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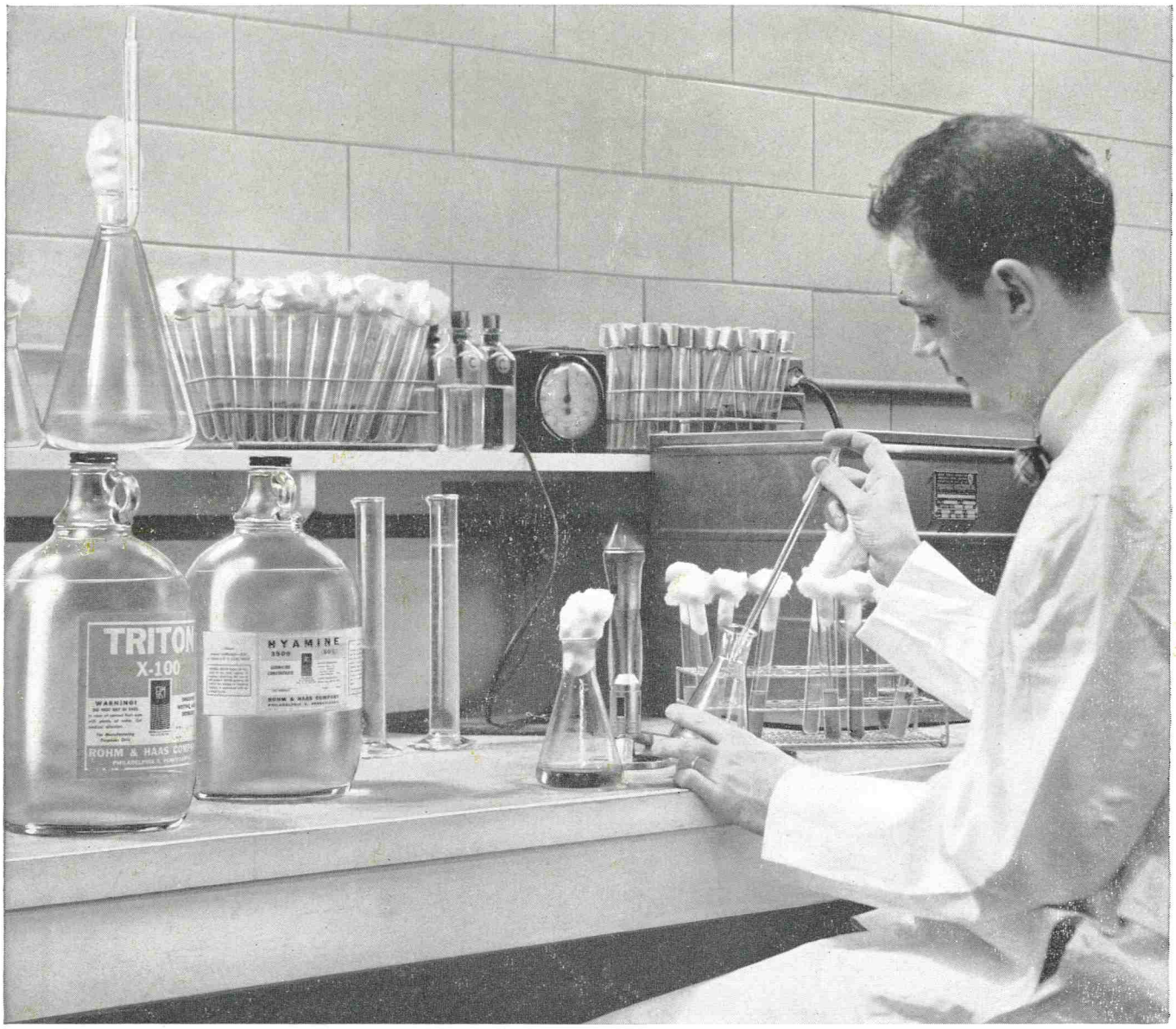

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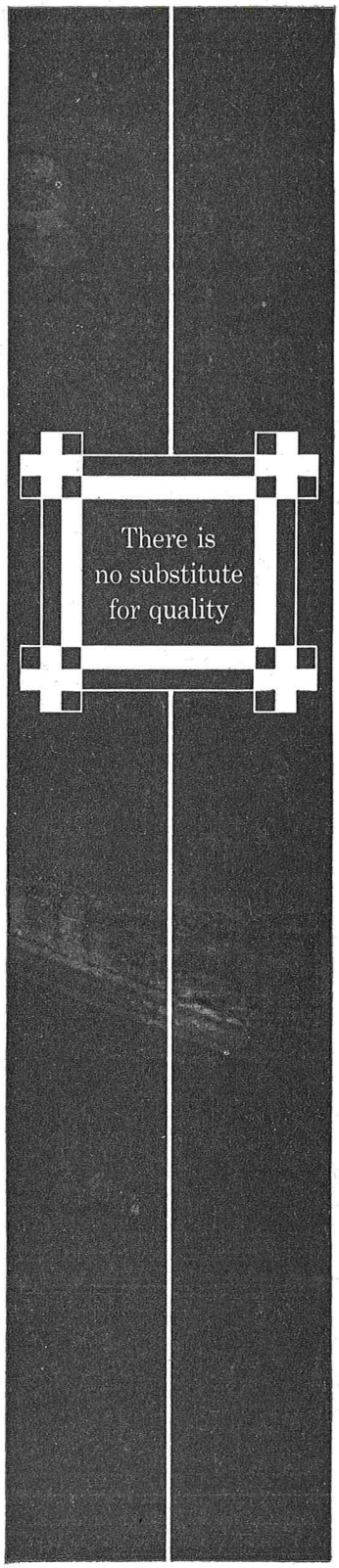

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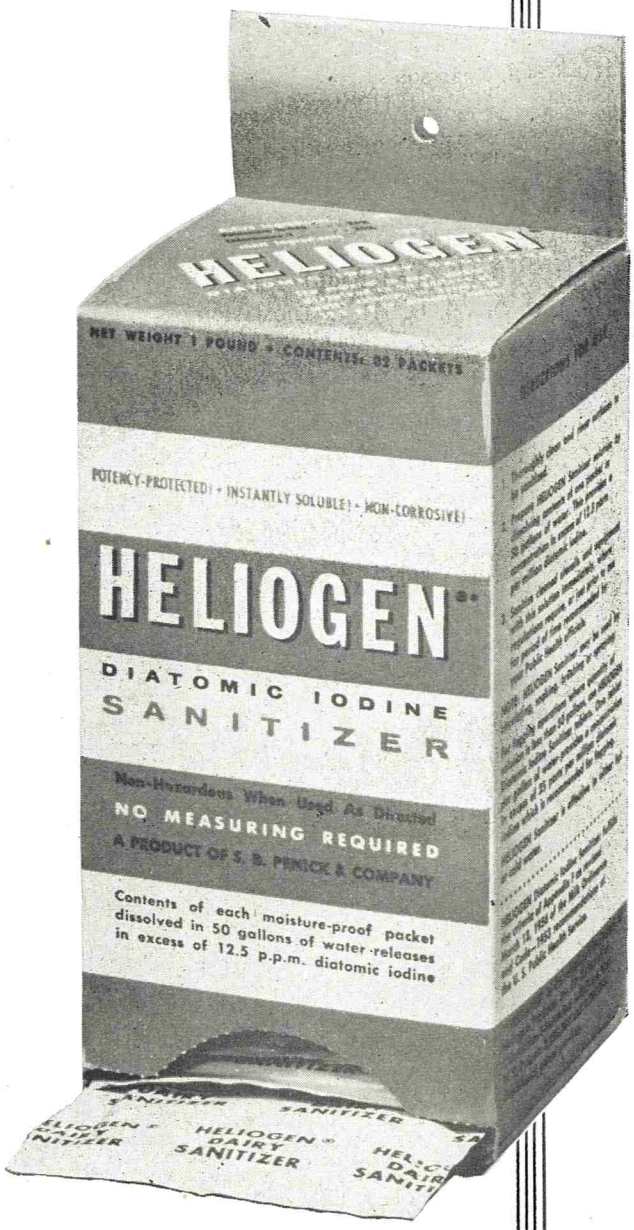

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THE INCIDENCE OF PENICILLIN IN THE MARKET MILK SUPPLY OF A LOCAL NEW ENGLAND AREA[1]

F. A. Siino, R. B. Czarnecki[2], W. K. Harris[2]

Amherst Board of Health and the

University of Massachusetts, Amherst, Mass.

(Received for publication May 12, 1958)

The incidence of penicillin in the pasteurized milk marketed in Amherst, Massachusetts was found relatively high when compared with the findings in earlier state and national surveys.

Twenty-five or 20.5 percent of 122 samples were found positive. Of these, fifteen or 12.3 percent of the total were detected by the ¼″ disc assay method of Difco. The ½″ disc was found more sensitive as with it ten additional positive samples were detected.

Penicillin has been used extensively for treating bovine mastitis since it first became readily available for animal use. Detectable amounts are frequently present in cows' milk for as long as three days after administration. Cheese manufacturers have called attention to its inhibition of starter cultures (*3*). Also, because the antibiotic can withstand pasteurization, it became a foreign constituent of importance in milk marketed for fluid consumption.

It was not surprising, therefore, that the Food and Drug Administration (F.D.A.) undertook a study of the situation. Its three nation-wide surveys (*9,10*) conclusively showed that penicillin and other antibiotics are often present in the nation's milk supply. These surveys included an evaluation of the possible harmful effects from drinking milk containing penicillin. It was the decided medical opinion that allergic reactions could result.

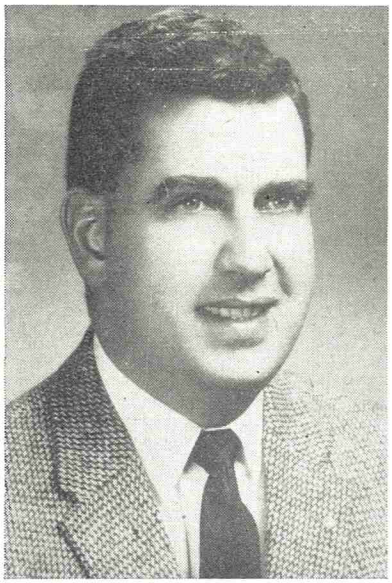
In a post-graduate seminar for physicians held in New York City during February 1958, it was pointed out that an increased incidence of dermatitis in private practice was probably due to penicillin reactions (*7*). It was also stated that about 20 percent of dairy products contain residual amounts of this antibiotic, thus incurring suspicion as the source when reactions occur. Of all the antibiotics commonly used today, penicillin was believed the most likely one to cause sensitivity reactions.

