JOURNAL OF MILK TECHNOLOGY

Volume 4 Number 1

JANUARY-FEBRUARY, 1941

Official Publication of

International Association of Milk Sanitarians

(Association Organized 1911)

Also designated publication of

California Association of Dairy and Milk Inspectors
Central States Milk Sanitarians
Chicago Dairy Technology Society
Connecticut Association of Dairy and Milk Inspectors
Indianapolis Dairy Technology Club
Massachusetts Milk Inspectors' Association
Metropolitan Dairy Technology Society
Michigan Association of Dairy and Milk Inspectors
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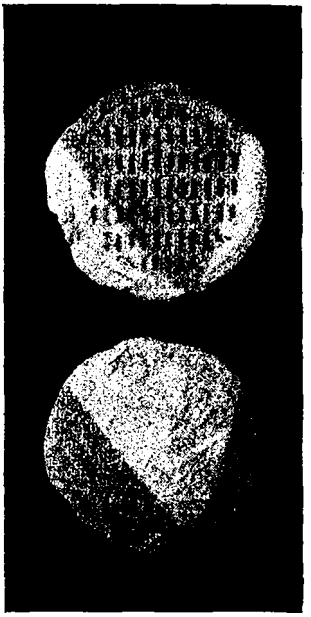

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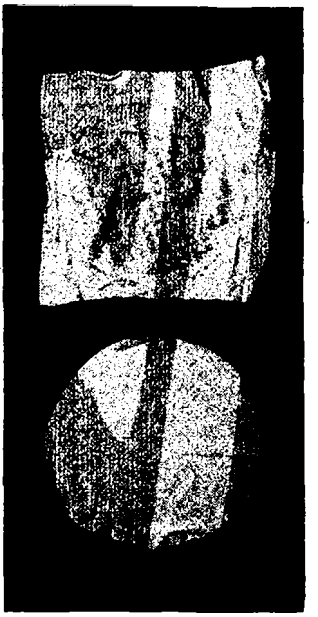
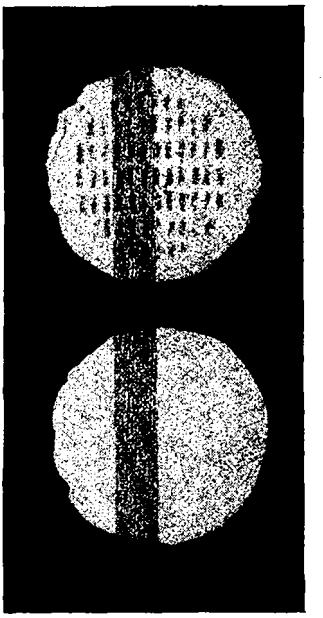
Rapid-Flo, the lower disk, caught dirt the upper disk failed to remove. Upper disk is neither best nor worst of competitive disks in the market. This test shows "just any cotton disk" is not enough.



Rapid-Flo vs. Flannel

Rapid-Flo, the lower disk, caught the dirt the flannel failed to remove. The flannel used in this test is the grade most generally used in the sections where flannel is still permitted.



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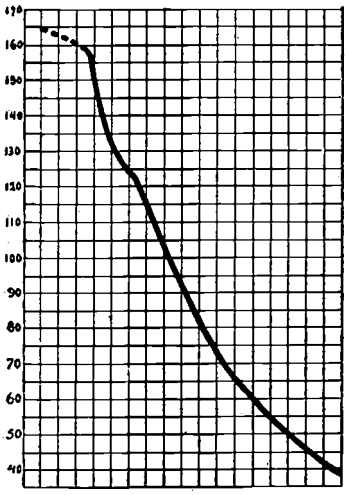

Unusual Operation Made Possible By Unusual Performance

Of interest to all ice cream manufacturers seeking to reduce cooling costs, is the unusual application made at Gehl's Guernsey Farms, Milwaukee, Wisconsin. Instead of using the conventional type of cooler, homogenized mix at 165° F. is run into a 500-gallon Pfaudler "Thermo-Process" Vat at the rate of 6 gallons per minute. Mix is cooled quickly with minimum refrigeration requirements.

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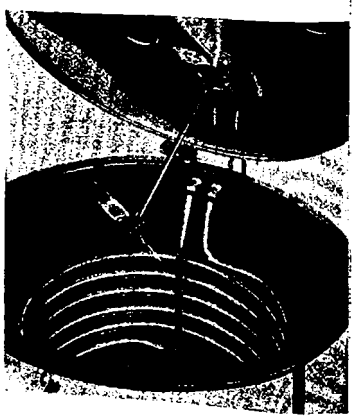

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JOURNAL OF MILK TECHNOLOGY

Official Publication of the

International Association of Milk Sanitarians

(Association Organized 1911)

and Other Dairy Products Organizations

Office of Publication 29 N. Day St., Orange, N. J.
Entered as second-class matter January 26, 1939, at the post office at Orange, N. J. under the Act of March 3, 1879.

(For complete Journal information, see page 54)

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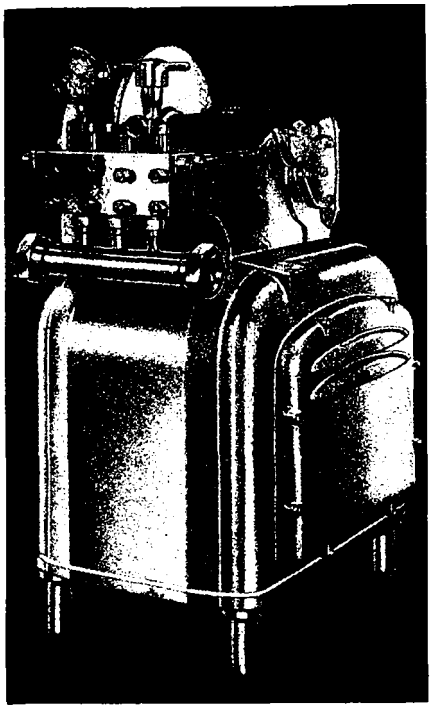
A NEW DEVELOPMENT



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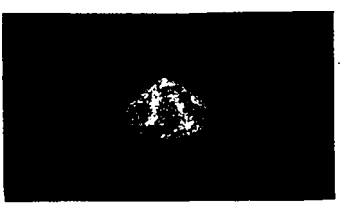

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Editorials

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

Message From President Frank

It was my misfortune to be absent from our last annual meeting and so I wish first of all to take advantage of this opportunity to express my very real appreciation of the honor which the Association has conferred upon me in selecting me as its President for this year.

Next, I wish to call the attention of the members to the fact that our Association has now completed its third decade of service in the cause of safe milk. We should be proud that our contributions to that cause have been sufficiently significant to merit thirty years of existence. No association can long survive if its output does not justify its continued existence. This would seem to be proof in itself, therefore, that our organization is one of worth. May it continue so for an indefinite number of decades.

Finally, I wish to extend an official greeting to all members of the Association. I hope the year 1941 will bring each of you a satisfactory portion of success, and that the financial part of that success will be at least great enough to pay your trip to Tulsa next Fall. I know Tulsa. It is a beautiful, clean city, with the tang of the west, and I suspect our friends there are already busy preparing something very special for us. Let us respond by full attendance. Let us make the Tulsa meeting the biggest and most enthusiastic we have ever held. Let us demonstrate that the International Association is not a sectional group but really deserves its broad name.

L. C. F.

Our Role in Defense

The editorial in the November-December issue raises an interesting and timely question: what role should our Association wish and expect to play in that process of reconstruction, reorganization and revitalization which we have come to think of as preparation for defense.

The writer heartily subscribes to most of the views expressed in the editorial but rises to take issue with the final proposal that the President appoint a Committee on Defense "to make the necessary contacts with governmental and other profes-

sional and civic agencies concerned," to the ends which the editor outlined. "When doctors disagree" it is evidence that there is, at least, no collusion.

Our president is well acquainted with the character and functions of the Association and knows what it has to offer. The United States Public Health Service, with which he is officially connected, is in a far better position than any association committee could be to make necessary contacts with other Federal agencies primarily concerned with organization for defense. Can we not safely assume, then, that we shall be called upon if it is considered that our services are needed.

There has been a large demand for reserved seats on the defense band wagon. With the most patriotic of motives, innumerable committees on defense have been organized. To utilize and coordinate their efforts would be an undertaking comparable with that of policing the invaded countries of Europe. Assuming that our willingness to serve will be taken for granted, it may be a distinction to be one of the few large organizations which have appointed no committees on defense.

Observation from an official vantage point leads to the belief that the military authorities would prefer that civilian agencies concerned with protection and promotion of the health of the civilian population "mind their own business" until called upon for assistance. Our business as an association is stated somewhat narrowly in our Constitution: "to develop uniform and efficient inspection . . . and to place the inspection . . . in the hands of men who have a thorough knowledge of dairy work."

We doubtless would now add to that the encouragement and promotion of research and education in the field of milk sanitation. Can we serve the cause of defense better than by doing the job for which we are organized—but doing it a little more energetically? If not, then what is needed if our efforts are to be effective is not, in the opinion of this writer, another committee or greater activity on the part of a few officers but more work on the part of the individual members of the Association. In the meantime, why not leave the matter to the Executive Committee?

P. B. B.

Public Health Service Conference on Milk Research

A conference on milk research was held recently by the National Institute of Health to supply information as a guide for the development of its investigational policies. Some of the views expressed would seem to be of such general interest to our readers that we are presenting them herewith.

The removal of the National Institute of Health to its new buildings at Bethesda, Maryland, has necessitated the discontinuance of the investigational work that had heretofore been conducted in the laboratory in association with the Office of Milk Investigations. It has not yet been determined whether these studies will be continued by the Institute. It is probable that another administrative unit in the Public Health Service may undertake them.

The importance of this kind of work is indicated by the character of the inquiries which have been received by the staff:

What other bactericidal times and temperatures are equally effective to those specified in the Code?

Is the bactericidal treatment of single service containers equivalent to that specified by the milk code for glass containers?

Is a rinse test adequate to determine freedom from pathogens sufficient?

What is the relative margin of safety of ice cream pasteurized at 150° F., as compared with that in regular milk practice?

What is the degree of effectiveness of various new chemicals that are used for the bactericidal treatment of milk containers and equipment?

What is the efficiency of dish-washing times and temperatures, and also the concentration of the caustic?

What type of pasteurization equipment, particularly high-temperature-short-time types, are safe to use?

Some of the fundamental investigations that the experimental laboratory had in mind were the determination of the degree of parallelism between the phosphatase test, and pasteurization from 142° F. up to 180° F., in order to establish equal bactericidal effectiveness and margins of safety over the entire range. Another investigation was to determine the relative resistance of pathogenic streptococci to the test coliform organisms over the full range of milk and ice cream pasteurization, including cleansing and sterilization of equipment. Closely related to this was the determination of the conditions which govern the bactericidal effectiveness of chlorine solutions in order to elucidate the causes of the great variability of present products.

In view of the practice already established of federal approval of state certification of interstate water and oysters, some idea was expressed as to the possible desirability of the approval of milk supplies and types of milk plant equipment. On the other hand, the view was strongly urged that it is undesirable for the federal government to approve any equipment. It was felt that there should be a quasi-official group (as in England) which would render valuable service in studying equipment and in publishing its findings for the benefit of everyone concerned, and government officials should participate in this work possibly through a coordinating committee. It was felt that the government should not enter the field of approving equipment, germicides, detergents, apparatus, etc., but that there should be some place provided where the fundamental principles could be elucidated and where the above products could be examined and tested. (It was pointd out that a type of dishwasher now used in the army is not satisfactory from a sanitary standpoint but where is there a place to examine, test and develop one that will pass a real inspection?) The approval of interstate shipments of milk might not be so dependable as might be desired, and the present system of rating the milk quality of a community was adversely criticized because of its alleged unreasonable emphasis upon arbitrarily selective score values. The study of equipment is a very desirable objective, but it must be fitted into a broader collaborative study. Much of this should be stimulated by the Public Health Service, which would see that the results of these studies are made available to the public, and certainly to interested health officers. Such unofficial agencies should be organized outside of the government service, but the Public Health Service should cooperate in its direction and help determine its policies and functions.

Fundamental research was stated to be needed for the milk industry. It was urged that the National Institute of Health should work on milk laboratory problems that are not being adequately handled in other laboratories which are not equipped so well or whose policies require a more immediate objective. In other words, it is necessary to broaden the base of our bacteriological knowledge that is involved in milk control. This can best be done by abstract studies on the fundamentals of bacteriology, detached from the immediate urge for publicity, financial returns and other distractions to pure research. Specifically, it is important to determine what other groups there may be—for example, the Pseudomonas versus now only the coliforms—as determinants of post-pasteurization contamination. It was suggested that the hemolytic streptococci, serological groups A, B and C, often found in five to ten per cent of the samples of pasteurized milk, should be differentiated.

A bacteriological study of the pasteurization of ice cream should determine the death curve in various solutions analogous to the bacteriology of the vaccines. A sugges-

tion has been made by Mickle and M. E. Parker that a schematic qualitative procedure be worked out for milk bacteriology analogous to that of qualitative chemistry.

More knowledge is needed on the nutrition needs of bacteria. Our lack of knowledge of the composition of peptones precludes our being able to specify adequately the proper composition to give us satisfactory growth. No laboratory is equipped to do fundamental research on this aspect of the preparation and use of the peptones. It was brought out that we now grow our bacteria in a kind of soup of inconstant composition from a variety of sources. More information is needed as to why high temperature pasteurization produces milk with higher counts, usually traced to thermodurics. With regard to the latter, we need to know their degree of importance, how to prevent them, how to measure them, what should be our standards, and information as to whether we are warranted in withholding high temperature permits. Other problems are as follows:

Is the condensing process the bactericidal equivalent of pasteurization? What is the effectiveness of cover caps to prevent contamination of bottled milk? What are the conditions of pasteurization of milk that are desirable for the production of cheese and butter? What are the most useful systems of soft curd milk production, control and measurement?

We need an abstract study of the death curve of pathogens versus the regular bacteria in milk. An important administrative problem is the scorching of milk, and information should be secured on how to prevent and control it. It was thought that the fortification of milk with vitamins should be directed to the proper feeding of the cow, rather than by the present method of directly adding them to the milk. A test for active chlorine is needed. Goat's milk needs more study as to its composition, control, nutritive value and bacteriology. A study is needed of split samples to try out the effectiveness of platform (deck) inspection versus present farm inspection as a measure of the quality of milk. Rat-feeding developing flabby hearts should be checked. The phosphatase test should be studied from the standpoint of its application to cheese and butter. Is the coliform test a possibly better procedure than the present regular bacteriological technique for bacteriological control in general?

Studies are needed on the extent of the parallelism between the killing of bacteria and the phosphatase test, particularly in ice cream. We also need more knowledge on the enzymic system in dairy products and the effect of heat and other treatments in commercial production and handling. Color stains should come in for more study.

In general, it was held that governmental standardization has possibly gone as far in the standardization of milk production and control as the situation warrants. Fundamental researches in the bacteriology and chemistry of dairy products are needed, and the government laboratories are in the best position for prosecuting these. There is a need for a continuation of the kind of technological investigation that has heretofore been conducted by the milk laboratory. A quasi-official institution of some kind is desirable for making tests of many products necessary in the commercial phases of the milk industry, and the federal service should exert a large influence in directing the policy, interpreting the data and publicizing the results of such an agency. It was considered that our knowledge of the fundamental sciences of bacteriology and chemistry needs expansion. Dairy technology has developed faster than our knowledge of the fundamental sciences involved. In all of this, we look to the government laboratories for leadership.

J. H. S.

The Instantaneous Heat Treatment of Milk *

G. C. Supplee and O. G. Jensen

The Borden Company Research Laboratories, Bainbridge, New York

The destruction of microorganisms by elevated temperatures is so well established as an abstract principle and manifold applications are so commonplace that it might appear that the general subject of this paper has little justification. Notwithstanding the general use of this lethal principle practically all of its applications embody an element of time; in fact it is almost impossible to cite a single instance wherein a measurable time component is not involved as a co-related factor.

One of the basic processes upon which the milk industry has been developed is pasteurization, for which time-temperature relationships are definitely stipulated. These stipulations carry the forcefulness of law when embodied in regulatory codes. The specifications for the pasteurization of milk and milk products were not determined by mere theoretical considerations, but by factual evidence (1-5), which determined the most expedient time and temperature for the heat treatment of milk. Pasteurization by the holding method, 145° F. for thirty minutes, has been so widely accepted and so much of the basic design and construction of milk plant equipment has been predicated upon these requirements, that any proposed departure from this practice is met with extraordinary skepticism. Short time or "flash" methods of pasteurization proposed in lieu of the standard holding method have, in the past, failed to receive acceptance by plant operators, sanitarians, and control bodies. The cause for rejection, however, has been frequently confused or misplaced in failing to discriminate closely between inadequacies of the equipment and refinement of control on the one hand, and the intrinsic lethal effectiveness of the elevated temperature momentarily applied, on the other hand.

