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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.*

### SANITIZATION — WHAT DOES IT MEAN?

THE word "sanitize" appears in Funk and Wagnall's *New Standard Dictionary*, 1913. Sanitize means *"to apply sanitary measures to: to bring into condition conducive to health."*

The word "sterilize" means to *free of living microorganisms as by physical or chemical means.*

Glassware and media are sterilized in the laboratory by the application of dry heat at 180° C. for the former and moist heat at 121° C. for the latter.

When heat or chemical agents are applied to restaurant dishes or dairy utensils, it has been common practice to state that they have been "sterilized" although it is known that *only a diminution* of microorganisms has occurred. It is seldom that sterilization is accomplished under practical conditions, although the physical or chemical treatment has been effective enough to kill all common non-spore forming pathogens and many of the vegetative cells of non-pathogenic bacteria.

The process of physical or chemical treatment when properly applied to utensils is comparable to the extent of microbial kill to the pasteurization of milk. Pasteurization is not necessarily sterilization. Pasteurized milk is never sterile.

There is a need for a word to cover the process of rendering equipment such as dairy utensils and restaurant dishes free of public health hazard. The word sanitize—*to bring into condition conducive to health* meets the need. The process of rendering free of public health hazard then would be sanitization.

The words *sanitize* and *sanitization* are in current use and have been used since 1937. Let's use sterilize and sterilization correctly so no one will misunderstand.

W. L. MALLMANN

# "IN UNION THERE IS STRENGTH" *

THERE is no better indication of the widespread interest in sanitation in the food industry than the appointment by a considerable number of food processors and food industry associations of Sanitation Directors to develop modern sanitation control programs.

The men given the responsibility for devising and supervising sanitation programs have felt the need for contacts with others in the same or related fields to exchange information and experiences, which would be helpful in carrying out their assigned duties. The modern sanitation concept is such that almost all sciences and professions can contribute something to its achievement. There is need for the expert council of public health engineers, chemists, bacteriologists, entomologists, public health officials, machinery design and building construction engineers, administrators, training experts, and other specialists.

As a natural result of the realization of this need, a number of more or less similar organizations have developed. Such groups as the "Association of Food Industry Sanitarians" and the "National Committee of Food Sanitarians," to mention only two, have aims which are essentially similar.

The next logical step would appear to be an amalgamation of the various groups into one strong national organization representing all the various branches of the food industry. A strong national association could be very valuable to its individual members and to the further advancement of the profession. Some of the advantages of a national association would be its ability to:

(a) Help standardize sanitation codes.
(b) Promote uniform legislation.
(c) Promote advanced machinery design.
(d) Publish sanitation information bulletins, etc.
(e) Promote research.
(f) Bring together groups more representative of the whole field of food industry sanitation.
(g) Attract outstanding speakers to its meetings.

Present local groups and other local branches which may be formed could continue as regional branches of the national organization. The advantages of local groups in holding frequent meetings along lines close to the specific interest of most of its members should be encouraged. Affiliation with a unified national association should help in obtaining company approval of membership and attendance at such meetings.

Officers and members of the several associations of sanitarians in the food field should find this a worthwhile subject for discussion and consideration.

* Editorial from February issue of *Modern Sanitation*, reprinted by permission of Editor.



# A NEW METHOD FOR THE EVALUATION OF QUATERNARY AMMONIUM DETERGENT SANITIZER FORMULATIONS *

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WHEN the quaternary ammonium compounds made their appearance as a new group of germicides, the phenol coefficient test was used almost exclusively as a laboratory measurement of bactericidal potency. It soon became apparent, however, that the phenol coefficient test did not afford a reliable guide to the disinfectant properties of germicides differing chemically from the phenolic or cresylic type.[1, 2, 3] As pointed out by Reddish,[4] the misuse of the phenol coefficient test by various modifications has resulted in considerable confusion as to the real merits of quaternary ammonium germicides.

Quisno *et al.*[5] presented data to show that deviations in test method can cause considerable variation in the apparent antibacterial power of quaternaries, and emphasized that studies on disinfectant action should not be devoted toward the development of a single test procedure but toward establishing a number of tests corresponding as closely as possible to actual use conditions.

A test designed especially to evaluate chemical compounds as sanitizing agents for use in food handling equipment was devised by Johns.[6] In this technique, the lower half of a sterile glass slide is immersed in a suspension of *Staphylococcus aureus* (200,000,000 bacteria per ml.) in a 1:10 dilution of sterile skim milk. After draining, the slides are immersed in the sanitizing solution, agitated for a given period of time, and placed in sterile petri dishes, which are poured with agar. The time required for 99.9 percent destruction of the bacteria is taken as the endpoint. By measuring the degree of destruction obtained against bacteria semi-dried on a glass surface, rather than rate or amount of bactericidal action in a liquid medium, a much more realistic approach is made to the practical significance concerning the use of the test materials in food utensil sanitation.

In the field of dairy sanitation, the most recent trend has been toward the use of the quaternary ammonium detergent sanitizer. These mixtures are prepared to contain a quaternary ammonium compound for bactericidal action a non-ionic synthetic detergent for grease emulsification together with alkalis for cleaning and sequestering action. Thus, one formulation serves the dual purpose of cleaning and sanitizing. The advent of dairy detergent sanitizers has posed the problem of finding a suitable laboratory test for measuring their comparative efficiency.

Mueller *et al.*[7] suggested a time-survival test for measuring the efficacy of dairy sanitizers. This consisted of the addition of a standardized inoculum to a germicide and reporting results as percentage survival for a definite contact period. On the basis of this type of test, detergent sanitizer formulations representative of good performance and poor performance were selected in our laboratory for further testing on a dairy farm. When these formulations were used on milking machines, we had the unusual result of finding that the preparation exhibiting the best activity in the laboratory was relatively ineffective in the milking machine, whereas one with

* Presented at the 49th Annual Meeting, Society of American Bacteriologists, Cincinnati, Ohio, May 18, 1949.

poor laboratory performance showed to much greater advantage in the field. It was thus obvious that the laboratory "yardstick" bore no relation to practical efficacy, and it was for this reason that a new laboratory procedure was developed which would more nearly simulate use conditions.

It has been established that the rubber parts of the milking machine are the most difficult to sanitize, because they present a much more porous surface than the metallic parts and thereby offer greater opportunity for buildup of bacteria through the accumulation of soil. The irregular surface of the teat cups also meets this objection. It seemed important, therefore, to test for destruction of bacteria which had been deposited on rubber from a milk medium. This resulted in what we have termed "the rubber strip test."

## RUBBER STRIP TEST

*Preparation of Strips.* Strips the size of an ordinary glass slide were cut from ¼"-thick gasket rubber, and a hole just large enough to admit a 6-mm. glass rod was bored in the center of one end. To prepare for use, the strips are held at the boiling point for one hour in a solution containing approximately 1 percent sodium metasilicate together with a small amount of one of the nonionic synthetic detergents. After a thorough rinsing the strips are packed upright in 250-ml. beakers, covered with aluminum foil, and sterilized by autoclaving.

*Culture Suspension.* *Streptococcus fecalis*, *Escherichia coli*, and *Pseudomonas aeruginosa* were selected as representative of both Gram-positive and Gram-negative organisms known to be somewhat resistant to quaternary ammonium germicides. A 15 percent by volume suspension of 24-hour broth culture of either *S. fecalis* or *E. coli* is made in sterile whole milk. In the case of *P. aeruginosa*, a 1.5 percent suspension is used. The whole milk is obtained by diluting canned evaporated milk 50–50 with sterile distilled water. Other organisms isolated from milk were tried at first but were found to be too susceptible to quaternary detergent sanitizers.

*Preparation of Sanitizing Solution.* Because quaternaries are less effective in hard water, a solution of the test preparation is made at the recommended use dilution in water of a good degree of hardness. Our tests have been made routinely in a natural water of 330 p.p.m. hardness.

*Performance of Test.* Five rubber strips are transferred from their container by means of forceps which have been flamed, to hang equidistant apart on a 6" length of a 6-mm. glass rod. The rod is laid across the top of a 400-ml. beaker containing 300 ml. of the milk culture suspension. The organisms are thus deposited slightly more than half way up the strip. After a 10-minute period the strips are removed from the culture suspension and the rod is laid across the top of an empty beaker, where the strips are allowed to drain and semi-dry for a period of 10 minutes. The rod is then laid across the top of a 400-ml. beaker full of the sanitizing solution under test. This beaker has been placed on an Arthur H. Thomas magnetic stirring apparatus set at a rheostat speed of 40. After three minutes exposure to the gently swirling sanitizing solution, the rod is removed and the strips rinsed by an up-and-down motion in a beaker of fresh tap water for a period of 10 seconds. The strips are removed from the rod by forceps and placed in individual sterile petri dishes, which are poured with tryptone glucose extract agar containing 0.1 percent TAMOL N as a quaternary inactivator[8] and subjected to vigorous agitation. As a control fresh tap water is substituted for the sanitizing solution, and following the final rinse the strips are placed in dilution bottles and thoroughly shaken. In this instance the dilution water is plated.

Figure 1 displays the physical setup required for the performance of the



rubber strip test. The beakers in the illustration contain from left to right: (1) the sterile rubber strips; (2) the inoculation of bacteria from the milk suspension; (3) the drainage and drying; (4) the detergent-sanitizer solution in place over the magnetic stirrer; (5) the fresh tap water for rinsing.

*Test Results.* The surviving bacteria are counted after 48 hours incubation of the plates at 35° C. A logarithmic average is made of the 5-time replicates for each sample and the control. A sanitizing solution which reduces the bacterial count 99.9 percent from that obtained in the control may be considered an excellent preparation. Typical results are shown in Table 1. This table represents different formulations of the same quaternary ammonium compounds with various alkaline materials and wetting agents, and readily shows why reliance cannot be placed upon a laboratory evaluation against a single test organism. There is only one preparation in the table which reaches the 99.9 percent mark against all three test organisms, although the others show to good advantage against one or two of the test bacteria.

Although it appears from the water controls that the inoculum is not too heavy, it must be remembered that many of the bacteria are removed by the physical agitation applied in two steps of the test.

TABLE 1

RUBBER STRIP TEST RESULTS

| | *E. coli* | | *S. fecalis* | | *P. aeruginosa* | |
|---|---|---|---|---|---|---|
| *Detergent Sanitizer* | *Log Av. 5X Rep.* | *% Reduction* | *Log Av. 5X Rep.* | *% Reduction* | *Log Av. 5X Rep.* | *% Reduction* |
| Water Control | 130,000 | | 210,000 | | 105,000 | |
| # 2 | 96 | 99.93 | 35 | 99.99 | 510 | 99.52 |
| # 5 | 110 | 99.92 | 180 | 99.92 | 100 | 99.91 |
| # 7 | 245 | 99.82 | 205 | 99.91 | 250 | 99.77 |
| # 9 | 120 | 99.91 | 470 | 99.78 | 140 | 99.87 |
| #21 | 1,100 | 99.16 | 225 | 99.90 | 260 | 99.76 |
| #35 | 140 | 99.90 | 140 | 99.94 | 1,700 | 98.39 |

### PRACTICAL APPLICATION

Detergent sanitizer formulations 5 and 9 were used to sanitize milking machines on a dairy farm and were compared to a standard hypochlorite and cleaner for effectiveness. Immediately after milking a warm water rinse was drawn through each machine, and this was followed by cleaning with the detergent sanitizer solution. Following the sanitizing procedure the machines were untouched until just previous to the next milking, when another warm water rinse was drawn through them. Between the pre-milking rinse and milking, one liter of sterile phosphate buffer solution containing both chlorine and quaternary inactivators was drawn through the machine. The bacterial population of this solution was determined according to *Standard Methods for the Examination of Dairy Products*.[9] Additional counts were made after pasteurizing the samples at 143–145° F for 30 minutes. During a fourteen-day control period three machines were sanitized with a standard cleaner and hypochlorite, and at the start of an eleven-day experimental period one machine was switched to quaternary detergent sanitizer 5, the second machine to quaternary detergent sanitizer 9, while the third machine was maintained on the hypochlorite and cleaner. Results of this experiment are given in Table 2, which shows the relative degree of efficiency of the various sanitizing agents. This led to the selection of quaternary detergent sanitizer 5 for large-scale field studies, which were made with the cooperation of a large Philadelphia dairy. Results of this study have shown the superiority of formula 5 over standard hypochlorite, in bringing about a reduction in the pasteurized bacterial count of milk by those suppliers which had consistently high counts previously. These results will be published separately.

The composition of the most effective formula (#5) is as follows:

| | |
|---|---|
| Hyamine 1622 | 10% |
| Triton X-100 | 5% |
| Sodium metasilicate | 30% |
| Tetrasodium pyrophosphate | 55% |

TABLE 2

BACTERIAL COUNTS OF RINSE SOLUTIONS

| | *Machine I* | | *Machine II* | | *Machine III* | |
|---|---|---|---|---|---|---|
| *Log, Av. Count for* | *Raw* | *Past.* | *Raw* | *Past.* | *Raw* | *Past.* |
| Control Period (All machines on hypochlorite) | 1,300 | 25 | 1,100 | 31 | 1,100 | 47 |
| | Change to Det. San 5 | | Change to Det. San. 9 | | Unchanged | |
| Experimental Period | 13 | 5 | 15 | 5 | 470 | 28 |

### SUMMARY

A new method is described herewith for determining the bactericidal efficacy of dairy detergent sanitizers, especially those formulated from quaternary ammonium germicides. The "rubber strip test" measures the ability of the sanitizing solution to destroy cells of *Streptococcus fecalis, Escherichia coli,* or *Pseudomonas aeruginosa* which have been semi-dried on rubber strips from a whole milk suspension. The test has been designed to measure the combined effect of germicidal and detergent activity. Excellent correlation has been obtained between results obtained by this test and actual large-scale field experiments.

### ACKNOWLEDGMENT

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*(Continued on page 125)*



# REPORT OF THE COMMITTEE ON MILK REGULATIONS AND ORDINANCES

WITHOUT undertaking to review the accomplishment of this Committee since its organization after the 1942 Annual Meeting, suffice it to state that it has labored earnestly, but has, as yet, not succeeded in accomplishing its purpose. At the 1947 Annual Meeting the Committee submitted the Tentative Revised Edition of the Milk Ordinance recommended by the U. S. Public Health Service as the nearest approach which could at that time be made to a generally acceptable set of standards and requirements which would conform to the stipulations of the motion which established the Committee. That Committee report also recommended that the Tentative Revised U. S. Public Health Service Milk Ordinance be published and circulated in order to provide an opportunity for study by the Association membership; that the Committee consider suggestions for changes submitted during the ensuing year; and promised to present a draft of an ordinance for consideration at the 1948 Annual Meeting.

The proposed ordinance was published and circulated among the Association membership during 1948. But comments and suggestions had not been received in sufficient number in time for the preparation of a comprehensive report to be presented at the 1948 annual meeting. It is now possible to report that a total of 59 of our members studied the proposed ordinance and submitted criticisms, or suggestions, or both. A summary of these criticisms, some of which are diametrically opposed, and others of which include no constructive suggestions, would take up much space and time, and would serve no good purpose.

In view of the criticisms submitted, however, the Committee has adopted a new approach, and has tentatively formulated an ordinance which places greater emphasis upon pasteurization, and greater dependence upon platform inspection than did the ordinance submitted in 1948. In drafting this tentative form of an ordinance, the Committee has considered the views of the members of the dairy industry, and others. The Committee suggests that, after additional suggestions now in hand have been considered, this report and the suggested draft of an ordinance be published in the JOURNAL, so that comments and suggestions may be submitted to the Committee for consideration.

It is the desire of the Committee that association members and all other interested parties give the suggested ordinance careful consideration and send in their comments at an early date. They should be mailed to C. J. Babcock, Research Division, Dairy Branch, Production and Marketing Administration, U. S. Department of Agriculture, Washington 25, D. C.

The Committee wishes to call attention to the fact that a study of the effect of milk regulations on milk quality is currently being conducted under the auspices of the National Research Council. The Committee takes the liberty of suggesting that the greatest benefit to the Association from the extended deliberations of the Committee would be obtained by continuing the Committee to serve as liaison between the Association and the National Research Council, in connection with the study currently being conducted.

C. J. BABCOCK, *Chairman*
C. A. ABELE
W. N. DASHIELL
H. L. DELOZIER
H. J. DUNSMORE
O. A. GHIGGOILE
C. S. LEETE

# A SUGGESTED MINIMUM MILK ORDINANCE

## PREFACE

The essential features or characteristics of a milk supply are few in number and readily understood: cleanliness, safety, initial high quality, nutritive value, and good keeping quality, all of which commend themselves to the consumer and promote increased consumption, which is in the public and economic interest. The attainment of these qualities, though complicated, is not impossible under ordinary, normal, environmental conditions.

Brevity, simplicity, and clarity are virtues in a milk ordinance as well as elsewhere. The same is true of a statement of a problem to be solved. It is believed the following represents a simple, yet adequate, statement of the milk problem:

*First:* Because digressions from normal may occur in milk, including disease potentialities from time to time, procedures and supervision providing adequate safeguards are essential.

*Second:* Because volume consumption of fresh milk tends to preserve and promote the public health, and because fresh milk should be regarded as a universal rather than a luxury product, abundant supplies of fresh milk always should be available to the public at the lowest price consistent with safeguards mentioned.

This ordinance is drawn in pursuit of these principles.

## EXPLANATORY NOTES

### *Grades*

Although the factor of safety should be common to all milk for human consumption, it is in the public interest to encourage those producers who set the pace for better methods and general improvement in the milk supply. In communities desiring to do so, the establishment of a premium grade of milk as a part of the general program of quality improvement should not be discouraged.

### *Direct Microscopic Counts*

Direct microscopic bacterial counts of milk and milk products, before and after pasteurization, are reasonably accurate indexes of keeping quality but without significance so far as safety (phosphatase test can be used) is concerned. Wide ranges in the count may be observed in different milk sheds which level out under monthly testing. A thorough initial survey of the present situation in each locality may well precede the fixing of a definite direct microscopic count standard. Since some markets prefer the plate count for pasteurized products, this procedure is provided as an alternate.

### *Enforcement Based on Quality Tests*

This ordinance depends upon quality tests on the product for enforcement; and, while many dairy farm and milk plant requirements are not specifically stated in the code, such requirements may be expected to follow naturally where farmers and dealers consistently produce and process a milk that meets the quality test requirements of this ordinance.

### *Judicious and Sane Application*

It is anticipated that when this ordinance is adopted and applied to existing dairy farm and milk plants, the requirements will be applied judiciously and sanely.

### *New Structures and Alterations*

For new or altered structures, the ordinance requirements shall be complied with.

### *Adoption Time*

In submitting this ordinance, it is the recommendation that the effective date should not be less than one year after its adoption, during which time it is anticipated that the dairy farms and milk plants not in conformity will gradually make necessary changes in procedures so as to be in compliance by the effective date.

### *Local Departures*

In order to conform to local conditions and promote harmonious public relations in the communities to be served (frequent testing of the finished products considered), reasonable departures from the proposed tests are not only permissible but sometimes desirable.

Larger places, for instance, have the advantage of volume processing and, possibly, already well-established systems of milk control. They have the disadvantages of using milk from many hundreds or thousands of different sources. In contrast, smaller places have the advantage of close proximity to a limited number of sources.

### *Economic Status*

The economic status of producing and consuming populations may temporarily dictate variations in the aesthetic or non-operative features to be required. Adequate safeguarding (through frequent testing of the finished products) permits no departure from fixed principles.

## *Suggested Minimum Milk Ordinance*

AN ORDINANCE TO REGULATE THE PRODUCTION, HANDLING, SALE AND DISPOSITION OF MILK AND CERTAIN PRODUCTS: TO DEFINE DIFFERENT KINDS OF MILK PRODUCTS AND PRESCRIBE STANDARDS FOR THE SAME: TO PROVIDE FOR APPROVAL IN CERTAIN INSTANCES AND FOR THE REVOCATION THEREOF AND TO FIX PENALTIES FOR THE VIOLATION OF THIS ORDINANCE AND TO REPEAL CERTAIN ORDINANCES.

Be it ordained by the ..... of the city ..... as follows:

*Section 1. Pasteurization Required.* No person shall sell, offer or expose for sale, or deliver, or have in his possession with intent to sell for direct consumption any milk or milk product (except certified) which has not been pasteurized, provided, however, that nothing contained herein shall prohibit the delivery of unpasteurized milk to a milk plant for pasteurization as provided for in this ordinance.

*Section 2. Examination of Pasteurized Milk and Milk Products.* In order to safeguard the public health and to assure that the pasteurized milk and milk products, processed in the City of ....., or brought into the City from other areas, are (1) clean, (2) of standard butter fat content, (3) of initial high quality, (4) safe for consumption, (5) of good keeping quality, and (6) kept at the proper temperature, as defined in this ordinance, the enforcing officer shall, as often as he deems advisable, but not less than once a month, cause a representative sample of such pasteurized milk and milk products to be subjected to the following tests: (1) sediment test, (2) butter fat test, (3) phosphatase test and coliform test, (4) direct microscopic test or the standard plate count, and (5) temperature test, according to the technics as provided for in this ordinance.

*Section 3. Standards for Pasteurized Milk.*

(a) *Standards.** All pasteurized milk, as provided for in this ordinance, shall not have an average direct microscopic bacterial clump count in excess of the number permitted at the pasteurizing plant for raw milk (see Section 15), or a standard plate count in excess of 30,000 per milliliter; shall contain no trace of sediment when a pint of milk is filtered through an approved sediment tester; shall show a negative phosphatase test; shall contain at least .. percentum butterfat; shall contain not less than .. percentum of solids not fat; shall be not over 50° F. and the milk shall be free of objectionable odor, color, and consistency, and shall not have a coliform count of over 10 per milliliter or shall not have a positive coliform test in 1 milliliter samples for more than one day out of 5, provided the samples are collected within 4 hours after pasteurization and that they have been properly refrigerated during the interval between collection and testing. For enforcement purposes, the bacterial counts shall be logarithmic averages of samples taken on five different days.

(b) *Samples.* Samples of milk and milk products shall be available to the enforcing officer for examination.

All proprietors of processing plants, stores, cafes, restaurants, soda fountains and other similar places shall furnish the enforcing officer upon his request, with the names of all suppliers from whom milk and milk products are obtained.

Examinations may include other bacteriological, chemical and physical determinations provided such examinations shall be made in accordance with the current edition of *Standard Methods for the Examination of Dairy Products*, published by the American Public Health Association.

*Section 4. Milk Plant Construction and Facilities.*

(a) *General.* A milk plant, as defined in this ordinance, shall be provided with: (1) a room or rooms for receiving and washing equipment, cans, and bottles, (2) a room for processing, cooling and bottling, and (3) a room for storing of milk and milk products. The various milk plant operations shall be so located as to prevent contamination of the milk or milk product or of the cleaned equipment.

(b) *Floors.* Floors, including platform and stairs, of all rooms in which milk or milk products are handled shall be constructed of concrete or other impervious material, shall be smooth, graded to drain, and in good repair. Floors shall be equipped with adequately trapped drains discharging into proper sanitary drains.

(c) *Walls and Ceilings.* Walls and ceilings of the milk plant shall be of material that is impervious and smooth or treated to provide an impervious, smooth surface.

