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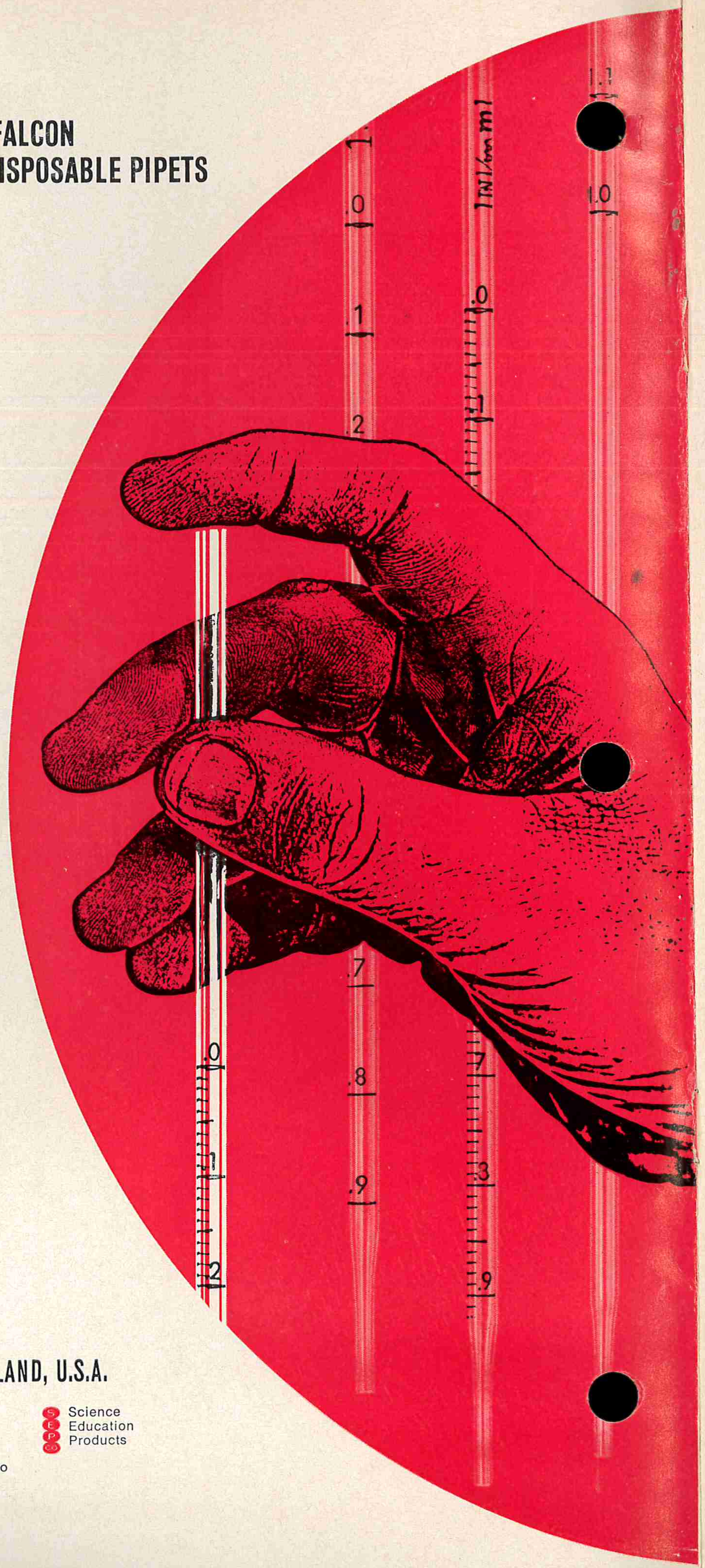

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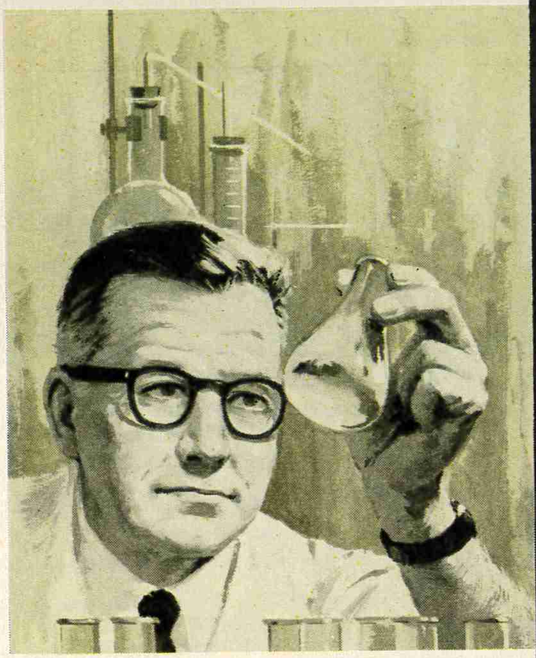

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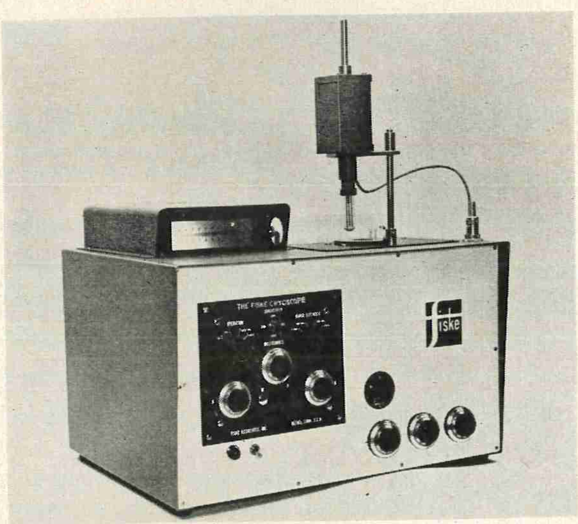

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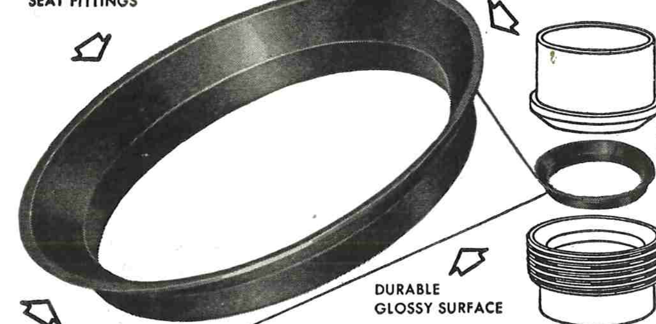

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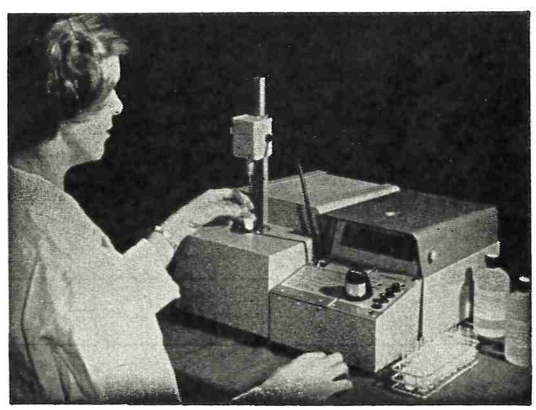

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PERFORMANCE ANALYSIS IN COMMUNITY SANITATION PROGRAMS[1]

H. E. Eagan[2]

Communicable Disease Center
Department of Health, Education and Welfare
Atlanta, Georgia

The ultimate evaluation of a sanitation program must be determined by the effectiveness of control of disease in the community. An analysis of the workload required to achieve a successful program for the management of the environment will include the evaluation of the performance. The correlation of achievement with the number of work units performed is a difficult task for all administrators of sanitation programs. However, by the use of performance analysis, statistical information may be developed that will be useful to the administrator. The data derived from performance analysis, however, must be used in conjunction with other accumulated information.

Morbidity and mortality rates, compliance with sanitation standards as determined by impartial surveys, and the judgment of the administrator as to the degree of accomplishment compared to the efforts expended, together with performance analysis data, are all indices available to the administrator. These indices are helpful in adjusting programs, changing priorities, balancing workloads, and placing certain programs under surveillance standards, as well as determining the feasibility of the inauguration of programs of more recent public health challenge.

An administrator having cold, hard facts before him can offset, when the need arises, having his program upset by the opinions of individual citizens, civic organizations, governmental agencies (fostering specialized idealogical programs) and other pressure groups. He will depend upon the available indices for the maintenance of established programs as well as for the generation of ideas for the studying of departmental operational improvements.

The sanitation administrator of today's programs is faced with an impelling fact that must be considered for all future endeavors. The real wealth of our nation includes land, water, food, and air, which are decreasing daily—while the wastes of civilization are increasing in direct proportion to the increase in population. The potential disease hazards are enormous. Proper planning today is essential to offset this potential.

Administration

The application of planning techniques, organizational standards, management and evaluation is essential. It must be acknowledged, however, that the accumulation of quantitative data is important. However, such data cannot be substituted for administrative initiative and the acceptance of responsibility. The administrator bent upon building a record of the number of work-units performed, without regard to the accomplishment of disease control, is spinning his wheels in the sands of time. He will become so mired down that only abandonment will be left to his choice.

A study of the records of most food sanitation sections of the environmental health divisions of local health departments will reveal that restaurants are inspected in accordance with the local regulations. One will also note that the periodic surveys made by the state official agency over a period of years indicate that the sanitation rating has varied very slightly from the figure of 70 per cent compliance. Equipment, fixtures, housing, and housekeeping meet with the standards, but the standards of operation are not being met. An analysis of the performance records indicates that manpower, finance and other factors are adequate, but the deficiency still prevails. A re-evaluation is indicated.

The effectiveness of the inspection service is not determined by compliance to the duties described by a job description, but to the degree of understanding of the standards by the sanitarians and the operator. The questions not answered by performance analysis are: (1) Did the operator comprehend the meaning of the standard for operation as well as he did the physical standards? (2) Was the operator motivated to comply to all the standards through understanding the disease hazards involved? I present the hypothesis that the program would improved provided the sanitarian had spent more time on each inspection trip, rather than making many cursory inspections in order to fill up the record book. The administrators of today's programs must be thinking in terms of quantity, but also must be cognizant of the words "understanding" and "motivation."

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[1]Presented at the 52nd Annual Meeting of the International Association of Milk, Food and Enviromental Sanitarians, Inc.. Hartford, Conn., Sept. 13-16, 1965.

[2]Public Health Advisor, Special Projects Unit, Community Services Training Section, Training Branch, Communicable Disease Center, Atlanta, Ga.

PERFORMANCE ANALYSIS

The final decision to be made by the administrator will be based upon many items of information. The cost of a program is an item of interest to all persons concerned, and the one best understood by the public. For this reason, performance analysis may be used to determine the manpower needed to carry out a program and the cost of that program. The comparison of the costs against the benefits to be derived from the program will determine the final decision to be made by the administrator, which will be based on sound reasoning.

The decision as to whether an activity shall be undertaken will be determined principally from the costs of that activity. How many man-days will be required? Will this activity require more man-days than can be spared from the activities required by laws or regulations? Finally, will this activity require additional manpower? Performance analysis will furnish data that will be helpful in making a decision and, as the case may be, it will be helpful in justification of a budget.

To make actual comparison, the administrator should also possess data that indicates the actual experience to which a comparison of the present or anticipated program and costs may be compared. Most administrators have a figure representing the cost of their entire programs as well as the workloads they must consider. However, rarely do you find that the actual costs and manpower requirements are broken down into the various activities. Many feel that this type of division is impractical because of the over-lapping of the duties of the sanitation section. However, one cannot evaluate one activity against another without such a breakdown as to costs and manpower requirements for each activity.

The reviewers of a program for a local health department utilizing performance analysis data should have several questions in mind: (1) How many work units can the average sanitarian be expected to accomplish in a given period of time? (2) What is the average cost of this manpower for each work unit?

One must bear in mind that only average manpower, as well as average costs, may be determined. The amount of work units accomplished will vary widely by individuals, and for this reason the unit costs will also vary. The administrator should not compare the workloads for farm sanitarians as against the workloads for in-town restaurant sanitarians. However, for an organization of any size the average figure will provide information upon which a decision may be based.

The survey of the community should be the first step in the collection of data. This type of survey should be an inventory of facilities, establishments and general working conditions. This survey should include an inventory of situations which require "extra curricular" services as they relate to the community disease potential. The condition of alleys, rat harborages, stagnant water, garbage and refuse collection all have a bearing on the environmental program. In short, the restaurant inspector who is concerned only with the interior of the restaurant cannot fulfill the full function that public health requires.

The factors that should be determined from this type of survey include: (*a*) the demand for a particular service; (*b*) the laws, rules, and regulations making the services possible; (*c*) the feasibility of incorporating newer services with the present personnel; and (*d*) the practicability of diluting present activities recognized as essential to the public health of the community in favor of newer public health challenges. These are all factors related to the data derived from performance analysis.

PLANNING FOR PERFORMANCE ANALYSIS

The organization for the utilization of performance analysis must take into account overhead costs, direct costs, work units required, manpower (presently employed or anticipated to be employed, as the case may be), past performance of the agency being analyzed, and the determination that the selected activities being compared are either identical or quite similar.

From the study of these individual factors, we may generalize that overhead costs are those costs which may not be attributed directly to a given function. Such costs are usually under the control of the general administrator. These cost include rent, water, laboratory services, pool-typing services, and salaries of administration personnel. They are usually assigned to the environmental health sanitation program without prejudice on a prorated basis with other divisions of the health department.

In contrast to the overhead costs, the direct costs are those figures attributed solely to the fulfillment of a given function of sanitation. Such costs vary directly with the amount of work units undertaken. These costs include salaries of individuals employed in a given function, the costs of travel, secretarial and clerical assistance, specialized equipment and supplies.

Records of performance are the figures representing the activities of the sanitation section for past years, or, records of performance experience of other similar agencies, provided they are comparable to the organization under study. The basic figure that must be determined will be the number of employees necessary to carry-on a given function. They may be representative of the number of personnel required to meet future objectives, or simply those required to meet current objectives. All costs are related to the figures of the number of personnel engaged in a project in one way or another.

The number of necessary employees is derived from the inventory of facilities, establishments and conditions. The objectives of a given program must be previously determined by the administrator from past experience, the opinion expressed by some author of a piece of literature, or may be determined solely upon the regulations or laws. An example may be derived from the U. S. Public Health Service Food Service Sanitation Ordinance and Code. This ordinance requires the minimum of one official inspection to be made on each establishment during each six-month period. This is a legal limit. In developing a program objective, one inspection may be deemed to be all that is necessary to maintain an established program. On the other hand, the judgment and experience of the administrator may indicate that four or five inspections within each six-months period will be necessary. The number of work units required will be determined by multiplying the number of legal inspections by the number of establishments under jurisdiction.

This calculation will provide a statistical figure, but does not provide a figure in measurable terms. A fully defined work unit figure would include necessary time to review plans for layout and construction of the establishments, office time, travel time, as well as the time to make the actual inspections. In order to derive a figure that is indicative of the number of inspection work units required, the non-productive time must be subtracted from the total working time.

Personnel requirements in terms of "work units" may be determined by analysis utilizing the following formulae:

(1) $$\text{Average number of inspections required} = \frac{\text{Number of establishments}}{\text{Legal requirements for the number of inspections per establishment}}$$

(2) $$\text{Average number of inspections per man-day} = \frac{\text{Number of inspections required}}{\text{Number of man-days to be utilized}}$$

(3) $$\text{Average number of hours per inspection} = \frac{\text{Number of productive hours per day}}{\text{Number of inspections per man-day required}}$$

Each activity of the sanitation program must be analyzed separately or determined for the total program. The performance analysis made annually will show trends of activity for the entire program. The quarterly or semi-annual analysis will tend to show those activities that are progressing satisfactorily as well as those that need immediate attention. The administrator may also utilize the performance analysis data in conjunction with the survey results and morbidity and mortality rates to determine the allocation of personnel from one project to another project of more public health significance.