Short-time–high-temperature pasteurization as developed today is established upon substantially the same principles and exigencies which served to establish the specifications for the holding process, namely, adequate margin of safety in eliminating pathogens, acceptable reduction in total count, maximum retention of creaming properties, and absence of cooked flavor. The degree of acceptance now accorded the short-time pasteurization system appears to be based upon proven bactericidal performance and significant advancement in the design and performance of the temperature control accessories. Analysis of comparable data now available leads to the general conclusion that the degree of bacterial reduction from the currently conventional holding method and from the short time method at 161°-162° F. for 15 - 16 seconds is substantially the same for raw milk of average quality; certain evidence however, indicates that the regular holding method is more effective in destroying certain thermoduric species.

The generally comparable lethal effectiveness of the two methods brings into relief the marked difference in the time factor (30 minutes versus 15 seconds) and the comparatively small difference in temperature—a 120-fold increase in time at the 145° temperature being necessary to achieve substantially the same bactericidal effect as is obtained by a 16 to 17

* Presented at the joint annual meeting of The International Association of Milk Sanitarians and New York State Association of Dairy and Milk Inspectors, New York, Oct. 18, 1940.

degree elevation in temperature through the 145° to 162° range. The obvious purpose of this single comparison is to emphasize the fact that in considering pasteurization specifications, the primary and basic bactericidal element is temperature within a recognized lethal range, time being the secondary or variable factor.

EXPERIMENTAL DATA WITH ELECTRO-PURE EQUIPMENT

If it were possible to integrate and segregate for controlled experimentation and detailed study, the effects of the temperature component at substantially zero time, it is quite probable that many of our present concepts concerning the heat treatment of milk would undergo substantial revision. It now seems that the most rational approach to the realization of such an integrated plan of investigation lies in the use of electrical energy. The application of this principle as employed in the Electro-Pure Pasteurizer exemplifies a significant achievement and a distinctively new departure* in milk heating methods. The usual or standard operation of the equipment raises the temperature of milk about 35° F. within a period estimated to be about 6 to 8 seconds during passage between the electrodes. This increment of temperature is superimposed upon the temperature of the milk at the time it reaches the electrode chamber, previous heating being accomplished by other than electrical means. Following the final heating phase the milk may be passed through holding tubes, a regenerative system or direct to the final cooling, depending upon established operating conditions or the requirements of a predetermined plan of procedure. Extended experience with this equipment in our laboratories has revealed a remarkedly flexible and mechanically satisfactory functioning apparatus for investigational purposes, wherein it is possible to establish and maintain or duplicate a wide range of time-temperature relationships synchronized with rapid, slow, or integrated rate of cooling as particular conditions may demand.

One of the initial objectives of our work was to establish representative bacterial reduction curves based upon variable operating temperatures and at exposure periods capable of attainment by minor modifications in the operation of the Electro-Pure Apparatus. For this purpose, substantial quantities of mixed raw milk from a grade "B" territory were processed daily for a period of some weeks. Such milk was subjected to a series of processing temperatures varying from 162° to 205° F. with a constant holding time of 15 seconds. Parallel runs were made through a temperature range of 175° to 205° F. without subsequent holding or passing through the regenerator, the hot milk from the electrode chamber passing directly through a minimum length of pipe to a brine-cooled surface cooler. All platings were made in triplicate with Bacto Tryptone Glucose Extract Agar with incubation at 37° C. The percentage reduction curves plotted from the massed average of all comparable results are shown in Chart I.

These characteristic curves illustrate the comparative bactericidal effect of high temperatures momentarily applied to raw milk of average bacterial quality. It is to be recognized however, that the time component contributing to these results is a definitely measurable one, in fact an appreciable number of seconds is involved in the interim between the time the unheated raw milk enters the system until the temperature is again reduced to a point below non-lethal effectiveness. Notwithstanding elimination of the arbitrary 15-second holding period a measurable time interval is involved in all comparisons, hence the results cannot be strictly interpreted as due to a given lethal temperature instantaneously applied. It will be noted however, that the curve for the milks not subjected to the 15-second holding period is of the same character and substantially of the same order of magnitude as was obtained for the held milk. This relationship is interpreted as

* Note by the editor—An earlier form of this equipment was successfully operated for many years.

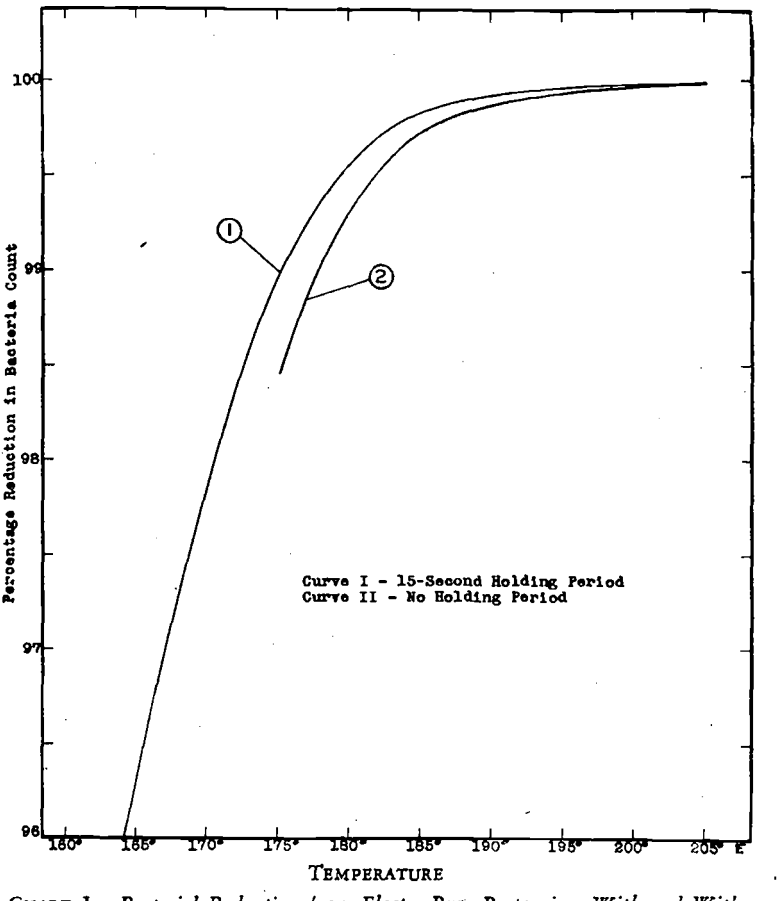

CHART I. *Bacterial Reduction from Electro-Pure Pasteurizer With and Without 15 Second Holding Period.*

prima facie evidence of the dominating bactericidal role of the temperature component even in this process wherein the time has been reduced to the minimum required for passage of the milk through the essential elements of the equipment.

Even though a consistent percentage reduction in bacterial count of 99 percent or more may be obtained at temperatures of 180° F. and above momentarily applied, it cannot be assumed that there is a continued commensurate increase in lethal effectiveness with increasing temperatures. It will be observed that the bactericidal efficiency of increasing temperatures at constant time shows substantially a straight line relationship between about 162° and 180° F. - 182° F., falling off rapidly at higher temperatures with approach to near constancy beginning at about 190° F. Only an insignificant gain in bactericidal effectiveness is obtained through the 190° to 205° F. temperature range. More than 90 percent of the individual samples showed counts below 1,000 per ml., and a substantial majority had less than 500 per ml. irrespective of whether a 15 second holding time or no holding time prevailed.

EFFECT OF HIGH TEMPERATURE ON FLOWING FILM

Since the particular purpose of this paper is to present the results of certain

developmental work designed to determine the effects of elevated temperatures applied to milk for a minimum time, it is desirable to present further evidence illustrating the results obtained by projecting heat radiations on the free interface of a flowing milk film of controlled capacity and flow characteristics. Briefly, the procedure involved the establishment of a smooth flowing film (6) over a vertical surface of stainless steel provided with a water jacket for maintaining the solid-liquid interface at any desired temperature and impinging radiant heat uniformly on the film during a given distance of travel, the milk being instantly cooled to a non-lethal temperature by continuing the flow of the film over an appropriate cooled surface. Numerous data have been obtained showing that the bacterial reduction in milk heated to a given temperature by this means is measurably greater than when certain other methods are employed even though such alternative methods may involve longer periods of exposure at the same temperature. The curves plotted in Chart II, derived from the massed averages of a number of determinations, will serve to illustrate the results mentioned.

Curve 1 is a typical percentage reduction curve obtained from milk treated in the Electro-Pure Apparatus at temperatures from 162° to 185° F. with a 15-second holding period. Curve 2 is the percentage reduction curve obtained by subjecting the Electro-Pure treated milks to a second heat treatment by the irradiated film method wherein the measurable temperature of the irradiated films did not exceed 162° - 164° F. The temperature of the milk at the point of origin of the flowing film was 70° F., the temperature rise to 162° - 164° F. being accomplished during the course of a 50 inch travel distance and an exposure period of 5 to 6 seconds.

The significance of these data is obvious from the difference in the character of the curves. The greater percentage reduction in the milk subjected to the sequence of heat treatments both at 162° F. is not due to the multiple heating at this temperature because a succession of two heat treatments in the Electro-Pure Apparatus at the same temperature showed substantially no greater reduction in count resulting from the second treatment. The tangential convergence of the two curves is interpreted as evidence of higher lethal temperature at the interface of the heat irradiated film than was susceptible of measurement by ordinary means. The horizontal curve for the film-treated milks and the intersection of this curve with that from the once-heated Electro-Pure-treated milk at a temperature of about 185° F. indicate that the lethal effectiveness of the heat radiations applied to the free interface is equivalent to a processing temperature of 185° F. with a 15 second holding period.

The data presented have been concerned with the bactericidal effects of varying time measurable in seconds, and temperatures through the 162° - 205° F. lethal range. The observations concerning creaming properties and flavor characteristics of the milks subjected to the various treatments may be summarized as follows. The Electro-Pure-treated milk processed at 175° and above with a 15-second holding period showed a distinctly cooked flavor increasing in intensity with increase in temperature. Elimination of the normal 15-second holding period decreased the intensity of this characteristic flavor, but it was nevertheless distinguishable at operating temperatures of 180° to 185° F. and above. Creaming properties were not significantly diminished at an operating temperature of 162° F. with a 15-second holding period. Measurable diminution in cream line was observed at a temperature of 164° - 166° F., rapidly decreasing with higher operating temperatures; at

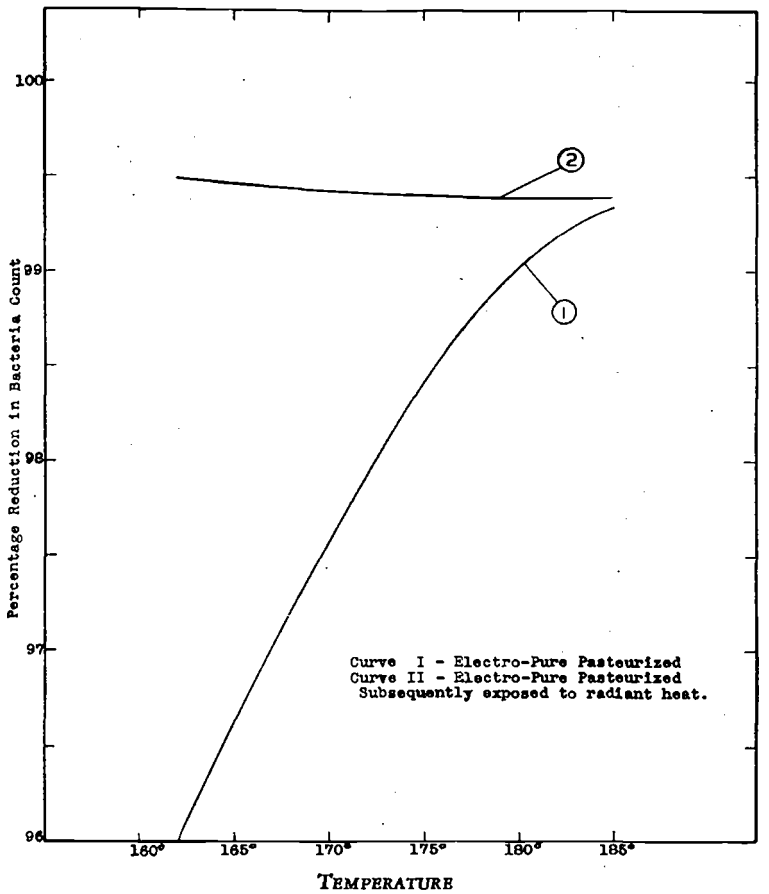

CHART II. *Bacterial Reduction in Electro-Pure Pasteurized Milk Subsequently Exposed to Radiant Heat.*

174° - 175° F. cream line was substantially non-existent.

A resume of the foregoing evidence shows that the dominant bactericidal factor in short-time pasteurization is the temperature component. The lethal effectiveness of elevated temperatures at a constant time of only a few seconds increases in a straight line relationship up to a temperature of about 180° - 185° F., efficiency falling off rapidly at higher temperatures. The time element is seemingly of major influence in development of the characteristic cooked flavor and destruction of creaming properties, whereas, the elevated temperature within the lethal range under consideration is the particular dominant component contributing to the bactericidal results observed. These deductions would seem to aid in clarifying the applicability of certain fundamental principles which are important in formulating ideal specifications for the heat treatment of milk. Such specifications hypothetically embodied in an operable process might be defined substantially as follows: A method wherein milk is subjected to lethal temperatures up to but not exceeding 185° F., the time of exposure during elevating and lowering of the temperature within the lethal range not exceeding about 5 sec-

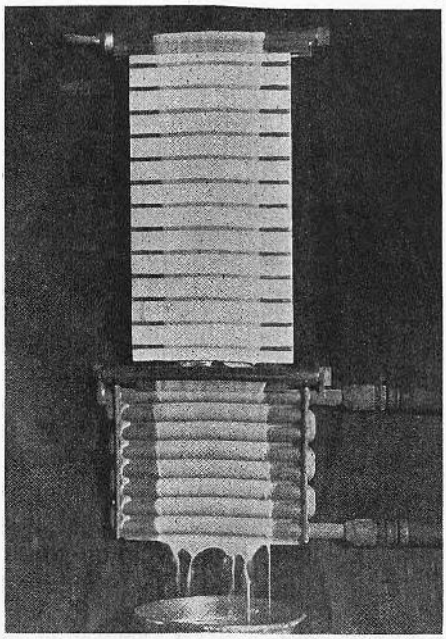

FIGURE 1. *Flowing Film Electric Pasteurizer and Aerator (Single Unit Assembly, Supplee-Jensen Method).*

ing they meet the following general requirements: They must not corrode or induce significant electrolysis; there should be no significant accumulation of oxide or salts as the result of electrolysis; and they must possess sufficient conductivity to prevent heating while carrying the required current. Pure tin or pure nickel electrodes have been found satisfactory for certain current frequencies but not for others. A 50,000 cycle current has been used almost entirely during the development of the method and for the experimental work reported at this time. It has been determined however that other current frequencies may be employed with suitable electrode material.

The heating elements may be used as single or multiple unit assemblies depending upon whether it is desired to reach a given maximum temperature in a single heating stage without interruption and redistribution of the film, or whether a slower multiple stage heating rate is desired. A number of small model units have been constructed during the course of development and study of the merits and limitations of the method. Ceramic units have proved to be highly satisfactory and at this point we wish to acknowledge the cooperation extended by the General Ceramics Company for the time and expense incurred in perfecting the fabrication of these units. The accompanying Figures 1 and 2 show small scale models of a single and double unit assembly in operation. The raw milk is applied through the slotted film-forming member at the top and flows across the electrodes under the influence of gravity. The heat generating current is confined to a 15 inch distance between the two extreme electrodes. In the single unit assembly raw milk is introduced at a temperature

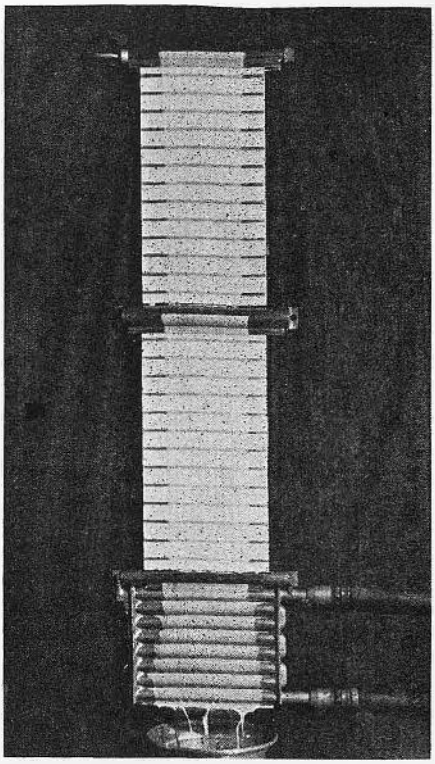

FIGURE 2. *Flowing Film Electric Pasteurizer and Aerator (Double Unit Assembly, Supplee-Jensen Method)*

of 60° - 65° F. At the end of the 16 inch flow it has reached a temperature of 185° F.; dropping immediately to the cooled surface, its temperature is reduced to 42° F. at the time it leaves the cooler.