A survey of pasteurized milks obtained throughout New York State was reported by Kosikowsky, *et al.* (*6*). The disc assay method for penicillin was used and six percent of 1794 samples produced inhibition zones in *Bacillus subtilis*-seeded agar. Penicillin was probably present in the majority of positive cases as indicated by the penicillinase identity test which was run on many but not all positive milks. The authors felt that many milks contained antibiotics in levels below the sensitivity limit of the test method.

Local public health interest prompted the present survey. It included multiple samplings of all dealers' supplies marketed for fluid consumption in the town of Amherst, Massachusetts during the summer of 1957.

Methods

Pasteurized milk which had been routinely collected from delivery trucks and retail outlets and subjected to quality control tests, was used for the penicillin



Mr. Siino, a member of the I.A.M.F.S., served in the armored infantry during World War II, following which he attended the University of Connecticut, where he received his B.A. in Bacteriology in 1950. He then did graduate work in public health at the University of Massachusetts, receiving his M.S. in 1952. He was employed as a sanitarian in Connecticut in 1951 and joined the Amherst Board of Health as Health Agent and Sanitarian in 1954.

[1]Contribution No. 1160 of the Agricultural Experiment Station, University of Massachusetts.

[2]Dr. R. B. Czarnecki is a member of the Department of Bacteriology and Public Health, and Dr. W. K. Harris is in the Department of Veterinary Science, University of Massachusetts.

survey. One hundred twenty-two samples from fourteen dealers' supplies were thus collected and examined. The samples were in glass or waxed paper containers and about two-thirds of them were homogenized. After collection, the samples were refrigerated immediately and deposited in the laboratory refrigerator within one hour, usually.

Standard plate count, coliform, and phosphatase tests were performed on most of the samples. These tests were conducted according to the Standard Methods for the Examination of Milk and Dairy Products (*8*). The phosphatase test was performed by using the Scharer Test Kit.

Penicillin Assay Procedure

The penicillin test procedure used as the basis for this study was the disc assay method of Difco (*1*). One hundred ml. of sterilized whey agar was cooled to 50° C. and seeded with 1 ml. of a Difco *Bacillus subtilis* spore suspension. The seeded agar was poured into a sterile 12½″ by 8½″ Pyrex baking dish, and allowed to cool at room temperature under a fitted aluminum cover. Duplicate sterile ¼″ discs (Difco) containing the milk to be tested were placed on the agar with flamed forceps.

Preliminary trials had shown that milk container design often prevented satisfactory control in moistening the assay discs. Further, the ¼″ discs did not absorb the milk samples at a uniform rate or with even distribution. Therefore, the following technique was adopted and excellent visibility and convenient access to the milk surface resulted. As soon as sampling was completed for the quality control tests, a thoroughly mixed portion of the sample was poured into the bottom of a sterile Petri dish for penicillin assay. The edge of the assay disc was dipped slightly into the milk sample. At the instant saturation was complete, the disc was removed, thereby avoiding taking up excess milk.

In order to make comparisons using variations of the disc method suggested by other workers (*2,4,5*), each sample was tested also with (*a*) double ¼″ discs (Difco), (*b*) a single ½″ disc and (*c*) double ½″ discs. The double discs were placed one at a time, the second on top of the first. The ½″ discs (No. 740-E) were obtained from the Schleicher and Schuell Company.

In addition to the Difco pencillin concentration discs for the standard curve, controls on each culture dish included (*a*) duplicate ¼″ discs and a ½″ disc containing raw milk from a first-calf heifer in the herd of the University of Massachusetts known to have never been treated with antibiotics, (*b*) a ¼″ and a ½″ dry blank disc, and (*c*) a penicillinase disc (Penase-Difco) containing the sample to be tested, for identifying penicillin.

Six or seven unknown test samples could be conveniently examined on one culture dish. When all the discs for test samples, controls, and standard curve had been placed on the agar, the dish was incubated at 35.5° C. During the first tests, plates were read after 4, 5, 6, 7, and 8 hours' incubation to determine which period gave the best zones for measurement. Six hours of incubation gave optimum results and this reading time was adopted for routine use. All tests were run in duplicate by using an identical set of discs on a separate culture dish.

RESULTS AND DISCUSSION

The incidence of penicillin in each dealer's milk supply is presented in Table 1. Fifteen of the one hundred twenty-two milk samples were found positive for penicillin by the disc assay method of Difco. This is 12.3 percent and approximates the 11.6 percent reported in the second F.D.A. survey. It is considerably more than the 3.2 and 5.9 percent incidence reported respectively in its first and third survey, and the 6.0 percent in the New York State survey. Admittedly, the total number of samples examined in the present survey was relatively low, but it did include the product of one dealer twenty-four times and the products of the others in a ratio of samplings to volume marketed that was roughly comparable for each dealer.

TABLE 1 — PENICILLIN INCIDENCE IN EACH DEALER'S MILK SUPPLY

Dealer	No. samples tested	No. samples positive by Difco method	Total samples positive by Difco and modified methods
A	4	1	1
B	11	2	2
C	24	8	9
D	14	3	3
E	8	0	1
F	6	0	3
G	7	1	2
H	11	0	0
I	13	0	2
J	4	0	0
K	11	0	0
L	1	0	0
M	2	0	0
N	6	0	2
Totals	122	15	25

Whenever a milk sample was found positive for penicillin by the Difco method, it was also found positive by each of the variations used for comparison. In addition, ten samples with penicillin concentrations not detected by the Difco method, were found positive by one or more of the other methods. Therefore,

the total incidence of penicillin, as indicated by the modified assay test results, was twenty-five of one hundred twenty-two samples, or 20.5 percent. This is nearly twice the highest incidence reported in the national surveys. Kosikowsky, *et al.* (*6*), reported that summer milk samples in New York State yielded a significantly smaller penicillin incidence than spring samples. Our seasonal climate is similar to that of New York and our survey was made during the summer months. If a similar seasonal variation in penicillin incidence occurs here, the significance of our relatively high incidence is even greater.

Five of the fourteen dealer's supplies were found positive within the range of sensitivity of the Difco method. These five and four others were found positive by modifications of the Difco method. The remaining five dealer's supplies were negative throughout the period of the survey.

TABLE 2 — MILK SAMPLES WITH MEASURABLE INHIBITION ZONES OBTAINED BY THE DIFCO PROCEDURE

Individual samples	Units of penicillin per ml.	Units of penicillin per qt.	Standard plate count per ml.	Coliform count per ml.
1	.039	37	*	0
2	.029	27	700	8
3	.041	39	15,000	1
4	.035	33	5,600	5
5	.029	27	9,700	0
6	.021	20	64,000	3
7	.155	147	9,000	2
8	.055	52	5,600	0
9	.042	40	7,500	0
10	.029	27	11,000	0
11	.024	23	21,000	0
12	.055	52	2,400	0
13	.038	36	3,500	0
14	.042	40	1,700	0
15	.064	61	*	*

*Not performed

In Table 2 is shown the penicillin content of the fifteen samples found positive by the Difco method. The range was .021 to .155 units per ml., and in terms of quart volume, these quantities are about 20 and 147 units respectively. For comparison, the ranges found in the first, second and third F.D.A. surveys (*9,10*) were respectively .010 to .084, .003 to .080, and .003 to .550 units per ml.; while that found by Kosikowsky, *et al.* (*6*), was .050 to .500 units per ml.

The zone diameters produced by the Difco penicillin concentration discs were plotted in the form of a dosage-response curve on three cycle semi-logarithmic paper (log.of concentration vs zone diameter). A standard reference curve was thus constructed for each set of standard concentration discs and in all cases it approximated a straight line. The least concentrated standard disc corresponded to .05 units per ml. All but four of the fifteen samples with inhibition zones obtained by the Difco procedure were found to be below this concentration. Therefore, their penicillin concentrations were determined by interpolation on an extension of the standard curve to the required point. The duplicate ¼″ discs gave identical zone diameters for nearly all of the fifteen positive samples. Averages were used for determining penicillin content in the instances of slight size difference.

The standard plate and coliform counts for the fifteen positive samples are also given in Table 2. There appeared to be no definite correlation between these results and the penicillin content. Furthermore, there was no clear indication that the counts had been influenced by the presence of penicillin when they were compared with the counts made on the other one hundred seven samples.

Compared in Table 3 are the results of tests made by modifications of the Difco method on the ten positive samples not detected by the Difco method. Quantitative determinations were not made on these since a standard reference curve could not readily be made. However, since a more sensitive test was necessary to detect penicillin in these samples, it may be assumed that their pencillin content was less than that found in the other fifteen positive samples. This assumption is borne out by a comparison of the zone diameters obtained in the two groups. For the ½″ discs in the fifteen samples the diameters varied from 14.5 to 19 mm., averaging 16.7 mm., while the largest diameter in the ten samples was 15.0 mm. Likewise, the diameters for the double ¼″ discs in the fifteen samples varied from 8 to 11 mm., averaging 9 mm., while the diameters for the two zones obtained in the ten samples were under 7 mm. The inhibition zones produced by the ten positive samples were very clear with a distinct outer margin.

The single ½″ disc was found to be as sensitive for detecting penicillin as the double ½″ disc, and there was an obvious advantage in handling one disc rather than two. The ½″ discs were more sensitive than either single or double ¼″ discs. The latter had

TABLE 3 — PENICILLIN CONCENTRATIONS FOUND IN MILK SAMPLES BUT NOT DETECTED BY THE DIFCO PROCEDURE

Sample	Double ¼" disc	Single ½" disc	Double ½" disc
1	−	+	+
2	+	+	+
3	−	+	+
4	−	+	+
5	−	+	+
6	−	+	+
7	−	+	+
8	−	+	+
9	+	+	+
10	−	+	+

Legend: + = Inhibition zone
− = No inhibition zone

little advantage over the single ¼" disc. Absorption of milk by the ½" discs was very uniform and easily controlled and their larger size made them easier to handle than the ¼" discs.

