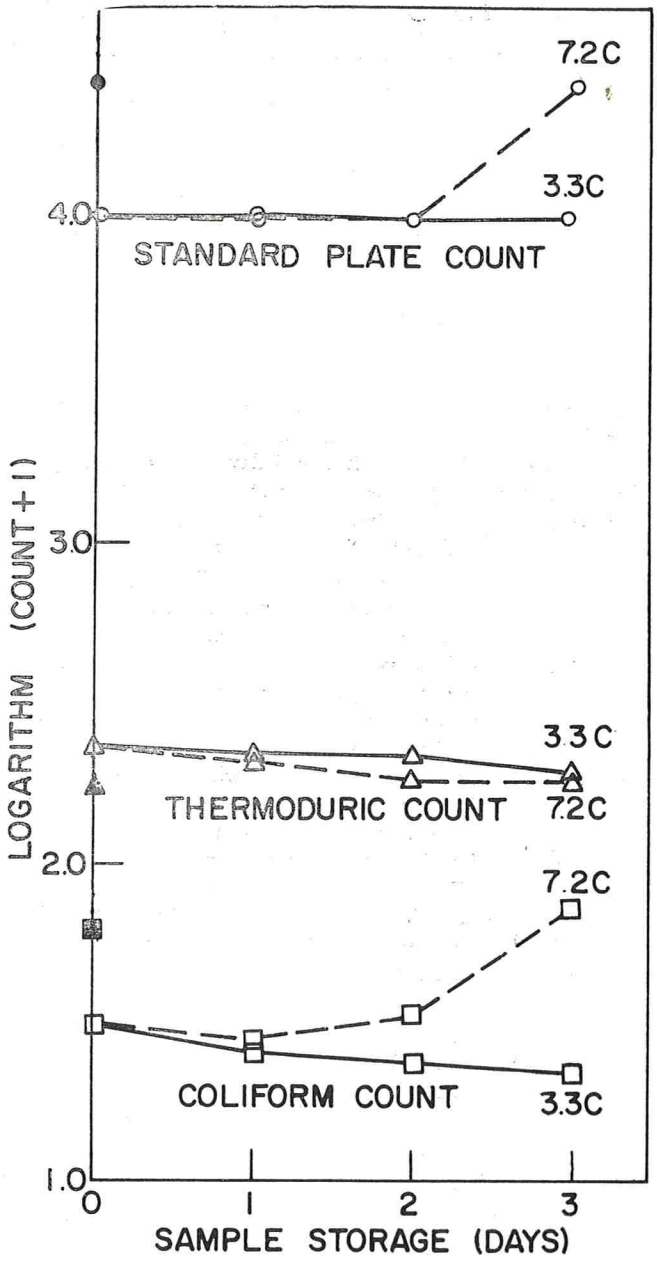

Figure 2. Trends of Standard Plate, thermoduric, and coliform counts of a "typical" grade-A raw milk sample receiving specified storage treatments. (_____Storage at 3.3 C, ... Storage at 7.2 C, ○ Standard Plate Count, △ Thermoduric bacterial count, □ Coliform count. The shaded symbols ●, ▲, and ■ represent the respective counts on the preliminary incubation sample which was stored at 3.3 C for 54 hr and then at 12.8 C for 18 hr.)

Regression coefficients were computed from results of six bacterial tests performed on 30 grade-A raw milk samples which had been subjected to eight storage treatments. These regression coefficients were then used to predict the effect of the eight storage treatments on bacterial counts of a "typical" theoretical grade-A raw milk sample.

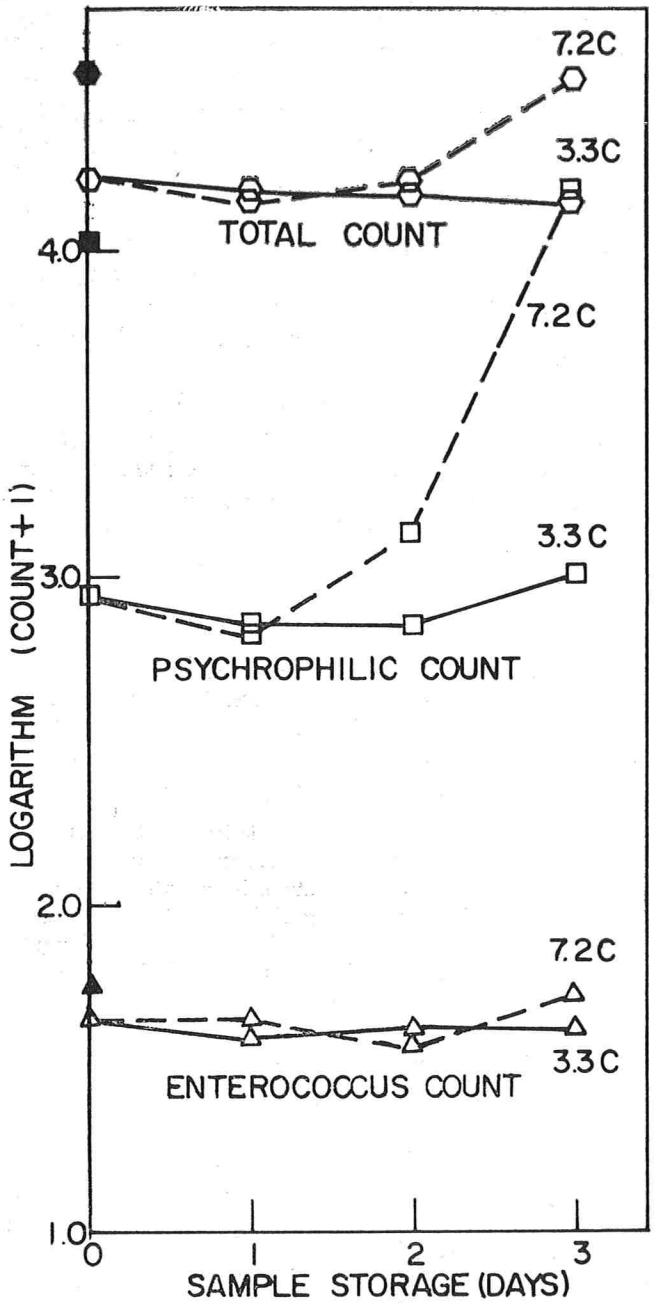

Figure 3. Trends of total, psychrophilic, and enterococcus counts of a "typical" grade-A raw milk sample receiving specified storage treatments. (_____Storage at 3.3 C, ...Storage at 7.2 C, ⬡ Total count, □ Psychrophilic bacterial count, Δ Enterococcus count. The shaded symbols ⬢ , ■, and ▲ represent the respective counts on the preliminary incubation sample which was stored at 3.3 C for 54 hr and then at 12.8 C for 18 hr.)

Regression coefficients were computed from results of six bacterial tests performed on 30 grade-A raw milk samples which had been subjected to eight storage treatments. These regression coefficients were then used to predict the effect of the eight storage treatments on bacterial counts of a "typical" theoretical grade-A raw milk sample.

enough to maintain the bacterial population. After 2 days, the flora contained a higher proportion of psychrophiles, and so the count began to increase rapidly.

The effects of temperature and period of sample storage observed in this experiment agree with results of other workers. Marth and Frazier *(12)* reported little increase in SPCs in most samples when high-count raw milk samples were stored at 2.2 C. Ayers, Cook, and Clemmer *(3)* demonstrated that with milk produced with good sanitation, the count decreased slightly when stored at 4.4 C for 24 hr and then increased slightly when stored for an additional 24 hr. Atherton and Bradfield *(2)* found significantly higher SPCs on raw milk samples stored at 5 C than at 3.3 C for 3 and 5 days. Provided the temperature is low enough, raw milk can be satisfactorily held for several days.

Thermoduric count

The TdBC was relatively insensitive to the sample-storage treatments. The only statistically significant effect shown in Table 1 was the linear effect of time. Figure 2 shows that the TdBC decreased when the aliquot was stored at either 3.3 or 7.2 C. The lack of significant interaction indicates there was no statistically significant difference between the rate of decrease at both storage temperatures. The TdBC decreased slightly more when the aliquot was stored at 7.2 C than at 3.3 C. The TdBC also decreased when the aliquot was preincubated; this decrease may result from death of the thermoduric microorganisms during storage, increased sensitivity of the cells to laboratory pasteurization after storage, clumping of cells, or growth of competitive organisms at 7.2 C.

These results agree with reports by Clegg et al. *(6)*, Marth and Frazier *(12)*, and Atherton and Bradfield *(2)*, who also observed that the thermoduric count did not increase when milk samples were stored at low temperatures. Johns and Berzins *(10)*, and Orr, McLarty, and Baines *(15)* found that thermoduric organisms did not increase in raw milk during PI.

Coliform count

The CC was responsive to sample storage; Table 1 shows that all three treatment comparisons were significant. Figure 2 shows that in aliquots stored at 3.3 C, the CC decreased with each additional day of storage. When held at 7.2 C, however, the count decreased slightly the first day, increased slightly the second day, and then more than doubled between the second and third day of storage. The count of the PI aliquot was almost as high as that of the one stored at 7.2 C for 3 days.

An overall review of the literature reveals conflicting reports on the relationship between sample storage and the coliform count. Ayers and Clemmer

(*4*), Finkelstein (*7*), and Thomas (*20*) reported little or no increase in coliform count when raw milk samples were held at 10 C or less. Skelton and Harmon *(18)* found that cultures of *Escherichia coli* and *Aerobacter aerogenes* decreased in numbers when stored at 0 and 4 C. McKenzie and Robinson *(14)* reported that pure cultures of coliforms did not grow at 4 C, but considerable multiplication occurred in raw milk stored at 10 C for 24 hr. Thomas et al. *(21)* and Panes and Thomas *(16)* reported up to 1000-fold increases in the coliform count of some milk samples stored at 3-5 C for 3 days. Strain differences could account for these conflicting reports.

Total count

All treatment comparisons shown in Table 1 were statistically significant for the TC. When a portion was stored at 3.3 C, the TC decreased slightly but continually (Fig. 3). At 7.2 C, the TC decreased slightly the first day, increased slightly the second, and then almost doubled between the second and third day of storage. The TC of the PI aliquot was slightly higher than of the sample stored at 7.2 C for 3 days.

Psychrophilic count

The PBC gave statistically significant responses to all treatment comparisons (Table 1) and showed the greatest response of any of the bacterial counts to sample storage (Fig. 3). When stored at 3.3 C, the count decreased the first 2 days and then showed a moderate increase between the second and third day of storage. Although the PBC on the portion stored at 7.2 C decreased after 1-day storage, it showed a dramatic increase on further storage. The large increase in count at 7.2 C was responsible for the significant interaction. The PBC of the PI portion was almost as high as of the sample stored at 7.2 C for 3 days. Rapid growth at 7.2 C beyond 1-day storage reemphasizes the necessity of maintaining a low holding temperature for milk coupled with reducing psychrophilic contamination.

There are many literature references substantiating the observed ability of psychrophiles to grow at milk storage temperatures *(2, 12, 19)*. Prouty *(17)* found that, when raw milk samples from bulk tanks were held between 2.8-3.9 C, facultative psychrophilic bacteria, as determined by the plate count at 17 C, increased more rapidly than did the microorganisms enumerated by the SPC. Marth and Frazier *(12)* reported that a storage temperature of 7.2 C permitted too much psychrophilic growth in bulk tank milk. In low-count milk, psychrophiles grew faster than in high count milk after 2 days of incubation *(13)*.

Enterococcus count

None of the treatment comparisons were statistically significant with the EC, as shown in Table 1, and it did not show a definite trend when the milk was stored (Fig. 3). When an aliquot was held at 3.3 C, the EC decreased slightly the first day, increased slightly the second day, and then decreased slightly by the third day. The trend of the EC was reversed on those stored at 7.2 C. The EC increased only slightly on the PI aliquot. Although enterococci are known to grow at 10 C *(5)*, the lack of response to storage treatment at 7.2 C indicated that their growth below 10 C is slow. Data presented by Higginbottom *(9)* show that enterococci gradually die at 5 C or below.

The preceding results show "typical" bacterial test responses to the effects of sample storage temperature and time. They also reemphasize the need for maintaining low milk-storage temperatures on the farm as well as for samples to be examined microbiologically.

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(Editor's Note: The following article was prepared by Mr. Roger Lewis, president of the National Association of Sanitarians (NAS) and appeared in the Journal of Environmental Health, Volume 31, pages 217-218. It is reproduced below with the permission of both Mr. Lewis and Dr. A. H. Bliss, editor of the indicated journal. Since the possible amalgamation of IAMFES and NAS has been a subject of much discusion, viewpoints expressed by Mr. Lewis should be of interest to all IAMFES members.)

Inquiries concerning the status of the proposed amalgamation have been directed to me. A review of the issues and the proposals of the National Association of Sanitarians are in order.

The proposed amalgamation of sanitarians' organizations has much to offer the sanitarians; one national organization representing all of the sanitarians of the United States, one annual educational conference, one national office to support, one publication to circulate. The increased membership could produce greater impact on legislative and administrative bodies, could result in more efficient operation, could produce more services. The energies expended in association competition and rivalry could be redirected into constructive channels.

Why aren't we progressing toward unification? After six proposed bylaws revisions and much discussion by the Unification Committee, the Board of Directors, during the 32nd A. E. C. of the National Association of Sanitarians, referred the seventh draft of the proposed bylaws to its Unification Committee for further consideration.

Lack of success in the recent efforts indicates the need to re-examine the proposal. The original proposal would establish a new organization with a name acceptable to both organizations. Bylaws, drafted by the Unification Committee were to be submitted to the board of each organization for review and, if approved, to the membership of each association. Members would accept or reject by mail ballot. The present associations members were to be absorbed into the new organization within sections. Present personnel and officers would be retained and serve alternate terms until replaced through attrition. Executive directors and national offices would be continued and assigned definite areas of responsibility and activity. Two publications would be continued for the present, and eventually phased into one monthly publication. The bylaws would be revised at some later date to establish the organization structure acceptable to the combined membership.

The procedures outlined were compromises and postponed decision on the issues until some later date.

On June 22 and 23 (1968) our Board of Directors, by referral to the Unification Committee, rejected the proposed bylaws. The Unification Committee has been instructed to re-examine the seventh draft of the proposed bylaws and the suggested procedures for combining the two associations. The committee was also instructed to first determine the objectives of an association that would be satisfactory to the membership of N. A. S. and the structure best suited to accomplish these objectives. Once these steps are taken, the membership should be informed and the proposed bylaws reviewed and revised, if necessary, to provide procedures to establish the structure and attain the objectives. The Unification Committee is composed of experienced and competent members: John McHugh, president-elect and chairman; John Todd, past president; William Walter, past president; Verne Reierson, second vice president; and Harry R. Pool, Jr., president, New York Association of Sanitarians.

Any new organization must be successful. To be successful, we must insure against a substantial portion of the membership separating from the new organization and setting up a splinter organization because a new association fails to represent their objectives.

MODIFICATION OF THE PRELIMINARY INCUBATION TREATMENT FOR RAW MILK SAMPLES[1]

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Abstract

Bacteria growing actively in raw milk during preliminary incubation at 12.8 C for 18 hr are usually strongly aerobic. Consequently, increasing the ratio of surface area to volume of sample during preliminary incubation results in a significant increase in count.

As the initial Standard Plate Count increased in magnitude, the percentage of samples showing more than a 10-fold increase after preliminary incubation also increased.

Aging of samples at low temperatures before subjecting them to preliminary incubation results in a marked increase in count in certain samples.

Interest in preliminary incubation (PI) of raw milk samples as a means of improving the effectiveness of bacteriological tests as indices of production conditions and practices is widespread, as indicated by a recent review article *(2)*. Some of the findings in studies carried out at Iowa State University offer pertinent information on the use of PI.

Experimental Procedures

Preliminary study

It has been shown *(4)* that when samples are subjected to PI at 12.8 C for 18 hr, a significant proportion show a marked increase in count; in most instances, psychrotrophic bacteria are responsible for the bulk of this increase. Since these organisms are strongly aerobic, it seemed reasonable to expect that the greater the surface area to volume ratio of the sample during PI, the greater would be the growth of these organisms. To verify this, 31 samples of raw milk were subdivided and treated as follows: *(a)* Standard Plate Count (SPC) at start, *(b)* SPC-PI on 10 ml of milk in 20 x 125 mm test tube, *(c)* SPC-PI on 10 ml of milk in 6 oz screw-cap Pyrex bottle, *(d)* As *(c)*, but in horizontal position, and *(e)* As *(d)*, but with 20 ml of milk.

The results are summarized in Table 1. Statistical analysis (analysis of variance) showed a statistically significant difference existed among treatments ($P<0.05$). Treatment No. 5 was selected for subsequent studies because it had the highest mean SPC. (The exposed surface here was almost double that in bottles that stood upright.)

Table 1. Mean Standard Plate Counts (SPC) for five raw milk storage treatments—31 samples for each treatment

Treatments	SPC[a]/ml Before PI[b]	SPC[a]/ml After PI[b]
1. Fresh, raw milk	2.3	
2. PI of 10 ml milk in test tubes		26.0
3. PI of 10 ml milk in bottles (incubated upright)		45.0
4. PI of 10 ml milk in bottles (incubated horizontally)		44.0
5. PI of 20 ml of milk in bottles (incubated horizontally)		54.0

[a]SPC X 10^4.

[b]Preliminary incubation at 12.8 C for 18 hr.

Main study

Thirty samples of milk were collected shortly after milking from individual farms near Ames during August and September, 1966. Twelve were from Grade A shippers, the others were from manufacturing-milk shippers. All had bulk tanks. Samples were taken from tanks at the completion of milking and handled as recommended by *Standard Methods for the Examination of Dairy Products (1)*. On arrival at the laboratory (0-hr old) the SPC and SPC-PI were determined on each sample. Aliquots of samples were then stored at 3.3 C. After 24 and 48 hr the SPC and SPC-PI were again determined; and plates were incubated at 32 C for 48 hr.