EXPERIMENTAL OPERATING DATA

The equipment offers considerable latitude in the choice of temperature and flow rates but in simplifying the presentation of significant data, only a single operating condition will be discussed. A flow rate of 4 ounces per inch per minute flowing over a heating unit 16 inches long will be used as the basis of calculation. The velocity of the milk film during a 16 inch distance of travel with concurrent progressive rise in temperature is difficult to determine because elevation of the temperature causes a decrease in the thickness of the film and a corresponding increase in rate of travel. Other factors being constant, the velocity with which a liquid passes down a vertical surface is inversely proportional to the viscosity of the liquid. Taylor (7) has shown that the viscosity-temperature relationship for milk obeys Poiseuille's law, which is expressed by the following equation:

$$Nt = \frac{No}{1 + \alpha t + \beta t^2}, \text{ where}$$

Nt=viscosity at any temperature, t (degrees C.)

No=viscosity at 0° C.

α and β are constants for milk, respectively 0.00723 and 0.000156.

Calculated relative viscosities for milk at various temperatures were made as the basis for determining the velocity, 8 inches from the point of origin, of flowing films; these calculations are shown in Table 1. The amount of heat generated within the film by the passage of the electric current, determined by appropriate calculations, shows that the heat developed is directly proportional to the time the current flows through the milk. Since the electrodes are connected in parallel the difference in potential is constant throughout the length of the heating area. Accordingly, if the conductivity of the milk were constant throughout the course of travel twice the amount of heat would be developed while traveling one inch at 65° F. as is developed during the same distance at 165° F. However, since the conductivity changes with the temperature this fact must be taken into account. It is well agreed that a large part of the conductivity of milk can be ascribed to the chloride ion, therefore, the established data correlating conductance of this ion with variations in temperature may be used as a basis of reference for further calculations. Such calculations show that the amount of heat developed per unit of flow distance is constant. The influence of the accelerating force of gravity operable on the flowing film progressively heated is difficult to calculate. It is estimated however, that the comparative influence of this factor at the medium distance of travel (8 inches) and at the end of the flow distance (16 inches) is in the ratio of 1 to 1.2. Hence, only slightly more than half of the heating is accomplished on the upper half of the unit.

TABLE 1

Relative Viscosity and Rate of Flow of Milk Films at Various Temperatures.

Temperature F°	Temperature C°	Relative viscosity	Time to travel 1 inch (8 inches from origin) (seconds)
32	0	1.0	0.24
65	18.3	0.845	0.20
83	28.3	0.75	0.18
105	40.5	0.65	0.16
115	46.1	0.62	0.15
145	62.8	0.48	0.13
165	73.9	0.42	0.10
185	85.	0.36	0.09

In applying these rather extended and complicated calculations for establishing a final value which expresses the time period during which the milk is exposed to a lethal temperature between, for example, 145° F. and 185° F., it is found that this value is between 0.7 and 0.8 second. This value is applicable when

a single unit assembly is used with milk entering the apparatus at 65° F. and leaving the heating element at 185° F. If a film-forming member is employed for spreading the hot milk on the contiguous cooler, a slight retardation in the continuity of the film flow will result, thus increasing the exposure period to a slight degree. When multiple heating assemblies are employed, the current input may be so regulated as to raise the temperature through any desired range on individual units. Such variations may be employed to extend the exposure during a given or pre-determined temperature range. For example, if a three unit assembly is employed and operation so adjusted that the milk goes to the third heater at 145° F. and passes therefrom at 185° F., the exposure period in this temperature range will be approximately 1.8 seconds.

This milk-heating method and equipment have been used extensively for a wide variety of comparative studies designed to determine the bactericidal and other effects resulting from varying conditions of operation at lethal temperatures for the nearly instantaneous exposure periods mentioned. One of the most consistent and outstanding results is the remarkably high retention of the fresh raw milk flavor. The characteristic heated-milk flavor defect is practically undetectable at operating temperatures of 185-186° F. This characteristic flavor can be detected by experts at an operating temperature of 190° F. but is not as pronounced as is frequently found in milk pasteurized by the usual methods. At operating temperatures of 185° F. and lower, improvement in the flavor is noted very frequently, depending upon the general quality of the raw milk processed. This improvement is no doubt due to the marked aeration effect at the elevated temperatures which facilitate the dispelling of absorbed flavors and odors and a considerable proportion of the dissolved oxygen. The aeration effect is achieved without concurrent development of the cooked flavor even at the critical operating temperature of 185° F.

Average bactericidal results from typical comparative groups and specimen examples chosen at random are shown in Table 2. Seventy-six percent of all milks exposed to 180° F. and above have shown a percentage reduction in bacterial count in excess of 99 percent, and 56 percent of the milks had a final count following cooling of 1,000 bacteria per ml. or less. Mixed commercial milk from grade "B" territory was used, and all platings were made in triplicate with Bacto Tryptone Glucose Extract Agar with incubation at 37° C.

PHOSPHATASE REACTIONS

In order to correlate operating temperatures with the phosphatase test response, various lots of commercial raw milk were processed at temperatures ranging from 163° F. to 186° F. The bacteria counts of the raw milk ranged from 65,000 to 1,195,000 with an average of about 700,000 per ml. The data were accumulated over a period of about six weeks and involved numerous samples subjected to each temperature. Duplicate or triplicate subsamples were taken during the course of each run and each of these subsamples subjected to the phosphatase test (8) (9) (10); bacteria counts were determined on Tryptone Glucose Extract Agar medium. Variations in temperature from the average operating level did not exceed about 3°. (A representative temperature chart obtained with a sensitive and rapid acting recorder, from the film as it leaves the heating unit, is shown in accompanying Figure 3. Inasmuch as no automatic temperature regulating mechanism was used with the equipment nor was any attempt made to regulate the flow of current to the equipment, it is believed that the major variations may have been due to surges in the feed line voltage.) The average or mean operating temperatures for which the data were obtained were 163°, 173°, 177°, 181° and 186° F. The phosphatase test results and the percentage reduction in bacteria counts are shown graphically in Chart III. It will be noted that there is a definite correlation between the operating temperature and the phosphatase test

TABLE 2

Typical Bacterial Reduction in Milk by the Flowing Film Electric Pasteurizer and Aerator

Bacteria per ml. of raw milk	Film flow rate (oz/in./min.)	Temp. on heating unit (degrees F.)	Bacteria per ml. after treatment	Percent reduction
297,000	1.62	161	4900	98.35
"	"	170	700	99.76
"	"	180	200	99.93
2,304,000	"	180	190	99.99
436,000	"	185	20	99.99
302,000	"	180	200	99.94
236,000	2.64	161	4800	97.96
"	"	170	950	99.60
"	"	180	600	99.74
"	"	190	110	99.95
5,888,000	"	170	2900	99.95
"	"	182	700	99.99
720,000	"	160	14400	97.99
"	"	171	2200	99.69
66,000	"	182	100	99.85
184,000	3.6	161	2300	98.75
"	"	170	2100	98.85
"	"	180	1000	99.45
"	"	190	200	99.89
39,000	"	162	350	99.10
"	"	170	100	99.74
"	"	186	75	99.81
30,000	"	184	850	97.16
44,500	"	185	1300	97.00
120,000	5.0	161	2800	97.66
"	"	170	1600	98.66
"	"	180	1200	99.00
"	"	190	150	99.87
1,092,000	"	162	44200	96.00
"	"	173	11200	98.97
"	"	184	2050	99.81
510,000	"	163	24900	95.11
"	"	173	7100	98.43
"	"	186	2000	99.61
91,000	"	186	3900	95.71
35,000	"	185	660	98.11
775,000	"	186	2100	99.72
1,100,000	"	185	3200	99.50
160,000	"	185	2400	98.50
222,000	"	184	1100	99.50
100,000	"	180	1300	98.65
82,000	"	180	700	99.14

response. Individual phosphatase test values fluctuated to the greatest degree at the 173° F. operating level, varying from 0.03 to 0.15. At 177° F. the values varied from 0.00 to 0.09; about 70 percent of the samples were classified as "satisfactorily pasteurized" and the remaining 30 percent as "slightly underpasteurized." At the 181° operating temperature and above, 100 percent of the samples were classified as "satisfactorily pasteurized," no phosphatase values showing in excess of 0.04 and the great majority showed values of 0.02 and 0.03. All samples treated at 163° F. showed values of 0.15 and above and were accordingly classified as "grossly underpasteurized." Detailed analysis of the data from individual samples as well as inspection of the graphs in Chart III indicate that milk subjected to 177° F. and above for the short exposure inherent in

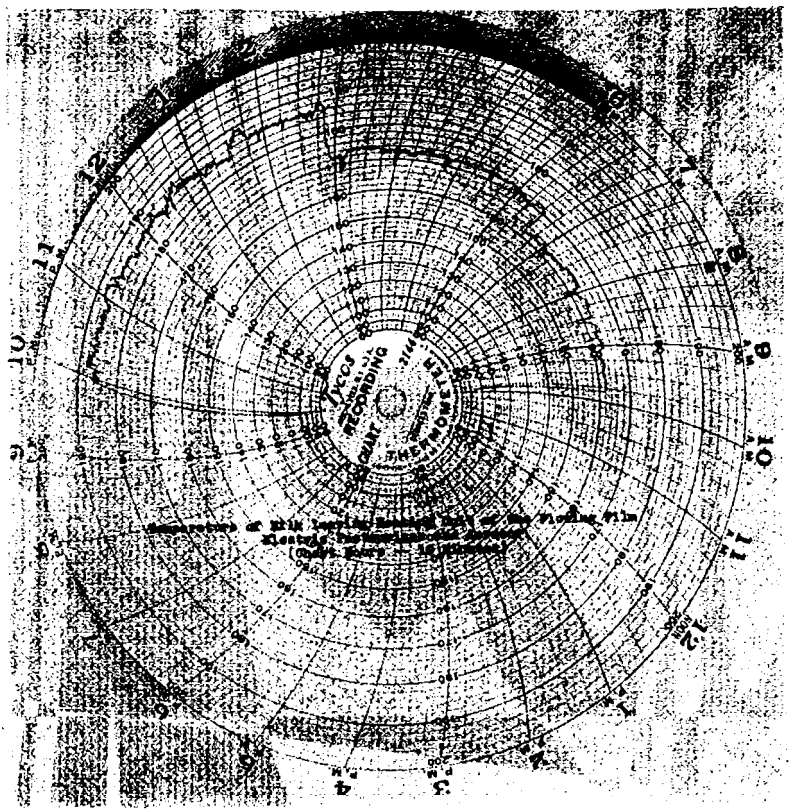

FIGURE 3. *Temperature Record, Flowing Film Electric Pasteurizer 186°, 173° and 163° F. (No Automatic Control).*

this method would be classified as "satisfactorily pasteurized," according to the phosphatase test. The percentage reduction in bacteria counts through the same temperature range being from about 96 percent to in excess of 99 percent. Milk subjected to temperatures of 173° F. to 177° F. would be classified as "slightly under-pasteurized;" temperature treatment immediately below 173° F. would be designated as "under-pasteurized" and as "grossly under-pasteurized" if the temperature is 163° F. or lower.

EFFECT ON CREAMING

The creaming properties of milk subjected to the elevated temperatures for momentary exposure periods posible of attainment by the electrically heated film method are retained to a comparatively high degree. Chart IV shows in graphical form the comparative reduction in cream line of the treated milk subjected to temperatures ranging from 160 to 190° F. The percentage reduction is computed on the basis of the depth of cream line obtained from the same lots of raw unheated milk. Reduction in cream line progresses from about 6 percent to 20 percent through the temperature range 160° F. to about 180° F. Creaming properties are destroyed most rapidly per degree increase in temperature through the 185° - 190° F. range.

SUMMARY

Since the various data and phases of the work reported herein have been discussed and correlated as presented, an exhaustive resume of the results does not

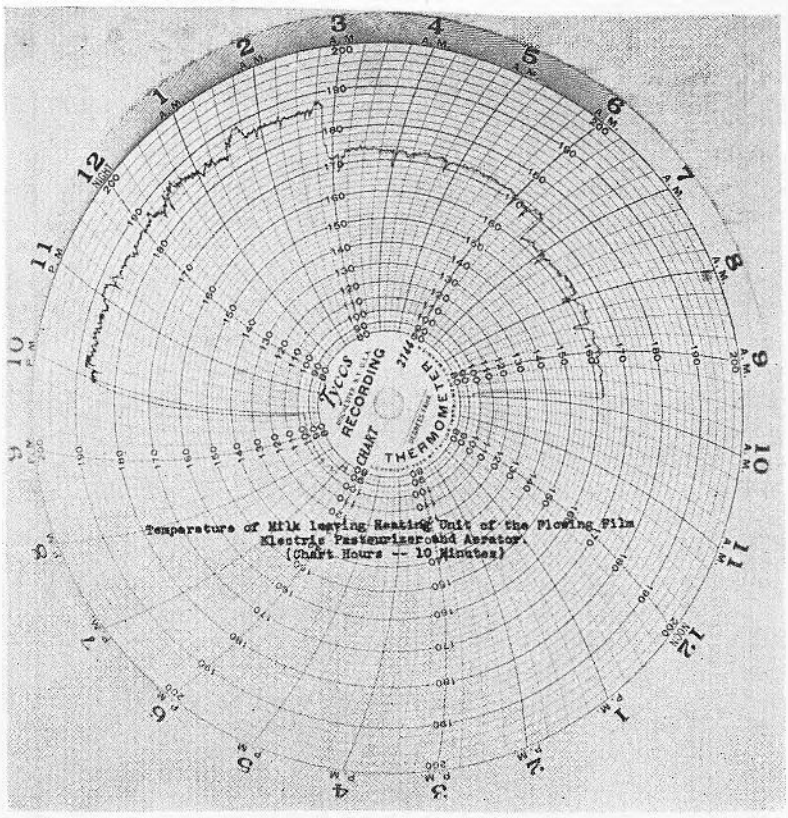

FIGURE 3. *Temperature Record, Flowing Film Electric Pasteurizer 186°, 173° and 163° F. (No Automatic Control).*

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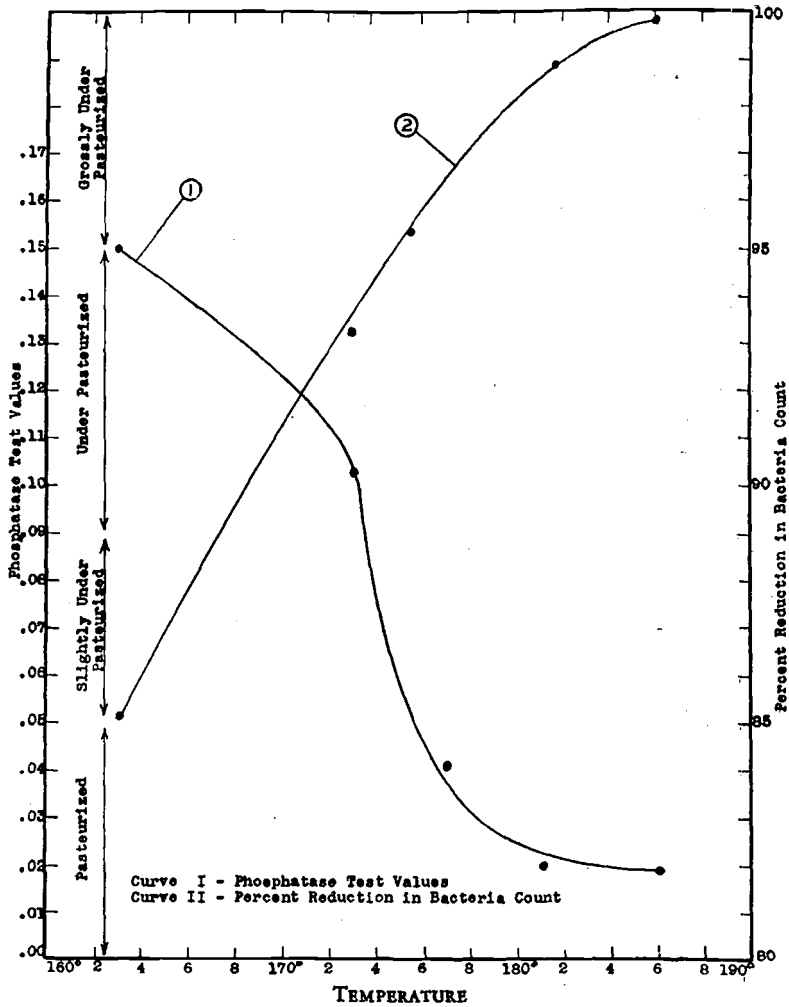

