

# JOURNAL of MILK and FOOD TECHNOLOGY

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## Editorials

*The opinions and ideas expressed in papers and editorials are those of the respective authors.  
The expressions of the Association are completely recorded in the transactions.*

### THE FOOD SANITARIAN AS A RESEARCHER

WE NOTE with interest the comment of Mr. Leete (see letter, page 124 of this issue) that the proposed research team omits a sanitarian. Why the omission? This is certainly a pointed question. The simple, unvarnished truth is that we never thought of a sanitarian on the same basis as we considered the dairy husbandryman, the chemist, the bacteriologist, and the sanitary engineer. Each of these latter four groups has received a professional training that is well recognized. The field covered by each is clearly defined; each member would be expected to contribute a type of outlook and a professional skill which can be evaluated and directed to coverage of definite avenues of approach to the problem. Moreover, each of those skills is based on the scientific method—a relatively precise educational discipline.

The work of the food sanitarian is broader than that of any one of the aforesaid groups. It utilizes information from each of the above fields, sifts and interprets it, and then applies it to the immediate problem. The available data do not usually exactly meet the needs of the immediate situation, and so the sanitarian uses his judgment. Thus, we tend to depend more and more on our experience, and thus to become opinionated. The contradictory state of our milk regulations indicates the extent to which we let opinions direct our actions instead of using facts.

It would seem to us that teams of researchers should engage in studies of the several problems, and present clear-cut facts. Then the sanitarian would have a dependable basis on which to base his action. In other words, the sanitarian, as a rule, would supplement the research work instead of participating in it—although we are well aware that the training of many sanitarians has been as rigorous as that of any other professional group.

J. H. S.

## ICE CREAM MANUFACTURERS' DESIRE TO PARTICIPATE IN SANITATION DEVELOPMENT

MOVED by the editorial, "Milk and Food Sanitation: One Field, One Organization," appearing in the November-December issue of this Journal and the discussions which ensued in the same vein at the Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS at Philadelphia, some exploratory work relative to the attitude of industry to Sanitarians seemed warranted.

Having been associated with the International Association of Ice Cream Manufacturers for some years as a member of its Sanitary Control Committee and as a representative on the Sanitary Standards Sub-Committee of the Dairy Industry Committee, I felt a personal responsibility in aiding, at least, in the narrowing of any differences, factual or fancied, which this industry might have with sanitarians.

My close association with sanitarians, both as a representative of an official agency and as an industrial sanitarian for a good many years, has permitted me the opportunity to judge for myself the rate and results of cooperation in attacking mutual problems. The outstanding current example of this cooperation with a mutuality of purpose has been the formulation of 3A Standards for processing equipment in the Dairy Industry. Granted, that progress in some instances has been slow, the blame can in a large measure be attributed to the lack of clear thinking and possibly procrastination in applying demonstrated effective sanitary technology on the part of industry and sanitarians in the past. Today we can take in stride the principles of such organizations as the National Sanitation Foundation whose eventual purpose is to delve into every phase of sanitation on an industry-official sanitarian collaborative basis as problems of importance develop.

We can foresee rapid progress in the future in achieving the desired ends of this collaboration.

We in the ice cream industry fully realize that sanitation is a great asset. That the International Association of Ice Cream Manufacturers is sincere in its efforts to align itself with the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS can best be attested to in the following statement to the writer by Mr. Robert C. Hibben, Executive Secretary of the International Association of Ice Cream Manufacturers:

"I certainly appreciate very much your letter . . . in regard to the milk sanitarians. They have always been welcome at our meetings as guests, and every year we have a certain number of them in attendance. In fact, some years ago we held a joint meeting of our convention with this group. However, two things should be done: first, secure a list of members of this group and send them formal invitations to attend our convention as guests, and second, endeavor to find some good speaker from this group to make a presentation at our Production and Laboratory Council meeting."

In retrospect it is of interest to review the ice cream manufacturers' efforts in the past to secure uniformity of thinking as it pertained to their problems in relation to the activities of official sanitarians. This is demonstrated by the cooperative program that was carried forward by the International Association of Ice Cream Manufacturers and the then National Association of Milk Sanitarians, which resulted in a joint committee of the two groups publishing

"Sanitary Regulations for Ice Cream" in 1929. This bulletin has been used by sanitarians and health officers throughout the United States, as well as members of the industry. Its major projects had been to secure a similarity of requirements, a uniform interpretation and reciprocity of inspection, admittedly motivated by a desire, inherent in us Americans, to secure an unlimited area in which to conduct our business. To that end it has seen fit, from time to time, to publish a set of Sanitary Standards as a guide for the industry and sanitarians in an attempt to foster some sort of uniformity of thinking and action.

It cannot be denied that the ice cream manufacturers are most vitally interested in the aims of the sanitarians to guarantee the consumer a safe healthful product and that they are willing to cooperate in any sanitation program which will stimulate a demand for their products particularly at point of sale. Ice cream manufacturers are much concerned with laboratory control technique and the enactment of mutually satisfactory standards as a means for pacing their efforts in the proper direction.

Because of the nature of the things that the ice cream manufacturer deals in, the industry is continually confronted with new ideas which must be screened. Many of these ideas are meritorious in their intent but the element of fraud, deception, and inconsistency with recognized established procedures quite often poses problems which could only be solved by mutual judgment and agreement.

Obviously, therefore, the ice cream manufacturers are sincere in their desire to participate in a one organization program because frankly, they stand to gain much and lose little.

FRED E. UETZ.

### EXAMINATION FOR APPOINTMENT OF SANITARIAN OFFICERS (MILK AND FOOD) IN REGULAR CORPS, U. S. PUBLIC HEALTH SERVICE

The examination announced in the preceding (January-February 1949) issue of this Journal will be held June 8-10, 1949. Applications for the examination must be submitted to the Surgeon General, U. S. Public Health Service, Washington 25, D. C., not later than May 18, 1949. Application forms may be obtained from the Surgeon General. Applicants will be notified where to report for the examination.

### Forty-fifth Annual Ice Cream Convention

The Forty-fifth Annual Ice Cream Convention of the International Association of Ice Cream Manufacturers will be held in Los Angeles during the week of October 24. A joint session will be held with the Milk Industry Foundation on Wednesday afternoon, October 26. Ice cream sessions will follow on Thursday and Friday, October 27 and 28. The names of the official hotels will be announced later. As in the past, the International, MIF, and DISA will have blocks of hotels in various geographical sections of the city assuring the accommodations of all active and associate members and guests.

Some features which will outline the

Convention and which can now be announced are the following.

1. A trip to Hawaii, November 7 to November 11, with eleven days on the Island.
2. A western trip beginning with a get-together dinner in Chicago of Eastern representatives at the Edgewater Beach Hotel. Entraining Sunday, October 16, on the "Special", the group will visit St. Paul, Minneapolis, the Lake Park region of Minnesota, the farming centers of North Dakota, Glacier National Park and other scenic sites in the Rockies, the Grand Coulee Dam, and numerous other attractive features. The "Special" will return to Chicago on Thursday, November 3.

International Association of Ice Cream Manufacturers  
Washington, D. C.  
January 24, 1949

Mr. W. B. Palmer  
Journal of Milk & Food Technology  
Dear Mr. Palmer:

...  
The members of the International Association of Milk and Food Sanitarians are invited to attend this convention as our guests, and if any of your members who desire to attend the convention will get in touch with us, we will send them hotel reservation blanks when they are distributed later in the year.  
...

Cordially yours,  
(Signed)  
ROBERT C. HIBBEN,  
Executive Secretary

### DIRECT MICROSCOPIC CLUMP COUNTS OF PASTEURIZED MILK BY CARBOLATED, NEWMAN-LAMPERT NO. 2, AND THE ACID-AND-WATER-FREE METHYLENE BLUE STAINING PROCEDURES \*

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AND

LUTHER A. BLACK  
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IN the 1939 edition of the *Milk Ordinance and Code* recommended by the Public Health Service,<sup>1</sup> it is stipulated that the logarithmic average bacterial plate count or direct microscopic clump count of grade A raw milk which is to be pasteurized shall not exceed 200,000 per ml. According to the 1947 tentative edition of the code,<sup>2</sup> this stipulation refers to milk, "as delivered from the farm." It is on this basis that the study here reported was conducted. If the grading of pasteurized milk is to be carried out in accordance with the above requirements, bacteriological examination of the raw milk prior to its pasteurization "as delivered from the farm" would be made. However, if a procedure for examination of the pasteurized milk could be found which would closely approximate the number of bacteria in the raw milk at the time of delivery, this would have certain advantages.

Since the standard plate count procedure as applied to pasteurized milk indicates only those bacteria, either singly or in clumps, which survived the heat treatment, it is evident that this can offer no indication of the number

of bacteria that were present in the milk prior to pasteurization. It would appear that the only other routine post-pasteurization procedure applicable is the direct microscopic count. Therefore, it appeared desirable to obtain information on the effect of laboratory pasteurization on direct microscopic counts of milk films stained by several procedures.

#### HISTORICAL

From a review of literature on the visibility of bacteria in milk after it has been pasteurized, in relation to bacterial visibility in its raw state, it is evident that contradictory conclusions have been reached in the past. Thus, Brooks<sup>3</sup> using Wright's stain, obtained in grade A pasteurized milks counts of dead bacteria running into millions. He found further that with the average plate count of 7,900, on these pasteurized milks the corresponding direct count was 440,000, or in a ratio of 1 to 55. In a study of 87 specimens of Grade A pasteurized milk, he found an average direct microscopic count of individual bacteria of 1,700,000 and an average clump count of 480,000. Hastings and Davenport<sup>4</sup> reported that the number of bacteria which stain by the Breed method varies from 3 percent to 83 percent.

\* Presented at a Joint Session of the Food and Nutrition and Laboratory Sections of the American Public Health Association at the Seventy-sixth Annual Meeting in Boston, Massachusetts, November 9, 1948.

Ward and Myers<sup>5</sup> stated that "Heating milk at pasteurizing temperature for 30 minutes caused a considerable reduction in the number of bacteria found in smears stained with methylene blue. In many cases the percentage of reduction in count would appear to be comparable to similar figures obtained by the plate counts. In general, the reductions after 30 minutes range from 75 percent upward, with 9 of the 16 samples showing above 90 percent reduction." They further express the opinion that heating milk at a pasteurization temperature for thirty minutes kills and possibly disintegrates most of the bacteria. In both instances last cited, the authors conclude that the number of bacteria lost to visibility after pasteurization is sufficiently great to impair the usefulness of the direct microscopic counts made on pasteurized milks by the procedures they employed.

Knaysi and Ford,<sup>6</sup> on the other hand, conclude that the bacteria made invisible by pasteurization do not vanish, but that their stainability is often sufficiently reduced so that they are not visible by methods requiring decolorization or when stains containing decolorizing agents such as strong acids, for instance, are used.

Baker<sup>7</sup> inoculated raw milk having low initial bacterial counts with skim milk cultures of different strains of bacteria commonly found in milk. He also found that direct microscopic counts of laboratory pasteurized milk expressed as percent of the corresponding raw milk counts, varied considerably with all types of organisms studied, and that in some instances it may be only a small fraction of the original direct count on raw milk.

On the basis of the contradictory results and opinions cited, it would appear difficult, if not impossible, to conclude whether or not the pasteurization of milk affects the direct microscopic count so as to make this procedure suitable or unsuitable for an estimation

of the number of bacteria in the milk prior to pasteurization.<sup>8</sup> It would appear that the contradictory results and the ensuing confusing opinions are due primarily to the fact that the studies were carried out by different workers, at different times, using different procedures, and possibly having a different purpose in mind. For this reason it seemed desirable to restudy this phase of the direct microscopic count procedures in a more coordinated manner, as described herein.

REASONS FOR SELECTION OF STAINING PROCEDURES

The carbolated methylene blue stain is accepted as the standard in the Ninth Edition of Standard Methods.<sup>8</sup> The results obtained with this stain were therefore taken as the basis for comparison. The Newman-Lampert No. 2 stain, as was pointed out by us in another report,<sup>9</sup> is capable of producing counts not lower than by the Carbolated Methylene Blue, so this stain also was included in the present study. The Acid-and-Water-Free stain developed in this laboratory has been described in a previous report.<sup>10</sup> The results presented in that report and in one recently prepared for publication<sup>11</sup> indicate the acid-and-water-free staining procedure to be capable of yielding maximal counts as compared to several other staining procedures used on a series of raw milks. Therefore, this staining procedure was also included in the study. The acid-and-water-free procedure consists of the following simple steps: The milk films are prepared and defatted in accordance with Standard Methods. Directly after defatting, the slides are submerged for one to one and one half minutes in an alcoholic solution of 0.6 percent certified methylene blue. It will be noted that this stain is free from added acid or water, from which fact it derives its name. The stained slides are then lightly rinsed in tap water and slowly but thoroughly airdried. They are

then examined microscopically, as usual.

EXPERIMENTAL PROCEDURE

This report is based on a study of two sets of 25 milk specimens each and should, therefore, be regarded as preliminary. Several sets of milk films of the milks studied were prepared in accordance with Standard Methods. Four of these sets were stained by each of the staining procedures indicated, as follows: one set prior to pasteurization, as soon as the milk samples were brought into the laboratory, and another set of the same raw milks after 24 hours storage in the refrigerator at 4° C.; one set immediately after pasteurization on the days the samples were brought into the laboratory, and another set after the pasteurized samples were kept for 24 hours in the refrigerator at 4° C.

The pasteurization was carried out on 10 ml. portions of the milks in sterile test tubes properly submerged in water kept at 143° F. in a LoSee Reduction Incubator for thirty minutes,

preceded by a 5-minute preheating period. In order to take account of the factors well expressed by Anderson,<sup>12</sup> that "direct microscopic counts may be high because of growth of thermophilic microorganisms during the process of pasteurization, or because of contamination after pasteurization, and may not reflect the true counts of the milk before it was pasteurized", counts were made on the raw milks before and after 24 hours storage as a control procedure.

EXPERIMENTAL RESULTS

In Table 1 the results are presented for 25 milk specimens in terms of arithmetic and logarithmic average counts for the group as a whole prior to and after pasteurization, and in terms of corresponding percentage count lost and remaining after pasteurization. This was done for counts made on the day milk specimens were brought in, and for the counts on the raw and pasteurized milk specimens after they were stored in the refrigerator for 24 hours.

TABLE 1  
SUMMARY OF DIRECT MICROSCOPIC CLUMP COUNTS OF MILK USING SEVERAL METHYLENE BLUE STAINS

(On the day milks were brought in and pasteurized)

	Carbolated		Newman-Lampert No. 2		Acid-and-Water-Free	
	Raw	Pasteurized	Raw	Pasteurized	Raw	Pasteurized
Arithmetic average/ml.	320,000	120,000	260,000	100,000	570,000	240,000
Percent of raw milk count		38		39		42
Percent of count loss	62		61		58	
Logarithmic average/ml.	190,000	78,000	150,000	65,000	330,000	160,000
Percent of raw milk count		41		43		49
Percent of count loss	59		57		51	

(After 24 hours storage in the refrigerator at 4° C.)

Arithmetic average/ml.	320,000	170,000	270,000	110,000	460,000	410,000
Percent of raw milk count		53		41		89
Percent of count loss	47		59		11	
Logarithmic average/ml.	190,000	100,000	160,000	66,000	270,000	250,000
Percent of raw milk count		53		41		93
Percent of count loss	47		59		7	

An analysis of the data presented in Table 1 appears to disclose the following facts:

1. Immediately after pasteurization, the percentage reduction of the counts was greatest in the samples stained by carbolated methylene blue (62 percent on the basis of the arithmetic average and 59 on the basis of the logarithmic average), and lowest in the Acid-and-Water-Free stained slides (58 percent on the basis of the arithmetic average and 51 on the basis of the logarithmic average). However, the difference is comparatively small and may be regarded as lying within the same range of magnitude.

2. Following 24 hours storage in the refrigerator, the average count of the slides stained with the carbolated methylene blue went up from 38 percent by the arithmetic count and corresponding 41 percent by the logarithmic count to 53 percent, thus gaining between 12 percent to 15 percent, taking both methods of averaging into consideration.

3. Practically no change was affected by refrigeration in the counts of the pasteurized milk with films stained by the Newman-Lampert No. 2 stain.

4. The counts in the slides stained with the Acid-and-Water-Free stain went up from 42 percent of the corresponding raw milk counts to 89 percent, or an increase of 47 percent, on the basis of arithmetic averages and from 49 percent to 93 percent, or an increase of 44 percent, on the basis of logarithmic averages.

5. No evidence was elicited which would point to a loss in counts during the period of storage in the refrigerator, by any of the staining methods studied, due to the progressive disintegration of the heated bacteria. The opinion reportedly held by Mr. F. Mott and others, namely, that cold storage of pasteurized milks effects a progressive loss in the bacterial stainability by the Newman-Lampert method, is not substantiated by the results of our experiments.

6. Refrigeration for 24 hours effected a considerable reversal in the adsorptive power of the heat-treated bacteria in the case of the carbolated methylene blue stain (12 percent by the log average and 15 percent by the arithmetic average), and especially so in the case of the Acid-and-Water-Free stained slides (44 percent by the log average and 47 percent by the arithmetic average).

7. Storage of the raw milk for 24 hours in the refrigerator did not materially increase or decrease the original bacterial counts.

It appears safe to assume, therefore, that any demonstrable change in the counts in the heated milks after storage was not due to bacterial growth. Certain observations during the performance of these experiments led us to believe that the increase in the counts under the circumstances discussed might be due to a rehabilitation to a greater or lesser degree of the heat denatured constituents of the bacteria. Other experiments conducted in part to secure an explanation of the increased counts tended to point also in the direction of a favorable shift in the buffer factors of the milk.

#### RESULTS WITH THE ACID-AND-WATER-FREE STAIN RESTUDIED

It appears from the data presented in Table 1 and from the discussion following that the effect of pasteurization on the visibility of the stained bacteria is largely dependent upon the type of staining procedure used. The Acid-and-Water-Free staining procedure was affected the least and demonstrated the possibility of securing bacterial counts on pasteurized milks which closely approximate those obtainable on the same milks in their raw state. To determine whether similar results could be obtained upon repeating the experiment, we followed the procedure previously described on another 25 milk specimens stained by the Acid-and-Water-Free procedure only. Individual counts of the entire set of

milk specimens are presented in Table 2.

It can be seen that post pasteurization counts on samples stained directly after pasteurization by the Acid-and-Water-Free procedure were signifi-

pasteurized milk at a temperature of 4° C., the arithmetic average of the post pasteurization counts had gone up to 480,000 and the logarithmic to 290,000, while the averages of the control counts on the corresponding raw milks

TABLE 2  
COMPARATIVE (MICROSCOPIC) COUNTS ON TWENTY-FIVE MILK SPECIMENS PRIOR TO AND AFTER PASTEURIZATION

Specimen	Raw Milk		Pasteurized	
	Day received	After 24 hrs. storage	Directly after pasteurization	Stored 24 hours after pasteurization
1	860,000	840,000	560,000	540,000
2	1,100,000	1,300,000	120,000	1,100,000
3	180,000	130,000	110,000	130,000
4	200,000	160,000	170,000	160,000
5	140,000	140,000	48,000	120,000
6	220,000	350,000	130,000	290,000
7	400,000	280,000	120,000	260,000
8	570,000	140,000	180,000	72,000
9	1,800,000	1,100,000	500,000	550,000
10	1,200,000	1,100,000	730,000	1,800,000
11	540,000	440,000	170,000	350,000
12	310,000	260,000	150,000	220,000
13	230,000	170,000	230,000	160,000
14	880,000	920,000	700,000	950,000
15	150,000	120,000	80,000	160,000
16	460,000	300,000	160,000	360,000
17	90,000	96,000	96,000	100,000
18	80,000	80,000	72,000	84,000
19	2,100,000	1,400,000	1,100,000	1,800,000
20	100,000	120,000	96,000	130,000
21	1,200,000	1,300,000	150,000	240,000
22	3,000,000	2,900,000	1,700,000	1,700,000
23	240,000	370,000	410,000	280,000
24	250,000	250,000	200,000	96,000
25	180,000	170,000	400,000	310,000
Arithmetic average/ml	670,000	620,000	340,000	480,000
Percent of raw milk count average			51.0	77.0
Percent of average count loss			49.0	23.0
Logarithmic-average/ml.	390,000	350,000	220,000	290,000
Percent of raw milk log. average			56.0	81.0
Percent log. average count loss			44.0	19.0

cantly lower than the corresponding raw milk counts. The average of the group as a whole was 340,000 as compared with 670,000, or 51 percent of the average group count of the corresponding raw milks when computed on the arithmetic basis, and 220,000 as compared with 390,000, or 56 percent, when computed on the logarithmic basis. After 24 hours storage of the

after 24 hours storage in the refrigerator were only 620,000 and 350,000 for the arithmetic and logarithmic average correspondingly. Thus, the average of the percentage of the post pasteurization counts increased from 51 percent to 77 percent by the arithmetic calculation, and from 56 percent to 81 percent by the logarithmic calculation.