One type of performance analysis requires that all tangible services be reduced to comparable units of endeavors. In order to be brief, we will use several examples of the inspection services regarding eating and drinking establishments. Arbitrary weights are given to the several functions of this service unit. Food establishment inspections are weighted as 1.4; bar inspections 1.2; itinerant establishments 4.0; collection of samples as 0.5. These weight units multiplied by the number of establishments will provide a total number of weighted units, which will provide a uniform basis for recapitulation. The survey indicates that the sanitation section has five-hundred eating and drinking establishments within its jurisdiction, and in addition, it has thirty-five bars, five itinerant restaurants and the established number of samples required by ordinance is 2160.

The number of estimated weighted units will be the weight times the number of functions required. Thus, for this example, a total of weighted units of work would amount to 1842. The estimated budget expenditure for the period is $47,308.64. Thus, we know that the cost of each work unit will average $25.68. To secure an estimate of each function, which would more nearly indicate a true cost, the cost of unproductive time would have to be calculated and deducted from the cost of productive time.

This type of information provides a means of evaluation of the effort to be performed by the sanitarian. However, the evaluation of effort and the cost thereof does not give the key answers to the effectiveness of the efforts or costs expended. When performance is evaluated, the number of inspections of the establishments or the number of samples taken are reduced to a numerical value or a cost value.

Whenever it is possible, the measurement of performance should always be made in terms of the total need for the function. This type of analysis is described as measuring the "adequacy of performance." Estimates for the evaluation of the adequacy of performance are difficult figures to obtain with any precison. The denominators require data that describe the total amount of unmet need under a given program.

The efficiency of a function may be reduced to the equation of output divided by input. In other words, efficiency represents the ratio between the improvement of the public health in a community to the effort expended, whether this data be in terms of the time expended by the sanitarian or by the number of dollars spent on the effort. The concept of efficiency is often used in the attempt to streamline a traditional program. In other words, can the administrator recapture some of the resources now expended on a given program? It is an attempt to reduce effort to mathematical figures in order to answer the following question: Could the same end result be obtained at less cost of time and material?

Such data is important to the administrator in determining budget requirements and the allocation of work units, but do not indicate the results in obtaining the objectives of a program designed to provide the maximum protection against public health hazards. Such figures provide the data to develop ratios of funds or manpower expended, or anticipated to be expended, to total funds available. The success of a program will depend upon the judicial use of such data; but the final analysis will consider all the aspects of the program and the judgment utilized by the administrator. Success can only be assured by the responsible interpretation of data and in the employment of competent, well-trained personnel who are motivated to the necessity for the control of the sanitation aspects of the environment in order to provide one phase of a total public health endeavor.

Performance analysis is one important method of determining data essential in evaluating a program by the administrator. It should not wag the dog, but the dog should wag the tail.

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STUDY EFFECT OF LIGHT ON MICROORGANISMS

Scientists at the University of California are pioneering in research on how laser beams kill yeasts and bacteria and how such microorganisms protect themselves against light. The work, supported in part by grants from the Public Health Service, U. S. Department of Health, Education, and Welfare, may help point the way to better methods for preserving foods.

So far the research has shown that the continuous laser beams will kill bacteria in test tubes to which a photo-sensitizer, such as toluidine blue, has been added. The amount of exposure, however, varies with different kinds of microorganisms.

Although it has been known for a long time that visible light can kill certain kinds of microorganisms, the researchers hope to discover how they protect themselves against light. The laser is valuable in these experiments because it speeds up processes which might normally occur with other light, such as that produced by the sun.

It is believed that more knowledge of the self-protective systems used by bacteria and fungi will be valuable for its own sake and might also point the way to better food preservation methods. The current aims of the research are to determine the role of the carotinoids, which are naturally occurring pigments, in protecting microorganisms exposed to the laser beam and to investigate the mechanism by which the organisms are killed.

SUMMER FIELD TRAINING INSTITUTE AT OKLAHOMA UNIVERSITY

The 16th Summer Field Training Institute for sanitary engineers and sanitarians sponsored jointly by the Oklahoma State Health Department, the University of Oklahoma and the USPHS is scheduled for June 6 to July 29, 1966 at the University of Oklahoma at Norman. Purpose of the course is to provide practical field training through "learn-by-doing" techniques and to give students a broad acquaintance with public health practice.

Courses will cover rural and municipal water supply and sewage disposal, food and milk sanitation, refuse storage and disposal, camp and school sanitation, swimming pool sanitation, industrial hygiene, radiological health, insect and rodent control, housing and emergency sanitation. The first five weeks will be attended by all enrollees and the last three weeks will provide specialized field training in the three areas of general sanitation, sanitary engineering and radiological health. A separate program for a fourth group is planned for those interested in international health.

Requests for information and applications for admission should be addressed to George W. Reid, Director, School of Civil Engineering and Environmental Sciences, University of Oklahoma, Norman.

COST ANALYSIS OF THE MILK LABORATORY APPROVAL PROGRAM IN ILLINOIS

J. C. McCaffrey

Bureau of Sanitary Bacteriology,
Illinois Department of Public Health, Chicago, Illinois

(Received for publication October 4, 1965)

During the past fifty years the laboratory examinations of dairy products vended to the general public have assumed a more and more important role in the general milk control program. Since 1910, when the first report of the Committee on Standard Methods of Bacterial Milk Analysis *(2)* was printed, both private and public health laboratories have engaged in the bacteriological and chemical examination of dairy products. Most laboratories have attempted to follow "Standard Methods For The Examination of Dairy Products" in making their determinations.

Through the years it has been realized by authorities in the field that different laboratories occasionally obtain conflicting results upon the bacteriological analysis of the same milk sample, and much has been published concerning the inherent errors and inaccuracies in the methods. In September 1941, Dr. L. A. Black of the United States Public Health Service began a series of laboratory surveys in defense areas to determine how closely Standard Methods was being followed. The results of his survey indicated that the majority of laboratories inspected were deviating from Standard Methods in one or more important aspects *(1)*.

Program Organization

The Milk Laboratory Approval Program in Illinois was inaugurated in the fall of 1946, as a result of the enactment of a Grade A Milk Law by the Sixty-Fourth General Assembly. A portion of this law stated that "average bacterial plate counts, average direct microscopic counts, and average reduction time tests shall be made in conformity with methods prescribed by the Director (of the Health Department) and *in laboratories approved by him.*" The law was further amended in 1949 to include coliform counts and phosphatase tests. When the Laboratory Approval Program was first inaugurated surveys were limited to state, county and municipal laboratories. The program was expanded in 1947 to include private commercial laboratories, and in 1948 to include dairy industry laboratories.

During the nineteen years which have passed since the inception of the program in Illinois various changes have taken place in the operational procedures. During the early years of the program, laboratories were visited semi-annually. As the program expanded, it became necessary, due to a lack of personnel, to make annual inspections. Still later on, due to a shortage of both personnel and travel funds, inspections were made on a biennial basis. In January 1961, a second survey officer was employed on the Approval Program. Since that time, inspections of approved laboratories have been made semi-annually, and split-samples have been sent out to approved laboratories on a semi-annual basis in accordance with the requirements of the National Conference on Interstate Milk Shipments *(3)*.

A laboratory requesting inspection with a view toward subsequent approval is required to complete a registration form and submit it to the director of the approval program. If the individual in charge of the laboratory seeking approval has the necessary educational qualifications, arrangements are made for an initial inspection. The minimum educational requirement is a Bachelor's Degree from a recognized college or university with at least a full-year course in college chemistry and a one-semester course in college microbiology, with both courses including laboratory work.

Laboratories are surveyed on each of the following points: *(a)* physical condition of the laboratory, *(b)* equipment available for conducting the tests for which approval is sought, and *(c)* techniques used in doing the actual laboratory work. The "Survey Form for Milk Laboratories" furnished by the United States Public Health Service is used in checking the laboratories.

Cost Analysis Plan

Despite the fact that the Milk Laboratory Approval Program has been an integral part of the activities of the Illinois Department of Public Health since 1946, no study was ever made to determine the actual cost of the program until January 1964. At that time, the two laboratory survey officers, after discussing the problem with the Bureau of Statistics, set up the framework for a year-long cost analysis study of the program.

The study was organized to determine the actual cost to the Department for each laboratory inspect-

TABLE 1. COMBINED FIELD TIME CHARGED BY SURVEY OFFICERS

Time charged to	No. of visits	Total hours	Total cost (dollars)	% of total cost	Avg hours per visit	Cost per visit (dollars)
Official	21	127.00	857.10	24.9	6.05	40.78
Industry	56	335.00	1,746.69	50.7	5.98	31.16
Private	13	78.5	492.48	14.3	6.04	37.87
Institution	15	70.75	348.13	10.1	4.72	23.22
Subtotal	105	611.25	3,444.40	100.0	5.70	32.09
Meetings, etc.		153.00	845.58			
Total	105	764.25	4,289.98			40.78

TABLE 2. COMBINED OFFICE TIME CHARGED BY SURVEY OFFICERS

Time charged to	No. of reports	Total hours	Total cost (dollars)	% of total cost	Avg hours per report	Cost per report (dollars)
Official	21	34.00	168.23	23.3	1.55	7.61
Industry	56	98.25	375.42	52.1	1.79	6.83
Private	13	20.75	94.80	13.1	1.59	7.25
Institution	14	24.50	82.57	11.5	1.75	6.89
Total	104	177.50	721.02	100.0	1.67	6.94

TABLE 3. COMBINED OFFICE AND FIELD TIME CHARGED BY SURVEY OFFICERS

Time charged to	Visits		Hours		Cost		Avg hr per lab	Cost per visit (dollars)
	No.	%	No.	%	Amount (dollars)	%		
Official	21	20.0	161.00	20.4	1,025.33	24.7	7.60	48.39
Industry	56	53.3	433.25	54.9	2,122.11	50.9	7.77	37.99
Private	13	12.4	99.25	12.6	587.28	14.1	7.63	45.12
Institution	15	14.3	95.25	12.1	430.70	10.3	6.47	30.11
Subtotal	105	100.0	788.75	100.0	4,165.42	100.0	7.37	38.91
Meetings, etc			153.00		845.58			
Total	105		941.75		5,011.00			47.72

ion. Cost factors included the amount of field time required for each inspection, office time required to write up the results of each inspection, and combined office and field time charged. IBM punch cards and Port-A-Punch boards were used to record the actual data concerned with each visit. Two punch cards were used for each survey, one indicating the time spent in actually surveying the laboratory and the other indicating the office time required to prepare the official report of the visit. Monthly travel vouchers and salary warrants were used in completing the study.

The IBM punch cards were printed to correspond with the "Survey Form for Milk Laboratories" so that deviation from accepted conditions could be properly indicated. The information available from the punch cards was divided into four main categories:

1. The name of the survey officer checking the laboratory, the date and time of inspection, the registry number and type of laboratory (official, industry, private, institution) and type of visit (original, semi-annual, or re-inspection).

2. Type of performance and defects found.

3. Reason for defects and recommendations for correction of same.

4. Miscellaneous activities related to the Approval Program.

Completed IBM punch cards, representing a total of 105 field visits by two laboratory survey officers and 104 office reports of these field visits, were turned over to the Bureau of Statistics for interpretation and analysis. The Bureau computed the cost analysis of the program and returned the material to the survey officers.

Interpretation

Table 1 shows the combined number of visits of both laboratory survey officers to the various types of laboratories included in the program as well as the total hours, total cost, average hours per visit, and average cost per visit. The overall average cost per visit included time spent in attending seminars and sending out split-samples, since these activities would not have been engaged in if the laboratory program was nonexistent. It is to be noted in Table 1 that the average hours per visit to institution laboratories is somewhat less than on the visits to the other three types of laboratories. This is due to the fact that most institution laboratories are approved only for the standard plate and the coliform count.

Table 2 shows the number of reports of the field visits prepared in the office by both survey officers, together with the average hours required per report, and the average cost per report. This table shows that more office time was spent in writing up the results of inspection of industry and institution laboratories than official and private laboratories. The additional time required for writing up results of inspections of industry laboratories was due to the fact that most of these laboratories were checked and approved for seven different procedures. The additional time spent in writing up results of the inspection of institution laboratories was due to the fact that in many instances an extensive number of deviations were found. Only 14 institution office reports are listed, since one report was not written until after the study period was completed.

Table 3 shows the combined office and field time charged by the two laboratory survey officers in carrying out the duties of 105 inspection visits and 104 office reports of the results of these visits during the period from February 1, 1964 through January 31, 1965.

The overall average cost per visit, including field time and office time was $47.72. This figure does not, however include the cost of using state-owned automobiles which were assigned to each survey officer. It is interesting to note that, due to a salary differential, the average cost per visit, including field and office time, was $40.79 for laboratories surveyed by Berry E. Gay, Jr., and $65.90 for those surveyed by the author. Mr. Gay made 76 surveys while the author made 29. If the ratio of visits had been reversed, the average cost would have been much higher.

Acknowledgments

The author wishes to acknowledge, particularly the assistance of Miss Isabelle Crawford, Data Processing Supervisor, Bureau of Statistics, for her help in developing and interpreting the various tables prepared from the IBM cards, and the help of Berry E. Gay, Jr., laboratory survey officer, in the careful preparation of the IBM punchcards.

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1966 NATIONAL RESTAURANT SHOW

The 47th National Restaurant Convention and Educational Exposition is scheduled for McCormick Place, Chicago, Illinois from May 23 to 26, 1966. Held in conjunction with the show will be the 24th American Motor Hotel Association Convention and Motelrama.

Sanitarians and other public health officials are invited to review the latest products, equipment and services available to the entire food service and lodging industries. Also featured will be educational and training programs designed by NRA and AMHA for executive, supervisory and operational personnel. More than 1600 exhibits will cover virtually every aspect of the food service and lodging field.

THE QUALITY OF RAW MILK FROM SELECTED OHIO MARKETS. II. BACTERIOLOGICAL ENUMERATION BY FOUR METHODS[1]

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(Received for publication October 21, 1965)

Summary

An 8-month survey of the bacteriological quality of bulk tank produced fluid milk supplies for four major markets in Ohio, was made utilizing the Standard Plate Count (SPC), the preliminary incubation count (PI), the thermoduric (pasteurized milk) count, and the coliform count. In terms of maximum standards of 200,000 and 100,000 organisms/ml, the SPC would have eliminated 13% and 20% of the milk samples, respectively. A SPC of 50,000/ml, a PI count of 200,000/ml, a thermoduric count of 500/ml, and a coliform count of 100/ml would have eliminated 37%, 34%, 40%, and 40%, respectively, of the samples but not all of the samples eliminated by one test were eliminated by another test. All of the tests employed showed a seasonal trend especially in the high count categories but the trend was less noticeable in the results of the preliminary incubation count. A combination of two of the methods was superior to any single bacteriological method employed in detecting unsatisfactory milk. Of the tests used, the combination of the thermoduric count (500/ml) and the coliform count (100/ml) was the most effective in the detection of unsatisfactory milk samples.

In the previous paper *(3)*, results were presented on the flavor evaluation of farm tank milk samples selected from the supply of four major markets in Ohio. This paper presents the microbiological results for these samples.

Procedure

The milk samples were obtained from the bulk tanks at the farm just before pick-up as indicated previously *(3)*. Using aseptic technique, two 3-ounce, well-mixed samples from each producer's supply were obtained and transported immediately to the laboratory in an ice refrigerated insulated chest. The bacterial counts were made immediately on one sample using the Standard Plate Count at 32 C, the thermoduric and the coliform counting techniques as described in Standard Methods *(1)*. Violet red bile agar was used for the coliform count. On the second sample, from each producer, the Standard Plate Count after preliminary incubation for 18 hours at 12.8 C (55 F) was determined *(2)*.