CHART III. *Phosphatase Test Correlated with Temperature (Flowing Film Electric Pasteurizer, Supplee-Jensen Method.)*

seem necessary. Therefore, in concluding this presentation attention is directed particularly to the evidence which seemingly establishes the significantly high bactericidal effectiveness of elevated temperatures for momentary exposure periods as short as 0.8 second within the lethal temperature range of 145° - 185° F. Bacterial destruction during this substantially instantaneous exposure period is equal and even in excess of that usually obtained by the established milk pasteurization methods. These results are accomplished with maximum retention of the flavor characteristics and physical properties of raw milk, flavor being frequently improved due to the aeration effect at the elevated temperature. The developmnt of the method which has made possible this integrated study of the heat treatment of milk is based upon the principle of electric heating wherein heat is generated within a predetermined area of a continuous flowing film. The adaptability of the essential features of the apparatus and method for the con-

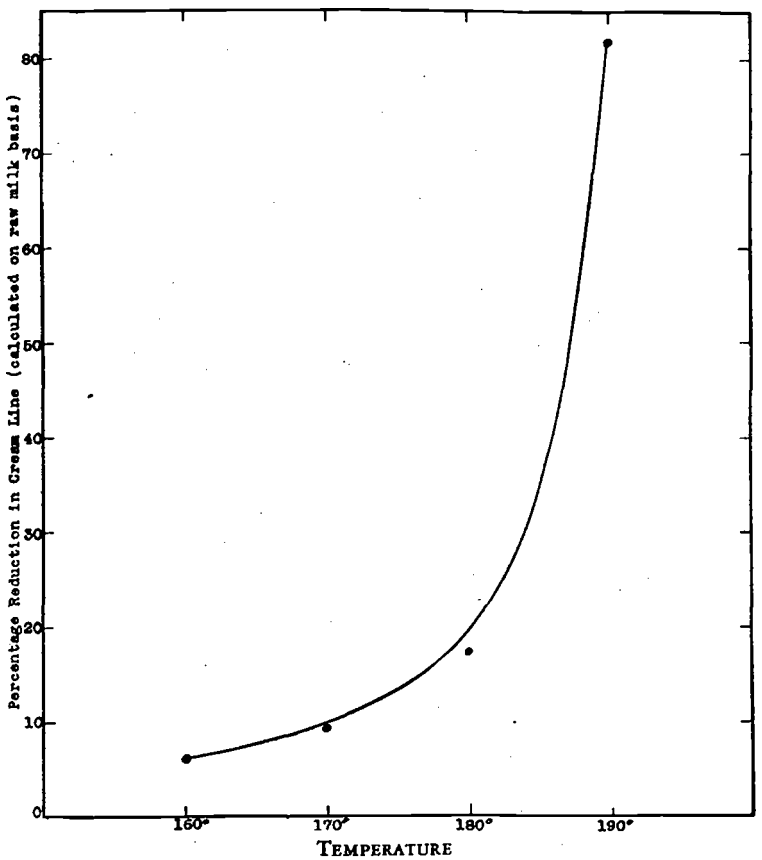

CHART IV. *Cream Line as Affected by the Flowing Film Electric Pasteurizer and Aerator (Supplee-Jensen Method).*

tinuous pasteurization of milk and other fluids is indicated by the evidence now available.

REFERENCES

(1) Smith T. *Jour. of Expt. Med.*, 4, 233 (1899).

(2) Russell, H. L., and Hastings, E. G. Wis. Agr. Expt. Sta. 17th Ann. Rept., p. 170 (1900).

(3) Rosenau, M. J. "The Milk Question," Houghton-Mifflin Co., New York, p. 95 (1912).

(4) North, C. E. Chart Time and Temperature for Milk Pasteurization (1912).

(5) North, C. E. and Park, H. *Am. Jour. Hyg.*, 7, 147 (1927).

(6) Supplee, G. C. and Dorcas, M. J. *Jour. Dairy Sci.*, 17, 433 (1934).

(7) Taylor, H. B. *Jour. and Proc. Royal Soc. New South Wales*, 47, 174 (1913).

(8) Gilcreas, F. W, and Davis, W. S., 25th Ann. Rept. Inter. Assoc. Milk Sanitarians, p. 15, (1936).

(9) Gilcreas, F. W. and Davis, W. S., 11th Ann. Rept., N. Y. State Assoc. Dairy and Milk Insp., p. 83 (1937).

(10) New York State Dept. Health, Div. of Labs. and Res., Form 18-A, 17-A-4170 (1939).

A Simplified Procedure for the Laboratory Examination of Raw Milk Supplies *

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VALUE OF BACTERIOLOGICAL EXAMINATION

In milk quality control work, the sanitarian is interested in employing only those tests which will be reliable guides in selecting wholesome, good flavored milk, and in eliminating milk supplies of inferior quality. He needs a procedure which will supply the most information regarding the probable causes of the inferior quality so that he may be of help to the producer in correcting the defects. Moreover the test itself must be sufficiently simple and inexpensive to permit its routine use in examining the hundreds of raw milk supplies coming into a plant. It has been the purpose of this study to work out a reliable procedure which would meet the above requirements.

The undue emphasis which has been placed on the total bacterial count of raw milk without consideration of the types of micro-organisms present and their sanitary significance has sometimes resulted in eliminating from the supply clean, wholesome milk, merely because of insufficient cooling, and selecting instead efficiently cooled milk which has often been produced under rather unsanitary conditions. The true sanitary quality of milk has often been obscured by effective cooling when the measure of quality rests entirely on bacterial count on the raw milk.

It has been shown that the milk from different farms varies greatly in pasteurization efficiency and that, in general, more careful methods in milk production result not only in lower initial counts but also in higher pasteurization efficiencies (5).

Because the presence of excessive numbers of thermoduric organisms has been found to correlate well with unsanitary production practices, laboratory pasteurization of raw milk has proven a most useful test (1, 6, 9). Almost invariably follow-up work in the field reveals faulty production practices on those farms supplying milk which shows abnormally high pasteurized counts. That the laboratory pasteurization test reveals unsatisfactory milk supplies which are given a clean bill by the methylene blue reduction test has been shown (12). Likewise, direct microscopic counts and standard agar plate counts are unreliable in detecting thermoduric bacteria in raw milk supplies.

It would appear, therefore, that the laboratory pasteurized count is a sounder basis for judging the true sanitary quality of a milk supply than is the total count on the raw milk. It has been suggested (3, 13) that, where milk is paid for on the basis of sanitary quality, the pasteurized count be the basis of payment of the premium rather than the raw count. In view of the fact that the standard plate count of pasteurized bottled milk is still the criterion by which sanitary quality is judged, this suggestion appears to be a logical one. A milk which gives a raw count of 100,000 per cc. may be considered a relatively low count milk, but if after pasteurization the count is still between 75,000 and 100,000 as is frequently the case, when thermoduric contamination is high, this milk must be considered a high count milk. From the standpoint of the milk distributor whose bottled product is judged on the basis of

* Presented at the joint session of the Laboratory and the Food and Nutrition Sections, 69th Annual Meeting American Public Health Association, Detroit, Michigan, October 10, 1940.

its bacterial count, a milk with such poor pasteurizability is definitely unsatisfactory.

Laboratory pasteurization of individual shipper samples is a simple procedure which requires very little time when properly organized. The time required to make plate counts on the pasteurized samples is considerable, however, and it was this phase of the work that required simplification.

The use of a standardized loop to measure the 0.01 cc. or 0.001 cc. of milk for plating obviously saves time, particularly in preparation work, by eliminating the dilution blanks and pipettes. Both the Burri quantitative smear culture technique (2), which has been applied to milk and dairy products (4, 7, 8) and the multiple streak plate (11) which has been used for milk, employ the loop measurement technique. Certain disadvantages, however, in these two methods which involve surface smearing of the agar were thought to be rather serious. Unless the agar has been permitted to dry down considerably, difficulty is encountered with spreaders and with coalescence of colonies, making counting on many samples highly inaccurate or entirely impossible. Furthermore, it is not always convenient to keep on hand sufficient slants or agar plates that have been held from two to four days to dry down properly.

DESCRIPTION OF METHOD

A procedure which, in our hands at least, has proved better than either of the above procedures is the use of the oval culture tube in which a standard loopful of milk is mixed with sterile melted agar and then slanted in a thin layer. This procedure eliminates the need of conditioning the agar surface, almost entirely eliminates spreaders and the coalescence of surface colonies, and permits of easy counting. The details of the procedure are as follows:

After a 5 cc. sample of milk in a screw-capped test tube has been laboratory pasteurized at 143° F. for 30 minutes in a constant temperature bath and cooled, it is vigorously shaken fifty times. (In order to save time, a group of tubes may be shaken at once.) This extra shaking largely compensates for the breaking up of clumps normally obtained by diluting and shaking the diluted sample in the course of plating. The data in Table I, obtained by including this extra shaking step, show that there is good agreement between the oval tube counts and the standard plate counts. On the other hand, when the extra shaking was omitted, other factors being kept the same, the oval tube counts were considerably lower than the plate counts.

With the standard loop (usually the 0.001 cc., occasionally the 0.01 cc.), a loopful of the milk sample is transferred to the oval culture tube containing approximately 4 cc. of sterile, melted tryptone-glucose-extract agar which has been previously sterilized and cooled to 45° C. The loop is moved back and forth through the agar so as to insure the removal of all the milk from the loop. The mixture of agar and milk is then shaken by swinging the tube back and forth through a small arc for a period of about 5 seconds. The tube is then laid on the table with the open end of the tube resting on a strip of wood or metal $\frac{1}{8}$ inch in thickness so that the tube is slanted sufficiently to permit the agar to flow to a point $2\frac{1}{2}$ to 3 inches from the bottom of the tube. When the agar has solidified, the tube is placed in a special wire rack in a horizontal position and inverted so that the agar is adhering to the upper side of the tube. The tubes are incubated at 36° - 37° C. for 48 hours, and the colony counts made in the usual manner by placing the tube over a well lighted colony counter. It is advisable not to disturb the tubes during the incubating period, since handling the tubes may cause condensed moisture to run down on the surface of the agar and increase the tendency for the formation of spreaders. (See illustrations in Fig. 1 to 5 inclusive).

The oval tube which has proven most satisfactory is the Pyrex oval culture tube without the indent. This tube is 152 mm. in length, and the two diameters of the tube are 23 mm. and $11\frac{1}{2}$ mm.

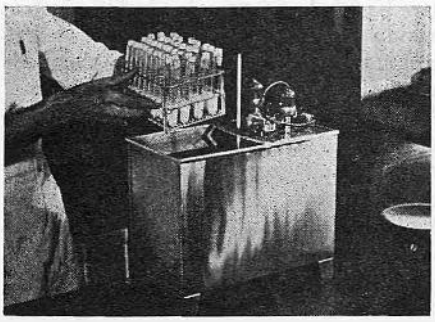


FIGURE 1
Laboratory Pasteurization of Milk Samples. Showing constant temperature bath and rack holding 40 tubes of milk.

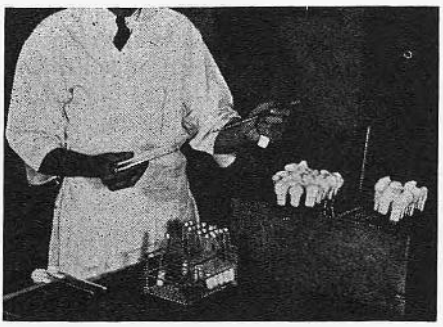


FIGURE 2
Inoculation of Oval Tube with Pasteurized Sample. Showing tempering bath holding tubes of melted agar at 45° C., rack of pasteurized samples, and tubes being slanted.

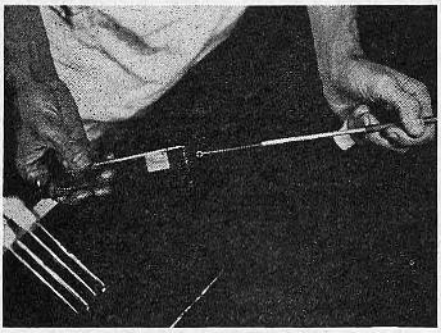


FIGURE 3
Inoculation of Oval Tube with 0.01 cc. of Pasteurized Milk.

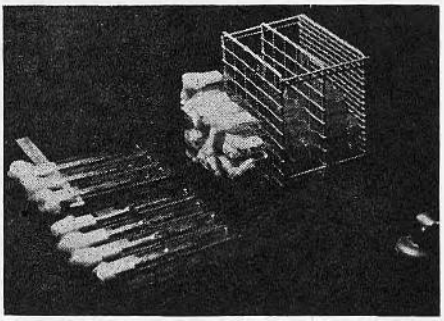


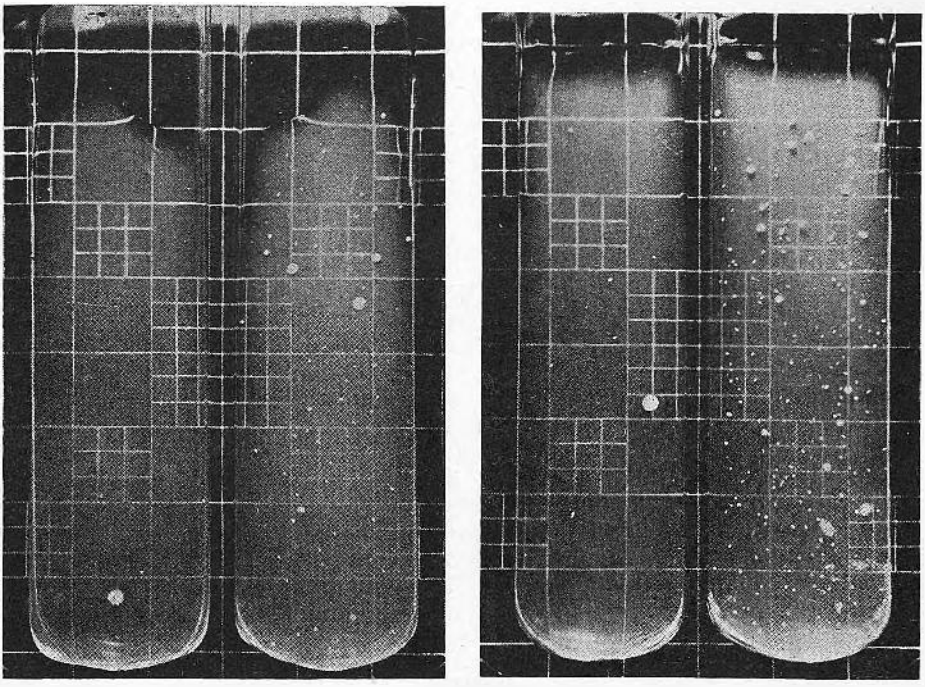
FIGURE 4
Oval Tubes Ready for Incubation. Showing plain and indented types of oval tubes and rack for holding 40 tubes.

Photographs by Fred C. Ward, Sealtest Inc., Baltimore, Md.

respectively. This tube was finally adopted for most of the work for the reason that it is easier to inoculate and easier to clean than a tube with an indent. However, an oval tube with an indent located at the middle of the tube proved to be satisfactory and has the advantage of giving an agar layer of uniform thickness and eliminates the necessity of slanting the tube.

An oval tube having a round neck and mouth has been described for use in making anaerobic counts (10). This tube was designed to facilitate plugging. We found, however, that by employing a reinforced cotton plug, the difficulty of plugging the oval tube was largely eliminated. This plug was made by simply placing a strip of folded aluminum foil on the cotton and folding the cotton around the foil. When this strip of cotton with the foil core was folded in the middle and pushed into the oval tube, it was easily removed and replaced. These plugs can be used repeatedly, if care is exercised when putting the agar in the tube to avoid smearing agar on the lip of the tube.

The loop employed was a platinum-rhodium welded loop having a 3 inch shank and mounted in the end of a piece of aluminum wire, B. & S. gauge No. 5. The loop is standardized so as to hold 0.01 cc. or 0.001 cc., as the case



1 2 3 4

FIGURE 5.

Oval Tubes after Incubation (actual size)

1 & 2—Plain oval tubes (without indent) showing low and high counts, respectively.
3 & 4—Indented oval tubes showing low and high counts, respectively.

Photographs by Fred C. Ward, Sealtest Inc., Baltimore, Md.

may be, when the loop is drawn vertically from the surface of the milk. Obviously, the loop should not be immersed more than 2 to 3 mm. in order to avoid carrying milk on the shank of the loop. When transferring the loopful of milk to the agar in the oval tube, it was found that this is made easier if the longer diameter of the tube is held parallel to the line of vision. If the loop is held in the hand in such a manner as to avoid undue tension and the loop turned so that the plane of the loop is parallel to the long diameter of the tube, no difficulty is encountered in inoculating the milk into the agar in the oval tube. An inexperienced worker may have difficulty at first in keeping the loop from touching the side of the tube, but this is readily overcome, with a little practice.