Analyzing the data presented in

Table 2 on the basis of individual sample counts, it was observed that in the majority of milks the post pasteurization counts made after storing the pasteurized milk in the refrigerator for 24 hours, increased sufficiently to make them similar in magnitude to the counts of the corresponding milks in their raw state. In a few instances, however, such counts were considerably higher. The differences were great enough to indicate that they were not due to errors in count, but to some other causes. In nine of the 25 milks the increase in the pasteurized samples following 24 hours storage in the refrigerator was of an insignificant value, but the loss in count ranged from 25 percent to as high as 80 percent. We intended to make a statistical study of these counts in order to determine the influence which such post pasteurization counts may have upon the grade placement of the milks. We found, however, that the number of samples at our disposal was inadequate for statistical purposes.

#### SUMMARY AND CONCLUSIONS

The effect of laboratory pasteurization on direct microscopic counts made with the carbolated, the Newman-Lampert No. 2, and the Acid-and-Water-Free methylene blue stains has been investigated. The study was made on two groups of 25 milk samples, and is to be regarded as of preliminary character. Films were made of the milks in their raw state, and after pasteurization, both on the days the samples were collected and again after 24 hours storage in a refrigerator at 4° C. The following tentative conclusions present the most pertinent points of this study:

1. With the Carbolated methylene blue stain the immediate post-pasteurization count loss appeared to be the greatest. Refrigeration of the pasteurized milks for 24 hours reduced this loss by 12 percent by logarithmic average and 15 percent by arithmetic average.

2. With the Newman-Lampert No. 2 stain the loss in bacterial counts after milk pasteurization was somewhat less than with the Carbolated methylene blue. However, 24 hours refrigeration failed to change this loss, and the loss is therefore regarded as permanent. No further loss in the bacterial count during such storage was demonstrable.

3. With the Acid-and-Water-Free stain the immediate post-pasteurization loss in the bacterial counts was the lowest after storing the pasteurized samples in the refrigerator for 24 hours. The loss was regained to a greater extent than in the Carbolated Methylene Blue stained slides. For the two sets of 25 milks tested, the average 24 hours storage post-pasteurization count with this stain, as compared with the raw milk count, was 89 percent by the arithmetic average and 93 percent by the logarithmic average, in the first series of 25 milks, and 77 percent and 81 percent correspondingly in the second series.

4. There appeared no evidence which might substantiate some current opinions that following pasteurization, heated bacteria generally disintegrate, especially so during the period of cooling.

5. The opinion is expressed that the heating process causes a denaturation of the constituents of the bacteria and a shift in the buffer influence of the milks. Such changes affect negatively the adsorptive power of the bacteria in relation to the methylene blue hydrochloride dye.

6. Refrigeration of pasteurized milks for 24 hours appears to cause a partial rehabilitation of the previously denatured constituents of the bacteria and reverses to a considerable degree the shift in the milk buffer influences, thus enabling the adsorption of the dye by the bacterial cells. The magnitude of gain in such adsorptive power appeared to be insufficient in the highly acidified

(Continued on page 83)

## METHODS OF CONTROL IN PRODUCTION AND MARKETING OF CERTIFIED MILK \*

J. HOWARD BROWN

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Department of Bacteriology, Johns Hopkins University School of Medicine, Baltimore, Md.

THE comparison of milk control with control of water supplies is not sound. Water is inorganic; milk is organic. Water does not sour nor decompose; milk does both. The source of drinking water is not animals that may be healthy or diseased, well nourished or poorly nourished; that of milk is pathogenic microorganisms tend to die out rather than multiply in water; in milk they may multiply. The control of a water supply is largely a chemical and engineering job but biology plays a much larger part in the production of good milk. If the "average Health Officer" wishes to see milk control pass out of the hands of the medical profession, let him continue to urge that it is purely an engineer's job. We may have safe milk but not better milk.

Why have some Health Officers rebelled against "super-milks"? Let's try to be honest. I think it is because they could not be sure that such milks actually represented different values; they did not have the personnel to carry out the necessary inspections and tests; and, besides, it was too much trouble. It is so much easier to see that the milk is properly pasteurized and let it go at that. Why should a Health Officer help support a premium milk? I can think of at least three reasons why he should. (1) He should want to encourage the production and use of better milk. (2) If a consumer is willing to pay a premium for a milk of better flavor, higher cream content, lower bacterial count, a milk from well-fed cows free from disease, at-

tended by employees under frequent medical supervision, a milk so labeled that he can recognize it, no one should have the right to deny it to him and the duty of the Milk Control Officials is to see that the milk is as represented. It is by the demand for "super-milk" that the quality of the general milk supply is raised. (3) Safety is not the only factor in good milk. Prevention of disease is only half the function of a Health Officer (the negative half); to promote health is the other half (the positive half). If he is unable to accept this responsibility he should at least accept and recognize the cooperation of other agencies that may be willing to undertake it. Such an agency is the American Association of Medical Milk Commissions and its component Medical Milk Commissions whose Methods of Control I shall describe only in such particulars as may differ from those commonly applied to other grades than Certified Milk.

#### ORGANIZATION

Few persons, even in our own organization, are fully aware of the form of organization which attends to the supervision of Certified Milk. I have tried to represent it graphically in Chart 1. In *Methods & Standards for the Production and Distribution of Certified Milk*,† four methods are described for establishing a Medical Milk Commission. 1. The oldest and most common method is for members of a Commission to be appointed by a city,

\* Presented at the Meeting of the Institute of Food Technologists, Philadelphia, June 7, 1948.

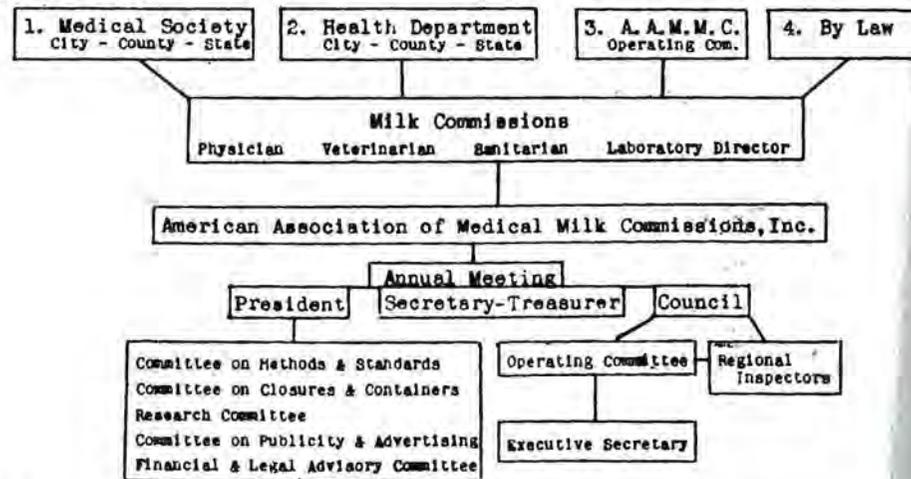
† Available from the office of The American Association of Medical Milk Commissions, Inc., 1265 Broadway, New York 1, N. Y.

county, or state medical society. 2. Sometimes a health department assumes the initiative and appoints a commission. 3. The Operating Committee of the American Association of Medical Milk Commissions may start a Commission, enlisting the cooperation of members of the local Health Department, physicians and veterinarians. 4. In Maryland the Commission is established by act of Legislature and in Connecticut the Dairy and Food Commission is the Milk Commission. Each Commission appoints or employs four "Supervisors", a Physician, a Veterinarian, a Sanitarian and a Laboratory Director, who carry out the duties which I shall describe.

& Standards for Certified Milk are adopted and revised. The President appoints the standing committees which are:—(1) The Committee on Methods & Standards, (2) The Committee on Closures and Containers, (3) The Research Committee, (4) The Committee on Publicity & Advertising, and (5) The Financial and Legal Advisory Committee. These committees function throughout the year and meet whenever occasion requires. The Council of ten members has charge of making the budget and is the interim authority between Annual Meetings. It appoints an Operating Committee which also includes a minority of members from the Certified Milk Pro-

Chart 1.

ORGANIZATION



Before the Commission can function as a certifying agency it must be recognized by the Council of the American Association of Medical Milk Commissions, Inc., which controls the copyright and use of the name "Certified Milk". The ultimate authority of the Association is the Annual Meeting of delegates from the Medical Milk Commissions. At this meeting a President, a Secretary-Treasurer, and members of the Council are elected, and Methods

ducers' Association. The Operating Committee meets several times a year to direct the business of the Association and employs an Executive Secretary with headquarters in the Central Office in New York City. The Executive Secretary edits *Certified Milk Magazine*. The Council also appoints Regional Inspectors who visit the various Commissions and Farms one or more times during the year. Contacts of the Commissions and Farms with

the Central Office are also maintained by monthly reports and correspondence. The first-hand responsibility for the production of Certified Milk rests with the "Supervisors" appointed by each Medical Milk Commission; Physician, Veterinarian, Sanitarian, and Laboratory Director. These maintain frequent contacts with each producing farm and make monthly or more frequent reports to their Commissions. The attitude of these Supervisors to the farms is one of cooperation and it is our experience that cooperation is the most effective method of control; Certified Milk cannot be produced successfully by police methods.

MEDICAL SUPERVISION

Chart 2, taken from the CONTENTS of *Methods & Standards*, lists the duties of the Physician, Farm Owner or Superintendent, and Employees in caring for the health of farm and milk-handling personnel. Except for tuberculosis and brucellosis, most of the diseases transmissible by milk have their origin in the personnel (e.g. septic sore throat, scarlet fever, typhoid fever). I do not have time to discuss all of the items under

CHART 2

- VIII. PERSONNEL, MEDICAL SUPERVISION, ETC.
1. Supervision and Reports
  2. Duties of the Physician
    - a. Medical Examinations
    - b. Medical Inspection
    - c. Special Examinations
  3. Duties of the Farm Owner or Superintendent
  4. Duties of Employees
  5. Management of Communicable Infections
  6. Records of Employees

this heading but in Chart 3 are listed three of the most important and on which I will comment.

a. Medical Examinations are thorough, including a physical examination and other items mentioned in the Chart. b. By Medical Inspections is meant that at least once a month the Physician visits the farm, is given an opportunity to interview (and examine if he thinks necessary) the employees and to be consulted by them. He inquires about their families, the existence of illness in the neighborhood and schools, etc. c. Upon occasion or call he makes Special Examinations and submits material for laboratory examination whenever he thinks advisable.

CHART 3

MEDICAL SUPERVISION OF EMPLOYEES

	Certified Milk	Other Milk*
a. Medical Examinations	For New Employees:—Medical history. Vaccination. Feces and throat cultures. X-ray of chest and Wassermann recommended. Cultures repeated in 30-60 days. For All Employees:—Repeat annually.	Not required of farm employees. Annual examination of employees at pasteurizing plant.
b. Medical Inspections	Nature and Purpose. Monthly or more often.	Not required.
c. Special Examinations	Upon call or occasion.	?

\* In this and some of the succeeding Charts the data under *Other Milk* are taken largely from the standards for "Approved Milk" in New York City. With slight modification they would apply to "Grade A", "Select", "Standard" or other pasteurized milks, other than Certified, sold in most communities. The requirements are not uniform and are often less severe than those for raw milk.

VETERINARY SUPERVISION  
Chart 4 lists the responsibilities of the Veterinarian.

#### CHART 4

##### VI. VETERINARY SUPERVISION OF THE HERD

1. Supervision and Reports
2. Herd Management
  - a. Identification of Cows
  - b. Herd Records
  - c. Milking and Calving Period
  - d. Pastures and yards
  - e. Feeding
  - f. Bedding
3. Disease Control
  - a. Isolation of the Herd
  - b. Admission to the Herd
  - c. Tuberculosis
  - d. Brucellosis
  - e. Withdrawals from the Milking String
  - f. Mastitis and Abnormal Milk
  - g. Notification of Veterinarian

He too visits the farm at least monthly, usually more frequently, and at times daily because he is likely to be employed in obstetrical practice and to treat the many minor accidents that befall the animals in a fair-sized herd. He thus becomes thoroughly familiar with the cows. In Chart 5 are detailed some of the major duties of his supervision.

There are likely to be more occasions for calling the Veterinarian than there are for the Physician. Because of his frequent visits and familiarity

with the conditions at the farm the Veterinarian sometimes makes an excellent Sanitarian.

#### SANITARY SUPERVISION

Buildings and Equipment (Chart 6) are under the supervision of the Sanitarian. The list of items in this section of Methods & Standards serves to indicate his duties.

#### CHART 6

##### V. BUILDINGS AND EQUIPMENT

1. Supervision and Reports
2. General
  - a. Location of Buildings
  - b. Surroundings of Buildings
  - c. Extermination of Flies and Other Insects
  - d. Exclusion of Rats and Other Vermin
  - e. Water Supply
  - f. Drinking Fountains or Cups
  - g. Toilets
  - h. Employees' Homes, Dormitories and Boarding Houses
  - i. Visitors
3. Cow Barns
4. Milking Barn or Room and Equipment
  - a. Construction and Condition
  - b. Cleanliness
5. Milk Receiving Rooms
6. Dairy Building
  - a. Construction and Condition
  - b. Rooms Required
  - c. Use
7. Dairy Building Equipment and Bottles
  - a. Necessary Equipment
  - b. Construction
  - c. Condition
  - d. Cleaning and Sanitizing

#### CHART 5

##### VETERINARY SUPERVISION OF HERD

	<i>Certified Milk</i>	<i>Other Milk</i>
Physical Examinations	Monthly.	Yearly.
Tuberculin Tests	Semi-annually. Additions retested in 60 days.	Yearly.
Blood Tests for Bang's Disease	On admission. Every 60 days if any reactors are found. Otherwise every 6 months.	Not required.
Admission or Readmission of Cows to Herd	Must be approved by Veterinarian or by laboratory examination.	Not required.
Isolation of Herd	From hogs, horses, dogs, fowls, diseased cows, and cows of non-certified herds.	Not required.
Feeding of Cows	Purpose:— Preservation of vitamins and flavor; uniformity throughout year.	No injurious foods.

#### CHART 7

##### VII. MILKING, MILK HANDLING, TRANSPORTATION AND DISTRIBUTION

1. Supervision and Reports
2. General
  - a. Employees' Clothing
  - b. Things to Be Avoided by Employees
3. Milking
  - a. Protection of Milking Equipment from Contamination
  - b. Preparation and Handling of Cows
  - c. Milkers' Hands
4. Milk Handling and Processing
  - a. Collecting and Filtering
  - b. Cooling
  - c. Processing, Bottling and Sealing
  - d. Labeling
5. Transportation and Distribution
  - a. Equipment
  - b. Temperature
  - c. Delivery Time Limit
  - d. Bottles from Quarantined Homes
6. Preservation of Vitamins and Good Flavor

The Sanitarian is also in charge of Milking, Milk Handling, Transportation and Distribution (Chart 7) although the supervision of milking may well be assigned to the Veterinarian. The Sanitarian is alerted for faults in equipment and dairy technique. No one is better able to insure the delivery of a milk of low bacterial count and good flavor to the consumer. Failure to do so may mean careless milking, milk stone in milking machines or pipe

lines, inadequate refrigeration, bad condition of milk-handling equipment, improper sanitizing, or almost countless other details. See Chart 8.

#### LABORATORY SUPERVISION

I now come to that part of the control of Certified Milk in which I take greatest pride. I am not one of those who think that the quality of a milk can be judged by studying valves and temperature charts; it is the milk itself that must be studied. The final result is in the bottle that goes on to the door step; all other things are subsidiary. The laboratory standards for Certified Milk are listed in Chart 9.

#### CHART 9

##### IV. LABORATORY STANDARDS FOR CERTIFIED MILK

1. Supervision and Reports
2. Certified Milk, the Basic Product
3. Pasteurization
4. Bacteriological Methods and Standards
5. Physical and Chemical Methods and Standards
6. Sediment and Flavor Tests
7. Certified Cream and Certified Fat-Free (Skim) Milk
8. Special Certified Milks
  - a. Vitamin D Certified Milk
  - b. Certified Milk-Homogenized
9. Modified Milk and Products Made from Certified Milk

#### CHART 8

##### SANITARY SUPERVISION

	<i>Certified Milk</i>	<i>Other Milk</i>
Inspections and Reports	Monthly or more often.	?
Buildings and Equipment	Location, construction, condition, cleanliness, use, sanitizing.	?
Milking, Milk Handling, Transportation, Distribution	Precautions for preservation of vitamins and flavor (e.g. exposure to copper and sunlight).	?
	Temperature below 50° F. from just after milking until delivery to consumer.	Not over 60° F. when received at city plant, 50° F. after pasteurization until delivered.
	To be delivered to consumer within 42 hrs. from day of production.	To be delivered within 48 hrs. after pasteurization; no time limit before pasteurization.
	Kept separate from all other milk until bottled. Source identified.	

### CHART 10

#### LABORATORY SUPERVISION

##### Certified Milk

##### Other Milk

Total Plate Count of bacteria per ml. of milk	10,000 for raw milk or before pasteurization; 500 after pasteurization (weekly count).	400,000 before pasteurization; 30,000 after (frequency?).
Coliform Count per ml.	10 for raw milk or before pasteurization; 1 after pasteurization (weekly count).	? before pasteurization; 1 after pasteurization (counts on request of Milk Division in N. Y.).
Blood Agar Plates	For recognition of streptococci and mastitis organisms (as requested by Physician or Veterinarian; required weekly by some Commissions).	Seldom done or of interest except during epidemics.
Spore Test	To detect contamination of milk by manure or dust.	Not required.
Brucella Agglutinins in Milk	Required to be negative (tested monthly or more often).	Not required (usually positive).
Butterfat	4.0 percent or as indicated on label.	3.3 percent.

I shall confine my discussion to the first few items which are summarized in Chart 10.

To meet these standards a milk must be good and, whether raw or pasteurized, I think it is as safe as a head of lettuce, a piece of rare meat, a radish, a piece of celery, or a drink of water. To have such a low bacterial count it must have been produced and handled carefully. To have fewer than 10 coliform bacteria per ml. (raw) the milking must have been clean and the milk handling equipment free from milk stone and must have been well sanitized. To have fewer than 1 coliform organism per ml. and to be phosphatase negative it must be properly pasteurized and put into clean sterile bottles. To pass critical inspection of a blood agar plate it must be free from streptococci pathogenic for man. To show relatively few bacterial spores it must have been clean milk before pasteurization. To be free from *Brucella* agglutinins it must have come from non-reacting cows and cannot have been mixed with ordinary milk.

In the APPENDIX to Methods & Standards are described methods for making the above and other tests. (Chart 11.)

### CHART 11

#### APPENDIX

#### APPROVED LABORATORY METHODS AND RECOMMENDATIONS.

1. Total Bacterial Counts
2. The Determination of Coliform Organisms
3. Heat-Resistant Bacteria in Milk
4. Examination for Hemolytic Streptococci
5. Suggested Routine Bacteriological Procedure
6. Diagnosis and Control of Mastitis
7. Sanitizing Methods and Materials
8. Determination of Curd Tension of Milk (American Dairy Science Association)
9. Titration of Ascorbic Acid in Milk (New Jersey Agricultural College)
10. Titration of Brucella Agglutinins in Milk
11. Nutritional Value and Flavor of Milk

I wish to illustrate some of these methods. In Figure 1 is shown a casein tryptone dextrose extract agar plate inoculated with 0.1 ml. of Certified Milk—raw. It contains 97 colonies, all of which were counted. The plate count is therefore 970 colonies per ml.