Results

Comparison of Methods:

The distribution of milk samples on the basis of bacterial counts is presented in Table 1. The results of the Standard Plate Count (SPC) reveal that 13% and 20% of the samples had counts in excess of 200,000/ml and 100,000/ml, respectively, but that about one-third of the samples had counts of 10,000/ml. Therefore, 80% of the milk samples met the new 100,000/ml USPHS Standard. It is apparent, however, that some producers still have difficulty producing low count milk as indicated by the fact that about one-fifth were producing milk with counts exceeding 100,000/ml.

A comparison of the results shows the number of samples exceeding the various standards by preincubation count (PIC) were always higher than those exceeding the corresponding standards by the (SPC). For example, the ratios between the number of samples exceeding the PIC and the SPC counts were 2.5 to 1 at the 200,000/ml level, 2.3 to 1 at 150,000, 2.3 to 1 at 100,000 and 1.8 to 1 at 50,000. These ratios indicate that the difference in the number of samples exceeding the standards between the two methods becomes greater as the counts increase. A SPC limit of 50,000/ml and a PIC of 200,000/ml would eliminate about the same percentage of samples, i.e. 37 and 34% respectively.

The data show that only 22% of the samples exceeded a thermoduric count of 1,000 and 28% had a count of less than 100. These values would indicate that much lower standards could be used than the 3,000 and 5,000 standards now commonly used as an indication of satisfactory sanitation of the milk handling equipment. A standard of 500/ml by this method would compare favorably to the 50,000/ml by the SPC and 200,000/ml by the PIC in terms of the percentage of samples excluded.

Eighteen percent of the milk samples had coliform counts above 1,000 and, in contrast, 60% of the samples had counts below 100. Forty percent of the samples would be excluded if a coliform count of 100/ml is used as an index of satisfactory sanitation practices. This limit of 100/ml by the coliform count compares favorably to 50,000/ml by the SPC, 200,000/ml by the PIC or 500/ml by the thermoduric count in terms of number of samples excluded. Even though a limit of 100 might appear to be too stringent, it would appear to be an effective tool to improve the sanitation of the milk supply.

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TABLE 1. DISTRIBUTION OF MILK SAMPLES ON THE BASIS OF BACTERIAL COUNTS BY FOUR METHODS (287 SAMPLES)

Limits bacteria/ml	Samples exceeding indicated bacterial limits							
	SPC[1]		PIC		TC		CC	
	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)
1,000,000			25	9				
500,000			37	13				
200,000	37	13	97	34				
150,000	52	18	121	42				
100,000	59	20	137	48				
50,000	106	37	190	62				
10,000	199	69	257	90	7	2		
1,000					63	22	52	18
500					115	40	70	24
100					207	72	115	40
<100							172	60

[1]SPC—Standard Plate Count. PIC—preliminary plate count. TC—thermoduric count. CC—coliform count

The results shown in Table 2 reveal considerable seasonal variation in the bacterial counts. In general, there were fewer number of samples in the higher count ranges during the winter than during the summer by all the tests employed. However, the difference between summer and winter milk in this respect was less for the PIC than for the other tests. For example, there were 97 samples exceeding 200,000/ml by the PIC with 38% occurring in the summer and 40% in the winter, whereas, 37 samples had a SPC above this same limit with 62% occurring in the summer and 16% in the winter.

Similarly, there was marked seasonal variation in the percentage of samples exceeding 1,000/ml by thermoduric and coliform counts i.e. 53% in summer vs. 20% in winter and 44% in summer vs. 21% in winter, respectively.

Comparison of Bacteriological Methods in the Detection of the Same Unsatisfactory Samples

From the results in Table 1, standards were arbitrarily adopted for each method used so that each would eliminate approximately the same percentage of milk shipments. Then it was deemed desirable to determine to what extent the different methods of testing would eliminate the same shipments. The results in Table 3 give the relative agreement among the various methods in eliminating the same milk when the following limits were used for each method: SPC 200,000/ml, SPC 100,000/ml, PIC 200,000/ml, thermoduric count 500/ml, coliform count 100/ml.

The results indicate that when a SPC of 200,000/ml was used as a limit, 37 samples had counts in excess of this limit and the greatest and most consistent agreement for eliminating the same milk was achieved with the other tests. This agreement ranged from 100% for the preincubation count to 81% for the coliform count. However, when the SPC limit was lowered to 100,000, 59 samples had counts in excess of this limit and the relative agreement of the other tests was 81% for the PIC, 76% for the thermoduric and 68% for the coliform counts.

When any one of the other three methods of counting bacteria was used as the standard of comparison, the agreement on eliminating the same milk samples was relatively poor in all cases. The agreement of the results of the SPC with the results of the other tests was particularly poor.

It is apparent from a comparison of the results that (*a*) the standards chosen can affect the results, and

TABLE 2. SEASONAL VARIATION IN THE BACTERIAL COUNTS OF RAW MILK

Bacterial counts	Total samples	Samples during season of the year[1] Summer		Fall		Winter	
		(No.)	(%)	(No.)	(%)	(No.)	(%)
Standard Plate Count							
>200,000	37	23	62	8	22	6	16
>100,000 to <200,000	22	10	45	5	23	7	32
> 50,000 to <100,000	47	20	42	9	19	18	38
> 10,000 to < 50,000	93	21	23	24	26	48	51
< 10,000	88	13	16	19	21	56	63
Preliminary Incubation Count							
>200,000	97	37	38	21	22	39	40
>100,000 to <200,000	40	7	18	11	27	22	55
> 50,000 to <100,000	53	19	36	14	26	20	38
> 10,000 to < 50,000	67	17	25	12	18	38	57
< 10,000	30	7	23	7	23	16	53
Thermoduric Count							
> 1,000	70	37	53	19	27	14	20
> 500 to < 1,000	45	9	20	11	24	25	55
> 100 to < 500	92	25	27	17	18	50	54
< 100	80	16	20	18	23	46	57
Coliform Count							
> 1,000	52	23	44	18	34	11	21
> 100 to < 1,000	63	31	49	15	24	17	27
< 100	172	33	19	32	19	107	62

[1]Summer—July to October; Fall—October and November; Winter—December to February.

TABLE 3. COMPARISON OF BACTERIOLOGICAL METHODS FOR THE DETECTION OF THE SAME UNSATISFACTORY SAMPLES

Comparative standard	No. exceeding standard	Detection of the same unsatisfactory milk samples by SPC 200,000/ml		PIC 200,000/ml		CC 100/ml		TC 500/ml	
		(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)
SPC 200,000/ml	37			37	100	30	81	32	86
SPC 100,000/ml	59			48	81	40	68	45	76
PIC 200,000/ml	97	37	38			61	63	51	53
CC 100/ml	115	29	25	62	54			59	51
TC 500/ml	115	30	26	47	41	58	50		

TABLE 4. A COMPARISON OF SIX COMBINATIONS OF METHODS IN DETECTING UNSATISFACTORY MILK SAMPLES

Standard	Total unsatisfactory samples	Combination of methods: SPC[1] and PI[2]		SPC and Coliform		SPC and Thermoduric		PI and Coliform		PI and Thermoduric		Coliform and Thermoduric	
		(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)
A	191	96	50	123	64	121	63	151	79	145	76	169	88
B	193	102	53	132	68	127	66	151	78	145	75	169	87
C	204	136	67	155	76	159	78	151	75	145	71	169	83

[1]Standard Plate Count.
[2]Preincubation Count.

(*b*) that no two methods measure exactly the same thing.

Comparison of Combinations of Two Methods in the Detection of Unsatisfactory Milk Samples

Since the results for individual tests did not correlate as well as desired, the data were treated to determine if a combination of two methods could be used more effectively in evaluating the bacteriological quality of milk. Three basic standards, A, B and C were chosen; Standard A: 200,000/ml by SPC and PIC, 100/ml by coliform count, and 500/ml by the thermoduric count; Standard B: same as in A except that a standard of 100,000/ml by the SPC was used; Standard C: same as in A except that a standard of 50,000/ml by the SPC was used. An unsatisfactory sample was one that did not meet the standard of one or more of the methods.

The results (Table 4) reveal that the number of samples that did not meet one or more of the limits of standard A, B and C were 191, 193, and 204, respectively; indicating that lowering the SPC limit from 200,000 to 50,000/ml did not have a marked effect on the number of samples involved. A combination of the coliform and thermoduric counts was the most effective combination in detecting the unsatisfactory milk samples and the combination of the SPC and preliminary PIC incubation count was the least efficient. The combination of the coliform and thermoduric counts eliminated 88%, 87% and 83% for standards A, B and C respectively, whereas, the combination of the SPC and PIC eliminated only 50%, 53% and 67% for the same standards. A combination of two methods was generally more satisfactory than one test alone.

DISCUSSION

The results obtained in this study reveal that the present day Grade A milk supply produced under the bulk handling system should have little difficulty meeting a bacteriological standard of 100,000/ml. In fact, a much more rigid standard would appear to be a logical objective for markets and/or companies which insist upon effective sanitation practices. The fact that 31% of the milk supply had a SPC below 10,000 adds further emphasis to the point that a lower limit is feasible when the bulk handling system is used. It is apparent, however, that an appreciable number of producers still are producing milk with excessive bacterial numbers, and these are the producers who should correct their sanitary practices.

The preliminary incubation of milk at 55 F for 18 hr before the SPC determination, which has been suggested as a means of detecting post-milking contamination, yielded more consistent results throughout the year than the other tests employed; a factor which should be considered in selecting a bacterial quality control measure. This study has indicated that it is as easy to meet a bacterial standard of 50,000/ml without incubation as it is to meet a standard of 200,000/ml with the preliminary incubation step.

The thermoduric count has been used as a means of detecting insanitary farm equipment. Some dairy plants use maximum limits of 3000/ml or 5000/ml as an index of satisfactory performance. The results of this survey would indicate that both of these limits are extremely lenient. A standard of 1000/ml or even 500/ml would make this test a much more effective quality control tool as it would require stricter adherence to correct sanitation procedures to meet this standard.

The coliform count of raw milk has been receiving more favor in recent years as an index of sanitary practices on the farm. The results obtained indicate that a coliform standard of 100/ml would eliminate approximately the same number of shippers as a SPC limit of 50,000/ml, a PIC of 200,000/ml, a thermoduric count of 500/ml and therefore might be used effectively as a guide in a quality control program.

None of the four bacteriological methods employed measure exactly the same thing and, therefore, cannot be substituted one for another. The standards chosen, as an indication of satisfactory sanitation influence directly the effectiveness of each test in detecting unsatisfactory milk. Combination of tests rather than a single test appears to be the most sound practice to obtain a strong milk quality control program. The coliform count using a standard of 100/ml and the thermoduric count using a standard of 500/ml appear to have excellent supplementary value as quality control tools and when used together appear to offer an effective basis for improving the quality of a milk supply.

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ADDENDUM

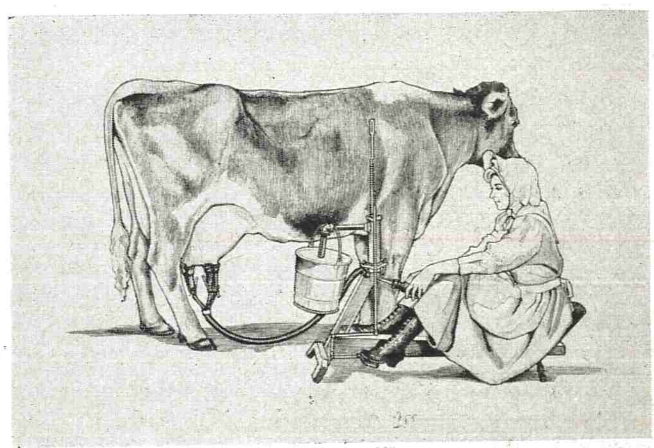
The authors wish to acknowledge the paper entitled "Interrelationships Among Some Bacteriological Methods Used for the Examination of Farm Bulk Tank Milk Supplies" by Tatini, Dabbah and Olson (J. Milk and Food Technol., 28: 368-371. 1965), which was published while this paper was in preparation.

BOOKLET TRACES HISTORY OF MILKNG MACHINE

The compelte history of the milking machine is outlined in a well illustrated 30-page booklet prepared by Babson Bros. Co., builders of the Surge milking machine, to commemorate their 50 years of milking equipment manufacturing. Considerable time, effort and research went into the production of the booklet which vividly illustrates some of the early methods which were devised to take the work out of cow milking. Many early prints from the Bettman Archives are shown.

The development of the milking machine from the crude devices of the past into the highly automated milking systems of today did not come about without a struggle. Much hard work and extensive scientific research marked the progress which made this remarkable development possible.

To many people associated with dairying, the name Babson Bros. is synonymous with the Surge Milker. For the past 50 years the company's efforts have been devoted primarily to the development and manufacture of quality milking machines and related dairy farm equipment. This history is an attempt to reflect the endless search for "a better way to milk cows" . . . and at the same time, to trace the growth of Babson Bros. into what today is one of the world's leading manufacturers of milking equipment.



An Early Predecessor of the Modern Milking Machine.

Those interested in obtaining copies of "The History of the Milking Machine" booklet may get them by writing Babson Bros. Co., 2100 South York Road, Oak Brook, Illinois. Enclose 25c to cover costs of handling and mailing.

RELATIONSHIP BETWEEN THE KEEPING QUALITY PROPERTIES OF GRADE A RAW MILK AND STANDARD PLATE, THERMODURIC, AND COLIFORM COUNTS[1]

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(Received for publication June 18, 1965)

Summary

The usefulness of a keeping quality test for evaluating the quality of a Grade A raw milk supply has been investigated. One hundred bulk tank truck and 81 individual producer samples were examined for keeping quality properties (development of off-odor, "leathery-like" fat, or gas during storage at 20-21 C for 16 to 40 hours) and for standard plate count (SPC), thermoduric count (TC), and coliform count (CC). Multiple correlations observed between the keeping quality properties and the bacterial counts of the milk were: off-odor vs. SPC, TC, and CC, 0.46; "leathery-like" fat vs. SPC, TC, and CC, 0.42; gas vs. SPC, TC, and CC, 0.38; SPC vs. off-odor, "leathery-like" fat, and gas, 0.49; TC vs. off-odor, "leathery-like" fat, and gas, 0.33; and CC vs. off-odor, "leathery-like" fat, and gas, 0.53.

Using 100,000/ml for SPC, 1,000/ml for TC and 1,000/ml for CC as upper limits for Grade A milk, over 75% of the samples exceeding one or more of these limits were detected by the keeping quality test after 16 hours incubation. Longer incubation periods resulted in the detection of higher percentages of samples which exceeded one or more of the bacterial standards. Based on results obtained, speed of obtaining results, and simplicity of the test, it is believed that this raw milk keeping quality test merits consideration as a supplement to other routine quality control procedures, particularly for plants having minimum laboratory facilities.

No single laboratory test available to the dairy industry is an adequate index of the sanitary quality of raw milk *(4)*. A simple, inexpensive test is needed that would serve as an indication of the sanitary conditions under which milk is produced. Information obtained from a test of this nature could be very helpful in directing fieldwork toward areas needing attention.

Some commercial organizations *(2)* use a raw milk keeping quality test to supplement other laboratory tests. Development of off-odor (other than a clean acid odor), "leathery-like" fat, or gas during incubation is supposedly an indication of undesirable sanitation and handling conditions. The nature of the defect that develops is thought to provide information regarding the type of problem involved, whereas the rate of development is assumed to be related to the intensity of the problem.

This investigation was undertaken to evaluate the usefulness of a raw milk keeping quality test as a practical quality control procedure and to determine the relationship between the keeping quality properties and the standard plate count (SPC), thermoduric count (TC), and coliform count (CC) of raw milk obtained from within a Grade A milkshed.

Experimental Procedure

Samples of raw milk were obtained from bulk tank trucks and from individual producers within a Grade A milkshed. All sampling was done by plant personnel. The samples were placed in sterile ½-pint milk bottles and stored at 4.5 C (40 F) or lower until examined (day received).