It is always desirable, but especially so when using the slanted tube, to keep the tube of sterile melted agar immersed in the 45° C. bath well up above the middle of the tube. This eliminates the condensation of moisture on the tube which is sometimes troublesome when slanting the tube.

We chose to use the tryptone-glucose-extract agar without added skimmilk, for the reason that our results with standard agar plates, as well as with oval tubes had shown that the addition of 1 percent skimmilk exerted a negligible effect on the count and merely was troublesome. The skimmilk makes the medium more turbid and occasionally precipitates are formed. However, the complete TGEM medium may be used if desired, with satisfactory results.

After we were convinced that the above procedure for the examination of raw milk supplies had merit, we tried it as a routine test in 3 different milk sheds in order to obtain milk of varied quality and bacterial flora. Farm inspections were made in conjunction with the laboratory tests in order to obtain data on production practices and condition of utensils and to correlate these data with the laboratory results. Some of the data obtained in these field studies are recorded below.

EXPERIMENTAL DATA

In Table 1 are recorded the counts which were made on a series of laboratory pasteurized milk samples using the oval tube technique in comparison with the standard plate count. The logarithmic averages of the two sets of counts are so close that the difference is of no significance, 1879 being the average for the standard plate counts and 1816 being the average for the oval tube counts. It may be seen also that the differences on the individual samples between the oval tube count and the standard plate count are no greater than would be expected by comparing duplicate plates on the same sample. The direct microscopic count on the raw milk is included in this table for the purpose of giving some idea of the total bacterial content of the different samples. It is quite apparent from these results that many samples which would be considered satisfactory quality raw milk as judged by the direct count, are far from being satisfactory for pasteurized bottled milk where an attempt is being made to supply pasteurized milk with counts under 5,000 per cc.

Laboratory-pasteurized counts are helpful to the milk plant, not only in locating those producers who are following unsatisfactory production practices, but

TABLE 1

Comparison of Oval Tube Count with Standard Agar Plate Count on Laboratory Pasteurized Milk Samples

Total Bacterial Count of Raw Milk shown by Direct Microscopic Count. (Milk Shed B)

Sample Number	RAW MILK Microscopic clump count per cc. (60 fields counted)	LABORATORY PASTEURIZED MILK Standard agar plate count per cc. TGEM agar	Oval tube count per cc. TGE agar 0.01 cc. loop
1	180,000	100	200
2	10,000	300	200
3	10,000	200	500
4	25,000	200	100
5	<5,000	2,600	2,400
6	<5,000	200	200
7	20,000	2,100	2,200
8	45,000	2,700	2,500
9	15,000	2,800	2,800
10	20,000	1,200	1,400
11	95,000	10,400	10,700
12	10,000	7,700	5,900
13	125,000	4,100	2,900
14	140,000	300	100
15	105,000	58,800	55,200
16	40,000	1,800	1,600
17	195,000	5,400	4,700
18	30,000	2,300	2,200
19	25,000	24,500	21,100
20	65,000	2,600	2,200
21	20,000	8,100	8,700
22	115,000	300	400
23	10,000	2,200	2,400
24	15,000	4,500	3,600
25	40,000	19,200	18,800

TABLE 1
(continued)

Sample Number	RAW MILK Microscopic clump count per cc. (60 fields counted)	LABORATORY PASTEURIZED MILK Standard agar plate count per cc. TGEM agar	Oval tube count per cc. TGE agar 0.01 cc. loop
26	5,000	600	1,000
27	<5,000	700	1,000
28	35,000	16,600	16,000
29	<5,000	100	100
30	70,000	15,300	14,800
31	15,000	300	400
32	10,000	200	300
33	160,000	7,000	6,600
34	10,000	3,300	2,300
35	25,000	400	400
36	10,000	400	400
37	25,000	300	100
38	<5,000	300	100
39	30,000	28,700	26,600
40	5,000	6,500	7,500
41	35,000	6,200	8,500
42	15,000	600	1,000
43	20,000	56,000	54,900
44	15,000	1,400	900
45	200,000	16,200	21,400
46	210,000	1,200	600
47	<5,000	2,700	2,900
48	35,000	35,100	28,900
49	5,000	3,100	4,500
50	10,000	36,200	26,400
51	50,000	36,700	30,600
52	<5,000	39,000	33,400
53	5,000	600	800
54	<5,000	100	200
55	10,000	2,900	2,800
56	30,000	300	500
57	10,000	2,500	2,200
58	40,000	2,500	2,800
59	30,000	1,300	1,800
60	15,000	200	400
61	<5,000	200	100
62	15,000	1,100	2,000
63	10,000	900	800
64	10,000	400	300
65	10,000	15,400	15,000
66	155,000	5,800	6,300
67	50,000	12,400	8,100
68	30,000	19,100	16,600
69	15,000	1,600	1,500
70	25,000	400	200
71	30,000	200	200
72	10,000	500	700
73	15,000	14,000	12,200
74	<5,000	300	400
75	30,000	400	400
76	5,000	900	500
77	<5,000	400	500
	Log Average	1,879	1,816

LT=Less than

also for checking up from time to time to ascertain whether the producer is consistently following the essential procedures of quality milk production.

In one group of 48 producers whose milk was tested, 42 were found to have laboratory-pasteurized counts as determined by the oval tube procedure in excess of 20,000, an arbitrary maximum limit adopted for the particular area, and 6 were below 10,000. Of the 42 producers having counts above 20,000 before inspection, 23 had counts below 20,000 after inspection, and 13 of these 23 had counts below 10,000. Of the 19 producers whose counts remained above 20,000 after inspection, 9 showed substantial reductions in counts. The original 6 low count producers continued to show low counts after inspection.

The data in Table 2 show how with one farm inspection, made with the object of showing the producer how to correct faulty practices, a series of rather high pasteurized counts were reduced to satisfactory levels. That this improvement persisted in most cases without further inspection is indicated by the results of the recheck made 7 to 25 days after the inspection. Obviously, the effect on the count of the pasteurized bottled milk is marked when high contamination with thermoduric bacteria is eliminated, as it was in this group of milk supplies. More careful cleaning of milking machines, elimination of open seam utensils and cans, removal of milk stone and solids accumulation from utensils, and more thorough cleaning of the udder of the cow almost invariably brings about the elimination of thermoduric bacterial contamination. Laboratory pasteurization with the oval tube technique of making the counts is a relatively inexpensive means of frequently checking up on producers and locating those that need the assistance of a field man.

ECONOMY IN MAKING COUNTS BY OVAL TUBE METHOD

Studies made in plant laboratories have shown that three man hours are required to laboratory-pasteurize and make the oval tube counts, including preparation of media and glassware, on 60 samples of milk. This amounts to about 3 minutes per sample, which is no more than the time required to make a direct microscopic count. Certainly more information about the suitability of a milk sample for bottled pasteurized milk is obtained by this oval tube count on a lab-

TABLE 2

Oval Tube Counts on Laboratory Pasteurized Milk Samples Before and After Farm Inspection (Milk Shed C)

Producer Number	Before inspection count per cc.			Immediately after inspection count per cc.	Seven to 25 days after inspection count per cc.
	6/4/40	6/6/40		6/10/40	7/2/40
11-7	98,000	141,000		14,000	10,000
9-3	35,000	14,000		8,000	4,000
9-5	47,000	18,000		14,000	5,000
9-27	64,000	18,000		4,000	39,000
	6/10/40	6/12/40	6/13/40	6/19/40	7/2/40
20-1	5,000	41,000	31,000	3,000	1,000
20-3	18,000	194,000	110.000	4,000	8,000
20-9	154,000	58,000	116,000	10,000	9,000
20-11	42,000	48,000	121,000	13,000	2,000
7-4	60,000	55,000	4,000	3,000	6,000
7-13	190,000	83,000	260,000	12,000	10,000
7-16	135,000	84,000	78,000	13,000	28,000
	6/17/40	6/19/40	6/21/40	6/26/40	7/2/40
3-2	166,000	10,000	82,000	15,000	3,000
3-5	68,000	50,000	59,000	5,000	1,000
3-15	111,000	62,000	71,000	6,000	over 300,000
3-30	200,000	86,000	188,000	2,000	2,000
5-16	62,000	60,000	55,000	5,000	1,000

oratory-pasteurized sample than can be obtained by the direct microscopic count.

When compared with the time required to make a standard plate count on the laboratory pasteurized sample, it was found that the oval tube method made it possible for a man to handle twice as many samples in a given time.

The saving in materials is likewise substantial, especially when it is necessary to examine large numbers of samples. About 1/3 the amount of agar is required, dilution blanks and pipettes are eliminated, and the incubator space required is about ½ that required when using the standard culture dish.

SUMMARY

The use of the loop measurement, oval tube technique introduces considerable savings in time and materials in making the laboratory pasteurization test on individual producer samples. Data are presented showing that this technique gives reliable counts on the pasteurized samples. Examples are presented showing how this procedure of locating producers supplying milk contaminated with thermoduric bacteria may be applied in a practical way in a milk quality control program.

REFERENCES

1. Anderson, E. B. and Meanwell, L. J. Studies in the bacteriology of low temperature pasteurization. I. The significance of heat resisting organisms in raw milk supplies. *J. Dairy Res.* **4**, 213-225 (1933).
2. Burri, R. The quantitative smear-culture: A simple means for the bacteriological examination of milk. Proc. World's Dairy Congress, London, 690-697 (1928).
3. Davies, Ben. Is the pasteurizability of raw milk adequately determined by the standard plate count? Proc. 26th Ann. Conv. Int. Assn. Milk Dealers, Lab. Sec. 59-72 (1933).
4. Hucker, G. J. and Haynes, W. C. Use of agar slants in determining the sanitary quality of milk. *Am. J. Pub. Health* **29**, 651-654 (1939).
5. Hussong, R. V. and Hammer, B. W. The pasteurization efficiencies secured with milk from individual farms. Iowa Agr. Expt. Sta. Bull. 286 (1931).
6. Krueger, P. F. Introduction into Chicago of the high-temperature, short-time method of milk pasteurization. *J. Milk Technol.* 1, (7), 29-33 (1938).
7. Long, H. F. and Hammer, B. W. Examination of butter with the Burri smear-culture technique. *Iowa State Col. J. Sci.* **12**, 441-450 (1938).
8. Long, H. F. and Hammer, B. W. Examination of ice cream with the Burri smear-culture technique. *Ibid.* **14**, 163-178 (1940).
9. Marcus, T. Low bacteria counts in milk with tryptone agar at 32° C. *J. Milk Technol.* **3**, 103-104 (1940).
10. Miller, N. J., Garrett, O. W. and Prickett, P. S. Anaerobic technique—A modified deep agar shake. *Food Research* **4**, 447-451 (1939).
11. Rydzewski, G. S. A new practical qualitative milk test–The Rydzewski standard loop colony count. *The Milk Dealer* **26**, 6, 42-44 (1937).
12. Wainess, H. and Parfitt, E. H. Non-spore forming thermoduric bacteria in milk. *J. Bact.* **40**, 157 (1940).
13. Wickham, A. R. and Widmer, P. D. Thermoduric bacteria: Their control and importance as a basis for payment. *The Milk Dealer* **20**, (7), 60-61 (1931).

The Frozen Desserts Code Recommended by the Public Health Service *

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NEED FOR PUBLIC HEALTH CONTROL OF FROZEN DESSERTS

Of 791 outbreaks of milk-borne disease compiled by Armstrong and Parran (1) from the literature as having occurred in the United States prior to 1928, 36, or 4 percent, were traced to ice cream. All but five of these were outbreaks of typhoid fever. This record is probably far from complete, since only a fraction of the outbreaks is recorded in the literature, but the proportion of the total in which ice cream was incriminated may be considered to be reasonably accurate.

Later information is available from the annual lists of milk-borne outbreaks compiled by the Public Health Service from reports submitted by state and local health officers. Unfortunately, prior to 1934 these reports did not identify the type of milk product involved, but for the 5-year period 1934 to 1938 the 10 outbreaks tabulated in Table 1 are listed as having been conveyed through ice cream, or an average of 2 outbreaks per year. They included 2 of typhoid fever, one of septic sore throat, 4 of gastro-enteritis, and 3 of food poisoning. The ice-cream-borne outbreaks represent 8 percent of the total number reported as conveyed through milk and milk products during that 5-year period.

In view of the lesser public health hazard involved, it is easy to understand why most health departments, with their limited resources and personnel, have devoted less attention to the sanitary control of frozen desserts than to milk sanitation. Nevertheless, a significant health hazard does exist and should be recognized. The ten ice-cream-borne outbreaks reported from 1934 to 1938 involved 252 cases, or an average of more than 50 cases per year. Nor can these reports be considered complete, since in some outbreaks the vehicle is not determined, and many small outbreaks are doubtless not reported or investigated Moreover, the increase in the percentage of milk-borne epidemics traced to ice cream, from 4 percent in the earlier reports to 8 percent in recent years, due probably to increased consumption of frozen desserts, lends added emphasis to the need for greater attention to the sanitary production and control of these products.

The Public Health Service became actively interested in frozen desserts sanitation in 1935 when it was invited by the Memphis health department to cooperate in formulating the Memphis frozen desserts ordinance. As a result of successful experience with the Standard Milk Ordinance, an increasing demand arose on the part of health officers and the industry for a recommended frozen desserts ordinance. These demands were based on recognition of the need for uniform legislation and enforcement in order to reduce disease outbreaks, to avoid friction with the industry and enlist its cooperation, to increase consumption, and to eliminate trade barriers and duplication of inspection arising from the dif-

* Read at joint meeting of International Association of Milk Sanitarians and New York State Association of Dairy and Milk Inspectors in New York City, Oct. 17, 1940.

(1) Further Studies on the Importance of Milk and Milk Products as a Factor in the Causation of Outbreaks of Disease in the United States. Supplement No. 62 to the Public Health Reports, 1927.

TABLE 1

Disease outbreaks conveyed through ice cream in the United States in the 5 years 1934 to 1938, as reported to the Public Health Service by State health authorities*

Disease	1934	1935	1936	1937	1938	Total, 1934-38 Outbreaks	Cases	Deaths
Typhoid	2	—	—	—	—	2	16	0
Septic sore throat	—	—	—	—	1	1	20	0
Gastro-enteritis	—	2	—	1	1	4	183	0
Food poisoning	—	1	—	2	—	3	33	0
Total	2	3	0	3	2	10	252	0

* Prior to 1934 the annual reports issued by the Public Health Service did not identify the type of milk product involved.

ferences in standards not only among the several states but also among municipalities within the state.

Accordingly, the first draft of a frozen desserts ordinance was prepared by the Public Health Service for consideration by a specially appointed Advisory Board on Frozen Desserts in July 1937. As a result of the discussion a second draft was mimeographed in August 1937 and resubmitted to this Board and to the Milk Sanitation Advisory Board. Further modifications were made, and an interpretative code was added, to produce the March 1938 tentative edition of the Ordinance and Code. This was carefully considered by several industry groups, and by the combined Advisory Board on Milk and Milk Products in September 1938. It was followed by a May 1939 edition which was reviewed by the Advisory Board in June 1939, by a further revised draft in July 1939, and later by the edition of November 1939 which was published in the January 1940 issue of the JOURNAL OF MILK TECHNOLOGY. A code was added in the March 1940 draft, and after a further slight revision by the Advisory Board, the May 1940 edition of the Frozen Desserts Ordinance and Code Recommended by the Public Health Service was finally issued.

The latest edition is, therefore, the culmination of three years' effort represented by seven earlier drafts, only two of which, the tentative Ordinance and Code of March 1938 and the Ordinance of November 1939, were publicly distributed. It embodies the best information at present available on frozen-desserts-control legislation, but should be considered subject to change as improvements are developed. It is recommended for voluntary adoption by states, municipalities, counties, and health districts in order to encourage a greater uniformity and a higher level of excellence in the sanitary control of frozen desserts.

GRADING VS. MINIMUM REQUIREMENTS

Naturally, many diverse viewpoints had to be coordinated in drafting an ordinance that would be generally applicable. Chief among the questions that were at issue was that of grading. Should the ordinance provide for grading, or should it merely specify the minimum requirements to be met by all plants? This question was settled by offering two different forms of the ordinance, one a grading type which permits enforcement by degrading or permit revocation or both, the other a non-grading minimum-requirements type enforceable by permit revocation only. Many health officers will prefer the grading type of frozen desserts ordinance because it offers them a choice of enforcement devices, and because experience with a grading type of milk ordinance indicates the advantage of being able to degrade for minor violations which the health officer would hesitate to punish with so severe a penalty as suspension of permit. Nevertheless, some health officers will prefer the non-grading form. Attention is called to the fact that the sanitation requirements for grade A frozen desserts plants in the grading form of the ordinance are identical with the minimum requirements in the non-grading form.