The presence of penicillin is confirmed in a milk sample when an inhibition zone occurs around the test sample disc but not around the penicillinase disc. Penicillin was thus identified in the twenty-five samples which produced inhibition zones. One penicillinase disc, however, which had no measurable zone did have a slight, very narrow halo, which suggested the presence of an inhibitory substance other than penicillin in the milk sample (No. 8 in Table 2). Even if such substance was present, the presence of penicillin is still confirmed by the definite zone of inhibition which was around the test sample disc.

The presence of penicillin in test samples was further confirmed by use of the identical set of discs on a separate culture dish. Occasional slight variation in inhibition zone size coincided with a corresponding variation in the zones of the standard concentration discs. None of the dry blank control discs and none of the milk samples from the untreated first-calf heifer produced zones of inhibition. No significant difference in incidence of penicillin was found between the homogenized and regular pasteurized milk samples.

The phosphatase test was run on most of the twenty-five samples that later were found to contain penicillin and none were found positive. This supports the findings of investigators who have found pasteurization ineffective for destroying penicillin in milk.

SUMMARY AND CONCLUSIONS

During the summer of 1957, a survey was conducted to determine the incidence of penicillin in the milk marketed for fluid consumption in the town of Amherst, Massachusetts. Fifteen of one hundred twenty-two pasteurized milk samples from fourteen dealers' supplies were found positive for penicillin by the ¼" disc assay method of Difco in the range of .021 to .155 units per ml. This incidence, 12.3 percent, is relatively high when compared with the New York State and national surveys.

The samples were also tested by modifications of the Difco method using double ¼", single ½" and double ½" discs. Penicillin was found by each of these in the same fifteen samples and in ten additional samples by one or more of these methods. The total incidence then was 25 of one hundred twenty-two samples or 20.5 percent. It would seem to follow that in the community surveyed, at least one family in five used milk containing penicillin. This estimate is probably conservative when it is considered that nine of the fourteen dealers' products were found postive at one time or another.

The ½" discs were found more sensitive than the ¼" discs in detecting the presence of penicillin in milk. Their larger size made them easier to handle and they were found uniform in absorbency of milk while absorbency by the ¼" discs was not uniform. On the basis of greatest convenience and high sensitivity the single ½" disc seemed to be the most suitable of the methods used.

ACKNOWLEDGEMENTS

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STORAGE TIME AT 40°F. REQUIRED FOR NEOTETRAZOLIUM REDUCTION AND FLAVOR SPOILAGE WITH CREAM AND CONCENTRATED SKIMMILK

Number of Samples	Reduction of tetrazolium: Days before positive test			Reduction of tetrazolium: Days between positive test and spoilage			Keeping interval (Days)			Psychrophilic count (21°C — 3 days) (Millions): Day of positive test			Psychrophilic count (21°C — 3 days) (Millions): Day of spoilage		
	Ave.	Median	Range	Ave.	Median	Range	Ave.	Median	Range	Ave.	Median	Range	Ave.	Median	Range
Pasteurized bottled single cream. Fat range — 18 to 23%															
28	7.4	8	0-13	4.7	4	1.12	12.3	13	4-21	20	12	1.3-63	104	83	9-370
Pasteurized bottled whipping cream. Fat range — 31 to 48%															
29	7.0	7	0-13	6.5	7	2-13	12.8	14	6-21	29	18	0.19-220	160	140	18-590
Pasteurized heavy cream stored in bulk. Fat range — 37 to 43%															
21	12.0	13	6-22	8.5	8	2-20	24.0	21	12-41	8.7	3	0.41-51	125	95	6-400
Concentrated skimmilk. T. S. range — 26 to 32%															
19	8.8	10	2-13	7.8	9	3-14	17.0	17	10-24	12	21	0.2-160	229	120	12-1100

Neotetrazolium reduction occurred in single cream an average of 4.7 days before flavor spoilage, with a range of from one day to 12 days. In whipping cream the interval was 6.5 days with a range of from two days to 13 days. These results indicate that incipient decomposition can be detected in cream farther in advance of spoilage than is the case with milk. The longer interval is attributed to the masking effect of the higher fat content and higher viscosity on flavor perception. The psychrophilic populations of the cream samples at the time of dye reduction and at the time of spoilage varied widely indicating variable ability of different psychrophiles to cause dye reduction and flavor changes. It is concluded that the neotetrazolium test can be used to detect deterioration in refrigerated bottled cream just as satisfactorily as in milk.

Bulk Cream

To simulate the bulk holding or can holding of cream as practiced by ice cream manufacturers and others, 21 different lots of pasteurized heavy cream from the University Creamery were held in 20 qt. dispenser cans located in a large refrigerator where the temperature range was from 35°F to 45°F. The higher temperatures were during limited periods of the operating day. The cans were not completely filled and agitation before sampling was accomplished by manually whirling the containers. Samples were removed through the dispenser tubes after flushing about 25 ml. of cream which was discarded. Screw clamps were set near the end of the rubber tubes and the exposed portions cut off before each sampling. Some differences in the degree of recontamination of the lots of cream were obtained by washing and sanitizing the dispenser cans at various degrees of efficiency, before they were used for storing the pasteurized cream.

The third line of data in the table shows that the bulk-refrigerated lots of heavy cream reduced neotetrazolium an average of 8.5 days before flavor spoilage was detected, ranging from two to 20 days. This product exhibited the longest keeping period, the lowest psychrophilic population at the time of dye reduction and the longest interval between a positive dye test and organoleptic spoilage, of any of the products studied.

Concentrated Skimmilk

All samples of concentrated skimmilk were obtained from different batches, made from time to time, in the University Creamery. Some of the batches were superheated, others were not. The samples were held in quart glass milk bottles and sampled in the manner described for bottled cream.

The results obtained with concentrated skimmilk are summarized in the last line of data in the table. The samples exhibited an average keeping period of 17 days with a range of from 10 to 24 and the reduction of tetrazolium occurred on an average of 7.8 days prior to organoleptic spoilage with a range of from 3 to 14 days. This product had the highest psychrophilic population at spoilage of any of the products studied. This, however, could not be attributed to the masking effect on flavor perception of high solids because the samples were reconstituted to a fluid basis before flavor evaluation. It is more likely due to the

fact that all samples exhibited a rather definite "cooked" flavor caused either by the preheating temperature (generally about 180°F) or the superheating treatment and this probably made detection of bacterial flavors more difficult.

Inasmuch as there was no significant difference in keeping ability between the superheated samples and those which were not superheated, the results of the two types of concentrated skimmilk were not considered separately. The fact that no difference was noted is not particularly surprising and only serves to emphasize the fact that recontamination is the important consideration in heat treated products as far as keeping ability is concerned, rather than the bacterial numbers following the heat treatment.

A few false-positive dye tests were encountered among the samples of concentrated skimmilk. These were obtained immediately after manufacture and usually became negative within 24 to 48 hours of storage. This phenomenon was mentioned by Day and Doan working with milk but in this study it only was encountered with concentrated skimmlik. The samples showing initial positive tests were not confined to the superheated product and had no other distinguishing characteristics. An effort to relate dye reduction in these samples to heat-generated reducing substances (sulfides and sulfhydryls) proved inconclusive.

Cottage Cheese

When the neotetrazolium test was applied to creamed cottage cheese or cottage cheese curd of any age, in the usual manner, positive tests always resulted. This apparently is due to the fact that starter organisms occluded in the curd develop very rapidly during the four hour incubation period of the samples and reduce the dye. Consequently the test does not measure the activity of psychrophiles but merely verifies the presence of mesophilic organisms in the product.

A modification of the dye reduction test which seemed to offer some possibility for the purpose of detecting psychrophilic activity in held creamed cottage cheese or cottage cheese curd was investigated. Approximately five grams of cheese or curd, randomly removed from the container, in small portions with a sterile spatula, were placed in a sterile test tube and shaken to the bottom. Then 0.5 ml. of the 0.2 per cent aqueous solution of the dye were added, the tube plugged with cotton and held under refrigeration along with the cheese or curd. The criterion used for a positive test was the appearance of any pink or violet color in the tube. Color usually appeared as pink pinpoints, below the surface of the curd, which grew into large lavender colored areas with continued holding.

In 37 trials with creamed cottage cheese and unsalted cottage cheese curd the modified test gave positive tests an average of 11.6 days before organoleptic spoilage could be detected in the sub-surface product. The range was from zero (for 3 samples) to 25 days. In these trials, however, spoilage more frequently occurred as a surface decomposition and the modified test failed, in nearly half the trials, to give any advanced warning of this type of deterioration.

It appears that this test, if useful at all, is limited to the detection of subsurface deterioration in stored bulk cottage cheese or cottage cheese curd. Under such conditions the surface of the product could show development of slime, mold, yeast, etc., yet the product under the surface be unchanged. Inasmuch as the surface could be discarded, the dye reduction test might be used as a quality test for the sub-surface bulk of the product. When used in this way, the dye usually showed reduction well in advance of any detectable change in flavor.

SUMMARY AND CONCLUSIONS

Blue tetrazolium and triphenyltetrazolium dyes were studied as possible substitutes for neotetrazolium in the Day and Doan keeping quality test for bottled milk but it was concluded that neotetrazolium is the best of the three for the purpose.

The neotetrazolium test was found to be applicable, without modification, to bottled cream, bulk cream and concentrated skimmilk for following deterioration caused by psychrophilic bacterial activity when these products are held under refrigeration. In practically all cases the test became positive (dye was reduced) several days in advance of organoleptic spoilage. It is believed that this test would prove very useful to ice cream manufacturers who hold supplies of cream and concentrated milk on hand for mix making.

Superheated concentrated milk exhibited no better keeping quality than unsuperheated, again emphasizing the critical role of recontamination as the major factor influencing the keeping quality of heat-treated products under refrigeration.

A modified neotetrazolium test for detecting psychrophilic deterioration in cottage cheese and cottage cheese curd was found to have only limited value due to the tendency for these products to exhibit surface spoilage not detected by the test.

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COMMITTEES OF THE INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., FOR 1958

The work done by committees of the International continues to be one of the most important contributions to the steady advancement and vigor of this Association. All members are encouraged to suggest topics and projects for committee deliberations. From personal observation or through the suggestion of others, there may be problems upon which research or inquiry is needed. In this connection, you are encouraged and urged to contact the Chairman of the appropriate committee.

COMMITTEE ON APPLIED LABORATORY METHODS

Objectives

To study new laboratory procedures and bacteriologicial problems, to evaluate both published and unpublished data, and to present conclusions which will be helpful to the sanitarian in the conduct of his work.