FIGURE 1



FIGURE 2

of milk. You will be interested to know something about the illumination of this plate and the counting of colonies.

Figure 2 shows four counting charts made of dull black paper. One of these charts is placed into the inverted lid of a Petri dish and over it, bottom side down, is placed the agar plate to be counted. By a strong oblique light the colonies appear white against the black background. If the plate appears to contain not more than 100 colonies the chart marked X1 should be used and all of the colonies counted. If the plate appears to contain from 200 to 500 colonies chart X2 should be used and all of the colonies in the four ruled sectors counted and the result multiplied by 2. Chart X5 should be used for counting plates containing 500 to 1000 colonies; chart X10 for plates containing more than 1000 colonies. The counting of four sectors at right angles to each other compensates for uneven distribution of colonies. Since the length of every arc of a radially ruled sector is in similar ratio to the circumference at that point, all areas from the center to the periphery of the plate are given proportionate evaluation, which is not true when a guide plate ruled in squares is used and consecutive squares are counted vertically and horizontally. Variations in the diameters of plates do not enter into

consideration when radially ruled charts are used. The radial ruling results in greater accuracy and simplicity of calculation.

For counting colonies in a blood agar plate similar charts ruled in black on transparent celluloid may be used, as shown in Figure 3. In this case strong transmitted light is used. In blood agar one may obtain not only a total count but a differential count. Colonies of the various streptococci are easily recognized and one becomes familiar with the udder flora of the herd.

Desoxycholate agar plates inoculated with 1 ml. of undiluted milk serve very well for the enumeration of coliform bacteria in Certified Milk. The plate

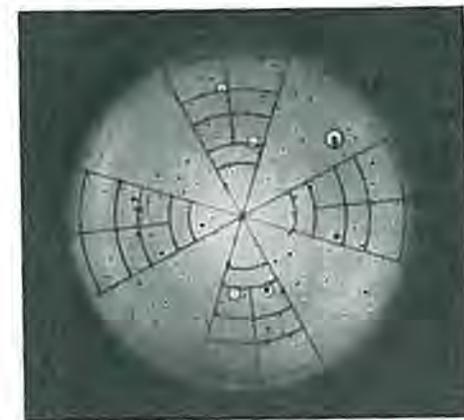


FIGURE 3

shown in Figure 4 is of 1 ml. of raw milk and contains only two characteristic red colonies of coliform bacteria. All Gram positive bacteria are inhibited either completely or so as to produce very small colonies. Should

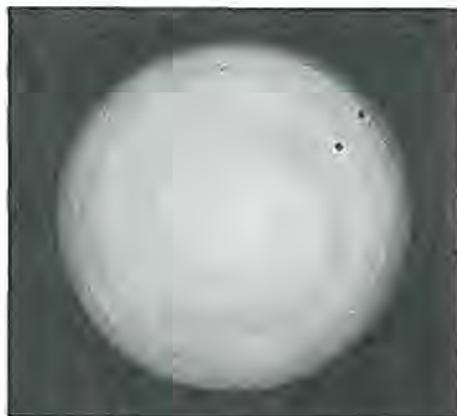


FIGURE 4

there be any non-lactose fermenting Gram negative bacteria in the milk they would form colorless colonies. This medium is excellent for the isolation of typhoid, paratyphoid and dysentery bacilli; *Proteus* does not spread. The coliform count does not parallel the total count and therefore has a different significance. When it is high it is time for cooperation of the Sanitarian and the Laboratory until the cause is found and corrected.

In Methods & Standards is described a method for titrating *Brucella* agglutinins in milk. I am aware that there have been reports of finding very few cows shedding *Brucella* organisms but whose milk was reported negative for agglutinins. However, I find that in these reports agglutination in dilutions of whey no higher than 1:25 or 1:50 was regarded as negative. With this interpretation I cannot agree. Recent investigation seems to indicate that the presence of agglutinins in the whey (or milk) is a more reliable indication of the shedder condition than are ag-

glutinins in the blood. Nevertheless, many cows with agglutinins in their milk are not shedders. During a visit to Denmark last summer I had an opportunity to observe their use of the so-called "Ring Test" for *Brucella* agglutinins in milk. In this test undiluted whole milk is used. To 1 drop of the concentrated stained antigen placed in the bottom of a Wassermann tube add 1 ml. of milk and mix immediately. Within 30 minutes the result may be read as shown in Figure 5. The phenomenon is explained by the fact that agglutinated organisms rise with the cream whereas non-agglutinated organisms do not. We have been experimenting with this test for more than a year and it has been incorporated into Methods & Standards (Ed. 1948). It is simpler and, I think, more sensitive than the whey titration. An improved antigen is available in small quantity from Mr. Ronald M.

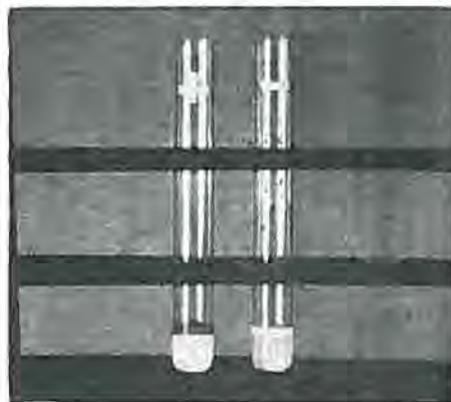


FIGURE 5

Wood, addressed care of this office or department.

Results to date indicate that if the milk of one cow showing agglutinins in whey diluted 1:50 is mixed with the milk of 50 negative cows, a readable positive result will be obtained by the Ring Test. Furthermore, an incomplete survey indicates that nearly all Certified milk is completely negative whereas every sample of other market

milk, raw or pasteurized, has been positive. Of course there are other herds than Certified which are negative but when milk is collected from farms over the countryside and mixed, it is invariably positive. What does this mean? Simply that some of the milk comes from reacting animals. The Ring Test or the whey titration are valuable for the control of Certified Milk.

In conclusion I wish to emphasize that although about 75 percent of Certified Milk is pasteurized, it differs from all other milk in that CERTIFIED MILK — PASTEURIZED MUST BE CERTIFIED MILK BEFORE IT IS PASTEURIZED. This can not be done if milk control starts and ends at the pasteurizing plant.

### Staining for Direct Counts

(Continued from page 74)

Newman-Lampert No. 2 stain to cause an increase in the count after 24 hours storage of the pasteurized milk in the refrigerator. It appeared to be marked enough to cause an increase of 12 percent by the logarithmic average and 15 percent by the arithmetic average, in the carbolated methylene blue counts. In the Acid-and-Water-Free stain, the regain in the adsorptive power of the bacteria was sufficient to bring the post-pasteurization counts to 83 percent by the arithmetic average, and 87 percent by the logarithmic average of the original raw milk counts.

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# INTERPRETATION OF U.S.P.H.S. ORDINANCE AND CODE REGULATING EATING AND DRINKING ESTABLISHMENTS

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A practical environmental sanitation program of any Health Department is not complete without an adequate food sanitation program—not a campaign. The Food Sanitation Program is of vital importance to the general public, to restaurant operators, and to health officers. To the general public, its importance is esthetic. This public demands food service under conditions not repugnant to their sensibilities. To the restaurant industry, it is important more on an economic basis. However, to the health officers, the program implements the elimination and prevention of food-borne diseases.

## NEED FOR REGULATION

The U. S. Public Health Service has been aware of the great need for improved methods of food regulations and food handling. A review of the statistics compiled from reports from state health departments since 1938 to 1944 shows the need for this work. During this seven-year period, there were reported an annual average of 44 disease outbreaks traceable to water, 41 to milk, and 212 due to other food sources. See Table 1. In other words, outbreaks traced to foods (212 total) have been nearly three times as numerous as those attributed to water and milk sources (total 85)—not mentioning sporadic cases of food poisoning which are never reported to health authorities.

The crying need for proper food sanitation is evident and understandable when one considers the findings of sanitarians out in the field. For instance, in Georgia during the last year, the following items are highlights of some of the inspection reports: Food so contaminated with rat excreta that it

was impossible to distinguish the food from the excreta; potatoes lying on floors directly beneath dripping sewage pipes; and roaches and maggots slithering and crawling through flour and sugar. In some kitchens, dishes were being washed in greasy, slimy single washtubs, the unchanged water thick as pea soup. Flies were crawling on cakes and exposed food. Of course, this is not to mention the victimized customers.

The need for proper regulation of public eating places has been further indicated by the interest shown by the U. S. Public Health Service and state health departments in the war against the "greasy spoon." In 1934, the U. S. Public Health Service proposed minimum sanitation regulations for the approval by the National Recovery Administrator in connection with the code of fair competition for the restaurant industry. The editions of 1935, 1938, and 1940 were mimeographed as tentative recommended ordinances. In 1943, the Ordinance and Code Regulating Eating and Drinking Establishments (Public Health Bulletin No. 280) was printed. This ordinance, or one based thereon, is now in effect statewide in 15 states and the District of Columbia, as well as in 176 counties and 373 municipalities located in 37 states and territories, with a population coverage of over 40,000,000. It has been adopted as state regulations in 25 of these states. Georgia adopted the ordinance in 1940.

## PROVISIONS OF ORDINANCE

There are two forms of this model ordinance. One provides for inspection, grading, and re-grading, (and this is what some eating and drinking

establishments do not like)—placarding so that the public can see the sanitation rating before entering. The alternate form is the non-grading type which provides for a single set of minimum requirements for all restaurants (except itinerant), and uses exclusively the permit revocation method. In both cases the minimum requirement must be fulfilled if the restaurant is to stay in operation. (The term "restaurant" in this ordinance refers to drinking as well as eating establishments.)

Under the grading system, an establishment meeting all the requirements is rated with an "A" classification, which is a perfect inspection report. An establishment receiving a "B" classification has met all of the minimum requirements necessary for proper food sanitation; while a "C" establishment has not even met the minimum requirements and is so placarded. Under the non-grading system there is no placarding.

The minimum requirements of this ordinance, grading or non-grading, are the same and are listed in the Ordinance and Code Regulating Eating and Drinking Establishments as recommended by the U. S. Public Health Service in 1943, Section 6—Sanitation Requirements for Restaurants. Summarized briefly, these minimum requirements are as follows:

All windows and doors are to be effectively screened, with doors opening outward and self-closing; and above all, the absence of flies. Each establishment shall have toilet facilities conveniently located for all employees—to be properly ventilated and in a clean condition, and not opening into rooms where food is being prepared. A safe and adequate water supply shall be available which has been approved by the state board of health. All lavatory facilities are to have hot and cold running water, soap and paper towels; the washing of hands after the use of the toilet is to be required. All utensils and equipment shall be in good condition and easily

TABLE 1  
SUMMARY OF DISEASE OUTBREAKS FROM WATER, MILK, AND OTHER FOODS, 1938-44

Year	Water			Milk and Milk Prod.			Other Foods			Undetermined			Total		
	Out-breaks	Cases	Deaths	Out-breaks	Cases	Deaths	Out-breaks	Cases	Deaths	Out-breaks	Cases	Deaths	Out-breaks	Cases	Deaths
1938	48	31,693*	17	42	1,685	27	70	2,247	25	8	882	3	168	36,507	72
1939	43	2,254	3	41	2,509	7	146	3,770	12	17	1,203	6	247	9,736	28
1940	43	44,184†	9	43	1,678	10	218	5,588	30	18	1,088	1	322	52,538	50
1941	60	12,039	24	37	1,049	4	223	6,070	53	20	1,876	24	340	21,034	105
1942	53	13,271	9	45	2,142	2	245	11,420	101	37	1,878	10	380	28,711	122
1943	26	5,712	15	40	1,590	7	285	13,938	33	38	2,525	1	389	23,765	56
1944	32	2,686	1	41	1,449	20	298	14,558	45	22	1,683	1	393	20,376	67
1938-44	305	111,839	78	289	12,102	77	1,485	57,591	299	160	11,135	46	2,239	192,667	500

\* Including a water-borne outbreak of gastroenteritis with 29,250 cases.

† Including a water-borne outbreak of gastroenteritis with an estimated 35,000 cases.

cleanable. (Enamelware is not recommended in any kitchen.) All cases, counters, shelves, tables, meat blocks, etc., used in the preparation of food shall be in clean condition. All eating and drinking utensils are to be thoroughly cleaned after each use. After thoroughly cleaning and rinsing all equipment and utensils, they should be properly disinfected. All plates and eating utensils which are exposed to the general public shall be sterilized for two minutes in water of 170° F. or disinfected with a chemical agent. (The U. S. Public Health Service recommends chlorine-containing compounds only for chemical disinfectants.) Utensils are to be stored in a manner to allow for proper protection from flies, dust, and exposure. Straws are to be protected from coughing, and all dispensing spoons and ice cream dippers to be kept in hot or running water. All liquid wastes are to be properly handled and disposed of, and a covered washable garbage receptacle to be available in every kitchen. All food and drink served to the public shall be wholesome and in a clean condition, while all milk is to be served in its original container unless an approved dispenser is available. There shall be no storage of food and drink anywhere accessible to rodents, flies, and roaches, and stored in such manner to protect the food and sewage contamination. It is hoped that the employees have proper personal hygiene, but it should be required that they are dressed in clean outer garments. All spitting and the use of tobacco, snuff, etc., is to be prohibited in the kitchen.

Besides the minimum requirements as listed above, an establishment which is to be rated with an "A" classification shall have complied with the following items:

The floors of every establishment shall be clean and of such construction as to insure proper cleanliness. All walls and ceilings shall be cleaned and of good repair; the kitchen walls must be smooth and washable to level of

splash. There shall be proper lighting and ventilation in all rooms where food is being prepared or served. It is important that the premises of any establishment be neat and clean, that living and sleeping quarters be entirely separated, and that clean lockers with sufficient space be provided for employees.

The interpretation of the U. S. Public Health Service of Section 9 (Disease Control), recommends that the requirement of food handlers' cards be waived at the discretion of the health officer. It also enlists the aid of the owner and proprietor in the elimination of workers suspected of having any communicable disease.

Owing to the limited number of trained personnel, engineers, and sanitarians, the program of food sanitation and the proper enforcement of the model ordinance have been gravely handicapped. It takes more than a few months in a training school to orient properly these field workers. As in the enforcement of all laws and regulations, common sense and reason are at a premium. Quite often restaurant operators are alienated by the picayunish and foolish methods of so-called food sanitarians. It is only when a thorough knowledge of this ordinance has been obtained by every health worker in the field, will any concrete advancement be made in the interpretation and enforcement of the U. S. Public Health Service Ordinance and Code Regulating Eating and Drinking Establishments.

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## THE DETERMINATION OF THE HOLDING TIME IN HIGH-TEMPERATURE, SHORT-TIME PASTEURIZING UNITS

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THE purpose of any holding time measurement is to determine the minimum time in which a particle of the material being pasteurized could pass from the point designated as the inlet end of the holding tube to the outlet end. The specific particle we are most concerned with is the bacterial cell since its destruction is the reason for pasteurization. Accurate timing of the period for which the milk and the bacteria in it are held at the desired temperature is extremely important. This fact is apparent when the time units in the short-time holding period are compared to those involved in the holder method of pasteurization. In the latter method the timing is done in minutes whereas accurate timing of a short-time holding period involves seconds or fractions of a second.

Many methods have been used to check the holding time in high-temperature, short-time holding tubes. The principle in all of the methods is the same, namely to provide some means of activation to an automatic or a hand-operated timing device when a charge of the test material in question first enters the holding tube and again when it reaches the outlet end. Salt has been used as a test material, the activation being due to an increase in conductivity of the water containing the salt molecules as it passed electrodes at the two measuring points. When dye is used, the activation is visual in that the appearance of color tells the operator when to punch his stop watch. The third method which has received some use involves charges of fluid with a temperature different from the main body of fluid moving through the tube.

This difference in temperature provides the activation to especially sensitive indicating or recording thermometers.

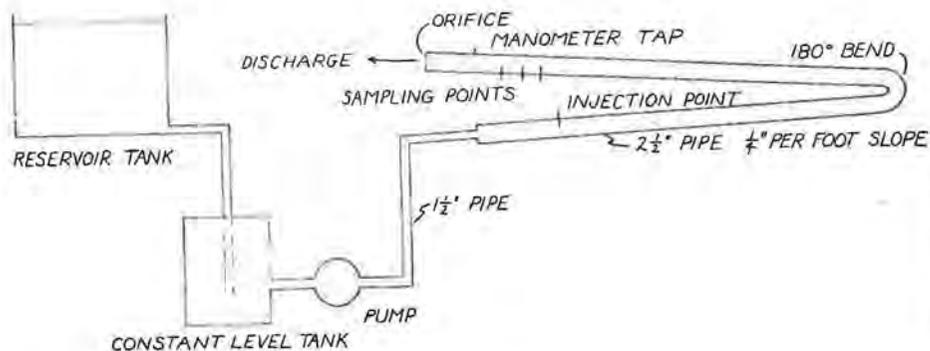
#### EXPERIMENTAL PROCEDURE

In the first two methods, the holding time is dependent on the passage of discrete particles, namely salt or dye molecules, through the tube. Such particles would be expected to be carried along at the same rate as would bacterial cells, but no proof of this was available previously. Part of the experimental work was carried out to find if this were true. In this experiment a 23-foot holding tube was constructed from 2½-inch sanitary pipe. A Waukesha 25BB pump was used to pump water through the system at an average velocity of about 1.3 feet per second. All of the experimental work was done with a setup consisting of a pump and a holding tube only. Since the tests were to deal with holding time measurements only, other standard apparatus such as the plate heating and cooling sections were not included.

The tube itself consisted of a straight run of about 12 feet, two elbows, end-to-end to form a 180° bend, and another straight run of about half the total length. All pipe, including the 180° return bend, was firmly mounted on supports which gave it a uniform slope of ¼ inch per foot. A sketch of the apparatus is given in Figure 1.

A hole was drilled near the inlet end of the holding tube to receive a short length of brass tubing through which small amounts of different test materials could be injected. Near the outlet end of the tube holes were drilled for three pieces of brass tubing

FIGURE 1 HOLDING TUBE AND AUXILIARIES



spaced 4 inches apart. Samples were drawn through these tubes by an electrically operated sampling device which was capable of withdrawing a sample large enough to work with in less than one-quarter of a second. Test material was injected into the holding tube with a solenoid, or an electromagnet, which pushed down the plunger of the syringe containing the test material. All electrical devices were controlled by one master timer which opened and closed the necessary switches in a regular order. This master timer consisted of a series of mercury switches which were tripped by pegs mounted on a drum that was made to rotate at a constant speed by a small electric motor. With this instrument the time between the injection of test material and the drawing of samples was exactly the same for as many tests as were considered necessary.

The time interval between the injection of test material and the withdrawal of samples was set by means of this timer at a value that would give samples from the front dilute portion of the charge of test material as it traveled past the sampling point. It was of interest to note that, under the conditions of the experiment, the "charge" or "slug" of test material

would take about 8 seconds to pass the sampling point. Small traces of test material would appear about 14½ seconds after the injection, and the concentration would increase sharply up to about 17½ seconds and then decrease less rapidly until about 23 seconds when no more could be detected. This elongation of the charge caused by the turbulent flow conditions in the tube resulted in a great dilution of the test material which had been introduced into the tube in about one-tenth of a second. From the public health point of view, the front of the charge is the important part since it contains the particles that are going through the tube in the shortest time.

Three different substances were used in the test solutions, salt, a dye called tartrazine yellow, and bacteria that could be easily detected, *Escherichia coli*. After each test with the living organism, the tube was sterilized by circulating a warm chlorine solution through it. Samples taken for blanks showed that this was sufficient to eliminate contamination. The most sensitive means available were used to analyze the various samples after they had been collected. A conductivity bridge capable of measuring 5 ppm. was used for the salt, a photoelectric colorimeter capable of measuring 0.2

ppm. was used for the dye, and plating on desoxycholate agar was used for the bacteria. The desoxycholate agar was used since *E. coli* forms bright red colonies which can be detected easily.