Official procedures *(1)* were used for determining the SPC (incubation at 32 C), TC, and CC of the samples on the date collected. The keeping quality test consisted of storing the raw milk samples at 20-21 C (68-70 F), and observing for the presence of off-odors, "leathery-like" fat, and gas after 16, 20, 24, and 40 hours.

Results and Discussion

One hundred bulk tank truck and 81 individual producer raw milk samples were examined for keeping quality properties and SPC, TC, and CC. The results are summarized in Table 1.

SPC's ranged from <25,000/ml to >300,000/ml, with 64% of the samples having a count of >100,000/ml. TC's ranged from <500/ml to >10,000/ml, with 57% of the samples having a count of >1,000/ml. CC's ranged from <50/ml to >3,000/ml, with 62% of the samples having a count of >500/ml. In general, the SPC, TC, and CC on the bulk tank truck samples were higher than those on individual producer samples.

In a recent survey of the bacterial counts of bulk milk for interstate shipment, Brazis and Black *(3)* found that in some cases the bacterial numbers increased enroute from the producer to the processing plant as a result of unclean bulk transporting trucks. Also, contamination from the down-stream side of the bulk tank valve could contribute to higher counts in tanker samples. Under sanitary handling conditions, significant increases should not occur in bacterial counts of milk during transportation from the farm to the receiving station *(5)*. Although the bac-

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TABLE 1. KEEPING QUALITY PROPERTIES, STANDARD PLATE, THERMODURIC, AND COLIFORM COUNTS OF GRADE A RAW MILK

	Samples		Development of keeping quality defects[b]								
			Off-odor				"Leathery-like" fat				Gas[c]
			(Incubation time - hours)								
Bacterial counts/ml[a]	No.	Per Cent	16	20	24	40	16	20	24	40	16 - 40
			(% of samples)								
SPC											
<25,000	28	16	7	7	15	50	25	50	57	82	28
25,000- 50,000	9	5	0	22	44	79	33	44	56	100	55
50,000-100,000	27	15	22	48	63	78	52	67	74	93	34
100,000-200,000	35	19	31	49	60	72	63	69	71	91	23
200,000-300,000	15	8	73	74	87	93	60	60	67	80	47
>300,000	67	37	58	66	75	88	87	91	96	99	58
CC											
<50	19	11	26	32	42	63	21	42	42	74	12
50- 100	10	6	0	0	18	91	27	46	73	100	18
100- 500	38	21	29	45	55	79	66	76	76	90	21
500-1000	20	11	30	40	40	60	50	50	26	95	35
1000-3000	28	15	32	46	68	75	64	82	89	93	50
>3000	65	36	59	69	79	85	82	85	91	97	66
TC											
<500	55	30	29	42	51	75	38	56	60	84	27
500- 1000	24	13	33	42	63	88	54	63	79	96	33
1000- 5000	66	37	47	56	65	77	73	77	82	97	53
5000-10,000	14	8	50	64	64	79	71	79	86	93	21
>10,000	22	12	32	46	64	73	96	100	—	—	68
All samples	181	100	38	49	60	77	62	72	77	93	42

[a]SPC=standard plate count; CC=coliform count; TC=thermoduric count.
[b]Storage at 20-21 C (68-70 F).
[c]Once sample was agitated, gas detection was difficult. For this reason, appearance of gas was not reported for the specific incubation times.

teriological counts of the tanker samples were higher than the individual producer samples, the general trend and relationships of the keeping quality properties were similar. Consequently, the results obtained with both types of samples are treated together in this paper.

Off-odor was observed in 38, 49, 60 and 77% of the samples after 16, 20, 24, and 40 hours incubation, respectively. The most common off-odors defects were unclean, malty, and fruity. These defects were present in 54, 17, and 6% of the samples, respectively. "Leathery-like" fat was observed in 62, 72, 77, and 93% of the samples after 16, 20, 24, and 40 hours incubation, respectively. Gas formation was observed in 42% of the samples during the incubation period. Keeping quality defects generally developed faster and were usually more prevalent in the samples having high bacterial counts.

Table 2 shows the linear correlation coefficients between the keeping quality properties and the bacterial counts. All of the correlation coefficients, with the exception of off-odor vs. TC, were statistically significant. The majority of the multiple correlation

TABLE 2. CORRELATION COEFFICIENTS BETWEEN KEEPING QUALITY PROPERTIES, STANDARD PLATE, THERMODURIC, AND COLIFORM COUNTS OF GRADE A RAW MILK

	Development of keeping quality defects[b]			
Bacteriological counts[a]	Off-odor	"Leathery-like" fat	Gas	Off-odor, "leathery-like" fat & gas
SPC	**0.43	**0.36	**0.22	**0.49
TC	0.06	**0.29	**0.22	**0.33
CC	**0.31	**0.35	**0.44	**0.53
SPC, TC, CC	**0.46	**0.42	**0.38	

**Significant at 1% level.

[a]SPC=standard plate count; CC=coliform count; TC=thermoduric count.

[b]The statistical analyses were based on data for the entire incubation period. Proportional allowances were made for differences in time required for development of defects.

coefficients were higher than the simple correlation coefficients, indicating that the keeping quality test reflects the general influence of the microorganisms which contribute to the three bacteriological counts. The relatively low magnitude of the correlation values indicates that other factors also influence the keeping quality test.

The ability of the keeping quality test to reveal samples which exceeded certain bacterial standards is shown in Table 3. The bacterial standards used are similar to those used by Tatini et al. *(6)* in the comparison of five bacteriological methods. The highest percentage of the samples which exceeded one or more of the bacterial standards was detected by the use of combinations of the criteria of keeping quality. Over 75% of the samples which had excessive bacterial counts were detected by off-odor and "leathery-like" fat development after 16 hours incubation. Of the samples which exceeded one or more of the bacterial standards, 70% were detected by "leathery-like" fat development and 45% were detected by off-odor development after 16 hours storage. While some samples meeting the bacterial standards developed keeping quality defects, it must be noted that the percentage of such samples was much lower than for those where at least one of the counts was excessive.

The percentage of samples with excessive bacterial counts which were detected by the keeping quality test increased with the incubation period; however, this also was accompanied by an increase in the percentage of defects observed in samples which did not exceed any of the bacterial standards. The high percentage of defects which were present in this bacteriologically satisfactory group of samples after 40 hours storage indicates that the value of keeping quality information obtained after that period of incubation would be limited. The results indicate that information obtained after 16, 20, and/or 24 hours storage may be of value in evaluating the raw milk supply. The fact that many of the samples with low bacteria numbers developed keeping quality defects,

TABLE 3. ABILITY OF THE KEEPING QUALITY TEST TO REVEAL SAMPLES WHICH EXCEED BACTERIAL STANDARDS

Bacteriological methods[a] and standards/ml	No. samples	Development of keeping quality defects[b]: Off odor (Incubation time - hours) 16	20	24	40	"Leathery-like" fat 16	20	24	40	Off odor & "leathery-like" fat 16	20	24	40	Off odor, "leathery-like" fat, & gas[c] 40
		% of samples detected												
SPC >100,000	117	52	62	72	84	76	80	85	94	83	89	93	100	100
CC >1,000	93	51	62	75	82	76	84	90	96	82	90	96	100	100
TC >1,000	103	44	54	64	77	77	82	85	96	82	86	91	99	99
SPC >100,000 & CC >1,000	134	48	58	70	81	72	80	85	95	78	87	93	100	100
SPC >100,000 & TC >1,000	139	47	58	69	81	73	78	84	94	79	86	92	99	99
CC >1,000 & TC >1,000	129	45	55	67	78	72	79	85	96	78	85	91	99	99
SPC >100,000 & CC >1,000 & TC >1,000	148	45	55	68	80	70	78	84	95	76	85	92	99	99
SPC <100,000 & CC <1,000 & TC <1,000	33	6	21	24	64	27	42	45	82	30	52	52	85	88

[a]SPC=standard plate count; CC=coliform count; TC=thermoduric count.
[b]Storage at 20-21 C (68-70 F).
[c]Once sample was agitated, gas detection was difficult. For this reason, appearance of gas was not reported for the specific incubation times.

indicates that other factors also influence this test. Additional work is needed in order to determine what factors, other than the bacterial flora as shown by tests employed here, affect the keeping quality properties of raw milk.

The results reported in this paper indicate that a keeping quality test can provide useful information about the quality of raw milk. The test may be helpful as a supplement to other laboratory tests and could be particularly valuable to plants having minimum laboratory facilities.

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NEW STUDY ON REFUSE AND SLUDGE DISPOSAL

The Tennessee Valley Authority, Public Health Service, and Johnson City, Tennessee have entered into a joint agreement to undertake a full-scale study of composting as a means of safety and economically disposing of municipal refuse and raw sewage sludge.

Under the agreement, TVA will design, construct, and operate a composting plant at Johnson City to process that community's daily production of refuse and untreated sewage sludge, amounting to about 60 tons. The plant will attempt to find an economic use for the finished product, in the form of soil conditioners and fertilizers, to offset disposal costs. TVA has had long experience in soil and fertilizer matters through operation of the National Fertilizer Development Center at Muscle Shoals, Alabama.

This joint effort is an attempt to evaluate the safety of composting as a means of disposing of refuse and raw sewage without creating health and welfare hazards through air and water pollution, insect and rodent infestation, scenic blight, and spread of disease-producing organisms.

The newly created PHS Office of Solid Wastes will be responsible for technical direction and financing of the project. The composting plant will cost approximately $750,000 to construct and about $100,000 a year to operate. Construction on a site adjacent to the Johnson City sewage treatment plant will be completed early in 1967.

The composting process will involve removing such materials as metals and glass, grinding the remaining refuse with raw sewage sludge, and arranging the wastes in long rows to facilitate decomposition. Composted refuse and sewage sludge produced by the Johnson City project will be used experimentally to condition "poor" soil. Tests will be carried out by TVA on bare areas, such as highway embankments and areas disturbed by strip mining, to determine the value of the compost in promoting growth of vegetation. Similar studies will assess the effectiveness of the compost in agriculture.

The Office of Solid Wastes, which is undertaking a program to investigate improved methods of waste disposal, will conduct and support health studies in connection with the Johnson City project. In addition to gauging any potentially hazardous conditions which may result from composting, personnel from the Office of Solid Wastes will work with TVA personnel to develop and apply techniques to prevent the growth and spread of pathogenic organisms.

The Johnson City project is one of the initial activities being carried out under the new Solid Waste Program of the Public Health Service. The Solid Waste Act of 1965 directed the Department of Health, Education, and Welfare to undertake a comprehensive program of research, surveys and demonstrations, and training to help find and apply improved techniques for disposing of municipal, industrial, and agricultural solid wastes. One of the major goals of the program involves exploration of techniques, like composting, that not only promise efficient and sanitary waste disposal, but also afford an economic return in the form of marketable materials salvaged from solid wastes.

THE CELLULAR CONTENT OF COWS MILK.

II. COMPARISON OF THE CMT AND MICROSCOPIC COUNT FOR ESTIMATING CELL CONCENTRATIONS IN QUARTER SAMPLES.

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Summary

The comparison of CMT score and direct microscope count on 1,187 quarter milk samples indicates some limitations in the use of the CMT as an indirect estimator of cell content in quarter milk samples. In these data a CMT score of one or less could be interpreted as good evidence that the sample contained less than one million cells per ml. CMT scores of 2.2 or more provide good evidence for cell counts in excess of one million. The intermediate scores range too widely in cell count to be interpretable in these terms.

In a previous paper *(5)* we reported on the inability of the CMT to give reliable information concerning the inflammatory state of an individual mammary gland as reflected by separately determined cell counts. Several possible sources of disagreement inherent in our data were discussed. This paper describes our attempts to reduce, or at least assess the contribution of, three sources of error. These are subjectivity in scoring the CMT reaction, error of undertermined magnitude in the direct microscopic cell count, and non-equivalence of successive 5-ml foremilk samples in cell content. The investigations were undertaken to determine the comparative reliability of the California Mastitis Test (CMT) and direct microscopic count (DMC) for estimating the concentration of body cells in split samples of milk. To this end we have standardized reading of the CMT and determined the repeatability of scores under our conditions. We have also considered it necessary to develop a method for the microscopic count for which the limits of precision could be defined.

Materials and Methods

Samples were collected from six Holstein heifers over a 12-day period during an udder perfusion study. The cows were milked with an individual quarter milking machine of our own design. At each milking we collected a 10-ml sample of strict foremilk and a 10-ml sample of the quarter's mixed milk. Additional foremilk samples were taken approximately 4 hr after each milking. Samples were taken to the laboratory and immediately either processed or cooled to 4 C for overnight storage. Refrigerated samples were warmed to 37 C and thoroughly mixed before examination.

We cultured the mid-morning and mid-afternoon foremilk samples on blood agar by quadrant streaking with a 0.01-ml calibrated loop and incubating the plates 24 hr at 37 C.

Duplicate Breed smears were made from each sample on separate slides and stained by the Levowitz and Weber method *(2)*. We use commercially available 2 x 3 inch slides on which 15 circles of one cm^2 area are outlined and surrounded by a frosted surface. Two separate counts were performed per smear by our routine procedure: 20 fields on smears containing fewer than two cells per field; only 10 fields on smears with higher counts. We also tested a more rigorous counting procedure on each smear of samples collected during the first five days. A 20-field count was made along each of the horizontal and vertical radii, beginning five fields in from the periphery. The inadvertent establishment of a number of peracute *Bacillus* sp. infections through contaminated saline infusate led to such extreme leucocytosis in the affected quarters that this latter counting procedure became too laborious to continue. For comparison with CMT scores we combined all counts on each sample to establish an average cell count.

The samples were scored for CMT reaction under uniform lighting in the laboratory by one experienced person. We added to Schalm's *(4)* recommended scoring procedure the intermediate classifications 0.2, 1.2, and 2.2 as explained previously *(5)*. The four quarter samples from a cow were examined simultaneously in the paddle and results were dictated to a record keeper. After all six cows were scored the test was repeated. The recorder called for a further retest on any sample in which the two scores differed by more than one scoring interval.

Results

Since the times of collection had forced us to store some milk samples in the refrigerator for periods up to 18 hours, we investigated the possible effect of this upon counts obtained from the smears. We made Breed smears from 112 samples of 28 quarters of 7 cows, immediately and following 18-hr refrigerated storage, rewarming and mixing. The equivalence of the two procedures is shown in Table 1. At all three levels of concentration, preliminary refrigerated storage had no effect on the cell counts obtained.

Subjectivity is inherent in grading CMT reactions. Our approach to minimizing it involved the use of the single most experienced member of the group, performance under uniformly good lighting conditions, and eliminating as far as possible the influence of the first test result on reading the retest. The repeatability of our scoring was surprisingly

Table 1. Comparison of Cell Counts on Samples Before and After Refrigerated Storage

No. samples	Samples smeared: Immediately		Following refrigeration		No. samples	
	Mean	Range	Mean	Range	Increased	Decreased
	(millions)		(millions)			
77	0.102	0.01-0.49	0.097	0.01-0.52	27	27
15	0.696	0.50-0.94	0.694	0.45-0.98	6	9
20	3.67	1.00-10.0	4.16	0.92-14.0	10	8

good. Of 1,187 quarter samples, tested and retested after an intervening 23 samples, 65% received identical scores and 28% received adjacent scores. In only 84 of the samples (7%) was the variation greater than one scoring interval. This last group of samples, the majority of which had cell counts below one million per ml, was not included in subsequent analyses.

In Table 2 we present the distribution of 1,103 cell counts according to CMT score. Those less than one million per ml are grouped in subclasses of 100,000; those greater than one million per ml are in subclasses of one million. The columns headed 0.0/0.2 etc., include samples for which duplicate CMT scores differed as indicated.