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COMMITTEE ON BAKING INDUSTRY EQUIPMENT

Objectives

The objectives of this committee are to provide consultative assistance to the Baking Industry Sanitation Standards Committee in the development of standards for items in the Baking Industry.

Members

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COMMITTEE ON COMMUNICABLE DISEASES AFFECTING MAN

Objectives

To study problems related to those diseases communicable to man through the consumption of foods, including milk and milk products, meat, poultry, and shellfish, and to recommend specific measures that can be taken by the sanitarian to control such diseases.

Members

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COMMITTEE ON DAIRY FARM METHODS

OBJECTIVES

To study dairy farm methods and procedures, to determine the sanitary problems involved, and to make recommendations for the solution of such sanitary problems, and for the improvement of dairy farm methods which have a relationship to the sanitary quality of milk.

MEMBERS

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COMMITTEE ON EDUCATION AND PROFESSIONAL DEVELOPMENT

OBJECTIVES

First, to develop plans and to devise methods whereby the Sanitarian can more fully gain recognition as a professional worker in public health, and secondly, to recommend standards of education, training and experience designed to establish desirable professional qualifications to the end that the title Sanitarian will denote adequate preparation for professional work and attainment.

MEMBERS

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COMMITTEE ON FOOD EQUIPMENT

OBJECTIVES

To participate with other health organizations and industries in the formulation of sanitary standards for food equipment. Specifically, the functions of this committee include: (1) cooperation with other health agencies and industry, under the auspices of the National Sanitation Foundation, in the joint development of NSF Standards for Food Service Equipment; (2) when directed by the Executive Board, to cooperate with other health groups and industry in the development of sanitary standards for food equipment; and (3) to present to the membership at the annual meeting those standards which the Committee recommends be endorsed or approved by the Association.

MEMBERS

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COMMITEE ON FROZEN FOOD SANITATION

OBJECTIVES

To study conditions and practices within the frozen food industry, to determine the sanitary problems involved which might contribute to a public health hazard, and to make recommendations for the solution of such problems.

MEMBERS

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COMMITEE ON MEMBERSHIP

OBJECTIVES

To make every effort to increase the membership of the organization by bringing to the attention of all qualified persons the advantages of belonging to the International Association of Milk and Food Sanitarians, Inc., and to interest State milk and food sanitarians' organizations in the advantages of affiliation with the Association.

MEMBERS

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COMMITTEE ON ORDINANCES AND REGULATIONS PERTAINING TO MILK AND DAIRY PRODUCTS

OBJECTIVES

To review and study the provision of sanitary ordinances and regulations pertaining to milk, milk products, and frozen desserts, to evaluate data on research findings relative to the sanitary and public health significance of the specific requirements of ordinances and regulations, and to prepare for submission to the members of the Association recommendations for changes in existing ordinances and regulations.

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COMMITTEE ON RECOGNITION AND AWARDS

OBJECTIVES

This committee is charged with the responsibility of implementing those objectives of the Association concerned with (1) recognition of individual milk and food sanitarians whose achievements have contributed greatly to the public health and welfare of their communities, and (2) recognition of those members of the Association who have, through distinguished service, contributed greatly to the professional advancement and growth and reputation of the International Association of Milk and Food Sanitarians, Inc.

The Committee receives and reviews nominations for the annual Sanitarian's Award, and has full responsibility for the selection of the recipient. The Committee also receives and reviews recommendations on candidates for the annual Citation Awards, and counsels with the Executive Board relative to the selection of the recipients. It is also responsible for handling all matters pertaining to the presentation of awards, publicity and other related items.

MEMBERS

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COMMITTEE ON RESEARCH NEEDS AND APPLICATIONS

OBJECTIVES

The objectives of this committee are: (1) to serve the field sanitarian as a clearing house for new ideas

and practices which would enable a more efficient discharge of their duties; (2) to coordinate its activities with those of a similar committee of the American Public Health Association (Engineering & Sanitation Section); (3) to ascertain the needs of the membership for specific information on given problems and to find the best method of disseminating information obtained by the Committee.

MEMBERS

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COMMITTEE ON SANITARY PROCEDURES

OBJECTIVES

To participate jointly with the Sanitary Standards Subcommittee of the Dairy Industry Committee and the Milk and Food Branch, U.S. Public Health Service, in the formulation of 3A Sanitary Standards for Dairy Equipment. Specifically, the functions of this committee are: (1) to receive, consider, and comment on proposed sanitation standards for dairy equipment submitted by the Sanitary Standards Subcommittee; (2) to bring to the attention of the Sanitary Standards Subcommittee items of dairy industry equipment and methods for which formulation of sanitary standards appear desirable; and (3) to cooperate with the Dairy Industry Committee, the U.S. Public Health Service, and health officials in attaining universal acceptance of the sanitary standards upon which mutual agreement has been reached.

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Special Service Article

PRIVATE SEWAGE DISPOSAL SYSTEMS
FUNCTION, DESIGN AND CAPACITY OF THE SEPTIC TANK

(Editor's note: This is the second in a series of these articles on this subject. The first appeared in the July 1958 issue of the Journal.)

As was pointed out in the July issue of the Journal, the percolation test gives a reasonably good estimate of the ability of the subsoil to absorb septic tank effluent. This test is highly important and forms the basis for further planing.

Functions of the Septic Tank

The first and most important function of a septic tank is to provide protection for the subsoil in which the effluent is absorbed. Untreated liquid household wastes will quickly clog all but the most porous gravel formations. Thus it is highly important that the absorption ability of the soil be protected.

The second function of the septic tank is to retain solids. As sewage from a dwelling enters the tank its rate of flow is reduced so that large solids sink to the bottom or rise to the surface. These solids are retained in the tank and the clarified effluent is discharged. The accumulation of solids at the bottom of the tank is the sludge, while scum is a partially submerged mat of floating solids that may form at the surface of the tank. Sludge, and to a lesser degree scum, will be digested and compacted into a smaller volume. Space must be provided in the tank to store this residue, otherwise sludge and scum will be scoured from the tank and may clog the subsurface disposal system.

The third function is accomplished through biologic action. Solids and liquids are subjected to decomposition by bacterial and natural processes. Bacteria present are known as *anaerobic* and they thrive in the absence of free oxygen. The treatment of sewage under the anaerobic conditions is termed, *septic*, hence the name septic tank. A considerable portion of the sludge and scum is liquified through decomposition and digestion. During this process gas is librated from the sludge, carrying a portion of the solids to the tank surface where they accumulate with the scum.

Septic Tank Location

The location of the septic tank is especially important whenever private water supplies are involved. Contrary to popular belief, a high degree of bacterial removal is not accomplished and the effluent may and does contain infectious material. Although the sewage undergoes treatment in the tank, the liquid discharge can in no sense be considered safe. Unfortunately some uninformed tradesmen leave the impression with the unsuspecting home owner that certain miraculous actions take place in the tank, and that the overflow is *as clean as pure water.* A little experience with the septic and malodorous conditions of the tank effluent will quickly convince any reasonable person that this is wholly untrue.

Most health officials agree that a horizontal separation of 50 feet between a private water supply and a septic tank is satisfactory. Like all rules, there are exceptions, and in some areas where there is creviced limestone or other similar subsurface formations, distances much greater than 50 feet may be no guarantee of safety. Not only should the tank be 50 feet from a private water supply, it should also be the same minimum distance from a pump suction line.

Underground pollution usually moves in the same general direction as the normal movement of the ground water in the locality and ground water moves in the direction of the slope of the water table, that is, from the high water table area, to the lower. In general, the water table follows the contour of the ground surface. It is for this reason that disposal systems should be located downhill from wells or springs.

The septic tank should be located at least 5 feet from any building. In general, the tank should be located where the largest possible area will be available for the subsurface disposal field. Consideration should also be given to location from the standpoint of maintenance and cleaning. Where practical, the top of the tank should be about one foot below the surface of the ground; on level ground the top may be even with the surface or slightly above and be mounded over with earth.

Septic Tank Capacity

The concept of septic tank capacity which prevailed a decade or more ago has now undergone considerable revision. The introduction of automatic

clothes washers, home dishwashing machines and garbage grinders, which increase water consumption, and hence increase the volume of liquid waste, have caused an upward revision to be made in tank capacities. Studies have shown that liberal capacity is not only important from a functional standpoint, but is also good economy. Recommended liquid capacities are shown in Table 1 below.

TABLE 1

LIQUID CAPACITY OF TANK IN GALLONS
(Provides for use of garbage-grinders, automatic washers, and other household appliances)

Number of bedrooms	Recommended minimum tank capacity	Equivalent capacity per bedroom
2 or less	750	375
3	900	300
4	1000	250

For each additional bedroom, add 250 gallons.

SEPTIC TANK DESIGN

The septic tank should be watertight and constructed of materials not subject to excessive corrosion or decay. Concrete, coated metal, vitrified clay, heavyweight concrete bricks or hard burned brick are satisfactory. Steel tanks, meeting commercial standard 177-15 of the U.S. Department of Commerce are generally acceptable. If heavyweight concrete blocks are used they should be laid on a solid foundation and mortar joints should be well filled. The interior of the tank should be surfaced with two quarter inch coats of cement-sand-plaster. Precast tanks should have a minimum wall thickness of 2½ inches and should be properly reinforced to facilitate handling. If precast covers are used they should be at least 3 inches thick and reinforced.

Access must be provided to each compartment of the tank for inspection and cleaning and so that both inlet and outlet are accessible. Either a removable cover or a 20 inch manhole in least demension should be provided. Where the top of the tank is more than 18 inches below the finished grade, manholes and inspection holes should extend approximately 8 inches below the finished grade. Such extensions can be made using clay or concrete pipe.

OUTLET DEVICE

The outlet device should penetrate just far enough below the liquid level to provide a balance between sludge and scum. A verical section of a properly operating tank would show three distinct layers, scum at top, a middle zone free of solids, and a bottom layer of sludge. The outlet device retains scum in the tank, but at the same time limits the amount of sludge that can be accommodated without scouring. The outlet device should generally extend to a distance below the surface equal to 40 per cent of the liquid depth. This should be reduced to 5 per cent for the horizontal cylindrical tanks. The outlet device should extend above the liquid line to approximately 1 inch from the top of the tank.