Results and Discussion

To facilitate comparisons and emphasize salient features, the frequency distribution of ratios of SPC and SPC-PI obtained are shown in condensed form in Table 2, along with similar data published by Johns at Ottawa, Canada *(4)*. Both sets of data bring out more clearly the tendency for SPC-PI to show an increase of more than 10-fold as the initial SPC increases. This is to be expected because various workers have shown that the microflora of high count milks, produced under unsanitary conditions, contain a higher percentage of gram-negative rods. Johns' results also show that an appreciable percentage of samples with initial counts not exceeding 10,000/ml will show at least a 10-fold increase, indicating the presence of saprophytic contaminants.

Johns et al. *(5)* in reporting collaborative studies at three Canadian centers suggested that the failure

[1]Journal Paper No. J6028 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project No. 1488.

[2]Address: Lazarus Laboratories (Canada) Ltd. Division, West Chemical Products, 325 Dalesford Road, Toronto 18, Ontario.

[3]Address: American Dry Milk Institute, Inc., 130 North Franklin Street, Chicago, Illinois 60606.

of PI to reflect unsatisfactory production conditions might have resulted from their use of samples representing two milkings (24-hr samples) and presented some evidence to support this. They also referred to Jackson's findings (3) of a similar nature. Our studies lent further support to this view. In Table 3, counts before and after PI after 0, 24, and 48 hr are given for the three farms showing the greatest change on PI and the three showing the least. Here again it is obvious that counts after PI increased appreciably from 24 to 48 hr, but without PI there was practically no change. There was practically no change as a result of longer storage with the three farms whose milk showed the least elevation in count from PI.

The results reported here suggest the desirability of further studies in different areas to establish the optimum ratio of surface area to volume of sample for PI and thus improve this procedure. They also suggest that, where samples represent only two milkings, it is desirable to hold such samples at under 4 C for an additional 24 hr to obtain the full benefit of PI in detecting contamination with saprophytes.

ADDENDUM

Since this article was submitted for publication, Canadian workers have reported investigations of factors contributing to the bacterial count of bulk-tank milk in a series of three papers (*J. Dairy Sci.* 51: 1182-1206, 1968). They too found a greater response to PI where milk was refrigerated for at least 48 hr than with fresher milk. At 2 of the 3 centers samples stored for 48 hr in Whirlpak bags floating in the bulk tank milk showed a greater increase on PI than those stored in sample jars in the refrigerator. Greater aeration of the Whirlpak samples as a result of agitation may have been a factor.

TABLE 2. FREQUENCY DISTRIBUTION OF RATIOS OF SPC-PI TO SPC

Initial SPC	Ratio[a] Ottawa ≤10	Ottawa >10	Ottawa %>10	Ames ≤10	Ames >10	Ames %>10
5,000 or less	20	8	28.6	17	0	0
5,001- 10,000	12	10	45.5	14	0	0
10,001- 25,000	12	12	50.0	15	0	0
25,001- 50,000	6	3	33.3	6	3	33.3
50,001-100,000	1	6	85.7	14	2	12.5
100,001-200,000	3	9	75.0	2	2	50.0
200,001-500,000	3	5	62.5	10	4	28.6
500,001 or more	4	14	77.7	15	76	83.5
Total	61	67		93	87	

[a]SPC-PI/SPC.

TABLE 3. STANDARD PLATE COUNTS OF SIX SAMPLES OF MILK SELECTED FOR FURTHER STUDY

Farm	Storage hr at 3.3 C	Counts/ml[a] Before PI[b]	After PI[b]	Ratio 1[c]	Ratio 2[d]
		Samples that changed greatly			
4	0	32.00	450.00	14.1	
	24	23.00	2,100.00	91.3	
	48	37.00	9,100.00	245.9	17.4
19	0	6.20	8.80	1.4	
	24	7.70	15.00	1.9	
	48	5.60	37.00	6.6	4.7
22	0	14.00	150.00	10.7	
	24	15.00	220.00	14.7	
	48	17.00	880.00	51.8	4.8
		Samples that changed little			
30	0	6.00	6.40	1.1	
	24	5.30	7.00	1.3	
	48	5.20	6.50	1.3	1.2
17	0	0.14	0.14	1.0	
	24	0.12	0.20	1.7	
	48	0.13	0.12	0.9	0.9
29	0	29.00	61.00	2.1	
	24	27.00	76.00	2.8	
	48	32.00	56.00	1.8	0.9

[a]SPC x 10^4.

[b]Preliminary incubation at 12.8 C for 18 hr (PI).

[c]SPC after PI/SPC before PI.

[d]Ratio after 48 hr/Ratio after 0 hr.

ACKNOWLEDGMENT

Appreciation is expressed to Mrs. Kay Schroeder who collected the milk samples and performed the necessary experiments to gather these data.

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EVALUATION OF THE RESAZURIN REDUCTION ONE-HOUR TEST FOR GRADING MILK INTENDED FOR MANUFACTURING PURPOSES[1, 2]

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ABSTRACT

Randomly selected dairy farms in three widely separated geographical locations, producing milk intended for manufacturing purposes, were sampled once each season of the year. Samples were analyzed by Standard Plate Count (SPC-32 C.), resazurin reduction test (RRT-5 P 7/4) and resazurin reduction 1 hr test (RRT-1 hr). Correlation between SPC and RRT-1 hr was 0.742 and between SPC and RRT-5 P 7/4, −0.777. Application of ADMI/EMA standards or calculated RRT-1 hr standards resulted in a quality distribution that differed from the distribution given by SPC or RRT. With the proposed RRT-1 hr test, a combination of the ADMI/EMA and the calculated standard levels, evaluation of the quality of can and of farm bulk tank supplies in various geographical locations was similar to the evaluation given by either SPC or RRT. The RRT-1 hr test was judged to be as useful as RRT-5 P 7/4, DMCC, SPC, or MBRT in assessing the bacteriological quality of various types of milk supplies, and has the advantage of being faster. For reliable results, standard illumination must be used.

Milk intended for manufacturing purposes can be classified by one of the following bacteriological tests: Standard Plate Count (SPC), direct microscopic clump count (DMCC), methylene-blue-reduction test (MBRT), and resazurin-reduction test (RRT) with a 5 P 7/4 Munsell color end-point. Dabbah, Tatini and Olson *(1)* have shown that a number of milk supplies would be upgraded or downgraded when one of the above tests was replaced with another when compared with the SPC as the base. They also showed that agreement between SPC and reduction tests was better when bulk and can supplies were considered separately. Although Johns *(3)* reported that a RRT based on a 5 P 7/4 end-point was of greater value than a so-called one-hour resazurin-reduction test (RRT-1 hr) where the color of milk samples are compared to a series of color standards after one hour of incubation at 37 C, certain branches of the dairy industry appear to favor the RRT-1 hr. The Evaporated Milk Association (EMA) and the American Dry Milk Institute (ADMI) published *(2, 4)* the bacteriological grade classification shown in Table 1. This classification includes a RRT-1 hr. Furthermore, variations of the RRT-1 hr, such as the 10 min RRT, have also been used in parts of the country.

The U. S. Department of Agriculture Standards *(6)* does not list the RRT-1 hr test *(5)* as a bacteriological method for classification of milk supplies. But, in view of the interest shown in the use of a RRT-1 hr, we are assessing the possibility of its use in lieu of SPC or RRT-5 P 7/4.

EXPERIMENTAL METHODS AND PROCEDURES

Sources of milk samples, statistical procedures for analysis of data, and methods of analysis were the same as previously reported *(1)*. The ADMI/EMA specify classification on the basis of purple, lavender, pink, and colorless (Table 1). The color of our samples incubated for 1 hr at 35-37 C, was determined with the Munsell Color Grader (Munsell Color Company, Inc., 10 E. Franklin Street, Baltimore, Maryland). The color standard contains four colors arranged in a clear glass test tube with color designated from bottom to top as follows: 5 PB 7/4 (blue); 10 PB 7/5.5 (Bluish-purple); 5 P 7/4 (purple) and 10 P 7/8 (Pinkish-purple). Colors were read under standard illumination provided by a Fluor-dent illuminator (Catalogue No. 335, Wolf X-Ray Products, Inc., 93 Underhill Avenue, Brooklyn 38, N. Y.) consisting of a single 14-22-watt daylight-type fluorescent light and a glass filter approximately 4 in. high by 15 in. wide.

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[1]This work was done under United States Department of Agriculture Contract 12-25-010-5318, Scientific Journal Series Paper No. 6618, Minnesota Agricultural Experiment Station.

[2]Mention of specific trade names is made for identification purposes only and does not imply endorsement by the U. S. Government.

[3]Present Address: Division of Microbiology, Bureau of Science, Food and Drug Administration, HEW, Washington, D. C. 20204.

TABLE 1. BACTERIOLOGICAL CLASSIFICATION OF MILK SAMPLES BY VARIOUS METHODS ACCORDING TO ADMI/EMA RECOMMENDED SANITARY STANDARDS CODES *(2, 4)*

"Milk shall be classified in accordance with the following table (the methylene blue test is recommended)"

Bacterial estimate classification	Standard plate count or direct microscopic clump count	Methylene blue test hr	Resazurin test No color change beyond P 7/4 hr	Resazurin test 1 hr
1	Not over 500,000	>4 1/2	2 1/4	Purple
2	Not over 3,000,000	>2 1/2	1 1/2	Lavender
3	Not over 10,000,000	1	3/4	Pink
4	Over 10,000,000	<1	<3/4	Decolorized

RESULTS AND DISCUSSION

A total of 3,873 samples (can, 2,756; farm bulk tank, 1,117) from approximately 970 producers from 20 processing plants located in seven states grouped in three widely separated geographical locations was collected and analyzed.

The linear correlation coefficient between RRT-1 hr and SPC was 0.742 and between SPC and RRT (5 P 7/4) was –0.777. These correlations compare favorably with the correlations between SPC, DMCC, MBRT, and RRT (5 P 7/4) taken two by two and shown in a previous paper *(1)*.

On the basis of regression equations between SPC and RRT-1 hr, color standards corresponding to SPC's of 500,000 and 3,000,000/ml were calculated for RRT-1 hr. The relationship between the various RRT and RRT-1 hr standards set by the USDA, ADMI, EMA or calculated on the basis of our data are shown in Table 2. The ADMI/EMA standards are more severe for Class 1 supplies, and more lenient for Class 3 supplies than our calculated standards which were devised to give the best possible agreement with SPC.

The various standards shown in Table 2 were applied to can and farm bulk tank samples. The RRT (5 P 7/4) test, using the USDA recommended standards or the standards calculated on the basis of all supplies, or on the basis of all can supplies, or on the basis of all farm bulk tank supplies, was always more severe than RRT-1 hr in classifying can as well as farm bulk tank supplies.

The use of dual standards for RRT-1 hr, one based on all can samples and the other based on all farm bulk tank samples for their respective type of supplies still resulted in a test less severe than RRT-5 P

TABLE 2. RELATIONSHIP BETWEEN VARIOUS RRT AND RRT-1 HR STANDARDS AND THE SPC STANDARD

Class	USDA SPC	USDA RRT	ADMI/EMA RRT-1 hr	Standards calculated on basis of all samples RRT	Standards calculated on basis of all samples RRT-1 hr	Standards calculated on basis of all can samples RRT	Standards calculated on basis of all can samples RRT-1 hr	Standards calculated on basis of all farm bulk tank samples RRT	Standards calculated on basis of all farm bulk tank samples RRT-1 hr
	(per ml)	(hr)	(color code)[1]	(hr)	(color code)	(hr)	(color code)	(hr)	(color code)
1	≤500,000[2]	>2-1/4	≤2	>2-3/4	≤3	>2-1/2	≤4	>3-1/2	≤3
2	≤3,000,000	≤2-1/4	≤6	≤2-3/4	≤5	≤2-1/2	≤5	≤3-1/2	≤4
3	>3,000,000[3]	≤1-1/2	>6	≤1-3/4	>5	≤1-1/2	>5	≤2-1/2	>4

[1] 1 = color bluer or equal to 5 PB 7/4 (blue)
2 = color beyond 5 PB 7/4 to, but not including 10 PB 7/5.5
3 = color equal to 10 PB 7/5.5 (bluish-purple)
4 = color beyond 10 PB 7/5.5, but not including 5 P 7/4
5 = color equal to 5 P 7/4 (purple)
6 = color beyond 5 P 7/4 to, but not including 10 P 7/8
7 = color equal to 10 P 7/8 (pinkish-purple)
8 = color beyond 10 P 7/8, but not including colorless
9 = colorless

[2] ≤Equal to or less than

[3] >Greater than

TABLE 3. CLASSIFICATION OF MILK SUPPLIES ACCORDING TO VARIOUS GRADING SYSTEMS (SEE TABLE 1) — % DISTRIBUTION BY METHOD INDICATED

Class	USDA SPC	USDA RRT	ADMI/EMA RRT-1 hr	Standards calculated on basis of all samples RRT-1 hr	Standards calculated on basis of all samples RRT	Standards calculated on basis of all can samples RRT-1 hr	Standards calculated on basis of all can samples RRT	Proposed Standards for RRT-1 hr[1] All Samples RRT-1 hr	Proposed Standards for RRT-1 hr[1] All Can Samples RRT-1 hr
					All can samples				
1	39.4	34.6	39.7	50.1	27.3	57.2	31.6	39.7	39.7
2	25.4	17.2	24.9	13.6	19.6	6.5	20.2	24.0	24.0
3	35.2	48.2	35.4	36.3	53.1	36.3	48.2	36.3	36.3
						Standards calculated on basis of all bulk samples		Proposed Standards All Samples	Proposed Standards All Bulk Samples
					All farm bulk tank samples				
1	58.2	70.9	70.0	81.4	65.5	77.1	53.1	70.0	70.0
2	21.2	11.0	15.0	5.8	14.3	4.1	15.8	17.2	11.2
3	20.6	18.1	15.0	12.8	20.2	18.8	31.1	12.8	18.8

[1]See Table 6

TABLE 4. CLASSIFICATION OF CAN SAMPLES ACCORDING TO VARIOUS STANDARDS (SEE TABLE 2) — % DISTRIBUTION WITHIN GEOGRAPHICAL SOURCES INDICATED

Class	USDA SPC	USDA RRT	ADMI/EMA RRT-1 hr	Standards calculated on basis of all samples RRT-1 hr	Standards calculated on basis of all samples RRT	Standards calculated on basis of all can samples RRT-1 hr	Standards calculated on basis of all can samples RRT	Proposed Standards for RRT-1 hr[1] All Samples RRT-1 hr	Proposed Standards for RRT-1 hr[1] All Can Samples RRT-1 hr
					Location A				
1	58.2	49.3	48.4	73.8	44.0	80.5	44.2	48.4	48.4
2	25.7	18.4	41.8	10.2	23.7	3.5	23.5	35.6	35.6
3	16.1	32.3	9.8	16.0	32.3	16.0	32.3	16.0	16.0
					Location B				
1	27.2	29.0	36.5	42.3	22.7	46.7	25.7	36.5	36.5
2	23.7	14.6	22.7	12.1	15.7	7.5	17.9	17.9	17.9
3	49.1	56.4	40.8	45.6	61.6	45.8	56.4	45.6	45.6
					Location C				
1	40.7	30.9	37.4	45.8	21.9	55.8	26.9	37.4	37.4
2	27.2	19.9	30.5	17.1	21.4	7.1	23.9	25.5	25.5
3	32.1	49.2	32.1	37.1	56.7	37.1	49.2	37.1	37.1

[1]See Table 6

7/4 as shown in Table 3.

The effect of the use of various types of standards for RRT-5 P 7/4 or RRT-1 hr in various geographical locations is shown in Table 4 for can supplies and in Table 5 for farm bulk tank supplies.

When the quality distribution of supplies (can or bulk tank) by calculated RRT-1 hr standards is compared to the quality distribution by RRT-5 P 7/4, SPC, and RRT-1 hr (ADMI/EMA) standards, we observe wide variations depending on the geographical location as well as on the test used. But generally, RRT-1 hr was always less severe than RRT-5 P 7/4 or SPC.

When the ADMI/EMA standards were applied to all types of supplies, the percentage of samples in Class 1 was approximately the same as the percentage of samples in Class 1 with either SPC or RRT (5 P 7/4). When the calculated RRT-1 hr standards were applied to their respective type of supplies, the percentage of samples in Class 3 was approximately

the same as the percentage of samples in Class 3 with either SPC or RRT (5 P 7/4). Apparently the color code corresponding to Class 1 by the ADMI/EMA standard is adequate, while the one for Class 3 is far too lenient. On the other hand, the color code corresponding to Class 3 by the calculated standards is adequate, while the one for Class 1 is far too lenient.

If we combine the color standard of ADMI/EMA for Class 1 and the color standard of calculated standards for Class 3, we obtain the standard levels shown in Table 6 under Proposed Standards for RRT-1 hr. The standards assigned for all samples and for can samples are the same. On the other hand, the standards for farm bulk tank supplies are different. These proposed standards are applied to various types of supplies in Tables 3, 4, and 5 (last two columns of each table). In Table 3, for instance, quality distribution by RRT-1 hr, using the proposed standards for all samples is similar to the distribution by SPC when applied to can supplies and is similar to the distribution by RRT (5 P 7/4) when applied to farm bulk tank supplies.

If we remove the geographical-source effect from the quality distribution of can as well as bulk supplies (Tables 4 and 5), in general, quality distributions are similar to the distribution by either SPC or by RRT (5 P 7/4). The use of dual RRT-1 hr standards, one for bulk and the other for can supplies, does not seem to improve the quality distribution over that obtained by the use of a single RRT-1 hr standard. However, the use of separate standards for bulk and can supplies does reduce the effect of geographical source.

CONCLUSIONS

Application of our proposed standards for RRT-1 hr, combining the color levels of ADMI/EMA standards and of those of calculated standards, resulted in an evaluation of the quality of can as well as of farm bulk tank supplies in various geographical locations that was similar to the evaluation given by either SPC or RRT.