Although our cell count means do not seriously deviate from the published range of interpretation for the CMT, the distributions cast doubt on the reliability of the test as presently used. Considering the magnitude of the range for each score category, one can distinguish only two degrees of leucocytosis with any assurance:

Low; in which a CMT score of 1 or less corresponds with a cell count of less than one million per ml, and

High; in which a CMT score of 2+ (our 2.2) or greater indicates a cell count greater than one million per ml.

An intermediate CMT reaction on a single sample is well-nigh impossible to interpret.

The introduction of saline infusate contaminated with a species of *Bacillus* led to the establishment of peracute infections in one or two quarters of each cow. Samples collected subsequently exhibited a shift in the relation between cell count and CMT score. This is shown in Figure 1, in which the average counts of 600 samples taken prior to infection are contrasted with those of 587 samples taken from all quarters following the onset of infection in some.

The extreme increase in average count for CMT 3 (4.7 to 22 million per ml) is obviously forced, since no higher CMT category was available for these counts to fall into. It is noteworthy, however, that the CMT score tended to reflect a higher count throughout the whole range. In the lower range of CMT scores this was not a direct result of infection, for only 17 of the samples with counts less than one million per ml were from infected quarters.

Discussion

The cell count distributions according to CMT category which are presented in this and the previous paper *(5)* point out the impossibility of making a reliable estimation of microscopic cell counts by degrees of reaction in the CMT. This conclusion is contrary to many published reports. It is also contrary to conclusions that might have been derived from these data had we relied on a regression or correlation analysis to evaluate the results of the

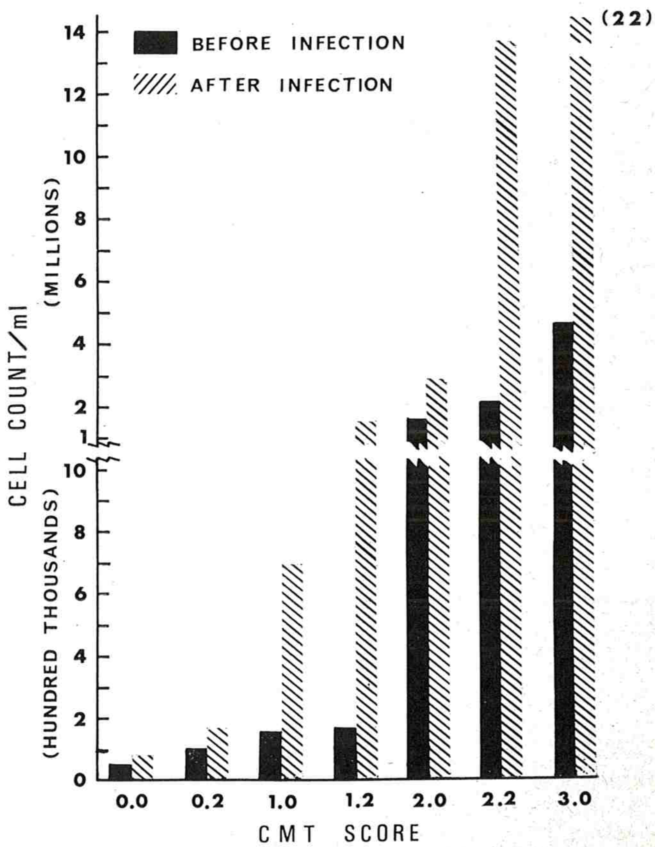

Figure 1. Influence of severe infection on the relation of CMT score to cell count in both infected and adjacent uninfected quarters.

TABLE 2. DISTRIBUTION OF QUARTER MILK SAMPLES BY CELL COUNT ACCORDING TO CMT SCORE

Cell count x 10^{-6}	Percent of samples with indicated CMT score												
	0.0	0.0/0.2	0.2	0.2/1.0	1.0	1.0/1.2	1.2	1.2/2.0	2.0	2.0/2.2	2.2	2.2/3.0	3.0
0.10 or less	86.3	85.4	74.3	67.2	47.0	40.6	48.8	28.6	9.0				
0.11 - 0.20	7.8	8.3	19.5	13.1	11.5	13.0	14.6	14.3	3.8				
0.21 - 0.30		6.2		5.1	8.2	7.2							
0.31 - 0.40	5.9			2.9	5.5								
0.41 - 0.50				2.2					10.3				
0.51 - 0.60			4.4	3.6			9.8	20.0		16.0			
0.61 - 0.70					15.9	17.4							
0.71 - 0.80				2.2								16.7	0.7
0.81 - 0.90									2.6		13.3		
0.91 - 1.0													
1.1 - 2.0					11.5	21.7	26.8	17.4	26.9	24.0	33.3		
2.1 - 3.0					0.5				19.2	32.0			
3.1 - 4.0								20.0	7.7				
4.1 - 5.0									9.0				
5.1 - 6.0									5.1			83.3	25.9
6.1 - 7.0									6.4	28.0	53.3		
7.1 - 8.0													
8.1 - 9.0													
9.1 - 10.													
>10.													73.4
No. samples	51	49	113	137	183	69	41	35	78	25	15	18	289
Mean count	0.067	0.078	0.12	0.20	0.36	0.53	0.52	0.98	2.4	3.3	7.5	5.4	21.

CMT. The cell content of milk has an extremely wide range. If we assume that 5,000 cells per ml is about the lower limit, we may expect to have some samples with 10,000 times this concentration. The influence of this extreme range on the correlation is revealed in an analysis of the 714 samples included in Table 2 that scored 0.0, 0.2, 1.0, 2.0, and 3.0. In this group of samples there is a correlation of 0.8 between cell count and CMT score. However, since four of the five recognized CMT scores are supposed to classify samples with a million or less cells per ml, we examined this segment of the data separately. It is interesting to find that the correlation between cell count and CMT drops to less than 0.3 when all samples with cell counts of over one million per ml are excluded from the analysis.

The interpretation of a CMT score in terms of a mean cell count is impossible. The present practice *(6)* is to specify ranges in which a certain amount of overlap is recognized. Our results indicate that the extent of the overlap is so much greater than is generally realized that the scoring categories (namely negative, trace, 1, 2 and 3) cannot be adequately differentiated. Rather, one can interpret in practice only a low count reaction, a high count reaction, and an intermediate reaction state which may reflect either a high or a low count. And, these results derive from a study in which we have made rigorous efforts to limit error in sample variation, cell counting and CMT reading. Our previous comparison, made under more nearly field conditions, yielded even less encouraging results.

By improving techniques we have reduced errors about as far as seems practical. The intensified counting procedure has reduced counting error, though it has not eliminated the nonuniformity of percentage error throughout the range of counts. This could be standardized by selecting an arbitrary number of cells to count, with the number of cells then determining the magnitude of the percentage error *(3)*. The system is manifestly impractical, however. The procedure used here has lowered the mean of samples in the lowest subclass by providing a lower minimum count (2,500 per ml vs. 30,000 per ml). The lowest count found was 5,000 per ml, representing two leucocytes counted in a total of 240 fields distributed between two slides.

The use of split rather than adjacent samples has reduced the disparity between the DMC and CMT. Our limited data given in the previous paper suggests that the second small sample will usually have a lower count or score than the first. Blackburn *(1)* reported a similar nonuniformity between successive small samples taken at the beginning of milking, but noticed no pattern to the variation.

Duplicating the CMT was effective in eliminating "wild" or unrepeatable values, but these amounted to only seven percent of our data.

Two possible explanations occur to us for the shift in relationship between cell count and CMT score coincident with severe inflammation in certain quarters. It is possible that the CMT reactivity of an udder secretion of given leucocyte level can be affected by the systemic stress of severe mastitis in an adjoining quarter. Alternatively, the occurrence of a large number of very strong CMT reactions among a series of samples may cause the operator to shift his mental standard of reference, and in effect to demand a more pronounced reaction at each scoring level. We tend to this latter interpretation.

It is our general conclusion that the CMT may be accepted for its value as a rapid but crude tool of the veterinarian and milk sanitarian. It is definitely not a precisely quantitative test and for that reason the score on a single quarter sample must be interpreted with considerable caution.

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NEW FEATURES IN FROZEN DESSERTS REGULATIONS FOR SEATTLE-KING COUNTY

Recently adapted regulations governing manufacture and sale of frozen dairy products and frozen confections in Seattle and King County, Washington, have several new and interesting provisions, according to L. D. Searing, Assistant Director, Environmental Health Services, Milk Division.

The new legislation is patterned after the USPHS Frozen Desserts Ordinance and Code and by reference incorporates the provisions of this standard ordinance. In addition to the usual requirements covering ingredients, pasteurization, packaging and distribution, the new regulations introduce a new feature relating to sampling and bacterial and coliform analysis of product. After two high bacterial counts on samples analyzed in the official department laboratory, the health officer may submit further samples to a private laboratory for analysis at the operator's expense. Samples are continued until three out of four meet standards which are set both for place of manufacture and for point of sale.

Among other provisions an operator or person responsible for failure to comply with standards may be required to attend a training course. All freezers and processing equipment must meet the standards of the National Sanitation Foundation or the 3-A Standards Committee.

A copy of the ordinance and summary of regulations may be obtained from L. D. Searing, Seattle-King County Health Dept., Public Safety Bldg., Seattle, Wash.

ENVIRONMENTAL HEALTH NEEDS OF METROPOLITAN AREAS[1]

The continuing expansion of metropolitan areas is perhaps the greatest single problem facing man in the second half of the twentieth century, according to the report of a WHO Expert Committee[2] that met in Geneva in June 1964 to consider the environmental health aspects of metropolitan planning and development.

About 50-60 million people are added to the world's population every twelve months; for every 100 people there were in 1950, there will be 251 in the year 2000.

In addition, the urban population continues to increase through an influx of people from rural areas. From 1800 to 1950, the population living in cities of 100,000 or more inhabitants increased almost twentyfold— from 16 millions to nearly 314 millions. This urban "drift" will probably continue. By the year 2000 it is expected that, because of increases in agricultural efficiency, a mere 8%-12% of a country's people will be sufficient to produce the food it needs.

Metropolitan life has its gratifying aspects in the opportunities offered for higher standards of living, education, housing, social satisfactions and public health. On the other hand, uncontrolled metropolitan growth is disquieting because of the encroachment on space (in terms of land, air and water), the potential spread of disease, and the threat to health from noise, overcrowding, and the general degradation of man's physical and social environment.

Over the years, the health and sanitary problems of cities have become well known, as have the methods of dealing with them. But as populations grow, so do the problems and so does the expense of tackling them.

An attempt to present a picture of urbanization problems on a small and understandable scale is quoted from a US estimate of 1955 which sets out the additional provisions needed in a modern metropolitan area in order to cater for its newcomers. For every 1000 new inhabitants the following are required:

(1) an additional 100,000 US gallons of water a day (36.5 million gallons a year); (2) additional sewage and treatment facilities for 170 lbs of organic water pollutants daily (62,050 lbs a year), or 300 new septic tank leaching systems; (3) an expenditure of about $65,000 for the control of air pollution; (4) 4.8 elementary-school rooms and 3.6 high-school rooms; (5) $114,000 more, each year, for running the schools; (6) another 8.8 acres of land for schools parks, and play areas; (7) 1.8 more policemen and 1.5 more firemen; (8) one additional hospital bed; (9) 1,000 new library books; (10) a fraction of a jail cell; (11) more streets to surface, provide with storm drains, maintain, and clean; more garbage and refuse to collect; (12) more money for new public service employees (public works, health, tax collection, recreation).

Public Health Aspects

Planning for the disposition of men, money, and materials to avert the danger of uncontrolled metropolitan development must take account of the fact that the more immediate problems are to be found in the health field and involve safeguarding water, air, food, conveyances, dwellings and the recreational and living environment.

While industrial and general economic production is the foundation on which modern urban development is based, environmental health is essential for effective industrialization and for the enjoyment of its benefits. Every year, for instance, about 500 million people suffer from disabling diseases that can be related to unsafe water supplies; even a partial reduction in this high prevalence rate would increase the amount of available manpower as well as its effectiveness. Lack of sewerage and sewage treatment facilities in many metropolitan areas of the world is a major cause of communicable diseases, including cholera, typhoid, diarrhoea, dysentery, filariasis, haemorrhagic fever, and infectious hepatitis.

The provision of water supplies, waste disposal facilities, and the network of lines that make up the system of water distribution, sanitary sewerage, and drainage should be an integral part of any metropolitan plan from the outset. These services call for vast capital expenditure, but they can, and should, be made self-amortizing and self-supporting. One practical method of collecting sewerage charges is to make them a percentage of the water charge.

With regard to industrial wastes, the Committee considered that metropolitan authorities should establish a policy under which industries must accept the responsibility for treating their own wastes in order to meet the criteria set by responsible government agencies. Also, as in the case of water pollution by industrial effluents, pollution of the atmosphere by industrial and domestic emissions should look to reduction, recovery and re-use of industrial

[1]Adapted from an article in *WHO Chronicle,* Vol. 19, No. 4, April, 1965.

[2]WHO Expert Committee on Environmental Health Aspects of Metropolitan Planning and Development. (1965) *Report,* Geneva (*Wld Hlth Org. techn. Rep. Ser.,* No. 297).

air and waste matters, as well as to air-cleansing in individualized and collectivized systems. In a fundamental sense, no industrial operation should be tolerated that violates the atmospheric rights and welfare of other members of the community: research into the legal and administrative aspects of air pollution is therefore much needed.

Solid wastes set an expensive disposal problem, largely because of the cost of transport, which accounts for almost 70% of the total cost. The Committee hesitated to emphasize any particular disposal system because of this factor, which is particularly important in larger communities.

HOUSING AND OPEN SPACE

Housing does not merely represent shelter, and living space is not simply a question of floor area but also of shape and volume. Since building costs are high, for instance, a community may reduce them by constructing large multi-family units. This may be false economy, since gigantic buildings, perhaps dwarfing the human scale, may give rise to psychopathological conditions caused by promiscuity and loss of identity: the costs of these effects, measured in terms of the loss in human efficiency or of medical care and treatment, may nullify the saving in construction costs originally contemplated.

With regard to the planning of open space, part of the problem faced by modern societies trying to feel at home in a complex, mechanized, bustling and overwhelming world is the breakdown of traditional social structures and the growth of new structures not yet clearly discerned.

More imagination is needed to develop the multipurpose use of public buildings such as schools and hospitals, and also of hospital grounds and even cemetery areas, which, in large cities, may become space-consuming to a high degree.

NOISE AND VIBRATION

Noise and vibration are known to exert deleterious effects on many organs of the human body, and especially on the nervous system. One of the most important tasks of architects, builders, acoustic engineers, and public health workers is to ensure that they are kept to an acceptable level.

Medical research has shown that even noise at a low level (35 to 37 decibels) is sufficient to make a deep impact upon the functional condition of the nervous system. Noise aggravates the course of cardiovascular and neuropsychiatric diseases; it can cause impairment and even complete loss of hearing.

The Committee considered that there should be close international collaboration in study and research on the effects of noise and vibration on the health of urban populations. Close co-operation between metropolitan planners and environmental health personnel is important in order to create urban environments in which these dangers have been reduced to a minimum.

INFORMATION AND RESEARCH

The importance is stressed of wide public participation in the preparation and adoption of a metropolitan plan, which should be broadly understood and approved by the people who are its ultimate beneficiaries and should command their general support and enthusiasm. A well-conceived and imaginative plan often releases constructive community forces far beyond the legal limitations inherent in the plan itself.

There is already in existence a sufficient background of scientific, technological, economic, and administrative knowledge to make it possible to introduce effective environmental health programmes immediately, but there is unfortunately the usual difficulty of lack of communication; information available as a result of research or investigation is often not widely disseminated. Often, too, information is reported in highly technical language, which limits its circulation.

A welcome move has been made by the UN Economic and Social Council's committee on Housing Building and Planning towards the setting up of an international centre or institute for housing, building, and planning, which would co-ordinate research in these fields throughout the world, WHO being an active participant.