TANK INLET

The inlet invert should enter the tank at least 1 inch, but preferably 3, above the liquid level in the tank to allow for periodic rises in liquid level during periods when wash is discharging to the tank. A vented inlet tee or a baffle should be provided to divert the incoming sewage downward. It should penetrate at least 6 inches below the liquid level but in no case should penetration be greater than that for the outlet.

TANK PROPORTIONS

For tanks of given capacity and depth, the shape of the tank is unimportant. For tanks of given capacity and surface area, shallower tanks function as well as deep ones. However, it is recommended that the smallest plan dimension be at least 2 feet. Liquid depth may vary between 30 and 60 inches.

TANK COMPARTMENTS

Although a number of arrangements are possible, the term "compartmentation," as used here, refers to a number of units placed in series. These can be either separate units linked together, or sections enclosed in one continuous shell with watertight partitions separating the individual compartments.

A single-compartment tank will give acceptable performance. The available research data indicate, however, that a two-compartment tank, with the first compartment equal to one-half to two-thirds of the total volume, provides an extra degree of suspended solids removal, which may be especially valuable under tight-soil conditions. Tanks with three or more equal compartments give at least as good performance as single-compartment tanks of the same total capacity. No tank should have in excess of four compartments, and each compartment should have a minimum plan dimension of 2 feet with liquid depth ranging from 30 to 60 inches.

An access manhole should be provided to each compartment. Venting between compartments should be provided to allow free passage of gas. Inlet and outlet fittings in the compartmented tank should be proportioned as for a single tank. The same allowance should be made for storage above the liquid line as in a single tank.

STORAGE TIME AT 40°F. REQUIRED FOR NEOTETRAZOLIUM REDUCTION AND FLAVOR SPOILAGE WITH CREAM AND CONCENTRATED SKIMMILK

Number of Samples	Reduction of tetrazolium: Days before positive test			Reduction of tetrazolium: Days between positive test and spoilage			Keeping interval (Days)			Psychrophilic count (21°C — 3 days) (Millions): Day of positive test			Psychrophilic count (21°C — 3 days) (Millions): Day of spoilage		
	Ave.	Median	Range	Ave.	Median	Range	Ave.	Median	Range	Ave.	Median	Range	Ave.	Median	Range
Pasteurized bottled single cream. Fat range — 18 to 23%															
28	7.4	8	0-13	4.7	4	1.12	12.3	13	4-21	20	12	1.3-63	104	83	9-370
Pasteurized bottled whipping cream. Fat range — 31 to 48%															
29	7.0	7	0-13	6.5	7	2-13	12.8	14	6-21	29	18	0.19-220	160	140	18-590
Pasteurized heavy cream stored in bulk. Fat range — 37 to 43%															
21	12.0	13	6-22	8.5	8	2-20	24.0	21	12-41	8.7	3	0.41-51	125	95	6-400
Concentrated skimmilk. T. S. range — 26 to 32%															
19	8.8	10	2-13	7.8	9	3-14	17.0	17	10-24	12	21	0.2-160	229	120	12-1100

Neotetrazolium reduction occurred in single cream an average of 4.7 days before flavor spoilage, with a range of from one day to 12 days. In whipping cream the interval was 6.5 days with a range of from two days to 13 days. These results indicate that incipient decomposition can be detected in cream farther in advance of spoilage than is the case with milk. The longer interval is attributed to the masking effect of the higher fat content and higher viscosity on flavor perception. The psychrophilic populations of the cream samples at the time of dye reduction and at the time of spoilage varied widely indicating variable ability of different psychrophiles to cause dye reduction and flavor changes. It is concluded that the neotetrazolium test can be used to detect deterioration in refrigerated bottled cream just as satisfactorily as in milk.

Bulk Cream

To simulate the bulk holding or can holding of cream as practiced by ice cream manufacturers and others, 21 different lots of pasteurized heavy cream from the University Creamery were held in 20 qt. dispenser cans located in a large refrigerator where the temperature range was from 35°F to 45°F. The higher temperatures were during limited periods of the operating day. The cans were not completely filled and agitation before sampling was accomplished by manually whirling the containers. Samples were removed through the dispenser tubes after flushing about 25 ml. of cream which was discarded. Screw clamps were set near the end of the rubber tubes and the exposed portions cut off before each sampling. Some differences in the degree of recontamination of the lots of cream were obtained by washing and sanitizing the dispenser cans at various degrees of efficiency, before they were used for storing the pasteurized cream.

The third line of data in the table shows that the bulk-refrigerated lots of heavy cream reduced neotetrazolium an average of 8.5 days before flavor spoilage was detected, ranging from two to 20 days. This product exhibited the longest keeping period, the lowest psychrophilic population at the time of dye reduction and the longest interval between a positive dye test and organoleptic spoilage, of any of the products studied.

Concentrated Skimmilk

All samples of concentrated skimmilk were obtained from different batches, made from time to time, in the University Creamery. Some of the batches were superheated, others were not. The samples were held in quart glass milk bottles and sampled in the manner described for bottled cream.

The results obtained with concentrated skimmilk are summarized in the last line of data in the table. The samples exhibited an average keeping period of 17 days with a range of from 10 to 24 and the reduction of tetrazolium occurred on an average of 7.8 days prior to organoleptic spoilage with a range of from 3 to 14 days. This product had the highest psychrophilic population at spoilage of any of the products studied. This, however, could not be attributed to the masking effect on flavor perception of high solids because the samples were reconstituted to a fluid basis before flavor evaluation. It is more likely due to the

fact that all samples exhibited a rather definite "cooked" flavor caused either by the preheating temperature (generally about 180°F) or the superheating treatment and this probably made detection of bacterial flavors more difficult.

Inasmuch as there was no significant difference in keeping ability between the superheated samples and those which were not superheated, the results of the two types of concentrated skimmilk were not considered separately. The fact that no difference was noted is not particularly surprising and only serves to emphasize the fact that recontamination is the important consideration in heat treated products as far as keeping ability is concerned, rather than the bacterial numbers following the heat treatment.

A few false-positive dye tests were encountered among the samples of concentrated skimmilk. These were obtained immediately after manufacture and usually became negative within 24 to 48 hours of storage. This phenomenon was mentioned by Day and Doan working with milk but in this study it only was encountered with concentrated skimmlik. The samples showing initial positive tests were not confined to the superheated product and had no other distinguishing characteristics. An effort to relate dye reduction in these samples to heat-generated reducing substances (sulfides and sulfhydryls) proved inconclusive.

Cottage Cheese

When the neotetrazolium test was applied to creamed cottage cheese or cottage cheese curd of any age, in the usual manner, positive tests always resulted. This apparently is due to the fact that starter organisms occluded in the curd develop very rapidly during the four hour incubation period of the samples and reduce the dye. Consequently the test does not measure the activity of psychrophiles but merely verifies the presence of mesophilic organisms in the product.

A modification of the dye reduction test which seemed to offer some possibility for the purpose of detecting psychrophilic activity in held creamed cottage cheese or cottage cheese curd was investigated. Approximately five grams of cheese or curd, randomly removed from the container, in small portions with a sterile spatula, were placed in a sterile test tube and shaken to the bottom. Then 0.5 ml. of the 0.2 per cent aqueous solution of the dye were added, the tube plugged with cotton and held under refrigeration along with the cheese or curd. The criterion used for a positive test was the appearance of any pink or violet color in the tube. Color usually appeared as pink pinpoints, below the surface of the curd, which grew into large lavender colored areas with continued holding.

In 37 trials with creamed cottage cheese and unsalted cottage cheese curd the modified test gave positive tests an average of 11.6 days before organoleptic spoilage could be detected in the sub-surface product. The range was from zero (for 3 samples) to 25 days. In these trials, however, spoilage more frequently occurred as a surface decomposition and the modified test failed, in nearly half the trials, to give any advanced warning of this type of deterioration.

It appears that this test, if useful at all, is limited to the detection of subsurface deterioration in stored bulk cottage cheese or cottage cheese curd. Under such conditions the surface of the product could show development of slime, mold, yeast, etc., yet the product under the surface be unchanged. Inasmuch as the surface could be discarded, the dye reduction test might be used as a quality test for the sub-surface bulk of the product. When used in this way, the dye usually showed reduction well in advance of any detectable change in flavor.

SUMMARY AND CONCLUSIONS

Blue tetrazolium and triphenyltetrazolium dyes were studied as possible substitutes for neotetrazolium in the Day and Doan keeping quality test for bottled milk but it was concluded that neotetrazolium is the best of the three for the purpose.

The neotetrazolium test was found to be applicable, without modification, to bottled cream, bulk cream and concentrated skimmilk for following deterioration caused by psychrophilic bacterial activity when these products are held under refrigeration. In practically all cases the test became positive (dye was reduced) several days in advance of organoleptic spoilage. It is believed that this test would prove very useful to ice cream manufacturers who hold supplies of cream and concentrated milk on hand for mix making.

Superheated concentrated milk exhibited no better keeping quality than unsuperheated, again emphasizing the critical role of recontamination as the major factor influencing the keeping quality of heat-treated products under refrigeration.

A modified neotetrazolium test for detecting psychrophilic deterioration in cottage cheese and cottage cheese curd was found to have only limited value due to the tendency for these products to exhibit surface spoilage not detected by the test.

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COMMITTEES OF THE INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., FOR 1958

The work done by committees of the International continues to be one of the most important contributions to the steady advancement and vigor of this Association. All members are encouraged to suggest topics and projects for committee deliberations. From personal observation or through the suggestion of others, there may be problems upon which research or inquiry is needed. In this connection, you are encouraged and urged to contact the Chairman of the appropriate committee.

COMMITTEE ON APPLIED LABORATORY METHODS

Objectives

To study new laboratory procedures and bacteriologicial problems, to evaluate both published and unpublished data, and to present conclusions which will be helpful to the sanitarian in the conduct of his work.

Members

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COMMITTEE ON BAKING INDUSTRY EQUIPMENT

Objectives

The objectives of this committee are to provide consultative assistance to the Baking Industry Sanitation Standards Committee in the development of standards for items in the Baking Industry.

Members

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COMMITTEE ON COMMUNICABLE DISEASES AFFECTING MAN

Objectives

To study problems related to those diseases communicable to man through the consumption of foods, including milk and milk products, meat, poultry, and shellfish, and to recommend specific measures that can be taken by the sanitarian to control such diseases.

Members

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COMMITTEE ON DAIRY FARM METHODS

OBJECTIVES

To study dairy farm methods and procedures, to determine the sanitary problems involved, and to make recommendations for the solution of such sanitary problems, and for the improvement of dairy farm methods which have a relationship to the sanitary quality of milk.