(d) *Light and Ventilation.* All rooms shall be well lighted, heated, and ventilated to prevent condensation on walls and ceilings.

(e) *Insect Control.* Openings to the outside shall be effectively screened and/or such other means shall be employed as are necessary to eliminate insects.

(f) *Rooms.* Rooms in which milk, milk products, cleaned utensils or containers are

* It is intended in this paragraph that an ordinance include either the microscopic or plate count standards, and also only one of the coliform standards.

handled or stored shall not open directly into any stable or living quarters.

(g) *Cleanliness.* Milk plants, including surroundings, shall be kept clean and free from objectionable odors.

(h) *Equipment Installation.* All major equipment installed in milk plants, constructed or remodeled following the adoption of this ordinance, shall be placed at least two feet from any wall and at least three feet from any other piece of equipment for easy cleaning, up-keep, and repair.

(i) *Toilets.* Milk plants shall be provided with conveniently located sanitary toilet facilities. Toilets shall have impervious floors and smooth, solid wall surfaces, the base of which shall be an integral part of the floor and impervious to a height of not less than four inches. Toilets shall be maintained in a clean condition and waste shall be handled so that it is inaccessible to flies and does not pollute the ground surface or contaminate any water supply.

(j) *Hand Washing.* Hand washing facilities of an improved type shall be provided and located in or approximate to toilet rooms and in or approximate to processing rooms. Hands shall not be washed in vats used for cleaning equipment.

*Section 5. Water Supply.* Water used in a milk plant shall be from a supply that is adequate and of a safe and sanitary quality and shall comply with recommendations of the ..... State Department of Health. Cross connections between a private water supply and a public water supply shall also conform with the regulations of the ..... State Department of Health covering cross connections.

*Section 6. Milk Supply.*

(a) *Cooling.* All milk and milk products received for pasteurization shall immediately be cooled in approved equipment to 50° F or lower and maintained at that temperature until pasteurized, unless pasteurized within two hours after receipt. All milk and milk products shall be stored and maintained at a temperature of 50° F or lower until delivered.

(b) *Recontamination.* Pasteurized milk or pasteurized milk products shall not be permitted to come in contact with equipment surfaces or utensils which unpasteurized milk or unpasteurized milk products have been in contact.

(c) *Material Storage.* Bottle caps or cap stock, parchment paper for milk cans, and single-service containers shall be purchased only in sanitary tubes or cartons and shall be stored therein in a clean dry place.

After bactericidal treatment and during storage and usage, containers and equipment shall be handled and maintained in such a manner as to prevent contamination of the containers, equipment or the milk.

(d) *Bottling.* Bottling or packaging of milk or milk products other than cultured products shall be done at the place of pasteurization immediately after pasteurizing and by approved mechanical equipment.

(e) *Capping.* Containers for milk and milk products of a capacity less than two gallons shall be capped by approved mechanical equipment. The cap or cover shall protect the pouring lip to at least its largest diameter.

(f) *Overflow Milk.* Milk or milk products which have over-flowed or leaked from equipment shall not be sold as fluid milk for human consumption.

*Section 7. Equipment.*

(a) *General.* Sanitary pipe fittings and equipment shall be constructed as to be easily cleaned. All new fittings and equipment shall be of 3-A or similar design and quality. 3-A equipment is that equipment approved by the Dairy Industry Committee, the International Association of Milk and Food Sanitarians and the U. S. Public Health Service and is so labeled. Specifications for approved equipment are published in the *Journal of Milk and Food Technology.*

Each piece of pasteurizing equipment shall be equipped with a self-recording thermometer with charts showing a 1° F graduation in the pasteurizing range, and 10-minute time arcs.

Charts shall be placed in the recorder before the pasteurization operation begins and left there until the pasteurization operation is completed, and no charts shall be used for more than one day's operation. Charts shall be dated and the name of the dairy written or stamped thereon before being placed in the recorder, and used recording charts shall be preserved for at least three months.

An accurate indicating thermometer shall be installed on each piece of pasteurizing equipment.

All regenerative heating and cooling equipment shall be so constructed and operated that the pressure on the heated milk side exceeds the pressure on the raw milk side by at least one pound.

Equipment used to pasteurize at a temperature not lower than 161° F for 15 seconds shall include: (in addition to the other requirements in this section) a flow diversion valve actuated by an accurate recording thermometer that will divert all of the milk before the falling temperature of the milk reaches 161° F, and a positive milk pump that is sealed at a maximum fixed speed.

(b) *Coolers.* Open surface coolers shall be provided with tight-fitting shields, preferably suspended on trolleys, unless such coolers are located in separate, well-ventilated rooms.

(c) *Bottling Bowl.* Automatic bottling bowls shall be provided with covers so constructed as to prevent the contamination of the product in the bowls.

*Section 8. Cleaning and Sanitizing Treatment, Utensils and Equipment.* The daily cleaning equipment and supplies and the training and supervision of employees shall be adequate to assure that the cleaned and sanitized bottles, cans and equipment will meet the standards of sanitization as set forth in the latest edition of *Standard Methods for the Examination of Dairy Products,* published by the American Public Health Association, a copy of which shall be on file in the office of the City Clerk.

*Section 9. Personnel.* No person who has a communicable disease or who is a carrier of such disease or has any type of open lesion shall be employed where milk or milk products are handled. Such persons shall furnish such information, submit to such physical examinations and submit such laboratory specimens as the enforcing officer may require for the purpose of determining freedom from such infection.

Persons coming in contact with milk, milk products, containers or equipment shall wear clean, washable outer garments and shall keep their hands clean while thus occupied.

*Section 10. Delivery Vehicles.* Vehicles used for the transportation of pasteurized milk or pasteurized milk products shall be constructed with permanent tops and with permanent or movable sides and back.

Vehicles shall be kept clean and no substances capable of contaminating pasteurized milk or milk products shall be transported with milk or milk products in such manner as to permit contamination.

Vehicles used for the distribution of pasteurized milk or milk products, shall have the name of the licensed milk plant prominently displayed on each side, if licenses are required.

*Section 11. Containers.*

(a) *General.* Milk and milk products other than cultured products shall be placed in their final containers in the plant in which they are pasteurized.

It shall be unlawful to sell or serve any milk, cream, chocolate milk or chocolate drink except in the original container: Provided that this requirement shall not apply to milk and cream consumed on the premises which may be served from the original bottle or from a dispenser approved by the enforcing officer for such service.

(b) *Retail Cooling.* It shall be unlawful for any store, hotel, soda fountain, hospital, restaurant or similar establishment to sell or serve any milk or milk products which have not been maintained, while in its possession, at a temperature of 50° F, or lower.

(c) *Washing and Use.* It shall be the duty of all persons to whom milk or milk products are delivered to wash or rinse the containers before returning such containers.

Containers used in the handling, storage, processing or transporting of milk or milk products shall not be used for any other purpose.

*Section 12. Delivery to Quarantined Residences.* The delivery of milk or milk products to, and the collection of milk or milk products containers from, residences in which cases of communicable disease (transmissible through milk supplies) exist shall be subject to the special requirement of the enforcing officer.

*Section 13. Labeling and Branding.* Bottles, cans and other containers containing milk and milk products defined in this ordinance shall be plainly labeled or marked with (1) the name of the contents as defined in this ordinance; (2) the word "pasteurized" together with the word or words "homogenized," "chocolate milk," "vitamin fortified," etc., in accordance with the contents thereof; (3) the name of the person preparing and putting up such products for sale and (4) in the case of vitamin fortified milk, the designation of the vitamin used and the number of units of vitamin contained in one quart. There shall be no words or markings which are misleading.

*Dairy Farms*

*Section 14. Examination of Raw Milk to Be Pasteurized.* In order to safeguard the public health and assure that the milk and cream brought into the City of ..... for pasteurization are (1) clean, (2) free of objectionable odor, color and abnormal consistency, (3) of standard butterfat content, (4) of good keeping quality, and (5) kept at the right temperature, the enforcing officer shall as often as he deems advisable but not less than once a month cause the milk from each dairy farm (samples to be collected at or from the weigh can) to be subjected to the following tests: (1) sediment test, (2) smell and appearance, which shall be done daily, (3) butterfat test, (4) direct microscopic bacterial test, and (5) thermoduric (laboratory pasteurized) counts, the results of which shall be tabulated as to (a) estimated number of bacteria, (b) utensil contamination, (c) inadequate cooling, and (d) evidence of mastitis, according to types of cells and bacteria observed. Said tests shall be done in conformity with the current edi-

tion of *Standard Methods for the Examination of Dairy Products*, published by the American Public Health Association.

*Section 15. Standards for Milk to Be Pasteurized.* All milk intended for pasteurization in the City of ..... must come from animals proven free from contagious and infectious diseases; shall before pasteurization and after arrival in this city have an average direct microscopic bacterial count not in excess of 400,000 per milliliter if clumps are counted; shall have a thermoduric (laboratory pasteurized) count not in excess of 20,000 bacteria per milliliter; shall not show more than 0.05 milligram of sediment as judged by the U. S. Department of Agriculture sediment standard for milk and milk products when a mixed pint sample of milk is filtered through an approved sediment tester; shall contain at least .. percentum butterfat; shall not contain less than .. percentum of solids not fat; temperature not over ..°F * and the milk shall be free of objectionable odor, color and consistency.

*Section 16. Herd Health.* All milk sold for human consumption shall come from cows that are located in herds under federal and state supervision for the eradication of tuberculosis.

When any recognized test or examination of any dairy herd indicates that any of the cows are extensively infected with mastitis, such cows shall be handled according to the approved federal and state plan for this area.

*Section 17. Cow Cleanliness.* The flanks, bellies and tails of all milking cows shall be free from visible dirt at the time of milking.

Cows shall be milked in a clean manner. Milking wet-handed is prohibited.

*Section 18. Personnel.* Persons handling milk or milk products shall be clean about their person and shall wear clean garments. No person with soiled hands or upon which there are open sores shall milk cows or handle milk utensils or milk products.

Milkers shall wash their hands thoroughly immediately before milking and following any interruption in the milking operation.

*Section 19. Cow Stable.*

(a) *General.* A cow stable or milking parlor shall be required in which all milking is done.

(b) *Floors, Gutters and Cleanliness.* Floors and gutters shall be constructed of concrete or other approved impervious and easily cleaned material. Floors shall be maintained in good repair and kept clean.

(c) *Walls, Ceilings, and Partitions.* The interior walls and ceilings of the milking barn or stable shall be whitewashed or painted as often as may be necessary, and shall be kept in clean and in good repair. In case there is a second story above the milking barn or stable, the ceiling shall be tight. If feed is ground or mixed, or sweet feed is stored in a feed room or feed storage space adjoining the milking space, it shall be separated therefrom by a dust-tight partition and door.

(d) *Lighting.* The milking quarters shall be sufficiently lighted for adequate visibility.

(e) *Ventilation.* Stables and milking parlors shall be so ventilated as to prevent condensation and to permit rapid drying of floors.

*Section 20. Barnyard, and Manure Disposal.* Barnyards shall be properly graded and kept clean. No wastes from the stable or milk room shall be allowed to accumulate in the barnyard.

Manure shall be removed and stored or disposed of in such a manner as best to prevent the breeding of flies and to prevent cows having access thereto.

*Section 21. Pen-Barns and Milking Parlors.* All pen-type barns shall be well drained and the walls and ceilings shall be kept clean, and bedded heavily enough to keep cows clean.

A milking parlor is deemed to be a place where cows are milked and, except for the feeding of concentrates, shall be used for milking purposes only; have impervious floors, properly drained, good impervious walls, well lighted, and adequate ventilation.

*Section 22. The Milk House.*

(a) *General.* A milk house or milk room shall be provided which shall be used for no other purpose than the cooling, handling and storage of milk and milk products and for the cleaning, storage and sanitizing of equipment.

(b) *Floors, Walls, Ceilings, Doors and Windows.* The milk house floors shall be of concrete or other impervious material, graded to drain. Walls and ceilings shall be of such construction as to permit easy cleaning. Milk houses shall be well lighted, ventilated and all openings well screened or otherwise protected to prevent the entrance of flies.

(c) *Liquid Waste Disposal.* Waste water from washing shall be drained as to prevent contaminating of water supplies or accumulation on the ground surface.

(d) *Cooling Equipment.* The milk house shall contain equipment necessary for the proper cooling and storing, in a sanitary manner, the volume of milk or milk products handled.

(e) *Utensil Rack.* A utensil rack, preferably of metal, shall be provided within the milk house, the lower shelf of which shall not be less than 24 inches above the floor.

(f) *Cleanliness.* Milk houses, including surroundings, shall be kept clean and free of objectionable odors.

*Section 23. Washing Facilities.* Suitable facilities for heating a sufficient amount of water and suitable vats for washing and sanitizing utensils shall be provided.

*Section 24. Cooling.* Milk to be delivered to a milk plant or receiving station shall be cooled to 60° F or lower within one hour after milking and so held until delivered.

*Section 25. Containers, Utensils and Equipment.*

(a) *Construction.* Containers, utensils and equipment used in the handling, storage or transportation of milk or milk products shall be of smooth, non-absorbent material and of such construction as to be easily cleaned and shall be in good repair. Joints and seams shall be soldered flush. All new milking pails shall be of 3-A or similar design. (See Section 7(a).)

(b) *Cleaning and Sanitizing Treatment.* Containers, equipment, and utensils shall be so thoroughly rinsed, cleaned and sanitized that they will not contribute to the contamination of the milk as reflected in the tests listed in Section 14.

(c) *Storage.* Containers, equipment and utensils shall be stored so as not to become contaminated before being used.

*Section 26. Sewage Disposal.* Outhouses and septic tanks shall comply with the regulations established by the ..... State Health Department. Septic tank waste shall be disposed of below the ground surface.

*Section 27. Water Supply.* The water supply for the milk house and/or milk room shall meet the recommendations of the ..... State Department of Health.

*Section 28. Removal, Straining and Delivery.* Milk immediately following milking shall be promptly removed to the milk house where it shall be strained through approved single-service straining pads. Unused pads shall be stored so as to be protected from contamination.

*Section 29. Sampling and Bacteriological Standards.* Samples of milk and milk products shall be taken or caused to be taken as often as the enforcing officer deems advisable, but not less than once a month, for examination.

*Section 30. Communicable Diseases.* When suspicion arises as to the possibility of infection from any person handling milk or milk products, the health officer is authorized to require any or all of the following measures: (1) the immediate exclusion of that person from milk handling, (2) the immediate exclusion of the milk supply, if necessary, and (3) adequate medical and bacteriological examination of the person, of his associates or of his or their body discharges.

*Section 31. Transportation of Milk.* Trucks or vehicles used for hauling milk from producing farms to milk plants shall adequately protect the milk from dirt and dust.

*Section 32. Approvals.* No milk or milk product, intended to be sold for direct consumption, shall be received at any milk plant from any producing farm unless such farms and such milk plant have first complied with the provisions of this ordinance as evidenced by written approval of the health officer.

The health officer may refuse to issue an approval or revoke any existing approval when it is determined by him that any provisions of this ordinance have not been complied with.

### *Definitions*

*Section 33. Definitions.* The following definitions shall apply in the interpretation and the enforcement of this ordinance:

A. *Milk.* Milk is hereby defined to be the lacteal secretion, obtained by the complete milking of one or more healthy cows, which contains not less than .. percent of milk solids not fat and not less than .. percent of milk fat.

B. *Milk Fat or Butterfat.* Milk fat or butterfat is the fat of milk.

C. *Cream:* Cream is a portion of milk which contains not less than 18 percent milk fat.

C-1. *Sour Cream.* Sour cream is cream, the acidity of which is more than 0.20 percent, expressed as lactic acid.

C-2. *Light Cream*, coffee cream or table cream is cream which contains less than 30 percent milk fat.

C-3. *Whipping Cream* is cream which contains not less than 30 percent milk fat.

C-4. *Light Whipping Cream* is whipping cream which contains less than 36 percent milk fat.

C-5. *Heavy Cream or Heavy Whipping Cream* is cream which contains over 36 percent milk fat.

D. *Skim Milk.* Skim milk is milk from which a sufficient portion of milk fat has

* Temperature will vary with climatic conditions, but should in no case be above 65° F, except milk that is delivered within 3 hours of milking need not be cooled.

been removed to reduce its milk-fat percentage to less than .. percent. (Insert same figure as given for fat in paragraph A.)

D-1. *Non-Fat, Fat-Free or Defatted Milk* is skim milk which contains not more than 0.1 percent of milk fat.

E. *Milk or Skim-Milk Beverage.* A milk beverage or a skim-milk beverage is a food compound consisting of milk or skim milk, as the case may be, to which has been added a syrup or flavoring consisting of wholesome ingredients.

F. *Buttermilk.* Buttermilk is a product resulting from the churning of milk or cream or from the souring or treatment by a lactic acid or other culture of milk or skim milk. It contains not less than 8¼ percent of milk solids not fat.

G. *Vitamin D Milk.* Vitamin D milk is milk, the vitamin D content of which has been increased by an approved method to at least 400 U.S.P. units per quart.

H. *Homogenized Milk.* Homogenized milk is milk which has been treated in such a manner as to insure break-up of the fat globules to such an extent that after 48 hours quiescent storage no visible cream separation occurs on the milk; and the fat percentage of the top 100 milliliters of milk in a quart bottle, or of proportionate volumes in containers of other sizes, does not differ by more than 10 percent of itself from the fat percentage of the remaining milk as determined after thorough mixing.

I. *Milk Products.* Milk products shall be taken to mean and include cream, homogenized milk, vitamin D milk, buttermilk, skim milk and milk beverages as herein defined.

J. *Cottage Cheese.* Cottage cheese is the soft uncured cheese prepared from the curd obtained by adding harmless lactic acid-producing bacteria, with or without rennet, to pasteurized skim milk, concentrated skim milk, or non-fat dry milk solids. It contains not more than 80 percent moisture.

K. *Pasteurization.* The terms "pasteurize," "pasteurized," "pasteurization" and similar terms shall be taken to mean the process of heating every particle of milk or milk products to a temperature not lower than 143° F. and holding it at such temperature continuously for not less than 30 minutes, after which it has been promptly cooled to 50° F or lower; or heating every particle of milk or milk products to a temperature not lower than 161° F and holding it at such temperature continuously for not less than 15 seconds, after which it has been promptly cooled to 50° F or lower.

L. *Dairy Farm.* A dairy farm is any place or premise where one or more cows are kept, a part or all of the milk or milk products from which is sold or offered for sale.

M. *Milk Plant.* A milk plant is any place, premises, or establishment where milk or milk products are received, handled, processed, stored, bottled pasteurized and/or prepared for distribution, except an establishment where milk or milk products are sold at retail only.

N. *Health Officer.* The term "health officer" shall mean the health authority of the ..... or his authorized representative.

O. *Person.* The word "person" shall mean any individual, partnership, corporation, company, trustee, or association.

P. *And/Or.* Where the term "and/or" is used, "and" shall apply where possible, otherwise "or" shall apply.

*Section 34. Penalty.* Any person who shall violate any of the provisions of this ordinance shall, upon conviction thereof before a court of competent jurisdiction, be punished by a fine not exceeding $... or by imprisonment in the city jail for a period not exceeding ninety (90) days, or by both such fine and imprisonment in the discretion of the court. (To be worded according to state involved.)

*Section 35. Unconstitutionality.* The sentences, sections, and provisions of this ordinance are declared to be severable, and any portion which is declared unconstitutional or invalid for any reason by a court of competent jurisdiction shall in no way affect the remaining sentences, sections or provisions of this ordinance. (To be worded according to state involved.)

*Section 36. Repealing Clause.* All ordinances and parts of ordinances inconsistent with the provisions of this ordinance are hereby repealed.

*Section 37. Effective Date.* This ordinance shall be in full force and effect on and after ....., 19...



# ABSTRACTS OF THE LITERATURE OF MILK AND FOOD DURING 1949

THESE ABSTRACTS WERE COLLECTED AND EDITED BY C. K. JOHNS, OTTAWA, CANADA, WITH THE COLLABORATION OF C. A. ABELE, F. C. BASELT, A. E. BERRY, P. B. BROOKS, F. W. FABIAN, C. R. FELLERS, R. W. HART, M. D. HOWLETT, AND K. G. WECKEL

Abstracts as published in several journals during the year 1949 are the basis for the following summary of literature in the field of the dairy industry. Consequently some of these papers were printed in 1948. However, the summary is not restricted to either of these calendar years. Limited space made it impossible for us to include all articles that are worthy of mention, but we estimate that about four-fifths of the available literature has been covered.

Most of the abstracts were condensed from *Chemical Abstracts* and *Journal of Dairy Science Abstracts.*

## ANALYSIS

Kosikowsky and Dahlberg[1] give formula for buffer solution to maintain optimum PH for phosphatase activity.

Lactose in milk products detd. simply by ferricyanide methods, claim Hites *et al.*[2] Applicable in presence of sucrose but not other reducing sugars.

Arias and Noya[3] conclude after long series of experiments under many conditions f.p. method not reliable in detecting watering of milk.

Tablets $K_2Cr_2O_7$-NaCl. Methylene blue and potato starch, 50% NaCl and rennet—NaCl, all shown satisfactory for plant laboratories properly used, says Rozanov.[4]

Historical description review of procedures used for determination of fat in milk given by Inikhov.[5]

Paul and Anantakrishnan[6] note decrease in Reichert and saponification no. and rise in I value at end of lactation.

Moriwaki[7] describes detn. fat in 1 cc. milk also new micro-method for est. iodine no. of human milk fat.

Ovchinnikov[8] gives method for rapid determination of calcium in cheese.

Wilkie[9] compares spectrophotometric and antimony trichloride methods for Vitamin A in margarine.

Hillig[10] recommended for official adoption a method for detecting decomposition in dairy products based on pres. water sol. fatty acids.

Association Babcock test modified for homogenized milk gave satisfactory results, state Brunner, Trout, & Lucas.[11]

The time and temperature relationship for inactivating phosphatase enzyme in milk between 143–185° F. is given by Hetrick *et al.*[12] as T-174-9 log. t (T = temp. ° F., t = holding time in sec.).

Sanders *et al.*[13] state that 1.5 to 2% of chloroform will preserve milk 2 to 3 weeks at room temperature for the phosphatase test with no appreciable inhibition of the enzyme.

It was recommended by Sanders[14] that the present phosphatase test for pasteurization be dropped, and the Sanders-Sager method be adopted.

Black[15] reviews investigations of laboratory methods conducted at the Public Health Service Milk and Food Sanitation Laboratory.

New instruments for detecting abnormal milk are described by Davis.[16]

Robinson *et al.*[17] conclude that the recognized mean value 120 mg. calcium per 100 ml. whole milk is subject to +20% error.

Qualitative detection of small amounts of surface active agents is possible by solubilizing of a Brilliant Oil Blue B.M.A. Solution according to Hoyt.[18]

Nelson[19] reviews the 9th edition of Standard Methods for the Examination of Dairy Products.

Sanders and Sager [20] show a semilogarithmic time-temperature relationship in destruction of phosphatase in milk.

The quantitative determination of DDT in milk is detailed by Frear.[21]

Arrington and Krienke [22] conclude that high butterfat and total solids milk can be watered without detection by the refractometer.

Analysis of milk within 10 days of birth of baby elephant given by Anselmi and Calo.[23]

Johnston *et al.*[24] recommend, for the determination of Fe in milk, wet ashing with concentrated $H_2SO_4$, conc. $HNO_3$, and Superoxol.