Various fields in which research is needed are outlined in the report, notably the chemistry of polluted atmospheres and their physiological effects, the management of water movements in relation to bilharziasis control, and the ever-growing problem of the disposal of solid wastes.

A COUNTY SANITARIAN LOOKS AT THE 3-A SANITARY STANDARDS PROGRAM[1]

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Did you ever stop to consider how your point of view changes with the addition of a few years and the accumulation of experience? When we are young we are most of the time unwilling to accept anything until we have proven it for ourselves. Our field of view is narrow and without the advantage of the true focusing device called experience. Moreover, we tend to cast aside the experienced help of others because we think it does not allow room in which to expand our "modern" ideas. Then as we grow older and sometimes reflect on our past experiences, our point of view begins to change. We discover that all the years we struggled to do our job, there were usually aids provided by more experienced people which could have made our job easier.

The 3-A Standards and the 3-A Symbol are aids provided for the sanitarian, manufacturer and buyers of dairy equipment. These standards are the output of knowledge and experience, yet many are not taking advantage of the assistance they can give. This is due perhaps to inexperience or to an imperfect point of view.

THE FUNCTIONS OF STATE COMMITTEES

Back in 1956 I became a member of the Dairy Industry Equipment Committee of the New York State Association of Milk Sanitarians. To tell the truth, at that time I knew very little about such a Committee or about such things as 3-A Standards, even though my association with the dairy industry began in 1940. My inexperience with groups who made recommendations for design and manufacture of dairy equipment led me to believe that such things as 3-A Standards could never replace or supplement my standards for such equipment. In spite of this youthful point of view, I thought that perhaps by joining such a group I could help them to understand "the man in the field point of view".

My first meeting with this Committee was a real experience and a revelation, for it was there that I met some of the sanitation keystones of the dairy industry—men like Clarence Weber, Jim White, Freddy Uetz, Paul Corash, and Bill Jordan, to name only a few. I learned at this meeting that the members of this Committee were dedicated to promoting the 3-A Symbol. It was apparent that these men of long experience were also dedicated to the dairy industry and that their energy was directed toward providing assistance to manufacturers of dairy equipment, as well as to the sanitarian.

HOW STANDARDS ARE FORMULATED

After that first meeting I decided to take another look at this idea of uniform equipment standards. The first thing I found was that a large number of sanitarians and industry people had a wide variance in their understanding and knowledge of the methods used to create a 3-A Standard. At other meetings I asked questions and obtained answers on why and how a 3-A Standard comes about. For instance, I found that people who make up the national Committee on Sanitary Procedure come from all over the United States, not just from New York State or Wisconsin or California, and that many of these committee members are leaders in the milk sanitation enforcement field. Also, there are men from the field who are dealing daily with the practical application of the standards. Such people have a large reservoir of knowledge concerning the sanitation needs of dairy equipment and no local sanitarian or equipment purchaser could ever be wrong in following the advice distributed by such a group.

This leads to another fact. All standards are the result of collective agreement, that is, the three representative groups of manufacturers, users and sanitarians must agree on its contents. This concordant attitude is the very hub of the system and assures standards which will be voluntarily accepted and put into practice. Other methods of writing and regulating standards for dairy equipment could be offered, but if a standards system is to satisfy all, then all must have a voice in their formulation.

Any interested person or group can request that a new standard be written for a specific type of equipment or an issued standard be revised. Such a request should be sent to the Chairman of the Committee on Sanitary Procedure of our International Association. It is a function of this Committee to receive, consider and comment on proposed standards and to request the participating groups to consider such items of dairy equipment for sanitary standards when it is desirable.

[1]Presented at the 52nd Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC., Hartford, Conn., September 14-17, 1965.

A very practical application of this procedure occurred within my duties as Chairman of the New York State Dairy Equipment Committee. In 1962, our Committee report contained information on pumps for recirculation of cleaning solutions. In this report we made reference to industrial type pumps and pumps of sanitary design. Some comparisons were made and our recommendations did not favor the industrial type pump. Shortly after the report had been sent to the New York Association's membership, I received a call from an industrial pump manufacturer who had read the report and took exception to its recommendations. I invited this man to one of our committee meetings to explain his pump and show its design. This man was introduced to the 3-A Standards system and the method used to formulate such standards and he was advised to request a revision of the 3-A Standards so that a pump of this type could be used in cleaning circuits. A letter from this manufacturer in April of this year stated, that after minor changes in design his pump was qualified under the revised standard, 3-A Recommendations for Permanently Installed Sanitary Product Pipelines and Cleaning Systems.

The prompt action of the 3-A Committee in this case stands out as an example of true cooperation between manufacturer and sanitarian. It also indicates that the standards system of attaining agreement among the three task groups, namely the national Dairy Industry Committee, the U. S. Public Health Service and our International Association, can be attained quickly in spite of the detail and number of persons involved.

Standards may also come about because of widespread interest by sanitarians and the dairy industry in new concepts. CIP systems containing welded lines is an example of this interest. In September of 1959 a pilot installation of welded sanitary pipeline was made in the metropolitan area of Buffalo, N. Y. This installation provided a practical means of developing methods for installation and inspections and it created a great deal of interest in the use of such lines throughout the industry. It also established a great number of axioms for welding procedures, inspection of such welds, the cleaning of such systems and the design of such systems.

All of the information gathered from this supervised instllation was made available to members of the 3-A Standards groups. Today you will find most of the experience from this and other like installations included in the welding requirements of the revised 3-A Standards Accepted Practices for Permanently Installed Product Pipelines and Cleaning Systems. This serves to illustrate that standards are also born from practical field work and that field practices influence their requirements.

FIELD APPLICATION OF THE STANDARDS

It is important to the success of the 3-A Standards program that each of us do our part in helping to bring field information to the 3-A Standards groups. This can be achieved if you are willing to start the word rolling within your state associations. If your state associations does not already have a committee on standards for dairy equipment, then work for one to be created. This committee and its members should be organized with the intent to study and evaluate the sanitary aspects of equipment used in the dairy industry in regard to official or unofficial specifications and requirements as they apply to design, installation and/or operation, and to report such studies, evaluations or procedures to their association membership and other interested parties. The wording, "other interested parties" is included so that the committee will be able to communicate with members of the various 3-A Standards groups in an effort to solicit their help in making correction to present standards or to create new standards.

It is paramount that any state association member who is a member of a national 3-A Standards group be a member of this state committee. Such a member gives the state committee an indirect representation in any standard that is written, assuming that the state committee chairman provides a way for an exchange of opinions between the committee members and the 3-A Standards member. This can be accomplished by holding meetings at which proposed standards can be discussed and evaluated. The national 3-A member then has the collective thinking of his state group to take to the study meetings of the national 3-A groups.

This state committee can also provide a source of field information for the 3-A Symbol Council. The state committee, through its members and its association members, can be a clearing house for complaints on existing standards or 3-A Symbol bearing equipment. I emphasize here that all such complaints should be handled and analyzed by this local committee and, when this committee is convinced that there is a reasonable and a desirable correction needed, communication should be made with the 3-A Symbol Council in the name of the state association.

IMPORTANCE OF FIELD CHECKING OF EQUIPMENT

Now, all of this requires a lot of work by a lot of people, but if you or I want to sit back and not help to make the 3-A Standards system work, then we must lose our right to say that the system can't provide the required results.

It is important to realize that trying to get information from people in the field is difficult and sometimes disappointing. Our state committee has made an effort for a few years to use a check list for each 3-A Standard established. These forms required a simple yes or no answer from the people using them and were sent to a number of people in the field. This check list not only offers a method of obtaining information concerning 3-A Symbol equipment, but it also serves the purpose of bringing to the official sanitarian, as well as others, the fact that such a standard exists, thus promoting the cause of standards. Our experience with this check list to date, has not been very satisfactory since very few are returned. Of those that were returned, all with the exception of one gave evidence that the present system of having the manufacturer attest to his conformance with the standard is working.

Most of the criticism that has evolved thus far consists of faults in finish or workmanship. It is this phase of manufacturing that can vary from time to time. It is also the area where the field sanitarian can function. When a piece of 3-A Symbol equipment is found to be unsatisfactory in one or both of these items, then not only should he ask for correction but he should see that a report of the conditions is transmitted to his state committee. The committee in turn should collect such information and, when sufficient items have been accumulated, the information should be transmitted to the 3-A Symbol Council. This brings about a step-by-step and more intimate system of transmitting information to the Council. I must add at this point that this method should not transplant the right of anyone to communicate directly with the Council when they so desire.

Use of the state committee will also help to resolve some of the ambiguity that so often results among sanitarians. For years I have heard sanitarians discuss in not so technical language what constitutes "smooth finish," "corrosion resistant," "easily cleanable," "sharp edge," "sanitary in construction," and many other terms. To resolve such terms requires the collective thinking of sanitarians. The state committee can act as interpreter and arbitrator for such terms when they are part of the field reports, thus assuring uniform use in communicating with the 3-A Council.

RESPONSIBILITIES OF THE LOCAL SANITARIAN

The local sanitarian must face up to his responsibilities and assert his right to insist that equipment bearing the 3-A Symbol be used in establishments under his jurisdiction. In today's priority of milk sanitation, the official sanitarian has little time for designing equipment on a "spot basis" or approving manufacturer's prints. Therefore, the 3-A Symbol is an assurance that adequate sanitary design has been applied. This thinking has been given considerable help by the statement in the 1965 Recommendations of the U. S. P. H. S. Grade A Pasteurized Milk Ordinance which reads, "Equipment manufactured in conformity with 3-A Sanitary Standards complies with the sanitary design and construction standards of this Ordinance". A published endorsement by such a respected agency makes it more difficult to justify additional local design requirements. Therefore, all sanitarians must adjust their point of view to accept this most practical method of controlling the design and manufacturer of dairy equipment.

The *Journal of Milk and Food Technology* has for a number of years published the various standards. They have also on occasion published the name and address of all concerns to which the 3-A Symbol has been granted. This has provided the needed reference that most of us require when necessary to answer questions concerning a specific standard. This information, however, may not be up-to-date because of publishing deadlines. The sanitarian can receive an up-to-date list by merely addressing a request to the 3-A Standard Symbol Council. This service provides the sanitarian with assurance his source is current to the date of his request.

Recently a standard for rubber used in the dairy industry drew some criticism from various quarters. As a working sanitarian I would like to say that rubber in the past has been a source and cause of unclean surfaces. We have demonstrated this several times with a swabbing technique known to many in this audience. In an investigation of the rubber manufacturer's methods used for dairy valves it was learned that no material standards were set up for this special dairy use. In fact, the rubber material used for dairy use varied little from the rubber used on the tires of automobiles. It is possible that the 3-A Standards written for such material may lack some detailed information or lack some testing method; however, the past rubber materials were not acceptable and some work with the rubber manufacturers was necessary. The 3-A Standard for rubber is a step in that direction and it is only by such steps that progress can be made.

THE ULTIMATE VALVE OF THE 3-A PROGRAM

This, I believe, is the true story of the 3-A Standards. They are not always perfect but, as they have been evolved over the past decade, they have provided the sanitarian with one of the finest tools in the trade. These standards have also over these years provided considerable foundation to the stature of the sanitarian. With the help of all groups these standards can become the right hand of every sanitarian and potential purchaser of dairy equipment. What we need to assure this is your cooperation in the following:

1. Familiarize yourself with the Standards, the Symbol and the system.

2. Work through your state association for a standards committee to act as a liaison between the field sanitarian, dairy industry people and the 3-A groups.

3. Accept and request 3-A Symbol equipment as the standard for design and construction of equipment being purchased for use, either as an official or as a purchaser.

4. Be sure 3-A Symbol equipment conforms to the standard, and, where it does not, report the instance to your state association.

And above all, if in the past you have not looked upon the 3-A Program with due consideration, be not reluctant to change your point of view. You do not take a step toward improvement until you accept the good in someone else's point of view.

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Kenneth Carl, Dairy Consumer Service Division, Oregon Department of Agriculture, Salem, Oregon.

D. C. Cleveland, Dairy and Food Division, Room 505, Municipal Building, Oklahoma City, Oklahoma.

Dudley J. Connor, Division of Environmental Health, Kentucky State Department of Health, 275 East Main Street, Frankfort, Kentucky.

P. J. Dolan, Bureau of Dairy Service, State Department of Agriculture, 1220 North Street, Scramento 14, California.

F. E. Fenton, Standization Br. Dairy Division, U. S. Department of Agriculture, Room 2740-Building, South, Washington 25, D. C.

Dr. Milton R. Fisher, St. Louis Health Department, St. Louis, Missouri.

Harold Irvin, Omaha-Douglas Health Department, 1202 South 42nd Street, Omaha, Nebraska.

Dr. W. K. Jordan, Department Dairy and Food Service, Stocking Hall, Carnell University, Ithaca, New York.

Joseph J. Karsh, Alleghaney City Health Department, Pittsburg, Pennsylvania.

C. K. Luchterhand, Wisconsin State Department of Health, 240 City-County Building, Madison, Wisconsin.

James A. Meany, Chicago Board of Health, 8948 South Laflin Street, Chicago 20, Illinois.

Samuel O. Noles, State Board of Health, P. O. Box 210, Jacksonville, Florida.

O. M. Osten, Food Inspection Division, Minnesota Department of Agriculture, St. Paul, Minnesota.

Dr. Richard M. Parry, Dairy Division, State Department of Agriculture, State Office Building, Hartford 15, Connecticut.

George H. Steele, Department of Agriculture, 515 State Office Building, St. Paul, Minnesota.

H. L. Thomasson, Ex-Officio, P. O. Box 437, Shelbyville, Indiana.

ONTARIO ASSOCIATION CHANGES NAME

Reflecting the interests of milk sanitarians in western and eastern parts of the province as well as in the central area, the Central Ontario Milk Sanitarians Association at its 8th Annual Meeting on January 26, 1966 voted to change its name to the Ontario Milk Sanitarians Association. This move was considered important in setting up a strong organization meeting the needs of sanitarians in all parts of Ontario.

The Annual Program was interesting and informative as usual and principal speakers included H. L. "Red" Thomasson of IAMFES, Drs. H. J. Neely and K. A. McEwen of the Ontario Department of Agriculture, Dr. Chater Sen Gelda of the Borden Co., and Mr. B. E. Scheib of Lazarus Laboratory Division of West Chemical Co. Dr. D. R. Arnott of the University of Guelph again moderated the Quality Problems Clinic, an annual feature of the meeting.

The honor of "Sanitarian of the Year" went to Mr. Fred R. Roughley, Director of the Ontario Department of Health Laboratory at Orillia. Mr. J. L. Baker, Ontario Dairy Commissioner, assisted by Miss Ruth McKinney, 1966 Ontario Dairy Princess, presented the award consisting of a plaque and a formal citation summarizing the recipient's many accomplishments. In making the presentation Mr. Baker gave special recognition to Mr. Roughley's work in the development of the Milk Gel Index Test for raw milk and the contribution it has made to the dairy industry in the control of abnormal milk. Mr. Roughley was further complimented for his continuing efforts in milk and food control.

New officers for the year are Glen White, President; Herman Cauthers, Past-President; F. S. Whitlock, Vice-President; and Jack W. Raithby, Treasurer. Tom Dickison was reelected Secretary.

Fred Roughley Receives 1966 Ontario Sanitarian's Award from Commissioner J. L. Baker and Princess Ruth McKinney.