Comparing the concentration of the particular test material in a sample to that of the stock solution injected told what fraction of the injected stock solution had reached the sampling point in a given time of travel. Analyzing the data in this manner permitted direct comparison of results when different concentrations of stock solution were used, and also gave a means of comparing results obtained with each of the three different test materials. A large number of tests were run and all indicated that regardless of whether the test material injected into the tube contained salt molecules, dye molecules, or bacterial cells, they were carried along by the water at the same rate. These tests were performed with water at 80° F. A similar result was observed when salt or dye molecules were used with water at 160° F. The conclusion to be drawn from this is that the holding time of dye or salt molecules is the same as that of bacterial cells. This does not mean, however, that any test made with salt or dye is satisfactory since many methods are not sensitive enough to detect the very first particles at the front of the charge. The most desirable test would be the one that was the most sensitive to small amounts of test material at the front of the slug. None of the methods used in this experiment would be suitable for field use since few plants would be equipped with conductivity measuring apparatus or photoelectric colorimeters. In addition, the methods just described involved the drawing of samples and their analysis, all of which takes more time than should be devoted to a practical field test.

#### COMPARISON WITH FIELD TESTS

The methods commonly used for field tests have not been standardized

so it was decided to see how the possible variations in a given test could affect the apparent holding time determined by that test. The salt test is a practical method of measuring holding time, and it was investigated in greatest detail. In order to carry out the work on the salt test, a holding tube, again of 2½-inch sanitary pipe, with places for the insertion of electrodes was constructed. The electrodes used were mounted in lucite blocks in such a way that only the prongs of the electrodes projected out into the stream, the rest of the block being curved to fit the shape of the pipe. A "T" containing one of these electrodes was placed at the inlet end of the holding tube and another one at the outlet end. The Waukesha pump was used to pump about 8500 pounds of water per hour through the tube which was about 20 feet long. This rate was chosen to give holding times which were about 15 seconds. In the cases where automatic timing of the holding period was employed, a flow-timer manufactured by the Industrial Instruments Corporation was used. The electric clock in this timer would start when water containing salt molecules passed between the prongs of the electrodes at the inlet end of the holder and stop when the salt charge reached the electrodes at the outlet end. The concentration of salt necessary to activate the relays in this timer compared favorably with the low concentration found at the front of the charge in the previous experiment.

The amount of salt solution injected into the tube is an important consideration. This fact can be easily demonstrated with two sets of electrodes, one at the inlet end of the holding tube and one at the outlet end. With a properly adjusted injection, the indicating devices will be activated as the salt charge passes these two electrodes. If a very small amount of salt solution is injected, its passage by the first electrode will be indicated, but, by the time the charge has traveled the length of the tube, it

will be so dilute that it will pass the second electrode undetected. This is the extreme case, but holding times from those that are apparently infinite to the correct holding time can be obtained by changing the volume of salt solution injected.

In a series of tests in which calibrated syringes were used to inject different volumes of saturated salt solution, a regular variation was found between the apparent holding time and volume injected. The smallest volume giving a charge that could still be detected at the outlet end of the holder was about 1 cc., the apparent holding time for this volume being about 16 seconds. As the volume injected was increased, the apparent holding time decreased. This continued up to a volume of about 15 to 20 cc., for which the holding time was 14½ seconds. All volumes above 20 cc. and up to 150 cc. gave about the same holding time. Results are tabulated in Table 1, and Figure 2 is a graph of the data obtained in this experiment. It shows apparent holding time plotted against volume of saturated salt solution injected. The 1 cc. injection gave a holding time of 16 seconds. The holding

times for the 100 and 150 cc. injections were the same as for 50 cc., but are not shown on this graph to prevent crowding of the points for smaller volumes.

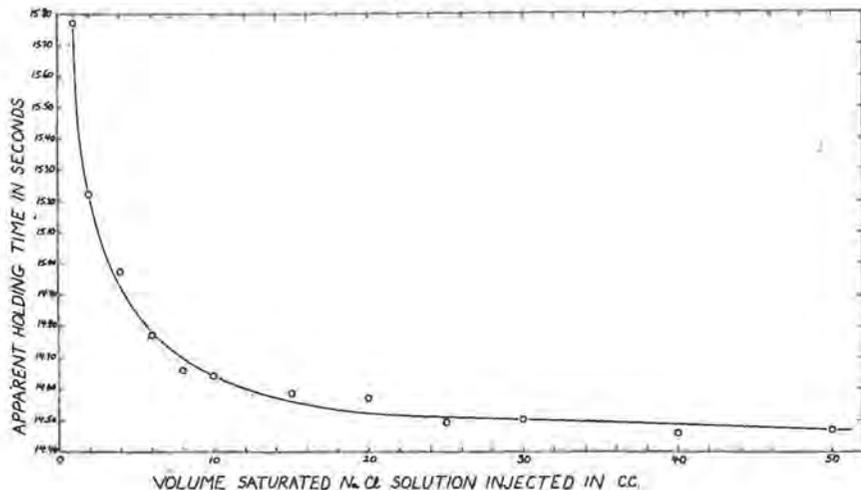
TABLE 1

APPARENT HOLDING TIME FOR DIFFERENT VOLUMES OF INJECTION OF SATURATED SODIUM CHLORIDE SOLUTION (WATER AT 80° F. IN 20.7-FOOT HOLDING TUBE)

Volume injected cc.	Apparent holding time sec.
1	15.77
2	15.22
4	14.97
6	14.77
8	14.66
10	14.64
15	14.58
20	14.57
25	14.49
30	14.50
40	14.46
50	14.47
100	14.50
150	14.43

Figure 2 is the plot of data obtained by injecting saturated salt solution into the tube through which 8500 pounds of water at 80° F. were pumped per hour. The experiment was also conducted at the same rate of flow with water at 160° F. and with a shorter tube with

FIGURE 2 THE EFFECT OF VOLUME ON APPARENT HOLDING TIME (80° F., 20.7 FT. TUBE)



the average velocity about one half the velocity used in the first two experiments. The variation of apparent holding time with volume injected was practically identical to that shown on the last table. From these results it appears that for a 2½-inch holding tube any volume above 20 cc. will be free from the effects of too small an injection. Less than 20 cc. gives false results, but injections of more than 20 cc. cause no error.

The concentration of the salt solution used can also affect the apparent holding time, although, when an ample size injection is used, slightly less than saturated condition does not cause a large error. When using a 50 cc. injection, it was found that all concentrations of salt solution from 60 percent saturated to 100 percent saturated gave holding times which agreed within 0.1 second. Concentrations less than 60 percent saturated gave false holding times. When using a smaller injection, the solution had to be more nearly saturated to give holding times which agreed within 0.1 second of the holding time for saturated salt solutions.

Figure 3 and Table 2 show the results of this experiment. In Figure 2, the apparent holding time is plotted against the concentration of salt solu-

tion used with 50, 25, and 10 cc. injections. The apparent holding time increases much more rapidly with the smaller injection as the concentration of the injected material is decreased. These graphs also show the effect illustrated on the last graph, that is, the difference in holding time for the 50, 25, and 10 cc. injections when saturated salt solution is used. These data indicate that with an ample volume injected, saturated salt solution is best, but a slight degree less than saturated will not cause a serious error in the holding time determination.

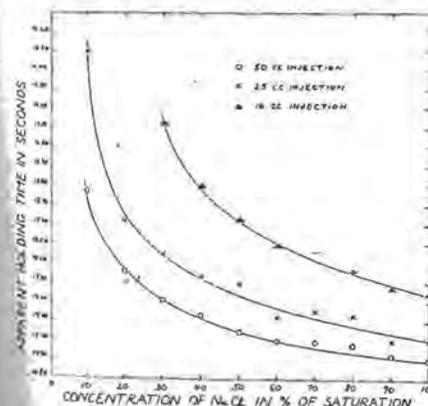
TABLE 2

THE APPARENT HOLDING TIME FOR DIFFERENT CONCENTRATIONS OF SODIUM CHLORIDE SOLUTION FOR 50, 25, AND 10 CC. INJECTIONS (WATER AT 80° F. IN 20.7-FOOT HOLDING TUBE)

Percent saturation of salt solution	Apparent holding time for injections of		
	50 cc. sec.	25 cc. sec.	10 cc. sec.
100	14.90	15.00	15.24
90	14.92	15.00	15.27
80	14.98	15.13	15.37
70	14.99	15.15	15.47
60	15.00	15.12	15.49
50	15.04	15.29	15.63
40	15.13	15.33	15.80
30	15.21	15.45	16.12
20	15.36	15.62	.....*
10	15.77	16.50	.....*

\* Concentration at second electrode not sufficiently great to stop clock.

FIGURE 3 THE EFFECT OF CONCENTRATION ON APPARENT HOLDING TIME



The automatic timing device was compared to manual stop watch timing, and both were found to give comparable results. The manual test required two operators, one to inject the salt solution and the other to work the stop watch. After a little practice at watching for the sudden deflection of the ammeter needle, the stop-watch operator could get consistent results in which the variation was only one-tenth of a second greater than the variation in the results obtained with the automatic timer.

EFFECT OF DIRECTION OF INJECTION

The direction in which the salt is injected into the tube can affect the

holding time. A number of nozzles were constructed which permitted the stream of salt solution to be injected in any desired direction. The variations due to this factor are especially important when the timed holding period starts with the instant of injection, that is, when the material is injected right at the start of the holding tube. Under a set of conditions such as these, a holding time of 15.33 seconds was obtained by directing the salt injection along with the direction of flow in the pipe. Turning the nozzle around so that the salt solution was directed against the direction of flow in the pipe gave a holding time of 16.03 seconds. Both of these tests were made by injecting at the same point, yet the results varied by 0.7 second. Injection of the salt solution across the flow (at right angles to the direction of the liquid in the pipe) eliminates this source of error. Another way to avoid such errors is to use a spray-type nozzle. One was constructed of 3/16-inch brass tubing with about twenty 1/16-inch holes drilled in it and the end sealed. Salt solution injected with this nozzle spreads out in all directions much as water comes out of a lawn sprinkler. This type nozzle gave holding times that were the same as those obtained by injecting at right angles. The spray-type nozzle has the advantage that no matter how it is mounted, it will always be a spray nozzle, whereas the straight tube used to inject at right angles could be mounted in such a way that it would inject with or against the stream and thus bring in the errors mentioned above.

Another way to minimize errors caused by direction of injection is to use two sets of electrodes, one at each end of the tube. If the injection is made a foot or so ahead of the first electrode, the direction of the injection has only a slight effect on the apparent holding time. To do this, a setup is needed in which there is a foot or so of

pipe after the plate heater before the actual inlet end of the holding tube. Results obtained using a setup in which the injections were made 19 inches before the first electrode with a 50 cc. injection are given in Table 3.

TABLE 3

THE APPARENT HOLDING TIME FOR DIFFERENT DIRECTIONS OF INJECTION (INJECTION 19 INCHES AHEAD OF FIRST ELECTRODE)

Direction of injection	Apparent holding time sec.
Spray-type injection	14.47
Right angles, downward	14.46
Right angles, across to left or right	14.49
With the flow	14.39
Against the flow	14.57

In this table, the effect of direction of injection is apparent although the magnitude of the effect is very much smaller than in the case where the timed period starts with the injection. The difference between holding time for with- or against-the-stream injection was 0.7 second for the latter case whereas it was only 0.2 second for the injection ahead of the first electrode.

#### CONCLUSION

Some of the things found to be important in measuring holding time are:

Dye, salt, and bacteria are all transported at the same rate by a stream of flowing water, and, if sensitive means are used to measure dye and salt, these substances can be used to measure the holding time of bacteria under the same conditions.

When using the salt test in a 2 1/2-inch tube, an injection of at least 20 cc. should be used, and a larger injection will cause no errors in the results.

Saturated salt solution is best, although a slightly less than saturated solution will cause no error when the volume injected is adequate.

Manual (stop watch) and automatic (electric clock) timing can both be made to give comparable results.

## AN AID IN RESTAURANT INSPECTION

A. APPLBY, B.S., D.V.M., M.S.

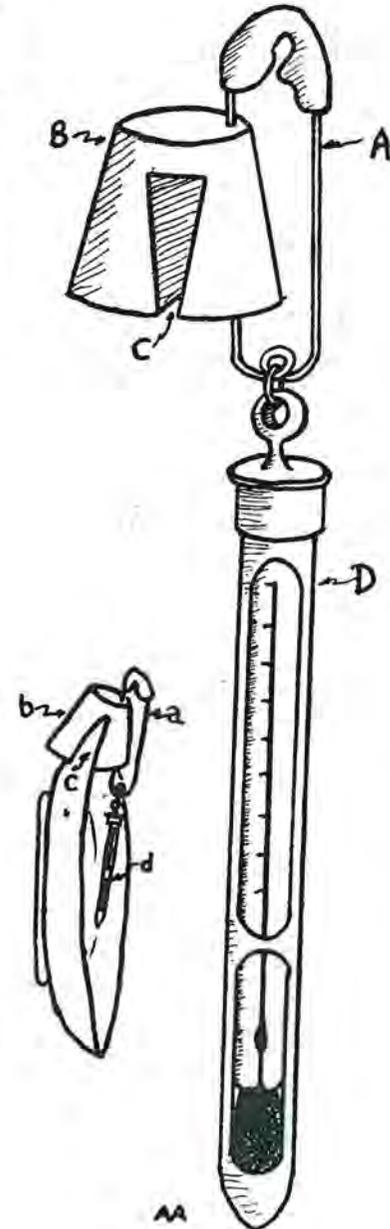
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THE piece of equipment described here was developed as an aid in the evaluation of the efficiency of dishwashing machines in restaurants, particularly in those cases where indicating thermometers on the machine are of questionable accuracy or are absent.

As shown in the diagram, a rubber stopper carrying a maximum-registering thermometer is attached to one of the dishes going through the dishwashing machine in a regular run. Being a maximum-registering thermometer, the reading at the end of the run will be that of the rinse spray at its hottest. To measure the temperature of the wash spray, the test dish can be pulled out at the end of the wash cycle.

Specifications are as follows: Safety pin—(A)—2" long; Rubber stopper—(B) No. 2, with a slot—(C)—1/16" x 3/4" x 1/8"; Thermometer—(D)—Taylor "Tell Tale" Maximum Registering, 3" long, brass armored, 140-220° F., catalogue No. 21810.

The design of the assembled outfit allows the thermometer bulb to rest at or near the center of the test dish. It is a compact piece of equipment, easily carried and easily used. The approximate price complete is \$6.90, which is the price of the thermometer.



## THE NATIONAL SANITATION CLINIC OF 1948 \*

A. W. FUCHS

Chief, Milk and Food Branch, United States Public Health Service, Washington, D. C.

BOTH public health workers and industry owe a debt of gratitude to the officers of the National Sanitation Foundation and the Michigan School of Public Health whose vision, hard work, and financial sponsorship made possible the first National Sanitation Clinic at Ann Arbor, June 22-25, 1948. More than 380 representatives of local, state, and Federal public health agencies, schools of public health, and the various segments of industry from all sections of the United States spent four full intensive days in discussion and exchanges of viewpoints on food sanitation.

The purpose of the Clinic was to arrive at the best current group judgments on some of the immediate problems in food sanitation, as a guide to industry and to sanitarians, and to delineate the longer range problems on which further research and education are needed. The sponsors envision this as the first of a series of similar clinics on a national and local scale.

The Clinic was divided into twelve separate panels or clinics, each in a separate field of food sanitation, and each consisting of a co-chairman and approximately six members representing public health, a similar group representing industry, several public health consultants, and a clerk. The panels deliberated separately and concurrently all four days except for two half-day general assemblies at which outline reports were presented by one of the co-chairmen of each panel. Questions for discussion were submitted in advance by the members of each panel

and were included in a work panel. On subjects of interest to more than one clinic, exchange and coordination of opinions were secured through joint meetings of panels, by conferences of representatives from different panels, and through discussions at the general assemblies.

A 300-page printed report of the proceedings of the First National Sanitation Clinic, dated July 1948, has been issued in a limited edition to the participants. After consideration by the Committee of Consultants of the National Sanitation Foundation, a large revised edition will be made available at an indicated price of one dollar per copy.

Among the results of the Clinic may be listed the agreement on answers to many pressing questions involving standards, procedures, and educational methods, a delineation of the specific fields in which further research is desirable, many valuable references to the literature, and a recommendation for the establishment by the National Sanitation Foundation of a testing laboratory where equipment, materials, and methods may be evaluated objectively. The outstanding result, however, was the development of mutual respect and confidence between public health and industry representatives and a greater appreciation of each other's problems.

The Clinic's recommendations do not, of course, have legal standing until they are incorporated in ordinances or official regulations. As Dr. Henry F. Vaughan has pointed out, "It is assumed that those who know its purposes and its methods will apply the conclusions with the wisdom and

statesmanship that is so vital to orderly progress in sanitation." It is the aim of the Public Health Service to include the recommendations of the Clinic in the agenda to be considered by the U.S.P.H.S. Milk and Food Sanitation Advisory Board in connection with the preparation of a revised edition of the recommended *Ordinance and Code Regulating Eating and Drinking Establishments*.

In the brief scope of this discussion it is, of course, impossible to do full justice to the proceedings of the Clinic. A summary of the highlights of the conclusions of each panel is all that can be attempted here.

*Sanitation Education.* The clinic on sanitation education urged the National Sanitation Foundation to establish a clearing house for ideas and methods to be employed in sanitation education. Included in the discussion were: (1) What sanitation problems will yield to health education? (2) For whom shall sanitation education be planned? (3) What media and methods are effective for reaching these groups—the spoken word, printed matter, photographs, exhibits, and conventions?

*Sanitation Supervision and Administration.* This clinic pointed to the need of uniform standards and supervision of food from source to consumer, and approved the development and improvement of uniform codes by the U.S.P.H.S. However, it suggested that the U.S.P.H.S. restaurant code be indorsed by other interested agencies and called the "Uniform Standard Code" instead of the U.S.P.H.S. Code.

The sanitation section of a health department should have the status of a major division and should include food and milk control but not drugs. The food sanitation program should be financed from tax funds, not from industry fees. Industry should, however, be encouraged, but not required, to employ qualified individuals for sanitary self-policing. It was agreed that supervisory personnel in health departments should have a college degree and

specialized training in sanitation; for other personnel, proper training courses should be established leading to a bachelor's degree in sanitation, preferably in schools of public health. On what constitutes a "work load" for a full-time sanitarian no decision was reached, but a maximum of 300 establishments was mentioned. Neither could agreement be reached on the need for routine medical examination of food handlers.

The clinic outlined the problems and responsibilities of health departments and industry. It approved the support by U.S.P.H.S. of training schools and refresher courses for sanitarians. It urged the National Sanitation Foundation to undertake appropriate research in food sanitation, to distribute the results of research, and to develop a testing laboratory.

*The U.S.P.H.S. Eating and Drinking Establishments Code.* Unlike the other panels, the one considering the Code was not limited to one field but discussed all subjects covered by food establishment codes. It was able to consider only a few of the 194 proposals contained in the prepared agenda. It agreed that a representative of the retail food industry should be a member of the U.S.P.H.S. Milk and Food Sanitation Advisory Board, and that the scope of the Code should be broadened to include all retail food establishments such as bakeries, delicatessens, groceries, meat, fish, and poultry markets, confectioneries, fruit and vegetable shops, locker plants, and soft drink dispensaries. Subject to control as eating and drinking establishments should be in-plant feeding establishments, hospitals, boarding houses and transient guest houses with facilities for five or more people, institutions, school lunch rooms, private and semi-private clubs, church kitchens, and food-vending vehicles.

Considerable discussion was centered on grading. It was decided that both the grading and the non-grading types of ordinance should be retained, but

\* Presented at the 35th Annual Meeting, International Association of Milk and Food Sanitarians, Philadelphia, October 22, 1948.

grading where used should be based on numerical scores with partial credit for partial compliance. As an additional method of enforcement, provision should be made for the serving of a closing order to be effective after 48 hours if violations listed have not been corrected.