Citric acid content cow milk. Methods of prepg. serum for detn. citric acid in cow's milk investigated by Taufel [25] use of trichloroacetic acid and thymol favored.

A rapid and simple phosphatase test for milk based on use p-nitrophenylphosphate as substrate, is described by Aschaffenburg and Mullen.[26]

Rangappa [27] showed that the refractive constants of defatted cow and buffalo milk are appreciably lowered and that these constants for skim milk will not permit the detection of even gross adulteration of skim milk.

Determination of vitamin $B_1$ in milk described by Tatarinova.[28]

Brunner *et al.*[29] propose a Babcock test for homogenized milk consisting of a modification of the I.A.M.D. modified Babcock test for buttermilk.

Using p-nitrophenyl phosphate as the substrate, Aschaffenburg and Mullen [30] employ a modification of the phosphatase test, in which the milk is incubated at 37° C with a buffered solution of the substrate, followed directly by a visual comparison of the intensity of yellow color of liberated p-nitrophenol with that of boiled milk standards containing known amounts of p-nitrophenol.

Sanders and Sager [31] found that phosphatase destruction at any specific temperature is rapid at first and then slows down. Agents that tend to stabilize the enzyme are alkalies, emulsifiers and lactose when added to cheese. In milk, the most stabile range is pH 6.5–7.4.

Microdetermination for detn. small amts. of biacetyl in butter given by Pien.[32]

Chilson [33] discusses the applications, significance, and interpretation of the acidity, odox, reduction, sediment, phosphatase, and incubation tests, and plate, microscopic, thermoduric, and coliform counts of milk and dairy products.

Suitable balance and rapid method described by Kozharin [34] for the determination of moisture in butter.

Moseley [35] describes a rapid method for determining quantitatively quaternary ammonium compounds in concentrations of 10 to 300 ppm.

In refractometric determination of solids in ice cream, Konokotina [36] claims 0.25% accuracy by detn. of $n$ of ice cream in standard refractometer, calibrated in percent dry solids instead of conventional values.

Ting [37] showed that the methods of Hilditch and Lea did not work well in the determination of fully saturated glycerides in New Zealand butterfat and stated that methods of determination and isolation are needed.

Govorenkova [38] mentions, but no details given, of glass butyrometer with direct calibrations on upright cylinder for determination of fat content in milk products.

Korprich [39] found that the higher serum nitrogen content in normal milk occurs at the beginning and end of the lactation period, the highest average values being obtained in September and the next July.

Formula given and reference to table for rapid calculation of sugar content in evaporated milk by Chekulaeva.[40]

Improved method for determination of casein in milk described by Churina.[41]

Hodson and Krueger [42] describe a direct *Neurospora* method for the determination of leucine in milk and other foodstuffs which does not require preliminary hydrolysis of the protein.

Casein in its natural state in cow milk is studied by Hostettler *et al.*[43] Mean diams. hydrated particles and other physical properties detd. along with N, Ca and P content of each fraction detd.

Dalby [44] recommends, for the determination of color in eggs, extraction with acetone and comparison of the extract with acidified-$K_2Cr_2O_7$ standard.

Refractometry of cow milk in Galicia discussed by Charro Arias and Ron Noya.[45] Cu serum preferred over Ca serum. Normal n(I) of serum measured 36 to 39 at 20°, acidity 6–9.5. An increase of 1° acidity increased I by 1 unit. Milk less than 36 watered. $HgCl_2$ preferred as antiseptic.

Delarouzee [46] shows that when the ash is determined in bread containing salt, a low value is found due to the loss of Cl on ignition; he specifies a procedure that shows how to correct this error.

Variation in elec. cond. of cow milk measured at different temperatures by Kohata.[47] At each temp., cond. does not change for certain period; then increases from acidity of milk.

Smith *et al.*[48] suggest that a mixture of equal parts by volume of a *72%* perchloric acid and glacial acetic acid be used as the reagent in a modified Babcock butterfat analysis of plain and chocolate ice cream.

Improved method for determination of chlorides in milk given by Duron and Fournier.[49]

Matthaiopoulos and Macris [50] showed that the Windhausen I test for adulteration of canned tomatoes with starch is valueless because ripe tomatoes from Greece contain starch.

A modified phosphatase test for cheese is described by Kosikowsky and Dahlberg.[51] Conclusions: Tentatively any value over 0.02 mg. phenol per .5 gm cheese with Folin-Ciocalteu rgt. or over .5γ phenol per 0.5 gm with BQC regt. indicates cheese made from raw or unproperly pasteurized milk.

Kramer *et al.*[52] reported that the color of raw and canned tomatoes can be determined by extracting the sample with benzene and measuring the color photometrically for percentage transmittance.

To prevent absorption of color by proteins, color liberated by hydrolysis of milk with trypsin. Simple, reproducible method outlined by Choi *et al.*[53]

Roeder [54] proposes a modification of the Gerber butyrometric fat determination by using 10.7 cc. of sample in place of 11 cc. to bring the Gerber method in line with gravimetric analysis.

Ball's method mentioned by Lear and Foster [55] as basis for comparing effect of heat on rate of phosphatase inactivation in milk pasteurized by different methods.

Shewman [56] reported that the Monier-Williams procedure for determining $SO_2$ in salt-water fish gives low values because the trimethylamin breaks down and reacts with HCHO. Pork, mutton, and beef yielded good recoveries.

Nikolaev [57] describes hand-operated syringe for mixing predetd. size sample in handle with predetd. amt. std. alkali and phenolphthalein. Sample ejected by spring and color used for extn. of sample visually.

Kruisheer [58] suggests that in the determination of acidity in milk, the titration endpoint should be determined by comparison with a fuchsin standard or by electrometric determination and to express the results in °N, i.e., cc. N NaOH per l. of milk, not as % lactic acid.

Rapid determination of milk acidity done with indicator paper impregnated with bromocresol purple which gives color change pH 6.3 reports Godel.[59]

Madsen [60] recommends comparison of the percentage fat in the milk and in the dry substance to detect the addition of water to milk.

Dry residue of milk estimated by formula: 1.215 F + 2.528 (100d — 99.823)/d; where d = milk density and F = fat content. In defatted milk, formula — 2.63(100d — 99.823)/d + F according to Zaikovskii.[61]

Singh *et al.*[62] found that average acidity of buffalo milk was 0.12% as lactic during the first month of lactation and then gradually increased; that at acidities of 0.13, 0.16, and 0.17%, 42, 70, and 85% of samples gave positive alcohol tests respectively; that phosphate number decreased as acidity increased.

Sjöström[63] reports that the phosphatase activity of sweet cream decreased 10% when shaken with $CHCl_3$, $CCl_4$, or toluene; however, the decrease using skim milk or buttermilk was variable.

Sjöström[64] found that total Fe in milk, cream and whey cannot be determined on trichloroacetic filtrates of the serums; that whole and skim milk have a higher iron-binding capacity than cream; that iron-binding power increases with increasing temperature.

Lear and Foster[65] found Ball's methods satisfactory for determining the rate of phosphatase inactivation in milk.

Gorbacheva[567] describes a method for determining casein and albumin in cow milk.

On the basis of many tests, a tentative standard of 0.0539° depression of the freezing point is taken and from this value the added water is calculated for bulk milk delivered in London. According to Macdonald[568] only 20 out of 1840 samples fell below this standard in 1947.

Allport and Garratt[569] discuss methods of determining Pb, As, Cu, Zn, and Sn in the amounts usually found in foods and indicate suitable methods.

Use of both values ($n$ and K (refractive constant)) is the most rapid, accurate, and practical method for determining addition of water, sucrose and skim milk to cow and buffalo milk according to Rangappa.[570]

Sanders and Sager[571] list chemicals which will preserve milk for the phosphatase test for periods as long as 10 days to 3 weeks under summer conditions at room temperature. $CHCl_3$ had the least inhibitory effect on milk phosphatase.

Value of $n^{15}$ of the serum is a useful criterion of the dilution of milk, while the density of normal serum is a further guide according to Anselmi.[572]

Whitman and Tracy[573] conclude from data obtained on dry buttermilk of high quality that it does not appear possible to select a definite ash alkalinity value which will exclude all samples containing added neutralizers and which will include only those containing no added neutralizers.

A rapid method for the determination of N in milk by direct nesslerization of the digested sample is described by Hetrick and Whitney.[574]

Mohr and Häsing[575] compare the methods of Schmidt-Bondzynski, Roese-Gottlieb, Schloemer, Grossfeldt and Stoldt, and recommend the latter as a standard method for determination of fat in dry milk and baby foods.

Studying the applicability of the formal titration, Thomé[576] found the mean value of the conversion factor to be 0.95, which figure is recommended for routine use and is sufficiently accurate to keep the variation in fat content of cheese within the limits of ±1%.

Dowden[577] describes the use of reagent, dimethyl-*p*-phenylenedramine-HCl, for the detection of fat oxidation in milk powders.

An address was given by Sanders[578] on the examination of foods for extraneous matter.

Na and K determinations on about 500 foods and 150 public water supplies are presented. A discussion of the occurrence of Na in foods and water, together with incidental comparisons on analytical methods is given by Bills *et al.*[579]

## ANIMAL HEALTH

Sassman[66] discusses veterinary public health in Arizona and along the international border.



Porterfield and Farnsworth[67] note an increase in bovine tuberculosis and urge a closer check on cattle.

Malcolm and Campbell[68] show a rise in the cell content of milk to be the first indication of bovine mastitis.

After infusing 100,000 to 500,000 units of streptomycin per quarter into normally-lactating, disease-free cows (and one goat), Smith *et al.*[69] detected this anti-biotic in the milk 48 hours later. Significant amounts were detectable in urine for 27 hours, but it was not possible to detect streptomycin in the blood. Streptomycin is relatively non-toxic when infused into the bovine mammary gland.

McCulloch *et al.*[70] report that aureomycin treatment of 61 staphylococcic-mastitis infected quarters (16 cows), by several methods of application and administration, resulted in apparent cure of 38 quarters (62.3%).

Ritchie[71] concludes that by the area eradication plan the elimination of bovine tuberculosis in England is a practical possibility.

Shepard *et al.*[72] found Q fever of apparently endemic proportions in portions of Los Angeles Co. California milk shed.

Cure of mastitis in 120 of 127 cows (94.6%), by treatment with sodium sulfamethazine and penicillin in fusions, making milk available for consumption 3 to 5 days after treatment, is reported by Fuller.[73]

Berman and Beach[74] report that the blood titer of heifers rose rapidly to over 1:1000 after revaccination (6 and 12 months after initial vaccination), and then declined gradually, leveling off at a considerably higher average than found in the singly-vaccinated group; all titers except those of one heifer in each revaccinated group of 20–22 were below 1:100 at the termination of the first pregnancy.

The fact that the incidence of human brucellosis (undulant fever) in 21 Minnesota counties under the area plan remained static from 1937 to 1947, while in the remainder of the State the incidence increased 400 to 1000 percent, is cited by Flemin and Roepke[75] as evidence that the area plan of bovine brucellosis control is of benefit from the public health standpoint.

Washko *et al.*[76] study pathogenicity of *Brucella suis* for cattle.

It is reported by Buxton[77] that treatment of all four quarters with 50,000 units of penicillin (in 50 ml. boiled water) once daily for 3 days effected only 11% reduction of group C hemolytic streptococcal mastitis infections among 10 animals; and that increase of the dosages to 100,000 units resulted in clinical cure of 58% of 41 quarters infected with group C streptococci, among 16 cows.

Schlingman and Manning[78] report that 50,000 units of penicillin, incorporated in 3.69 of a bland ointment base, and infused into the teat canals of all four quarters of infected animals, freed 22 to 25 streptococcus or staphylococcus-infected quarters, after from 1 to 10 treatments, for at least 12 weeks.

Pigs were reported by Pecego[79] to have been poisoned by consuming whey that was stored in galvanized tanks.

Spencer[80] gives methods of detection control and prevention of bovine mastitis.

The results of a mastitis herd survey in the N. E. Midlands area of England are presented by Hughes.[81]

Robertson *et al.*[82] indicate that at times inflation may be better treatment for milk fever than calcium therapy.

Van Drimmelen[83] outlines the procedure for making the rapid ring test of fresh milk for brucellosis.

Huddleson[580] reports undiluted fresh serum or plasma from most normal as well as immune cattle contained specific antibodies which in combination with complement killed *Brucella* organisms, but this property could not be shown in similar blood constituents from *Brucella* infected cattle.

Packer [581] reports on penicillin levels in the udder during treatment.

### BACTERIOLOGY

The control of thermoduric bacteria is presented from the standpoints of the health dept., plant laboratory, dairy serviceman, and milking machine manufacturer.[84]

Josephson [85] compares chlorine sterilizers with quaternary ammonium compounds.

Cousins and Wolf [86] found hypochlorites most effective for destruction of *Staph. aureus* at pH 9.5–11.

Johns [87] compares quaternary ammonium and hypochlorite solutions in sanitizing dairy utensils and equipment.

Hucker *et al.*[88] found a wide variation in germicidal efficiency of various cationic germicides studied.

Prouty [89] summarizes the current knowledge of quaternary ammonium compounds, with respect to: (a) methods of determining germicidal efficiency, (b) physical reaction of bacteria in contact with quaternaries, (c) bacteriostatic action of the compounds, (d) the influence of pH, type of water, and organic matter on the germicidal efficiency, and (e) selective action on organisms.

Jones-Evans [90] compares different screening and rejection tests in relation to the keeping quality of milk.

Watson *et al.*[91] report that resazurin gave better reproducibility in reduction time than methylene blue.

Method for determining butyric bacteria contamination in milk by Rodygin.[92]

Levine and Black [93] compare several staining procedures for direct microscopic counts of pasteurized milk.

Comparative analysis of the Standard Methods methylene blue stain and advantages of the polychrome and acid-and-water-free stains in direct microscopic examination of milk shown by Levine and Black.[94]

Johns and Katznelson [95] found that extremely low concentrations of penicillin in milk lengthened dye reduction times.

Air express shipment of milk samples for bacteriological analysis at a central laboratory is reported to give good results.[96]

Cone and Ashworth [97] recommend revision of Standard Methods (1941) for bacterial examination of reconstituted milk powder.

Advantages of quaternary ammonium germicides are presented by Salton.[98]

Thomas *et al.*[99] found steam sterilization best, hypochlorite next best in treatment of dairy utensils.

Bacteria count is reduced in egg meat by adding germicide to wash water, according to Penniston and Hedrick.[100]

Spurgeon *et al.*[101] found a quaternary and hypochlorite equally effective in destroying certain organisms on teat cups.

Five rules to be adhered to in the use of chemical bactericides are suggested by Johns.[102]

Hucker and Esseltine [103] review the literature to evaluate quaternary ammonium compounds.

Halamid, a chloramine, was found to be 3 times as powerful as carbolic acid, effective as a preservative for milk samples and reduced bacterial counts in milk bottles and pails, according to Hoekstra.[104]

Foster [105] concludes that quaternaries "may be preferable to chlorine as a rinse solution for udders before milking."

Capstick *et al.*[106] state that more investigations are needed to evaluate pasteurization by ultraviolet rays, although good results are claimed for a German process.

The results of Mueller *et al.*[107] indicate that 200 p.p.m. of a quaternary salt is satisfactory for most sanitizing jobs in most potable waters.

Davis [108] gives principles and methods of cleaning and sanitizing dairy equipment.



Thomas *et al.*[109] suggest sterility standards for apparatus and equipment in British milk laboratories.

Findings in an analysis of colony counts of the dilutions of 7,427 samples of dairy products lead Courtney [110] to confirm the position taken in the US PHS Milk Code that the ratio of colony counts which lie between 30 and 300 on plates of both dilutions should not exceed 1:2; and to recommend that milk sanitarians ascertain the ratios, and employ them as a check on the accuracy of the laboratory technic.

Watson [111] reviews the literature on the resazurin test.

Five major causes of bacteriological shortcomings of milk, related to producing farms, are listed by Boland [111a] and the functions and equipment needs of fieldmen are outlined and discussed.

Singh *et al.*[112] recommend the use of the ten-minute resazurin test at the platform for rapid examination of milk. The test was useful in identifying milks of high count and poor keeping quality but milks showing intermediate quality should also be given the 1-hour test.

Having determined that *Str. cremoris* in cheese starter is markedly inhibited by as little as 0.1 unit of penicillin per ml. of milk, and *Str. lactis* by 0.25 to 0.30 unit per ml. of milk, and that very little inactivation of penicillin results from pasteurization at 145° F for 30 min. Hunter [113] suggests the exclusion from the supply of milk from quarters being treated with penicillin in order to avoid a real problem in the cheese industry.

Elliker *et al.*[114] found hypochlorites more rapid-acting than quaternaries and comparative residual effect dependent on whether wet or dry storage was used.

The sources of thermodurics, the avenues by which they enter milk, and precaution and methods of control, including methods of cleaning and sanitizing milk utensils and milking machines are discussed and described by Partin.[115]

In a study of the factors influencing thermoduric counts in cow milk, Thomas [116] concluded that the manner of milking made no appreciable difference in the thermoduric count when utensils were effectively sterilized; the use of milking machines, washed only in warm water, led to much higher incidence of excessive thermoduric counts; and that, in general, the proportion of samples with high thermoduric counts increased with increasing raw milk counts, although some high-count milk had low thermoduric counts.

Humphries [117] describes a modification of the Frost little-plate technic.

Katznelson and Hood [118] found that, when penicillin is used in the treatment of mastitis, the carry-over into milk may be sufficient to inhibit the activity of acid-producing bacteria in cheese starters added to milk from cows so treated.

Although boric acid in culture media inhibits some strains of *Aerobacter* more than some strains of *Escherichia*. Poe and Charkey [119] report that because of overlapping results secured from individual strains of each genus, boric acid media are not suitable as differential media for these two genera.

Sixteen reproductions of electron micrographs of cells of *Str. lactis* in the presence of and in various stages of lysis resulting from attack by phage particle, are presented by Parmelee *et al.*[120]

Poe and O'Kelly [121] report that *Escherichia* and *Aerobacter* are not inhibited by media containing as much as 11% bile and 0.1% phenol, whereas spore-forming lactose-positive aerobes were inhibited by 5% bile and 0.05% phenol, and conclude that solid media containing bile and phenol do not serve to differentiate between *Escherichia* and *Aerobacter* species.

Sekhar and Walker [122] observe temperature characteristics of some facultative psychrophilic bacteria.

Boyd and Hanson [123] compare the resazurin test with other tests for the quality of milk.

Methods of controlling mold in milk plants and dairies are given by Knight.[124]

Morton and Vincent[125] present a temp. compensation scale for decreases of dye-reduction time with storage time and temperature.

Lenhard and Caseno[126] found molds, yeasts and bacteria inhibited by 0.1% benzoic or acetic acid in immersion solutions of the polyphase quick freezing process.

Types of thermoduric bacteria in farm milk cans are presented by McKenzie *et al.*[127]

McKenzie and Lambert[128] present a modified procedure for determining the thermoduric bacterial content of milk.

Morris and Edwards[129] report a summer bacterial contamination of a pasteurization plant.

Bacterial counts on washed milk cans were found by Jones[130] to be worse during June–Sept. with another minor peak in February.

Thomas and Thomas[131] found a high percentage of farm water supplies contained milk-souring organisms.

Epstein[132] found that a quaternary killed yeasts in carbonated beverages.

An improved medium for enumeration of bacteria in milk and milk products is described by Pelczar and Vera.[133]

Thomas and Evans[134] found thermoduric counts in milk highest in the Dec.–Feb. and June–Aug. periods.

Singh *et al.*[135] found the 10-min. resazurin test useful for application at the platform.

Laxminarayana[136] finds the 1-hr. resazurin test useful in identifying milk produced under insanitary conditions or for finding mastitis, late lactation or colostrum.

It is pointed out by Golding[137] that the resazurin test in milk is a greater time-saver and more adaptable to various grades than the methylene blue test.

Felsenfeld *et al.*[138] discuss the ecology of 85 strains of *Salmonella* belonging to 18 serological types which were isolated.

Soto and Oterd[139] give results of typing 130 cultures of *Salmonella typhosa* by the Craigie and Yen method, and also according to Kristensen's scheme.

Golding[140] recommends using vials containing dry sterile resazurin where resazurin test operators have little or no bacteriological or chemical training.

A milk staining procedure which gives higher bacterial counts is described by Levine *et al.*[141]

Bortree and Spencer[142] suggest that the resazurin test and direct microscopic count be used together for bacteriological examination of milk.

Weber and Black[143] describe their method for evaluating quaternary ammonium compounds and other germicides.

Laxminarayana[144] recommends the 1-hr. resazurin test in identifying milk produced under unsanitary conditions or for drawing attention to mastitis, late lactation, or colostrum.

Anderson *et al.*[145] give a new staining technique for use in direct microscopic counts of milk.

Chapman[146] presents a medium with no inhibition for coliforms. About 30% higher counts are obtained than on other media.

Kesler *et al.*[147] report little difference in bacterial flora between strict foremilk and the second 15 ml. sample, fewer long chain streptococci in midmilk, and excessive numbers of lencocytes in strippings.

Techniques and a series of "highly selective media" used in the discovery of typhoid carriers are described by Ruys.[148]

Prucha *et al.*[149] compared the standard plate and direct microscopic methods of bacterial examination of milk and found 75% agreement as to compliance with the Standard Ordinance, but neither method gave complete information.

Wyss and Poe[150] reported that the phenol coefficients of 11 benzoic acids on 6 different microorganisms showed that salicylic, 3-nitrosalicylic, and 3,5-dinitrosalicylic acids exhibited the greatest germicidal effectiveness against the food-spoilage organisms, and that the phenol coefficients of the food-spoilage organisms were generally higher than those of the pathogenic organisms.



Moore[582] states the addition of from 50 to 175 p.p.m. quaternary sanitizer to milk, with or without added starter, definitely reduced rate of acid development upon incubation for 20 and 40 hrs. Musty, putrid or stale odors were noted in all but one of 36 samples containing 50 or more p.p.m. quaternary sanitizer.

Thomas *et al.*[583] find the thermoduric bacterial content of monthly samples of milk from 210 farms was highest in summer and lowest in winter, increasing with raw milk total counts.

One extra milker head assembly for every 2 complete milking machines used is recommended by Mueller and Seeley[584] to increase contact time between teat cup and germicide.

Corash *et al.*[585] report on control of thermoduric bacteria in milk.

Paper disks saturated with lactose fuchsin were used by Müller[586] as economical media for growth of coliform colonies.

Heim and Poe[587] found ethylene glycol, diethylene glycol, propylene glycol and trimethylene glycol gave phenol coefficients that varied from 0.0 to 0.021, while six benzoic acids gave values ranging from 0.0 to 7.8 when tested against *Staph. aureus* and *E. typhi*.

Twenty-one days incubation at 3–5° C were necessary to give maximum counts of psychrophyls on yeastrel agar, state Thomas, and Chandra Sekar.[588] Raw and pasteurized milks contained psychrophyls; laboratory pasteurized milks (63° C.–30 min.) did not. Pure cultures did not survive laboratory pasteurization.

Leggatt[589] found the remarkable affinity of wood for quaternary ammonium compounds affects the latter's suitability as a sanitizer for equipment such as wooden churns. Microflora may be conditioned to become gram-negative which types are known to affect flavor.