An earlier paper *(1)* showed that methods of classification of manufacturing milk based on SPC, DMC, RRT-5 P 7/4, or MBRT could not be used interchangeably, but concluded, on the basis of available information, that any one of the four tests could be used if standards were set so that one method did not grade milk more leniently or more severely than another.

Present results show that the RRT-1 hr test should be equally useful in quality control of milk intended for manufacturing purposes. As in any other tests that compare colors to a set of standard colors, illumination of the sample is critical and must be standardized (see Experimental Methods and Procedures). Furthermore, no color-blind person should be allowed to classify samples on the basis of color. Both of these limitations apply to RRT-1 hr as well as to RRT-5 P 7/4 tests.

ACKNOWLEDGMENT

Appreciation is expressed to F. E. Fenton, Consumer and

TABLE 5. CLASSIFICATION OF FARM BULK TANK SAMPLES ACCORDING TO VARIOUS STANDARDS (SEE TABLE 2) — % DISTRIBUTION WITHIN GEOGRAPHICAL SOURCES INDICATED

Class	USDA SPC	USDA RRT	ADMI/EMA RRT-1 hr	Standards calculated on basis of all samples RRT-1 hr	Standards calculated on basis of all samples RRT	Standards calculated on basis of all bulk tank samples RRT-1 hr	Standards calculated on basis of all bulk tank samples RRT	Proposed Standards for RRT-1 hr[1] All Samples RRT-1 hr	Proposed Standards for RRT-1 hr[1] All Bulk Tank Samples RRT-1 hr
				Location A					
1	60.7	78.2	70.2	92.8	72.6	92.7	56.5	70.2	70.2
2	26.0	14.2	27.3	4.0	16.7	2.7	20.6	26.6	25.2
3	13.3	7.6	2.5	3.2	10.7	4.6	22.9	3.2	4.6
				Location B					
1	27.6	40.1	53.4	56.5	33.5	56.5	21.2	53.4	53.4
2	23.9	13.3	12.1	5.9	17.7	4.7	15.0	9.0	7.8
3	48.5	46.6	34.5	37.6	48.8	38.8	63.8	37.6	38.8
				Location C					
1	74.8	82.4	80.3	86.5	77.5	86.5	69.0	80.3	80.3
2	14.3	6.2	14.7	7.2	9.5	5.1	10.9	13.4	11.3
3	10.9	11.4	5.0	6.3	13.0	8.4	20.1	6.3	8.4

[1]See Table 6

TABLE 6. PROPOSED STANDARD LEVELS FOR RRT-1 HR BASED ON A COMBINATION OF ADMI/EMA AND CALCULATED STANDARD LEVELS

Class	SPC (/ml)	RRT-1 hr for all samples (color code)[1]	RRT-1 hr for all can samples (color code)	RRT-1 hr for all bulk tank samples (color code)
1	≤500,000	≤2	≤2	≤2
2	≤3,000,000	≤5	≤5	≤4
3	>3,000,000	>5	>5	>4

[1]See Table 2 for color code.

Marketing Service, Standardization Branch, U. S. Department of Agriculture, for his review of the manuscript.

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AUTOMATED CLEANING IN THE MEAT PROCESSING INDUSTRY

The greatest opportunities for automated cleaning systems in the meat processing industry are presented at the point of building and equipment design, according to Dr. Neil B. Webb, associate professor of North Carolina State University's Department of Food Science, Raleigh. Dr. Webb told a food technology seminar at the Oct. 13-17 Food and Dairy Industries Expo that, to date, automated systems have been primarily of the small unit type such as portable spray units, loaf mold washers, trolly cleaning units and smoke rack spray systems. Although more sophisticated systems have been developed for cleaning-in-place (CIP) equipment—such as smokehouses, cookers and pork cutting lines—these have not been widely used by the industry.

Recent innovations have included centralized cleaner distribution systems which offer a tremendous potential for more fully automated approaches to cleaning meat processing plants. However, this type of system has some major problems to solve prior to broad applications as a practical automated system.

While cleaning compounds increase efficiency of material removal, the proper application of cleaners can be fully realized only when a cleaner is prepared for a specific automated system.

Since the greatest opportunity for more fully automated systems occurs at the point of building and equipment design, the meat processor must be resourceful in demanding the development of a greater degree of mechanization of cleaning for plant ceilings, walls and floors and for large mechanized processing equipment. For reduction of manufacturing costs, the design of facilities and equipment which can be mechanically cleaned by flow-through spray applications is essential. Cleaning systems which are used immediately following cessation of the manufacturing operation should take complete advantage of the wetting properties of the food product on the equipment surface.

CORRELATIONS BETWEEN FLAVOR SCORE, FLAVOR CRITICISM, STANDARD PLATE COUNT, AND OXIDASE COUNT ON PASTEURIZED MILKS.

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ABSTRACT

A numerical flavor score together with flavor criticism judgement, Standard Plate Count and oxidase count was made on each of 395 commercially pasteurized milk samples. A statistically significant correlation was found between the flavor scores and the oxidase counts on samples criticized as being old or lacking freshness. Nonsignificant correlations were found with defects not usually considered to be of bacterial origin such as feed and vitamin flavor.

Off-flavors in milk characterized as old, unclean and lacking freshness could result from pseudomonad contamination. The oxidase test applied to plates used for Standard Plate Counts of milk allows us to test for pseudomonads quickly, as has been reported *(2, 3)*, since these bacteria are strongly oxidase-positive (most other bacteria are not) *(5)* and the number of oxidase-positive organisms gives an estimate of the number of pseudomonads. Since most off-flavor problems of bacterial origin in milk are caused by pseudomonads *(6)*, the oxidase test applied to pasteurized milk gives an indication of potential psychrophiles *(2)* and in raw milk of the efficiency of sanitation practices on the farm *(3)*. In this study we attempt to show a relationship between certain off-flavors in milk and oxidase-positive organisms. Correlations between flavor score, flavor criticism, Standard Plate Count, and oxidase count on 395 commercial samples are given.

METHODS

Samples were collected at retail outlets in Connecticut and refrigerated immediately. One portion of the sample was tested organoleptically, the other was reserved for bacteriological analysis. Less than 24 hr elapsed between collection and analysis. Milk flavor intensity was judged according to the following scale: excellent flavor, 40.0; very good flavor, 39.0 to 39.5; good flavor, 37.0 to 38.0; and unsatisfactory flavor 36.0 and below. Total bacterial counts (Standard Plate Count) were made according to *Standard Methods (1)*, and the test for oxidase-positive organisms as described by Hankin *(2)*. In instances where the count was less than 30 per plate, the actual number found was recorded. The logarithms of the actual counts were grouped into six equally spaced log units for ease in computer analysis according to the code shown in Table 1. Flavor criticisms were numerically coded; also for ease in computation. The data obtained were subjected to correlation analysis by a standard routine at the Yale University Computer Center.

RESULTS AND DISCUSSION

The flavor criticisms applied to the 395 samples are shown in Table 2 and the distribution of flavor scores in Table 3. As expected, since all samples were pasteurized, most (over 35%) were criticized as having a cooked flavor. A combination of cooked and feed flavor accounted for over 32% of the samples. These two categories, cooked, and cooked and feed, comprised 78.1% of the samples examined. Only about 25% of the samples scored 36.0 or less, and were considered to be of inferior quality. Samples with values above 36.0 are considered to be of good quality and flavor. A table of the distribution of flavor scores within groups of flavor criticisms is not warranted since significant correlations will be noted in the discussion to follow.

Samples with zero flavor scores were omitted before the correlations were calculated in order to avoid any bias, since the flavor scores are in a discontinuous series, i.e. there are no scores between 0 and 30.0. All data are shown in Table 4 and reference to a specific line number hereafter is to this table. Several correlations were considered to

TABLE 1. SEQUENCE OF CODED VALUES FOR STANDARD PLATE COUNT AND OXIDASE COUNT

Actual Count	<3,000	3,000 to 9,480		9,481 to 30,000		30,001 to 94,800		94,801 to 300,000		>300,000
Logarithm	–	3.477	3.977	–	4.477	–	4.977	–	5.477	–
Code	0	1		2		3		4		5

TABLE 2. DISTRIBUTION OF FLAVOR CRITICISMS ON 395 PASTEURIZED MILK SAMPLES

Flavor criticism[1]	No. of samples	%
Cooked	139	35.2
Cooked and feed	130	32.9
Feed	22	5.6
Vitamin flavor	17	4.3
Old	11	2.8
Unclean	10	2.5
Cooked and unclean	10	2.5
Rancid	7	1.8
Feed and unclean	5	1.3
Oxidized	5	1.3
Cooked and old	4	1.0
Cooked, feed, and unclean	3	0.8
Old and bitter	2	0.5
Old and vitamin flavor	2	0.5

[1]One sample (total for all combined, 7.1%) of each of the following: barny and rancid; musty; burnt; cooked and rancid; feed and moldy; feed and oxidized; sour; sweet; unclean and lacks freshness; old and musty; cooked, old, and lacks freshness; cooked, feed, and watery; old and high acid; chalky; chemical; feed and old; vanilla; sour and old; lacks freshness; flat; cooked, feed, and musty; earthy; barny and old; cooked and vitamin flavor; malty and old; malty; putrid; and feed and rancid.

TABLE 3. DISTRIBUTION OF FLAVOR SCORES ON 395 PASTEURIZED MILK SAMPLES

Flavor Score	No. of samples	%
39.5	4	1.0
39.0	46	11.7
38.5	15	3.8
38.0	109	27.6
37.5	10	2.5
37.0	111	28.1
36.0	41	10.4
35.0	25	6.3
34.0	8	2.0
33.0	1	0.3
32.0	8	2.0
30.0	7	1.8
0	10	2.5

merit attention. Over all samples there was an inverse correlation between the flavor score and both the Standard Plate Count (SPC) and the oxidase count (line 1); as the flavor score decreases, bacterial counts increase. This is important because the range in coded counts was small, 0 to 5.

In samples designated as old or lacking freshness, there was an inverse correlation between the flavor score and the oxidase count (line 2); however, no correlation existed between the flavor score and the SPC. It has been suggested that these flavors could result from contamination of the milk with pseudomonads or oxidase-positive organisms, especially psychrophiles *(2, 3)*. Our data support this contention. When all the zero flavor scores were omitted from this category of flavor criticisms, the correlation between flavor score and bacterial counts was not statistically significant (line 3). This indicates that the 7 samples with a zero flavor score exerted considerable influence on the correlation. However, this in no way negates the results shown in line 2 since of the 395 samples tested, 10 had zero flavor scores and of these, 7 were classified as old. These 7 samples all had an oxidase count in excess of 300,000 per ml. This further suggests that high oxidase counts are associated with flavor criticisms of old or lacking freshness.

Unclean is another flavor which has been attributed to pseudomonad contamination. In samples criticized as unclean and with a flavor score of 36.0 or less (lines 4 and 5), a highly significant inverse correlation was found between flavor score and both the SPC and the oxidase count. This indicates that unclean flavors cannot be solely attributed to oxidase-positive organisms since other (oxidase-negative) organisms may contribute to this flavor defect as well.

Samples with a rancid flavor were also examined (line 6). The correlation between flavor score and either the SPC or oxidase count was nonsignificant indicating that, as the flavor score increased, bacterial counts also increased. This suggests that, at least with these samples, the cause of rancidity was other than bacteriological.

Two flavor criticisms, feed and vitamin flavor, not normally thought to be of bacterial origin were also examined. No correlations were found between flavor score and bacterial counts (lines 7 and 8). These two flavor categories serve as a check against the validity of the significant correlations found in samples designated as unclean and old or lacking in freshness.

The data further show that the oxidase test is a useful tool to provide information quickly on the type of bacterial contamination in milk which could produce off flavors. A study of oxidase-positive organisms and of pseudomonads surviving pasteurization is clearly of value to the food industry. Some work on this subject has been reported already *(4)*.

ACKNOWLEDGEMENTS

We are indebted to Dr. George Stephens of the Connecticut Station, New Haven, for advice on the computer programming of this project and for many helpful discussions. We also acknowledge the help of the Dairy Division, Connecticut Department of Agriculture and Natural Resources whose inspectors collected the samples, of Mathew Meyer who assisted in making flavor judgments, and of Richard Eglington and Mrs. Guna Gregors of the Connecticut State Department

TABLE 4. CORRELATION COEFFICIENTS BETWEEN FLAVOR SCORE, STANDARD PLATE COUNT[1] AND OXIDASE COUNT[1] ON PASTEURIZED MILK SAMPLES

Line No.	Description of Samples	No. of Samples	Correlation coefficients: Flavor Score/ SPC	Correlation coefficients: Flavor Score/ Oxidase Count
1	All samples tested—zero flavor scores excluded	385	−0.1393**	−0.1213*
2	Samples with flavor criticism of old or lacks freshness: zero flavor scores included	29	−0.3626	−0.4165*
3	Samples with flavor criticism of old or lacks freshness: zero flavor scores excluded	22	−0.0203	−0.0066
4	Samples with flavor criticism of unclean: zero flavor scores excluded	28	−0.1258	−0.1076
5	Samples with flavor criticism of unclean and with flavor score of 36.0 and below: zero flavor scores excluded	24	−0.5401**	−0.5956**
6	Samples with flavor criticism of rancid: zero flavor scores excluded	10	+0.5443	+0.4251
7	Samples with flavor criticism of feed: zero scores excluded	166	−0.0612	−0.0013
8	Samples with flavor criticism of vitamin taste: zero flavor scores excluded	20	−0.1796	−0.2526

**Highly significant; *significant

[1]Correlations were made on the coded bacterial counts

of Health for the bacteriological analyses. Funds provided by the State Departments of Agriculture Division, U. S. Department of Agriculture, Washington, D. C. were used for a portion of this project.

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BAKING INDUSTRY SANITATION STANDARDS

Editors Note: permission has been granted to International Association of Milk, Food and Environmental Sanitarians, Inc. to publish in the Journal of Milk and Food Technology the Baking Industry Standards as published to-date. This is being done for many of our members who have an interest in bakery and food sanitation. In order to clarify the program, the foreword and general material which applies to all standards are being published along with this first standard. Balance of standards will appear in future issues in accordance with available space.

Copies may be obtained from the
BAKING INDUSTRY SANITATION
STANDARDS COMMITTEE
521 Fifth Avenue, New York, New York 10017

Price—
Basic Criteria (Applicable to All Standards):
_____25 cents per copy
Standard for Specific Bakery Equipment: ___
_____25 cents per copy

Foreword

In recognition of the need for the uniform application of principles of sanitary design to bakery equipment, the leading associations and societies serving the baking industry initiated a joint project to promulgate such standards. At a meeting held November 22, 1949, the Baking Industry Sanitation Standards Committee was organized for this purpose. The primary objective of this committee is the development of fundamental standards for the design, construction and installation of bakery machinery and equipment. These standards are part of a series covering the various categories of bakery machinery and equipment which are being written and published as they are developed.

The successful completion of these standards has been made possible by the efforts of (1) the Task Committee chairmen who devised and compiled the provisions of each standard, (2) the Consultants who lent their guidance and professional experience, and (3) the considerable number of individuals throughout the industry who served on the Task Committees.

The Baking Industry Sanitation Standards Committee publishes its standards so that the first nine pages of Basic Criteria (Index, Definitions, and General Principles of Design and Construction) are applicable to all standards. Each standard for specific bakery equipment refers to the Basic Criteria so that if only one standard is needed, the Basic Criteria and the specific standard are required. Additional standards for the specific bakery equipment can be added by purchasing the standards only.

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ROBERT S. TAGGART, 1958-1961
J. LLOYD BARRON, 1953-1957
ALAN T. PROSSER, 1949-1953
Vice Chm. _H. EDWARD HILDEBRAND, JR., 1964-
MORRIS COHEN, 1961-1963
PHILIP E. WINTERS, 1959-1961
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Baking Industry Sanitation Standards Committee

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Verner E. Lundberg, Interstate Bakeries Corp.
Leland M. Moss, Campbell Taggart Associated Bakeries, Inc.

American Institute of Baking
Dr. William B. Bradley, American Institute of Baking
Louis A. King, Jr., American Institute of Baking
David M. Levitt, DCA Food Industries, Inc.
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Consultants

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Charles L. Senn, 1962-

Milk, Food, and Environmental Sanitarians
Harold Wainess, 1949-
Vincent T. Foley, 1955-
National Association of Sanitarians
Lois Cole, 1953-
Jerome Schoenberger, 1962-
U. S. Food and Drug Administration
M. T. Bartram, 1965-
William L. Jackson, 1965-
U. S. Public Health Service
W. C. Miller, Jr., 1949-
W. R. McLean, 1949
J. H. Fritz, 1954-
Frank Mackison, 1965-

GENERAL, SCOPE, DEFINITIONS, DESIGN AND CONSTRUCTION

1.1 Scope. The requirements of these standards apply to the design, construction and installation of various items and groups of items of bakery equipment as specifically set forth herein. These standards apply equally to accessory equipment where applicable.

1.2 Purpose. The purpose of these standards is to serve as a guide to: Manufacturers in the design, construction and installation of machinery and equipment which can readily be maintained in a clean and sanitary condition; Users of such equipment in the selection, purchase, installation and modification;
Federal, state, county, district and municipal health authorities and other food regulatory agencies.

1.3 New Developments. It is intended that these standards shall allow and encourage freedom for inventive genius and new developments. Equipment specifications which are developed proposing differences in design, material, construction or other features, and which are, in the opinion of the manufacturer or fabricator, equivalent or better, may be submitted at any time for consideration to the Baking Industry Sanitation Standards Committee.

1.4 New Equipment and Installation. After the date on which a specific standard is adopted by all sponsoring agencies, all new items of equipment referred to in the standard shall conform to the requirements of the standard.

1.5 Existing Equipment and Installation. These standards are not intended to be retroactive in their application to existing installations; but when modifying existing equipment, the modification shall conform to the standard covering this equipment.