A number of decisions were reached on construction standards. The submission of plans for new establishments in advance of construction should be encouraged but not required. Vestibules between the toilet and food-handling rooms should not be required, even in new establishments. Lavatory facilities should be convenient to food preparation areas as well as to toilet rooms. By "convenient" is meant on the same premises, and, in new establishments, on the same floor. Detailed plumbing requirements were approved for the protection of water supplies against cross-connections and backflow and for the protection of food and equipment against sewage backflow, by means of suitable air gaps or vacuum breakers. Water dispensers, if used, should be so constructed that no portion thereof comes in contact with the rim or inner surface of the glass during filling. If drinking fountains are provided they should be of an approved sanitary type. To protect foods on display, "sneeze boards" should be so designed that the direct line from the customer's mouth to the foods will be intercepted by glass or other partitioning. Drinking straws and toothpicks should be either individually wrapped or kept in sanitary dispensers protected from handling and other contamination during filling, storage, and dispensing.

Perishable foods should be kept below 50° F., preferably below 40° F., in daily refrigerators, and below 40° F. if stored more than four days. Prior to refrigeration, hot foods may be air-cooled either down to 150° F. (some considered 140° F. as safe), or for not more than one hour. To promote

rapid cooling, sandwich and salad mixtures, and chopped, cut, boned, or left-over food should be refrigerated in shallow containers, not over 3 inches in food depth. Hollandaise sauce, since it cannot be satisfactorily refrigerated, should not be used for more than two hours after preparation. Milk in quart containers or bottles packaged at the milk plant may be permitted in the preparation of mixed drinks at fountains and in dispensing milk at hospitals and institutions, pending further research on the possible hazards involved in not using original individual containers. Finally, in view of the recent advances in the effectiveness and use of insecticides less toxic to humans, sodium fluoride was disapproved for use in food preparation areas.

*Dishwashing.* The clinic on dishwashing suggested the following field tests of utensil cleanliness: (1) sight and touch, (2) water break test for grease film detection, (3) carbon dioxide test, (4) adhesion test for sugar, and (5) the alkali test with test papers or liquid indicators; but the field-applied soil test was not recommended. The swab test, with the U.S.P.H.S. maximum count standard of 100, was approved provided the dishwashing equipment and methods are satisfactory.

For machine washing, scraping or prerinsing of dishes is desirable, and wash water temperatures above 140° F. and up to 160° F. were recommended. Effective washing by machine is dependent on time, volume, and jet pressure of the wash water. The return of rinse water to the wash water tank is desirable for maintaining the temperature and cleanliness of the wash water, but to overcome the resulting dilution of detergent automatic detergent dispensers should be provided.

In single-tank door-type machines the rinse water temperature at the dish should be at least 170° F., at a flow pressure of 15 to 25 p.s.i., and at a

flow rate of 1½ gal. per 20" x 20" dish-rack for a period of not less than 10 seconds. In single-tank conveyor-type machines the wash water temperature should be at least 160° F. and the curtain rinse water temperature at least 170° F. at the dish. Push-through machines with curtain rinse were not approved, as rinse time standards cannot be set. While automatic timing controls for wash and rinse cycles of single-tank door-type machines are desirable, they should not be made mandatory as yet. Automatic rinse-temperature stops are still in need of improvement. Thermometers of a type and location as to be easily readable should be provided on all wash and rinse positions.

Hot water heaters for mechanical dishwashers were under discussion. Instantaneous gas-fired types cannot supply enough water at the proper temperature. Booster types are unsatisfactory unless a definite minimum temperature can be maintained in the water supplied to the booster. Storage type heaters having a peak-hour capacity rating are generally the most satisfactory type.

For manual diswashing a three-tank system was recommended, with sanitization either by total immersion in 170° F. water for 30 seconds (instead of the usual 2 minutes) or by equivalent chemical treatment.

Additional research was suggested on the design of wash racks to improve wash patterns, water heaters, low-temperature machine rinses containing chemical bactericides, improvement of automatic temperature stops, and immersion type dishwashing machines.

*Detergents and Sanitizers.* This clinic considered quaternaries, detergent-sanitizers, and detergents.

Under the right conditions and in proper concentration quaternary ammonium compounds are bactericidal. The F.D.A. phenol coefficient is not a proper test of their bactericidal efficiency, however, and other tests should

be devised. Their germicidal activity should be evaluated on the basis of 99.99 percent kill in one minute, and bacteriostasis must be eliminated by use of a suitable inactivator or controlled dilution technique. Quaternaries have a selective action on bacteria, and are not effective against *M. tuberculosis*. Their germicidal activity increases with pH and temperature, but is adversely affected by anionic detergents, soaps, alkaline silicates, fats, organic materials like egg yolk, casein, and lecithin, and by hardness and other minerals in water. The residual concentration is not a measure of bactericidal efficiency of quaternaries in different waters. A committee was appointed to study laboratory methods for testing bactericidal efficiency, including those suggested by Mallmann and by Weber and Black. To obtain further knowledge, quaternaries should be permitted for food processing sanitization under adequately controlled conditions.

Detergent-sanitizers are not recommended as yet as a sole sanitizing agent, but they may have useful application at dairy farms, milk plants, and food plants, and their use should not be discouraged.

Detergents for use in mechanical dishwashers should contain organic dispersing agents to improve their free-rinsing properties. Polyphosphates are sequestering agents which may also act as detergents. Water minerals and organic matter have a detrimental effect on detergency. Further study was recommended on performance tests of detergents. No agreement was reached on the best method of controlling detergent feed to dishwashing machines, but effective methods are in use, and the hard-block method was considered superior to manual feeding.

*Food Service Equipment.* This clinic recommended that to permit ready cleaning and servicing of equipment at least 4 inches of unobstructed space be provided between walls and adjacent

equipment, and 6 inches clearance above the floor for equipment on legs. The desirability of setting heavy pieces on solid bases needs further study. Only sealed, splashproof motors of the 3-A sanitary type should be installed on food equipment.

The clinic also suggested that garbage be ground and discharged into the sewer; in warm climates it should be stored in cold rooms. Although pressure can washers are desirable, hand washing is necessary in small establishments.

Much discussion was devoted to construction and design standards for food equipment. Materials for working surfaces should be impervious, corrosion-resistant, smooth, easily cleanable, durable, resistant to chipping and crazing. Joints and seams should be smooth, easily cleanable, without crevices, with all hollow spaces filled or sealed, and unnecessary ledges eliminated. Rounded corners are desirable with a minimum radius of  $\frac{1}{4}$  inch, and edges and exposed corners ground smooth. Undershelves may be slatted or solid, in short sections that are easily removable for cleaning. Legs should be made of welded or seamless tubular metal.

The construction of cooks' tables, bakers' tables, dish tables, drawers, cabinets, and sinks was also discussed. It was agreed that sinks for manual dishwashing should have three compartments, each not less than 16" by 14" deep, and, if near the wall, mounting with brackets is preferable to legs. Steam outlets should be provided for cleaning equipment. Separate future sub-clinics were recommended on (1) equipment for baking, frying, roasting, and broiling, (2) food preparation machinery such as slicers, choppers, cutters, mixers and grinders, (3) steam cookers and peelers, (4) refrigeration equipment, and (5) utensils and kitchen tools.

*Soda Fountain and Luncheonette Equipment.* This clinic discussed and

accepted the nomenclature prepared by the Soda Fountain Manufacturers Association. It then took up general construction principles and the design of specific equipment.

The general aim is to minimize the shelter of vermin and dirt. Stainless steel or monel metal is most desirable for fountain sinks and workboards, but too expensive for kitchen and scullery sinks. Angle-iron construction was discouraged. There should be no rough or open seams, and corners should have a minimum radius of  $\frac{1}{16}$ " with a larger radius wherever practicable. Solders containing a minimum of antimony, cadmium, lead, or zinc are preferred, and these toxic metals should be eliminated by the industry as soon as practicable.

If the space between adjoining fountain units is less than 8 inches it should be completely sealed at the top and on the operator's side. The space between the units and the inside of the counter should be protected by splash boards at the back and the ends of the units. To permit access to the space behind the units, counters should be built off the floor and elevated foot rests should replace counter steps. Further study is needed on the possibility of eliminating the space under fountain units or rearranging pipes and drains to provide a 6" clearance for ready cleanability. Floor sinks should not be installed where they are not accessible for cleaning.

As for specific equipment: syrup pumps of sanitary construction are essential. Wood cutting-boards should be removable, with smooth surface free of cracks. Compartment lids and the breaker strip or collar which forms the seat for the lid should permit no seepage into any unpackaged food compartment. Refuse chutes must be so constructed as to prevent material falling outside the garbage receptacle. All food storage compartments, except ice cream compartments, should be provided with not less than 1 inch drains except for a  $\frac{3}{4}$ " drain from the syrup en-

closure. Rubber tubing is not approved for drains for the drip plate and chipped-ice pans. Refrigerant coils in food compartments should be either of the finless brushable type or enclosed in a housing; those immersed in water bath coolers should be accessible for brushing and the water bath should be drainable for cleaning.

Utensil washing equipment at soda fountains was also considered. To prevent contamination of wash water, a dumpsink was recommended on all fountains for scraping service utensils before washing, equipped with running water, removable strainers, and a drain. Separate drainboard space should be provided for clean and dirty utensils, sloped toward and away from the wash sink, respectively, with a pitch of  $\frac{1}{4}$ " per foot. Where utensils are manually washed at fountains a 3-compartment basin should be required, but if washed elsewhere only one fountain sink is necessary. If only glassware and spoons are washed, each compartment should be at least 8" wide, with  $6\frac{1}{2}$ " water depth and  $3\frac{1}{2}$  gal. capacity. Tumbler rinsers were disapproved, as they are frequently misused for washing glasses and may cause backflow. Brushing is desirable for proper cleaning of glasses. Ice cream dipper wells should have at least a 4" by 4" top and be equipped with running water or spray. Water inlets of the overhead type were recommended, with at least a 1" air gap above the spill level of the fixture.

*Food Handlers Training.* As training courses have improved sanitary conditions in food establishments, this clinic recommended their inauguration and continuation for all classes of food handlers. It urged that the National Sanitation Foundation study techniques for evaluating their effectiveness.

Adult vocational training should be recognized as the standard course, but induction training and on-the-job courses are of definite value and deserve encouragement. A standard

course of five 2-hour classes, at the rate of 2 or 3 per week, was recommended and a subject outline presented. Courses may be conducted not only by health departments but also by others. Certificates of attendance should be issued, by the official agency only, to those completing all 5 classes. All supervisory personnel as well as all food handlers should attend the basic course, but mandatory attendance was not recommended. Permanent class record cards for those completing the course are desirable. The National Sanitation Foundation was urged to inaugurate a training program for instructors, with provision for regional seminars, and to furnish a minimum basic instructor's kit.

*Vending Machines.* Although information concerning disease transmission through food and drink vending machines is meager, nuisance conditions and high bacterial counts have been observed, so that in the opinion of this clinic the attention of health officers is justified.

Coin-operated vending machines are of two types: (1) Packaged and bulk foods requiring little attention to sanitation, and (2) food or drink that is heated, cooled, or mixed, thus requiring sanitary control. Such machines should be so constructed, located, maintained, and operated that the delivered products are clean, wholesome, and free from contamination. They do not, however, need to be considered as manufacturing plants. Nation-wide uniformity of sanitary standards is desirable. Accordingly, detailed standards are suggested covering the construction and operation of coin-operated cup-type vending machines for dispensing hot and cold liquids other than milk. These standards are not necessarily applicable to other types of vending machines such as for sandwiches, bottled drinks, and other packaged foods. On many of the suggested standards further research is considered necessary.

*Bars and Taverns.* It was the belief of this clinic that the adoption of a uniform sanitary code for the control of all public eating and drinking establishments by health departments should be encouraged. The grading of bars and taverns is not, however, considered advisable. Sanitation inspection service can be improved by adequate training of sanitarians and by industry use of trained personnel. Education should be directed first at management and then the employees, in cooperation with trade associations.

Adequate lighting of the bar and the working spaces under the bar is believed to promote sanitation. Thorough washing of glasses after each use with suitable brushes and detergent is essential, and the prime need is for a satisfactory detergent-sanitizer. Ice should be from a safe source and contamination avoided during handling, delivery, storage, and serving. Crushing ice on delivery trucks together with subsequent handling may contaminate the ice used in drinks. Adequate control of insects and vermin is necessary. The code should contain definite standards for the construction, size, and number of toilet fixtures, possibly one fixture for each 25 persons of establishment capacity, with substitution in male toilets of urinals for all but one water closet. Ultra-violet radiation is not considered acceptable as the sole sanitizing agent for glasses. For odor control only safe methods, such as air conditioning or activated carbon panels, should be recommended rather than commercial deodorants.

*Food Protection.* For refrigeration of raw meat, raw poultry, eggs, milk, cream, cheese, and cooked protein sandwich fillings stored for less than 7 days, this clinic recommended a maximum temperature of 40° F. All refrigerators should be equipped with a reliable, readable thermometer located in the warmest zone near the top. Defrosting of frozen foods immediately before use was recommended, in the refrigerator

in the case of frozen meat, poultry, and fish.

For hot foods held for service, the desirable minimum temperature at the center is 150° F. but further study is needed to determine if a lower temperature, such as 140° F., is safe. Hot foods of animal origin and those containing protein, including custards, should be cooled rapidly from 150° F. to 40° F.

The food contact parts of all food preparation machines should be easily dismantled for cleaning. Original individual milk containers should be served unopened, but the cap may be removed in the presence of the consumer. A recommended design of sugar container is one in which a spoon cannot be inserted. Samples of food to be tasted should be placed on small dishes; spoons used for tasting should not again be put into food until sanitized. Food handlers with cuts, lesions, pimples, boils, sores, or skin infections on hands or arms, and those with head colds, throat or lung infections, should not be permitted to handle food or utensils until the condition is remedied. The last recorded recommendation of this clinic was that cats should not be permitted in food establishments.

*Rodent and Insect Control.* The recommendations of this, the twelfth and last clinic, were so meaty and numerous that a comprehensive picture cannot be presented in a brief summary. Consequently, only a few points will be mentioned.

First came a general discussion of the responsibilities of health departments, pest control operators, the food industry, and of research needs. A well-balanced municipal rodent control program should include general sanitation, ratproofing and rat eradication in existing business buildings, a rat eradication program on an area basis, and the ratproof construction of all new buildings. A continuous pest control service was recommended for all food establishments. The most effective

(Continued on page 112)

## MILK and FOOD SANITATION

### ABSTRACTS OF SOME OF THE PAPERS PRESENTED AT SYMPOSIUM OF SANITATION STUDY SECTION, DIVISION OF GRANTS AND FELLOWSHIPS

NATIONAL INSTITUTE OF HEALTH, U. S. PUBLIC HEALTH SERVICE,  
WASHINGTON, D. C., JANUARY 26-27, 1949

#### REVIEW OF RESEARCH GRANTS AND FELLOWSHIP PROGRAM

HENRY L. ROHRIG

*Executive Secretary, Sanitation Study Section, Public Health Service*

THE grants program is intended to support basic and fundamental research. Already 127 applications for sanitation projects have been submitted to the Division of Research Grants and Fellowships, and 62 have been approved for payment, amounting to \$553,646. These acceptances constitute 49 percent of applications in this field as compared to 72 percent for all projects. Applications are accepted on the

basis of their basic value and their public health importance. Many of the applications were either testing projects or only locally important. Funds will soon be so limited that priority lists and more intensive evaluation will be necessary. If a project is to be started during the next fiscal year which begins July 1, the application must be submitted before April 1, although the project may begin later than July 1.

#### FROZEN HOMOGENIZED MILK FOR ARMY USE

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FROZEN homogenized milk in individual containers has been acceptable for consumption after three months, and at times up to nine months. However, some milk is unacceptable in less than three months, although apparently processed in the same manner as the acceptable milk.

The milk used in this study was pasteurized at 155° F. for thirty minutes, and packaged in ½-pint and 1-quart paper containers by a commercial dairy. The milk averaged 3.8 percent of fat.

The length of time that the milk remained normal depended on the freezing and storage temperatures. Milk frozen and stored at -32.8° C. was found to be normal for 115 days, and presumably longer. The best results were obtained with milk frozen and stored at -40° C. When the latter was stored at -10° C., the appearance and flavor was off if the storage time exceeded 50 days.

During the freezing process the concentration of milk solids was highest in

the bottom third and lowest in the top third. This distribution was not affected by changes in freezing or storage temperature.

The bacterial count was only slightly lowered by the freezing and storage temperatures, and there was no cryophilic growth.

Homogenized milk when thawed as compared with fresh homogenized milk did not develop acidity, off flavor, or bacterial counts significantly different when held at usual storage temperatures.

Homogenized milk of good quality could be held up to 120 hours at 1.7° C. before freezing without adversely affecting the keeping quality of the frozen product although there was a slight tendency for off flavors to be more pronounced as the age of the samples before freezing was increased. There was no significant change in the bacterial content of the samples either in the 120 hours that they were held at 1.7° C. or in the 89 days that they were held in the frozen state at -17.5° C., nor was there any correlation between the degree of separation and the age of the milk prior to freezing. The acidity as shown by titration and by pH determinations did not vary significantly either before the samples were frozen or while they were held in the frozen state. These finds should not detract from the fact that the milk should be frozen as soon as possible after processing.

Apparently before homogenized milk can be held in the frozen state for long periods of time before use, methods must be developed for the preservation of flavor quality and the prevention of separation of the milk solids which is evident at times on thawing.

To this end experiments were undertaken to determine the ability of certain chemical agents to act as stabilizers. With the exception of ascorbic acid the quantity of each chemical required to impart a detectable flavor to the milk was determined and a slightly smaller

quantity was then added to the milk to be frozen.

The chemicals used and their concentration per liter of homogenized milk were as follows: (1) ascorbic acid, p. 1 gram; (2) pectin, 1 gram; (3) calcium chloride, 0.5 gram; (4) urea, 3 grams; (5) carboxyl methyl cellulose, 0.5 gram; (6) sodium citrate, 2 grams; (7) disodium phosphate, 1 gram, and (8) 30 percent hydrogen peroxide, 1 ml. A ninth group of samples to which no chemical was added served as a control group.

The samples were frozen and stored at -17.8° C. They were removed and thawed at intervals of about 10 days beginning with the fifth day of storage, for determination of the degree of separation and of the flavor.

The milk samples containing pectin, calcium chloride, carboxyl methyl cellulose, and disodium phosphate each showed separation and flavor deterioration at about the same time as the control group. Urea and hydrogen peroxide each delayed the occurrence of separation but did not help to preserve the flavor of the milk. Sodium citrate added at the rate of 2 grams per liter was found to be of value as the milk did not show separation until it had been stored for 145 days although flavor deterioration became evident after 105 days of storage. Noticeable separation had taken place and flavor deterioration had begun in the control samples after a storage period of 65 days. The milk with added ascorbic acid showed separation at the same storage age as the control samples, but its addition preserved the flavor slightly longer than did the addition of sodium citrate.

To establish further their value as stabilizers, 2 grams of sodium citrate per liter of milk with and without 0.1 gram of ascorbic acid were used under different storage conditions, especially to test their value when milk was frozen at a low temperature and subsequently held in a frozen condition at a higher temperature.

The addition of the sodium citrate-ascorbic acid combination doubled the time that homogenized milk frozen and stored at -11.5 and -17.8° C. remained normal in appearance and flavor in comparison with the control samples, and, furthermore it was found materially to increase the usable storage life of milk frozen at a low temperature and subsequently stored in a frozen condition at a higher temperature.

The addition of 2 grams of sodium citrate and 0.1 gram of ascorbic acid doubled the time that homogenized milk frozen and stored at -11.5 and -17.8° C. remained normal in appearance and flavor in comparison with the control samples. Also, it materially increased the usable storage life of milk frozen at low temperature and subsequently stored in frozen condition at a higher temperature.