Thermoduric counts of over 100/ml. were found by Thomas and Roberts[590] in 21% of 116 farm water supplies; of 342 thermoduric colonies bacilli 74%, micrococci, 9.1%; actinomyces, 8.2%; gram negative rods, 3.8%; yeasts, 2.6%; microbacteria, 2.0%; streptococci, 0.3%. Thermophiles were present in 21% of the samples; only 2.5% had more than 10/ml.

## BUTTER

The use of yeast in prevention of mold and souring of butter discussed by Blok.[151]

Milk inoculated with lactic acid culture produced higher acidity in ghee. Preboiling milk reduced acidity and curd report Paul and Anantakrishnan.[152]

Guriye *et al.*[153] report ghee made by boiling cream gave high yield if previously acidified but quality not up to curd process.

Chem. changes in ghee studied by Achaya[154] attributed to oxidation, polymerization, lipolysis.

Addn. yeast to butter compn. prevents mold growth, states Bogdanov.[155]

Oily taste of butter caused by oxidative decompn. of fat. Causes and prevention explained by Csiszar.[156]

Process for stabilizing canned butter concentrate for hot climate reported by Coombs.[157]

Godel states addn. vit. E, ascorbic acid and $Na_2P_2O_7$ gave stability and resistance to oxidation in butter.[158]

Faulty butter consistency and its characteristics described and causes explained by Tverdokhleb.[159]

Stability of butter does not depend on protein content but on freshness of

milk and sanitation in production, claims D'yachenko.[160]

D'yachenko[161] states taste of butter affected adversely by excess protein. Plasma content varies with effectiveness of washing.

Gregory[162] finds that 4-day cream delivery improved Indiana butter quality.

Olsson[163] found that a suitable treatment of cream eliminates the possibility of poor consistency of butter which is caused by too low or too high I values of the butterfat and recommends temperature treatment of cream.

Neseni[164] found that total protein content of butter varies from 0.5–0.6% of butter weight; that casein makes up 86–89% of the protein and sol. albumin the lowest fraction; that 3 months storage at 8° did not change the proportions.

Barnicoat[165] found that incipient oxidation is important in determining loss in grade score for flavor in salted butter; that rancid flavor in stored unsalted butter may have been caused by microorganisms.

Barnicoat[166] found that working butter under reduced pressure offered no advantage and that the keeping quality of butter of "sweet cream" or "mild starter" type was not dependent on the free air content.

Mohr and Wellm[167] found that the increase in viscosity obtained by concentration of cream is due to close packing of fat globules which lose their roundness and is a factor in cream to butter conversion by the new Fritz process.

Barnicoat[168] showed that exposure to sun's rays through glass or prolonged exposure (4–24 hours) lowers the quality of butter. However, exposure to interior diffuse daylight, not over 50-ft. candles, nor for more than 2 hours, does not.

Trivedy *et al.*[169] showed that ghee (butterfat), when heated at temperatures up to 200° or fried at 250°, has its color and vitamin A destroyed, its peroxide value increased, its flavor hurt despite the fact that its chemical constants remained the same.

Ueno and Tsuchikawa[170] showed that the properties of fresh Japanese butters were generally normal except the acidities which were high. Margarines, however, showed great irregularities, some having bad odors and not conforming to quality on the package.

Antonini and Creac'h[171] found that the butter produced by natives in the Chad from zebu milk has a higher water content than French butter, but otherwise its composition is very similar.

Pont[172] found little difference in keeping quality between washed and unwashed butter after 4–5 months cold storage. Difference in keeping qualities between different factories not correlated with Cu and Fe contents nor peroxide and aldehyde values.

Varying rate of action of lipase on various fats can be used to detect adulteration of butter, claim Vitali and Caccia-Bava.[173]

Schultz[174] determined the specific gravities of the following butters in correlation with air content: (1) Alfa process—0.955–0.960 with no air; (2) ordinary churn—0.910–0.940 with air content 4–1% resp.; (3) Fritz process —0.885–0.905 with air content 7–5% resp.

Rapid method of butter formation preferred by Makarin[175] to slow method. Best flavor obtained by adjusting acidity of starting material to 45° T.

Rangappa and Banerjee[176] recommend storage of native Indian butter in buttermilk or lactic acid rather than in air or water.

Keeping qualities of ghee produced by different methods discussed by Ramaswamy and Banerjee.[177]

Meuron[178] recommends that method for prep. of butter samples described be adopted as official.

Claydon and Martin[179] report little practical difference between quality of cream segregate from mixed cream. Emphasis that improvement in quality



of cream produced must be followed by improvement of later holding conditions.

Dhengra and Chandra[180] report chemical compn. of ghee or milk fat affected by climatic conditions, season, breed of cow, period of lactation, kind of fodder, locality and ration fed. Range of analytical values shown.

Fatty acids produced from samples of butter made by pure cultures of different organisms described by Richards and El-Sadek.[181]

Sidorova[182] outlines lactose production in butter factories.

Stoin[591] describes the preparation and composition of ewe butter (cashcaval butter) in Romania.

Jax[592] gives the chemical composition of Austrian butter. Higher moisture contents were associated with butter produced during the period May to September, and the lower figures with winter butter.

Bång's[593] studies on the microbiology of starter bacteria resulted in a method for chemical flavoring of butter on a technical scale, giving a butter which can compete favorably in odor, taste, and other qualities with starter-flavored butter.

Ghee aroma varies with the temperature to which butter is heated during its preparation according to Runaswamy and Banerjee.[594]

Trivedy *et al.*[595] compared nutritive value of fresh, rancid, high-acid, and bazaar ghee. Ghee allowed to rancidify was low in vitamin A; high-acid ghee prepared from aged butter was high in vitamin A; bazaar ghee was low in vitamin A, compared to fresh ghee prepared in the lab.

Verona[596] reviews the microbic origin of the flavor of butter.

## CHEESE

Blanchard[183] details methods used in identifying crystals of calcium tartrate found in processed cheese.

Carbone[184] reports analyses and comparison of Fontina cheese. Nutrient value calcd. and discussed.

Production and plant operating control date for mfg. new cheese from sheep milk given by Turovets.[185]

Dilanyan[186] discusses variations in yields of Swiss cheese due to variation in milk quality.

Kochankov[187] describes new mixture paraffin coating cheese.

Ribeiro[188] describes manufacture of pasteurized Minas cheese.

Water sol N index of aging of cheese. Method of extn. for detn. given Yakhnina.[189]

Babel[190] found that in actual cheese-making operations, a cooking temperature of 102° slightly retarded acid production of 5 of 7 cultures worked with as compared to 100°; that 104° appreciably retarded acid prod.

Kosikowsky *et al.*[191] found pasteurization of American Cheddar cheese by radio frequency heat possible but developed many problems requiring investigation.

Mucciolo *et al.*[192] found that sanitary measures were not enough to check a penicillium mold, isolated repeatedly from cheeses of one factory. Control was obtained by the action of Merthiolate—soaking cheese 5 minutes in a 1:50,000 soln. or 1:25,000 before paraffining.

Thome *et al.*[193] found that the quality of cheese when stored at 2° is improved, especially the consistency, as compared to the usual storage temperature of 13–14°.

Effect of added amino acids on flavor of Cheddar cheese from pasteurized milk investigated by Baker and Nelson.[194]

Relation between biacetyl content and flavor in Cheddar and other cheeses discussed by Calbert and Price.[195]

Hood and Katznelson[196] suggest the inactivation of penicillin in milk, at the cheese factory, by means of the enzyme penicillinaze, 0.02 mg./100 ml. of milk, when the problem of inhibition of starter activity in the milk presents itself, in areas where extensive use of this antibiotic is being made.

Cailleau, Adrian, and Levy[197] report

Swiss cheese poor source of riboflavin, niacin and pantothenic acid. Camembert and Roquefort cheeses are better.

Bacterial count, tyramine content, and quality of American Cheddar and stirred curd cheese made with *Streptococcus faecalis* starter is described. Little difference from com. lactic acid starter and *Strep. faecalis* starter. Slightly in favor of latter.[198]

Janzen and Brown[199] found cheeses made from pasteurized milk had higher average flavor scores.

Wilson[200] reports that all Cheddar cheese soon will be made from pasteurized milk.

Brown[201] shows that quality of cheese as indicated by flavor scores is definitely in favor of pasteurized milk cheese.

According to Blix[597] whey cheese is rich in Fe only when prepared by the traditional method of evaporating the whey in open Fe kettles.

Uses of cheese whey may include: feeding to livestock; preserving ensilage; drying and incorporating into food products; or fermenting to form $(CH_3CO)_2$, $CH_3COOH$, $CH_3CHOHCOOH$, or $C_4H_9OH$; no outlet feasible for small cheese plants has been developed, however, according to Sanders.[598]

Keilling and Barrett[599] found that casein and lactalbumin may be biologically determined in cheese by means of a bacterial method. Uses suggested are for the preparation of amino acid preparations from casein for human and animal use and also for the maturing of certain cheeses.

Calcium tartrate crystals were found in processed cheese probably as a result of adding tartrate as an emulsifier. This results in impairment of quality but the cheese is not injurious to health according to Leather.[600]

Blanchard[601] identified crystals found in processed cheese as calcium tartrate.

In their studies of the elastic properties of rennet curd, Hansson *et al.*[602] found the greatest elasticity at 35°; at pH 6.29 elasticity was more than 7 times as great as at pH 6.61; the addition of 60 g. $CaCl_2$ per 100 kg. milk doubled the elasticity (pH 6.54).

Maas and Noerr[603] describe the use of Dermolan Z to precipitate proteins from whey. They claim precipitation is more complete than by the use of heat. In the concentration employed Dermolan is not toxic and does not affect the flavor.

According to Dahlberg and Kosikowsky[604] Cheddar cheese containing *S. faecalis* developed more tyramine and Cheddar flavor as the ripening temperatures were increased. The increase in the tyramine content of cheese showed an approximately direct logarithmic relation to the days ripened.

Thomé[605] describes the maturation process in hard rennet cheese.

Krishnamurti and Subrahmanyan[606] describe the use of vegetable rennets in the preparation of cheese. Cheddar cheese prepared with *F. carica* extract which had been precipitated with alcohol from citrate-phosphate buffer at pH 4 compared well with cheese made with animal rennet.

Hansson and Hietaranta[607] found that pasteurization and cool-storing of skim milk decrease curd elasticity considerably.

### Concentrated

King[202] showed that spray dried milk has spherical particles; always contains air cells; is optically active when old, not active when fresh; readily soluble in water when fresh, not when old; that roller dried milk has irregular platelets; very few air cells; shows optical activity; is not readily soluble in water.

Coulter *et al.*[203] show that the development of deteriorative products may occur in dry whole milk during storage according to increase in vapor pressure of water in the system.

Effect of heating whole milk before drying on enzymes, bacteria after drying and on flavor of reconstituted milk discussed by Ashworth.[204]

Costilion *et al.*[205] recommend procedures for the manufacture of cultured buttermilk from non-fat dry milk solids.

Method for estg. equiv. processes in terms of time and temp. with respect to physical properties of evaporated milk described by Nelson.[206]

Higginbottom[207] reports that higher preheating temperatures and better plant management have reduced bacteria counts in British spray dried milk powder.

Colvard and Roberts[208] indicate a relatively good concentrated milk after 6 months storage at —12° F or lower.

Lebedev[209] discusses procedure for prevention of crystn. of lactose in large crystals in cond. milk.

Higginbottom[210] discusses the bacterial growth in reconstituted spray-dried milk.

Addn. of ascorbic acid to milk before drying increased keeping quality dried product, state Wright and Greenbank.[211]

Hawley[212] found better cleaning of equipment necessary to improve the quality of sweetened condensed milk.

Parfitt[213] presents an outline of the Sanitary Standards Program of the Evaporated Milk Industry.

### Food Industries

Winter and Wrinkle[214] state that frozen egg quality depends on clean eggs, clean equipment, and quick cooling.

Milyutina[215] reviews new technology of sour cream production.

Demurov[216] reviews production of sour milk products in Soviet Union.

Montequi[217] reported that the determination of volatile basic N, trimethylamine, actual acidity or buffer capacity, alteration of the fat, and fluorescence did not give concordant results in measuring the alteration of fish.

Production of antioxidative preparations from whey and their effect in milk and butter reported by Larsson and Sjostrom.[218]

Tretsvan[219] suggests that possibly skim milk should not be pasteurized until the curd-forming process is started.

Current U.S.S.R. procedure for preparation of leaven described by Bogdanov[220] and application of new method by Khlebnikova.[221] New method satisfactory.

Dorn[222] suggests frozen food research is necessary in processing, process evaluation, financing and equipment, and merchandising and marketing.

Procedure for preparation high-quality casein described by Pozdnyak.[223]

Searles[224] gives general precepts about building food plants from a sanitarian's point of view.

Belgian regulations for private slaughterhouses are detailed.[225]

Hennerich[226] states that the food manufacturer's sanitary responsibility extends to the final consumer.

Wagner[227] relates experience of a bakery in reorganizing for higher sanitary standards.

A simple empirical formula is worked out by Merrill[228] for extending the process time in tin to glass containers.

Gubser[229] indicates that high velocities at least 500 ft. min. are necessary in air blast freezing.

Morse *et al.*[230] found acetic acid effective in preventing yeast and mold growth in carbonated beverages. No taste difference was detectable.

Licensing of frozen food locker plant is provided for in this Frozen Food Locker Act and Regulations.[231]

Vaughn *et al.*[232] declare that continuous sanitizing of conveyor belts, etc., in food preparation plants is effective with routine control.

Sterilization of foods, processing edible fats, and the frozen food industry are discussed in this symposium on food technology.[233]

Duffy[234] describes the cannery inspection services operated by California.

Abrahamson[235] gives specifications for sanitary design of food handling equipment.

The baking industry with effort can improve on the construction standards of the New York City Health Department.[236]

Barron[237] describes the methods used by National Biscuit Company to provide for plant sanitation.

Solworth[238] believes great improvement necessary in sanitation of food plants.

It was observed by Bashford[239] that the number of spoiled cans was greatly reduced by substituting good water for contaminated cooling water.

Woodruff and Shelor[240] found a continual loss of natural appearance, color, aroma and flavor, related to temperature of storage in vegetables and fruit stored over one year.

Pottinger[241] found pH values an indication of the freshness of shucked Eastern oysters.

"The Mites Associated with Stored Food Products," by A. M. Hughes, is reviewed.[242]

Shilovich[243] describes casein pptd. from defatted milk neutralized by baking soda to give water soluble caseinate, dried and packaged as powder. Used in food fortification.

Biswas[244] showed that fresh confectioners' waste (whey discarded after separating the casein from milk for the preparation of edible products) yielded 2% or more of weight as lactose.

Sanitation standards for bakeries are discussed by Holmes.[245]

Gilman and Semeniuk[246] hold that mold deterioration in stored grain is best controlled by drying because fungicidal chemical residues are possibly toxic.

Nishiyama[247] reports that margarine prepared from coconut oil, hydrogenated whale oil, hydrogenated stearin from cottonseeds and cottonseed oil, stored in the dark at 27°, remained unchanged until the fourth week and markedly increased in 6–10 weeks in the Reichert-Meissl value, the Polenske value somewhat, the peroxide value gradually, the saponification number gradually, and the iodine number decreased gradually.

Possibilities of high-frequency heating in the frozen food industry are given by Bartholomew.[248]

Bure[249] maintains that until the present 90%-extraction flour can be reduced to 80–85%, it is advisable to add 0.2% $CaCo_3$ to neutralize the decalcifying effect of phytic acid.

Tavernier and Jacquin[250] showed that apple juice when pasteurized in acid (Pyrex) glass gave the best flavor, especially when deaerated and more so when carbonated.

Production of milk sugar described by Bubnov[251] yield of lactose 2.5% of wt. of whey used.

Mishustin *et al.*[252] showed that since grain which had spent the winter in the field sharply reduces yeast growth, this indicates the use of a fermentation test for such grain which is capable of producing aleukia.

Procedure for acid hydrolysis of casein outlined by D'yachenko *et al.*[253] Product used for food fortification.

Okolov[254] showed that defective meat reveals a great increase in catalase activity, using the procedure of Bakh and Zubkova which is based on the determination of the residual amount of 2% $H_2O_2$ after 5 min.

Discussion of methods of casein production by Romanov.[255]

Leskov[256] reported that fluorescence of spoiled fish is useful in detecting spoilage, and that white or blue-white fluorescence of skin punctures is a definite indication.

Allison[257] reviewed attempts to correlate numerous tests with quality of fish and states that methylamine for raw or frozen salt-water fish and volatile acids for all fish and fish products are best.

Discussion of process for fractionation of lactose and soluble proteins by low temperature methanol extraction by Leviton.[258]

Friess[259] reported that through the crystallization of $CuCl_2$ mixed with plant extract, it is possible to demonstrate changes brought about by processing.



Overman *et al.*[260] showed that the desirability of doughnuts fried in fat was not affected by fat that was stored 2.5 years prior to use but was lowered after 3.5 years storage of the fat.

Rozanov[261] describes technology of lactose production.

Tarr and Deas[262] found that $NaNO_2$ (0.02%) inhibited bacterial growth more than sulfathiazole (0.001–2%) or sulfanilimide (0.002%). The sulfa compounds did not delay the fading of the red astacin pigments but did delay the development of mal-odors.

Kertesz and Sondheimer[263] reported that the loss in red anthocyanin color in commercially prepared strawberry preserves was greater above 60–70° F. storage, and that flavor deterioration was slight until after the loss of 50% color.

Exposure of foods to cathode rays and X-rays decreased the niacin content as shown by Proctor and Goldblith[264] but the destruction was affected by various protective ingredients.

Gilroy and Champion[265] state that containers of pure Al and alloys of Al with Mn and Mg are satisfactory for storage and transportation of apple and black currant juices, and also for citrus juices if the $SO_2$ preservative is suitably controlled.

When the moisture content of beef muscle was below 150% (as % dry weight), ozonization at 3–5 ppm for 3 hrs. daily extended storage life, according to Kefford.[266]

Mukherjee and Goswami[267] found that dissolved hydrogen, pyrogallol, catechol, Na citrate and NaK tartrate were effective as hydrolytic and oxidative rancidity stabilizers.

The B vitamins were completely preserved but the buffering properties were practically lost in the demineralyzing of whey by electro-dialysis according to Wiechers and De Vries.[608] By adding demineralized whey powder and fat to a water-milk mixture, a synthetic milk was prepared which was practically identical in all details to human milk.

The equipment and procedure used to prepare milk products of soft-curd properties by removing calcium and other mineral elements by means of hydrated synthetic sodium aluminum silicate, crystalite, are presented by Otting.[609]

Cuenot[610] describes the composition of the various Milei products (products of skim milk and milk serum) made in Germany.

The methods of preparation of different milk products in India—their composition, vitamin-content, and nutritive value are described by Sen and Dastur.[611]

The composition of khoa or mawa is given by Iyer *et al.*[612]

### Food Infection and Poisoning

Gray[268] analyzes two outbreaks of botulism in man from canned beetroot.

Perry *et al.*[269] found no danger from botulism in commercially frozen vegetables in hermetically sealed tin cans or in cartons.

The report of a conference on food and drink infections is said to be useful propaganda on an important subject.[270]

Babione[271] describes a gastro-enteritis outbreak caused by contaminated reconstituted milk powder.

Little[272] describes an outbreak of para-typhoid fever from chicken salad prepared by a carrier of the disease.

The most important cause of fish poisoning occurs when the flesh of the fish is itself poisonous according to Von Bonde.[273]

Gorman reports on an outbreak of food poisoning from roast turkey.[274]

Porteous[275] discusses the bacteriology of food poisoning.

Four outbreaks of food poisoning were traced to custard filled cakes.[276]

West[277] gives statistics on food-borne disease and discusses regulation of public eating places.

Grant and McMurray[278] describe an outbreak of staphylococcal food poisoning from tinned ox tongue.

The eating of either raw or cooked rock cod, black jack, bonefish, surgeon fish or reef fish, schnapper, red schnapper, greenfish, mullet, bream, and balloon fish was shown by Ross [279] to be poisonous.

Moustafa *et al.*[280] present the bacteriology and incidence of food poisoning in Egypt.

Jones and Symons [281] report an outbreak of food poisoning (*Salm. dublin*) conveyed by sausages and sausage meat.

Abstract of article by Dack, "Ptomaine Food-Poisoning a Myth," was coined in 1870, based on misconceptions. Hemolytic staphylococcus toxin most frequent cause of food poisoning. Adequate refrigeration is best preventive.[282]

Brandis [283] reports an outbreak of food poisoning (*Salm. montevideo*) from fish salad with red turnip.

Three milk borne outbreaks of disease are described by Henderson *et al.*[284] *Salm. dublin, Sh. sonnei,* and *Sh. manchester* were the causative organisms.

Hussemann and Tanner [285] vainly attempt to find means of distinguishing between strains of staphylococci which do and do not cause food poisoning.

Névot [613] reports that many microorganisms besides *Salmonella,* namely *Staphylococcus aureus* or other proteolytic organisms, may be responsible for toxemia following ingestion of spoiled meat.

## HUMAN HEALTH

The 4000 human brucellosis cases reported annually indicate 30,000–40,000 actual cases. Better methods of control, diagnosis and treatment are necessary.[286]

The meat inspection section of the Los Angeles, California, City Health Department is described by Ziegler.[287]

Osler *et al.*[288] produced symptoms of acute gastric or intestinal disturbances in ¼ of the human volunteers with egg salad, custard, or milk in which single strains of *Streptococcus faecalis* had grown for 5 hours; failed to produce symptoms with 20-hour cultures in milk or infusion broth.

In summarizing the PHS Disease Outbreak Reports, 1946, Brooks [289] deals with the causative agents. He doubts that outbreaks with unknown causes should be reported.

Sanitation, properly trained inspectors and location and operation of slaughterhouses are the main principles of safe meat in England according to Tweed.[290]

Fabian [291] classifies infections and infestations of food causing outbreaks of disease or poisoning.

Modes of infection and sources of Q fever are thought to be related to residence, occupation or household milk supply according to Beck *et al.*[292]

Andrews *et al.*[293] give data to prove that pasteurization prevents milk-borne disease and causes no significant loss of nutritive value.

The Spinose ear tick was found to be a possible vector of Q fever by Jellison *et al.*[294]

Fitzhugh [295] shows that small amounts of DDT in animal food become significant to man.

Q fever rickettsiae were demonstrated to be in milk and udder tissues of all 4-quarters of an infected cow and in the supramammary lymph nodes proximal to the udder. Possibly excepting lung tissue, no other tissue demonstrated infection according to Jellison *et al.*[296]

Although specific therapy is available for brucellosis, Tureman [297] stresses prevention and discusses methods of diagnosis.

Baum [298] recommends a State meat inspection service to be conducted by local governmental units.

Legal sparring over a 12-year period was required by Fowler [299] to protect the public health from a dairy owned and operated by a typhoid carrier.

Lehman [300] tabulates the toxicology of the newer agricultural chemicals.

The food of the nation is considered by Riley [301] to be more and more the concern and responsibility of public health officials.



McKenzie [302] reports on a milk-borne diphtheria outbreak in children.

The committee [303] discusses three methods of preventing transmission of trichinosis by microscopic inspection of pork, boiling garbage for hogs or processing (freezing) of pork.