1.6 Safety Code. Attention is directed to the American Standards Safety Code for Bakery Equipment (Z50-1-1947 or its subsequent revision), the provisions of which should be observed in the manufacture, installation and operation of bakery machinery and equipment.

1.7 Plumbing Code. Attention is directed to the American Standards Association National Plumbing Code (ASA-A40.8-1955 or its subsequent revision), the provisions of which should be observed in the manufacture, installation and operation of bakery machinery and equipment.

1.8 Interpretations. In the interest of uniform and reasonable application of these standards, interested persons are invited to submit inquiries pertaining to these standards to the Baking Industry Sanitation Standards Committee, 521 Fifth Avenue, New York 10017.

1.9 Effective Date. These standards shall become effective on and after the dates indicated in each standard for specific items of machinery and equipment.

DEFINITIONS

2.1 Product Zone. The product zone includes all surfaces of the equipment with which product or ingredients may normally come in contact and return to the product or ingredients.

2.2 Non-Product Zone. The non-product zone includes all surfaces outside the product zone as defined in 2.1.

2.3 Accessible. An accessible surface is one which is or can be quickly exposed for inspection and cleaning, using simple tools normally used by operating or cleaning personnel, such as screwdrivers or wrenches.

2.4 Readily Accessible. A readily accessible surface is one which is or can be easily and quickly exposed for inspection and cleaning without the use of tools.

2.5 Removable. A removable part is one which can be quickly separated from the machine or equipment, using simple tools normally used by operating or cleaning personnel, such as screw drivers or wrenches.

2.6 Readily Removable. A readily removable part is one which can be easily and quickly separated from the equipment without the use of tools.

2.7 Smooth. To be smooth, a stainless steel or nickel alloy, or similar corrosion-resistant material, shall be finished to at least a No. 2B mill finish. A metal surface of other than corrosion-resistant alloys shall be at least as smooth as commercial grade rolled sheet steel and shall be free of scale. Product zone surface of castings, forgings, moldings and ex-

trusions shall be finished to a surface no rougher than American Standard No. 125. Galvanized metal surface, where permitted, shall have the smoothness of good quality commercial hot dip.

2.8 Non-Toxic. A material shall be considered non-toxic, if under conditions of its use, it is acceptable under procedures and requirements of the U. S. Food and Drug Administration as being non-toxic.

2.9 Non-Absorbent. A material to be non-absorbent, under ordinary conditions of use, shall not retain an amount of the substances with which it normally comes in contact to be adversely affected, or to adversely affect the product or ingredients with which it comes in contact, or to create an insanitary condition. The 3A Sanitary Standards tests for Rubber and Rubber-Like Materials, and the 3A Sanitary Standards tests for Multiple-Use Plastic Materials, shall be used as the criteria for determining compliance of such materials with this definition.
When absorbency tests acceptable to the BISSC are developed for other materials, they shall be included in this definition.

2.10 Corrosion Resistant. A material to be corrosion-resistant shall maintain its original surface characteristics under prolonged influence of the normal components of the environment, such as product, ingredients, ambient conditions, and cleaning and sanitizing materials.

2.11 Protective Coating. A protective coating shall prevent corrosion of the base material, shall not affect or be affected by the substances in contact with it, shall be non-toxic, non-absorbent, shall not impart an odor or taste to the product, and shall be bonded to the underlying surface, so as to be resistant to chipping and peeling. It shall have a durable, smooth surface without breaks exposing the base material, shall resist abrasion in ordinary use, and shall maintain its surface characteristics under prolonged influence of the environment such as the product, and cleaning and sanitizing agents.

2.12 Sealed. Sealed shall mean the condition resulting from the filling of a crack, crevice, joint or opening, so as to effectively prevent the entry, or passage, of moisture and liquids.

2.13 Closed. Closed shall mean fitted together tightly.

2.14 Dead End. A dead end is a space wherein product, ingredients, cleaning and sanitizing agents, or extraneous matter, may be trapped, retained, or not completely displaced in normal operation or cleaning procedures.

2.15 Shall. When the verb "shall" is used, the requirements of these standards can be met only by literal compliance.

2.16 Should. Use of the verb "should" indicates a preferred condition.

GENERAL PRINCIPLES OF DESIGN AND CONSTRUCTION

The following general principles of design and construction shall apply to all equipment covered in these standards except where exemption from compliance is specifically stated in the Special Principles of Design and Construction relating to individual types of bakery equipment. Particular attention is called to accessories such as pumps, valves, pipe couplings and thermometers, which may be an integral part of the equipment.

3.1 Product Zone

3.1.1 All surfaces shall be smooth.

3.1.2 All surfaces should be readily accessible or readily removable, and shall be accessible or removable.

3.1.3 All surfaces shall be non-toxic.

3.1.4 All surfaces shall be non-absorbent.

3.1.5 All surfaces shall be of corrosion-resistant material.

3.1.6 Dissimilar materials shall not be used where electrolytic corrosion may take place during use or during exposure to cleaning or sanitizing materials.

3.1.7 Cadmium or antimony shall not be used.

3.1.8 Wood shall not be used.

3.1.9 Lead and tin alloy solder shall not be used.

3.1.10 Copper, bronze, brass, monel and other copper alloys shall not be used where edible oils, liquid shortening, chocolate liquor and other fatty food products come in contact with the metal.

3.1.11 Projecting screws, rivets or bolt heads shall not be used.

3.1.12 Permanently joined metal surfaces shall be butted and welded, or brazed, and finished flush and equal to the surrounding area.

3.1.13 Permanently joined surfaces with internal angles less than 135° shall have a radius of not less than one-quarter inch.

3.1.14 Bearings should be outside the product zone and should be sealed or self-lubricating. Bearings in the product zone shall be self-lubricating and shall conform to the requirements of 3.1.1, 3.1.2 and 3.1.3. Bearings requiring lubrication shall be outside the product zone,

and the design and construction of these shall be such that lubricant cannot leak, drip or be forced into the product zone.

3.1.15 Seals shall be non-toxic, non-absorbent, non-exuding, self-lubricating and smooth, and shall not affect or be affected by the product, ingredients or cleaning and sanitizing compounds. Seals shall be removable.

3.1.16 Belting, other than metal, shall be coated, impregnated, or made of odorless, non-toxic and non-absorbent material.

3.1.17 Gaskets shall be non-toxic, non-absorbent, non-exuding, and self-lubricating, and shall not affect or be affected by the product, ingredients, or cleaning and sanitizing compounds, and shall be installed in a manner which results in a true fit to prevent protrusion in the product zone or creation of recesses or ledges between the gasketed joints.

3.1.18 Hinges and latches shall be of the simple, take-apart type and shall be so constructed that when taken apart no cracks or crevices exist.

3.1.19 Inspection windows and light ports shall be of shatter-resistant material. They shall be permanently sealed or readily removable.

3.1.20 All air and other gases mechanically introduced into the product or product zone shall be properly filtered or washed to remove particles fifty microns or larger and shall not contain oil, water and other liquids unless specifically required as an operational procedure.

3.1.21 Covers shall be of the overlapping type and if they are in two or more parts, they shall be designed with drip protectors. Hinged covers shall pivot outboard.

3.1.22 Dead ends shall not be permitted.

3.2 Non-Product Zone

3.2.1 All surfaces, unless sealed, shall be accessible or removable for cleaning.

3.2.2 All materials shall be suitable for the purpose intended and shall conform to the requirements of cleanability.

3.2.3 All surfaces including joints, and surfaces of insulation unless sealed, shall be cleanable and impervious to moisture.

3.2.4 Screws, bolt heads, nuts and rivets and similar projections shall not form pockets, patterns or areas difficult to clean.

3.2.5 All joints and edges where two members are permanently joined shall be filled or welded, be free from cracks, crevices or protrusions, and should not form horizontal ledges.

3.2.6 Equipment other than that on solid bases sealed to the floor shall provide a floor clearance of at least 6" or shall be accessible for cleaning. Structural members shall be arranged as not to form traps, recesses or pockets. If made of hollow stock, frame members shall have the ends closed.

3.2.7 Housings or guards shall either be hinged or readily removable or removable; or shall be fitted with covers that are either hinged, readily removable or removable. If hinges or latches are used, they shall be of the simple, take-apart type. Where safety codes permit, the guards shall be left open at the bottom.

3.2.8 Permanently joined surfaces having interior angles shall be accessible and should be curved, rounded or cove-shaped with not less than 1/16" minimum radius or curvature.

3.2.9 Where lubrication is required, the design and construction shall be such that lubricant cannot leak, drip or be forced into the product zone.

3.2.10 Totally enclosed motors shall be used. When a BISSC standard on electric motors becomes effective, it shall apply.

3.2.11 Name plates, if present, shall be sealed to the surface.

3.2.12 The electrical wiring system shall be dust-tight. Conduit terminal boxes, relay boxes, fuse boxes and switch boxes shall either fit tightly against the supporting members so that open cracks or crevices are not formed, or shall be mounted so that the back of the box shall not be less than 3/4" from their supporting members. Conduit piping shall be so installed that it does not form hard-to-clean areas or crevices against adjacent surfaces, and should be self-supporting. If flexible conduit is used, it shall have a smooth external surface.

BAKING INDUSTRY SANITATION STANDARDS COMMITTEE

STANDARD NO. 1
for
FLOUR HANDLING EQUIPMENT

Revised Jan. 1, 1969

The requirements of this standard shall apply to the design, construction and installation of equipment for transporting, receiving, storing and handling of flour.

This standard, as revised, shall become effective on or after January 1, 1969.

The General Principles of Design and Construction (pages 7 through 9) shall apply to all equipment covered in this standard and shall be considered as a part of this standard except where specifically exempt. Special or Specific Requirements for equipment covered in the standard follow, and shall also be considered a part of this standard.

SPECIAL PRINCIPLES OF DESIGN AND CONSTRUCTION, DEFINITIONS, AND INSTALLATION OF EQUIPMENT OR MACHINERY COVERED BY THIS STANDARD

4.1 Storage Bins

4.1.1 Mild steel bins subject to condensation shall have a protective coating on product zone surfaces.

4.1.2 Product entrance and discharge openings connected to the attendant conveying equipment shall be dust and moisture tight and shall be accessible for cleaning.

4.1.3 Vents shall be protected against entry of foreign matter and water, and shall be provided with readily removable filters to exclude particles of 50 microns or larger.

4.1.4 Permanent lighting fixtures shall not be installed within the product zone. If interior lighting is required, externally mounted fixtures shall be used with shatter-proof transparent panels or discs flush mounted.

4.1.5 Interior horizontal ledges shall not be permitted.

4.1.6 Covers or filters for all openings shall be readily removable and designed to permit readily replacement and sealing.

4.1.7 Level controls, if used, shall be accessible for cleaning and inspection.

4.1.8 All discharging surfaces shall be adequately sloped or equipped with mechanical means to cause discharge of product.

4.1.9 Outdoor installation shall be made water-tight or suitably housed to prevent entry of water.

4.1.10 Cages used for bin cleaning shall be designed and constructed of round tubular metal except for the floor which may be constructed of flat bars installed on edge.

4.1.11 Auxiliary agitators, if used, shall be designed and constructed to be smooth, crevice free and readily cleanable.

4.1.12 Access openings shall be provided in all storage bins. The openings shall be at least 18 inches in its smallest dimension and if on a horizontal surface, shall have exterior rims raised at least 1 inch. Covers or filters for all openings shall be designed to permit ready replacement and sealing.

4.1.13 Vertical bins shall have an access opening not more than 4 feet above discharge opening.

4.1.14 The attachment mechanisms for holding inspection port covers, access doors, and other removable accessories shall have no loose parts.

4.1.15 Fumigation ports, if installed, shall be flush with the product zone surface and so designed that threads are not exposed within the product zone.

4.1.16 Screw discharge conveyors should not be used in storage bins. If used, housings of screw discharge conveyors shall be hinged or removable so that the area around the helical flights can be cleaned from outside the bin. The screw housing shall be dust-tight and readily accessible. Sufficient clearance shall be provided between the bottom of the screw housing and the floor to permit sufficient exposure of the screw for proper cleaning.

4.1.17 Continuous welding on both sides of the spiral flight shall be used for fastening the spiral to the shaft unless the spiral flight is designed to provide at least 1 inch clearance between the shaft and the spiral.

4.1.18 Screw housings shall open along their entire length and expose at least one-half of the circumference of the screw. Fixed supports or plates in such openings shall have a width not greater than two-thirds the pitch of the screw.

4.2 Portable Bins

4.2.1 Mild steel bins subject to condensation shall have a protective coating on product zone surfaces.

4.2.2 All discharging surfaces shall be designed and

constructed so that when in use, the discharging surfaces shall permit complete discharge of flour.

4.2.3 Covers for all openings shall be provided, shall be readily removable, and shall be designed and constructed to permit ready replacement and sealing.

4.2.4 Casters shall conform to the requirements of BISSC Standard No. 15 for Caster Assemblies and Wheels.

4.3 Dump Bins

4.3.1 All discharging surfaces shall be adequately sloped or equipped with means to cause discharge of product.

4.3.2 Auxiliary agitators, if used, shall be designed and constructed to be smooth, crevice free and readily accessible for cleaning.

4.3.3 The bag rest shall either be readily removable, or there shall be a minimum of 2 inches open space between the shelf and the housing. It shall be a minimum of 2 inches lower than the edge of the dump opening of the bin or housing.

4.3.4 Screening grids shall be readily removable.

4.3.5 Covers or doors shall be provided to enclose the product zone when flour is not being dumped. These shall be constructed so that dirt or dust on their exterior surfaces will not slide or fall into the bin when the cover is opened.

4.3.6 Skirts or aprons shall not be used as exterior trim.

4.3.7 All interior surfaces of accessary dust collecting systems shall be accessible for cleaning.

4.3.8 Interior horizontal ledges will not be permitted.

4.3.9 Housings of screw discharge conveyors shall be hinged or removable so that the area around the helical flights can be cleaned from outside the bin. The screw housing shall be dust-tight and readily accessible. Sufficient clearance shall be provided between the bottom of the screw housing and the floor to permit sufficient exposure of the screw for proper cleaning.

4.3.10 Continuous welding on both sides of the spiral flight shall be used for fastening the spiral to the shaft unless the spiral flight is designed to provide at least 1 inch clearance between the shaft and the spiral.

4.3.11 Screw housing shall open along their entire length and expose at least one-half of circumference of the screw. Fixed supports or plates in such opening shall have a width not greater than two-thirds the pitch of the screw.

4.3.12 Electric motors shall conform to the requirements of BISSC Standard No. 29 for Electric Motors.

4.4 Automotive Truck and Trailer Bins

4.4.1 Access openings shall be provided for all tanks or bin compartments. Such openings shall not be less than 18 inches in its smallest dimension and shall have exterior rims raised not less than 1 inch.

4.4.2 If constructed of mild steel, such bins shall have a protective coating in the product zone.

4.4.3 Tight-fitting covers or protective housings shall be provided for all fill and discharge openings to prevent entrance of moisture and foreign material, and to prevent leakage of the product. Provisions shall be made for the application of shipping seals.

4.4.4 Vent and access openings, when open, shall be protected against entrance of foreign matter and water and shall be provided with readily removable filters to exclude particles of 50 microns or larger.

4.4.5 If the truck is pneumatically discharged, the air supply shall be filtered so as to remove particles of 50 microns or larger in size and the filters shall be accessible for inspection and cleaning.

4.4.6 Discharge piping and unloading hoses shall be fabricated from materials which are non-toxic, non-absorbent, corrosion-resistant, and smooth, and shall not affect nor be affected by product and ordinary cleaning and sanitizing compounds. All surfaces shall be accessible.

4.4.7 Air relief assemblies shall be accessible for inspection and cleaning.

4.4.8 All discharging surfaces shall be adequately sloped or equipped with means to cause discharge of product.

4.4.9 Unloading hose shall have the ends closed when not in use, and shall be carried in an enclosed space which is readily accessible for cleaning and is completely drainable. This enclosure shall be open at both ends for cleaning and inspection. These openings shall be equipped with readily removable dust-tight covers.

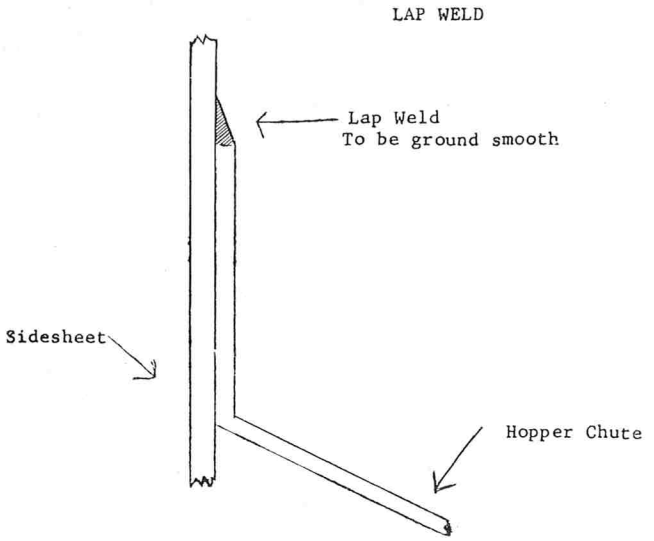
4.5 Railroad Tank or Hopper Car Bins

4.5.1 Bulk railroad cars shall comply with all the requirements of 4.4.

4.5.2 All joints in bulk railroad cars shall be welded and made smooth. Joints between the sides and hopper sheets, conforming to the sketch below, are exempted from the requirement for butt welding.

4.6 Mechanical Conveying Equipment

4.6.1 All bucket elevators shall have openings with



readily removable covers on both sides of the boot. Such openings shall have a minimum side dimension of not less than seventy-five percent of the width of the housing. The locations of the openings in the boot shall not be higher than immediately above the arc of the boot if the boot is curved. The openings shall be flush with the bottom level of the boot, if the bottom of the boot is level and fixed. There shall be openings with readily removable covers at both sides or at the top or the head of the elevator placed in such a way that the area into which the product is discharged by the buckets shall be readily accessible for cleaning. Any fixed baffles in these sections shall be attached with full length welds and be readily accessible. Any adjustable baffles shall be arranged so that all sides are readily accessible.