## INSECTICIDE STUDIES WITH DAIRY CATTLE

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AND

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WHEN certain insecticides of the chlorinated hydrocarbon type are used to control insects on crops fed to milk cows, it is possible that milk may contain appreciable quantities of these insecticides. This possibility has been demonstrated where pastures or forage crops have been sprayed with DDT and the cows consumed the DDT on the feed and as a result secreted it into the milk. It has also been demonstrated that DDT can be absorbed through the skin of animals. Therefore, when cows are sprayed with DDT for the control of flies, DDT will appear in the fat portion of the milk.

Under the Research and Marketing Act of 1946 the Bureau of Dairy Industry is conducting research on the relation between the amount of insecticide ingested by a dairy cow and the amount appearing in the milk. The amount of DDT in the hay was calculated from the total organic chloride in the residue following the procedure of Carter and Hubanks. The amount of DDT in the milk was determined by the colorimetric method of Schechter as modified for use with milk samples.

The average insecticide residue content of the alfalfa treated with 0.6 pound

per acre was 15 p.p.m., while the average residue content of the alfalfa treated with 2.4 pounds per acre at time of feeding was 114 p.p.m.

Average daily intake	Average concentration in milk	Average daily output in milk	DDT in milk during feeding period
727 mg.	6.4 microgram	136 mg.	18.6%
553 mg.	7.3 microgram	165 mg.	22.4%
303 mg.	2.2 microgram	51 mg.	16.8%
109 mg.	0.5 microgram	5 mg.	4.8%

In 1948 the experiment was enlarged to include chlordane and chlorinated camphene along with DDT. The fields were sprayed at the rate of 1 pound of DDT per acre, 1 pound of chlordane per acre, and 1½ pounds of chlorinated camphene per acre.

No results are as yet available on this winter's feeding trial.

In another series, crystalline DDT dissolved in soybean oil was administered in capsules.

DDT fed daily	DDT in milk
50 mg.	0.23 p.p.m.
250 mg.	1.33 p.p.m.
1000 mg.	4.15 p.p.m.

It seems that the quantity of DDT in the milk may be greater when it is fed as a residue in the hay ration.

No data is available on the effect of ensiling hay crops on the destruction of the insecticide, but is under investigation. Previous data show that DDT is fairly stable in baled hay.

Preliminary data show that when barns are sprayed with a 5-percent solution of DDT and the cows with a 0.5-percent solution, only often enough for fly control, the DDT content in the milk ranged from 0.16 to 0.27 p.p.m.

In summary, the U. S. Department of Agriculture is conducting research on various phases of the relation of insecticides to market milk production. The work will be continued and expanded to include insecticides other than DDT. There is also an indicated need for fundamental studies on the absorption and elimination of insecticides by animals. For instance, what is the relationship of the DDT content of milk fat to body fat of the producing cow; is there a fundamental physiological law governing the elimination of insecticides from the body and what is that relation to fat turnover in the body; does a high-producing cow excrete more total DDT in the milk than a low producing cow on the same level

of intake; these and many other questions need to be answered to give a fundamental background to the problems of production of milk. A further question of vital interest to the dairyman is, what effect will the insecticides have on the health and reproduction of cows if fed over a period of years.

There is a glaring need for chemical methods for the quantitative determination of various insecticides. In some instances the determination of organic chloride is the only tool at hand with which to work.

It is quite apparent that where DDT is used to control insects associated with the feed of cows the milk produced will contain DDT. If the quantities of DDT used are kept to a minimum for the control of insects, the quantity of DDT that appears in the milk is not great. However, under practical conditions this practice may be difficult to follow. It is also apparent that when DDT is used to control flies in barns and on the cows it will find its way into the milk.

It is possible that there are other insecticides, or that others will be found, which are as effective as DDT against insects but which will not be as readily absorbed and secreted into the milk.

## UNDER-PASTEURIZATION OF DAIRY PRODUCTS DETECTED BY CHEMICAL TEST

Picture Story No. 58, U. S. Department of Agriculture, Washington, D. C.

THE phosphatase test for the determination of adequacy of pasteurization has been developed for the examination of fluid milk, cream, all cheeses and their spreads, butter, buttermilk, fermented milk drinks, ice cream and sherbet, chocolate milk, cheese whey, and goat's milk. The test will reveal a decrease in pasteurization temperature of 1° F., or the presence of 1 pound of raw milk in 2,000 pounds of properly pasteurized milk, or the

presence of 1 pound of raw cream to 5000 pounds of properly pasteurized cream.

In principle, the test measures the amount of phenol set free from the added reagent, phenyl phosphate, by the enzyme phosphatase which would have been destroyed if the milk product had been properly pasteurized. The measurement is so precise that one-millionth of a gram of phenol can be detected in 10 milliliters of solution.

## STUDIES ON HIGH TEMPERATURE DISHWASHING

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A study of single tank conveyor curtain rinse machines was made. Tests were made to determine the percentage-kill of *Micrococcus caseolyticus* with a rinse of 170° F. Four leading manufacturers' machines were tested. The results were as follows:

Machine	Percentage-kill of bacteria
A	70
B	57
C	70
D	22

For satisfactory results the percentage-kill should be 99.5. Thus these machines do an unsatisfactory job.

The minimum requirements for satisfactory kill are: (1) temperature—170° F., (2) exposure—10 seconds, (3) amount of water—1.5 gal. per a 20 in. tray or 9 gal. per min.

The single tank conveyor curtain rinse machines gave water flows from 3.7 to 5.3 gal. per minute and exposure time of approximately 6 seconds. These figures show that a curtain rinse alone is not sufficient to give satisfactory kill of bacteria.

Because these machines meet a definite need in restaurant dishwashing, other means of sanitizing were investigated, namely high temperature washing and addition of chemical sanitizers to wash and rinse water. Chemical sanitizers will be discussed in another paper.

Laboratory tests were made of water at temperatures of 140, 145, and 150° F. supplemented by various concentrations of an alkaline detergent. It was found that even at 145° F. in the presence of 0.2 percent concentration of detergent, marked reductions of *M. caseolyticus* occurred in 15 seconds exposure. These data confirm the work of other workers.

Four machines were tested for removal of soil with and without detergents. The results were:

Machine	Percent removal of soil	
	Without detergent	With detergent
A	91.2	99.1
B	55.6	98.6
C	81.1	99.2
D	0	45.4

Washing efficiency of the machines varied markedly. Further explanations will be presented in another paper. Data shows need of detergent for good soil removal.

Tests were made on high temperature washing machines in college dormitories. Machines were equipped with electronic dispensers so that detergent concentrations could be maintained at constant levels. All dishes were hand scraped but not prewashed. Selected menus were checked, for example, soft boiled eggs, macaroni and cheese, spaghetti, etc., which are hard to remove. Temperatures tested were 140, 155, and 170° F. Plates were examined for visible soil and bacterial content.

Results show that 155° F. gave best soil removal and 170° F. gave poorest results but percentage-wise the variations were slight. The data show that high temperature washing is feasible.

### RECOMMENDATIONS

Wash temperatures in single tank conveyor curtain rinse machines be maintained at a minimum of 160° F. with rinse temperatures at 170° F.

Wash temperatures for other machines equipped with rinses at 170° F. for 10 seconds be held at temperatures between 140 to 160° F.

## "QUANTITATIVE DETERMINATION OF BACTERIAL VIRUSES AND THEIR RESISTANCE TO TRIETHYLENE GLYCOL AND HEAT IN WATER"

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IN the control of virus diseases through the control of environment, it is of primary importance to know the relative resistance of different viruses to common disinfecting agents and the dynamics of the viricidal action. Studies of this nature on pathogenic viruses have been held back because of the lack of a method for an accurate quantitative determination of the viruses.

Employing bacterial viruses (also known as bacteriophage), attempts have been made to determine the reproducibility of the virus concentrations ascertained in different experiments. It was found that results were frequently non-reproducible and that the virus-adsorption activity of the glassware was chiefly responsible for this irregularity. By coating the glassware with silicone, soaking the glassware overnight in a 2 percent  $\text{Na}_2\text{CO}_3$  solution, or using 250 p.p.m. of Tween-80 in the virus suspension, this disturbing phenomenon could be eliminated; but the silicone-coating method was preferred because of its permanent effect.

Using silicone-coated glassware, studies were made on the destruction of *Phagus alpha H* and *Phagus coli H* in water by both thermal energy and triethylene glycol. In these studies, it is seen that the destruction of these viruses by these two agents is a rate process of the first order in that the number of survivors decreases logarithmically as the time of reaction increases. This unimolecular-reaction type of the process of virus destruction suggests that each virus particle behaves toward a disinfecting agent like a single molecule, and that a chemical

change brought about in the virus by the agent is a lethal change.

Different values for the energy of activation have been reported in pure chemical reactions at different magnitudes of temperature. The present studies bring out results showing different magnitudes also for the destruction of *Phagus coli H* by thermal energy. At temperatures from 50° to 65° C., the activation energy is found to be 99,720 calories, and at temperatures from 65° to 75° C., 17,520 calories. This phenomenon leads to interesting speculations as to the mechanism of destruction of viruses and carries practical importance as well. The higher activation energy is thought to reflect a process of thermo-denaturation of proteins, and the lower activation energy a process of thermo-disorganization. For rapid destruction of virus, the thermal energy of the higher energy level is more effective than that of the lower energy level.

The data on the destruction of *Phagus alpha H* by triethylene glycol show that the glycol is an effective viricidal agent only when it has reached concentrations over 90 percent. At concentrations of 70 percent and lower, no viricidal effect was observed even for a period of 6 hours. At a concentration of 98 percent, the glycol destroyed practically all the virus particles (100 to 200 million virus particles per ml. of water) in 15 minutes. This observation lends support to the theory that the efficiency of triethylene glycol as an aerosol in the control of air-borne infection is achieved through the condensation of the glycol vapor in the moisture around the "infective nuclei."

## STUDIES OF QUATERNARIES AS BACTERICIDES

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THE quaternary compounds are being increasingly used as germicidal agents but there is considerable controversy in the literature regarding their germicidal efficiency.

They are surface active, having a lipophilic and lipophobic group in which the lipophilic group is cationic. As a result, they are readily inactivated by anionic agents such as soaps and synthetic detergents, and may be adsorbed by organic substances which are amphoteric (such as proteins) and others. The molecules of these substances are oriented to form a film over surfaces, and bacteria below the film may be protected. This is encountered in sanitizing food utensils, in which case brushing increases the germicidal action. Anionic agents readily break such a film.

There is need for inactivators for quaternaries (similar to the use of sodium thiosulfate against chlorine) to be used in methods for evaluating germicidal efficiencies as well as in swab vials used for determining residual bacteria count on food utensils sanitized in quaternaries. We have found that bacteriostasis may be reduced by use of lecithin (in tween 80) in the plating agar medium.

A laboratory testing procedure simulating actual practical usage of food utensil germicides was developed (reported in *Amer. J. Pub. Health*, October, 1948) by which the killing time of unknown germicides is compared with that of 50 p.p.m. available chlorine as alkaline hypochlorite. Other factors such as interfering substances, etc., are discussed in *J. Milk and Food Technol.*, Nov.-Dec., 1948).

There is need for:

1. Studies on the efficiency of quaternaries against pathogens, including filterable viruses;
2. A chemical measure for effective quaternary residual;
3. A better inactivator;
4. Studies relative to interfering substances in natural waters;
5. Studies on the "life" of the germicides in the rinse vat;
6. Determination of the concentration level for adequate disinfection; and
7. Other studies.

It is anticipated that when we fully understand the underlying chemical and physical phenomena which govern germicidal activities of quaternaries, we shall be better able to predict their proper use for disinfection under practical conditions.

## THE TESTING OF FROZEN EGGS FOR PATHOGENS

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THE appraisal of the sanitary care that a frozen food has received may involve consideration of the pathogens that are present. Project No. 836(C) of the Research Grants Division of the National Institute of Health relates to

this problem. Studies are being made on the longevity and the behavior of pathogens in frozen foods, particularly the behavior after defrosting and the methods employed by the bacteriologist when detecting such forms.

Liquid eggs were intentionally inoculated with pathogens, frozen at  $-25^{\circ}\text{C}$ . ( $-13^{\circ}\text{F}$ .), then stored at  $-1^{\circ}\text{C}$ . ( $30^{\circ}\text{F}$ .) and  $-17.8^{\circ}\text{C}$ . ( $0^{\circ}\text{F}$ .). At various intervals thereafter the eggs were defrosted in a  $37^{\circ}\text{C}$ . water bath and the number of viable bacteria per ml. determined.

Much of the experimental work involved the use of glucose tryptone agar, yeast-water, veal-infusion agar, as well as the selective media—Desoxycholate agar, MacConkey agar, and Staphylococcus Medium No. 110. *S. typhosa*, *S. oranienburg*, *E. coli*, *S. aertrycke*, and *Staph. aureus* were observed to survive storage in frozen eggs for periods up to 10 months at  $-17.8^{\circ}\text{C}$ . ( $0^{\circ}\text{F}$ .). The order of in-

creasing sensitivity of the pathogens was as indicated. Greater destruction of these pathogens occurred in frozen eggs stored at  $-1^{\circ}\text{C}$ . than when stored at  $-17.8^{\circ}\text{C}$ . All pathogens, with the exception of *Staph. aureus*, were inhibited by selective media and they were markedly encouraged in their growth if a highly nutritive medium such as yeast-water, veal-infusion agar was present.

The study, to date suggests that better plating media should be developed for the testing of frozen eggs for pathogens and that considerations of the importance of pathogens in this food should take into account the inhibitive effects of selective plating media.

## THE LONGEVITY OF THE COLIFORM BACTERIA AND ENTEROCOCCI IN ICED CRABMEAT

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THE cans of crabmeat were stored in cracked ice in a room held at 5–8 degrees C., and the determinations were repeated at intervals until the meat was spoiled.

At the time of sampling, the crabmeat was mixed as thoroughly as possible with a sterile spoon, and 15 grams were weighed directly into a sterile 200 ml. wide-mouth bottle containing a quantity of broken glass. One hundred and thirty-five ml. of water was added, and the bottle was placed horizontally on a Kahn shaker and shaken at high speed for three minutes. Decimal dilutions were prepared in the usual way, and two replicate plates were prepared from appropriate dilutions. The plates were poured with nutrient agar and incubated for 3 days at room temperature ( $22\text{--}28^{\circ}\text{C}$ .).

For the determination of coliforms, "standard" lactose broth was employed in the presumptive test, using 5

replicate tubes of each dilution. Confirmation was in brilliant green lactose bile (2 percent), and the completed test (not done on all samples) was as prescribed in *Standard Methods for the Analysis of Water and Sewage* (1948).

The enterococci were determined by the method of Winter and Sandholzer (1946), using 5 replicate tubes of each dilution in the presumptive test. Incubation was at  $45^{\circ}\text{C}$ . in a thermostatically controlled water bath. Confirmation, using the "slant-broth" method, consisted of the development of pin-point colonies on the slant, sediment in the broth, negative catalase test, and streptococcus morphology by microscopic examination.

### RESULTS

The aerobic plate counts on the crabmeat, at the time of arrival in the laboratory, were found to vary between

260,000 and 10 million, with about half the samples exceeding 1 million per gram. In most instances there was no significant increase in numbers during the first 5 days of storage; often the 3-day count was lower than the initial count. These results, considered to be possibly erratic, together with fluctuations in the coliform and enterococci counts, led to the making of all determinations with duplicate samples. Two separate samples were taken from each batch of meat at each period of testing. Many of the results show very close agreement between the duplicate samples, as indicated by the low ratios (average 1.4); a few samples however showed astonishing disagreement (ratios 11.4, 20.4 and 156.1).

Of all the samples studied, about 80 percent had initially less than 20 coliforms per gram, and about 50 percent of the samples had less than 20 enterococci per gram. It was observed that while the coliforms increased greatly in some samples during storage, in others there was a decrease in numbers. Likewise, the streptococci apparently increased in some samples but decreased in others. In most instances, however, the coliforms increased while the enterococci either decreased or showed little change in numbers.

## MICROBIOLOGICAL EXAMINATION OF SHRIMP

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THE irregular intervals between capture of shrimp and their processing at remote distances from the coast engenders deteriorative changes which render the product unsuitable for food. This project is concerned with determination of the microbial flora of the shrimp as caught, the changes with handling, and eventually to determine whether deterioration is due chiefly to enzymes, or to bacteria,

and which ones. This preliminary report is concerned with the determination of the natural flora of shrimp. In general the highest counts were obtained on sea water nutrient agar at room temperature, ranging per washings of the freshly harvested shrimp from 3,000 per ml. to 100,000 ml. and a slight increase at the time of arrival at the weighing wharf several hours after capture. Heading reduced the

On some samples determinations of the MPN of total coliforms and *E. coli* were made. The results indicate that *E. coli* may persist in crabmeat throughout the period of storage, but there was no evidence of marked increase in numbers. It was noted that of 446 isolates from the limited number of "completed" tests, 25 percent were citrate negative, of which 64 percent were indol positive.

The evidence we have indicates that the number of coliforms in the fresh crabmeat had little or no relationship to the number of enterococci in the product. Also the results seem to indicate little or no relationship between the initial coliform count and the count after 9 to 13 days' storage. The average number of coliforms present in the meat samples at the termination of the storage period was almost 100 times the initial number, while the number of enterococci remained practically unchanged.

These observations suggest that the enterococci may fulfill the need for a more satisfactory indicator organism for the sanitary quality of crabmeat, provided their incidence in the product is closely correlated with sanitary conditions in the plant, as has been stated by Ostrolenk, Kramer and Cleverdon (*J. Bact.* 53:197).

count. The wash water collected after washing the headed shrimp gave counts of several thousand per ml.

Bacteria capable of growth at refrigerator temperature were found in all samples from the Galveston area but in less than half of those from the Rockport-Arkansas Pass area. No obligate psychrophilic organisms were found. There was no correlation between counts at refrigerator and at room temperatures. Relatively low counts were noted at thermophilic temperature, and there were no obligate thermophiles.

The counts on potato dextrose agar ranged from 0 to 50 per ml. as the shrimp were taken from the water.

Few anaerobes grew at ice box temperature but all samples showed such growth at room temperature.

## BACTERIAL CONTAMINATION OF TOMATOES GROWN IN POLLUTED SOIL

LLOYD L. FALK

Rutgers University, New Brunswick, N. J.

THE possible transmission of human bacterial diseases through the consumption of raw vegetables is important not only where nightsoil fertilization is practical but also where polluted irrigation waters are being used or conservation of sewage sludges as fertilizer is considered.

The residual coliform contamination of tomatoes so grown was considered an index of the possible health hazard of such crops.

Tomatoes with normal stem ends showed lower contamination than those with cracks and crevices which can harbor and protect bacteria.

Tomatoes grown in soil irrigated with settled sewage showed no greater surface coliform contamination than those grown in similar soil which had received no pollution. There were no

The plating media prepared with sea water were found to be the most productive, with that containing 3 percent salt being slightly better than the same nutrient base prepared with distilled water.

*Pseudomonas* not found.

*Achromobacters* found were favored by the sea water media.

*Bacillus* species were predominantly *B. subtilis*, then *B. pumilus*.

*Alcaligenes* were fairly common.

*Proteus* were occasionally isolated.

Coliforms were irregular, but mostly *Escherichia coli*.

Additional work contemplated for this year includes a more extensive investigation of changes in flora which result from heading and handling, and some preliminary work on the changes from deterioration up to the point of definite spoilage.

trends toward decrease of contamination with increasing height of the fruit above the ground.

Exposure to the sun reduced to some extent the coliform count of normal tomatoes, but for cracked tomatoes this effect was nullified by protective action of these crevices.

When tomatoes grown in unpolluted soil were intermittently sprayed with suspensions of feces or *E. coli*, the coliform counts were found to decrease after spraying was stopped. In one month after spraying the coliform counts of such tomatoes were no higher than on control unsprayed tomatoes.

The survival of pathogenic enteric bacteria under these conditions were also studied. *Salmonella cerro* cultures in feces or alone were sprayed on tomatoes. Only one tomato of 31 tested

showed contamination, this being found 3 days after the spraying. Thereafter, *S. cerro* could not be isolated.