Galton and Hardy [304] conclude that the carrier state in salmonellosis is relatively transient.

A dysentery outbreak involving 45% of a ship's crew is reported by Mount and Floyd.[305]

Bhat *et al.*[306] showed that mawa (crude evaporated milk used in Bombay) is a dangerous source of infection as it quickly deteriorates in storage, has a high plate count, and pathogenic organisms survived for long periods.

A study by Lennette [307] reveals that Q fever is a rickettsial disease occurring naturally in ticks, possibly transmitted through milk, not seasonal or confined to any one age group or sex.

Wilson [308] suggests that the nitrate from fertilizers, stored in leafy vegetables, frozen foods, and prepared infant foods may cause illness.

Potential health hazards of new pesticides are discussed.[309]

McCullough *et al.*[310] report the recovery of *Brucella abortus* from naturally infected hogs.

A case of typhoid from raw clams is reported.[311]

Jordan [312] found brucellosis in humans closely associated with occupation.

In a serological survey in eastern Washington, reported by Doddananjayya,[313] 6 of 289 samples of human sera, and 9 of 327 beef and dairy cattle sera, were found to contain Q-fever complement-fixing and bodies in titers ranging to 1:128, although only three of the human subjects had close contact with animal.

Kemkes [314] lists sources of pathogens and shows the manner of their entrance into milk.

In an epidemiological study of 268 cases of human brucellosis in Minnesota, occurring between January, 1945 and June, 1948, incl. (3½ years), Magoffin *et al.*[315] found that *Br. abortus* was the causative organism in 85% of the cases; the causes of the remaining cases were divided almost equally between *Br. suis* and *Br. melitensis,* and occurred mainly among meat-packing plant employees handling infected swine. Raw milk was the only recognized potential source of infection in about one-fourth of the cases. The authors conclude that prevention of the human disease is dependent upon eradication of the disease in animals.

*Br. abortus* was isolated from two, and *Br. melitensis* from one, of 34 enlarged prostates examined; and *Br. abortus* from one of 43 fibrosed fallopian tubes, of individuals having had farm contact with animals, and clinical records of illness compatible with brucellosis, but the blood of whom was negative for agglutinins for brucella, in research conducted by McVay *et al.*[316]

It is concluded that pasteurization must remain the greatest bulwark against brucellosis until methods of control can be developed.[317]

Van Drimmelen [318] reports infection of rats with brucellosis by injection of infected milk.

News item in re. movement to control brucellosis. At meeting of interested national organizations, in Washington, March 15, 1949, decided to form permanent committee to advise Congress.[319]

Resumé, by Mullholland,[320] re. animal diseases affecting man. Part of a symposium at National Conference on Rural Health.

Olson [321] reports the ability of the cockroach to harbor Salmonella organisms.

Abstract of article in Amer. Jour. Medical Science which says that out of 8 cases of human ornithosis, 7 patients had been in close contact with domestic ducks. No reference to use of ducks as food.[322]

London letter: bill pending in Parlia-

ment to protect children against milk containing tubercle bacilli. Relates largely to gradual promotion of pasteurization.[323]

Brown[324] concludes that, with the exception of infectious hepatitis, milk and water are not major vehicles in the spread of virus infections.

Brief abstract of article on Q fever in California, in *Public Health Reports*, 63, 1712 (Dec. 31), 1948. Jellison *et al.*[325] reports organism found in raw milk from several dairies and found to be infectious.

Abstract of article "Tuberculosis Among Philadelphia Foodhandlers" by Boucot and Sokoloff, *Amer. Review of Tuberculosis*, 58, 684 (Dec.), 1948. In chest x-raying of 43,000 foodhandlers 771 showed evidence of tuberculosis. On follow-up 66 were active cases.[326]

Huebner *et al.*[327] report Q fever in milk destroyed by proper HTST pasteurization.

Answer to query concerning surveys to determine effect of food handler examinations on control of tuberculosis. Surveys in several cities cited indicated that, roughly, 1 to 2 percent of active cases found.[328]

Abstract of report by McGough, on 10 human cases of Newcastle virus disease following eating chicken.[329]

Abstract of article by Henderson and Brooksby[330] report quick freezing of beef infected with virus of foot and mouth disease suspends acid formation in muscle tissue and virus has been demonstrated as long as meat was frozen.

Pesticides are a public health hazard as a chemical contaminant of food when improperly used.[331]

Lehman[332] discusses the effects of small doses of various insecticides on man and animals.

Milk is suggested by Mathews[333] as a vehicle of dissemination of poliomyelitis virus in a naval station epidemic.

A symposium on Q fever[334] presents the history and present status, experimental Q fever in cattle, Q fever survey in Southwest Texas, and complement fixing antibodies with *C. burnetii* antigens in various geographic areas and occupational groups in the U. S.

Appreciable quantities of DDT applied to control insects on crops fed to cows may appear in the milk state Moore *et al.*[614] It may be kept to a minimum by lesser application of DDT.

### ICE CREAM

Pederson[335] suggests raw material control, sanitation, and insect and rodent control to eliminate sediment in ice cream.

Parry[336] states that British ice cream regulation was highly received by trade and further improvements can be achieved by cooperation.

The New Jersey ice cream industry[337] gives 13 reasons advanced against sale of ice cream by weight.

Uetz[338] presents a definition of sanitary quality in ice cream with reference to ingredients, pasteurization and ice cream containers.

Hennerich[339] states that sanitation is necessary to attract customers.

The methylene blue test was found to be a good indicator of general bacterial contamination in ice cream by Watson *et al.*[340]

Minthorn[341] reviews HTST pasteurization of ice cream mix.

Discussing vitaminized ice cream, Mikhailov[342] recommends homogenizing before pasteurization and addition of vitamin B and vitamin A reinforcements.

Remaley[343] predicts that concentrated and dry ice cream mixes have an excellent future.

Shadwick[344] enumerates effective pasteurization of mix, thorough cleaning and sanitization of equipment, care in handling ingredients and packages, and extreme cleanliness on the part of personnel as essentials to the production of coliform-free ice cream products.

200° F and 50% relative humidity for 30 min. proved effective for pasteurization of nut meats according to Erickson and Colmer.[345]



Shadwick[346] presents methods of eliminating coliform bacteria from ice cream.

Snyder[347] believes artificial emulsifiers in ice cream useful, but of doubtful legality.

### MILK

Robertson *et al.*[348] give the correlation between off-bottom sediment testing and farmer's filter aids.

Trout[349] states that different groups consider quality factors in milk to be: cream line, appearance, safety, cleanliness, good flavor, keeping quality, nutritive quality, low bacteria count, production background, composition, and miscellaneous such as no adulteration, no watering, etc.

A review of the literature by Trout[350] indicates that homogenized milk is especially suitable for hospital dietaries.

Thomsen[351] points out that in fluid milk plants 36–45% of sales income is required for operation, depreciation reserves, and return on investment.

Clayson *et al.*[352] give methods of cleaning and sanitizing utensils.

The adequacy of standard pasteurization times and temperatures for chocolate milk is questioned by Speck *et al.*[353]

Eagan[354] believes that lack of plant operator education causes most consumer prejudice against pasteurized milk.

Babcock *et al.*[355] conclude that homogenized milk should be frozen as soon as possible after processing.

According to Gregory,[356] the city-owned dairy at Tarboro, N. C., has improved the health of the community.

Baker[357] presents recognized principles of dairy farm sanitation.

Bailey[358] gives the fundamentals of detergents for use on dairy equipment.

Recent amendments to the USPHS Milk Code are reviewed by Fuchs.[359]

Saal and Heukelom[360] predict taste changes in milk by measurement of the oxidation reduction potential.

Guyot[361] indicates that chemical oxidizing agents can cause milk to acquire a tallowy flavor.

The keeping quality of homogenized milk after being kept frozen and then thawed was found by Babcock *et al.*[362] to be very little different from fresh homogenized milk.

Lindquist and Donaldson[363] show that benzene hexachloride in cattle food will produce a bitter taste in milk.

Blouser[364] points out that milk cooling costs are lower with an electric cooler than with ice.

Forster[365] defines and discusses oxidized flavor in milk.

Weckel[366] believes that more uniform, better quality milk is leading to greater sales.

Berry[367] discusses the various factors in farm inspection of dairies for the last 30 years in Canada.

Rockford, Ill., sues Dean Milk Company to test ordinance requiring pasteurization within 25 miles of Rockford.[368]

Roine[369] shows that a low oxidation-reduction potential almost completely inhibits the oxidation of ascorbic acid in milk.

Georgievskii[370] states that the fluorine content of milk is not affected by the fluorine content of the water supply.

Two hundred and thirty-one references are given by Greenbank[371] in a literature review of developments relating to oxidized flavor in milk.

Pien[372] suggests that until economic conditions improve in Paris, 1–2 cc. 40% (130 vol.) pure electrolytic hydrogen peroxide be added per liter of milk after milking.

Judkins[373] states that essentials of milk quality control are: physical tests by employees, complete lab tests, raw milk quality, care in the plant, and general employee habits.

Fat-free vitamin fortified milk is presented by Weckel[374] as a low-cost very nutritious food for those with low incomes or on special diets.

Moore[375] found addition of sanitizers to milk very detrimental to the quality as well as being illegal.

Gologorskii[376] indicates the desirability of adding vitamin C to the winter milk in Dnepropetroysk.

It is concluded by Weckel[377] that greater uniformity of sediment testing is needed among sanitarians in procedures and interpretation of results.

Crossley and Patten[378] found pasteurized, cooled milk shipped in cans without refrigeration for 24-hour periods to be generally satisfactory.

Babcock[379] believes that enforcement differences make it impossible to judge a milk supply by the ordinance under which it is produced.

A cooperative milk inspection program of six Wisconsin communities is described by Keown.[380]

Cimino[381] reports the $H_2O_2$ in milk does not affect the phosphatase enzyme.

Satta[382] concludes that addition of hydrogen peroxide to milk is valuable under certain conditions.

Studies show pasteurized milk is the only safe milk.[383]

Holmes[384] reports no significant difference in rate of loss of reduced ascorbic acid when lactose added to milk.

Csiszar *et al.*[385] report .1 gm. HCHO used and neutralization before consumption with NaHSO, or $K_2S_2O_5$ proved unsatisfactory.

Communities awarded milk sanitation ratings of 90% or more in 1947 and 1948 are listed.[386]

Alexander and Yapp[387] recommends testing 3 times during lactation, 2nd, 6th and 10th months. Sufficiently accurate to keep down costs of testing for milk and fat production.

Krukovsky *et al.*[388] state NDGA added to milk before pasteurization prevented oxidized flavors. Salt added to butter prolonged stability of fat stored at low temperatures.

Singh Verma *et al.*[389] found that hydrogenated peanut or coconut oil when used as supplements to a wheat bran-gram husk-peanut cake-green grass-ragi straw ration on cows, there was a decrease in milk and butterfat yield; on buffaloes, an increase was shown; however the changes in composition of the butterfat were the same in both cases.

Interruption in milking normal cows in middle lactation cycles increased leucocyte count 27-fold, say Anderson and MacLeod.[390]

Krukovsky *et al.*[391] used the re-emulsification test to show that ascorbic acid was important in the oxidation deterioration of milk fat at the end of its storage life, which results in off-flavors and losses in vitamins A and E and carotene. Factors include milk treatment, pasteurization temperature, type of product, storage conditions and light.

Anantakrishnan and Herrington[392] isolated glucose from fresh cow milk and found that the glucose content of cow colostrum decreased with time.

Destruction of vitamin C is more rapid in soybean milk than in cow milk. state Rangnekar *et al.*[393]

Georgievskii[394] found that in regions where the water supply is high in fluorine, the F content of milk is no greater than in regions of low fluorine water.

Thacker[395] gives desirable characteristics of chocolate milk or chocolate drink.

Formulas derived for amts. cream to be added to dehydrated milk powders to give final products of standard fat and protein content are given by Kivenko.[396]

Burnett[397] believes pen stables will cut milk production costs.

Vitolac, a low-fat milk is described by Foust.[398]

Reeves[399] described the conversion of Evansville, Indiana, to grade A milk production.

The fieldman's role in producing quality milk is presented by Boland.[400]

Amerding[401] described dairying on the West Coast and in Hawaii.

A progress report is presented by the Louisiana Division of Milk and Dairy Products.[402]

Lightner[403] discusses tank truck hauling of milk from farm to plant.

Koestler[404] suggests that in Switzerland, a minimum requirement of 5 hours on the methylene blue test be established as the quality of milk cannot be judged solely by its degree of acidity.

Indianapolis milk dealers give the results of a 3-day delivery plan.[405]

Nabben and Wagner[406] recommend electric heaters in milk houses to attain a temperature of 40° F.

Methods of control in production and marketing of certified milk are discussed by Brown.[407]

Krizenecky and Podhradsky[408] give biometrical analysis on liquid and dry milk and compare liquid milk and value for manuf. Correlations do not always correspond.

Physical constants of milk and their application of food control discussed by Borrell.[409]

Kugenev and Alatyrtseva[410] discuss chemical composition and microflora of sheep milk.

Kannan and Basu[411] report that goat and sheep milk show highest phosphatase activity at pH 5.3 and 10. Cow and buffalo at 10 only.

Protserov[412] claims no present method of detg. leucocytes in milk reliable criterion of presence of infection.

Singh and Laxminarayana[506] found that normal cow milk, milk from cows in early lactation, and milk of advanced lactation, when used as a medium for lactic streptococcus, showed faster acid production when pasteurized or boiled; that milk from cows with clinical mastitis gave the least acidity and this acidity was not affected by pasteurization or boiling.

Previtera[615] describes the amino acid behavior in milk treated with pure electrolytic 39% hydrogen peroxide solution. The addition of 0.3% did not affect amino acid content by giving rise to the formation of keto acids and $NH_3$.

Results of treatment of enzymes in cow's milk with pure and stable 39% hydrogen peroxide solution are described by Cimino.[616] Amylase, lipase, tryptase and phosphatase were not affected but peroxidase, catalase, and reductase were nearly destroyed.

Provan and Jenkins[617] show trends in butterfat content of bulk milk in England and solids-not-fat which indicate a deterioration in over-all milk quality. They believe quality and bulk of hay are important factors in the decrease in S.N.F.

Future trends in milk production are discussed by Foot[618] with reference to breed, artificial insemination, feeds, fertilizers, grazing, hay, artificial stimulants, machine milking, and control of disease.

Krukovsky, Loosli, and Whiting[619] found that a significant correlation (0.51) exists between the tocopherol content of milk fat and the ability of milk to resist the reaction, involving ascorbic oxidation, which produces oxidized flavors.

Peroxidase in milk may be responsible for the quick conversion of ascorbic acid to dehydroascorbic acid by added $H_2O_2$ according to Krukovsky.[620]

Moghul *et al.*[621] report the effects of oil feeding in ghee made from the milk after 5-day intervals of oil feeding and 7 days after the end of oil feeding. Oil lowered the Reichert value and increased I number, and butyro-refractometer value, the changes being more pronounced in buffalo milk than in cow milk.

Composition of South African milk is given by Bakalor.[622] Extensive tests in the winter rainfall area show a positive relationship between S.N.F and fat content where the highest averages are obtained in the winter period.

Allen[623] showed that the bacteria count of milk produced by clipped cows was definitely lower than that from unclipped cows when hand milked, and similarly favorable when machine-milked.

## Milk Processing

Geiger[413] indicates that brine is probably most satisfactory as a cooling medium in small milk plants.

Flash boiling of water contents of milk prevents oxidized flavor and ascor-

bic acid destruction in a process by Sharp *et al.*[414]

Hetrick and Tracy[415] indicate that the destruction of phosphatase by heat is a first order reaction.

Automatic liquid level controls in milk plants save man hours and product wastes, says Maxwell.[416]

Luchterhand[417] outlines a course for pasteurization plant operators and employees.

A book by Cuttell, The HTST Plant. An Introduction to Technique, Control and Management.[418]

Trout and Bortree[419] conclude that home electric milk pasteurizers adequately pasteurize milk when operated according to instructions.

The 3-A sanitary standards for homogenizers and high pressure pumps of the plunger type are given.[420]

Stamberg[421] finds that recombined milk is superior in quality to most products from whole milk powder.

In discussing the 3-A sanitary standards program Tiedeman[422] points out that if the program is to accomplish its purpose, the sanitarian must carefully follow and apply the standards in the field.

Baker[423] points out that the coliform count is an index to the sanitation in a pasteurizing plant.

Electroneutralization of milk is reported by Benson.[424] Milk subjected to d.c. 2–8 v. lowers acidity by 10° T, requires 1,000 coulombs.

Huddleson *et al.*[425] found electric home pasteurizers effective in destroying Brucella abortus organisms.

The effects of low temperature holding and HTST pasteurization on cream line and bacterial destruction are compared by Itzerott.[426]

Jordan and Holland[427] discuss procedures in the conductivity method of testing HTST pasteurizer holding time.

A continuous electric pasteurizer has been patented by Southerwick.[428]

Olson[429] has patented a HTST pasteurization system stopping any possible leakage of raw to pasteurized milk.

A small town plant—"one of the most modern and sanitary plants to be found anywhere" is described.[430]

Doan[431] discusses frozen storage of milk as a method of preservation.

The report of the British Committee on Milk Distribution recommends pasteurization where feasible and control of distribution.[432]

Jordan *et al.*[433] report the factors affecting holding time measurements for HTST pasteurizers.

Removal of vitamin C removed oxidized flavors. Addn. of vit. C caused development oxidized flavor, report Guthrie and Krukovsky.[434]

Meyer[435] gives advantages of newer types of electronic temperature indicating recording and controlling equipment in dairy plants.

Effect of pasteurization on reduction ability of whole milk, skim milk, and cream studied by Sjostrom and Larsson.[436]

Chilson *et al.*[437] propose the addition of ascorbic acid to milk to prevent oxidized flavor.

The Stambaugh-Graves method of pasteurizing and canning milk, immediately after it is drawn, is described by Rudolph.[438] Milk is drawn by vacuum, homogenized, heated to 290° F for 19 seconds, and canned in an atmosphere of nitrogen. The method is considered to hold promise for the disposal of seasonal surplus production.

Babcock, Windham and Randall[439] state rotation of homogenized milk during freezing kept solids evenly distributed, but did not improve keeping quality.

Bell[440] found that a low oxidation-reduction potential, obtained by the addition of ascorbic acid to milk, greatly defers but does not prevent oxidized flavor; that this potential does not increase the retention of vitamin C in the form of ascorbic acid.

The cardinal points in checking the performance of HTST pasteurizing units, and compliance with milk ordinance requirements, are divided into four phases by Dolan.[441]

An efficient electric pasteurizer for home use is reported upon by Moore.[442]

Hetrick and Tracy[443] showed that the time required to inactivate the lipase enzyme in milk varied with the rate of heating to and cooling from the holding temperature.

Herreid and Francis[624] report that the amount of dissolved oxygen in raw milk is influenced by the temperature, bacterial content, and amount of milk in the cans at the time of delivery and that the greatest amount of O absorption occurs during milking.

The results of the use of different stabilizers in frozen homogenized milk are described by Babcock *et al.*[625] Addition of Na citrate with ascorbic acid to homogenized milk frozen and stored at —11.5 to —17.8° doubled the time the milk remained normal in appearance and flavor when thawed and compared with the control.

Chilson, Martin and Parrish[626] claim that no oxidized flavors developed in milk fortified with ascorbic acid in 5- or 7-day storage periods, while in control samples, they began to develop after 2 days' storage, increasing with storage time.

According to Barker[627] cream of high uniform quality may be produced if: milk at intake is closely graded for flavor, odor, sediment, bacteria, clean cans are used; milk is cooled to 40° F; air is excluded; copper contamination is avoided; equipment is cleaned and sterilized, and of proper design; and shipping cars are properly iced.

LeRoi[628] states that milk can be heated to 205° F in 0.067 sec. in an electronic system wherein the milk falls freely between two electrodes joined to alternating current. It has no trace of cooked flavor and the bacteria count is less than 1%.

### MISCELLANEOUS

Fuchs[444] reports on the first Natl. San. Clinic at Ann Arbor, Michigan.

Kleiber *et al.*[445] found cows injected with radioactive phosphorus P32 produced radioactive milk almost immediately.



Abstracts of the papers presented at Symposium of Sanitation Study Section, Division of Grants and Fellowships, are given.[446]

Searles[447] discusses methods of preventing insect infestation in dairy plants.

Methods of evaluating detergents for dairy plants are recommended by Harding and Trebler.[448]

Gibbons and Brown[449] report that microlysine (chloropicrin) was used during the war to preserve milk in France.

The use of ultraviolet light for the detection of rodent urine and its chemical confirmation is discussed.[450]

Page and Lubatti[451] report the results of the effects of fumigants on food. Flavor changes may be detected by controlled tasting.

Carter *et al.*[452] found that pigs fed beef containing DDT stored 49–57% of the amount ingested.

Only aerobic spore-bearing bacteria survive pulp and paper manufacture according to Tanner.[453]

Smith *et al.*[454] reported that alfalfa sprayed with DDT at 0.25 lb. per acre gave a residue on the hay of 7–8 p.p.m. The milk from the cows that were fed this hay contained 2.3–3.0 p.p.m. and the butter therefrom contained 65 p.p.m. DDT. This did not seem to affect the cows nor the milk production.

Test insects, inserted deep into sacks or bales with a special pointed cage provide a good check on fumigation.[455]

Crocker *et al.*[456] stated that color, size, or consistency, are examples of food properties that can be measured directly, but others such as flavor, odor, and taste must be evaluated organoleptically by expert tasters.

"Milk Products," by Harvey and Hill, a British book of general information, is reviewed by Robertson.[457]

Krishnamurti and Subrahmanyan[458] found that the most potent source of rennet among a number of plant materials including Euphorbia weeds was the latex of *F. carica* (edible fig). The

latex also contained much ascorbic acid.

Gelman [459] gives the purposes of the Quartermaster Food and Container Institute for the Armed Forces.

The Council on Physical Medicine [460] accepts ultra-violet lamp disinfection only as a supplement to other methods of air disinfection.

Forstner [461] discusses the occurrence of metallic contaminants in food.

Searls [462] points to success in the use of DDT and clap-type traps for insect and rodent control respectively.

The Committee on Professional Status of Sanitarians of the IAMFS [463] presents its progress report.

McAlister [464] found pyrenone emulsion very effective as an insecticide in a large food storage warehouse.

Planning ideas for a small cafeteria are given by Zipfel.[465]

Carter [466] reports residues of DDT on fruits, vegetables, and forage crops, as well as absorption of DDT in plants and animals.

A 10-volume German reference work, *Manuale Lactis,* classifying dairy literature with references and lengthy abstracts, is reported.[467]

Allport and Garratt [468] discuss methods of determining amounts of metallic contaminants in food.

The qualifications of a good fieldman are given by Birch.[469]

Monier-Williams [470] discusses toxic effects and allowable amounts of metallic contaminants in food.

When the milk of one cow of a herd of Shorthorns, which had been high-pressure sprayed, over the entire body to super-saturation, with a wetable powder suspension of a concentration of 4 lb. of DDT per 100 gal. of water, and which was milked manually without precautions to avoid contamination of the milk by DDT, was tested two days after spraying, and five times subsequently, by Carter and Mann,[471] it contained from 3.0 to 0.4 p.p.m. of DDT, up to five weeks.