4.6.2 The elevator discharge conveyor trough within the elevator housing shall be readily accessible or readily removable.

4.6.3 Intermediate trunk sections of bucket elevators shall be equipped with a sufficient number of hinged or readily removable cover plates for adequate inspection on at least one side of the housing, with opening having minimum side dimensions of at least seventy-five percent of the housing width and not less than 30 inches in length.

4.6.4 Take-ups of bucket elevators, if located in the product zone, shall conform to 3.1. If located outside the product zone, they shall conform to 3.2. Take-up plate surfaces, grooves, threads, etc., shall be accessible and shall be designed so as to retain a minimum of the product.

4.6.5 Buckets shall be of seamless construction. Spaces between buckets and chain or carrier belt shall not be less than 1/4 inch.

4.6.6 Sprockets within the product zone of bucket elevator should be of the disc type. If steel plate sprockets are used, the hubs shall be full welded and the fillets ground or machined smooth.

4.6.7 Where two elevator housing members are joined, other than by welding, the adjoining members shall be aligned, or otherwise designed, so that in final assembly no internal ledges are formed.

4.6.8 Drag-type conveyors shall not be permitted.

4.6.9 Electric motors shall conform to the requirements of BISSC Standard No. 29 for Electric Motors.

4.7 Pneumatic Conveying Equipment

4.7.1 Straight runs of pneumatic conveyors shall comply with the provisions of 3.1 and 3.2, except that piping or tubing which is self-purging is exempt from the requirements of accessibility.

4.7.2 The entire pneumatic conveyor system shall be dust-tight and water-tight.

4.7.3 All valves and rotary feeders shall be designed, constructed and installed so that the interiors are accessible for cleaning and inspection.

4.7.4 All interior surfaces of activators and surge vessels shall be accessible. Access openings shall be protected with filter bags readily removable, dust-tight covers, which when fitted should not create any interior ledges or other obstructions.

4.7.5 The attachment of the cover shall be such as not to form an interior crevice or ledge where product dust may collect.

4.7.6 Air supply for blowers or compressors shall be filtered to exclude particles of 50 microns or larger in size. The unit shall be so designed as to deliver oil-free air.

4.7.7 The system shall be so arranged that there will be no product traps or dead ends.

4.7.8 All piping shall be cut square and made true to its intended form. The joints shall be provided with a true-fitting gasket and shall have a smooth interior without shelves, projections, or recesses at joints. All horizontal piping shall be so installed as to eliminate sagging.

4.7.9 Product dust collectors shall permit no visible product dust to escape.

4.7.10 The interior of product dust collectors shall be accessible for inspection and cleaning.

4.7.11 Air filters, on the discharge side, shall permit no visible product dust to escape.

4.7.12 Openings not less than 24 inches in diameter, or not less than 20 inches x 24 inches if rec-

tangular, shall be provided for inspection and cleaning the interior of air filters.

4.7.13 Air filtering media shall be removable for cleaning or replacement.

4.7.14 Bags or sack type air filters shall have no ledges in the interior of bags or sacks.

4.8 Sifters

4.8.1 Flour handling systems shall include a sifter except for coarse ground flour.

4.8.2 Separate conveying air systems shall be provided before and after the sifter in the system. Conveying air of the system supplying the sifter shall not discharge into a vessel or conveyor into which the sifted product is present unless the conveying air also passes through the sifter screen.

4.8.3 Sifters which are a part of flour handling system shall permit continuous discharge of tailings through dust-tight connections to an enclosed container located within easy reach and readily visible.

4.8.4 Sifters shall employ no rubbing action or other physical pressure to facilitate flour flow.

4.8.5 Sifter screen frames shall be so designed that they are readily removable, and should be designed so that they cannot be replaced in an improper position.

4.8.6 Sifter screen cloths shall be readily removable.

4.8.7 Sifter screen shall not be less than 30 x 30 mesh (openings shall not exceed .027 inches in width and length) except for coarse ground flours and prepared mixes that contain shortening and egg solids.

4.9 Weigh Hoppers

4.9.1 Covers shall be attached in such a manner that a crevice or shelf shall not be formed on which flour dust may collect.

4.9.2. An access or inspection opening, not less than 15 inches wide and 12 inches high, shall be provided unless there are other equivalent means of access. Covers for access or inspection should be readily removable and shall be removable.

4.9.3 A readily removable dust-tight connection shall be provided between the inlet to the hopper and the flour delivery equipment.

4.9.4 A readily removable dust-tight connection shall be provided between the discharge from the hopper to the mixer or other equipment.

4.9.5 The scale beam housings shall be dust-tight or constructed with an open bottom so as not to form a dirt collecting pocket.

4.9.6 Air relief vents shall be readily removable or accessible for cleaning and inspection.

4.9.7 The attachment mechanism for a flexible connection on the discharge shall be readily removable for inspection and cleaning of the gate from below.

4.9.8 Electric motors shall conform to the requirements of BISSC Standard No. 29 for Electric Motors.

4.10 Installation

4.10.1 Sufficient clearance shall be allowed for the convenient use as intended of all accesses and inspection openings. Such clearances shall be sufficient for the removal or swinging open on hinges of all cover plates, inspection doors, and screw conveyor drop bottoms.

4.10.2 Wherever equipment passes through walls or floors, sufficient space shall be allowed between the equipment and floor or wall to provide for cleaning. If fire regulations do not allow this type of construction, equipment shall be sealed or erected within fire protected shafts. Access openings shall not be blocked by such construction.

4.10.3 All supports of fixed equipment resting on floors, except when resting on ball-type feet, shall be sealed to the floor. All structural bracing attached to walls shall be sealed at point of attachment.

4.10.4 Plant-installed additions, modifications and connections shall be dust-tight.

4.10.5 The electrical wiring system shall be dust-tight. Conduit terminal boxes, relay boxes, fuse boxes and switch boxes shall either fit tightly against the supporting members so that open cracks or crevices are not formed, or shall be mounted so that the back of the box shall not be less than 3/4 inch from their supporting members. Conduit piping shall be so installed that it does not form hard-to-clean areas or crevises against adjacent surfaces, and should be self-supporting. If flexible conduit is used, it shall have a smooth external surface.

Screw conveyors—Top opening type not less than 18 inches from ceiling.

Bucket elevators—With side opening heads, not less than the width of the door, and in no case not less than 15 inches. With top opening heads, not less than 18 inches.

Sifters—Sufficient head clearance shall be allowed so that equipment can be dismantled for cleaning.

Weight hoppers shall be installed so that no cross braces or structural supports hinder the removal of hopper cover.

4.10.7 Motors should be mounted on the equipment and off the floor.

SELF-CERTIFICATION IN THE VOLUNTARY COMPLIANCE PROGRAM[1]

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ABSTRACT

In 1964, the Food and Drug Administration (FDA) embarked on a voluntary Compliance Program designed to assist and encourage the regulated industries to adopt concepts of self-regulation. Administered by the Bureau of Voluntary Compliance, this program is aimed at providing industry with facts and techniques that will give industry the greatest opportunity to comply with FDA regulations and standards. FDA will do all it can to provide industry with: *(a)* advisory assistance and information, *(b)* an explanation of how laws and regulations affect it, *(c)* results of our scientific research and improved analytical methodology, and *(d)* recommendations for controlling bacterial contamination and adopting good manufacturing practices.

FDA's traditional reliance on enforcement through its own staff is being reinforced to include an Industry-State-FDA partnership. Self-Certification, an example of such a partnership, is a co-operative approach of Government and industry to assure the quality of our American food supply. Under this program, industry and FDA agree upon and share specifications for products covered. These include operating guidelines, product specifications in the form of tolerances, and complete quality control programs. In addition, the company and FDA share reports of inspections, reports of analyses, and consumer complaints.

At present priority attention is given to products with a public health problem, namely microbiological hazards. However, when agreements are negotiated, problems of less priority are included so that products under the agreement comply fully with the Food, Drug, and Cosmetics Act.

Two pilot programs are presently operating. One of these involves an industry-State-FDA agreement. We are confident that this is a fore-runner of many other agreements in which regulatory officials join industry and FDA in this partnership.

To many the concepts of self-regulation, quality assurance, and self-inspection are far from new. Those persons involved in milk regulation or production are very, very familiar with the extensive self-regulation practiced by the milk industry—in equipment design, in testing and inspection programs, and processing and product standards. Many are also familiar with the self-regulation practiced by other industries, such as National Canners Association, the baking industry, and the flavoring industry. Thus, we can see that self-regulation in industry has been used for many years, in many different ways.

[1]Presented at the 55th Annual Meeting of the International Association of Milk, Food, and Environmental Sanitarians, Inc., St. Louis, Mo., August 18-22, 1968.

FDA AND VOLUNTARY COMPLIANCE

Now let us look at how the Food and Drug Administration (FDA) got into the voluntary compliance picture. To do this we have to retrace our steps to 1955, when the first Citizen's Advisory Committee's (CAC) report was issued. The first CAC report was responsible for initiating an informational and educational arm within FDA. In addition, meetings and conferences with industry groups were held to discuss new amendments and regulations.

It was not until the second CAC report was issued in 1962 that a tangible voluntary compliance program began taking shape.

The Second Citizen's Advisory Committee reported in October 1962:

> "FDA is a regulatory agency, and therefore, has certain police powers which are the source of its real authority and influence . . . However, today's job of regulation in the food, drug, and cosmetic fields is far more complex than it was in 1906, in 1938, or in 1954. In the opinion of this committee, it is unrealistic to think in terms of an inspector in every plant. Although inspection and punitive action are vitally necessary, the time has arrived for a more constructive approach to the problems of consumer protection. After-the-fact enforcement is not always good consumer protection".

The committee referred to a health regulatory official in the United States who had identified three stages in the development of a regulatory agency such as the FDA: the period of police power enforcement, the period of health education, and the period of mandated self-inspection and self-regulation. In October 1962, FDA was in the first stage. The committee recommended that FDA proceed to the second and third stages as rapidly as necessary changes and administrative philosophy could be achieved, and the proper climate created within industry.

Re-evaluation and reorientation of an entire agency, its self-concept and its public image require much time, imagination, and hard work. It became apparent during this period of self-evaluation that compliance is a responsibility shared by regulated industries, State and local food and drug control authorities, as well as the Food and Drug Administration. Thus in 1964 FDA initiated a Voluntary Compliance Program designed to assist and encourage

the regulated industries to adopt concepts of self-regulation.

This program is administered by our Bureau of Voluntary Compliance with the cooperation and assistance of all FDA headquarters and field facilities. Our mission is aimed at providing facts and techniques that will give industry the greatest opportunity to comply with FDA regulations and standards. FDA will do all it can to provide industry with: *(a)* advisory assistance and information, *(b)* an explanation of how laws and regulations affect it, *(c)* results of our scientific research and improved analytical methodology, and *(d)* recommendations for controlling bacterial contamination and adopting good manufacturing practices.

Therefore, FDA's traditional reliance on enforcement of the Food, Drug, and Cosmetics Act through its own inspectional and laboratory staffs is being supplemented in other ways to reach a full Industry-State-FDA partnership.

SELF CERTIFICATION

Self-Certification is an example of such a program and one in which many are vitally interested. As a reader you probably asking yourself two basic question—what is the Self-Certification Program and how does it work? This is a co-operative approach of Government and industry to assure the quality of the American food supply. While the roles of industry and Government are distinct, their objectives are common—to provide safe, wholesome, and properly labeled foods for the consumer. Implied in this concept is the commitment on the part of both Government and industry to do everything reasonable to assure the quality of the food supply.

Industry, on the one hand, must be committed to quality assurance from the top down in its management philosophy and actions. It must provide adequate training programs for its personnel, it must have equipment and facilities to build quality into the product, and it must have the technical skill to monitor the process and environment to know that the quality objectives have been met. On the other hand, Government cannot expect to invest enough resources in each plant of an industry to oversee the work of each manufacturer. At best, Government can look at industry at a point in time to determine how industry is complying with the laws and regulations which it enforces. Quality assurance is a full time job and must be handled systematically and continuously by industry. Therefore, it becomes obvious that industry has a very large role to play in quality assurance and with Government's help can perform this role more efficiently.

The second question can be answered by indirection. To be effective a program of this type requires good communications between Government and industry. Both parties must communicate freely and fully. I cannot emphasize this enough because effective communication is a critical element in the negotiation of Self-Certification Quality Assurance programs. Government must communicate its requirements to industry, its operating guidelines, its specifications in the form of tolerances, inspectional and analytic methodology, or other precedents for raw materials, finished products, and processes. Industry, on the other hand, must communicate its quality control programs, sampling techniques, analytical procedures, and internal tolerances for defective units or acceptable quality limits.

DEVELOPING FDA-INDUSTRY RELATIONSHIPS

When both sides have had the opportunity to review what each considers to be the critical aspects of the raw material, process or finished product, this program requires that FDA and industry agree on essential control measures for preventing, detecting, and eliminating problems. Industry will know what it has to do to comply with the law. In the past such information was not made public. Industry and Government have agreed to share certain information, for example, reports of inspections, reports of analyses, and consumer complaints. FDA does not necessarily need recipe or formula data nor does it need to know how many packages of a product a firm sells. It does need to know what is in a product and industry's findings with respect to the quality of its products. This information can be furnished on a rate basis, for example, X complaints per 100,000 packages produced and still not reveal confidential sales information.

In approaching this program FDA has attempted to look at the problems in industry which cause potential danger to health of the consuming public. We feel that our resources can be used most effectively and efficiently if we concentrate on public health problems and devote relatively less effort to aesthetics and economics. However, we include problems of lesser priority in agreements which we negotiate with industry. Although we have minimized reporting requirements in this area, industry's records are on file for the review of inspectors as necessary. The manufacturer has not neglected the problem and is capable of doing a very effective job in this area.

REGULATORY OFFICIALS AND SELF-CERTIFICATION

Many of you are regulatory officials. We think that you too have a role in the Self-Certification Program. FDA believes that it does not have a corner on the consumer protection market. Neither FDA nor industry nor any other agency devoted to con-

sumer protection can operate alone. For mutual cooperation benefits all concerned with quality, particularly the consumer.

COST OF PROTECTION

As tax payers we are willing to pay only so much for protection. We do not want our tax dollars wasted through duplicative programs by State, local and Federal Governments. At the same time, we do want adequate protection from the possible hazards associated with food production to provide the consumer-tax payer with the most bang for his buck. We as government employees must do everything in our power to protect the consumer at a reasonable cost. If better protection could be afforded through a self-certification program we believe that it is money well spent.

PILOT STUDIES

We are exploring the operation of this program in two pilot studies; one at the General Foods Corporation, Dover, Delaware plant, the other at the Green Giant plant located at Blue Earth, Minnesota. Each firm agreed to conduct a quality control program which will assure that each of their products meets the agreed upon specifications. In essence, self-certification adds a firm's approved quality assurance program to FDA's own arsenal of consumer protection programs and with the Green Giant plant —to the arsenal of consumer protection programs operated by the State of Minnesota. Taken together, they enhance the consumer's assurance that quality is protected as much as current food technology will permit. What may be the most significant part of such a program is that it will save scarce inspector and laboratory manpower at the State, local, and Federal levels and still provide sound consumer protection. This program requires a careful evaluation of all firms that desire to adopt it to be sure that they have the competence and facility, not only in FDA's eyes, but in the eyes of State and local officials.

Enumerating these principles will not assure their implementation. Implementation requires not only the best thinking of all of us but the willingness to share our thinking and to work together toward a common goal of a government-industry partnership dedicated to total consumer protection.

COST OF A 2-YEAR COLLEGE EDUCATION IN ENVIRONMENTAL HEALTH TECHNOLOGY AT BROOME TECH, BINGHAMTON, NEW YORK

The cost of a college education in the two-year environmental health technology program at Broome Tech is about $950 per year for Broome County students who live at home, about $1,900 for New York State residents from outside Broome County and about $2,500 for students coming from outside of New York State. These figures can be put into an interesting perspective, when one considers that graduates of the college's environmental health technology program earn close to $6,000 as starting salaries.

The reason for the different cost levels is twofold. There is much greater financial aid available for New York State residents, and it obviously costs more to live away from home. All New York State students pay $400 in tuition, compared to $800 for those from outside the state, as the students' home counties match his tuition payments, if he is a New York State resident. In addition, most New York State residents can qualify for the state Scholar Incentive Award payments of $200 per year. This grant is not available for students from outside the state.

Costs are figured as follows: tuition $400 per year for New York State residents, $800 for out-of-staters; fees and insurance $81; books about $125; transportation $150; personal expenses $400. Room and board is an additional $1,000 approximately. The Scholar Incentive Award, for which most New York State residents can qualify, pays the student back $200 per year.

Whether a student comes from New York or another state, the college has many scholarships, grants and loans available through the Broome Technical Community College Foundation, Inc., the Federal government, and the student's home state.

SOLID WASTES PROBLEMS AND PROGRAMS: A CHALLENGE TO THE PROFESSIONAL SANITARIAN[1]

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ABSTRACT

This paper is expected to encourage the professional sanitarian to seriously consider problems related to solid waste disposal. It is divided into four specific parts: *(a)* solid waste disposal, a universal environmental health problem; *(b)* public awareness;*(c)* the Solid Waste Disposal Act; and *(d)* solid waste disposal—a challenge.

The term "solid waste disposal" includes storage at the point of production, collection, and transportation to the point of ultimate disposal. Solid waste disposal is an important facet of most all environmental sanitation programs. Today the professional sanitarian knows that many diseases are spread by improper solid waste disposal. In addition, improper solid waste disposal adversely affects many aspects of the environment.