Another question then arose: In the grading form of the ordinance should the grade apply to the product itself or to the frozen desserts plant? Grading of the product was provided in the Memphis ordinance and in the earlier drafts of the Public Health Service frozen desserts ordinance. It was also discussed in the 1936 report of the Committee on Milk and Dairy Products of the American Public Health Association. The Advisory Board finally disapproved grading of the product itself on the ground that, to a much greater extent than in the case of fluid milk, the consumer judges the quality of a frozen dessert by its flavor and texture, which might be different from the quality as based on sanitation requirements, and might, therefore, discredit the latter. The grading form of the ordinance provides, therefore, for grading of the frozen desserts plant. However, a product-grading form of the ordinance can be obtained with relatively few changes, and communities desiring this form will be furnished a list of such changes by the Public Health Service.

The frozen desserts ordinance and code follows the same general form as the Standard Milk Ordinance which has had such wide acceptance. Part I is the short enabling form of the ordinance suggested for use wherever adoption by reference is considered legal. The short form greatly reduces the cost of publication, and is more readily kept up to date because it is so easily amended. Two short forms are presented, one a grading type, the other a non-grading type. Part II is the unabridged ordinance recommended for adoption only where the short enabling form is not legal. All words referring to grading are enclosed in parentheses, so that the grading form of the unabridged ordinance is obtained by omitting the parentheses signs only, while the non-grading form is obtained by deleting both the parentheses signs and the words included therein. Part III is the interpretative code, which gives the public health reason for each requirement of the ordinance and explains in detail what constitutes satisfactory compliance.

PROVISIONS OF THE ORDINANCE

A brief outline of the provisions of the ordinance may be of value in this discussion.

Section 1 deals exclusively with definitions. Frozen desserts include partially frozen combinations of the usual ingredients, so as to enable the health officer to control also similar products which are not completely frozen. Composition standards for the various types of frozen desserts have been omitted, but when such standards are issued by the Food and Drug Administration they will be included as suggested standards in later editions of the ordinance. All mix must be pasteurized by heating every particle to 155° F. and holding for at least 30 minutes in approved equipment, or by any other equally efficient process approved by the state health authority. A number of other terms are defined.

Section 2 prohibits the sale of adulterated or misbranded mix or frozen desserts. Section 3 deals with the issuing, suspension, and revocation of permits, and is broad enough to include retailers who do not manufacture or freeze if the health officer wishes so to interpret it. Section 4 prescribes the labeling of containers and prohibits the use of unapproved grade placards.

Section 5 requires the inspection of all plants at least once every 6 months. A plant found violating any item of sanitation must be notified in writing and must be given a reasonable time to correct the defect. If the same violation is again found on the next inspection the plant is subject to degrading or suspension of permit.

Section 6 provides for the examination of at least 4 samples of the finished product from each plant every 6 months. The decision as to whether at least 4 samples of each flavor of each product should be taken or random sampling should be relied upon to represent all products of the plant, is left to the individual health officer's judgment and will depend on the laboratory facilities available. Ingredients may be sampled as often as the health officer may deem necessary in order to determine compliance with the

bacterial requirements. If the logarithmic average of the last 4 bacterial counts exceeds the specified standard, the plant must be notified and an additional sample taken before punitive action is in order.

Section 7, the longest and most important of the sections, lists the sanitation standards for grade A frozen desserts plants, which are identical with the minimum requirements where the non-grading form is adopted. These cover construction and cleanliness of floors, walls and ceilings, doors and windows, lighting and ventilation, protection from contamination, toilet, water supply, hand-washing facilities, sanitary piping, disposal of wastes, the construction, cleaning, bactericidal treatment, storage, and handling of containers and equipment, pasteurization of mix, cooling, handling, packaging, spillage, returns, health and cleanliness of personnel, vehicles, plant surroundings, bacterial count of frozen desserts, and standards for ingredients. These items of sanitation are conveniently summarized in the frozen desserts plant inspection form prepared for use with this ordinance. Except for the few items specifically applying to frozen desserts, the sanitation requirements are similar to those for pasteurization plants in the recommended milk ordinance, and need not be discussed here.

Counter freezer plants must meet the same requirements as other frozen desserts plants, except that floors may be covered with tight linoleum, and the mixing, freezing, and packaging operations may be conducted in a covered, fan-protected, sanitary enclosure open only on the side farthest from the public. It was hoped that single-batch containers could be required for transporting mix from the pasteurization plant to the freezing plant, but this has not proved practicable to date. Instead, item 17p provides for transporting the pasteurized mix in sealed containers, handling it in a sanitary manner, with dipping from these containers prohibited. Counter freezer plants may, therefore, aspire to the highest grade.

The bacterial standard for pasteurized mix and frozen desserts is a logarithmic average plate count not exceeding 50,000 per gram. With pasteurization set at 155° F. for 30 minutes, this standard is not considered too stringent for the top grade.

SANITARY CONTROL OF INGREDIENTS

To the establishment of sanitary standards for ingredients, particularly those derived from milk, prolonged and careful consideration was given by the Advisory Board. In the earlier drafts of the ordinance, grade A plants were required to use milk ingredients complying with production standards on the farm and at the milk products plant as well as with bacteriological standards. The importance of production control of milk ingredients was emphasized in the Report of the Committee on Milk approved by the 1940 Conference of State and Provincial Health Authorities. The following quotation is from the Committee's report:

> "Inspection of dairies and processing plants producing milk and milk products for use in ice cream has lagged because of the expense involved and because reliance has been placed on pasteurization of the mix to produce a safe product. While the Committee recognizes the difficulties involved, it believes that . . . . production control of milk and milk products should go hand in hand with pasteurization, as in the case of milk, in order to insure the maximum in safety and palatability. Being subject to human frailties, the pasteurization process is not always perfect and should not be relied upon as the sole line of defense.
>
> "Some cities already recognize the need for production control and require all milk and milk products ingredients of frozen desserts to come from inspected sources. A significant indication of the trend in this direction was the action taken recently by the Midwest Regional Conference on Milk called by the Council of State Governments at Chicago. In order to remove unwarranted barriers to interstate shipment, the Conference recommended the adoption of uniform sanitation and inspection standards for the production of milk and cream for acceptance by the 8 States participating, and appointed a Committee of Dairy Technicians to formulate such standards. This Committee subsequently proposed the mutual acceptance by these States of milk and cream for manufacturing purposes which the shipping State certified as complying to the extent of 90 percent or more with production standards based on the Public Health Service Milk Ordinance but with some items or parts of items omitted."

During the Advisory Board's discussion of this problem it was pointed out that the inauguration of production control of ingredients would be long delayed in communities which adopt a plant-grading on a minimum-requirements type of ordinance. Where the plant is graded and the grade specifications include production standards for the milk ingredients used, the entire output of the plant must comply. Where a minimum-requirements type of ordinance is in effect and these include production standards for the milk ingredients used, the situation is even worse, for then the entire output of all the plants serving the community must comply. On the other hand, where the ordinance adopted provides for grading of the product itself and permits a plant to sell more than one grade, even the largest manufacturer is in position to obtain at least a portion of his milk products from inspected sources and thus produce some grade A frozen desserts in competition with the small manufacturer in the same or nearby communities. By the same token, the community adopting such an ordinance would be able to inaugurate production control of ingredients derived from milk without waiting until a majority of the plants were in position to obtain graded ingredients for their entire output.

Due to the fact that many ice cream manufacturers must procure their dairy products ingredients from widely scattered sources and because the demand for these products varies greatly with season and weather conditions, the Advisory Board was of the opinion that quality control of these ingredients at their source was impracticable for most areas at present and should, therefore, not be made mandatory in an ordinance recommended for general adoption. The Ordinance instead provides for platform control of ingredients at the frozen desserts plant. However, communities adopting the ordinance which are in position to institute production control are urged to use the alternative wording given in the footnote to item 25p, which proposes the same production standards for dairy ingredients as are required by the Standard Milk Ordinance for grade A pasteurized milk.

The Advisory Board believes that as quality control procedures for dairy products at their source are established in the other manufacturing branches of the dairy industry, it will be possible for more and more communities to provide for production control of ingredients used in frozen desserts. Since only a fraction of the dairy products entering the manufacturing field go into ice cream, the Board felt that any attempt to set up production standards for such dairy products through the medium of ice cream regulations would be equivalent to the tail wagging the dog. For this reason the Advisory Board at its last meeting recommended to the Surgeon General that the Public Health Service undertake the preparation of recommended sanitary standards for milk and milk products used for manufacturing purposes. This proposal has been approved by the Surgeon General.

For the present, therefore, only platform control is made mandatory in the ordinance. Item 25p, which deals with ingredients, contains a general requirement as to cleanliness, quality, and handling of ingredients, and establishes bacterial standards for ingredients derived from milk. Those used in the raw state are limited to a logarithmic average plate count not exceeding 200,000; those used in the pasteurized, condensed, evaporated, or dried state are limited to an average of 50,000. These limits are doubled in the case of cream. In the Code, tentative microbiological standards are recommended for ingredients not derived from milk, including a plate count of under 200,000 for egg products, and for other flavoring or coloring materials a plate count not exceeding 10,000 and mold and yeast counts not exceeding 100. These standards are particularly recommended for all ingredients added after the mix has been pasteurized.

OTHER PROVISIONS OF THE ORDINANCE

In the grading form of the Ordinance, the remainder of section 7 is concerned with specifications for grade B and grade C frozen desserts plants. Grade B plants are those which fail to meet certain grade

A requirements that are not of major public health significance, but which comply with an upper average bacterial limit of 100,000 for the pasteurized mix and the frozen desserts, and an upper bacterial limit of 1,000,000 for raw milk ingredients and 250,000 for heated milk ingredients. In communities which are not yet in position to limit operations to plants of the highest grade only, the grade B definition serves as the specifications for the second grade. In municipalities which under section 8 permit none but grade A plants to operate, except during temporary degrading periods, grade B serves a useful role as a penalty grade to which grade A plants may be temporarily degraded for minor violations which the health officer would hesitate to punish with so severe a penalty as suspension of permit.

Grade C plants are those which violate any of the requirements for grade B plants. Where the grading ordinance is in effect grade C serves as a temporary penalty grade for those plants which fail to satisfy the grade A or the grade B requirements. If any plant which has been degraded to grade C fails to qualify for a higher grade within the 30 day period specified in section 8, its permit is suspended.

Section 8 provides that after 12 months following adoption, no frozen dessert plant may continue in business unless it complies with the minimum requirements, or (in case the grading form is in effect) unless it qualifies for grade A or grade B. Communities in position to do so may restrict operations to grade A plants only, except during temporary degrading periods not exceeding 30 days.

Section 9 outlines the procedure for reissuing of the permit or for regrading upward any plant whose permit has been suspended or which has been degraded.

Section 10 deals with retail dispensing and prohibits transfer from one container to another except in a sanitary room under approved conditions.

Section 11 permits mix and frozen desserts from points beyond the limits of routine inspection to be sold if the health officer is satisfied that they meet the provisions of this ordinance.

Section 12 requires plants hereafter constructed, reconstructed, or extensively altered to conform to the grade A construction requirements, and to submit plans for signed approval.

Section 13 requires the manufacturer to notify the health officer of any communicable disease among his employees, and section 14 confers on the health officer broad powers of control when infection is suspected.

Section 15 specifies that enforcement shall be in accordance with interpretations contained in the Code. In section 16, on penalties, the exact wording is left to the community. The last two sections deal with the usual provisions regarding repeal, date of effect, and unconstitutionality.

The Public Health Service urges states not already doing so to launch a frozen desserts control program along the same lines as the milk control program. A satisfactory state program would include the appointment of a frozen desserts supervisor where necessary, promotion of the local adoption of the ordinance by municipalities, counties, and health districts, the training of local inspectors, provision for consultant service to local health departments on technical problems, and the measurement of the effectiveness of local control programs by means of sanitation ratings. The promulgation of this ordinance as state regulations may serve to encourage their local adoption by cities and counties within the state. Most states will prefer to delegate the enforcement of such state regulations to local health units where these are functioning.

The Frozen Desserts Ordinance recommended by the Public Health Service deserves careful consideration by all communities. It is suitable for adoption by large cities as well as small, by those which advocate grading as well as those which prefer minimum requirements, and by communities which are in position to inaugurate production control of ingredients as well as those which must for the present be satisfied with platform control.

To What Extent Should Bacterial Counts of Milk Be Given Publicity? *

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Regarding the manner in which plate counts of milk should be published, *Standard Methods for the Examination of Dairy Products,* Bacteriological Section, Seventh Edition (1), states as follows: "Do not publish counts from individual samples of milk or cream. If publicity is given to analytical results, either as standard plate count or as scores, give equal ratings to all dealers or persons selling milk or cream that conform to the standard fixed by regulation, i. e., where a regulation calls for a count of less than 10,000 per cc., report all counts from supplies with less than this figure as less than 10,000 per cc., etc."

The above recommendation is based upon certain inherent limitations possessed by the agar plate method, recognizing that results by this method are only estimates, and do not represent the total number of bacteria in the milk nor the types present. Inherent factors such as the uneven distribution of bacteria in milk, the occurrence of the organisms in clumps, the inability of certain forms of organisms to develop on the medium and at the temperature employed, coupled with variables in the technique of the method, materially influence the results.

Those who have had extensive experience with the agar plate method recognize the limitations of the method and know that of two or more samples analyzed, the one showing the lowest count may not necessarily contain the smallest number of individual organisms. Likewise duplicate or triplicate plates carefully made from the same sample of milk may give results in which the numbers of colonies developing on the respective plates may vary in a ratio of one to two and frequently higher. Unfortunately the methods available for counting the bacteria in milk, as yet, have not and probably will not be perfected to the point where these variations will be eliminated even though extreme care in technique is exercised.

Public health administrative officials very frequently are not aware of the limitations of the plate count nor are they always aware of the significance of the count in evaluating the sanitary quality of milk. Accordingly and contrary to the recommendations of *Standard methods for the Examination of Dairy Products,* it is not uncommon to find public health administrators continuing to publicize the results obtained on individual samples and reporting these results in numbers as obtained. In some instances these published reports show differences between samples of as few as ten bacteria per cc., thus giving to the milk-consuming public an implied accuracy that is fictitious. Too often, through the influence of public health administrative officials, milk consumers gain the impression that all of the bacteria in milk are undesirable types. This creates a false impression as to the value of the count as an index of the sanitary quality of milk.

When the counts obtained on a number of samples fall into the same general bracket—high, intermediate, or low—without information as to the types of

* Presented at the Joint Session of Laboratory and Food and Nutrition Sections, American Public Health Association, Detroit, Michigan, October 10, 1940.

microorganisms, the count alone is not sufficient evidence to differentiate between these samples as to their sanitary quality. When the count is extremely high, it is recognized at once that some process in the method of production and handling is faulty, and remedial measures are in order. Whether a high count is the result of improper cooling, excessive contamination from utensils, a combination of these or other conditions cannot be ascertained by merely knowing the numbers present. However, in general the possibility of a high count milk containing harmful organisms is increased over a milk in which the count is low and on this basis public health officials are justified in degrading high count milk. On the other hand, there is the possibility of low count milk being contaminated or exposed to contamination with pathogenic bacteria and under this condition the count would naturally fail to classify it properly as to its sanitary quality. For this reason the sanitary inspection of premises, health records of animals and milk handlers, and in the case of pasteurized milk the phosphatase test are all essential procedures in arriving at the sanitary quality of the product. Unfortunately, no particular group of bacteria has presented itself which is of similar value in indicating the sanitary quality of milk as is the coli-aerogenes group of bacteria in water.

The emphasis placed on dairy sanitation during the past decade has had a tendency to make many milk consumers germ conscious without giving them a proper appreciation of the significance of these forms of life. When milk counts are published it is logical for a person with little or no knowledge of the limitations of the method of counting, or who lacks a proper understanding of microorganisms, to overestimate the value of the total count in evaluating the sanitary quality of the milk. This is particularly true where no explanatory note accompanies the publication of such results and where publication is made under the heading of "Health Scores" or "Health Ratings". In some communities considerable amounts of the usual run of market milk may show a bacterial count of less than the maximum permitted for certified milk. It is not uncommon for such milk to be compared with certified milk as being its equal in sanitary quality regardless of the fact that many additional precautions are taken to prevent the entrance of undesirable and pathogenic bacteria into the milk of certified grade.