Claydon [472] shows the material in dust on ledges in creameries, cream stations, and farms to be closely related to the material in cream sediment.

In a test of DDT, DDD, methoxychlor, and toxaphene emulsions, at 0.5% concentration, conducted by McGregor [473] to determine effectiveness of hornfly control on Jersey cattle in Texas, he found considerable variation in the range of protection, periods afforded, and that one quart of any of the products sprayed on the topline was as effective as one or two quarts on the entire body.

Luchterhand [474] describes the milk sanitation education program in Wisconsin.

The desirability of heating milkhouses in cold climates is set forth by Wagner and Nabben [475] and approximations of the current (kw-hr. per season) required to maintain a temperature of 40° F inside the milkhouse, under various conditions of construction and location, and by several means of heating are given.

Weed [476] gives best applications of pyrethrum, DDT, chlordane and benzene hexachloride in milk and food plants.

General principles of the design standards for milking barn and milkhouse combinations for the production of grade A raw milk for pasteurization, developed in collaboration by Oklahoma A. & M. College, Oklahoma State Health Department, and 19 county and city health departments, are enumerated by Nelson.[477]

Yeomans *et al.*[478] report that the chemical recovery of DDT applied by aerosols is only 1.0%, in the case of wall panels, as great as the recovery from floor panels.

Studies conducted by Burgess and Sweetman [479] indicate that the toxicity to houseflies of DDT treated screens decreased more rapidly of 98.6° F and 60% to 75% relative humidity than at 73.4° F and 25% to 40% relative humidity.

Eddy and McGregor [480] report that, of 11 recently developed organic insecticides which were tested, DDT and methoxychlor were fastest acting, methoxychlor and the bromine analog of DDT were superior to others in knockdown and duration of effectiveness.



Of 5 preservatives $H_2O_2$ 3 ml. 3% per l. milk most effective, claims Vintika.[481] Palatability not affected.

Fletcher [482] gives precautions necessary for methyl bromide fumigations.

Rowe [483] discusses measures effective in insect and rodent control.

Brushes for piping should not mat, but should swab. The bristle should bow. Nylon bristles are more durable than animal fibre bristle, and do not become water soaked, states Myrick.[629]

Reif [630] found that pure Al and alloys (Pantel, Mangal, BSS), chrome steel, and chrome-nickel steel have no effect on the vitamin C content of milk, but alloys containing Mn and those with Ti carbide precipitates do.

According to Tracy [631] physical condition of a milk can is not significant unless open seams are present. Washing solutions with compounds that can stand high temperature must be hot to kill the bacteria. "Dry" cans have sufficient moisture to support bacteria growth.

## NUTRITION

Kon and Henry [484] present an extensive review of nutritive value of many dairy products with 913 references.

Kuiken *et al.*[485] found that when hens were fed isopropanol extracted cottonseed meal, their eggs did not develop olive yolk or pink albumin on storage which is found in eggs from hens fed hydraulic meal.

The Council on Foods and Nutrition [486] finds evidence lacking that fortification of milk with vitamin A is in the interest of public health.

Brenner *et al.*[487] studied the vitamin retention in 13 foods through an 18-months storage at 70, 90, and 100° F. Thiamine and ascorbic acid decreased, as per time and temperature. Carotene and niacin decreased less than 10% at all temperatures, except for yellow corn, green beans, and orange juice which showed 30%. Dairy products retained 85–100% of their carotene and vitamin A content. The riboflavin content of the other products increased.

Millares and Fellers [488] showed that chicken meat is an excellent source of the indispensable amino acids, and that it is equivalent to beef, pork, lamb, and veal therein. No significant differences were found in feeding chicken, beef, and fish at 8% levels.

Answer to query re effect of pasteurization on nutritive value of milk. Review of changes. Such slight reductions in nutritive value as may occasionally result "do not significantly affect the over-all value of the milk." [489]

Noble *et al.*[490] reported that beef tongue contained 0.10 mg. thiamine and 0.35 mg. riboflavin moist raw meat, and around 0.04 and 0.35 mg. per 100 g. cooked meat respectively.

Sheft *et al.*[491] reported that storage temperatures of 50, 65, and 85° F accelerated losses of ascorbic acid and thiamine more than did extended storage periods. Carotene in tomato juice and niacin in peaches held up well. Niacin in tomato juice decreased 6–8% in 2 years at 50–80° F and 8–15% in whole tomatoes.

A new vitamin which increases the resistance of the mouse to Salmonellosis has been discovered by Schneider.[492]

Varma and Paul [493] showed that the vitamin C content of the milk of some important breeds of Indian cattle was low in the first month of lactation and reached peaks in the 4th month and toward the end of the period.

Krijt [494] found that the amounts of fats, vitamin A, thiamine and ascorbic acid present in goat milk are higher than those of cow milk, making it an important food.

The sale of fat-free milk is being promoted with the backing of the medical profession.[495]

Gologorskii [496] found that summer milk contains 36.4% more vitamin C than winter milk; that winter milk can be vitaminized by extracts or tablets

as there is no appreciable destruction of vitamin C in 3 days at the keeping temperature of 9–10°.

Segard [497] suggests fat-free vitamin fortified milk for a high protein diet.

The amino acid composition of bovine colostrum and milk, reported by Ray Sarkar *et al.*[498]

Minster [499] presents methods of analyzing refrigeration requirements for ice cream and milk plants.

Helmholz [500] points out the qualitative and quantitative inadequacy of milk for European children.

Average values of amino acids in milk albumin: arginine 3.25, histidine 1.63, lysine 10.21, cystine 2.86, typrosine 4.48%, reports Kugenev.[501]

Cary and Hartman [502] identify nutrient X present in non-fat portion of milk, as vitamin B12.

Scott and Norris [503] conclude that the rat is a poor experimental animal for evaluating young infants' food.

Quaife [504] found vitamin E content much higher in human milk than in cow's milk.

In studying the riboflavin content in a variety of child foods, Pushinkova [632] found that exposure to light for 24 hours leads to average loss of 30%; elimination of light cuts the loss to 0.3%. Those foods based on polished rice are devoid of riboflavin, those with barley are highest, oatmeal type is intermediate.

Wolf [633] states that with irradiated milk the vitamin D potency increases with the fat content of the milk but is not proportional to it and that normal irradiation of milk does not seem to modify its composition or digestibility appreciably.

### REGULATIONS

Dodsworth [505] discusses regulations and methods to deal with adulteration of food especially milk.

Walters [506] suggests that Britain needs more specific regulation of the food industry.

A committee has recommended adoption of the USPHS Milk Ordinance for the State of Washington.[507]

Tobey [508] gives his conception of a "reasonable" city milk ordinance.

The district court upheld the constitutionality of a Pueblo, Colorado, ordinance requiring pasteurization within 3 miles of the city.[509]

Lounsbery [510] summarizes New Jersey's new bacteriological standards for milk, cream and ice cream.

### FOOD AND SANITATION

Fuchs [511] presents recommendations of the First National Sanitation Clinic of 1948.

Mallmann *et al.*[512] found that 170° rinse for 10 seconds gave satisfactory results on single tank hand operated dishwashing machines.

Procedures for evaluating mechanical dishwashing are presented by Mallmann *et al.*[513]

Kleinfeld *et al.*[514] found a low percentage of restaurants complying with swab-testing bacteria requirements in a N. Y. City survey.

Brown [515] finds that 27% of Pennsylvania eating places surveyed violate swab test standards.

According to Chanlett,[516] the elements of restaurant sanitation are food purchased, methods used, equipment, and personnel.

Mangold [517] abstracts A Guide to the Selection and Training of Food Service Employees prepared by the American Dietetic Association.

Chamberlayne [518] believes the Jamieson Kit for swab slant testing of utensils gives a "seeing is believing" approach to sanitary control.

Oregon is using a mobile laboratory to check bacteria on eating utensils in restaurants.[519]

Williams [520] believes that food handler education contributes to the over-all control of certain communicable diseases.

In discussing methods of sanitization of restaurant utensils, Weber [521] points out that any new chemical germicide should be thoroughly tested before being placed in use.



Henderson [522] believes an understanding of restaurant economics aids greatly in eliminating insanitary practices.

The Oregon State Board of Health's mobile laboratory found many restaurants not complying with bacterial standards for utensils.[523]

Villaflor [524] gives New York City procedure for checking plans of new restaurants.

The procedure of examining 14,000 Columbus, Ohio, food handlers is described and results given.[525]

Molner and Wilson [526] present Detroit's program for control of food sanitation.

For bacterial examination of eating and drinking utensils Henderson [527] believes the agar slant practical and useful.

Davis and Resuggan [528] show that transmission of infection in drinking establishments occurs through glass rinse water.

Methods of, and reasons for, restaurant sanitation programs are given by Mallmann.[529]

Shubert [530] discusses interpretation of the Standard Restaurant Ordinance.

The Evanston, Illinois, Health Department found a 1-hour concentrated food handlers' course most effective.[531]

Belam [532] outlines methods of awakening interest of food handlers in food cleanliness and safety.

Communicable disease and food poisoning are stressed in a Baltimore food handlers course by Korff.[533]

Mallmann [534] gives characteristics of a good cold sanitizer and discusses various methods of cold sanitization.

A Newark food handlers course of four 1-hour periods is described by Haskin.[535]

Gerberg [536] gives measures for insect and rodent control in food industries.

The APHA Committee on Sanitary Practices in the Food Industry is preparing a manual of sanitary practices.[537]

Karnes [538] describes the Beatrice Foods Co. sanitation improvement program.

Methods of insect and rodent control in food establishments are discussed by Barron.[539]

Fisher [540] tells of the frozen food locker sanitation program in Indiana.

Requirements for operating eating houses in Freemantle, Australia, are detailed.[541]

Rowland and Fritz [542] suggest for food handler courses: Some bacteriology, specific categories of personnel, stress violated items, plan adaptable course, and controlled speed of presentation.

A food handler's home study course using Benmeyr's book, "Sanitation for Food Handlers and Sellers," is reviewed.[543]

Eagan [544] describes 2 week refresher courses in milk and food sanitation at Topeka, Kansas.

Searles [634] states effective rodent control requires rodent-proof barrier construction on openings into the building, after which clap-type traps baited with foods unavailable to rats.

Searles [635] recommends keeping insects out of plants, cleaning out breeding and hiding places, using 5% DDT in odorless kerosene by trained personnel with proper sprayer only on insect roosting, nesting and hiding places, and avoiding contact of spray with food or food holding containers.

### TECHNOLOGY

Stull *et al.*[545] found that concentrations of 0.00125 to 0.005% dihydronorguaiaretic acid retard the development of oxidized flavor in unsweetened frozen cream.

Hucker [546] reports that studies with modified non-ionic quaternary mixtures for use in dairy and food plants indicated satisfactory performance, provided surfaces are brushed as part of the cleaning technic.

A simple means of determining the effectiveness of can-washer nozzle-jets is presented, and the importance of maintaining wash-solution strength at

an effective level is emphasized by Abele.[547]

Jamieson and McLeod[548] present proof that producer education in sanitation is needed in Manitoba, and that improvement in conditions and milk quality is possible.

Poe and Leberman[549] give the effect of acid foods on aluminum utensils.

The reasons for adopting the intermittent use of organic cleaning material, or the alternate use of allcaline and organic (acid) cleaning materials in the dairy industry are set forth by Shogren.[550]

Thomas[551] reports that hand-washing of bottles followed by chlorine or steam sterilization gave better results than bottle-washing machines.

The various factors to be considered in deciding upon the installation of a can-washer are outlined and discussed by Faust.[552]

Bacon and Smith[553] show a relationship between concentration of detergent and amount of work necessary to remove soil.

A few simple rules for the operation of straight-line can washers, and the alternate use of alkaline and acid detergents, are given and recommended, respectively by Shogren.[554]

Robinson[555] shows that milk plant clean-up economies can be effected by using the right cleaning compound in the minimum concentrations.

The functions of the polyphosphates in softening water, preventing precipitation of detergent chemicals and water minerals to form film on cans and scale on can-washers, and in dissolving the denatured proteins in milkstore are outlined by Razee.[556]

Resuggan and Davis[557] describe a new non-foaming wetting agent with strong bactericidal powers which may be of use in cleaning milk bottles.

Kanungo *et al.*[558] showed that reseparation of high-fat skim milk after addition of NaOH could be used to make rennet casein from cow or buffalo milk.

Alternating acid and alkaline detergents in mechanical can washing is recommended by Shogren.[559]

Solberg and Hansson[560] showed that precipitation of Ca in milk with sodium oxalate decreases the cream volume obtained with a separator, but increases that obtained on natural standing at 4° for 24 hours.

Good practices in laying out a milk plant are presented by Mitten.[561]

Brash[562] patents an electronic sterilization process.

Lucas[563] gives some chemical and physical properties of dairy cleaning compounds.

Various uses for cathode rays X-rays for heatless sterilization of food products are given.[564]

Morgan[565] discusses physical and chemical properties of synthetic detergents and their uses.

Well-settled vegetable waste, diluted with recirculated effluent to give a 250 p.p.m. B.O.D. can be purified successfully by biological filters when applied at the rate of 100 gals. per cu. yd. per day for 10 hrs. followed by 14 hrs. of recirculation, reports Dickinson.[636]

Kern[637] reports bagging cleaning powders in lb. packages and dispensing these incorrect amounts to workmen for respective jobs resulted in a reduction in the quantity of powder used.

Dickinson[638] describes a waste disposal plant in which the average monthly B.O.D. has been reduced from a minimum of 330 p.p.m. in settled waste, and from a maximum of 1568 p.p.m. in screened waste, to 14 and 11 p.p.m., respectively in the effluent.

Smith[639] notes that the vast majority of wetting agents belong to the anionic group, being produced from non-fat materials and should have sequestering, penetration, suspension, dispersion, emulsifying, detergency and surface tension lowering properties. All detergents may be called wetting agents, but not all wetting agents may be called detergents.

Aids to cleaning suggested by Perry[640] include water mechanically controlled at 115° F, light, flexible hot-water hose, control of water pressure, automatic hose water shut-off, and a special wash solution fed brush.




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## SUPPLEMENT TO MINIMUM REQUIREMENTS FOR EFFECTIVE MACHINE DISHWASHING

NATIONAL RESEARCH COUNCIL, WASHINGTON 25, D. C.

This supplementary statement is made to amplify and correct certain items in the previous publication, dated 7 October 1949.* That draft is now amended as indicated below:

1. Under *Curtain Rinse*, delete entire paragraph and substitute the following:

> A curtain rinse is not required. A top limit of two gallons of water per minute is proposed for such a rinse, if provided, in order to limit this ineffective use of hot water.

2. Under *Construction*, insert the following between the last two paragraphs:

> All valves, fittings and pipes shall be so placed as to avoid obstructing door openings.

3. Under *Water Supply*, the "100 grains" in the second paragraph is a misprint. This paragraph should read:

> When the hardness of the water exceeds five grains per gallon (85.5 p.p.m.) a hard water detergent should be used; when it exceeds 10 grains (171 p.p.m.), softening to five grains or less is recommended.

4. Under *Water Supply*, delete the last paragraph and substitute the following:

> Means shall be provided, as by booster heater with or without storage tank, to supply not less than 2¼ gallons per 100 square inches of tray area per minute of water at 180° F, or higher, at the inlet to the spray arms for single tank machines, and as much as two gallons per minute of water at 180° F for each curtain rinse on a multiple tank machine. Adequate provisions shall be made to prevent the delivery of water at less than 180° F at the spray arms when operation starts after the machine has stood idle for one hour.

5. After the last paragraph under *Water Supply*, insert the following:

> *Sewer Connection*
>
> There shall be an airbreak in the line carrying drainage and overflow from the machine to the sewer to prevent possible backflow of sewage into the machine.

* Printed in this JOURNAL, November-December issue, pages 360-362 (1949).

# DRINKING STRAWS

W. D. TIEDEMAN
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HEALTH officials having responsibility for the enforcement of regulations requiring that only wrapped drinking straws be used have been interested in determining whether or not wrapped drinking straws offer greater health protection to the consuming public than unwrapped straws and, if so, whether such protection is adequate. This investigation was designed to give such information.

## MANUFACTURE

Straw manufacturing operations were observed at two large manufacturing plants selected as being typical in equipment and operation of the general run of plants producing wrapped and unwrapped drinking straws.

It was learned that drinking straws were not manufactured in a single machine but in a series of separate steps. The first operation was to split relatively large rolls of paper into narrow strips. Two of these narrow rolls were attached to a machine with a revolving steel mandrel on which one strip was automatically wound spirally followed rapidly by the overlapping second strip to the under side of which an adhesive at about 180° F. was applied continuously. The adhesive used was said to be a vegetable preparation similar to that used on postage stamps. When the tube thus rapidly formed was a little more than twice the length of a drinking straw it was automatically cut and dropped into a metal tray.

In this and similar trays the straws were placed in a drying oven and held at about 180° F. for removal of excess moisture. Then the double length straws were placed in latticed metal covered trays in which they were passed mechanically endwise through a hot paraffin bath. The melting point of the paraffin was said to be about 125° F. and the bath was maintained at about 180° F. The motion of the trays was such as to cause the paraffin to flow back and forth through the straws. Near the end of this machine the straws emerged endwise to permit drainage and then were shaken mechanically in the hot space above the paraffin for more complete drainage.

The hot paraffined straws from these trays were dumped on a long metal-top table, and were rolled along by hand to prevent the straws from sticking together as the paraffin solidified on cooling. At the end of this table the cooled straws were gathered by hand into bunches of about 500, and rubber bands were placed around each end.

These bunches of paraffined double length straws were carried to and fed by hand into still another machine where disc saws trimmed each end and a third saw then cut the bundle through the middle making two bundles of single length straws.

An operator then examined each bundle, touching the ends in doing so and removing occasional straws with ends cut unevenly. Some of these bundles then were placed in large cartons to be taken to the wrapping machine and others were placed in printed boxes while the rubber bands were removed. These were to be sold as unwrapped straws.

The cartons containing bundles of straws were trucked to the wrapping machine to which the bundles were transferred by hand. The tissue paper for wrappers was said to be of cigarette-paper grade. It came in large rolls about 29 mm. wide. It passed through printing wheels where the outside was printed in from one to three colors. The paper then was formed in the shape of a tube, the edge being sealed by milling wheels.

Bundles of straws were placed in the machine by hand and the rubber bands were removed. As the tissue paper tube was formed it was cut automatically into sections slightly longer than straw length, the machine inserted two straws and the ends were sealed by milling wheels. These were placed in cartons of 500 pairs of wrapped straws each, ready for sale.

## HANDLING IN THE PLANT

Wrapped and unwrapped straws were subjected to about the same handling in the plant so the following comments apply to both. In fact the wrapped straws received an additional handling in being taken to, and the bundles placed on, the wrapping machine. After the hot paraffin bath which may be considered to be the sanitizing treatment, all of the straws were handled in rolling them along the table during cooling, in assembling them in bunches held by rubber bands, in placing them in the trimming machine, and in inspecting and packaging them.

Many studies have been made to show the bacterial load of the hands of the average person and there is no doubt that some of these bacteria are transferred to the straws at the plant. We would not expect the numbers per straw to be great in view of the tremendous number of straws handled daily. However, there is the possibility for hand contamination of a number of straws. Although we do not consider it to be a serious problem, we would recommend supervised sanitizing treatment for the hands of these workers. The problem here is the same for wrapped or unwrapped straws. The manufacturers were interested and cooperative. In fact, we are advised that a sanitary practices code has been drawn up by the Drinking Straw Institute and has been adopted by all of its member plants.

## OBSERVATIONS AT THE SODA FOUNTAIN

Some limited observations were made of the manner in which drinking straws were handled at soda fountains. There was altogether too much handling of unwrapped drinking straws by operators in removing them from the cartons to place them in dispensers, and also, in removing them from the dispensers to place them in drinks or on the counter along side of drinks. There also appeared to be considerable opportunity for air-borne contamination of such straws under the conditions in which they were stored and handled, for example, as by sneezes.

Although the possibilities for contamination were not so great, some unsatisfactory procedures were observed in the handling of wrapped straws. There was a tendency on the part of clerks in some cities to remove the wrapper partially in handing a straw to the customer. Also, there was a tendency to throw the wrapped straws on a wet counter that had just been wiped with a rag that looked like a floor mop. There also was the possibility of contamination of the wrapper by mouth spray or by sneezing.

## EXPERIMENTAL WORK

Some samples were taken at intervals during a period of four months and tests were run with a view to comparing bacteriologically the condition of wrapped and unwrapped straws as found at soda fountains. Fifteen samples of wrapped straws and an equal number of samples of unwrapped straws were collected by Mr. N. J. Hohl* at various soda fountains, restaurants, and hot dog stands taken at random without any attempt at selecting the good or bad ones. The straws collected were from 11 different manufacturers.

The samples were examined in the Field Sanitation Laboratory, Division of Laboratories and Research of the

Presented at the Thirty-sixth Annual Meeting of the International Association of Milk and Food Sanitarians, Inc., at Columbus, Ohio, October 20–22, 1949.

* Bureau of Environmental Sanitation, New York State Department of Health.

Department, under the direction of Mr. F. W. Gilcreas. To make the standard plate counts of bacteria on the outer surface, the straw was cut aseptically into pieces that would fit in a sterile Petri dish. The pieces then were cut longitudinally and flattened. The dish was flooded with standard tryptone glucose extract, skim milk agar and kept submerged until the agar hardened. The colonies were counted after incubation for 48 hours at 35° C. Other straws from the same sets of samples were disintegrated in sterile buffered distilled water, a portion plated, incubated, and counted, and the bacteria count per straw was calculated. The results are shown in Table 1.

TABLE 1

STANDARD PLATE COUNTS OF BACTERIA ON DRINKING STRAWS FROM DIFFERENT SOURCES AT DIFFERENT TIMES

| *On Outer Surface—per Straw* | | *Per Disintegrated Straw* | |
|---|---|---|---|
| *Wrapped* | *Unwrapped* | *Wrapped* | *Unwrapped* |
| <5 | 85 | 32 | 60 |
| 5 | 1,400 | 120 | 225 |
| 83 | 90 | 14,000 | 34,000 |
| 5 | 18 | 31 | 790 |
| <10 | 105 | 41 | 190 |
| <10 | 10 | 660 | 230 |
| <10 | TNC | 53 | 190 |
| <5 | 5,000 | 63 | 54 |
| <5 | 100 | 210 | 670 |
| <5 | 65 | 300 | 690 |
| 10 | 200 | 35 | 140 |
| 15 | 50 | 17 | 15 |
| <5 | <5 | 60 | 280 |
| 15 | 60 | 260 | 190 |
| 620 | 50 | 140 | 16 |
| Median <10 | 85 | 63 | 190 |

A study of these counts indicates considerably less surface contamination of the wrapped straws and also a slight tendency for the count of the unwrapped straws on disintegration to run higher than the wrapped. Disintegration counts vary considerably between plants and runs so these differences are not significant.

## PROTECTION OFFERED BY TISSUE PAPER

After seeing wrapped straws placed [illegible] possibly bacteria-laden counters and noting the exposure to possible contamination by mouth droplets or sneezes, the question arose as to whether bacteria might readily penetrate the tissue paper under these conditions. Ten samples of wrapped straws dipped for 5 seconds in a solution containing coliform organisms showed on examination surface counts of coliform organisms per straw after the wrapper was removed, ranging from 130 to too numerous to count. Most of the coliform counts were between 1,000 and 10,000 per straw. Of course, this treatment was tremendously more drastic than was likely to occur in ordinary practice. It was evident that these organisms would readily penetrate the paper and contaminate the enclosed straws.