MEMBERS

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COMMITTEE ON EDUCATION AND PROFESSIONAL DEVELOPMENT

OBJECTIVES

First, to develop plans and to devise methods whereby the Sanitarian can more fully gain recognition as a professional worker in public health, and secondly, to recommend standards of education, training and experience designed to establish desirable professional qualifications to the end that the title Sanitarian will denote adequate preparation for professional work and attainment.

MEMBERS

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COMMITTEE ON FOOD EQUIPMENT

OBJECTIVES

To participate with other health organizations and industries in the formulation of sanitary standards for food equipment. Specifically, the functions of this committee include: (1) cooperation with other health agencies and industry, under the auspices of the National Sanitation Foundation, in the joint development of NSF Standards for Food Service Equipment; (2) when directed by the Executive Board, to cooperate with other health groups and industry in the development of sanitary standards for food equipment; and (3) to present to the membership at the annual meeting those standards which the Committee recommends be endorsed or approved by the Association.

MEMBERS

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COMMITEE ON FROZEN FOOD SANITATION

OBJECTIVES

To study conditions and practices within the frozen food industry, to determine the sanitary problems involved which might contribute to a public health hazard, and to make recommendations for the solution of such problems.

MEMBERS

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COMMITEE ON MEMBERSHIP

OBJECTIVES

To make every effort to increase the membership of the organization by bringing to the attention of all qualified persons the advantages of belonging to the International Association of Milk and Food Sanitarians, Inc., and to interest State milk and food sanitarians' organizations in the advantages of affiliation with the Association.

MEMBERS

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COMMITTEE ON ORDINANCES AND REGULATIONS PERTAINING TO MILK AND DAIRY PRODUCTS

OBJECTIVES

To review and study the provision of sanitary ordinances and regulations pertaining to milk, milk products, and frozen desserts, to evaluate data on research findings relative to the sanitary and public health significance of the specific requirements of ordinances and regulations, and to prepare for submission to the members of the Association recommendations for changes in existing ordinances and regulations.

MEMBERS

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COMMITTEE ON RECOGNITION AND AWARDS

OBJECTIVES

This committee is charged with the responsibility of implementing those objectives of the Association concerned with (1) recognition of individual milk and food sanitarians whose achievements have contributed greatly to the public health and welfare of their communities, and (2) recognition of those members of the Association who have, through distinguished service, contributed greatly to the professional advancement and growth and reputation of the International Association of Milk and Food Sanitarians, Inc.

The Committee receives and reviews nominations for the annual Sanitarian's Award, and has full responsibility for the selection of the recipient. The Committee also receives and reviews recommendations on candidates for the annual Citation Awards, and counsels with the Executive Board relative to the selection of the recipients. It is also responsible for handling all matters pertaining to the presentation of awards, publicity and other related items.

MEMBERS

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COMMITTEE ON RESEARCH NEEDS AND APPLICATIONS

OBJECTIVES

The objectives of this committee are: (1) to serve the field sanitarian as a clearing house for new ideas

and practices which would enable a more efficient discharge of their duties; (2) to coordinate its activities with those of a similar committee of the American Public Health Association (Engineering & Sanitation Section); (3) to ascertain the needs of the membership for specific information on given problems and to find the best method of disseminating information obtained by the Committee.

MEMBERS

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Dr. K. G. Weckel, Dept. of Dairy & Food Industries, Univ. of Wisconsin, Madison, Wisconsin.

COMMITTEE ON SANITARY PROCEDURES

OBJECTIVES

To participate jointly with the Sanitary Standards Subcommittee of the Dairy Industry Committee and the Milk and Food Branch, U.S. Public Health Service, in the formulation of 3A Sanitary Standards for Dairy Equipment. Specifically, the functions of this committee are: (1) to receive, consider, and comment on proposed sanitation standards for dairy equipment submitted by the Sanitary Standards Subcommittee; (2) to bring to the attention of the Sanitary Standards Subcommittee items of dairy industry equipment and methods for which formulation of sanitary standards appear desirable; and (3) to cooperate with the Dairy Industry Committee, the U.S. Public Health Service, and health officials in attaining universal acceptance of the sanitary standards upon which mutual agreement has been reached.

MEMBERS

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Special Service Article

PRIVATE SEWAGE DISPOSAL SYSTEMS
FUNCTION, DESIGN AND CAPACITY OF THE SEPTIC TANK

(Editor's note: This is the second in a series of these articles on this subject. The first appeared in the July 1958 issue of the Journal.)

As was pointed out in the July issue of the Journal, the percolation test gives a reasonably good estimate of the ability of the subsoil to absorb septic tank effluent. This test is highly important and forms the basis for further planing.

Functions of the Septic Tank

The first and most important function of a septic tank is to provide protection for the subsoil in which the effluent is absorbed. Untreated liquid household wastes will quickly clog all but the most porous gravel formations. Thus it is highly important that the absorption ability of the soil be protected.

The second function of the septic tank is to retain solids. As sewage from a dwelling enters the tank its rate of flow is reduced so that large solids sink to the bottom or rise to the surface. These solids are retained in the tank and the clarified effluent is discharged. The accumulation of solids at the bottom of the tank is the sludge, while scum is a partially submerged mat of floating solids that may form at the surface of the tank. Sludge, and to a lesser degree scum, will be digested and compacted into a smaller volume. Space must be provided in the tank to store this residue, otherwise sludge and scum will be scoured from the tank and may clog the subsurface disposal system.

The third function is accomplished through biologic action. Solids and liquids are subjected to decomposition by bacterial and natural processes. Bacteria present are known as *anaerobic* and they thrive in the absence of free oxygen. The treatment of sewage under the anaerobic conditions is termed, *septic*, hence the name septic tank. A considerable portion of the sludge and scum is liquified through decomposition and digestion. During this process gas is librated from the sludge, carrying a portion of the solids to the tank surface where they accumulate with the scum.

Septic Tank Location

The location of the septic tank is especially important whenever private water supplies are involved. Contrary to popular belief, a high degree of bacterial removal is not accomplished and the effluent may and does contain infectious material. Although the sewage undergoes treatment in the tank, the liquid discharge can in no sense be considered safe. Unfortunately some uninformed tradesmen leave the impression with the unsuspecting home owner that certain miraculous actions take place in the tank, and that the overflow is *as clean as pure water.* A little experience with the septic and malodorous conditions of the tank effluent will quickly convince any reasonable person that this is wholly untrue.

Most health officials agree that a horizontal separation of 50 feet between a private water supply and a septic tank is satisfactory. Like all rules, there are exceptions, and in some areas where there is creviced limestone or other similar subsurface formations, distances much greater than 50 feet may be no guarantee of safety. Not only should the tank be 50 feet from a private water supply, it should also be the same minimum distance from a pump suction line.

Underground pollution usually moves in the same general direction as the normal movement of the ground water in the locality and ground water moves in the direction of the slope of the water table, that is, from the high water table area, to the lower. In general, the water table follows the contour of the ground surface. It is for this reason that disposal systems should be located downhill from wells or springs.

The septic tank should be located at least 5 feet from any building. In general, the tank should be located where the largest possible area will be available for the subsurface disposal field. Consideration should also be given to location from the standpoint of maintenance and cleaning. Where practical, the top of the tank should be about one foot below the surface of the ground; on level ground the top may be even with the surface or slightly above and be mounded over with earth.

Septic Tank Capacity

The concept of septic tank capacity which prevailed a decade or more ago has now undergone considerable revision. The introduction of automatic

clothes washers, home dishwashing machines and garbage grinders, which increase water consumption, and hence increase the volume of liquid waste, have caused an upward revision to be made in tank capacities. Studies have shown that liberal capacity is not only important from a functional standpoint, but is also good economy. Recommended liquid capacities are shown in Table 1 below.

TABLE 1

LIQUID CAPACITY OF TANK IN GALLONS
(Provides for use of garbage-grinders, automatic washers, and other household appliances)

Number of bedrooms	Recommended minimum tank capacity	Equivalent capacity per bedroom
2 or less	750	375
3	900	300
4	1000	250

For each additional bedroom, add 250 gallons.

SEPTIC TANK DESIGN

The septic tank should be watertight and constructed of materials not subject to excessive corrosion or decay. Concrete, coated metal, vitrified clay, heavyweight concrete bricks or hard burned brick are satisfactory. Steel tanks, meeting commercial standard 177-15 of the U.S. Department of Commerce are generally acceptable. If heavyweight concrete blocks are used they should be laid on a solid foundation and mortar joints should be well filled. The interior of the tank should be surfaced with two quarter inch coats of cement-sand-plaster. Precast tanks should have a minimum wall thickness of 2½ inches and should be properly reinforced to facilitate handling. If precast covers are used they should be at least 3 inches thick and reinforced.

Access must be provided to each compartment of the tank for inspection and cleaning and so that both inlet and outlet are accessible. Either a removable cover or a 20 inch manhole in least demension should be provided. Where the top of the tank is more than 18 inches below the finished grade, manholes and inspection holes should extend approximately 8 inches below the finished grade. Such extensions can be made using clay or concrete pipe.

OUTLET DEVICE

The outlet device should penetrate just far enough below the liquid level to provide a balance between sludge and scum. A verical section of a properly operating tank would show three distinct layers, scum at top, a middle zone free of solids, and a bottom layer of sludge. The outlet device retains scum in the tank, but at the same time limits the amount of sludge that can be accommodated without scouring. The outlet device should generally extend to a distance below the surface equal to 40 per cent of the liquid depth. This should be reduced to 5 per cent for the horizontal cylindrical tanks. The outlet device should extend above the liquid line to approximately 1 inch from the top of the tank.

TANK INLET

The inlet invert should enter the tank at least 1 inch, but preferably 3, above the liquid level in the tank to allow for periodic rises in liquid level during periods when wash is discharging to the tank. A vented inlet tee or a baffle should be provided to divert the incoming sewage downward. It should penetrate at least 6 inches below the liquid level but in no case should penetration be greater than that for the outlet.

TANK PROPORTIONS

For tanks of given capacity and depth, the shape of the tank is unimportant. For tanks of given capacity and surface area, shallower tanks function as well as deep ones. However, it is recommended that the smallest plan dimension be at least 2 feet. Liquid depth may vary between 30 and 60 inches.