Until quite recently, public interest in solid waste disposal was minimal. This interest currently is high and the public expects appropriate action on the part of someone. The Solid Waste Disposal Act is indicative of public interest and provides several areas for improving solid waste disposal practices of the nation. Solid waste disposal presents a challenge to the professional sanitarian, and provides him with a real opportunity to fill the void in today's solid waste disposal management.

The professional sanitarian has a real opportunity and an obligation to aggressively participate in environmental pollution control programs. His interests and experience are such that he should have real concern for all aspects of problems related to solid wastes. In my opinion, solid waste disposal, which we frequently refer to as land pollution, is perhaps the most important of the triad of environmental pollution—air, land, and water.

This paper deals with the problem of solid wastes in four separate subdivisions, as follows: *(a)* solid waste disposal, a universal environmental health problem; *(b)* public awareness; *(c)* the Solid Waste Disposal Act; and *(d)* solid wastes disposal—a challenge.

SOLID WASTE DISPOSAL, A UNIVERSAL ENVIRONMENTAL HEALTH PROBLEM

For purposes of this discussion, the term "solid waste disposal" will include storage at the point of production, collection and transportation to the point of ultimate disposal, and ultimate disposal whether it be by incineration, composting, sanitary landfill, or any other method. Solid waste disposal is an important facet of practically every environmental health program. Whether we are dealing with restaurant sanitation, milk sanitation, housing, lodging, recreation, or almost any other environmental sanitation program, we invariably must consider the matter of solid waste disposal. Unfortunately, in the past, we have generally lost interest after determining that the method of storage at the point of origin is satisfactory. Many times I have made an inspection of one of the above indicated facilities, checked the cleanliness, location and general condition of the garbage can, carefully noted as to whether or not the lid was in place, and stopped my inquiry at that point. This may have been because of my limited knowledge and interest in the whole field of solid waste disposal at that time.

Today we know that many diseases may be spread by improper solid waste storage, collection, and disposal. The role of insects and rodents in communicable diseases is well known. Perhaps one of the best, and certainly the most up-to-date publication on this subject is *Solid Waste/Disease Relationships (4)*. In addition to the actual vector-borne diseases which may result from improper solid waste disposal, we must also consider several aspects of environmental degradation.

In our urban communities, one of the most upsetting and undesirable features of the poorer housing areas is improper solid waste storage. This not only endangers the public health of the community but is certainly instrumental in degrading property and aesthetic values. In many instances, you have observed the collection and transportation of solid waste in open vehicles. This practice provides ample opportunity for scattering solid wastes over the streets and highways en route to the point of ultimate disposal, and serves also to attract insects and rodents. Ultimate disposal for most communities is an open dump that is a disgrace to the community. Aesthetic values must be given a high priority in the design and operation of an entire solid waste disposal system.

Our neglect of the past, in all phases of solid waste disposal, has resulted from several considerations. Quite possibly our training has not been

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[1]Presented at the 55th Annual Meeting of the International Association of Milk, Food, and Environmental Sanitarians, Inc., St. Louis, Mo., August 18-22, 1968.

enough concerned with the entire solid waste disposal system, despite the fact that we are particularly knowledgeable regarding the storage container at the home or the commercial establishment, which is under surveillance in some other environmental sanitation program; that we know why proper storage is important; that most of us know that a packer truck is desirable for collection, and we have heard of sanitary landfill as a means of solid waste disposal. However, it is my opinion that few of us, in the course of our entire professional careers, have taken the time to become really informed as to the necessity for improved collection vehicles. Furthermore, I dare say that only a small percentage of the readers have actually seen an ultimate disposal facility which could meet normal regulatory agency criteria.

The quantity and quality of solid wastes today are such that they must receive the professional's concern. It has been estimated that more than 800 million pounds of solid wastes are produced each day, and that by 1980 that figure will be approximately three times what it is today *(8)*. The composition of solid wastes is ever changing. In bygone times, food particles and food wastes were a large portion of solid wastes. Today, because of increased technology in containerization, eating habits, improved and increased standards of living, etc., the actual putrescible portion of solid wastes is decreasing, and other materials (paper, wood, metals, plastics, etc.) are on the increase. As you will recognize, many of the nonputrescible materials are relatively nondegradable, that is, they will not deteriorate for many, many years in most land disposal operations or, as you know, when cast away by a tourist or camper.

One reason for the staggering proportions of the solid waste problem is a lack, at all levels of government, of people trained specifically in solid waste management. I am now speaking of state and local regulatory agencies, municipalities, and also the Federal agencies. As has been previously mentioned, we each have a vague idea or ideas concerning solid waste disposal but, because of the press of other duties or understaffing of our particular unit, have been unable to prepare for the task before us. Also, in past years, the lack of public pressure or public awareness has prevented the funding of a solid waste disposal program.

PUBLIC AWARENESS

The public is now aware of the need for controlling environmental pollution. It recognizes land pollution or improper solid waste disposal as a principal part of pollution control. For the past two years, national magazines have been carrying lead articles pertaining to solid waste disposal *(1, 2, 3)*. Practically all outdoor and recreation oriented publications are widely publicizing the need for proper solid waste handling. Daily newspapers of most metropolitan areas frequently carry articles pertaining to solid waste disposal.

It has been estimated that state highway departments spend over $100 million per year picking up solid wastes strewn along the right-of-way of the primary highway systems. Surely support for this activity, when funds are so needed for new highway construction, is indicative of the public's interest and willingness to support this area of solid waste disposal.

The passage of Federal legislation normally is indicative of the public's interest in a particular matter. An Act pertaining to solid waste disposal was adopted by the Congress and signed into law by President Johnson on October 20, 1965.

THE SOLID WASTE DISPOSAL ACT

This Act, known as Public Law 89-272, was the first Federal effort in the solid waste disposal problem. It provides for four principal types of grants: (*a*) research, (*b*) training, (*c*) demonstration, and (*d*) planning (*5*). Research grants are available to institutions of higher learning for the development of new and improved ideas or new methods applicable to the solid waste disposal problem. Training grants are available also to institutions of higher learning for the purpose of encouraging them to develop a curriculum for training experts in solid waste disposal. As the need for competency in solid waste management develops at supervisory levels of government and industry, there certainly will be a real demand for trained individuals. The demonstration grants are available to nonprofit institutions and units of government to demonstrate new and improved ideas of regional or national significance, which can serve as a model to similar situations over the nation. These grants are available to assist in demonstrating solutions to storage, collection, and ultimate disposal problems. Finally, planning grants are available to state and interstate solid waste agencies for the purpose of developing a solid waste disposal plan which, when implemented, will solve solid waste disposal problems for the geographical area under consideration.

Details concerning the nature, the recipient, the work, the results, etc., of each of the above noted grants are available through the Solid Wastes Program. Periodic publications concerning each of these grants are available from the Regional office of the Public Health Service or from the Solid Wastes Program headquarters at Cincinnati, Ohio.

SOLID WASTE DISPOSAL—A CHALLENGE

The general public is now beginning to demand decent solid waste disposal. Citizens do not, at this time, know what to ask for or who to ask; however, it is my opinion that state and local public health agencies are going to be expected to take the leadership necessary to provide for approved solid waste storage, collection, and disposal.

Each of the 7 states of Region VI (U. S. Public Health Service) is now in the process of developing a state solid waste disposal program. In 6 of these states, the State Health Department is the state solid waste disposal agency. The seventh (Minnesota) has placed responsibility for solid waste disposal in the Pollution Control Agency. Two interstate agencies of Region VI (the Kansas City metropolitan area and the Omaha, Nebraska-Council Bluffs, Iowa, metropolitan area) are proceeding with the development of solid waste programs. Five of the aforementioned 7 states have solid waste planning grants under Public Law 89-272 and each of the 2 interstate agencies has a solid waste planning grant.

Perhaps a most important aspect of developing a solid waste program for a state or for an interstate agency is in making a determination as to the number and profession of the people required to carry out such a program. At the present time, the maximum number of people working full time in solid waste disposal for any state agency in the Region is two. In 2 of our states, the solid waste program is directed by a sanitarian; the solid waste program for one interstate agency is being directed by a sanitarian. The nature of solid waste management is such that competency, training, and individual resourcefulness are the most important attributes required. The solid waste disposal program is a wide-open field for the professional sanitarian. In order to participate in this very important aspect of environmental pollution, the sanitarian has a real obligation and an opportunity to become qualified to properly take his place in the forefront of this war on environmental pollution.

Disposal of solid wastes was a problem in man's first effort at community living. Ultimate disposal was solved by utilizing an open dump. In the midwest, we are still using the open dump. We have altered the operation somewhat. It is now generally an open burning dump.

Would you believe that, in the 7 states with which I work, less than 1% of the solid waste ultimate disposal facilities can be considered acceptable from a sanitarian's viewpoint? How many proper solid waste disposal facilities are there in your home state? What happens to the solid wastes that you or your wife place at the back door once or twice per week? I believe that, if you will become informed and if you will take advantage of the great upsurge of public interest in solid waste, you can find a real challenge, professional recognition, job satisfaction, etc., in the solid waste management programs of the future. I highly recommend that your first effort to become better informed should be attendance at one of the Solid Wastes Program training courses offered by the Solid Wastes Program *(7)*.

In conclusion, it is quite obvious that problems related to good management of solid wastes are of a universal nature. Every community and every home has solid wastes that must be disposed of. The larger the community, the more complicated and difficult the matter of disposal. In past years, public awareness and public support have not been ample to develop programs for effective management of solid wastes. Currently, public interest is at a relatively high level and is continuing to increase. The Federal government has recognized the need for participation in the matter of solid waste disposal and, as stated earlier, has adopted (October 20, 1965) the Solid Waste Disposal Act. One of the primary aspects of this Act is the encouragement of state and interstate solid waste agencies to develop solid waste programs. I believe public interest is such that these plans will be implemented.

To recap for the professional sanitarian: solid waste management offers a real opportunity for professional advancement. To participate, you must become informed, express your interest, and actually get into the problem. "There is still time to take prompt and strong action to reverse the trend toward pollution of the environment" *(6)*. The time is now and you have a real opportunity in solid waste programs at any level of government. Will you accept the challenge?

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EAT, DRINK, AND BE WARY[1]

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I welcome this opportunity to discuss, from the standpoint of the consumer, some of the issues of current concern.

In preparing this paper, I took special note of an item in the January, 1956, issue of *Food Processing* which listed new developments in the food field. Progress was assessed in terms of the employment of professionally trained food technologists in management positions in food plants, and the growth of a new profession—plant sanitarian—which had joined the other branches of sanitary engineering. The growth of this industry in the intervening dozen years, in terms of both quantity and expertise in keeping with advancing technology, as well as the establishment of the professional academy for sanitarians, appears to parallel the consumer concern about the growing complexity in the marketplace. We share an objective.

THE MARKETPLACE

Our marketplace—for all its greatness and perhaps because of it—has become a massive and mysterious place, so vast and complicated that the consumer too frequently does not really know what it's all about.

This wasn't always true. Our grandmothers, and some of our mothers knew what ingredients went into the bread they baked, set their own standards of sanitation, and were all too familiar with the value involved. It wasn't true when the storekeeper was on the local scene, rather than an impersonal supermarket offering items grown, prepared, distributed, and cleverly labeled by unseen hands.

But the computer age gradually changed all that, and with typical American optimism, consumers for years have blithely assumed that somebody up there is watching over them, and that the miracles of the marketplace are blessings. To many, it has been a rude shock to find that even miracles have their drawbacks, and that there are gaps in consumer protection that may result in real hazards. Moreover, these are hazards with which the consumer cannot cope alone.

CONSUMER PROTECTION

The consumer's confidence in available products, and indeed in his environment, was affected when he found that there was inadequate inspection of his meat, his poultry, and his fish; that coverage of the law protecting him from flammable fabrics was limited; and that some of the products in his home were poorly designed in relation to safe use. And certainly, if my mail is any indication, the idea of a color TV set being a radiation hazard, endangering the health of the family, really has the consumer concerned.

While issues involving economic values, like the Truth-in-Lending law, seem to get more attention from the press, the fact is that most of the progress in consumer protection in the last few years has related to safety. When President Kennedy delivered his landmark consumer message to Congress in 1962, he enunciated four consumer rights, the first being the right to safety. More than half of the legislative objectives listed in the consumer messages delivered by President Johnson in 1967 and 1968 concerned safety. Indeed 7 of the 10 recommendations enacted into law during 1967 and 1968 concern safety.

LEGISLATIVE PROGRESS

Because of this legislation, the consumer will now benefit from the work of the National Commission on Product Safety which will investigate the adequacy of measures employed to protect consumers against unreasonable risk of injuries from hazardous products, such as a child's doll with legs affixed by three-inch spikes; improved standards for clinical laboratories in interstate commerce; extended coverage of the law relating to the flammability of fabrics to such items as baby blankets and drapes; an improved and expanded program of meat inspection; research on improved techniques in fire prevention; safety standards for gas pipelines; and improved inspection of poultry products. Moreover, we are hopeful that some progress will be made on fish inspection and standards for electronic products to protect the consumer from hazardous radiation.

That's quite a gain for safety in just a 2 year period! It reflects the continuing concern of the Govern-

[1]Presented at the 55th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc., St. Louis, Mo., August 18-22, 1968.

ment for the problems besetting the consumer, and the support of the consumer himself who, once described as "seen but never heard," has become quite adept at acting in concert.

IS LEGISLATION ENOUGH?

Should the consumer rest on his legislative laurels? You—of all people—know better. You know that the beneficial effects of a law depend on both the efficiency with which it is administered and the cooperation of the system to which it relates.

For example, basic standards for the food industry have been in the law for many years. They have been amended and up-dated from time to time. They have been administered by a group of dedicated people, within the limitations of authority and funding. Yet it is estimated that the true incidence of food poisoning approaches a million cases a year, even though standards have improved and continue to improve.

It is unrealistic to think that 275 billion lb. of food per year could be produced, processed, distributed, stored, and sold with a public official watching over the shoulder of the provider all the time. Consequently, the fundamental concepts in the industry are just as important to the consumer as any law.

In reading the Food and Drug Administration's (FDA) recent materials, I noted continuing emphasis on procedural operations, industry-State-Federal partnerships, and experiments in voluntary compliance. Within these concepts, the attitudes of the leadership in the industry become even more important to the consumer who must rely on unseen controls.

COMMUNICATION NEEDED

As professionals in this field, you are not only in a position to exercise continuing leadership in maintaining a sound market, you can provide the kind of communication that will send a confident consumer to the store. There is a gap in positive information. Generally, the consumer only hears about the problems. No one tells him about the processor with an outstanding record for the elimination of health hazards. (And ads are more likely to tell him "ho! ho! ho!" than anything designed to create consumer confidence.)

To effect better communication, it might be helpful to include the consumer in some of these partnerships once in a while, at least to the extent of being sure the consumer organizations know of work in their behalf, and putting an occasional consumer on some of the advisory committees.

SANITATION

For the most part, I have been talking about health and safety, but I certainly wouldn't want to slight sanitation. I am not sure that these two things are as separable in the mind of the consumer as they appear to be to the professional. I know they aren't in my mind.

As I understand it, foreign matter in food may be a matter of sanitation rather than health and safety because, while unpleasant, it probably won't kill you. This always reminds me of some of the basic cases on negligence in law school which had to do with foreign matter, usually a thumb or a toe, found in soda bottles. For some reason, the person who wound up with the adulterated soda pop was always a pregnant woman, and the cases involved damages resulting from a miscarriage. Consequently, to me, foreign matter can be dangerous.

And to give you an idea of what goes on out there, the mail containing consumer complaints relates more to sanitation than health and safety, because this is what the consumer can see.

I would like to report a complaint which was received by the President's Committee on Consumer Interests. It may not be typical, but it is relevant. A lady in Boulder, Colorado, had purchased a package of frozen goods in her supermarket and was not altogether satisfied. "According to the package label," she wrote, "it contained simply chicken gizzards 'thoroughly cleaned and ready for cooking.'

"Upon opening, the package was found to contain 9 1/2 oz. of chicken gizzards and 6 1/2 oz. of chicken fat.

"For those customers who like to stuff their freezers with chicken fat, it would be helpful to have the gizzards/fat ratio of this great little package specified on the label.

"The package contained one human hair 2.5 inches in length. Although my appetite for human hair is modest, I do not complain for this one hair occupied little space in the package, and I am confident that it, too, was 'thoroughly cleaned and ready for cooking.'"

While this lady had a little lighter touch than some, the letter does reflect consumer thinking. Nothing will turn the consumer on faster than a hint of filth, rats, roaches and the like, as Upton Sinclair proved when he started this whole thing.

The goal President Johnson has set is to assure every American a fair and honest exchange for his hard-earned dollar. When the consumer thinks he is paying for good food prepared under appropriate conditions, and finds that somebody shaved a point on those conditions, he feels cheated.

Too, as the letter illustrates, the consumer feels

cheated when he is fooled by a label. Actually, it was the labeling problem that gave form to the current consumer momentum. The consumer effort was sporadic for years, and some suggested that the consumer interest was too intangible to serve as a rallying point.

FAIR PACKAGING LAW

However, there was a flood of support for the Fair Packaging law. During that legislative campaign and subsequently, with a win to its credit, the consumer movement organized. There are now between 30 and 40 State and city consumer organizations, and a national federation of these organizations and others with a consumer component.

As an aside, it may be of interest that St. Louis helped lead this effort. The St. Louis Consumer Federation and the Missouri Association of Consumers were among the first and strongest consumer voices. Too, the first consumer conference in cooperation with the President's Committee on Consumer Interests was held in St. Louis.

It is well known that the purpose of the Fair Packaging and Labeling Act was to solve some of the problems that the housewife was having in the supermarket. She was annoyed when she couldn't read the weight without a magnifying glass, and confused by peculiar designations like "jumbo quart."

The basic requirement in the law is simply a clear statement of the contents and size of a package. This seems to me so reasonable that I sometimes wonder what the dispute was about. Since the regulations became effective just last month (July, 1968), consumers have pretty much put this one in limbo until the results are in.