In addition to misleading the milk consumer, not qualified properly to interpret published reports of bacterial counts, the milk distributor may be adversely affected in an unwarranted manner and forced to suffer economically through loss of business and increased costs of operation. Milk distributors, on numerous occasions, have reported the loss of customers to competitors whose product showed a count of only ten, fifty, or one hundred fewer bacteria per cc. Under this condition competition between distributors may become exceedingly keen as to which can head the list with the lowest bacterial count. In order to head the list they may find it necessary to resort to unusual and unnecessary methods, insofar as improving the sanitary quality of their product is concerned, and at the risk of sacrificing quality in some other form, merely for the sake of producing an extremely low count product and heading the published list of bacterial counts. Some may argue that this is well and good and that by so doing a safer product will result. Up to a certain point this may be the case as more care undoubtedly will be paid to numerous details. However, where the practice is carried to the extreme as is exemplified in carrying out the pasteurizing process, the argument fails to be valid. Fortunately pathogens that might gain access to milk are readily destroyed, with an adequate margin of safety, at a pasteurizing temperature of 142° F. for an exposure period of 30 minutes. When distributors resort to the use of pasteurizing temperature as high as 145° F. and exposure periods as long as 40 to 45 minutes and when raw milk distributors apply heat to their product merely to meet competition resulting from the publishing of bacterial counts, one must admit

that the practice of publishing counts is at fault. Such conditions as these are not hypothetical but are known actually to exist.

Frequently numerical scores, which include ratings allotted to fat, sediment, total solids, flavor, and bacterial count are published. Since the numerical value usually allotted to the bacterial count is greater than that for any other constituent, in some instances constituting forty percent of the total numerical score, the same objection to the publication of the score holds as to the publication of bacterial counts themselves.

Research work of the past few years has shown that abnormal flavors in milk, especially the so-called cappy or oxidized flavors are associated with low bacterial counts. Likewise pasteurized milk, on extensive holding, often fails to develop acid fermentation but instead undergoes proteolytic decomposition. To overcome this condition the addition of lactic acid-producing bacteria has been advocated and actually used by some distributors of milk. Such milk would be discredited by its increased bacterial count and especially so when the results are published in numbers as obtained. However, the sanitary quality of the product is not impaired and its appeal to the customer is increased by its improved flavor. Since the flavor of milk probably has the greatest consumer appeal of any of its attributes and largely determines the demand for this excellent food product, care must be exercised at all times to maintain flavor at its best.

Public health administrators, milk sanitarians, the medical profession, and those who are leaders in the dairy industry are greatly interested in having available to the milk-consuming public a product of high sanitary quality and one that contains a maximum nutrient value and a pleasing flavor. While the bacterial count is important and has a definite place in the sanitary control of market milk, the objective of a wholesome and sanitary product can be reached in a more congenial and in a better manner by placing less emphasis on the bacterial population as indicated by total numbers. An important step in this direction would be taken by following the recommendations contained in *Standard Methods for the Examination of Dairy Products* wherein equal ratings are given to all samples falling within the same count brackets. Even under this plan it is necessary to establish certain arbitrary boundaries between brackets. The point at which these boundaries are established may necessarily vary somewhat from one section to another, depending upon differences in climatic conditions, distances to market, and differences in other factors that influence the rate of growth of microorganisms and over which control is difficult. This is exemplified by the variations that are to be found in the maximum numbers of bacteria permitted in the same grades of market milk in different cities operating under the United States Public Health Milk Ordinance and Code. To eliminate all boundary lines is impossible but those occurring between samples having only slightly different total counts would be done away with and a better evaluation of the bacterial count would result.

DIGEST

Since the milk consuming public is not aware of the limitations of the method of making bacterial counts of milk and therefore, not qualified to interpret bacterial counts of milk in relation to the sanitary quality of the product, counts as such should not be given publicity. Instead equal ratings should be given to all samples falling into the same count brackets. Where bacterial counts are given publicity as obtained milk distributors frequently report the shifting of customers from one distributor to another. In many instances the bacterial counts between samples of milk may not differ greater than ten, fifty or one hundred bacteria per cc. To prevent the loss of customers distributors may resort to costly and unnecessary practises, merely for the sake of maintaining a low bacterial count and heading the list of published bacterial counts.

REFERENCES

(1) Standard Methods for the Examination of Dairy Products, Seventh Edition 1939. American Public Health Association, p. 35.

Discussion

M. E. Parker

Beatrice Creamery Company, Chicago, Illinois

Professor Prouty has ably pointed out that placing bacterial count standards too low detracts from the importance of proper pasteurization and the protection of pasteurized milk from contaminations.

We are inclined to agree with Professor Prouty's opinion that: "An important step in this direction would be taken by following the recommendations contained in *Standard Methods for the Examination of Dairy Products* wherein equal ratings are given to all samples falling within the same count bracket. Even under this plan, it is necessary to establish certain arbitrary boundaries between brackets." However, in our acceptance of this viewpoint, we would definitely underscore the last sentence.

We do not believe that the art of making standard plate counts—and we say "art" advisedly—has become sufficiently advanced to permit the establishment of arbitrary standards. Its mathematical accuracy in the critical ranges of many bacterial count grades is subject to the criticism that Mr. Abele has voiced: "Care in the conduct of milk plating procedures and in the computation of the plate count . . . . is something which is much rarer than many of you suspect."

We will not attempt to discuss in any detail the mathematical inaccuracies inherent in plate counts of different dilutions or even the same dilutions such as has been pointed out in the detailed data of plate counts that came to Mr. Abele's attention as Referee for the Examination of Milk and Milk Products. We have no desire to prolong this discussion on such a basis, although in all too many quarters average counts obtained from different dilutions are being given far too great an emphasis while other inherent discrepancies are apparently being ignored.

Quite aside from the mathematical probabilities of error, we are opposed to the publication of standard plate counts even when averaged logarithmically because in our opinion the standard plate count is not a reliable index of quality and therefore publication of its results is not essential in the interests of the public health.

We have reviewed the reports of the Coordinating Committee on Standard Methods of the American Public Health Association by referring to the Year Books for the past five years. It seems to us that the keynote of the changes for the enumeration of bacteria in milk and dairy products, which have been so far authorized, is outlined in the report of that committee appearing in the 1937-1938 Year Book.

In essence, as we understand the report, it is upon the premise that changing the temperature of incubation to 32° C. permits the growth of bacteria which seem to be suppressed by the higher temperature of 37° C., with the added impression that the bacteria suppressed at the higher temperature are important indicators of milk quality. It is further stated that changes in the composition of the plate substrate by furnishing essential nutritional factors result in an increase of bacteria and particularly those which indicate poor quality.

We have been following with considerable interest the reports which have been made from time to time by Mr. Abele. Apparently his latest findings fail to confirm the original premise that milk of poor quality gives greater increases in counts than does milk of good quality. As we interpret his data, Mr. Abele has demonstrated that the opposite is true; in other words, that with only certain insignificant exceptions, there appears to be

fully as great an incidence of the increase in count of good quality milk as there is in poor quality milk.

We must confess a personal feeling of apprehension for the extension of dairy products in the national diet described as essential by nutritional experts whenever we consider the direction that the Standard Methods Committee is apparently taking in its recommendation for the adoption of the new agar and the lower incubation temperature of 32° C. *for the purpose of making a total bacterial count.* This apprehension is founded on the opinion that such practice provides the tendency to make milk of better keeping quality than the average consumer demands, for which he will be forced to pay more than otherwise would be necessary, while there is the added detrimental influence that such purified products will not be intrinsically better. Therefore, so long as the standard plate count is our yardstick, keeping quality will be enhanced, but consumer acceptance (and consequently optimum nutrition) will be impaired.

We do think the new agar if used qualitatively would be of more definite and positive value not only in insuring adequate keeping quality but also in assuring taste appeal. We even believe that the 32° C. incubating temperature might prove helpful. However, as long as a total bacterial count constitutes the standard method, just so long will our national objective for optimum nutrition be delayed, at least, as far as milk is concerned. We base this conviction on our repeated observation of market milk supplies in municipalities in the area bounded by Montana in the Northwest, by Texas in the Southwest, by Maryland in the Southeast, and by the State of New York in the Northeast.

We have another objection to a total bacteria count as the official standard method. In milk control work, there is altogether too much "Rule and Rote" and too little "Rhyme and Reason"! We are not particularly interested in any procedure that seeks to simplify methods at the expense of ignoring a profession. To us, a bacteriologist worthy of the honor is a professional man and as such is not to be confronted by a layman with a cookbook. The professional man no doubt has need of standardized procedures. In our opinion, the suggestion for a schematic plan of bacteriological qualitative methods that could be applied to unknown samples in a manner similar to the orderly procedures that have been developed in qualitative chemical analyses, for example, would be a much more constructive endeavor for the Standard Methods Committee to be considering than the effort now being expended in perfection of a quantitative plate count method. Incidentally, an index of quality whose value would imply the relative state of sanitation and care in handling as well as flavor would be more constructive than a mere bacterial count.

Frankly, if we were a regulatory official engaged in public health work, we would be somewhat restive lest the esthetic advantages of super-sanitation as typified by lower and lower bacteria counts should some day be labeled as "debits" in the economics of public health. In other words, could we convince our constituents that the increased cost they were asked to assume for the milk supplies under our jurisdiction is justified by the protection from disease? No doubt we could. But could we also justify a practice which has made that commodity of better keeping quality at the expense of becoming more costly and less palatable to them even to the degree of discouraging its consumption by their children? That we definitely doubt.

In brief, we must confess a conviction for qualitative methods which, incidentally, should enhance not only the keeping quality but the taste appeal of milk supplies as well. The public health official as well as the dairyman must protect the consuming public from disease. Yet they must also guarantee maximum nutrition which can be gained only by enhanced palatability.

We do not hesitate to affirm that our interest in improved quality control meth-

ods originates from a selfish viewpoint in that financial rewards can only accrue to the company with which we are associated by increasing the consumption of dairy products. This objective, regardless of motive, is identical with that of the public health officer who is interested in increasing the consumption of dairy products on the basis of providing optimal health rather than merely adequate nutrition.

With sanitarians bending every effort in their programs to eliminate, or at least minimize, natural types such as the lactic group normally found in fresh raw milk and with the growing realization that the strong-oxidizers, such as some of the Achromobacter and Pseudomonas types whose normal habitat is water and soil, have varying resistance to the chlorination of water supplies, we are apprehensive lest super-sanitation is engaged in "upsetting the balance of Nature." We are finding that some of the influences in the quality impairment of dairy products are actually being enhanced by the scrupulous efforts for sanitary perfection. While we do not infer a return to "the horse and buggy days," we definitely are of the opinion that more attention must be paid to the final freedom of cleaned equipment from films bearing spoilage types of microbes and nutrients for their subsistence.

Wisconsin Dairy Manufacturers' Conference

The annual Wisconsin Dairy Manufacturers' Conference will be held at the Department of Dairy Industry of the University of Wisconsin, Madison, on March 11, 12 and 13, inclusive. The three-day conference is divided into four full-day sessions:

1. Quality problems and plans.
2. Symposium on pasteurization of milk.
3. Ice cream manufacture and merchandising.
4. Butter manufacture and merchandising.

Thirty-four titles of papers are listed. The scoring of ice cream samples will be reported by the staff, and the results on each sample will be discussed. This will be followed by an ice cream round table and clinic, conducted by conferees and staff members.

Special demonstrations are listed as follows:

Tests for coliform organisms in milk.

Tests for fat in chocolate milk.

Determinations of the curd tension of milk.

Use of the phosphatase test for pasteurization.

Methods for determining mold mycelia count in butter.

Babcock ice cream fat tests.

Registration only is announced at $1.00, but when inclusive of the bound papers, $1.75. A copy of the bound papers alone costs $1.25, but this must be ordered in advance.

Copies of the program may be obtained by writing to Dr. H. C. Jackson, Department of Dairy Industry, University of Wisconsin, Madison, Wisconsin.

New Directory of Chemical Consultants

The Association of Consulting Chemists and Chemical Engineers, Inc., has just published the sixth edition of their directory. Each of the fifty-two members is listed, together with detailed information on the kind of service that they are prepared to render. Some are best described as general practitioners, whereas others are specialists in various fields. All are prepared to discuss, without obligation to the prospective client, the character of the services that they are prepared to render. Inquiries may be directed to the Executive Secretary, 50 East 41st Street, New York, N. Y.

"Approved Milk" for New York City in Place of Grade A and Grade B *

J. L. Rice and Sol Pincus

New York City Department of Health

Modern milk control is a development of the last three decades. This fact, along with the history of our milk regulations, is very familiar ground to milk sanitarians gathered here. We need, nevertheless, to review the events of this development in order to show how they have led up to the latest step in our milk control, the elimination in New York City of the "A" and "B" grades and their replacement with "Approved Milk."

What we may call the corner-stone of our milk regulations dates back to 1896 when the prohibition of the sale of milk in New York City, except under a permit from and subject to the regulations of the Board of Health, was enacted. Ten years later, in 1906, the New York City Health Department inaugurated a system of country milk inspection. This was followed in 1911 with the regulations for the grading of the milk supply with bacteriological standards for various grades. Subsequently other sanitary requirements were enacted. Always regulations followed closely new scientific data on the relation of disease to milk.

The following description of milk production forty years or more ago cited by the late Professor Sedgewick in his *Principles of Sanitary Science and Public Health* may be of interest at this point:

> ". . . . some old fellow stumbles out of the house and to the barn, with the stump of a clay pipe in his mouth, and wearing overalls and boots saturated and covered with the filth acquired by a winter's use. When he reaches the barn he selects some recumbent cow, kicks her until she stands up, dripping and slimy, and as he is a little late and the milk will have hardly time to cool before the man who carries it to the city will come along, he does not stop to clean up behind the cow, but sitting down on a stool, proceeds to gather the milk and whatever else may fall into a pail which perhaps is clean and perhaps is not. Of such refinements as washing the udder of the cow or wiping her flanks, he has never heard. If he has, it is only to scoff. Then he strains the milk behind the cows. That is bad enough, but it is not all the story. Every one knows that in straining the milk the strainer becomes obstructed more or less with dirt and filth, and when the milk does not run fast enough, he would be a rare milker who hesitated to scrape away a place with his fingers so that the milk might run more freely. Those who have seen certain fingers, as I have, know what that means."

Although this statement describes the condition in New England, we believe it applied equally to dairy farms supplying our city at that time.

In the early 1900's, outbreaks of cholera infantum, or infant diarrhea as the mothers called it, typhoid fever, scarlet fever, septic sore throat, tuberculosis, undulant fever, and other diseases, in part at least carried by an impure milk supply, were a frequent occurrence. Physicians and public health authorities continued their search for means of improving the quality of our milk supply to prevent the incidence of milk-borne disease.

Investigators at that time were able to demonstrate the fact that under controlled conditions it was possible to produce milk with very low bacteria counts. Dr. H. L. Coit, working in northern New Jersey, conceived the idea of the certification of milk sources by local medical societies. Of course, such certification would be carried out on a very limited scale, and affected only an insignificant portion of the milk supply. Through the instrumentality of philan-

* Presented at the Joint Meeting of the International Association of Milk Sanitarians and the New York State Association of Dairy and Milk Inspectors, New York, October 18, 1940.

thropic organizations, a company was formed in 1910, which was called the New York City Dairy Demonstration Company. The object of the organization was to demonstrate the commercial feasibility of producing milk of good sanitary quality. A receiving station was established at Homer, New York, careful control was set up, and an educational campaign among the producers was launched. Premiums were paid to farmers whose milk met the prescribed bacteriological standards.

The venture proved quite successful in that it definitely showed that under properly controlled conditions, milk of excellent sanitary quality could be produced on the average dairy farm.

All of this activity concerning milk led to the conclusion that if the milk supply was to be made reasonably safe, a system of grading based on sanitary quality would have to be established, and toward this end the National Commission on Milk Standards was appointed. Some of the most eminent bacteriologists, chemists, health officers, and dairy experts of the country were members of this Commission. In 1911 this Commission submitted its recommendations for grade classification. They were adopted by the New York City Board of Health in preliminary form that year, and in final form in 1914 as follows:

Grade A. Raw Milk
Grade A. Pasteurized Milk
Grade B. Pasteurized Milk
Grade C. Pasteurized Milk

In addition to the above, we still had raw certified milk. This, however, represented but a small portion of the milk supply. The primary distinction used in this classification was the number of bacteria permitted for the respective grades. In other words, bacteria counts were the cornerstone of the grading system, and since the variations in bacteriological quality of the milk were so tremendous, there was ample room for the multiplicity of grades.

Between this period and 1926, our knowledge of bacteriology and sanitation had been growing rapidly, and the application of these sciences by the dairy industry did not lag behind. Many other factors played prominent parts in the gradual, steady improvement of our milk supplies. Country inspection of sources of supply was extended and intensified; and producers became alert to the methods of producing clean milk. Agricultural colleges and experiment stations carried on educational programs directed toward the same end. Pasteurization equipment was improved and the process was made compulsory for this market. As necessities arose, new regulations were adopted and enforced which had for their aims the improvement and rigid sanitary control of the milk supply.

The cumulative effect of all these improvements began to manifest itself in a narrowing of the distinction between the various grades of milk, thus eliminating the necessity for such grading. In 1926, the sale of Grade A raw and Grade C pasteurized milk was abolished by the New York City Board of Health, leaving only Certified milk, Grade A and Grade B Pasteurized milk.