TANK COMPARTMENTS

Although a number of arrangements are possible, the term "compartmentation," as used here, refers to a number of units placed in series. These can be either separate units linked together, or sections enclosed in one continuous shell with watertight partitions separating the individual compartments.

A single-compartment tank will give acceptable performance. The available research data indicate, however, that a two-compartment tank, with the first compartment equal to one-half to two-thirds of the total volume, provides an extra degree of suspended solids removal, which may be especially valuable under tight-soil conditions. Tanks with three or more equal compartments give at least as good performance as single-compartment tanks of the same total capacity. No tank should have in excess of four compartments, and each compartment should have a minimum plan dimension of 2 feet with liquid depth ranging from 30 to 60 inches.

An access manhole should be provided to each compartment. Venting between compartments should be provided to allow free passage of gas. Inlet and outlet fittings in the compartmented tank should be proportioned as for a single tank. The same allowance should be made for storage above the liquid line as in a single tank.

The third and concluding article on "Private Sewage Disposal Systems," will appear in the September issue of the Journal and will deal with, the sub-surface absorption systems.

Reference

[1] Department of Health, Education and Welfare, Public Health Service, Manual of Septic Tank Practice, PHS Publication No. 526, U.S. Government Printing Office, Washington 25, D.C.

NEWS AND EVENTS

AUTHORIZATION TO USE THE 3-A SYMBOL

Following is a list of concerns to which 3-A Symbol Council authorization to use the 3-A symbol have been issued since publication of the list in the July 1958 issue of the Journal. This list supplements other listings published in earlier issues of the Journal.

Authorization Number	Concern and Address	Model Numbers
	EVAPORATORS AND VACUUM PANS	
106	Henszey Company 202 North Water Street Watertown, Wisconsin	Evap: 36T, 55T, 85T, 120T, 150T, 198T, 252T, and 378T. Pans: 36", 42", 48", 60", 72" and 84".
107	C. E. Rogers Company 8731 Witt Street Detroit 9, Michigan	Evap: Single, Double, and Triple Effect. Pans: 28", 36", 42", 4', 5', 6'.
	FARM TANKS	
11	Creamery Package Mfg. Co. 1243 W. Washington Blvd. Chicago 7, Illinois	Add: RFB: 180, 250, and 375. Also RS: 200, 300, and 400.
10	Girton Manufacturing Co. Millville, Pa.	Substitute "Thrifite" for "Scotsman."
48	Metal Products Co. 222 Dewey Wichita, Kansas	Replace "R" and "S," with PR, PS, 4R, and 4S.
42	Van-Vetter, Inc. 2130 Harbor Ave., S.W. Seattle 6, Washington	Add: VVS: 125, 1250, and 1500. VVSS: 125. AV: 200 to 1000, inclusive
	PIPING FITTINGS	
105	Girton Manufacturing Co. Millville, Pa.	Girton Lever Lock Valve
	PUMPS	
5	Waukesha Foundry Co. Waukesha, Wisconsin	Add: DO-200
	TANKS - AUTOMOTIVE	
64	Atlas Metal Products, Inc. 554 Wilbur Cross Highway Berlin, Conn.	

PUBLIC HEALTH TRAINING NEEDS GIVEN CLOSE SCRUTINY

The National Conference on Public Health Training met in Washington, D.C., July 28-30 to make recommendations to the Surgeon General of the U. S. Public Health Service on current and future national needs for trained public health personnel. Some one hundred educators and administrators met representing graduate public health, nursing education, sanitary engineering and sanitary science and other health related fields.

The 84th Congress in 1956, through Public Law 911, authorized the establishment of a program of public health traineeships to be administered by the Public Health Service. This became known as the Title I Amendment and for the fiscal year 1956, provided one million dollars for traineeship funds to assist several categories of public health workers in obtaining both graduate, and in some instances, undergraduate education. The Act also required that a National Conference be called to evaluate training and other needs of public health personnel and to advise the Surgeon General on three points in particular, as follows:

1. Appraise the effectiveness of the traineeship program in meeting needs for trained public health personnel;
2. Consider modification in basic legislation, if any, which may be desirable to increase its effectiveness;
3. Consider the most effective distribution of responsibilities between Federal and State Governments with respect to the administration and support of public health training.

With this charge before the Conference, and working through four separate task groups, a number of resolutions were drawn and adopted which will have far reaching effects on the recruitment of new personnel and will more adequately provide for the preparation of those currently engaged in public health activities. Some thirty-five resolutions were adopted for the Surgeon General's consideration. These in turn will be reported to the Congress in 1959 with the request that further pertinent amendments be made to the existing act plus the appropriation of additional funds to further implement the training program. It is of course impossible to predict what congressional action will be taken, but it is reasonable to assume that Congress will seriously evaluate the urgency of the several resolutions and take appropriate action.

A number of resolutions adopted by the Conference are of broad national import and point to the need for a stepped up program in terms of both recruitment and academic and technical preparation. Some of the more significant resolutions adopted are as follows:*

1. The length of the training period should be increased especially for persons who hold or will fill key positions requiring highly technical skills or, who have complex adminstrative assignments.
   (Currently, Title I traineeships are for an academic year plus an extension for field or special training up to 12 months).
2. There be provided a mechanism whereby direct grants for special graduate or other types of training can be made to qualified persons who have been working in public health for an extended period of time.
   (This resolution overcomes the objection that Title I funds are now awarded largely to new recruits or to persons with not over five years of public health experience. An analysis of personnel needs indicates that a large group of public health workers with extensive experience should receive further specialized preparation).
3. That there be appropriated for direct training grants to individuals, the aggregate sum of $1,500,000 for the first year of the program and that this amount be increased $500,000 for each of the next five years.
   (Under the currently operated plan an applicant for a traineeship must apply to an accredited educational institution and be accepted prior to the time funds are granted through the Public Health Service. In a small proportion of cases, the educational institution may give a direct grant. The new proposal would liberalize existing procedure and policy).
4. That there should be basic support for the operation of Schools of Public Health by a separate Act and on a continuing basis.
   (Enrollment in School of Public Health dropped from a high of about 900 in 1947 to a low of about 400 by 1954. With the advent of Title I traineeships, student enrollment has increased. Since 1956, the number of students receiving preparation in various educational institutions, largely, Schools of Public Health, has been slightly in excess of 1,000, exclusive of nurses taking a year of preparation in nursing education).
5. Establish a categorized grants-in-aid program to the several states for public health training and for professional recruitment.
   (In addition to the Title I traineeship program of awards to individuals directly or through training institutions and through federal support to educational institutions, there is need for federal grants-in-aid to states to assist them in meeting their public health training requirements. Such program might well include academic and non-academic training, pre-service and in-service training, field training and residency

*Numbers shown here do not correspond with numbered resolutions adopted by the Conference.

training. From a survey of training needs in local and state health departments it is estimated that some 12,000 public health workers are now in need of at least one academic year of public health preparation. If adequate training funds and facilities are made available about 7,000 persons can receive such training within the period 1959-1963).

6. If a grants-in-aid program is established between the states and the federal government, it should be on a matching ratio basis of two dollars to one. This is predicted upon the following points:
   a. Such program will provide nation-wide coverage.
   b. Personnel trained at the expense of one state will frequently pursue their public health careers on other states.
   c. Field training provided in one state may be for the benefit of trainees and educational institutions of other states.

   (Under the current Title I program there have been no training grants directly to states. It is felt that the broader grants-in-aid plan will give better coverage).
7. The Public Health Service should extend its program assistance to states by making available teams of training specialists where needed programs cannot be developed on a local or area basis.

   (In this case the facilities of the Taft Sanitary Engineering Center, the Communicable Disease Center and the National Institutes of Health, might be called upon to extend their services to state and local agencies through courses conducted by traveling teams of specialists).
8. The public Health Service should seek authority and funds to make available personnel on loan to operating agencies and to institutions to assist them in maintaining services during the time their regular personnel is away for academic training.

   (This would be used if no other feasible solution is available. However, one of the deterrents to training leave has been the lack of persons who could take over the normal and regular duties of the trainee).
9. A certain portion of the traineeship funds should be allocated for the awarding of traineeships, on a pilot study basis, for the public health training of students for first level sanitarian positions and that such funds be granted for the last year of undergraduate academic training to students pursuing a public health course at schools recognized as offering courses in this area.

   (Under present procedures, Title I funds are for graduate education or for undergraduate education for nurses who hold an R.N., or for dental hygienists holding a certificate. Other students pursuing a public health course at the undergraduate level are excluded. While the recommendation is for a pilot study, it would permit the channeling of some funds in the direction of sanitarian training).
10. Teaching grants should be made available to improve graduate training for sanitarians, sanitary engineers, public health laboratory personnel, public health nutritionists and for others in public health related fields. Such funds, in this case, should be in addition to those provided for Schools of Public Health and Schools of Nursing.

In addition to the ten recommendations given above, others were adopted which included requests

for funds to assist graduate schools of public health in administration and other expenses attendant upon the increase in student enrollment, the extension of training fund usage to other than official agencies concerned with public health, and for appropriations to help defray expenses incurred in an expansion of buildings, laboratories and other physical facilities.

During the three day session the Conference made many significant observations and recommendations. These will have to be carefully evaluated and placed in proper perspective by the Public Health Service and later by the Congress. With public health practice changing and with new situations and conditions to be met, an adequate complement of well trained workers and scientists is urgently needed to insure the continued health protection and promotion at a high level nationally.

FLUORESCENT DYE GIVES RAPID ANTIBIOTIC TEST

The Journal of Dairy Science has reported that R.J. Lehman and Charles A. Matthews of the Animal Husbandry Research Division, U.S.D.A., Beltsville, Maryland, and R. E. Hargrove, Eastern Utilization Research and Development Division, USDA, Washington, D.C., used fluorescent materials for the indirect detection of antibiotics in milk. A rapid sensitive and reliable means for detecting antibiotics in milk is needed urgently by dairy manufacturers, dairy farmers, and public health officials. Although several sensitive and apparently reliable tests for antibiotics have been proposed recently, all of them are laboratory tests that require from 2½ to 8 hours. The time, laboratory equipment, and skill required for these tests reduce their usefulness, particularly to cheesemakers and farmers.

The addition of a combination of fat-soluble fluorescein (Fluoral) and uranine, as a "marker," to penicillin preparations intended for intramammary infusion, was found to provide a rapid and satisfactory means for detecting the antibiotic in milk. The marker was detected visually in the milk for 48 hours after treatment and with ultraviolet light for 96 hours. The marker was nontoxic to the treated animals and did not affect milk production. Statistical analysis of the data showed a close correlation between the excretion of marker and penicillin from the treated udders.