One of the major concerns related to proliferation of package sizes. This matter was handled in terms of voluntary product standards under a procedure to be instituted at the Department of Commerce. I understand that approximately 50 commitees are at work on standards for various products and that several agreements have been reached on the reduction of the number of package sizes, beginning with the instant coffee and edible oils industries.

But it is true that there's no such thing as a little deception, and that some deceptive practices have become commonplace (in ads, repair cheats, phony sales tricks) because a majority will put up with it. It's also true that groups endorsing the consumer cause, along with their natural allies like this organization, are fast becoming—if not a majority—at least sufficiently influential to make some progress on the worst of the abuses.

This has been called the consumer era. They are on the move. But in truth it will take a great deal more effort from all sides to establish the consumer ethic in our daily transactions.

NEW ALL-DAIRY LOW FAT SPREAD

Developers of a new all-dairy, low fat spread said consumer surveys have been encouraging for a new dairy product which was released nationwide May 1 to processors through the Agricultural Experiment Station at South Dakota State University.

S. W. Seas, assistant professor, told of results of 1 survey in a South Dakota community in which consumers liked the product and rated it right next to butter in preference. "While families still like the fine flavor of butter, they were enthusiastic over spreading properties of the new product and felt that it was superior to margarine," Seas reported.

He disclosed that during the survey slight changes made in formulation of the product were guided by information obtained from the consumers.

"We found they preferred a medium level of color, similar to butter, plus a salt content of 1.25%, he said. "They also liked the distinct cultured butter-like flavor."

He added that consumers used the product mostly as a spread although some other uses in cooking and serving were reported. Prior to release of the product, dozens of recipes in which it was used were developed and tested by SDSU home economists. Versatility is a characteristic of the product for use as a spread, in baking, in sauces and in other ways.

Co-developer Kenneth R. Spurgeon discussed technical aspects encountered during the past several years while the two South Dakota State scientists worked with the spread.

First commercial introduction of the product in South Dakota was in early June by a dairy in Brookings.

ARE WE PROFESSIONALS?[1]

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As individuals, are we "professionals?" I would ask each reader to take a good look at himself and ask, "Am I a professional sanitarian or environmental specialist?" Do I conduct my day to day responsibilities in a "professional" manner? Do I leave a "professional" attitude in the minds of those individuals with which I work as a member of this great Public Health team? Have I, through my conduct, developed professional respect among those individuals with whom I must have personal contact while I perform my routine, day to day responsibilities?

What is a "Professional?"

Before preparing this paper, I researched to try to obtain a good, sound, realistic definition for the term "professional" as it would apply to practicing "sanitarians or environmental specialists."

Webster's definition of a professional is: "characteristic of or conforming to the *technical* or *ethical* standards of a profession or an occupation regarded as such." The terms technical and ethical stand out in this definition. Technical is defined as: "a word or explanation, or a meaning, confined chiefly to a particular occupation or specialized field of thought." Ethical is defined as: "professionally right or befitting; conforming to professional standards of conduct." To sum up this definition, one could say that the term "professional" is based upon one's technical skill and ethical conduct.

Not completely happy with this definition, I continued to look for a better one. While searching, many thoughts dawned on me, one being that if you are a registered sanitarian in Indiana or some other state, you might feel comfortable with the thought that you are a professional. In many circles, the adoption of a state registration act automatically establishes a profession and some of those becoming registered feel that they are automatically professionals.

For some reason, this philosophy leaves me completely cold. It is impossible for me to conceive that the passing of a law and complying with the minimum requirements of same automatically makes a "professional" out of that individual. I have the same uneasy feeling about this approach as I have about that Act of the U. S. Congress which automatically makes an officer and gentlemen out of anyone who receives a commission in any of the armed forces. I must take the same attitude as it applies to an individual automatically becoming a "professional sanitarian or environmental specialist" upon receiving his certificate of registration from any state having a Sanitarians Registration Act.

The next though was, that many readers not only consider themselves professional but could and would be more than willing to provide a good definition of this term "professional" as it applies to a sanitarian or environmental specialist. I must confess at this time, I am firmly convinced that there is not a simple, acceptable definition available which would describe what a professional sanitarian or environmental specialist is.

Criteria for Individual Performance

With this decision at hand, another path must be taken which will provide, if not a definition for the word professional, at least some basic criteria which we can use to outline our individual performances to determine if we are conducting ourselves in a proper manner. I know no better way than to list, item by item, the criteria within which I as an individual performing in this profession must live. *(a)* A professional sanitarian or environmental specialist must dare not allow himself to perform in a manner intentionally or unintentionally which would leave doubt in anyone's mind that he is not qualified through *experience*, *education*, or a combination of both. I would now refer you to the term *technical* which was used in the Webster's definition which I provided earlier.

The many short courses being offered by the Public Health Service (PHS) in Cincinnati or in Atlanta, or the conducting of courses within the State of Indiana provides opportunities to all persons to obtain the latest training available regarding environmental health programs.

You may be interested in knowing that for the past 5 years, the Illinois Association of Sanitarians, has sponsored a 1 week training course on five different environmental health subjects. These courses use the same material and same instructors as the PHS courses and are offered at no cost to members or friends of the Illinois Association of Sanitarians.

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[1]Presented at the 18th Annual Meeting of the Indiana Association of Sanitarians, Terre Haute, Indiana, September 25, 1968.

In addition, in Indiana, you are extremely fortunate in having two universities providing environmental health courses and degrees. I am confident that both institutions, have and will continue to provide short courses regarding environmental health programs in addition to their degree curriculum.

The State Health Department has in the past, and no doubt will continue in the future, to provide constant training for anyone interested in putting forth the effort. *Don't kid yourself*, to become proficient as a practicing sanitarian or environmental specialist, it is not necessarily mandatory for one to have a college degree.

However, let me assure you that a person fortunate enough to obtain a degree will, no doubt, have an easier time in becoming proficient and will have an advantage, position wise, over a person without a degree. In my opinion, is it not mandatory that an individual have a college degree before he can become proficient as a practicing sanitarian or environmental specialist. To qualify technically as a professional sanitarian or environmental specialist, you and only you can initiate the efforts and put forth the time that it takes.

(b) An individual professing to be a professional sanitarian or environmental specialist must, regardless of the circumstances, never engage in the practice of accepting gratuities regardless of how large or how small. I now refer you to the term *ethical* conduct which was used in Webster's definition discussed earlier.

If you will permit me the privilege of reminiscing, I will go back some 10 or 15 years while working in southern Indiana. I can recall attending numerous meetings at Spring Mill Park. At one particular meeting at Spring Mill Park I remember Harold S. Adams made a statement during his presentation that we who perform our responsibilities may feel comfortable in accepting gratuities from individuals or operators *provided* these same individuals or operators offer the same gift to each and every individual that walks into their establishment. In short, if the operator of a restaurant wanted to give you $10 for services well rendered, you could consider taking the gift *provided* he gave the same reward to every person who entered his restaurant that particular day.

Ridiculous it is not, because we all know that only an insane person or an individual having more money than sense would offer a gift to everyone who enters his door on any one particular day. It does not take a genius or even a person with average intelligence to realize that he offered that $10 to you trying to get you to perform in an unprofessional manner. Call it what you may, it is still a gratuity whether it be a cup of coffee, a Coke, lunch, dinner, a couple of tickets to the football game, a new car, or even a new home. It is an unprofessional act which cannot be classified as anything other than conduct which is extremely unethical and unprofessional. How many times have you heard or have you even reasoned with yourself, "I can take that ham or bottle of booze because it is Christmas time and this individual is only offering it to me in the spirit of the season." My question to this individual would be "offering to you in what spirit?" It is certain you could not, through your wildest dreams, consider this act as being anything connected with Christmas or the spirit that goes with Christmas.

Rest assured the individual offering this gift to you is not operating under the basis that it is 'better to give than to receive'. If he is successful in getting you to accept this offer, you better believe that he will receive in return not 7 times, but 70 times its value. I am confident that there are many other approaches or reasons that we might use to justify in our own minds which would in some small way let us feel that as an individual we can do this without having it considered as a bribe. One that I feel is a real gem, "I can take this gift because it is too small to be considered as a bribe or no one can bribe me for a dinner." I say to them or to any other person who would even consider this approach that if, in your opinion, you are not being adequately reimbursed by your employing agency to conduct yourself in an ethical manner at all times, then it is time that you seek employment in some other location. No, better than that, in my opinion, it is past time for you to seek employment in some other endeavor. You and only you are responsible for your conduct whether it be at the office, in the field, or at church.

(c) An individual professing to be a professional sanitarian or environmental specialist must not only prepare himself with the proper technical skills and conduct his everyday responsibilities in an ethical manner, but he must also strive to achieve a professional status with all other individuals working as sanitarians or environmental specialists. If we as individuals cannot conduct ourselves as professionals while we are working with or socializing among other members of this profession, then how in the world can we expect the general public to not only accept us individually as professionals, but to consider the sanitarian or environmental specialist as being a truly established profession? If we in this profession cannot sit down across the table from other members of this profession and iron out our problems, difficulties, misunderstandings, confusion, biases or call it what you may in not only a gentlemanly fashion but also with a true spirit of professionalism, *our cause is lost.*

Many of you are aware of the mountainous efforts which have been put forth by a joint committee

to provide one professional society for sanitarians in these United States. This goal can only be achieved when those responsible, you and me—the general membership of these societies, demand that their leadership be conducted and maintained, regardless of the subject, on a strictly professional level for the benefit of every sanitarian or environmental specialist in these United States. Then and only then will we be able to reap the rewards of amalgamation.

Tremendous strength can be obtained through a solid united front supported by all of us practicing in this profession. Once we reach this plateau, we will have proven conclusively that we can conduct our own business in our own backyards as professionals and on a strictly professional level. This will ultimately lead to obtaining complete respect as professionals from the general public whether our day to day responsibilities are being conducted in southern Indiana, northern Illinois or just Po Dunk, U.S.A. The time is here that we, the grassroot members of our professional societies, provide our national officers with our entire support and efforts to obtain this solid united front. Naturally our complete support can only be provided if the general membership of these societies is convinced that our national officers are conducting themselves and the business of the societies in a strictly professional manner for the benefit of every member. When this ultimate goal is reached then, and only then, will every practicing professional s a n i t a r i a n or environmental specialist in this country be adequately rewarded.

Space limitations have permitted the listing of only three items as the basic criteria for the establishment of a professional. We all know that there are many more items which could be added to this list. However, I am firmly convinced that if every one of us would live within the framework of these three basic items, we would be much closer to achieving our goal, individually or as a group, of being accepted throughout our profession, our nation, our state, and our community as true professionals.

In closing, if this profession is good enough for you to make your living, it should be good enough for you to put forth the effort to obtain the technical skills and to maintain the ethical conduct becoming of a dedicated professional sanitarian or environmental specialist.

STORAGE OF POISONOUS SUBSTANCES

Poisonous substances, such as turpentine, gasoline, and pesticides, should not be stored in reusable plastic milk containers, Federal officials warn. Studies indicate that certain substances stored in these containers are absorbed by the plastic and sometimes resist cleaning and sanitizing. If the container is then used for milk, juice, or water, the poison could cause contamination. The studies were made by the Cincinnati, Ohio, milk research facilities of the Environmental Control Administration. ECA is a unit of the new Consumer Protection and Environmental Health Service. Both CPEHS and ECA were formed in the July 1968 regrouping of health programs of the Department of Health, Education and Welfare.

Robert E. Novick, Chief of ECA's Environmental Sanitation Program, said that plastic, unlike glass, is a porous material which absorbs certain liquids. He commended the dairy industry for developing an instrument which detects contaminants left in these containers after sanitizing. The instrument consists of a sniffing device that triggers destruction of any contaminated containers. Mr. Novick said that his group is greatly concerned over the containers that are used for poisonous substances, then washed and reused in the home. He suggested that if plastic containers are used for any poison, they should be permanently marked in some way and thrown away afterwards to prevent their use for food products.

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NELSON HOHL RETIRES FROM STATE DEPARTMENT OF HEALTH SERVICE

After more than 38 years with the New York State Department of Health, Mr. Nelson J. Hohl retires November 30, 1968. At his retirement, Nelson was Assistant Chief with the Milk and Food Section in the Division of Environmental Health Services and Chief State Rating Officer under the Interstate Milk Shippers program.

During the 1930's he had been in charge of one of the State's mobile milk laboratories conducting evaluation of milk sanitation activities of local health departments and pushing for pasteurized milk in every village, city and town. Mr. Hohl's reminiscence of this period was of continual travel and the more than doubling of the number of pasteurizing plants in the state. He also produced figures to show the percentage of pasteurized milk sold in the state rose from 68% to over 90% and the number of milk-borne epidemics dropped to a very few. He stated that the few that did occur in the early forties were due to the remaining raw milk. Also he said that no milk-borne epidemics had occurred in the state since the forties and for the last 10 years, 99.9 percent of milk sold has been pasteurized. He cautioned however, that continued vigilance by the Health Departments and the milk industry is necessary to maintain the good record. He points to the 1927 Montreal epi-

demic where improperly pasteurized milk was involved in about 5000 cases of illness and nearly 500 deaths.

During the 1940's he was assigned as District Milk Sanitarian in the Buffalo District and since 1950 his headquarters has been in the Central Office in Albany.

Nelson has been long associated with the New York State Association of Milk and Food Sanitarians and International Association of Milk, Food and Environmental Sanitarians, Inc., as a matter of fact, the records show 38 years. Checking the records again we find he has been involved with many activities in the Association and the affiliate groups. He was a Charter Member of the Capitol District Sanitarians and president. He was Chairman of the Education and Professional Development Committee and member for several years. He has been a Newsletter reporter since its inception and we have it on good authority from the editors that he seldom missed an issue without submitting copy. He was a member of the executive committee of the Association for 2 years before resigning on his doctor's recommendation. He was Chairman of the local arrangements committe for the Association's 1941 annual meeting in Buffalo. He was Chairman of the Association's resolution committee for 9 years. He was also Chairman of the Awards Committee and read several papers before the annual meetings and has given many talks before Affiliated Association group meetings.

Nelson and Mrs. Hohl plan to return to California, the place of his birth, for the winter.

INTER-SOCIETY AND -AGENCY COUNCIL APPOINTED TO DEVELOP NEXT EDITION OF STANDARD METHODS

The American Public Health Association (APHA) negotiated a contract with the Bureau of Disease Prevention and Environmental Control of the U. S. Public Health Service for "development, evaluation, and publication of *Standard Methods for the Examination of Dairy Products*" (13th edition). The contract calls for: (a) establishment of an intersociety council to guide the program, (b) review of methods in the 12th edition, (c) selection of methods which need collaborative studies, and (d) support of such studies and also of the preparation of samples needed for the studies.

According to the contract, the American Public Health Association shall "establish a Council on Standard Methods for the Examination of Dairy Products composed of people of recognized ability in the field of laboratory examination of dairy products. The members of the Council shall represent interested professional organizations and the Public Health Service."

Dr. W. J. Hausler, Jr., Director of the State Hygienic Laboratory, University of Iowa, Iowa City, has been appointed as the APHA representative to the Council and he will also serve as its chairman. Other members of the council who represent societies are: Dr. Elmer H. Marth, Department of Food Science and Industries, University of Wisconsin, Madison, representing the American Dairy Science Association; Mr. Joseph Murphy, Division of Laboratories, Texas State Department of Health, Austin, representing the International Association of Milk, Food, and Environmental Sanitarians, Inc.; Dr. George Kupchick, Department of Sanitation, City of New York, 125 Worth St., New York, representing APHA; and Dr. Charles Okey, Division of Laboratories, Maine Department of Health, Augusta, representing the Association of States and Territorial Public Health Laboratory Directors and the Conference of Public Health Laboratory Directors.

Council members from governmental agencies include: Dr. Joseph C. Olson, Jr., Food and Drug Administration, 200 C Street, S.W., Washington, D. C., representing the Food and Drug Administration and Dr. R. B. Read, Jr., Division of Food, Milk, and Interstate Carrier Sanitation, Environmental Control Administration, Department of Health, Education and Welfare, 222 E. Central Parkway, Cincinnati, Ohio, representing the Public Health Service. Industrial interests are represented by Dr. Warren S. Clark, Jr., American Dry Milk Institute, 130 Franklin Street, Chicago, Illinois. Representatives of academic institutions include: Dr. Verner H. Nielsen, Department of Dairy and Food Industry, Iowa State University, Ames, and Dr. William Walter, Department of Botany and Bacteriology, Montana State University, Bozeman. Dr. Walter served as editor of the 12th edition of Standard Methods for the Examination of Dairy Products.

The Council held its first meeting in New Orleans in January, 1969. Its initial undertaking is to assess the weak and strong points of the 12th edition. To this end round table discussions are being planned for the 1969 annual meetings of several professional societies, including the International Association of Milk, Food, and Environmental Sanitarians, Inc. Written comments are also invited and members of IAMFES who have experience with the 12th edition and wish to offer suggestions are asked to contact Mr. Joseph N. Murphy, Jr., Division of Laboratories, Texas State Department of Health, 1100 W. 49th St., Austin, Texas 78756. Alternatively, comments may also be sent to the editor of this journal.

EGG PROCESSING INDUSTRY LAUNCHES SANITARY STANDARDS PROGRAM

A newly organized Steering Committee from the 3-A Sanitary Standards Committees met at the 3-A offices to inaugurate plans for developing a new series of 3-A Sanitary Standards for egg processing equipment. The committee, composed of representatives from U. S. Public Health Service, International Association of Milk, Food, and Environmental Sanitarians, U. S. Department of Agriculture, Dairy and Food Industries Supply Association, and Institute of American Poultry Industries-Sanitary Standards Committee, established procedures for re-structuring the 3-A Committees to provide appropriate user-group representation within the group's established operating plan.