On the basis of the results obtained it is felt that the growth of tomatoes on soil which had received nightsoil or sewage sludge fertilization would yield

crops which, if eaten raw, would not be likely vectors for the transmission of human bacterial enteric diseases.

The work reported is part of a Quartermaster project pertaining to factors affecting the contamination of fruits and vegetables by pathogenic organisms.

## BACTERIAL STUDIES OF SOILS AND WASHINGS OF IRRIGATED FRUITS AND VEGETABLES

STUART G. DUNLOP, PH.D.

Assistant Professor of Bacteriology, University of Colorado Medical Center

THIS paper presents a progress report on three separate projects concerned with the public health hazard of using sewage-contaminated water for the irrigation of fruits and vegetables. The first of these projects, under the direction of Dr. W. L. Mallmann at Michigan State College, is aimed at studying the effects of adding various types of sewage sludge and effluents to soils, and searching for new indices of bacterial contamination. The second project, established at the University of Colorado Medical Center, with the writer as principal investigator, has as its primary goal the development of quantitative procedures for measuring the intestinal pathogens in irrigation water and in the washings from fruits and vegetables. The third project, directed by Dr. A. H. Berkman at the College of Mines and Metallurgy, El Paso, Texas, includes plans for studying the hazards of using raw sewage and primary treated sewage on soils and vegetables and comparing these directly with irrigation employing potable water from a deep well. This last project has just gotten underway. Therefore, the data presented here will be drawn from the first two studies.

Four types of media were employed initially for the isolation of *Salmonella* and *Shigella* organisms: Bismuth sulfite pour plates, SS agar streak plates, and tetrathionate and selenite broths. The multiple-tube-dilution technic us-

ing the most probable numbers statistical tables was used with the broths. Attempts were made to characterize the different types of colonies appearing in or on the bismuth sulfite and S S agar plates, with representative colonies of each type being picked to tetrathionate broth, then to MacConkey's agar, and finally to Kligler's iron agar slants. Tubes of tetrathionate or selenite enrichment broth showing cloudiness in 24 or 48 hours were streaked on MacConkey's agar from which the different types of colonies were picked to Kligler's iron agar.

Coliform counts were made by the multiple-tube-dilution method, using lauryl tryptose broth with confirmation in brilliant green bile broth; and the technic of Winter and Sandholzer was used for the enterococci. Five-day B.O.Ds. at 20° C. incubation were run by the State Health Department Industrial Hygiene Laboratory, using the sodium azide modification of the Winkler method according to Standard Methods for the Examination of Water and Sewage, Ninth Edition.

It was immediately evident that the direct plating technics were rather unsatisfactory, since it was not practical to pick all the colonies appearing on the plates, and colony characteristics could not be depended upon in picking representatives of each type. At this point, also, we were definitely able to see a necessary division in the technics used for the isolation of the typhoid

organisms on the one hand, and of the other *Salmonella* and the *Shigella* organisms on the other, based simply on the probability of the numbers of these organisms present in a given dilution. In other words, we might expect to get *Salmonella* or *Shigella* in a dilution of 1:100,000, whereas perhaps 100 cc. or more of undiluted material would be required to find the typhoid organism.

It was also apparent to us at this time that the tetrathionate and selenite enrichment broths were not completely satisfactory, since there were wide differences in the counts made with these two media, there were too many proteus and *Alkali-genes fecalis* organisms cultured and, according to the literature at least, these two media are not particularly suitable for the isolation of *Shigella*. We recalled further the experience of Knox, Gell, and Pollack<sup>1</sup> who recommended the use of selective media for indirect plating from enrichment broths. Therefore, our recent experiments have been concentrated toward trying various enrichment broths and plating media, with

the hope of getting one or more combinations which will give the highest count of intestinal pathogens, and at the same time the largest percentage of confirmed positives.

Dexoxycholate citrate leads in the number of confirmed colonies per plate as well as in the percent of confirmed colonies per plate. Many other combinations are being evaluated but the data are not sufficiently complete at this time to be presented.

Isolation of the typhoid organism, we believe, will have to be attacked separately from that of the other *Salmonella* and the *Shigella* with much larger inocula and different media than those used for the other organisms. In addition to the bacterial methods studies we are now including a search for intestinal parasites, amoebic cysts particularly, in the irrigation water, and we have some 1,500 odd cultures to identify from the samples run to date.

#### REFERENCE

1. *J. Path. and Bact.*, 54, 469 (1942).

### National Sanitation Clinic

(Continued from page 100)

poison against rats is 1080, but the safest to use is fortified red squill. All openings within 36" of surfaces that rats may reach should be rat-proofed with galvanized sheet steel of 24 gauge, or sheet aluminum 1/40 inch thick, or 19 gauge 1/2" mesh galvanized hardware cloth. On all new construction concrete floors should be installed in the basement, ground, and first floors. L-shaped concrete curtain walls extending 18" below ground with a 12" horizontal flange were recommended.

Under insect control, the common housefly was named as the most important insect from a health standpoint, while cockroaches, stored grain insects, and ants are chiefly of economic and aesthetic importance. Residual insecticides like DDT, chlordane, and pyrenones may be applied in all food

establishments but not on exposed foods or on food-contact surfaces. Subjects discussed included frequency of application, oil bases, emulsions, and suspensions. While residual insecticides are excellent for fly control in food establishments, screening must still be required where necessary. For control of ants, chlordane as a 2 per cent spray or a 5 per cent dust is more effective than DDT. In food establishments shelves of pantries should be painted, kept clean, and given DDT residual treatment, but not covered with paper. Properly designed garbage cans are considered superior to storage boxes or chambers for garbage. The clinic proceedings finally closed with a discussion of fumigation of concealed or inaccessible places, and structural features contributing to insect control.

## NEW BOOKS AND OTHER PUBLICATIONS

**Food Products.** Henry C. Sherman. 4th Ed. The Macmillan Company. New York 1948. 428 pp. \$4.80.

As a sequel to Sherman's standard text "Chemistry of Food and Nutrition", the present freshly revised volume is doubly welcome. The book adequately covers the subject matter for a broad general study of foods and food adjuncts. As stated in the preface, "For nearly all of us, food is the largest item in the cost of living and usually the most potent factor in the influence of daily habits upon health. Wise use of food thus means much for satisfaction and welfare. And to use food wisely one should have a fairly wide knowledge of food products." The 15 chapters consider the several types of foods—fresh, and processed, from the points of view of production, composition, processing and economics. As one would expect, the author interjects freely much material on nutritive value and dietetics. This adds materially to the value of the book. Each chapter is followed by a list of well-chosen suggested readings and reference material. The book closes with an excellent chapter on "The Problem of the Best Use of Foods: with Some Aspects of Food Economics". An excellent book for the food and dairy technologists' book shelf.

CARL R. FELLERS

**Milk and Milk Processing,** by B. L. Herrington. Published by the McGraw-Hill Book Co., Inc., New York, Toronto, London. 343 pages. Illustrated. 1948. \$3.75.

Here is an elementary textbook on the dairy industry written for beginners but is interesting to those who are farther along. Its scope covers the whole range from production to laboratory test. There is something about its style, about its manner of presentation of a subject that arrests the attention, that stimulates thinking. No wonder that the course originally "planned for sophomores majoring in dairy industry" now attracts four times as many

students from other departments of the colleges of agriculture and home economics, and occasionally from arts and sciences and from engineering.

The author has organized his material into twenty-five chapters covering the well-known aspects of milk and its products. Each chapter carries a series of words whose definitions are significant to an understanding of the text, together with thought-provoking questions. Many well-designed tables and illustrations support the presentations.

**Principles of Food Freezing,** by W. A. Gortner, F. S. Erdman, and N. K. Masterman. Published by John Wiley and Sons, Inc., New York and London. 281 pages. 60 figures. 1948. \$3.75.

The subject of food preservation by freezing is presented for *interested* individuals but without great technical detail. The first part deals with I. The Product: Frozen Food, discussing proper treatment and handling procedures including much bio-chemistry, nutrition, and quality criteria; the second part covers II. The Consumer and His Needs, outlining the needs of consumers and the types of service that appeal; and III. The Engineering of Food Freezing, dealing with the industrial aspects of design, construction, operating temperatures, home and locker installations, plants, and commercial freezing. Although written for persons who want to apply the information in actual practice, the book is more widely serviceable by assembling much practical information on freezing technology that is widely scattered. Particularly useful is the editorial summarizing and interpretation of much of the literature, thus informing the reader as to the really significant and important aspects that should guide him in his procedure. The book is useful also as a refresher to workers in related fields, and can be used as a text in beginning courses in food proc-

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# JOURNAL of MILK and FOOD TECHNOLOGY

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## ASSOCIATION NEWS

### January Meeting of the Chicago Dairy Technology Society

At the January meeting, Mr. Albert I. Kegan of the law firm of Kegan & Kegan spoke on "Trends in Government Regulation of the Food Industry."

Mr. Keegan said the trend is to more and still more government regulation. He stated that the dairy industry is the second most regulated food industry. The policing by Food & Drug is only one aspect, as local regulations are also very important.

Indications are that the food laws for the 48 states are going to be rewritten to closely follow the Federal Laws, with close cooperation between the State and Federal Officials.

Federal Standards are being established for a great many foods. Once these standards are set, it will be difficult and expensive to have them changed. Because of the high cost of making a change in the standards, the big companies will undoubtedly have to instigate and bear most of the expense. Any deviation from a standard is a criminal offense regardless of whether the product is made better or worse.

The trend is to place more responsibility on the manufacturer. The guarantee the manufacturer receives on ingredients used is not an "out" for him. Authorities say the consumer is not in a position to determine what is good, so it is the manufacturer's tough luck if anything goes wrong with his product.

The present trends tend to make the food technologist the "king pin" in the food industry.

The attendance at the meeting was 121.

H. P. SMITH  
*Recording Secretary*

### Connecticut Association of Dairy and Milk Inspectors

Last January the name of the Connecticut Association of Dairy and Milk Inspectors was changed to the Connecticut Association of Dairy and Food Sanitarians. The constitution was revised in the interest and the activities of the Association.

C. W. CHAFFEE  
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H. C. MITCHELL	State Health Dept., Richmond, Va.
JOHN TAYLOR	State Board of Health, Indianapolis, Ind.

## RESOLUTIONS:

W. D. TIEDEMAN, *Chairman* State Health Dept., Albany, N. Y.

All ex-presidents of the Association in attendance at the annual meeting.

## SANITARY PROCEDURE:

C. A. ABELE, <i>Chairman</i>	Diversey Corp., 2617 Hartzell St., Evanston, Ill.
H. E. BREMER	State Dept. of Agriculture, Montpelier, Vt.
PAUL CORASH	Department of Health, New York, N. Y.
C. B. DALZELL	Cherry-Burrell Corp., Little Falls, N. Y.
A. W. FARRALL	Michigan State College, E. Lansing, Mich.
M. R. FISHER	Div. of Health, Dept. of Public Safety, St. Louis, Mo.
O. A. GHIGGOLLE	State Dept. of Agriculture, Sacramento, Cal.
I. M. MARTY	City Health Dept., Baltimore, Md.
H. L. THOMASSON	State Board of Health, Indianapolis, Ind.
HAROLD WALNESS	USPHS Regional Office, Chicago, Ill.
C. W. WEBER	State Health Dept., Albany, N. Y.

## Penn State Ice Cream Short Course Well Attended

The 58th annual ice cream short-course held at The Pennsylvania State College January 17-28 concluded with a one day conference attended by many men from the industry. Sixty-two students, the limit permitted for men from the ice cream industry, were in attendance and came from 11 states and three foreign countries. More than 200 applied for the course. A previous course was given December 13-18 for members of the supply industry which was attended by 44 salesmen.

The entire two weeks were devoted to lectures and laboratories in making and freezing ice cream, sherbets and ices. As in the past, considerable time was spent in learning how to calculate mixes.

On the evening of January 27 Rhen Gundrum of the David Michael Company, spoke on vanilla and showed pictures of vanilla culture and curing in Puerto Rico.

On Friday, January 28, seven speakers discussed problems of importance to the ice cream industry. These speakers and their subjects were as follows:

D. V. Josephson, Head, Department of Dairy Husbandry, The Pennsylvania State College: Flavor Evaluation of Ice Cream
Robert H. North, Executive Assistant, International Association of Ice Cream Manufacturers: Meet a Maker
Vincent M. Rabuffo, The Ice Cream Trade Journal, New York, N. Y.: Dealer Pricing and Profits
J. Hoffman Erb, The Borden Company, Columbus, Ohio: Some Production Problems in Ice Cream Manufacturing
V. C. Patterson, V. C. Patterson & Associates, York, Pennsylvania: Safe Application and Operation of Ammonia Equipment in Ice Cream Manufacturing
George P. Gundlach, G. P. Gundlach & Co., Cincinnati, Ohio: Present Merchandising Methods as Applied to Ice Cream and Their Acceptance by the Customer
Kenneth Hood, Agri. Economics Extension, The Pennsylvania State College: Outlook for Dairy Products in Pennsylvania

At the banquet held on the evening of the 28th and sponsored by the Serum Solids Club, Director of the

Agriculture Experiment Station, Dr. F. F. Lininger, spoke on the China problem and showed colored slides taken on his recent trip to China. Scholarship awards presented at the banquet were a silver cup donated by Joseph Costa of Athens, Georgia, and four \$50.00 Government bonds donated by M. B. Weisl of the Borden Company, New York. The winners of the awards were:

Donald A. Nelson, 757 Main Street, Royersford, Pennsylvania
Charles F. Bowman, North Fifth Street, Hamburg, Pennsylvania
Alva Ray Love, 944 Sheridan Avenue, Williamsport, Pennsylvania
Stanley Overland, 1559-40th Street, Brooklyn, New York

The officers of the "Sucrose" chapter of the Serum Solids Club were:

President, Robert H. North, International Association of Ice Cream Manufacturers, Barr Building, Washington, D. C.
Vice-President, Joseph H. Hittinger, Crowley Milk Company, Allentown, Pennsylvania
Secretary, Mary Jo Fox, Hendler Creamery Co., Baltimore, Maryland
Treasurer, Herbert Riehl, Dept. of Agriculture, Victoria, British Columbia
Chairman of Arrangements, Thomas L. Hagan, Hill's Dairy, Baltimore, Maryland

## Michigan Food Sanitarians' School

The sixth annual Dairy and Food Inspectors' and Sanitarians' School will be held at Michigan State College on April 4-7 for the busy worker in these fields to secure the latest information on many aspects of food inspection with a minimum of time and expense. Considerable effort is expended each year in bringing together National leaders on the various topics pertaining to sanitation problems. Anyone interested may obtain full details of the School and a copy of the program by writing Dr. W. L. Mallmann, Department of Bacteriology and Public Health, Michigan State College.

## New Food Technology at M.I.T.

A new laboratory building for biology and food technology is among the projects proposed in a \$20,000,000 development program announced on November 20 at the Massachusetts Institute of Technology.

More than 250 members of a Committee on Financing Development, assembled at the Institute on November 19 and 20 to consider its responsibilities and needs, recommended the \$20,000,000 development program. Half of this amount is required for endowment and unrestricted funds; the balance will be used for new facilities and equipment at the Institute.

The laboratory for biology and food technology will house, in a single building, the Institute's work in biology, nutritional biochemistry, and food technology; approximately 60,000 square feet of working floor space will be available, according to present plans.

Plans for the building call for a flexible space layout through the widespread use of temporary partitions, so that changes may be made easily and quickly to adjust to new conditions.

It is anticipated that the laboratory will become a major center of biological research where problems in the field can be attacked with all the powerful tools and methods of modern science. Under present conditions the various groups contributing to the M.I.T. program in biology and food technology are separated by long distances, and some of the units are housed in temporary facilities inadequate for this type of work. Cooperation on a coordinated research and training program is difficult.

The building is estimated to cost \$2,000,000 according to present plans. This is one phase of a construction program which, as now proposed, includes a gymnasium-auditorium, faculty club, and new laboratories for nuclear science and engineering, metals processing, biology and food technology, hydrodynamics, and electronics.

## CANADA'S NEW DAIRY CHIEF



William C. Cameron was appointed Dominion Chief of Dairy Products to succeed J. Frank Singleton who retired recently. Mr. Cameron is known to the readers of this Journal through his many contributions to the Reports of the Frozen Des-

serts Committee of the *International Association of Milk Sanitarians*.

Graduated as a dairy major in 1925 from the University of British Columbia, he has had an excellent training and background for the high position which he now holds since his entire life has been devoted to the dairy industry. Even as a student while at the University his summers were spent in the dairy industry except for one when he worked in a gold mine. One summer he made ice cream for the Frazier Valley Milk Products Association and during the others he graded cream for the Dairy Division of the Saskatchewan Department of Agriculture. After graduation he was manager of a branch of the Saskatchewan Co-operative Creameries, Ltd., at Shellbrook. Then he was appointed Creamery Instructor and Junior Butter Grader in Saskatchewan. During the winter of 1926-27 he was loaned to the University of Saskatchewan where he was an instructor in the Dairy Short Course. In the spring of 1927 he was appointed Dairy Products Grader and spent several months at various grading centers gaining valuable experience in grading dairy products.

Mr. Cameron's first position with the Dominion Department of Agriculture was at the Calgary office where he was in charge of their Dairy and Cold Storage Branch. In 1928 he returned to private industry as Branch Superintendent of the Central Creameries, Ltd., where he had charge of the manufacture of dairy products at their various branches. After 5 years in industry he again returned to government service as Chief Creamery Instructor for the Province of Alberta and at the same time he served as Creamery Instructor at the University of Alberta.

In September of 1935 he returned as Chief Inspector of Dairy Products to the Dairy and Cold Storage Branch of the Dominion Department of Agriculture and has been in their service ever since. In 1937 he became Associate Chief, Dairy Products, Grading and Inspection Service and in March, 1944, was promoted to Chief of this Branch. On December 9, 1948, he was appointed Dominion Chief of Dairy Products.

To his new position Mr. Cameron brings a wealth of training and experience. His association with the dairy industry since 1925 as worker, teacher, inspector, supervisor, and administrator has admirably fitted him for his present position. He is known and respected from coast to coast as a man of wide experience, administrative ability, high integrity, and sympathetic understanding of dairy problems. We congratulate Canada on choosing this type of man for its new "Dairy Commissioner".

F. W. F.

## Gould Goes to Ohio State University



Dr. I. A. Gould, Professor of Dairy Manufacturing, University of Maryland, is the new Chairman of the Department of Dairy Technology, Ohio State University, succeeding the late Professor R. B. Stoltz. Dr. Gould assumed his position

at Ohio February 1.

Prior to coming to Maryland, Dr. Gould was on the Dairy Manufacturing staff at Michigan State College for approximately ten years, leaving there in 1944 to assume the position at Maryland. At Maryland, Dr. Gould was responsible for administering the dairy manufacturing activities as well as serving as Director and Chief Examiner of the Maryland Dairy Inspection Service. He was closely associated with the activities of the Dairy Technology Society of Maryland and District of Columbia, serving as its Vice-president in 1945-46, its President in 1946-47, and its Program Chairman in 1947-48. He assisted the Society in creating an educational fund to establish scholarships for deserving students in Dairy Technology at the University of Maryland.

Dr. Gould's degrees were obtained at West Virginia University, Michigan State College, and the University of Wisconsin. He has conducted research on practically all phases of milk and milk products, and has published approximately seventy manuscripts dealing with these researches. His major research has dealt with chemical changes in milk as produced by high temperature heat treatment, including studies on heat labile sulfides and sulfhydryl formation, total acid, lactic and formic acid production; lactic acid in milk and milk products; chemistry of milk fat as related both to enzymic

lipolysis and oxidation. He received the 1946 Borden Award from the American Chemical Society for studies of the chemical changes in milk and milk products produced by the application of heat. Prior to completing all of his collegiate training, Dr. Gould spent approximately eight years in commercial work.