SODIUM NITRITE MORE ACCURATE FOR CHECKING H.T.S.T. HOLDING TIME

G. I. A. Lang and W. K. Jordan of the Department of Dairy Industry, Cornell University, Ithaca, N.Y., made a comparison of standard methods of measuring holding time in H.T.S.T. pasteurizers. The universal adoption of H.T.S.T. pasteurization of milk, with a holding time of a matter of a few seconds, necessitates a precise and accurate method of measuring the time of holding of the milk under this system. Various methods have been used or suggested for use in the determination of holding time in H.T.S.T. pasteurizers, each having its relative advantages and disadvantages. The object of any method is to determine the minimum time in which a bacterial cell will travel through the holding tube. Recent years have seen the development of more accurate methods. This study is a comparison of two methods of determining holding time, one of which is considered to be the most accurate method available, and the other, one of the most widely used methods. The former method may be called a chemical method as it involves the injection of a chemical substance at the entrance to the holding tube which is detected at the outlet of the holding tube by a reagent which gives a colour reaction. The latter method is the electrolytic or salt conductivity method which has been standardized in the United States for the measurement of holding time in H.T.S.T. pasteurizers.

Three tests for the determination of holding time were compared; namely, the nickel-chloride-dimethylglyoxime chemical method, the sodium nitriate-Griess-Ilosvay chemical method, and the salt conductivity method. Tests were carried out, under field conditions, on five commercial plate-type, high-temperature, short-time pasteurizers, the capacities of which ranged from 3,935 to 16,525 lb. per hour. The size of holding tubes on these units was from 1½ - 2½ in. nominal size sanitary piping whereas one of the units had a plate-type holder section.

The methods were compared under conditions as nearly identical as circumstances would permit. Results of tests, carried out in accordance with these methods, were compared on the basis of the same flow rate, with the same type of injection being used. The point of injection of the solution used as a tracer was the same in all tests in relation to the flow of liquid entering the holding section.

The results indicate that the sodium nitrite test was more sensitive as a method of determining holding time than either the nickel chloride test or the salt conductivity test. This was more apparent in high-capacity units, using larger-sized holding tubes, and in lower-capacity units with a low holding-tube efficiency. The nickel chloride test and the salt conductivity test were shown to be of comparable sensitivity on low-and medium-capacity units, but on higher-capacity units the nickel chloride test appeared more sensitive than the salt conductivity test.

The salt conductivity test was more easily adapted to varying conditions than the chemical test and it was not more difficult to operate. The reagents for the chemical test required greater care and time in preparation and handling than the salt solution for the salt conductivity test; the salt conductivity test could be done in much less time than the chemical test.

Quoted From: Journal Dairy Science Abstracts, June 1958.

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THE FOOD INDUSTRY IN A CHANGING WORLD

Excerpts from an address by Dr. Bernard L. Oser, upon receiving the 1958 Babcock-Hart Award from the Institute of Food Technologists, May 27, 1958, Chicago, Illinois.

. . . If we, as food scientists, appraise the situation which confronts mankind we will have to acknowledge that whether man's tenancy of the world continues depends upon how well our science progresses . . . we have paid but little heed to two matters which are vital to man's future existence. . . . More than half of the world's population now struggles to receive fewer than 2200 calories per capita. Shortly before World War II there was sufficient food to provide a world average of 2300 calories per person. Now, despite a 9 per cent increase in food output, the average available today is down to 2260 calories. We are indeed walking a nutritional tight-rope. . . . Much of the earth's 36 billion land acres is not arable. In fact, less than one-tenth is under cultivation and, it has been estimated, present agricultural technology would permit at most a doubling of current world food production. Compare this with the anticipated trebling or quadrupling of population (in the next 100 years) and it becomes obvious that some control of human multiplication must be exercised . . . every means will have to be taken to expand and conserve food supplies. . . . We shall have to find or make new foods. . . . These foods may come from some of the thousands of known plant varieties never before consumed by humans, from artifically cultivated algae or yeasts, or from the sea. . . . But in addition to tapping these natural sources and biological factories, future mankind will have to look to the chemical laboratory—or the chemical factory—for supplemental amino acids and calories as we do today for vitamins. . . . The science of chemistry is our greatest potential ally. Through the study of soils, the fixation of atmospheric nitrogen, the development and improvement of fertilizers, the chemist has already rendered great contributions to the agricultural revolution of

our age. In recent years, too, significant strides have been taken in the effective use of chemicals to destroy plant and animal pests—including insects and rodents, pathogenic microorganisms and viruses, and weeds . . . functional uses of chemicals have contributed greatly to expanding the variety and wholesomeness of our foods. . . . In spite of the established virtues of food additives there is a growing tendency to look at them askance as if they debase foods. The rigid structure of our laws has cast most of these substances as poisons . . . We will have to gear our thinking, legislative and otherwise, to technological and agricultural progress if we are to satisfy human needs in the days to come . . . science is but one constitutent of progress. To reap its fruits we must also have boldness and courage. . . . In our concern lest a few parts per million of a useful food additive violate the letter of the law, let us bear in mind that if we are to produce and protect food for future billions, the advances of chemistry must be capitalized upon. Additives are important today and always will be. But the "food chemicals" of tomorrow will be eaten by the pound and by the ton. They will be the synthetic proteins, fats, and carbohydrates that will augment the cruder products of nature. . . . A negative or shortsighted attitude toward chemicals will not come to the rescue of a world population threatened by mass starvation . . .

Quoted From: Food and Drug Research, June 1958

TWENTY YEARS OF PUBLIC HEALTH PROGRESS HIGHLIGHTED IN NEW YORK HEALTH SHOW

The first city-wide report of public health progress in twenty years will take place at the New York Coliseum August 6th to 23rd, when more than eighty leading health organizations will provide striking testimony to the advances made in these years in public health protection.

New Yorkers and out of towners are invited to visit the vast Coliseum's first floor, where they will see the benefits of continuing scientific investigation, and how the knowledge gained and its application help U. S. citizens to be among the healthiest people in the world.

The more than eighty organizations participating in the New York Health Show will exhibit and point up some of the outstanding advances in public health during the last two decades, including such outstanding benefits to the public as:

Protection against polio, diphtheria and other dread diseases;

Education about vaccines, hygiene, diet, cleanliness, weight control and other important public and private health protective measures;

Significant progress in coping with cancer, and in awakening the public to taking proper precautionary steps for general health protection.

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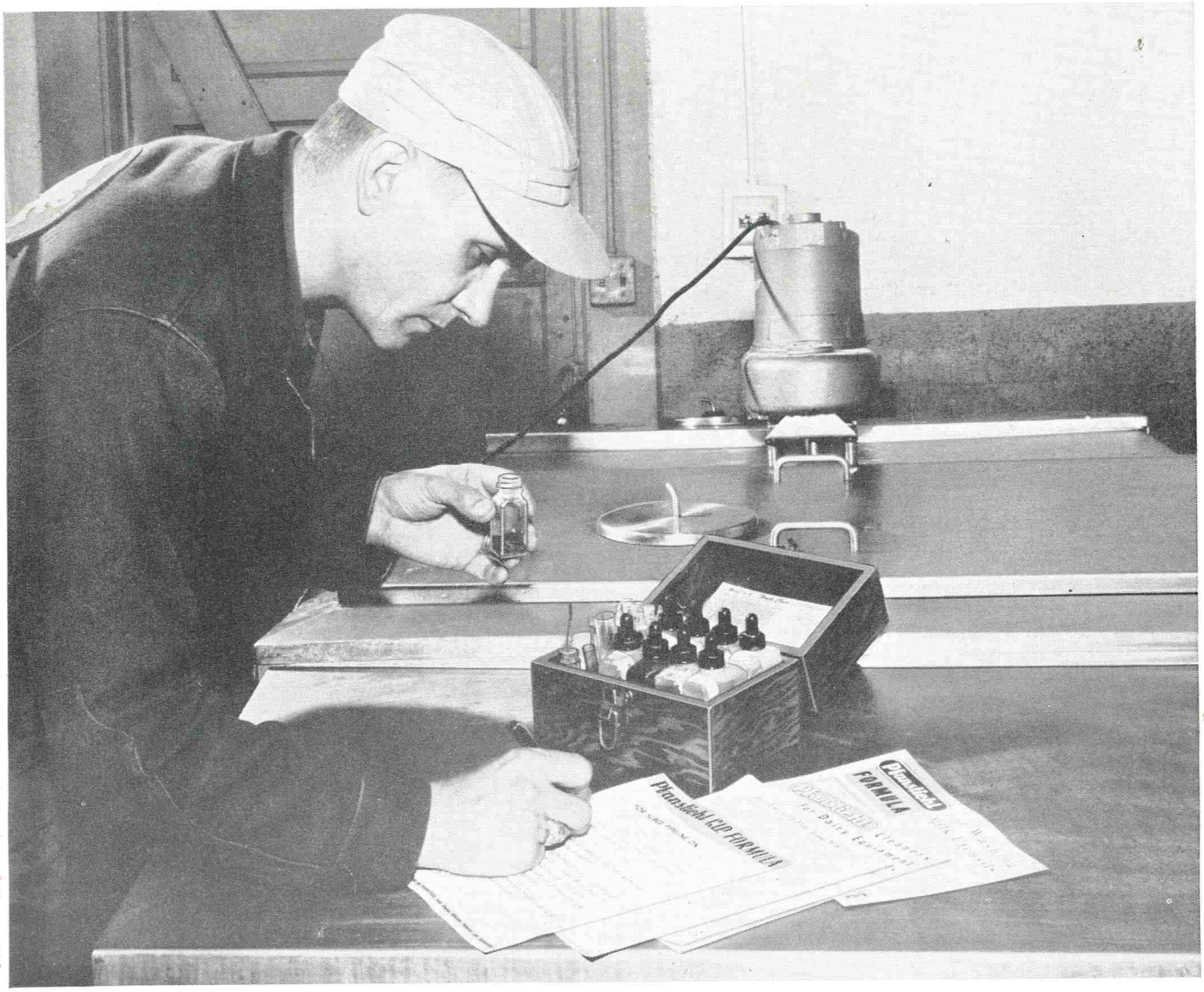

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