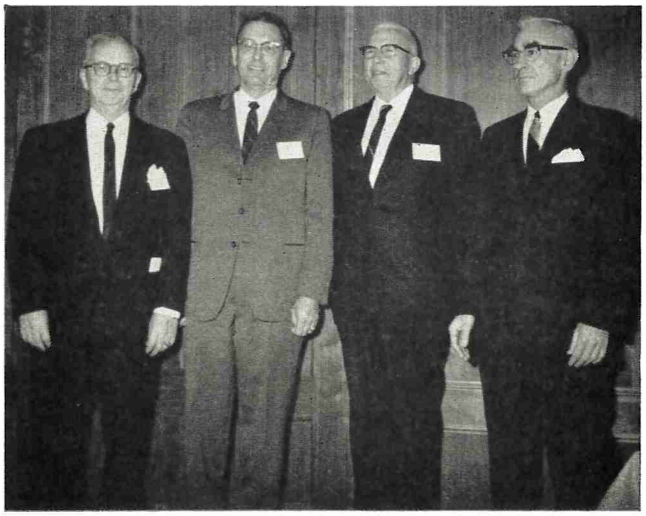
NEWS AND EVENTS

RECORD ATTENDANCE AT NATIONAL MASTITIS COUNCIL ANNUAL MEETING

More than 300 persons interested in the control of mastitis and betterment of the nation's milk supply attended the 5th Annual Meeting of the National Mastitis Council, Inc., at Chicago, Illinois on February 3-4, 1966. Representatives from 37 states as well as Puerto Rico, Canada and Peru attended the sessions, indicating that the program of the Council is receiving wide attention.

The Council is a non-profit organization depending on voluntary personal services of its officers and leaders and financed by contributions from industry and interested individuals and by sale of educational material. Its stated objectives are to serve as a clearing house for factual information on the problem of bovine mastitis, to encourage research in areas of greatest need, to develop and distribute sound information and to help enforcement agencies and other organizations set up effective programs for reducing the incidence of mastitis.

Opening the two day meeting, Dr. H. G. Hodges, President of the Council reviewed accomplishments of the past year and credited the success of the program to the fine cooperative spirit and dedication



Officers of the National Mastitis Council for 1966, elected at the annual meeting, were (L to R), M. G. Van Buskirk, treasurer; G. T. Coulter, vice president; H. G. Hodges, president; and J. C. Flake, secretary.

H. G. Ellsworth handled the registration booth.

of so many people concerned with the welfare of the dairy industry. He pointed out that while great strides had been taken in the technical aspects of milk production and processing, nevertheless much remains to be done in the elimination of abnormal milk as a vital factor in the overall improvement of the raw milk supply.

Thirty-two speakers from all parts of the country, representing industry and public health and noted for their personal activities and special accomplishments in mastitis control, presented papers and participated in symposiums. Several speakers discussed various aspects of the Wisconsin Mastitis Control Program as a typical state activity. Other topics included prevention and control of clinical infectious mastitis and the need for uniform bacteriological tests in diagnosis. Present milking practices were reviewed, including currently used milking machines and milker systems and the interests of the Milking Machine Manufacturers Council in support of the national mastitis control program.

An outstanding feature of the two day meeting was the fieldmen's symposium reviewing and discussing problems encountered in the field in the control of mastitis and elimination of abnormal milk. Emphasis was placed on the necessity for an adequate herd testing schedule, producer use of services of his veterinarian, milking machine serviceman, dairy plant fieldman and sanitarian and the importance of producer education programs. State activities particularly in screen testing were reviewed.

Another interesting symposium covered mastitis control in relation to the national Interstate Milk Shipments program. It was pointed out that the aims of the Mastitis Council and the National Conference are essentially the same and that problems faced are similar in many aspects. There is a need for greater uniformity in regulations and administrative practices as well as reciprocity between regulatory agencies. Similarly the efforts of industry and educational institutions need coordination within the entire program. The four year experience of the Chicago milk shed was reviewed as a practical and sensible approach to control problems.

Achievements of the National Mastitis Council have been great. According to Dr. Hodges, it's strongest asset is the large number of individuals representing industry in one form or other working closely with educational and regulatory groups. The result has been a more comprehensive understanding of the bovine mastitis problem and potentialities of its control.

Three of the Council's officers were reelected as follows: President, Dr. H. G. Hodges, DeLaval Separator Co., Phoenix, Ariz; Treasurer, M. G. VanBuskirk, Illinois Dairy Products Assoc., Chicago; and Secretary, Dr. J. C. Flake, Evaporated Milk Institute, Chicago. G. T. Coulter, Kraft Foods Co., Chicago, was elected Vice-President.

Copies of the proceedings of the 5th Annual Meeting, consisting of some 88 pages, are available at a cost of $4.00 to members of the Council and $5.00 to others. Orders should be directed to the office of the National Mastitis Council, 118 W. First St., Hinsdale, Ill. 60521.

FDA HAS NEW COMMISSIONER

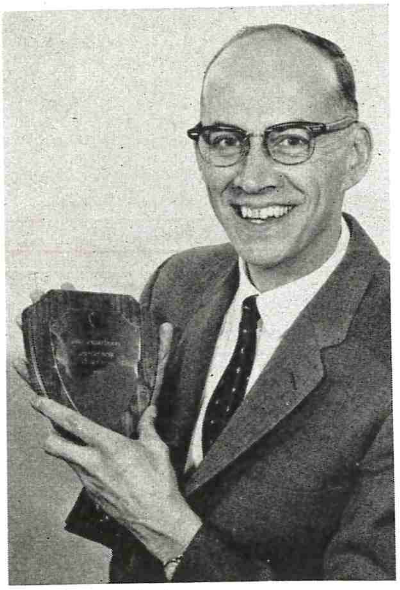
Dr. James L. Goddard, formerly assistant Surgeon General of the United States Public Health Service, is the new Commissioner of the Food and Drug Administration, succeeding George Larrick who retired in December.

Dr. Goddard, 42, has been director of the Communicable Disease Center in Atlanta. He has served with PHS the past 15 years. Dr. Goddard is described as an exceptionally capable administrator. He earned his medical degree from George Washington University in 1949. He also has a master's degree in public health from Harvard University.

In his new post he will have responsibility for an expanding agency that regulates the manufacture and sale of foods, drugs, and cosmetics and has a large degree of control over agricultural pesticides. Its purpose is to protect the consuming public from fraud and health hazards.

The agency has grown from an annual budget 10 years ago of $5.1 million to $53 million in the current fiscal year. It has a largely professional staff of 4,441 and shortly will occupy its own building. It polices a complex of industries with gross annual sales of approximately $117 billion.

FRED SIEBENMANN "BOSS OF THE YEAR"



A singular honor has come to Fred J. Siebenmann, Jr., Sanitation Officer for the Moline, Illinois, Health Department. The Moline Junior Chamber of Commerce named him "Boss of the Year" for 1966 at its Annual Distinguished Service Award Dinner and presented him a plaque.

Fred has the responsibility of supervising milk and food inspections, housing and sanitation complaint inspections, garbage collection, air pollution measurements and miscellaneous other duties in environmental sanitation in a city of 45,000. He has been with the Department since 1959 and is a graduate of the University of Illinois.

Recognizing that his duties give him plenty of opportunity for being unpopular, particularly with errant citizens, the Jaycees have credited Fred with having unusually fine public relations. He is well thought of by the City Council and the press and especially by his subordinates. His department is known for its young and aggressive staff, its high morale and its efficient operation.

SCHLAFMAN TO DIRECT HEALTH OPERATIONS RESEARCH PROGRAM

Sanitarian Director Irving H. Schlafman has been named to direct "Operation SAM" (Systems Analysis Model) in the Office of Program Planning and Evaluation, PHS Division of Indian Health, Bureau of Medical Services.

Operation SAM, to be headquartered at Tucson, Arizona, on or about July 1, 1966, has been established for the purpose of conducting a specialized program of applied research relating to the development and implementation of more effective and efficient curative, rehabilitative and preventive health services in the Division of Indian Health. Mr. Schlafman, will head an operations research team of multiple disciplines, including an epidemiologist, biometrician, hospital manager, econometrician, communication specialist, and data processing personnel.

Mr. Schlafman was commissioned as a Sanitarian in the Public Health Service in May, 1949, served as an environmental health training officer, PHS Regional Milk and Food Consultant and most recently, as the Assistant Chief, Milk Sanitation Section, Milk and Food Branch, PHS, Washington, D. C. He is a graduate of Clark University, Worcester, Mass. and received his Master of Science Degree from the University of Massachusetts at Amherst.

W. E. GILBERTSON DIRECTS SOLID WASTES PROGRAM

On December 3, 1965, PHS created the Office of Solid Wastes, BSS (EH) to fulfill its obligations under the new Solid Waste Disposal Act of 1965. The act authorized a national program for research, demonstration, training, planning and technical assistance to improve methods of handling and disposing of solid wastes. Responsibility was split between Interior (mineral and fossil fuel wastes) and the Public Health Service.

Future plans of the Office of Solid Wastes include setting up regional office staffs and conducting research and training at Cincinnati.

Acting chief of the program is W. E. Gilbertson, formerly chief of the Division of Environmental Engineering and Food Protection. Mr. Gilbertson emphasized the new program's public health engineering challenges and the resulting need for additional long- and short-term training in the field of solid wastes. He observed that the University of West Virginia is developing a graduate program in solid waste engineering and at least six other universities are considering similar steps. He added that short-term courses in solid waste technology are already being offered at the Taft Center in Ohio.

The first course is scheduled for May 16-20. Topics will include the national solid-waste problem, typical solid-waste programs, storage practices, collection methods, on-site disposal, transfer stations, mineral and fuel production wastes, waste salvage, commonly used disposal methods, sanitary landfill and incinerator design and operation, and municipal refuse composting.

Applications for the new course should be addressed to the Director, Training Program, Robert

A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati, Ohio, 45226. No tuition or registration fee is required.

VIRGINIA DAIRY PRODUCTS ASSOCIATION CONVENTION

1966-67 Officers of the Virginia Dairy Products Association, left to right; W. M. Gaunt, C. L. Fleshman, J. W. Nussey, Jr., E. H. Denney and H. A. Habeck.

Over 400 dairy industry people attended the 51st convention of the Virginia Dairy Products Association held at Richmond, Virginia, January 16, 17, and 18, 1966.

Speakers, and topics discussed, at the convention included: J. F. Lyles, Virginia Department of Agriculture, who discussed the "Checkweighing of Dairy Product Packages"; John F. Speer, Jr., MIF-IAICM, who spoke on the topic "Are Regulations Affecting Our Future in the Market Place?"; Dr. Herbert W. Warburton, National Dairy Council, who introduced the new Dairy Council educational program "Project Weight Watch"; David W. Hughes, III, Virginia State Chamber of Commerce, who discussed the "Status of Organized Labor in Virginia"; M. J. Framberger, American Dairy Association, whose topic was "Building Profitable Dairy Sales in 1966"; and Bernard M. Suttler, Inspector, F.B.I., Washington, D. C. who spoke on the subject "The F.B.I. and Challenges of Today."

Officers of the Virginia Dairy Products Association for the 1966-67 term are: President, E. H. Denney, Norfolk; 1st Vice-President, H. A. Habeck, Roanoke; 2nd Vice-President, J. W. Nussey, Jr., Colonial Heights; Treasurer, C. L. Fleshman, Lynchburg; and Executive Vice-President, Secretary & Ass't. Treasurer, W. M. Gaunt.

JIM KING DIES

Sanitarian Director James A. King, 51, Associate Chief of the Division of Computer Research and Technology, National Institute of Health, died in Washington, D. C. on December 29, 1965 as a result of cancer.

Jim was well-known in the field of environmental sanitation and at one time served with the National Sanitation Foundation. He was active in a number of organizations in the sanitation and public health field and for several years was secretary of the Engineering and Sanitation Section of the American Public Health Association.

FOCUS ATTENTION ON DAIRY COW AT INTERNATIONAL DAIRY CONGRESS

At the Seventeenth International Dairy Congress at Munich, Germany, July 4-9, 1966, where problems of the dairy industry will be discussed, attention will be focused on the dairy cow whose history has been closely linked with man for 7000 years.

Quoting from a press release on the meeting, "Ancestors of the dairy cow, like other wild animals that could be hunted, served as a basis for feeding and clothing human beings. In the course of thousands of years, the cow has had a variety of functions among many races. It has provided meat and milk, served as a sacrificial victim, a draught animal and a beast of burden. Charlemagne gave orders that larger dairy herds should be maintained on his estates and laid the foundations for the development of breeding.

"Soon butter and cheese were produced, as well as milk. In 1493 Columbus transported the first cattle to the New World, and in 1788 the British introduced cattle into Australia. The wild ancestor of the cow, the aurochs, gradually died out with the advance of civilization; the last of these animals was seen at Jaktorowka in Poland, in 1627. Great historical epochs mark the development of the cow down to the high yield animal of the present day, with a total yield of over 25,000 gallons of milk in its life.

"The ancestor of our dairy cattle, in prehistoric times, already had advanced from India into extensive areas of Eurasia and North Africa. In the Stone Age it was hunted along with the mamoth, reindeer, prehistoric wild horse and bison. It was captured in pits and hunted with spears and arrows. Hunting scenes of this kind have been preserved in the prehistoric caves in Spain and southern France.

When the nomadic tribes of hunters began to establish settlements, they turned to arable farming and animal husbandry. Together with the sheep, the ox was one of the first animals to be domesticated by man. The oldest domestic ox yet discovered comes from the Halafia layers at Banahilk in northern Mesopotamia, and is more than 7,000 years old. In Central Europe, the surochs was not domesticated until the later Stone Age (3500-2500 B. C.)

"Later on milk, too, became important as a food for man. A relief from the eleventh dynasty in Egypt, 2100 B. C., depicts a cow crying because she is being deprived of the milk intended for her calf.

"It was evidently a difficult matter to milk the first domestic cattle; the cow's legs had to be tied beforehand. Moreover, the milk yield was low. The Hereros, a tribe in Africa which kept herds of cattle, had to milk 60-70 cows to obtain enough milk for one family. Systematic breeding, however, has let to a constant increase in milk yield. Later on butter produced from milk fat also became an important food. The development of settlements and towns meant that more adequate supplies of food were required from organized agriculture."

More than 500 scientific papers will be presented at the 5-day meeting at Munich, covering present day espects of milk production, market milk, butter and cheese and special dairy products. An International Dairy Produce and Equipment Exhibition will be held in conjunction with the Congress.

PROGRESS IN IDENTIFICATION OF FLAVORS[1]

There are many definitions for an expert, some rather witty, and there are many types of expert. But when it come to flavor, everyone is his own expert as each person knows best what he likes or dislikes.

Just how a person is able to distinguish flavors and what compounds are responsible for the flavors of various foods is largely unknown. There is, however, a tremendous amount of research being directed toward these problems and much data is being accumulated.

Early in September, 1965, research workers from throughout the world gathered at Oregon State University to discuss the status of flavor research and 243 scientists from 8 foreign countries and 30 states gathered for the Symposium on Foods: The Chemistry and Physiology on Flavors. The 3 day program consisted of discussions on the physiological aspects of flavors, advances in the analytical methodology for flavor determinations, the flavors of various foods, and the origin of flavor in foods. Probably more questions were raised than answers provided. Yet it is apparent that the research efforts are beginning to provide answers.

As to how we taste, the electron microscope has opened up a whole new field in the study of taste-buds and olfactory receptors. A number of theories have been proposed to explain the mechanism of tasting and smelling. None of these explanations are completely adequate and people will probably be making regular commuter trips to Mars before we really understand how a person distinguishes flavors, transmits this message to his brain, and there sorts cut the information to say "This smells like a rose", "That tastes like a potato", or "I like these apples".

More progress is being made in determining the chemical composition of food flavors. This has been greatly aided by the development of new instruments and techniques which enable chemists to separate and isolate extremely small amounts of pure chemicals from foods, to identify them chemically, and to determine the amounts present. The gas chromotograph has been largely responsible for the increase in research efforts as it has opened the door for the separation and isolation of the various chemicals thought to make up a flavor of a food. Improvements are being made almost daily with this instrument for increasing its sensitivity, and exploring new techniques for its use. The infra-red spectrometer, the mass spectrometer and other instruments of recent origin are extremely helpful to the chemist in identifying and quantifying minute quantities of chemical substances. A number of laboratories now have the necessary hardware and trained personnel to carry on meaningful research in flavor analysis.