Essentially a three element program, with *users*, *fabricators*, and a tri-partite *sanitarian-regulatory* segment (with representatives from USDA, USPHS, IAMFES), the newly-augmented 3-A Sanitary Standards Committees, with the IAPI-Sanitary Standards Committee has scheduled its first meeting for the afternoon of March 13, El Mirador Hotel, Palm Springs, California, with a brief first-time agenda not yet finalized, but likely to include sanitary pumps, and sifters.

The 3-A Sanitary Standards program originated in 1944 to provide criteria for cleanability and product protection in food processing equipment. Twenty-six 3-A Sanitary Standards have been published for dairy processing equipment. These voluntary standards have been regarded as the greatest single factor contributing to the uniformity of equipment requirements, and reciprocity of acceptance, among state and local regulatory jurisdictions. It is hoped that the sanitation criteria found in published 3-A standards may be utilized in the preparation of the new 3-A series for the egg processing industry.

Three-A Sanitary Standards are published officially in the Journal of Milk and Food Technology. Complete sets of published standards are available at nominal cost from the Journal at Box 437, Shelbyville, Indiana.

REPORT OF THE COMMITTEE ON FROZEN FOOD SANITATION, 1967-1968

The objectives of the IAMFES Committee on Frozen Food Sanitation have been to review existing problems and to formulate recommendations for all persons and/or organizations interested in various aspects of frozen food sanitation. Consequently, the efforts of the committee have been directed toward frozen food sanitation in general.

The committee has determined that the training of food processing plant employees is still a major problem. Preparation of a list of reference material and an exchange of ideas by persons responsible for employee training may be helpful.

There are no standards for design of all frozen food processing equipment. The committee recommends that those agencies currently preparing food equipment standards consider development of standards for all frozen food processing equipment.

There are, at present, no uniform bacteriological guidelines for the various classes of frozen food. The committee urges all interested agencies to participate in the development of these guidelines which may be used as an index in determining the sanitary quality of a product.

There has been little effort to familiarize sanitarians with the time and temperature relationship of frozen foods. Sanitarians should be encouraged to give more careful attention to this aspect of frozen food sanitation which may involve both public health safety and food quality.

The freeze dry process for preserving foods is becoming more prominent. These processes should be kept under surveillance and the committee encourages the food science departments of educational institutions to participate in sanitation research of the freeze dry process.

The committee recommends that each state seriously consider the adoption of the AFDOUS Frozen Food Code (Adopted June 22, 1961). Adoption of the Code would promote uniformity of regulations and enforcement.

EUGENE C. VIETS, *Chief, Food Sanitation,* Bureau of Milk, Food & Drugs, Missouri Division of Health, Jefferson City, Missouri 65101.

STEPHEN J. PALMER, National Association of Frozen Food Packers, 919 18th Street, N.W., Washington, D. C. 20006.

C. P. ORR, *Associate Environmental Health Consultant,* General Foods Corporation, White Plains, New York 10602.

FRANK E. FISHER, *Director, Division of Food & Drugs.* Indiana State Board of Health, 1330 West Michigan Street. Indianapolis, Indiana 46202.

EATON E. SMITH, Food Division, Department of Consumer Protection, State Office Building, Hartford, Connecticut 06115.

NEWS AND EVENTS

DAIRY MANUFACTURING SHORT COURSE

The Department of Animal Sciences and the Food Sciences Institute at Purdue University have announced plans for a one-week short course in Dairy Manufacturing to be held March 30-April 5, 1969. The purposes of the short course will be to give plant foreman and supervisors a better understanding of the Dairy Industry and the basic principles of dairy technology. The course will emphasize proper processing techniques of fluid milk, cultured products, ice cream and cottage cheese manufacture, sanitation, and quality control as well as good management and personnel practices.

The short course will be conducted by Emeritus

Professor Dr. G. Malcolm Trout, Michigan State University, Emeritus Professor Dr. E. O. Herreid, University of Illinois; as well as other members of the Purdue staff and guest lecturers from Industry.

Enrollment is open to anyone in dairy or allied fields, but will be limited to 30 on a first come basis. A registration fee to cover the cost of the short course will be charged.

For further information or registration, please write to Professor Roy W. Stein, Purdue University, Department of Animal Sciences, Smith Hall, West Lafayette, Indiana, 47907.

KENYA DAIRY FARMERS FOR U.S.A.

The University of Minnesota has offered Kenya two scholarships for young dairy Farmers. Kenya's leading farming magazine *Kenya Dairy Farmer* is now running a competition to select these two men. Pan American World Airways Inc., has been selected as the airline to fly the winners the 8,928 miles from Nairobi, Kenya's capital, to Minneapolis. This was announced by the publishers of *Kenya Dairy Farmer* who hail the competition as a new link between the U.S.A. and Kenya, Africa's leading milk and cheese producers.

In an interview, Mr. T. D. Bridge, the publisher of *Kenya Dairy Farmer* said "There is great admiration here in Kenya for the skill, knowledge and hard work shown by America's dairy farmers. The two young men who will be flown to Minnesota via Pan Am next April are fortunate that they will be going to one of the worlds oldest agricultural training centres. We have some 420,000 head of high grade cattle on farms all over Kenya which produce something like 50/55 million gallons of milk per year."

In a further statement Mr. LaVern A. Freeh, Head of the Department of Agricultural Short Courses of The University of Minnesota has said that his University is proud to be part of a new adventure in learning as represented by the recently developed agricultural training program for selected dairy farmers from Kenya. "We look forward to the arrival of the two young Kenyan dairy farmers. We are confident that the combination of practical and academic experiences and courses we have developed for them in the dairy field will be interesting, enjoyable, and above all, educational," he continued.

Dairy farmers in Kenya range from breeders of high yield Jersey dairy herds on Kenya's tropical Coast to farmers on Mount Kenya. Thousands of new African farmers now farm resettled settler preserves in the former White Highlands.

TRAINING COURSE ON COMMUNICABLE DISEASE ANNOUNCED

The Training Program of the National Communicable Disease Center would like to announce that the headquarters course, No. 3230-G, "Communicable Disease in the Community," will be held in Atlanta, Georgia, May 19-23, 1969. The course is for all Public Health workers with particular orientation toward Sanitarians, Public Health Engineers, and Administrators.

The purposes of the course are to provide information and afford the opportunity to develop proficiency in the solution of communicable disease problems existing in the community. Emphasis will be given to increasing the capabilities of Public Health personnel for participation in the overall disease control activities of the health agency.

Anyone who wishes to attend or would like more information about this course should write Dr. John R. Bagby, Jr., Deputy Director, NCDC, and Director, Training Program, National Communicable Disease Center, 1600 Clifton Road, N.E., Atlanta, Georgia 30333.

NSF EVALUATION/CERTIFICATION OF WATERCRAFT SEWAGE DISPOSAL

A program for the evaluation, testing, and Listing of watercraft sewage disposal devices has been initiated, effective January 1969, by the Testing Laboratory under the provisions of NSF Standard No. 23. Applications for evaluation and testing are currently being received and processed on a first come–first serve basis. It is anticipated that an initial Listing of such devices found to meet the Standard will be available in the early Spring.

FOUR CORRESPONDENCE COURSES IN ENVIRONMENTAL HEALTH

Utah State University announces the immediate availability of four correspondence courses in the area of Environmental Health. The courses and their titles are: Public Health 150, Environmental Sanitation (4 credits); Public Health 162, Communicable Disease Control (3 credits); Public Health 163, Insect and Rodent Vector Control (3 credits); and Public Health 164, Water-borne Disease Control (3 credits). Developed jointly with the U. S. Public Health Service, National Communicable Disease Center, Atlanta, Georgia, the courses parallel NCDC Home study courses 3010G, 3012G, 3013G and 3014G. These correspondence offerings provide the

opportunity to take basic disease control courses in environmental health for college credit. While the courses are not prerequisite to each other, some knowledge of biology and the content of Public Health 150 are assumed for PH 162, 163 and 164. For information on fees and application forms, write to: Correspondence Study Division, Extension Services, Utah State University, Logan, Utah 84321.

REPORT ON THE 1968 KENTUCKY DAIRY INDUSTRIES CONFERENCE

Dr. C. Bronson Lane

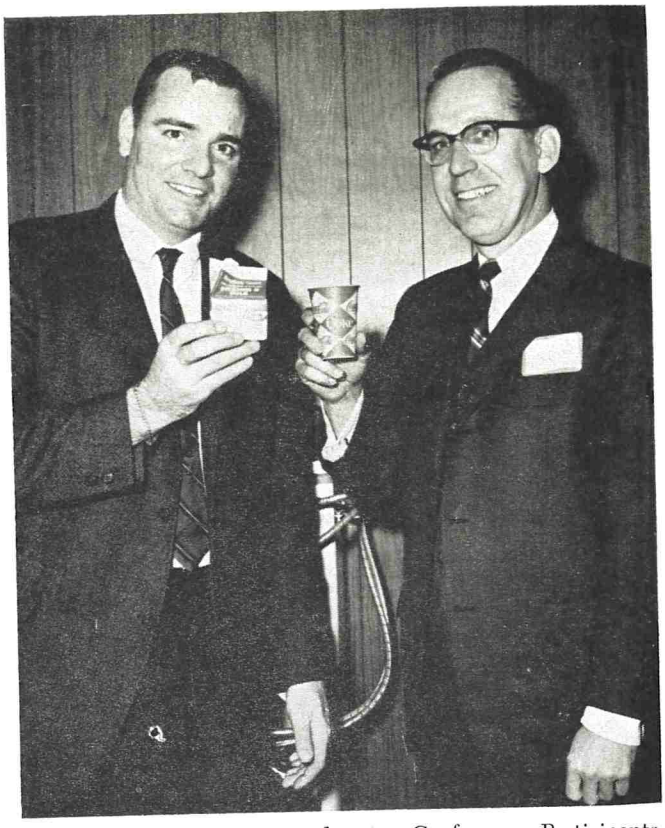
Some of the new milk product taste treats now being market-tasted include a hickory-smoked cheddar cheese, a powdered blue cheese, and a chocolate flavored cheese confection, a Michigan State University professor told over 100 delegates to the 16th annual Dairy Industries Conference, held in Lexington, Kentucky, on December 4, 1968.

Prof. A. L. Rippen, speaking in the meeting at the Continental Inn, said other new foods being produced in the MSU's food science department include a cherry flavored milk drink and a frozen dairy coffee creamer. New production techniques in curing cottage cheese and machinery to handle it now permits one man to operate a machine that will process 2,000 pounds an hour, he said. A packaging machine for filling cartons of milk has a capacity of 150 half-gallons per minute and it also can be operated by one man, the researcher stated. He said sales volumes of yogurt is increasing in the U. S., with $25 million worth sold in 1967.

The area of sales and distribution was the topic of Edward J. Austin of Providence, R. I. He said his company has found that consumers do not object to having milk deliveries cut to once a week. Some other items now being sold through home delivery include bread and cakes, spices, chips and pretzels and soft drinks, he noted. He stated that delivery of most of these items by milk distributors is becoming fairly commonplace in some parts of the nation. "We have found that on the subject of buying habits, the housewife is articulate, well read, allergic to fattening foods, price conscious, and aware of what makes an attractive package," Austin said.

Dr. Eric C. Oesterle, Purdue University agricultural economist, spoke on the subject of dairy products merchandising and how shelf location and product placement affect sales. He called for new methods in displaying milk and milk products, as well as other foods. Stating that he favored vertical display of items on shelves, Dr. Oesterle said the trend now is to spread out food in long rows. He said tests have proved conclusively that merchandise located at the shopper's eye level will get better attention and relatively more sales. People shopping for milk in the bottoms of dairy cases often overlook dairy items on the top of the cases, he said.

There will be an estimated 20,000 convenience-type grocery stores in the U. S. by 1975, with an annual sales volume of $3.4 billion dollars, John Kellum of the Southland Corp. of Dallas, Texas, told the con-



1968 Kentucky Dairy Industries Conference Participants. Left: Dr. C. Bronson Lane; Right: Mr. Jim Williams, Coca-Cola USA, Atlanta, Georgia, who discussed "Marketing Beverage Products Aggressively."

1968 Kentucky Dairy Industries Conference Participants. Left to right: Speaker Ed Austin, H. P. Hood and Sons, Providence, R. I.; Speaker Prof. A. L. Rippen, Michigan State University, East Lansing, Michigan; Speaker Dr. Eric Oesterle, Purdue University, Lafayette, Indiana; Chairman Paul Saalwaechter, Ideal Pure Milk Company, Owensboro, Kentucky; Conference Chairman Dr. C. Bronson Lane, University of Kentucky, Lexington, Kentucky.

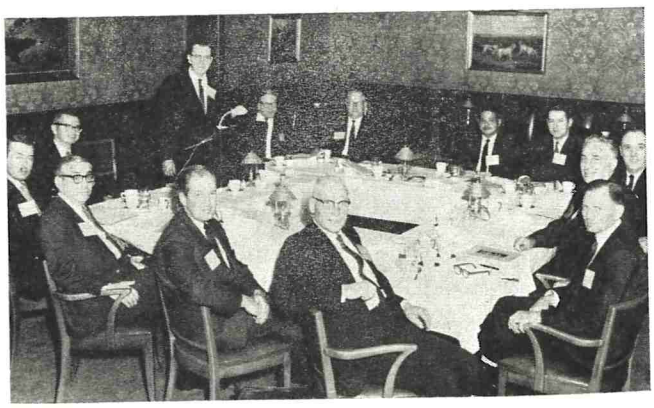
ferees. These figures compare with the 7,000 such stores in existence in 1967, with an annual sales of $1.2 billion, said Kellum, who is in the purchasing department of Southland grocery chain. Principal commodities sold in the convenience-type store are bread and cakes, milk and milk products, ice cream, beer, cigarettes, and soft drinks, he said. Southland operates convenience-type stores called Seven-Eleven, principally in the South and Southwest.

James F. Williams, vice president for advertising and sales promotion with the Coca-Cola Company, Atlanta, discussed "Marketing Beverage Products Aggressively." His talk featured a combination slide and movie presentation showing advertising film clips on the company's various beverages. He said his company sells its products in 130 countries. Edward F. Rickelman, president of the Penn-Michigan Manufacturing Corp., West Lafayette, Ohio, talked on the subject of his company's product—dairy metalware and dispensing cabinets.

The conference was sponsored by Dairy Products Association of Kentucky, the UK Cooperative Extension Service and the UK Department of Animal Sciences. Dr. C. Bronson Lane, assistant extension professor of animal sciences, was the conference coordinator. Master of ceremonies was Paul Saalwaechter, an employee of the Ideal Pure Milk Company, Owensboro. Harry Lancaster, acting athletic director at the University, was the luncheon speaker.

NATIONAL RESTAURANT MEETING WITH PUBLIC HEALTH OFFICIALS

A joint meeting with representatives from national-level public health organizations, educators, and food service operator members of the National Restaurant Association was held recently at Stouffer's Washington Boulevard Restaurant in Detroit to discuss the education and training of all who are concerned with sanitation and food protection in commercial and institutional food service.



The group concurred in a plan to develop appropriate guidelines covering the content of text material and supporting graphics. Shown clockwise are: M. B. Crabill, Conference of Local Environmental Health Administrators; Dr. Chester G. Hall, NRA Director of Education; Tom S. Gable, National Sanitation Foundation; Harold C. Gant, Jr., Executive Vice President, Michigan Restaurant Association; Arthur B. McIntyre, U. S. Public Health Service; L. E. Starr, Chairman, NRA Public Health and Safety Committee; Roger Lewis, President, National Association of Sanitarians; Vernon E. Cordell, Director, NRA Public Health and Safety; Harvey F. Davis, Jr., American Public Health Association; two educators representing the Council on Hotel, Restaurant and Institutional Education—Raymond Simescu, Oakland Community College, Michigan; and Edward J. Martin, College of DuPage, Naperville, Illinois; John L. Bolhuis, Chairman, NRA Education Committee; and Dr. Roy V. Upham, Association of State and Territorial Health Officers.

VIRGINIA TECH STUDENTS RECEIVE DAIRY INDUSTRY SCHOLARSHIPS

Scholarships totaling $4,750 have been presented to 10 Virginia Tech students by the dairy industry of the state. The dairy science scholarships were awarded on the basis of college or high school academic performance, interest in the dairy industry, youth activities and financial need. The scholarships will enable the students to better prepare for one of the many careers in the dairy field. The university's department of dairy science scholarship program also serves as a stimulant to outstanding high school and junior college students entering Virginia Tech.

TECH DAIRY SCIENCE SCHOLARSHIPS—Winners of $4,750 in dairy science scholarships at Virginia Tech are, left to right, Roger L. Barnhart, Boones Mill; Clifford T. Owen, South Boston, R. Bentz Rhoads, Leesburg; M. Daniel Laprade, Rocky Mount; George T. Kiser Jr., Lebanon; Thomas A. Carroll, Midlothian; Jerry W. Jamison, Boones Mill; David L. Hiner, Doe Hill; and Dwayne Yoder, Gladys. Roger McGraw of Mt. Airy, N. C., was absent.

CONFERENCE ON WASTE MANAGEMENT

A conference on "Waste Management and Disposal For The Food Processing Industry" has been scheduled for May 6 and 7, 1969 at The Pennsylvania State University, University Park, Pennsylvania.

Dr. Gerald Kuhn, Extension Food Technologist and N. Henry Wooding, Extension Agricultural Engineer state that anyone interested in waste problems relating to canning, freezing, or processing of fruits, vegetables, potatoes, mushrooms, milk, red meat and poultry products is invited to attend and participate in this conference.

The program has been planned to present information that will help plant managers and supervisors make decisions about waste problems in their plants. Methods and techniques of waste prevention, waste reduction or processing, waste product utilization and waste disposal will be discussed. Speakers and participants will discuss methods of solving problems and they will emphasize least cost alternatives.

Programs will be available April 1, 1969. Registration, housing and other information can be obtained from the Agricultural Conference Coordinator, J. O. Keller Conference Center, The Pennsylvania State University, University Park, Pennsylvania 16802. Telephone area code 814-865-9547.

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