## BACTERIOSTATIC PAPER

This indicated that the use of a paper impervious to bacteria was desirable. Such paper, however, did not lend itself to the present process of manufacture involving sealing the paper by means of milling wheels. Studies were undertaken by the New Jersey Dairy Laboratories sponsored by the Drinking Straw Institute, of methods to prevent bacteria from penetrating the wrapper to the straw. Doctor Levowitz (1) has reported on the impregnation of the wrapping tissue with a germicide with a view to preventing viable bacteria from penetrating the paper. Tests made by spraying cultures of *E. coli* on such paper by means of a De Vilbiss No. 15 Atomizer showed no viable *E. coli* on the straws after 20 seconds contact. In this work, also done under the direction of Mr. Gilcreas, Tween 20 and avolectin were used to inhibit further action of the quaternary ammonium compound after the contact period. In some of these tests a few organisms were recovered from the wrapper but none from the straws. It is believed that the concentration of moisture and bacteria used was greater than might result from a vigorous sneeze or the handling of the wrapper with moist bacteria laden fingers.

There appears to be no danger in the use of a quaternary ammonium compound for this purpose. Experience in other uses as in surgery and in the disinfection of eating and drinking utensils indicates that such compounds are not highly toxic. Dr. Levowitz reports that at the maximum level of treatment the extractable quaternary per square inch of paper is 0.000139 gram. The wrapper ordinarily used for two straws measures 17.4 square inches and thus contains a total of 0.00242 gram of extractable quaternary. The treatment required to wash all of this through to the straw would leave the wrapper drenched and make it unpresentable for use. The spray treatment used for testing possible penetration of bacteria did not carry enough quaternary through to the straw to be detectable by available tests.

The Drinking Straw Institute has announced a plan for supervising the manufacture and distribution of this bacteriostatic or bactericidal paper to all users with a view to insuring its potency.



## DISPENSING OF UNWRAPPED STRAWS

The investigation at the factory showed that unwrapped straws are handled in the same manner as wrapped straws, and are as satisfactory from the standpoint of sanitation when they leave the factory, as the wrapped straws. If these could be placed in a dispensing device in the original package, or without handling from the original package, and dispensed automatically and directly to the hands of the user, they should be as satisfactory as wrapped straws.

An examination of all of the dispensers known to be on the market revealed that none of them met these requirements. It is believed, however, that the door should be left open for the use of unwrapped straws in the event that adequate dispensers should be developed.

## SUGGESTED REGULATION

In view of these findings, it is recommended that: Straws when offered for use shall be completely enclosed in an impervious or a bactericidal wrapper to be opened by the ultimate user; or unwrapped straws may be used when they are kept in an approved sanitary dispenser loaded from the original package without handling, which dispenses one straw at a time directly to the user and which is so constructed that the interior may be cleaned and kept in a sanitary condition. Unused loose straws already dispensed from the dispensing container shall not be used again.

### REFERENCE

1. Levowitz, David. Improved Drinking Straw Wrappers. Paper presented at the Annual Meeting of the International Association of Milk and Food Sanitarians, 1948.

# REPORT OF THE COMMITTEE ON PROFESSIONAL STATUS OF SANITARIANS FOR 1949

In the report of last year this committee pointed out that there existed a general unsatisfactory situation with respect to the rates of compensation being paid sanitarians in comparison to other categories in the field of public health. It was also pointed out that it was questionable whether there was a general acceptance of the sanitarian as a professional entity because there existed no uniform training specifications for sanitarians in merit system job description sheets from the state health departments. From this it could be concluded that there existed a need for professional development of the sanitarian.

During the past year this committee has endeavored to explore three questions basic to the professional development of the sanitarian.

1. What does the sanitarian do and how does it relate to training needs?
2. What are the means by which professional recognition may be further developed?
3. How should a program of professional development be projected?

The first question "What does the sanitarian do and how does it relate to training needs?" has a variety of answers which may be found in merit system specifications of the various health agencies and has been answered in a general way in the report of the Committee on Professional Education of the American Public Health Association.* There is, however, a need for a detailed description of the work of the sanitarian which will bring out the specific skills which he must possess and which may tend to characterize him as a professional in the field of public health. One approach to the question is to derive an empirical answer from a study of the procedures employed by sanitarians in the daily performance of their duties. This method is somewhat beyond the resources of this committee but will be explored by the research project currently being conducted by the Engineering Section of the American Public Health Association. The committee in the past year has been privileged to confer with the directors of this project and review the forms which they will use in their appraisals. It is hoped that an answer to this question can be derived from this project.

The second question "What are the means by which professional recognition may be further developed?" seems to have two approaches. First, status of the sanitation programs in which the sanitarian is engaged must be established as matters requiring the services of a professional. Consequently, it is this committee's recommendation that our association lend its full support to movements which tend to educate the public in the need for better sanitation services. Second, the status of the individual might be improved by the enactment of legislation which would tend to identify him as a person requiring certain special talents to practice as a sanitarian. Such legislation could be either laws requiring the licensing of sanitarians or requirements incorporated in the merit system laws of the state or municipality. It is believed that the desirable type of legislation may vary among the different states. Consequently, this committee is unwilling at this time to recommend any one program of legislation for general application.

This leads logically to the third question "How should a program of professional development be projected?". It is the opinion of this committee that

*(Continued on page 120)*

* *American Journal of Public Health* **38**, 1003-7 (1948).



# DAIRY PRODUCTS IMPROVEMENT INSTITUTE

The Third Annual Meeting of the Dairy Products Improvement Institute was held in New York City, January 12. Officers elected were:

President, W. A. Wentworth, New York, N. Y.
Vice-President, J. F. Gerber, Lancaster, Pa.
Treasurer, R. C. Hibben, Washington, D. C.
Secretary and Managing Director, C. W. Larson, 1107 Liberty Bank Bldg., Buffalo 2, N. Y.

The New Jersey State Commissioner of Health, Dr. Daniel Bergsma presented a paper "Public Health and the Dairy Industry," from which excerpts follow:

Through the years legislatures and public health officials in their respective areas of jurisdiction, have passed laws and adopted regulations governing the production, processing and distribution of milk and milk products. Most of these laws have had one basic aim, namely, to provide a safe and wholesome food. These laws when collectively examined, however, lack uniformity in many details. As a result, a producer or dealer serving more than one market sometimes finds himself unable to comply with the differences in specifications for the production and handling of milk to be sold in several jurisdictions. I, too, have heard the story about the farmer who after considerable expense in rebuilding his milkhouse and relocating it to satisfy his new milk inspector, finally put it on skids so that it could be moved around at will to please them all.

This difference of opinion in minor details is not too serious if compliance with them all can be obtained without too great a cost, but I doubt if any one present could explain to this farmer why his milk was wholesome and safe in one town and not in another. In the light of our present-day knowledge the unimportant details should be eliminated from our laws and regulations and the remainder standardized insofar as possible.

Recently, along the Eastern Seaboard, another factor has entered into the consideration of health regulations where interstate shipments of milk and milk products are concerned. Previously, a shortage of milk developed during the fall months in certain areas causing great competition for the available supply. However, a reversal in the usual trend has occurred and an excess of supply over demand exists throughout the entire milk shed. Great quantities of good quality milk in surplus areas seek a market elsewhere at a lower price. This is objected to by some on the grounds that such shifts demoralize the local markets pricewise. Health authorities, while not primarily concerned with the economics of milk distribution, are quite rightly greatly concerned with the maintenance of a continuously adequate supply of good quality milk. A serious shortage of milk for our people would result in an actual health hazard due to the fact that bidding for available milk in time of short supply would increase the cost and deprive low-income groups of adequate nutrition.

Some of the codes that I have seen, particularly those regulating producing farms, cannot be supported by evidence that they improve the quality of the product. Many of them contain unnecessary details relating to the type of building construction and costly equipment which may or may not affect the wholesomeness of the milk.

Standardization of the basic requirements and the elimination of conflicting, out-dated regulations on a milk-shed basis, are timely and necessary and must be made subjects for prompt study. This, I realize, is a difficult and time-consuming task. The objections of a diversified group of enforcement agencies must be harmonized before common agreement is attainable. . . .

We all know the trend towards big business, towards improved methods and decreased labor time per quart of milk. This has changed the complexion of the dairy industry. In public health work, therefore, we cannot afford to be static.

In New Jersey recently we were faced with the problem of allowing or disallowing a certain type of management procedure in the housing of dairy cattle. Perhaps, if I take the time to tell you our method of approach to the problem, you will see that we want to work with you as an industry to produce more milk, more efficiently and safely. We want the best bottle of milk for our consumer at the most reasonable price consistent with a fair return to the producer and distributor. Some dairymen in New Jersey felt that by housing their cattle loose and using a milking parlor they could produce quality milk at less man hours per can. It had been our rule that a stanchion was needed for each milking cow. This problem was given to my staff and all available data were examined. A special meeting of an advisory group on "Animal Diseases Transmissible to Man" was held to evaluate the data and to offer our department its advice. This group is composed of men intimately acquainted with research

work and data analysis. They considered the problem and came up with some useful suggestions: they pointed out that cattle defecate the greatest amount at the time they are feeding. We, therefore, set up our procedure for a separate feeding area with an easily-cleaned walk-over section which might be cleaned with the aid of a tractor. This group studied and evaluated all the possible ifs, ands, and buts; it called in experts in animal husbandry and agricultural engineering from Rutgers University. The final result was an acceptable management procedure for the loose housing of dairy cattle. This was in response to a simple, earnest request of industry to attempt to lower the cost of production. . . .

Health authorities have seen the gradual increase in distance between dairy sheds and centers of consumption. As urbanization continues, land becomes more valuable and the dairy industry continues to seek cheaper, more productive land. Feed and space to house dairy cattle are becoming increasingly important problems to the producer. As a result of such considerations, new and important public health problems arise. Health authorities are now facing the problem of determining whether exporting states should provide dairy inspectors to supervise exported milk; of what calibre such inspectors and inspections should be; what status and authority should they have and what part shall importing states have in such internal problems of the exporting states. Importing states will have to know the degree of reliance that can be placed in an inspection system which is not under their own control. Final agreements will, of necessity, have to be clearly defined. Considerable standardization of requirements, inspection criteria and terminology will be necessary. Conflicting inspection reports should not exist. Unnecessary or duplicating inspections should not be made. Unification of control procedures, if properly accomplished within each state and between states, can eliminate much confusion.

Mr. W. S. Anderson, Director of the Pennsylvania State Bureau of Milk Sanitation, Harrisburg, addressed the meeting on the subject "Quality Milk Production Under the Pennsylvania Dairy Farm Inspection Program." Excerpts from his address follows:

We realize that the lack of cooperation between the various States and Health Departments, has greatly retarded the progress of quality milk production, since their requirements have varied to so great a degree that the farmers have been at a loss to know to whom they should look for proper guidance.

When every one knows that the intent of all milk sanitation laws is identical, it has always been difficult to understand why there could not be some uniformity relative to interpreting and enforcing milk sanitation regulations. . . .

Sometimes I wonder if the failure of accomplishing the desired sanitary conditions on a dairy farm, might not be largely due to the manner in which many inspectors have been qualified for their assignments. In an industry as large as the dairy industry is, and as important as quality production is, I am confident that the best trained men in the field cannot be too good, since they must know thoroughly their subject and, above all, must be diplomatic educators. Being a farmer myself, I am not hesitant in saying that it was rather annoying for an inspector to try to sell me a program with which he, himself, was not familiar. In my opinion, a good inspector should know the farmers' problems, particularly from a practical standpoint, and he should never become so technical that he might lose the practical application of his knowledge.

For an inspector to build up a pleasant relationship with the milk producers, he should impress the producers with the fact that the recommendations which he makes will naturally help to provide a better quality of milk for the families on the farms who usually use the milk in its raw state. Most milk producers are interested in providing a quality product for their own families. It might be well to mention the fact that many farmers today are pasteurizing their supplies of milk used on the farm. I am very much interested in seeing the day when milk producers will be producing the quality of milk to which their families are entitled. When that is accomplished, the plant operators will be getting the quality which they need, the public will be getting that which it is deserving of, and all milk sanitation laws will be complied with according to their intent.

As an inspector, working on a quality-production program with the milk producers, in order to accomplish the desired results, I feel that it is most important that the inspector makes a complete and thorough study of his subject, not only from the standpoint of sanitation, but from the standpoint of proper care and feeding, since care and feeding play a very important part. Inasmuch as the cow is the source of supply, any disturbance in the source of supply would certainly impair its quality.

An inspection should start at the cow, in order to be certain that milk comes from the udder in good condition, for, if it does not, further inspection will certainly not correct this unsatisfactory condition.

Most of us will agree that udder trouble is retarding increased milk production to a greater degree than is realized. Since that is the case, I feel that we, as milk sanitarians or health officials, have an important part to play in trying to correct this. Of course, the first thing to do is to learn how to recognize the trouble; second, to find its cause; and third, to eliminate the cause. . . .

If the inspector, whether he is a veterinarian or not, feels that udder trouble is caused by improper feeding, probably feeding with grain that has a too-high protein content, the matter of harvesting crops should be discussed to show how the use of high-priced concentrated feeds may be eliminated by the farmer, thus, conserving the protein which he raises on the farm by putting up the green-grass silage and mow-drying his hay.

I think that most people familiar with good milk production, will agree that the protein raised on most farms, if conserved as mentioned above, is sufficient to meet the needs. It will be more palatable, more easily digested than other types which are purchased from other sources, and it is naturally the best from the standpoint of cost.

If the inspector feels that udder trouble is being caused by rough handling or improper milking, then, it should be brought to the attention of the farmer and the necessary recommendations made. The same approach should be used should there be indications of other causes. Where evidence of udder trouble exists, an inspector should always discuss it. However, the inspector always should finish the discussion by recommending that he consult his local veterinarian relative to the treatment. I have learned from my own practical experience with the services of a veterinarian, that a herd infected with organisms that cause mastitis, can be cleaned up. A larger, better and cheaper supply of milk can be produced from a clean herd, rather than from one carrying an infection. It might be interesting to know that some cows in my herd, which had previously carried some udder infection, produced over 2,000 lbs. more milk during a lactation period, after the udder infection had been eliminated. I am a firm believer in the fact that there is no sound reason why mastitis is taking the toll that it is today, when it can be eliminated or prevented by the application of proper methods of feeding and handling the dairy herd.

After an inspector has made his physical inspection on a milk producer's farm, it then becomes the plant operator's obligation to see that the inspector's work has accomplished the desired results, and, of course, it is the bacteriologist's job to decide by systematic bacteriological analysis. I find that a bacteriological follow-up has a very desirable effect on most inspectors.

To me, it is most pleasing to see the pleasant relationship which is being built up between the plant operators and their producers—a movement which should have been started years ago since the milk producers need the plant operators just as much as the plant operators need the producers. If all the milk producers would just stop to think and realize that plant operators are their salesmen and without salesmen the producers' products would be a "drug" on the market, I think that many producers would be more interested in giving their salesmen a better product to sell. A superior product is always easier to sell; and the more sales, the more profit. . . .

If the dairy industry's demands in the eastern market were uniform and regular, all of our problems would be easy ones, and a fair and just solution could be found. However, since that solution has never been found, I sincerely believe that with the proper cooperation between health officials and members of the dairy industry, it can be done.

It is my belief that most of the eastern market's milk sanitation requirements are essential to good milk production, and should be met by the manufacturers in the western states who are interested in the eastern market. . . .

The issuance of "temporary permits," in my opinion, is not in accordance with the intent of the milk sanitation laws. From a public health standpoint, I feel that if a supply is safe in October or November, it should be just as safe in May or June. . . .

In Pennsylvania, we feel that our Bureau of Milk Sanitation is a part of the dairy industry, and in order to have a successful operation, we must continue to enjoy that relationship.

Mr. Frank E. Mott, Milk Inspector and Director, Laboratory of Chemistry and Sanitary Biology, Boston Health Department, Boston, presented the paper "The Boston Cream Quality Control Program" from which excerpts are as follows:

More cream from the west arrived by carload in 1924. When 1928 came around, cream from the west was arriving in every month of the year and, on the average, every week in the year and by the carload. Since 1928 without western cream we would have had no cream supply.

In the beginning the quality of the cream supply from the west was very bad. The control was so incomplete that the market was subject to spot shipments. Consequently, for example, a carload of western cream might go first to Philadelphia and finding no buyer, perhaps because of quality, would be diverted to some other market, perhaps Boston.

In 1923 I arranged with the railroads, as there were no truck shipments by highway, to hold every carload under seal until my

representative had sampled it. In the laboratory we then did a complete analysis of that cream, chemically—chemically because adulteration by neutralizers, water or foreign fat, was then the big problem. Bacteriologically, the quality of all cream was bad. There were no legal standards. . . .

I define good quality as pasteurized, free from foreign substance including added water, and having a standard plate count at 32° C of less than 40,000 colonies of bacteria in one cubic centimeter. I arrived at 40,000 as the standard in this way; one grade of milk before pasteurization whether the final result is sold as milk or cream. Our standard for our poorest grade of pasteurized milk is not more than 20,000 colonies of bacteria in one cubic centimeter. Cream from such milk would have not more than 30,000 colonies and I allowed an increase of ⅓ for handling, thus getting the result of 40,000. Another fundamental starting point was that milk must be in quality equivalent to Massachusetts legal raw milk before pasteurization whether the final use would be milk or cream.

I then recognized that we have a legitimate ice cream industry which uses huge volumes of cream, and also a relatively small cream cheese industry. Since both ice cream and cheese are pasteurized, it seemed logical to consider them as potential users of cream which might be shipped as bottled cream in good faith but which, on arrival, might be found to have more than 40,000 colonies of bacteria. I recognized that such arrivals of cream, because of human error, would occasionally be inevitable.

A licensed system for shippers seemed imperative.

I recognized further a fundamental fact, which is often overlooked, that the cream industry is peculiar in certain respects. It is peculiar because desirable shipping points for western cream are plants which handle milk under the supervision of large western cities which have good inspection programs. Such large plants have cream from surplus milk to sell at times. However, when the cities in the west need milk, the milk at those plants which did go to cream, will be shipped as milk. Western plants also have other obligations which make it impossible for an eastern market to be able to determine with certainty that on short notice it can always get a carload of cream from a particular plant. Consequently, there must be more potential shippers of cream than are apparently needed. Another way of stating this important fact, is that when cream is short and you need a carload of cream, you must first find who has a carload to sell. That carload may be available today at a certain moment but it may not be available an hour later, for everyone is likely to be looking for cream. If the potential shipper is on the licensed list, fine, but suppose he is not on the licensed list but is willing to guarantee that the cream will comply with all laws and standards relating to cream. It is obviously impossible to wait to send an inspector 1,500 miles away to make the inspection before you buy the cream and before the cream is shipped.

I then asked myself the $64.00 question, "If the cream shipped is found in fact to be good cream after testing on arrival in Boston, complying with all laws and standards, how much, if any, prior inspection of dairies or plants in the west is necessary by Boston?" The answer came clearly and emphatically, "No physical inspection of western plants or dairies would be necessary in such a case."

A licensed shipper keeps his license only so long as he ships good cream. This implies a system of control of the quality of the cream shipped. We have that system, and it is the key to our control.

The license issued is to ship cream under a warranty system. The shipper makes certain tests of all batches of cream shipped. He records the results of the tests on a warranty form furnished by me. He signs the warranty as a true statement made under the penalties for perjury. He sends the warranty by air mail to the buyer. The buyer is also licensed and required by his license to sample all receipts of cream and perform similar tests of all cream on arrival. This work is done in inspected and approved laboratories. The buyer enters his results of tests on the back of the warranty as true under penalties for perjury and then sends the warranty to me. I then classify the shipment, according to the tests of quality on arrival, as bottling, manufacturing or illegal. The State Milk Control Board and the Federal Market Administrator have access to the books of all handlers of cream and to railroad and truckers records. These official agencies need my facts on quality in order to do their job of setting an accurate period price. My price for supplying the facts on quality, is a tabulated statement of all receipts of cream. I believe that no one can receive any cream from any source without knowledge of such receipt coming to my attention.

Here are the tests made by the seller and the buyer and perhaps I should repeat that such tests are made only in inspected and approved laboratories: Microscopical smear, standard plate count 32° C, acidity, phosphatase, neutralizer.

My laboratory makes one further test bacteriologically and that is a direct microscopic clump count, using a stain that dyes live cells only. A complete chemical and bacteriological analysis is made on all samples of cream in the final container offered for sale to the consumer, but only enough check tests on the quality reports of the buyer of cream are necessary to provide assurance that no one is falsifying results. Such tests are almost unnecessary with our set-up.

Boston began inspecting producers of milk, plants and dealers back in 1856. We were pioneers. We had to write our laws and standards and learn the hard way. What we have learned, we have made available to others. Now every state and every city does such physical inspection work on plants and farms. We believe that others can do this physical inspection work and we accept a sworn statement made by an official government agency on a farm or a cream plant as prima facie evidence of the facts so far as they relate to what was inspected. If the report of the inspection states that the plant is equipped in compliance with regulations relating thereto and was found to be maintained and operated in a clean and sanitary manner, then a license to ship cream will be issued on the agreement of the applicant to comply with the regulations of the City of Boston, which the applicant says he has received and read. The license is revocable at will by the licensor. . . .

Let me now read to you a normal laboratory report on the tests of a carload of cream from Michigan. This is taken from the record.

New England Dairies, adapted the resazurin test to measure the keeping quality of cream. Cream that stood up for 6 hours on resazurin, showed a low plate count and had good keeping quality. This test has proved itself through the years, and I am still using it today as the quickest measure of cream quality when a car is sitting on the siding and a quick answer must be given.

Dr. A. C. Fay of H. P. Hood & Sons, has written of the part psychrophilic bacteria play in cream troubles. He pointed out that these bacteria are of water origin, contaminating cream after pasteurization and growing at low temperatures. He used standard plate counts after keeping the cream samples 7 days at 38° F. . . .

Now to approach laboratory conditions under plant conditions—plant equipment cannot be sterilized as laboratory equipment can. Taking line samples looking for points of contamination after pasteurization, showed very little. But keeping the same samples, as Dr. Fay suggested, for 7 days at 38° F, showed where the cream was being contaminated in the plant. However, keeping cream 7 days was not very practical, even for an experimental procedure. I soon found that 1 hour incubation at 90° F is the equivalent of 1 day at 38° F.

CARLOAD OF 250 JUGS 40 QUART. FIVE BATCHES.

| *Tests made by* | *Microscopical smear* | *Standard plate count at 32° C* | *Acidity* | *Phosphatase* | *Neutralizer* |
|---|---|---|---|---|---|
| Shipper | Normal | 300 | 11 | Negative | Absent |
| Buyer at Boston | Normal | 400 | 11 | Negative | Absent |
| | | 2,400 | | | |
| | | 18,000 | | | |
| | | 2,400 | | | |
| | | 24,000 | | | |

Mr. Theodore Marcus, Director of the Massachusetts Dairy Laboratories, Boston, spoke on "Why Some Dairy Plants Fail to Deliver Quality Cream to Market," excerpts of which are the following:

There are two reasons why there is considerable trouble with sweet cream. First, not enough is known about the keeping quality of sweet cream and the bacteriology involved. Second, there is not enough attention paid to the quality of sweet cream.