Considerable research has been directed toward the identification of the compounds thought to make up the flavors of various foods. Much of the discussion at the symposium was concerned with the flavors of bread, meat, wines, poultry, fish, onions, milk, cheese, hops, coffee, and pineapple. Starting with the food researchers have separated, through distillation, and the use of chromatographic techniques, a number of flavor compounds. Many of these have been identified and in some cases the proportion of these chemicals have been determined. Yet in most cases we still cannot take pure chemicals, mix them together at the proportions indicated, and come up with a suitable or typical synthetic flavor.

Still we are approaching this situation. More work is needed to determine the concentration of the various compounds thought to make up the flavors, the importance of the substrate in which they are placed,

[1]Reprinted from *Food Processing Review,* newsletter of Oregon State University, Corvallis, Ore., Vol. 47, September 30, 1965.

and probably other factors not even thought of yet, before we have a thorough understanding of flavor composition.

Another group of scientists is looking to determine where these flavor compounds come from which make the characteristic flavors for various foods. Some of them originate through a non-enzymatic browning process, others are related to lipid reactions, and the natural metabolic process of the various plants or animals are responsible for the production of some of the flavor compounds.

The last topic discussed at the symposium dealt with the flavor potentiators. Monosodium glutamate belong in this class and has been known and used for some time. A flavor potentiator is a compound which in small quantities has little or no sensory effect itself but which tends to exaggerate the effects of other flavors in a food. More recently inosinates and guanylates have been shown to possess powers for flavor potentiation. A synergistic effect has been noted between some flavor potentiators and this is being studied.

The proceedings of this conference will be published in book form as have the proceedings of the three previous Symposia on Foods at Oregon State University. This book will be an excellent reference for flavor researchers and practicing food technologists. Our understanding of the chemistry and physiology of flavors is far from complete, yet remarkable progress has been made, and some practical applications have already come out of this work. We will see even greater strides in the next few years.

INFORMATION FROM INDUSTRY

Editorial Note: Following are items of information on products, equipment, processes and literature based on current news releases from industry. When writing for detailed information, mention the Journal.

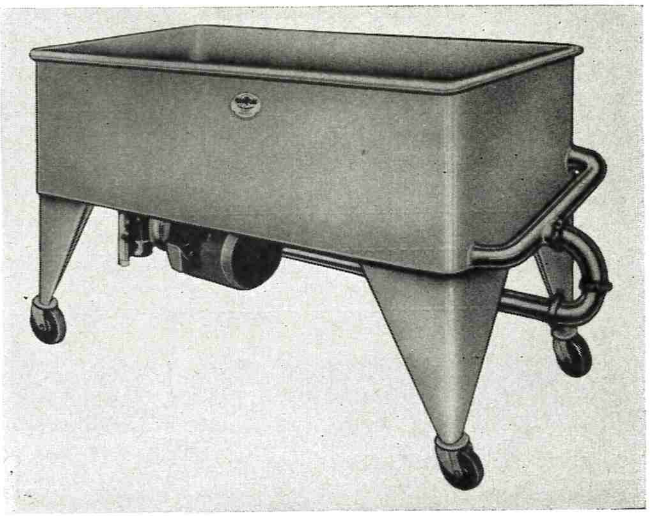
FLAT WIRE MATS UTILIZED ON PACKING HOUSE FLOORS

According to the Cambridge Wire Cloth Company of Cambridge, Maryland, a new use for its flat wire belting is as floor mats in packing house operations. It may have similar applications in other industries. The mats, constructed of stainless steel rods and pickets in 1" x 1" mesh, are placed on the floors of the boning and kill rooms where operators find it difficult to keep their footing among the animal fats and fluids. When chips of fat fall on the mat, the operators' feet soon press it against the relatively sharp edges of the flat wire picket where it is cut and forced down into the mesh openings, affording a clean footing surface.

One user advises that mats constructed of neoprene and rubber only compounded the problem. Once tile floors become greasy the rubber-type mats acted like skids whereas Cambridge's new stainless flat wire grips the floor. The new mats may also be used on top of scaffolding where normal metal treads have worn smooth.

To clean the flexible mats, it is necessary only to stand them on their side against a wall and steam them with a pressure hose. A mat measuring approximately 3' x 3' is the size most satisfactory and is easy to roll up and move about for cleaning. For further information, write to Belt Manager, Cambridge Wire Cloth Company, Cambridge, Maryland 21613.

GIRTON HAS NEW MODEL PARTS WASHER



A new model Pump-Master Parts Washer has been introduced by Girton Manufacturing Company, Millville, Pa. This all-purpose washer will clean dairy or food processing equipment by the "clean-in-place" method, or will handle a wide variety of disassembled machine parts, sanitary pipes and fittings.

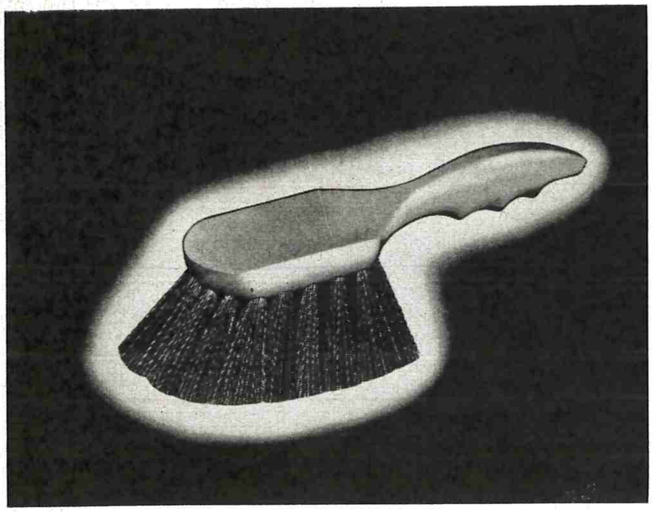
Many machine parts, such as separator discs, filler, homogenizer and ice cream freezer parts can be placed in specially designed baskets or racks during dismantling, transported to the washer, then washed and returned for assembly with no handling during the washing operation. This protects delicate, expensive parts from damage and keeps them in order for quick assembly.

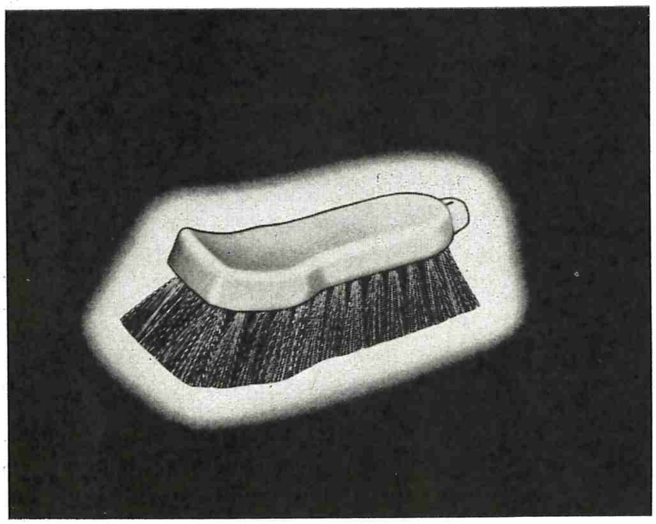
The Pump-Master cleans by combined chemical-mechanical action. Detergent solution softens all foreign matter, which is washed away by agitation of the rapidly circulating solution under positive pump pressure. It hooks directly into in-place lines for cleaning-in-place.

MOBILE POLYETHYLENE TRUCKS

A new bulk mobile polyethylene truck has been introduced by Interplastic Corp. The capacity of the truck is 16 bushels, 140 gallons, or 19 cubic feet. The complete assembly consists of a large polyethylene bin mounted on a frame equipped with 5 inch casters. The container slips out of the frame for cleaning and in the event of breakage of any part, it can be readily replaced without discarding the entire unit. The bin is smooth and snag-proof with rounded corners, made from virgin white polyethylene with seamless non-welded construction. More information is available from Interplastic Corp., Resco Div., 102 Fairfield Ave., St. Paul 7, Minn.

SPARTA INTRODUCES TWO BRUSH LINES





Production of two new styles of plastic block brushes at prices competitive to wood has been announced by the Sparta Brush Co. of Sparta, Wisconsin.

The two new brush styles include The Golden Line featuring a golden plastic block with a short handled pistol-grip design. The plastic block is said to be virtually indestructible and eliminate the splintering and sanitation problems of bacteria soak-up caused by wood blocks. The entire brush rinses clean and dries completely. Five types of bristle fills are also available. Three plastic bristle fills are "crimped" to hold more cleaning solution. Two fibre type bristle fills round out the Golden Line.

The Golden Series of hand style scrubbers feature a smooth golden plastic block made from the mold of the Sparta Viking. The same "soak-proofed" construction features and five bristle fills are also available in the Golden Series.

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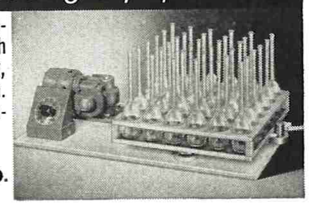

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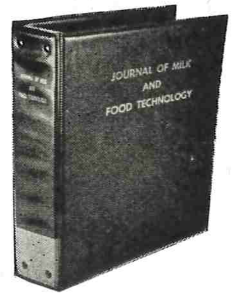

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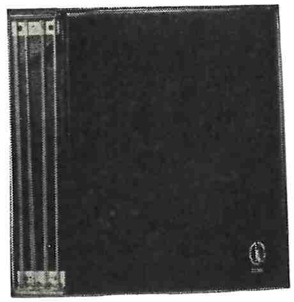

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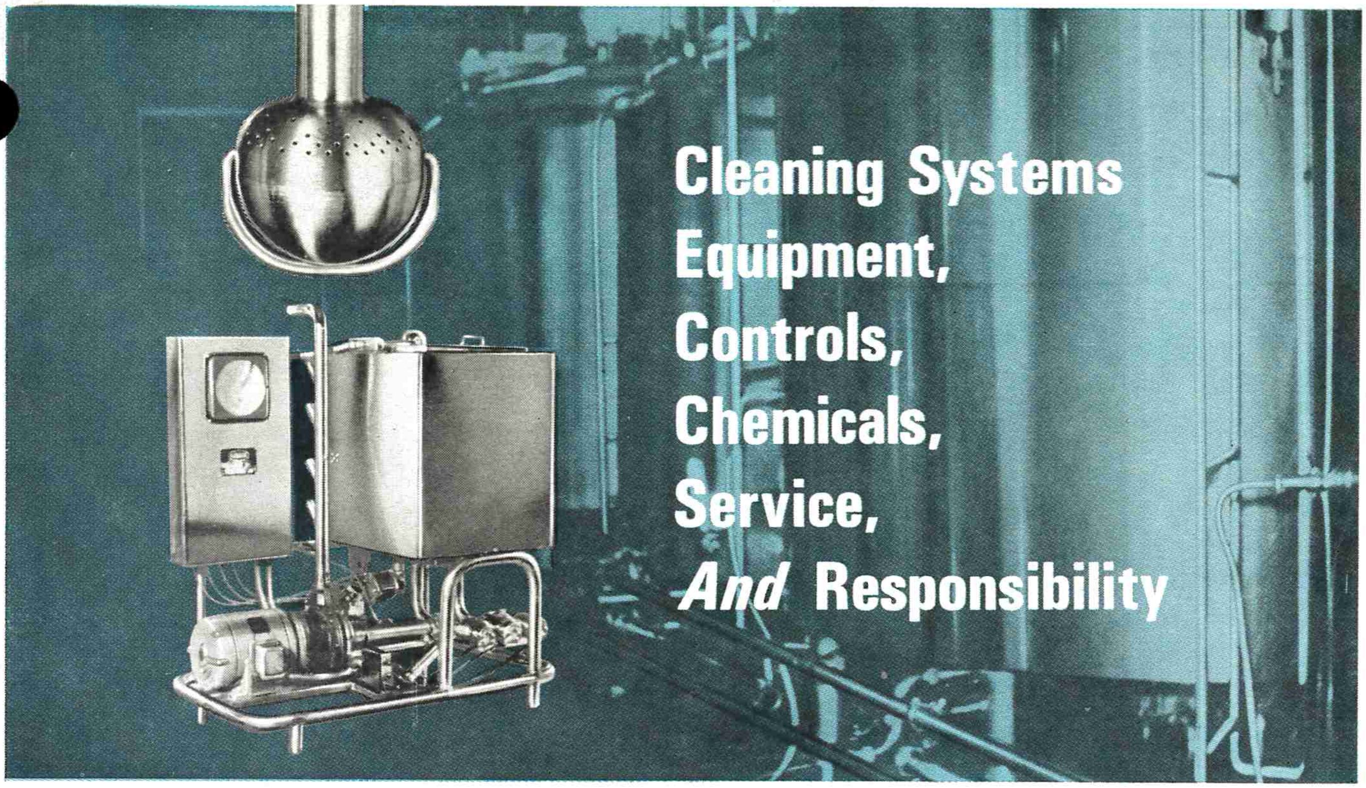

Get ALL in one package from KLENZADE

Few CIP plant cleaning systems work as well as Klenzade's—because no other system is the result of a single organization's engineering.

The Klenzmation "Packaged" Approach includes everything you need for the cleanest food processing plant possible. It is a *system that works*—engineered for your specific needs—rather than a collection of unrelated components.

The **Series 1800 Recirculating Unit** (tank, supply pump, air-operated valves, and control accessories) circulates cleaning solution at proper velocity and detergency for best spray and recirculation cleaning action. Provides safeguards against inadequate or excessive solution temperature and product-solution mixing.

Series 1490 Program Control Panels are designed for use with Series 1800 Recirculating Units to provide any number and combination of rinsing, washing, and sanitizing cycles for transport tanks, storage tanks, process vats and piping, and heat exchanger equipment.

Air-Operated Piston Type Pumps assure proper blending and feeding of detergents to handle any soil condition . . . in any water supply.

Precision designed **Klenz-Sprays** permit fast, efficient CIP cleaning of tankers, tanks, and vats. They spray all the surfaces all the time. Simple—no moving parts.

Klenzade Automation Chemicals are specially formulated for maximum cleaning action in the Klenzmation "Packaged" Cleaning System under a wide variety of soil and water conditions. **AC-1 Liquid Alkaline Detergent** handles heavy soil loads; **AC-6** or **AC-7** may be added for water conditioning. To prevent milkstone or other mineral deposits, **AC-3 Liquid Acid Detergent** is used in the final rinse.

XY-12 Liquid Chlorine is used to enhance the alkaline detergent solution and is also available for automatic sanitizing.

Phone or write for more information about how you can benefit from the Klenzade approach—*Single Organization Responsibility* for design, manufacture, installation and service.

For quality, completeness and cost control, it's . . .

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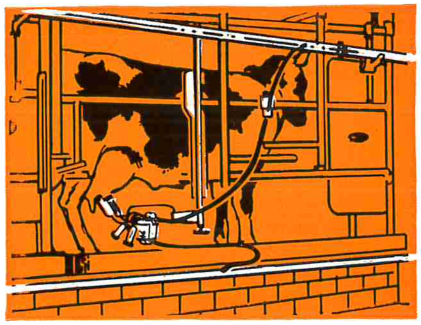
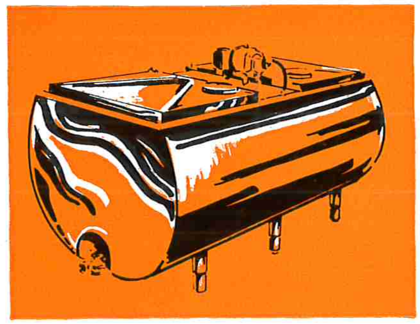
Why milk and food processors spell clean with a "K"





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***Surge Water Analyzer** complete with black lite provides laboratory condition testing right on the dairy farm.

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