Dr. Gould is Associate Editor, *Journal of Dairy Science*; Chairman of the American Chemical Society Canvassing Committee for the Borden Award in Milk Chemistry; member of the American Dairy Science Association Borden Award Committee in Dairy Manufacturing; member of the Food Industries Award Committee of the Institute of Food Technologists; member of the Scientific Liaison and Advisory Board of the Quartermaster Food and Container Institute for the Armed Service.

He holds membership in the following organizations: American Dairy Science Association, American Chemical Society, Washington Academy of Sciences, Institute of Food Technologists, International Association of Milk and Food Sanitarians, Alpha Zeta, Sigma Xi, and Dairy Technology Society of Maryland and District of Columbia.

## The Babcock Test for Reconstituted Milk

Increasing quantities of dry milk are being used in and sold as reconstituted milk, and the fund of information regarding some of the peculiarities of this reconstituted milk is rather limited. Studies made by Trout, Brunner, and Lucas at the Michigan Experiment Station indicate that the Babcock test is not entirely accurate for determining the fat content of this reconstituted milk. It generally shows it to be somewhat lower than it actually is as determined by other methods to the extent of 0.25 per cent.

## Industrial Notes

### Oakite's Fortieth Year

February this year holds particular significance for Oakite Products, Inc., pioneers in the field of industrial cleaning materials and methods. For it marks the completion of Oakite's fortieth year of cooperation with industry on its production and maintenance cleaning procedures.

John A. Carter, General Manager of the Company, in commenting on the increasing utilization of its methods and products by industrial plants, states, "The 40 years of achievement we celebrate this month can be attributed in large measure to the Company's fundamental policy of rendering a service and selling a product on the side. In the years ahead, Oakite will continue to direct its efforts toward developing this service still further, along with the designing of new materials and improved methods for applying them, to the end that cleaning costs in industrial plants and shops may be substantially lowered."

It is interesting to note that since its founding in 1909, the Company has steadfastly stressed service over and beyond the mere sale of its products. In support of this policy, it maintains a nationwide field service organization of 180 experienced technical representatives to provide in-plant assistance and to assure the most effective and economical application of its materials by its customers. Striking testimony to the effectiveness of this basic principle is indicated by the fact that now the Company supplies more than 80 specialized compounds for cleaning and related operations in the dairy field and in many other branches of industry.

### Diversey's Twenty-fifth Anniversary

The Diversey Corporation, Chicago, a leading factor in the field of industrial chemicals—cleaning compounds, disinfectants, insecticides—signalized its 25th anniversary with the largest technical and engineering conference in its history, Dec. 13-17, in the Edgewater Beach Hotel, Chicago.

Guest speakers who addressed various general sessions are Dr. Samuel N. Stevens, president of Grinnell College; J. N. Bauman, vice-president of White Motor Company, Cleveland; and Harry Simmons, management consultant, New York.

From small beginnings in 1923, Diversey has grown to the point where its products are known around the world today. More than 100 different products are marketed under the Diversey label. As a yardstick of growth, the corporation began with two fieldmen, while today the total sales organization exceeds 300 men.

The conference paid particular tribute to the individual sales engineer—the D-Man—upon whose efforts depends Diversey's unique program of "sales through service."

H. W. Kochs is Chairman of the Corporation, and L. Shere, President. W. E. Noyes is General Sales Manager.

### Sanitation Schools

Modern sanitation programs have been recently conducted by Klenzade Products, Inc., Beloit, Wisconsin, in various Texas cities. Dallas, Fort Worth, Austin, Houston, and Amarillo, Texas, were included in the meetings.

The programs presented covered the following three major divisions:

1. General Sanitation
2. Dairy Sanitation
3. Restaurant Sanitation

The Dallas meeting was well attended by local sanitarians and basic sanitary science was covered in the presentations.

Mr. W. R. Hardy, Sanitary Engineer, presided over the Fort Worth meetings which were well attended by both Sanitarians and representatives of industry. Dr. D. A. Reekie, Director of Health, discussed "The Need for Better Sanitation". Various members of the Klenzade staff presented discussion covering the basic principles of bacteriology and cleaning chemistry. Dr. H. V. Cardona presented a very constructive paper on "The Significance of Thermophilic Organisms in Farm Milk Supplies".

Restaurant Sanitation was discussed in detail by the various speakers and the questions from the audience testified as to the interest in the various topics under discussion.

Several types of programs were included in Austin. Sanitarians from the entire area attended sessions where material was presented for the type audience involved. Milk producer meetings were held and two well attended meetings for food handlers conducted. Mr. H. A. Hargis, Sanitary Engineer, presided over the Austin meetings.

Meetings were held at Houston, Texas, for Sanitarians employed by the City of Houston and Harris County. Milk and restaurant sanitation subjects were presented by members of the Klenzade Products, Inc. staff. Attendance at these meetings was exceptionally good and all present displayed a high degree of interest in the subjects under discussion.

Exceptionally well attended meetings were held in Amarillo, Texas. A meeting for food handlers was held in the afternoon and a session for milk producers conducted at night. As in

previous meetings all material presented covered basic sanitation discussions.

The fact that meetings designed for Sanitarians were all well attended by members of the various industries concerned speaks well for better cooperation between official agencies and industry and the acceptance of programs free from commercial implications.

### Peterson Heads Wyandotte's Milwaukee Office



Frank E. Peterson has recently been promoted to managership of the Milwaukee Office of Wyandotte Chemicals Corporation, as announced by Carter B. Robinson, Vice-President — Sales of the J. B. Ford Division of

the Wyandotte organization.

Mr. Peterson joined the Wyandotte organization in 1937, and has been continuously attached to the Milwaukee territory. He was made assistant Milwaukee manager last year.

Mr. Rohrbacher, who preceded Mr. Peterson as manager, and who is now on leave of absence, is widely known in Wisconsin, became a Wyandotte laundry representative in 1921 and was appointed manager of the Milwaukee territory in 1943. On his return to active duty, Mr. Rohrbacher will do special sales and jobber promotion assignments for the laundry department and the food and beverage department of Wyandotte Chemicals.

Fred R. Hayden has taken over the territory formerly covered by Mr. Peterson.

## CORRESPONDENCE

New York State Association of Milk  
Sanitarians  
February 7, 1949

Dr. J. H. Shrader  
23 E. Elm Avenue  
Wollaston, Massachusetts  
Dear Doctor Shrader:

Today I received the January-February issue of the JOURNAL OF MILK AND FOOD TECHNOLOGY and have read with interest your editorial "Facts Versus Opinions".

There is one statement that you have made to which I would like to take personal exception. In the next to the last paragraph, you suggest that a team of competent investigators might be used in studying the effect of non-farm-straining of milk. This, of course, is used as an example. However, on this team you have suggested a dairy husbandryman, a chemist, a bacteriologist and a sanitary engineer. Just where does the milk sanitarian fit into

this picture? As you know, we are doing all we can to "elevate" the position of milk sanitarian in order that the engineer may not take over the entire work. We, of course, believe that such a stand is logical in view of the fact that the sanitarian really has better training than the engineer for sanitation work. Likewise, in this same issue, appears the Committee Report of Mr. Robinson on the Status of Sanitarians. This Committee Report, again, emphasizes the need for "elevating" the sanitarian to a higher status.

It is possible that not including a good sanitarian in this set-up was perhaps an oversight on your part. I do not see how a discussion of this in future issues would help the matter any but am bringing this to your attention as a matter of personal viewpoint.

Sincerely,

(Signed)

C. S. LEETE,  
Secretary-Treasurer

## New Books and Other Publications

(Continued from page 113)

essing by freezing. Over 200 references support the text, and the illustrations are clear and usefully selected.

**Definitions and Standards for Food**, issued by the Federal Security Agency, U. S. Food and Drug Administration, Washington, D. C. 72 pages. 1948.

This publication contains the definitions and standards for food and amendments thereto promulgated under the Federal Food, Drug, and Cosmetic Act, as they appear in the compilation published in the Federal Register on October 30, 1948 (13 F. R. 6377), as amended (13 F. R. 6969),

together with the general regulations for food standards as they appear in the Code of Federal Regulations (21 CFR Cum. Supp. 10.2; 21 CFR 1943 Supp. 10.0). The preface contains some of the relevant sections of the Federal Food, Drug, and Cosmetic Act and general regulations.

The foods listed are:

Cacao products	Fruit butters
Cereal flours	Shellfish
Alimentary pastes	Eggs and egg products
Milk and cream	
Cheeses and related spreads	Oleomargine
Canned fruit	Canned vegetables
Fruit preserves and jellies	Tomato products

## NEW MEMBERS

## ACTIVE

William E. Brandt, 3233 Fanshawe St., Philadelphia 24, Pa.  
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W. L. Mallman, Michigan State College, East Lansing, Michigan  
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Max Schubert, State of Georgia, Dept. of Health, Atlanta, Ga.  
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G. J. Turney, 534 Edison St., Lansing, Michigan  
Cranston Wilcox, 26 South Fremont St., Coldwater, Michigan

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M. G. Cassel, 402 Union St., Selma, Ala.  
Charles Clarkson, 220 West 5th St., Imlay City, Michigan  
Charles S. Cohen, 18 South Perry St., Pontiac, Michigan  
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A. E. Durkee, Flint City Health Department, Flint, Michigan  
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Dr. Jacob Finkelstein, Forrest Ave. & Elm St., Norristown, Pa.  
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Y. M. Hanson, Universal Milking Machine Div., Waukesha, Wis.  
Ernest W. Hembroff, Dafter, Michigan  
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H. T. Himmelein, 649 South 4th St., Saginaw, Michigan  
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Arthur W. Howe, Jr., Lincoln Liberty Bldg., Philadelphia, Pa.  
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William W. Joy, 222 West Maple St., Lansing, Michigan  
Don S. Kennedy, Route 1, Williamsburg, Michigan  
Orvo Kuusisto, 428 Franklin St., Waukegan, Ill.  
Henry J. Lammers, 3338 No. 17th St., Milwaukee 6, Wis.  
Jack Lammy, 18 South Perry St., Pontiac, Michigan  
Julius F. Lang, Kennersley Farms, Church Hill, Md.  
Robert Langsenkamp, 1234 Shelby St., Indianapolis, Ind.  
Roger William Lewis, Calhoun County Health Department, Battle Creek, Michigan  
Leonard Limpach, Flint City Health Department, Flint, Michigan  
C. J. Manis, 600 Park St., Port Huron, Michigan

Bonner J. Martin, 310 State St., Lexington, N. C.  
 John Maxwell, 506 Webb Drive, Bay City, Michigan  
 William E. Meadowcroft, Hillsdale County Health Department, Hillsdale, Michigan  
 Joseph A. Meiser, Jr., Dairy Department, Michigan State College, East Lansing, Michigan  
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 Ralph W. Moore, 2618 Almont Ave., Southeast, Grand Rapids, Michigan  
 Charles Mortimer, 320 South Pt. Crescent, Bad Axe, Michigan  
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 Miles Nelson, 726 State Office Building, Lansing 13, Michigan  
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 Richard Paulus, Breckenridge, Michigan  
 Owen S. Pilgrim, Fraser, N. Y.  
 John Pomeroy, Kalamazoo City-County Health Department, City Hall, Kalamazoo, Michigan  
 Herman A. Price, Jr., Centre Hall, Pa.  
 Robert M. Rau, Saginaw City Health Department, City Hall, Saginaw, Michigan  
 Wesley Rau, Route 2, Cedar Springs, Michigan  
 Lorenz F. Rein, 16041 East 9 Mile Road, East Detroit, Michigan  
 John B. Reynolds, Allegan County Health Department, Allegan, Michigan  
 C. V. Roose, 60 Reading Ave., Hillsdale, Michigan  
 Harold Rothchild, 10205 Mack Avenue, Detroit, Michigan  
 Armin A. Roth, 21551 Garrison Street, Wyandotte, Michigan

#### CHANGES OF ADDRESS

Roy H. Allan, East St., Darlington, Wis. to 520 East Cook St., Portage, Wis.  
 J. E. Brecklin, R 1, Monroe, Wis. to 2007 8th Ave., Monroe, Wis.  
 Earl G. Buelow, 716 S. Michigan Ave., Stevens Point, Wis., to 601 S. Michigan Ave., Stevens Point, Wis.  
 Lieut. Col. Wm. F. Collins, V.C., Station Veterinarian, Fort Monroe, Va. to Station Veterinarian, Camp Campbell, Ky.  
 Dwight Davis, Central Dairy, Shawnee, Okla. to Mgr. Steffens Dairy, 304 W. Main, Shawnee, Okla.  
 Arthur Graber, Co-op. Health Unit, Dist. 1, Talequah, Ohio to Kay County Health Dept., Ponca City, Okla.  
 Glen M. Hansen, 1252 So. Farwell St., Eau Claire, Wis. to 2014 E. Park Place, Milwaukee 11, Wis.

Fred Rowlader, 703 Cadillac Square Building, Detroit 26, Michigan  
 Gaylord Scaulon, Saginaw City Health Department, City Hall, Saginaw, Michigan  
 Lee Schreibeis, 538 Capitol, Southwest, Battle Creek, Michigan  
 William M. Scott, 210 Beckford Ave., Princess Anne, Md.  
 W. K. Sharpe, Department of Health and Welfare, Charlottetown, Prince Edward Island, Canada  
 Paul E. Sheridan, P. O. Box 145, University Sta., Syracuse 10, N. Y.  
 Philip Shirley, Lansing-Ingham County Health Department, County Building, Mason, Michigan  
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 Herman Sievert, Saginaw City Health Department, Saginaw, Michigan  
 Ferris L. Smith, P. O. Box 64, Paw Paw, Michigan  
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 Walter F. Snyder, School of Public Health, University of Michigan, Ann Arbor, Michigan  
 Del Soper, Flint City Health Department, Flint, Michigan  
 Edward Stockton, Calhoun County Health Department, Battle Creek, Michigan  
 J. C. Temple, Gueder, Paeschke & Frey Co., 324 No. 15th St., Milwaukee 3, Wis.  
 T. Dewey Waller, Flint City Health Department, Flint, Michigan  
 Lewis A. Wileden, 534 West Ash St., Mason, Michigan  
 William Wolf, Flint City Health Department, Flint, Michigan  
 Edward J. Wykes, 1873 Haines, Northwest, Grand Rapids, Michigan  
 Gaby L. Yusko, 1623 Saw Mill Run Blvd., Pittsburgh 10, Pa.

Mrs. Martha Hanson, State Co-operative Laboratory, Superior, Wis. to State Branch, Lab. of Hygiene, Rhinelander, Wis.  
 F. W. Harris, East Dane Quality Co-op., Lake Ripley, Cambridge, Wis. to 1202 Church St., Boscobel, Wis.  
 R. W. Hart, 206 Mutual Bldg., Kansas City 6, Missouri to 2200 Fidelity Bldg., 911 Walnut, Kansas City 6, Missouri  
 R. L. Howell, Pittsburg Co. Health Dept., McAlester, Okla., to Health Dept., Tahlequah, Okla.  
 Andrew J. Krog, Dept. of Health, City of Plainfield, N. J., to 806 Kensington Ave., Plainfield, N. J.  
 John C. Mahoney, 3241 Humboldt Ave. So., Minneapolis 8, Minn. to R.10-334 N. 1st, Minneapolis, Minn.

Joseph Mandelaro, 3 Dawson Place, Batavia, N. Y. to 16 Center St., Caledonia, N. Y.  
 Dr. V. V. Martinson, 472 N. Story Parkway, Milwaukee 13, Wis., to 620 N. 8th St., Milwaukee 3, Wis.  
 Vern P. Melhuish, Carnation Co., Oconomowoc, Wis. to Box 2035, Wilshire-LaBrea Sta., Los Angeles 36, Cal.  
 N. A. Monson, 1325 Rutledge St., Madison 4, Wis. to Box 773, Madison, Wis.  
 Phillip C. Newman, 205 Park St., Westby, Wis. to 225 W. Elm St., Chippewa Falls, Wis.  
 Hermon A. Price, Jr., Centre Hall, Pa. to R. No. 2, Huntington, Pa.  
 Eugene Reeves, 510 Interstate Bldg., U. S. Public Health Service, Kansas City, Mo. to 2200 Fidelity Bldg., U. S. Public Health Service, Kansas City 6, Mo.

Dr. Edmund R. Rice, U. S. Public Health Service, Richmond, Va. to 8232 Goodman Rd., Overland Park, Kansas  
 H. H. Schutz, 4300 N. Pt. Washington Rd., Milwaukee, Wis. to H. H. Schutz, c/o Food Processing Co., 161 W. Wisconsin Ave., Milwaukee 3, Wis.  
 John J. Taylor, Osseo, Wis. to Pigeon Falls, Wis.  
 William W. Wallace, 531 New Custom House, Denver, Colo. to 501 Federal Office Bldg., Seattle 4, Wash.  
 H. Kenneth Wilson, 612 S. 24th St., Philadelphia, Pa., to 107 E. Elm St., Urbana, Ill.  
 Louis A. Zahradka, c/o Consolidated Badger Co-operative, Shawano, Wis. to Dairyland Co-operative Assn., Juneau, Wis.

#### Experimental Flow-Diversion Valve Developed for Use in Dairy Research Laboratories

F. P. Hanrahan, engineer in the Bureau of Dairy Industry, U. S. Department of Agriculture, observes the flow diversion valve which he and other investigators developed in the Bureau's dairy products research laboratories. The valve was designed and built several years ago when dairy researchers found it necessary to devise a more accurate means of temperature control for an old-style, centrifugal flash pasteurizer that was being used in various laboratory experiments. The original valve, which functioned satisfactorily on an experimental basis, has been modified and improved.

In operation the valve is actuated by either one or two solenoid coils. Only one coil is needed when the valve is operated in a vertical position, as the lower valve outlet closes automatically with the weight of the plunger. If the valve is operated in a horizontal position, both outlets can be held alternately open and closed by providing a solenoid coil at each outlet end.

A valve of this type can be used to control temperatures in heating liquids other than milk, and the valve will

provide as good a temperature control in cooling liquids as in heating liquids, the dairy researchers believe.

A descriptive sheet of the improved valve, with a cut-away sketch, is available from the Bureau of Dairy Industry, U. S. Department of Agriculture, Washington 25, D. C.



USDA Photo

## "DOCTOR JONES" SAYS

BY PAUL B. BROOKS, M.D.

Well, I see they've established another "mastitis laboratory"—the State Department of Agriculture and Markets and Cornell, working together. It's over in Earlville: the sixth in the state. I was reading about the "doings" they had when they dedicated it, a while back. It reminded me of a question they asked on one of the State medical licensing examinations. "What is bovine mastitis?"—that was part of it. "Bovine mastitis," one doc wrote, "is inflammation of a cow's rudder." I figured he probably grew up where boats were more common than cows.

Anyway, I was glad to hear about this laboratory because mastitis (inflammation of cows' udders) is one of the toughest problems dairy farmers are up against. It comes from germs working their way up through the teats into the milk-secreting glands. It not only makes the milk unfit for use but may destroy the milk glands. A cow that's a "three-teater": that usually means she's had mastitis and one "quarter" has been put out of business.

Even human nursing mothers occasionally get mastitis. When you stop to think that, when cows lie down, their udders are on the floor, it's easy to see how much more likely they are to get infected. If one infected animal is left with the rest it can spread through the herd.

It's caused by various germs but whichever ones it is—it isn't nice, of course, to think of drinking milk from diseased udders but, if the milk's pasteurized, there's probably no actual danger from it. Fortunately, the germ that ordinarily causes mastitis works mainly, and perhaps only, on cows. But, once in a great while it's one that's come from a human case of streptococcus sore throat and so on. It was those mastitis cases that were responsible for the big milk-borne epidemics we used to get, practically every year, before most of our milk was pasteurized. So this mastitis control program: in the long run it'll save money for the farmers and, while it may not have much effect on public health it certainly won't set it back any.

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### Illinois Dairy Plant Conference

Conference for Small Dairy Plant Operators on April 14, 1948, will be held at the Urbana Campus of the University of Illinois. The Central Illinois Dairy Technology Society meets there the evening of April 13th. It is sug-

gested that members of other dairy technology societies in Illinois drive down on Wednesday afternoon in time for the Technology meeting and stay overnight for the conference. If so, hotel reservations should be made early.