The keeping quality of sweet cream has always been a real problem. First, because Mrs. Jones uses for Saturday morning's breakfast the last of a pint of coffee cream she bought on Monday. It has been in and out of the refrigerator a dozen times since. It was a week or two old when she bought it. Second, Metropolitan Boston must buy its cream thousands of miles away. . . .

In 1939 Herbert Jenkins, then with the

I also found that an *E. coli* count using Desoxycholate agar, was an excellent measure of cream contamination. I incubated cream samples for 7 hours at 90° F, then plated 1–1000 on tryptone glucose extract agar, incubating these plates at 90° F, and 1 ml. direct on Desoxycholate agar. I read these plates in 24 hours and had a good measure of the quality of the cream.

However, if cream is good in the vat, and poor thereafter, one of two things must happen:

1. The time and temperature of storage after pasteurization are such that surviving bacteria start growing; and/or
2. The bacteria added after the cream leaves the pasteurizer continue growing.

Let us explore the first of these reasons why good cream in the vat goes bad thereafter. Undoubtedly, there are surviving bacteria in cream even after 33 minutes at 160° F. . . .

Under unfavorable temperature conditions

it could take weeks, even months. I think that if cream can be cooled quickly enough and kept cold enough, this lag phase can be maintained for 30 days. Thirty-four degrees F would be a good storage temperature; 40° F would shorten the lag phase; 45° F even more so. The temperature of the cream after it leaves the vat is of utmost importance, the lower, the better. Cooler chest temperatures with blowers to take out the heat of fat crystallization, and the heat absorbed in jugging the cream, would help. Even more important is the temperature of cream after bottling. The temperature must be kept low if surviving bacteria are to be kept in their lag phase.

As to the second reason why good cream in the vat goes bad thereafter, I cannot but repeat Dr. Jensen's statement in his "Microbiology of Meat," "When you contaminate at the logarithmic phase, your growth from then on is logarithmic." If the plant equipment were as sterile as my laboratory equipment, the cream would keep if the first condition of temperature is observed. But, if active, growing bacteria from a jug or from equipment were added after pasteurization, all the refrigeration this side of freezing will not stop growth at a logarithmic rate. Lower temperatures may slow them down but not stop them. I am inclined to view this as a problem in psychrophilic growth as well as psychrophilic bacteria. Apparently many bacteria are capable of psychrophilic growth.

Following these principles of bacteriology, I have set up certain general rules which must be followed in making cream that will have a low-count and good-keeping quality:

1. Pasteurize cream at 160° F for 33 minutes.
2. Cool to below 40° F and place in a blower chest to cool below 34° F for storage at that temperature. Bottled cream should be iced after bottling.
3. All equipment must be sterilized immediately before using with 180–190° F water. The simpler the equipment, the better.
4. The cream jugs, besides being clean, must be steamed not more than an hour before filling.
5. There is no substitute for heat in sterilizing equipment or jugs.
6. Good cream after 7 hours' incubation at 90° F will show a low plate count and *E. Coli* 0.

That, gentlemen, is what I have learned of the keeping quality of cream and the bacteriology involved. It has done wonders in the plants that have faithfully followed it. It has not solved all the problems, especially that of human nature. This material was given to a large cream shipper over a year ago. That plant has still not figured out how to steam jugs. Perhaps it is too much trouble. Its cream still bothers and it has to be threatened with a shut-off to bring it in line. Another thing is that cream quality is at the mercy of the first good salesman that comes along. "That is all wrong. Our X compound eliminates all that work." The research data go out the window, and X compound comes in. I was in one large plant that shifted to quaternary ammonium sterilization without adequate data, and ended up with a poor quality cream. I was at two plants that could not get their butter fat testing done in time to standardize before the holding period started, and so were standardizing with water. They did not know about the bacteriology of water. One of these plants had cream in its chest the day after pasteurization at 47° F. . . .

## Report on Professional Status of Sanitarians

*(Continued from page 114)*

definitive action can best be taken by the state governments. Consequently, it is our recommendation that organizations of milk and food sanitarians affiliated with the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS establish within these organizations a committee on the professional development of sanitarians whose duty it shall be to investigate the situation within their own area, and initiate a program which they deem to be desirable in the interest of improving the professional status of milk and food sanitarians.

HAROLD B. ROBINSON, *Chairman*
JOSEPH J. DONOVAN
JAMES A. KING
H. CLIFFORD MITCHELL
J. L. ROWLAND
JOHN TAYLOR



# NEW BOOKS AND OTHER PUBLICATIONS

**Patent Practice and Management,** by Robert Calvert. Published by Scarsdale Press, Box 536, Scarsdale, N. Y. xii + 371 pages. 1950. $5.00.

This book deals with the essentials of patent law and practice from the standpoint of the interested executive and inventor. The author himself was formerly a research director. Starting with a chapter in "What to Patent," the author deals with the many questions which concern the executive and would-be patentee such as "When to Patent," inventions, rights of employers, and employees, policies, claim drafting, application, interference, secret information, license, validity, infringement, and an excellent glossary of patent law terms. The subject is handled in a pleasing, conversational style. This enables the reader to glean a lot of practical information that is not clouded under dry, complicated legal phraseology. In fact, it is so readable that one finds himself reading page after page from mere interest.

### Correction

The book, *Judging Dairy Products*, by Nelson and Trout, published by the Olsen Publishing Company, was reviewed in our January–February issue, page 50. The price is given as $5.00, this is incorrect. The correct price is $6.00 plus $.20 per copy for mailing.

# HAVE YOU SEEN

*(Compiled by Dr. K. G. Weckel, University of Wisconsin, Madison)*

"Reaction of Certain Fly Strains to D.D.T. and Methoxychlor Deposits," E. J. Hansens, Rutgers University, and A. H. Goodin, E. I. DuPont de Nemours & Co. *J. Econ. Entomology* **42**, 843 (1949).

"A Line of Houseflies Resistant to Methoxychlor," G. W. Barker and J. B. Schmitt, Rutgers University, *Ibid.* **42**, 484 (1949).

"Protection Afforded the Consumer Against Added Chemicals in Foods," W. B. White. *Food, Drug, Cosmetic Law Quarterly* **4**, 479 (1949).

"*Food Poisoning,*" G. M. Dack, Revised edition, University of Chicago Press, 1949, 184 pp. Price $3.75.

Have you seen the 16th of a series of articles on Bakery Sanitation now appearing in *Bakers Weekly*, **144**, No. 12, p. 42, December 1949, "Bakery Sanitation Under the Federal Food, Drug, and Cosmetic Act"?

"*Cheese,*" by L. L. Van Slyke and W. V. Price, 2nd edition, Orange Judd Pub. Co., New York City, N. Y. Price $4.50.

"Public Relations in Public Health," V. A. Getting. *Amer. J. Pub. Health* **39**, 1561 (1949).

"The Local Health Department Services and Responsibilities." *Amer. J. Pub. Health* **40**, 67 (1950).

"Labor Requirements on Dairy Farms." *Hoards Dairyman*. Dec. 10 (1949).

### Michigan Food Sanitarians School

The Seventh Annual Dairy and Food Inspectors' and Sanitarians' School will be held at Michigan State College on April 4–7. This is an opportunity 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.

## IN-SERVICE TRAINING PROGRAM AT WISCONSIN

This In-Service Training Program, sponsored by the Wisconsin Milk Sanitarians Association and presented at the University of Wisconsin by cooperation of members of the University Faculty, Wisconsin State Board of Health, Wisconsin Department of Agriculture, U. S. Public Health Service, and Industry Organizations is intended as a refresher course for dairy sanitarians currently engaged in and having responsibility for dairy sanitarian work.

It is intended that all participants enroll for the entire five-day period of the course. Advance registration is necessary for participation. Application for enrollment, by letter, accompanied by a registration fee of $5.00 should be mailed to—

Dr. K. G. Weckel
Department of Dairy Industry
University of Wisconsin
Madison 6, Wisconsin

by April 1, 1950. Checks should be made payable to "The College of Agriculture".

**Monday, April 10. 1950**

Dairy Animal Diseases Transmissible to Man
Dr. John Schwab

Human Diseases Transmissible to Man via Milk
Dr. A. R. Zintek

Changes in Micro-flora in Milk During Pasteurization
Dr. E. M. Foster

Problems in Pasteurization, and Equipment Deficiencies
Harold Wainness

Pasteurization Plant Layout
Professor L. C. Thomsen

HTST Pasteurizer Control Requirements and Test Procedures
H. E. Eagan

A complete panel of a HTST control system, including pumps, holding tube, recording and indicating thermometers, and flow diversion valve will be set up for operation demonstration. Participants will be requested to demonstrate familiarity with operating parts and test procedures, including dye test, solubridge, cold milk injection, and instrument interval timer.

**Tuesday, April 11, 1950**

Problems of Municipalities in Administering Public Health
Frederick MacMillan

The Accredited Area Plans
Dr. W. R. Winner

The Use and Interpretation of the Phosphatase Test
Dr. L. W. Brown

The Direct Microscopic Count of Raw Milk
Prof. Evert Wallenfeldt

Significance and Control of Coliform
Dr. K. G. Weckel

New Techniques in Selling Sanitation
Ralph Kuhli

Antibiotics and Milk
Dr. W. C. Winder

Sanitarians Travelogue

**Wednesday, April 12, 1950**

Laboratory Tests, Putting First Things First
Dr. H. E. Calbert

Problems of Meeting Requirements of Interstate Milk Shipments
Clarence Luchterhand
Harvey Weavers
C. H. Adkins

Farm Water Supply and Water Systems
Harvey Wirth



Farm Sewage and Waste Disposal Systems
George Bernauer

Significance of Thermoduric and Thermophylic Organisms in Milk
Miss Laura Bates
Clarence Widder

Essential Records and Their Use
H. E. Eagan

**Thursday, April 13, 1950**

Physiology of Milk Secretion
Dr. Vearl Smith

Herd Management and Herd Health
Prof. George Werner

Important Details of Milk House Design and Construction
William Roper

Cleaning and Bactericidal Treatment Procedures
Dr. C. A. Abele

Institution Dairy Products Use Problems
Karl A. Mohr

Space and Water Heaters
Prof. Carl Neitzke

*Seminar*
Organization of an Effective Ordinance, U.S.P.H.S. Milk Ordinance & Code
Sections 1–6
Sections 8–18
Section 7
H. E. Eagan

**Friday, April 14, 1950**

Organization of an Effective Milk Sanitation Program
Clarence Luchterhand

Plumbing Cross Connections
Richard Mason

Public Relations Between the Producer and Sanitarian
M. P. Welsh

Cleaning-Sanitizing Techniques for Milking Machines
Dr. Richard Guthrie

A Re-Examination of Specific Conference Problems
H. E. Eagan

## SUMMER SESSION OF MASSACHUSETTS INSTITUTE OF TECHNOLOGY

A three weeks special course in food technology, from June 12 to June 30, a feature of the 1950 Summer Session at the Massachusetts Institute of Technology, has been announced by Professor Walter H. Gale, in charge of M.I.T. summer session activities.

To be given under the direction of Dr. Bernard E. Proctor, professor of food technology at the Institute, the intensive course will give particular emphasis to recent developments in food manufacture and control. In addition to lectures, demonstrations, and conferences at M.I.T., there will be opportunities for group visits to representative food industries throughout greater Boston.

The course, intended principally for those having some knowledge of the basic sciences pertinent to food technology, should prove valuable to advanced students in other sciences as well as to executives and employees in food industries, according to Dr. Proctor.

The following subjects are among those on which the course will include fundamental material: economics and statistics of food supplies; food cost accounting and business law; food bacteriology, sanitation, and fermentations; food chemistry and nutrition; materials handling; food control instrumentation; flavor and food acceptance; and food sterilization by electronics. Detailed

studies of bakery operations, canning, food freezing, meat packing, milling, and yeast operations will be among several special food processing reports.

In addition to Professor Proctor, the following M.I.T. faculty members will take an active part in the course: Professor William L. Campbell, head of the Department of Food Technology; Dr. William C. Bauer, assistant professor of food technology; Dr. Cecil G. Dunn, associate professor of industrial microbiology; Dr. Robert S. Harris, professor of biochemistry of nutrition; and Dr. Ernest E. Lockhart, assistant professor of food chemistry.

Only a limited enrollment will be accepted, according to Professor Proctor, and preference will be given to those applicants having a background of technical or executive experience in food industries, faculty members of other schools, government workers in food control or nutrition, and advanced students in chemistry and engineering. Letters of application, giving the applicant's experience and background, should be sent to Professor Gale at Room 3-107, M.I.T., Cambridge 39.

Tuition for the three-week course will be $100; academic credit will be given for satisfactory completion of the course only to those who elect to take a final examination.

The special course in food technology is part of a broad program of summer activities at M.I.T., designed to make the Institute's special facilities available to technical and scientific personnel not able to participate in the Institute's regular academic work. All students will have full use of the Institute's dormitory, library, and recreational facilities at nominal cost.

## Dr. Lavery Appointed Director of Food Control

Dr. J. Franklin Lavery was appointed Director, Division of Food Control, Department of Public Health, Toronto, Ontario, Canada, on June 10th, 1949, succeeding Dr. A. R. B. Richmond, who was retired after 38 years service. The latter will be remembered as President in 1930-31 of the International Association of Milk Inspectors.

Dr. Lavery is a graduate of the Ontario Veterinary College, and after leaving college engaged in general practice, which he left to serve for three years during the first World War as a Veterinary Officer with the Imperial Army in France and Germany.

On his return to Canada he resumed practice until June 1925, when he joined the Toronto Department of Health in the capacity of Meat Inspector, and was later transferred to Dairy Farm Inspection.

For a period of ten years previous to his appointment as Director, Dr. Lavery acted as Assistant to Dr. Richmond, during which time he supervised the inspection of farms, dairies, and also food establishments in the City, thus familiarizing himself with the various problems affecting these industries.



## THIRTY-SEVENTH ANNUAL MEETING, 1950, AT ATLANTIC CITY

The 37th Annual Convention of the International Association of Milk and Food Sanitarians will be held in Atlantic City on October 13th, 14th, 15th and 16th, with headquarters at the Dennis Hotel. Since this convention is scheduled during the end of the week preceding Dairy Industries Exposition sufficient rooms have been set aside for our group at the Dennis Hotel. Registration for rooms should be made directly with Mr. Wesler T. Keenan, Convention Manager of the Hotel.

The Program Committee is under the direction of Dr. K. G. Weckel, President Elect, University of Wisconsin, Madison, Wis.

Note that the convention runs for four days including Sunday, October 15th, and Monday, the 16th. The Executive Board felt that because of the large volume of association business, Constitutional Amendments, etc., which will consume considerable time, decided that Sunday, the 15th, would be a good day to carry on these discussions. The 16th is the start of the Dairy Show.

## Evaluation of Quaternary Compounds

*(Continued from page 66)*

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(*including* MILK AND FOOD SANITATION)

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*Ass't. Secretary-Treasurer*, Donald Hayes, Philadelphia

# ASSOCIATION NEWS

## Philadelphia Dairy Technology Society

The Philadelphia Dairy Technology Society has made a grant-in-aid to further the work of the Nutrition Clinic of the Philadelphia General Hospital.

W. S. HOLMES
*Secretary-Treasurer*

## Michigan Association of Sanitarians

The annual meeting of the Michigan Association of Sanitarians will be held in East Lansing on Tuesday, June 4, 1950. This same week, the Annual Michigan Food and Milk School will be in session at Michigan State College.

Mr. John Pomeroy, Director of the Division of Sanitation of the Kalamazoo City-County Health Department, has been selected by the Executive Committee of the Michigan Association of Sanitarians as their representative to the Program Committee for the 1950 Michigan Public Health Association meeting to be held in Grand Rapids in 1950.

The Michigan Association of Sanitarians participated on February 14, 15, and 16 in the Annual Michigan Allied Dairy Association meeting in Grand Rapids. Thursday, February 16, was devoted to programs principally of interest to milk sanitarians.

## Missouri Association of Milk and Food Sanitarians

The annual meeting of the Missouri Association of Milk and Food Sanitarians and short course will be held in Columbia, April 17 through 19.

## Minnesota Milk Sanitarians Association

Minnesota Milk Sanitarians Association is the new name of the former Minnesota Dairy Fieldmen and Inspector's Association.

## New York State Association of Milk Sanitarians

The 1950 annual meeting of the New York State Association of Milk Sanitarians will be held on October 2, 3 and 4, 1950, at Syracuse, New York, with Hotel Syracuse as headquarters.

## Wisconsin Milk Sanitarians' Association

The Wisconsin Milk Sanitarians' Association is sponsoring an In-Service Training Program for Sanitarians at the University of Wisconsin April 10–14, 1950. Professor Weckel is in charge, and inquiries may be directed to him. See program on page 122.



## COMMITTEES OF THE INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., 1950

APPLIED LABORATORY METHODS:
Luther A. Black, *Chairman,* USPHS Environmental Health Center, Cincinnati, Ohio
F. W. Barber, Nat'l Dairy Research Laboratories, Oakdale, Long Island, N. Y.
P. R. Elliker, Oregon State College, Corvallis, Oregon
C. K. Johns, Dominion Dept. of Agriculture, Ottawa, Ontario, Canada
J. N. Murphy, Jr., State Department of Health, Austin, Texas
J. C. Olson, Jr., University of Minnesota, St. Paul, Minn.
W. K. Mosely, Mosely Laboratories, Indianapolis, Indiana
Harry Scharer, New York City Health Department, New York, N. Y.

COMMUNICABLE DISEASES AFFECTING MAN:
I. A. Merchant, *Chairman,* Prof. Vet. Hygiene, Iowa State College, Ames, Iowa
R. G. Flood, San Francisco Medical Milk Commission, San Francisco, Calif.
J. G. Hardenbergh, American Veterinary Medical Association, Chicago, Ill.
R. J. Helvig, USPHS Milk & Food Branch, Washington, D. C.
C. K. Mader, Board of Health, Kitchener, Ontario, Canada
E. R. Price, USPHS, 2200 Fidelity Bldg., Kansas City, Mo.

DAIRY FARM METHODS:
R. G. Ross, *Chairman,* State Health Department, Oklahoma City, Okla.
C. F. Bletch, Maryland & Virginia Milk Producers Association, Washington, D. C.
L. E. Bober, Babson Bros., Chicago, Ill.
Geo. H. Hopson, DeLaval Separator Company, New York, N. Y.
E. H. Parfitt, Evaporated Milk Association, Chicago, Ill.
F. L. Schacht, State Department of Health, 18 Dove St., Albany, N. Y.
J. E. Dolan, Department of Public Health, Denver, Colo.

FOOD HANDLING EQUIPMENT:
C. W. Weber, *Chairman,* State Health Department, Albany, N. Y.
Paul de Konig, Michigan State College, East Lansing, Mich.
Lewis Dodson, 1609 Van Buren, Amarillo, Texas
F. H. Downs, Jr., Major MSC, Hq. 4th Army, Fort Sam Houston, Texas
John Faulkner, USPHS Milk & Food Branch, Washington, D. C.
W. A. Maclinn, Rutgers University, New Brunswick, N. J.
Jerome Trichter, Health Department, New York, N. Y.
James H. McCoy, State Board of Health, Indianapolis, Ind.

FROZEN DESSERTS SANITATION:
F. W. Fabian, *Chairman,* Michigan State College, East Lansing, Mich.
W. C. Cameron, Dept. of Agriculture, Ottawa, Ontario, Canada
O. A. Ghiggoile, State Department of Agriculture, Sacramento, Calif.
R. E. Irwin, Irwin's Dairy, Inc., Camp Hill, Pa.
David Levowitz, New Jersey Dairy Laboratories, New Brunswick, N. J.
J. M. Scott, State Department of Agriculture, Gainesville, Fla.
M. L. Speck, University of North Carolina, Raleigh, N. C.

ORDINANCES AND REGULATIONS:
C. J. Babcock, *Chairman,* Dairy Branch, PMA, USDA, Washington, D. C.
H. L. Delozier, City Health Department, Louisville, Ky.

H. J. Dunsmore, City Health Department, Pittsburgh, Pa.
A. W. Fuchs, USPHS, Washington, D. C.
O. A. Ghiggoile, State Department of Agriculture, Sacramento, Calif.
C. S. Leete, State Health Department, Albany, N. Y.
C. K. Luchterhand, State Department of Health, Madison, Wisc.

PROFESSIONAL STATUS OF SANITARIANS:
H. B. Robinson, *Chairman,* USPHS—Regional Office, New York, N. Y.
J. J. Donovan, Health Department, Brookline, Mass.
J. A. King, State Department of Public Health, Denver, Colo.
H. C. Mitchell, State Health Department, Richmond, Va.
John Taylor, State Board of Health, Indianapolis, Ind.
Milton E. Held, State Board of Health, Des Moines, Iowa

RESOLUTIONS:
W. D. Tiedeman, 18 Dove Street, Albany, N. Y.
A. W. Fuchs, *Chairman,* USPHS, Washington, D. C.
R. G. Ross, State Health Department, Oklahoma City, Okla.

SANITARY PROCEDURE:
C. A. Abele, *Chairman,* Diversey Corporation, 2617 Hartzell, Evanston, Ill.
M. R. Fisher, Div. of Health, Milk Control Section, St. Louis, Mo.
H. E. Bremer, State Department of Agriculture, Montpelier, Vt.
Paul Corash, Department of Health, New York, N. Y.
C. B. Dalzell, Cherry-Burrell Corporation, Little Falls, N. Y.
A. W. Farrall, Michigan State College, East Lansing, Mich.
H. L. Thomasson, State Board of Health, Indianapolis, Ind.
O. A. Ghiggoile, State Department of Agriculture, Sacramento, Calif.
Harold Wainess, USPHS Regional Office, Chicago, Ill.
C. W. Weber, State Health Department, Albany, N. Y.
Mark Howlett, City Health Department, Los Angeles, Calif.
H. J. Weavers, Chief of Dairy Section, Dept. of Agriculture, Madison, Wisc.

PROGRAM:
K. G. Weckel, *Chairman,* University of Wisconsin, Madison, Wisc.
C. S. Leete, State Health Department, Albany, N. Y.
H. L. Thomasson, Indiana State Board of Health, Indianapolis, Ind.

## Chicago—Host City for the IFT Decennial Conference

The Chicago Section of the Institute of Food Technologists are hosts to the National Society for the IFT Decennial Conference to be held May 21–25, 1950, at the Edgewater Beach Hotel. The first annual conference was held in Chicago in 1940 when IFT had a membership of about 700 food technologists and has since grown in size to approximately 3,000 members.

In view of the growing influence of food technologists in the continuing development of food and allied industries, it is planned to extend invitations to outstanding leaders in finance and industry for a special luncheon to be followed by a timely and provocative address by an international banker. The purpose for such a gathering is to create a broader appreciation of the significant roles food technologists have already assumed and are prepared to extend in the future development of food industries and the national economy. As a means of emphasizing past and potential capabilities, no technical sessions will be held on Tuesday afternoon May 23 (following the luncheon for their business guests) in order to permit uninterrupted inspection and review of the exhibits by the invited executives, IFT members, and guests.