If the improvement in producing and handling milk was great prior to 1926, then the progress made in the next 14 years must be deemed even more outstanding. This period saw the introduction of the insulated tank truck and tank car for the shipment of raw milk, replacing the previously used milk can which was often rusted and open-seamed, and which was all too frequently left on the railroad platform for hours at a time with insufficient ice. The use of electrical cooling of raw milk on the farm began to take the place of inefficient well cooling. Transfer of milk pasteurizing plants from the country to the city enabled closer bacteriological supervision and the delivery of pasteurized milk to the consumer within a few hours instead of nearly a full day. The sale of bulk milk and later bulk cream in grocery stores with its attendant insanitary handling was abolished. New principles were adopted for the construction of milk

handling equipment to facilitate dismantling and cleaning. Temperature control devices on pasteurizing equipment were made more sensitive and the entire pasteurizing procedure became more thorough and dependable. At about this time a requirement was made for making monthly bacteria counts of each producer's milk by country plant operators.

Deck inspection of producer's milk was introduced in 1936. This was found very effective in rejecting milk of poor sanitary quality which formerly found its way into the weigh tank. Our country inspectors were equipped with microscopes to make direct bacterial counts of suspicious looking milk in the field. The requirement that a continuous sanitary control record be kept for each producer, introduced in 1938, had done much to show up the inferior producers and to compel changes in methods. The phosphatase test for the determination of proper pasteurization was developed to give control officials an invaluable weapon for detecting irregularities in processing.

The means for assuring an excellent supply of milk to the consumer were available and were being most effectively used. Tuberculosis eradication among dairy cattle in the milk shed became an accomplished fact. Milk-borne disease in New York City became a matter of history rather than a dreaded reality.

Those of us in the Department of Health who have been close to the sanitary control of the milk supply, have felt for a long time that the actual differences between Grade A and Grade B milk had been narrowed tremendously. As far back as 1935 as Commissioner of Health of New York City, I felt it advisable to make the following recommendation relative to the activities of the Baby Health Stations:

> "In the work of our Baby Health Stations we formerly urged mothers to use Grade A milk for bottle fed babies. While Grade A milk is governed by somewhat stricter bacteriological standards than is Grade B, the latter is absolutely safe and can be used for infant feeding.
>
> In times like the present, where the cost of milk is an item to the mother she should be told that Grade B milk and also canned evaporated milk are entirely suitable for infant feeding.
>
> Please see that the emphasis on Grade A milk is modified accordingly."

No deleterious effects were noticed due to the change in the grade of the milk being given to infants as a result of these instructions.

For the past four or five years at least, the bulk of our Grade B *raw* milk supply showed bacteria counts within the accepted standards for Grade A *raw* milk. In the case of Grade B *pasteurized* milk we had even a greater portion conforming bacteriologically to Grade A requirements. The laboratory results of the major milk companies paralleled our own bacteria findings rather closely. Nor was there any significant difference with respect to the butterfat content of the two grades of milk. Our Grade B milk had been running about 3.7 percent butterfat while Grade A milk averaged approximately 4 percent. Outside of a hood cap requirement for Grade A milk, there were very few additional requirements in our regulations to justify the position that Grade A milk was superior to Grade B milk.

Of course, the lay public was still unacquainted with the fact that the *difference* between A and B milks had diminished. This was partly due to the Department of Health sanctioning Grade A, and partly to company advertising and salesmanship in emphasizing its purported superior virtues. Many citizens had an actual fear of using Grade B milk for their children. Our Department had many letters from consumers stating that they were no longer in a financial position to purchase Grade A milk and wondering if it were safe for them to use Grade B.

Nobody is more willing to concede the past importance of the old grading system in improving the sanitary quality of milk than the Department of Health, but the changes in the milk supply during

the past decade compelled the Department to re-examine its position.

The proponents of Grade A milk justify their position chiefly on the ground that bacteria counts of both Grade A raw, and Grade A pasteurized milk are lower than the Grade B counts, and of course, there is no dispute on this point. We must go one step further than this, however, and ask ourselves what the significance of this difference might be from a health standpoint. We wanted to get some authentic opinion on this question and therefore wrote to Dr. J. M. Sherman, Professor of Bacteriology and Head of the Dairy Department at Cornell University. He replied in part as follows:

> "I cannot believe there is a difference in the health value of pasteurized milk made from raw milks of varied bacterial contents below 750,000 per c.c. With respect to the actual average counts before pasteurization, (40,000 to 190,000 per c.c. for Grade A and B respectively, I feel positive that there can be no difference in the wholesomeness of such milks because of bacterial metabolic products after pasteurization. In order to be on the safe side and at the same time assure progress, I should think it would be advisable if one grade is established, to place the limit of raw milk before pasteurization below the present 750,000 per c.c. which is permitted for Grade B. This would apparently be done without undue hardship since the majority of the dairymen are now actually meeting a much higher standard as shown by your figures."

We also communicated with Professor M. J. Rosenau, Director of the Division of Public Health, School of Medicine of the University of North Carolina, asking his opinion as to whether there was a difference in the health value between Grade A and Grade B milk based on bacteria counts which we were getting and whether any of the by-products resulting from a large number of organisms of the type usually found in raw milk might have any deleterious health effects as long as the milk had been properly pasteurized. His reply was in part as follows:

> "There is no convincing evidence that by-products are deleterious if taken by mouth. I know of no evidence that dead bacteria cells in milk after pasteurization have any health significance."

I wish now to make one more observation bearing on the sanitary quality of our milk supply. New York City, which consumed about 85 percent to 87 percent of its fluid milk in the form of Grade B has not suffered a single milk-borne outbreak in over 22 years. This, of course, is the ultimate test of the safety of any city's milk.

We must now frankly face the question of what the attitude of the New York City Health Department should be with respect to the milk supply. Briefly stated, it would seem to be our job to establish a set of uniform minimum standards to assure to our people a safe, wholesome and ample supply of milk. There would seem to be no more justification for the Board of Health to maintain two separate standards for our milk supply at this time than there would be to have two standards of safety for our water supply, or two separate standards governing the wholesomeness of our foods. The sanctioning of Grade A milk by an official control agency like the Department of Health is a position which cannot conscientiously be maintained in view of scientific facts, and the opinions of experts that there is no significant health difference between the former Grade A milk and our present "Approved Milk". Grading of milk for *marketing* purposes should not properly be the function of a Department of Health.

Change to a single grade of milk has not been exclusively confined to New York City. Thirty-four (34) of the sixty-one (61) cities in New York State, and many other large municipalities, such as Chicago, Cleveland, Baltimore, and Washington, now permit the sale of but one grade of market milk and a similar change in its sanitary code is now contemplated by the New York State Department of Health.

Prior to making changes in our regulations, the whole problem was given a great deal of study, and the Board of Health devoted many meetings to its consideration. Numerous conferences with various groups, which included producers, dealers, plant operators, consumers, health

NEW YORK CITY MILK SUPPLY

Former Requirements—Performance of Former Grade "B"—New Standards for "Approved Milk"

	Former Requirements		Performance Grade "B"	Uniform Standards
	Grade "A"	Grade "B"	1938-1939	effective 9-1-40
Bacteria Standards:				
Raw milk to be pasteurized in country	100,000 per cc.	300,000 per cc.	90% of producers show 100,000 per cc. or less	150,000 per cc.
" " " " " in city	200,000	750,000	76% of samples 300,000 per cc. or less 87% of samples 500,000 per cc. or less	400,000 per cc.
Raw cream to be pasteurized	No standard	No standard	Insufficient official records	250,000 per cc.—country 500,000 per cc.—city
Pasteurized milk	30,000 per cc.	50,000 per cc.	Log. average 8,200 per cc. 85% less than 30,000 per cc.	30,000 per cc.
Pasteurized cream	150,000 per cc.	500,000 per cc.	Log. average 8,500 per cc. 90% less than 100,000 per cc.	100,000 per cc.
Chemical Standards:				
Butterfat	3%	3%	3.7%	3.3%
Total Solids	11.5%	11.5%	12%	11.5%
Cooling Temperature				
Raw night's milk—country	50 deg F.	60 deg. F.	Estimate 60% of producers cool below 55 deg. F.	60 degrees F.
Age Limit:				
Pasteurized milk	36 hours	54 hours	90% sold within 24 hours 99.5% sold within 48 hours	48 hours
Pasteurized cream	36 hours	96 hours	Estimate, 90% sold within 48 hours	72 hours
Cover cap requirement	Yes	No, except vitamin D milk	16 smaller dealers using cover caps	Required January 1, 1941
Cows T. B. tested by Modified Accredited Herd Plan:	No regulation	No regulation	100% compliance	Required

officials, and retail distributors, were held, at which time the principle of milk grading as well as proposed new standards were discussed. While we cannot say that our proposals were unanimously favored, the majority in each group were generally in accord with our basic program. In addition to these conferences the Board of Health held a public hearing with the same general result.

In passing, let us mention a few of the more important advantages which we may expect to gain by our simplification of the grading system.

We can concentrate all our energies upon improving our general milk supply without regard to the grading factor. Some producers and operators at times felt that since their milk was not classed as Grade A they did not have to make any particular effort to produce high quality milk, and even resisted attempts to improve their methods. With the elimination of dual grading, we removed from Grade A the sanctity of being considered the only safe milk, and also removed the implication of inferiority given to the bulk of our milk supply designated as Grade B. This should increase the confidence of the public in our milk and encourage greater consumption by the needy. Our sanitary control will be simplified and the industry will be enabled to eliminate some plant duplication. We had quite a few instances where companies maintained a Grade A plant alongside of a Grade B plant when on the basis of milk volume one would have been sufficient.

The statement has been made that the new milk standards reduce the status of our milk supply to one of mediocrity and that they deprive a large number of people of the right to purchase a quality product. The first charge is completely answered by the fact that we have established stricter standards than heretofore existed for the vast bulk of our milk supply, as will be seen from the accompanying chart. The second one is refuted by the fact that we do permit the sale of so-called premium milks based on their butterfat content, which, in reality, represents the only tangible superiority which they possess over the ordinary market milk.

To summarize our attitude on grading, I might say that it was the tremendous disparity thirty years ago between the then recognized sanitary essentials for the production and handling of safe milk and the actually existing conditions universally found which made the employment of the grading principle for market milk a wise administrative procedure, yes, even a necessary step for the Health Department to take. With the passage of nearly a third of a century, great changes in production and control and in sanitary quality of the milk supply of this area have taken place, in large part as a result of the grading system. But now the producers' and dealers' acceptance of and compliance with sanitary standards for milk far beyond any considered practical even by the sanitary leaders of those earlier days, and the excellent health record of the present milk supply, make it just as much the part of wisdom, even of compulsion, for the honest health administrator to discontinue grades in milk, when the health significance of the minor differences between grades has been illusory or non-existent for some years as in the case of New York City.

We realize that our present regulations involve a major readjustment on the part of the milk industry and we also know that such an adjustment is not worked out overnight. It is our intention to be reasonable, patient, and cooperative during this period of transition so that a firm foundation may be established for the ultimate achievement of our milk control program.

Report of Committee on Applied Laboratory Methods

In the spring of 1939 the aims and purposes as well as the name of this committee were changed. From a body of long standing which had ruled on methods of Laboratory Technique, a subject already being excellently handled by committees of the A.P.H.A. and A.O.A.C., it was changed to one which it was hoped would comment in a helpful manner upon the application in milk sanitation of the various old and new laboratory tests, giving reports upon their practicality and servicability in field work, commenting upon their good and weak points, indicating pitfalls to be avoided, etc.

Much of 1939 was spent in organizing the committee proper, which was to have as its new function: ". . . to make formal reports concerning the most practical applications of the various milk examination and test procedures as they attain recognition. The committee would also have the responsibility of pointing out to the Association membership the most desirable uses of the various tests, their respective reliability, and how best to make use of them in milk quality control administration."

Unfortunately the former chairman, Mr. C. A. Abele, felt obliged to relinquish his post. The present chairman was not definitely assigned until June of the Current year. The result is that the summer months, always difficult ones during which to conduct any intensive business, were spent in making initial contacts and in becoming familiar with the present active fields of endeavor of each of the members.

The committee wishes to present the following proposed program of work for the coming season. It is of such nature that at least one member is actively interested in one or more of the subjects, and it is hoped that in whole or part it will appeal to the Association. The committee presents it with the hope that it will be discussed and criticised from the floor to the end that the best of it may immediately be put into operation.

While extensive data on a single subject might be of most value still, due to the varied nature of each member's daily duties, some members would be prevented from contributing to such a plan. On the other hand a twelve point program with separate reports from each member on a single subject would again defeat the counter-balancing of opinion which is the purpose of committee work.

The following six subjects if considered of sufficient interest can be dealt with rather extensively by the Committee during the coming year.

1. A study of and requirement recommendations for officially certified milk and milk products analysis laboratories.

2. A study of the relationship of laboratory tests to field inspection work and an evalaution of the emphasis to be placed on each.

3. A study of the use of the reductase tests in controlling raw-to-plant milk supplies.

4. A study of the tentative 32° C. temperature requirement for milk, and milk products incubation.

5. A study of the numerical bacterial content of city supplies of raw-to-plant milk and the best tests for estimating same.

6. By means of a questionnaire to industry and control officials, a study of the present usefulness of the phosphatase test and the most valuable modification for general use.

T. H. BUTTERWORTH, *Chairman,*

Some Practical Applications of Milk Technology

E. Eugene Chadwick
Acting City Sanitarian, Astoria, Oregon

Like myself, no doubt many of our sanitarians are reading the Journal every month with interest and profit to themselves, and without thinking that perhaps they could be of service to the Staff, by reporting their reactions and conclusions and even desires for some practical applications experienced in our field work in milk sanitation.

Being a college-trained man, I naturally feel the necessity for a thorough preparation and training before entering upon the duties of imparting knowledge and giving instruction to those working with me. The art of carrying out our plans to advantage depends largely upon the interest aroused and the instructions given from time to time when needed and useful. One step at a time seems best rather than to complicate the situation. It takes time and patience to accomplish the desired results, especially where one is dealing with farmers and dairymen who have their time and thoughts taken up in their daily routine work. But we can and do get results through careful painstaking suggestions and assistance in making them feel that we have their interests at heart and are working with them shoulder to shoulder to accomplish the results desired.

INAUGURATION OF SANITATION PROGRAM

While I grew up on a dairy farm in southern Minnesota and have been identified with dairying and farm operations ever since, I had not been connected with the sanitation side of the work until seven years ago when I became a field examiner for the Oregon Milk Control Board in its work under the new Act passed by the Oregon State Legislature in December 1933. After several months of organization work for the Board over the State, I was asked to come to Astoria to do some special work, along with my milk control work, in helping to build up a badly run down market milk situation in this community.

The market milk dairymen and others interested in the improvement of the milk supply for Astoria asked the Board for this assistance, agreeing to cooperate with the Board's representative in putting the market milk industry on a more favorable and satisfactory basis. The first thing we did was to interest the City Council in applying for a U. S. Public Health Service Standard Ordinance. This the council did upon the assurance from the industry that they would take care of the cost of inspection and any other costs connected with the work under the new ordinance. A preliminary survey was requested from the State and Federal authorities to find out the actual conditions at the time, and to learn what had to be done to qualify under this new ordinance.

Our preliminary survey gave us a picture that was not in the least complimentary to the market milk industry serving Astoria's milk supply. But a person lying upon his back can only look upwards and this was much the condition these dairymen were in, so they undertook the task of building and reconstructing in earnest. We began doing one thing at a time–first, the most needed piece of work in each individual set-up; and then, we went to the next and so on until the fog began to disappear and results began to show signs of progress. We, however, never lost sight of the importance of producing and giving the public a clean wholesome milk supply which is indicative of the fact that our sediment tests and bacteria counts showed a very satisfactory condition from the start.

RESULTS

Many thousands of dollars and many days of hard work were spent by these dairymen in building, reconstructing, and buying new equipment to meet the requirements. Many individual conferences were held so as to avoid mistakes in building or buying equipment that was not suitable to the best interest of that particular dairy. Many meetings were held for the group in which mutual problems were worked out. Thereby a friendly feeling was brought about and a mutual sense of cooperation that has proven beneficial and that will continue to cement a bond of lasting friendship in working out problems individually and collectively.

So eager were these dairymen to show satisfactory results by the time of the next survey (which was the 1935 survey and the first after the preliminary one) that their first year's work under the new ordinance brought them a rating of over 85 percent as shown by the report of the State and Federal survey. The results were so gratifying and encouraging that a day was set aside for celebrating the event. The dairymen invited the public through the local Chamber of Commerce to visit their dairies and see for themselves what had been accomplished in this first year of work to improve Astoria's market milk supply. This day was called "Dairy Day," and was so successful, educational, and enjoyable that it has become an annual event.

Three hundred and fifty people made the excursion tour in groups so that all the dairies could be visited. The several groups all met at one of the Grange Halls at noon where a big dinner was served by the Grange ladies, the food being furnished by the market milk dairymen themselves. A program was given, and visitors from over the State were called upon for short talks. The Governor has always sent a representative and last year he attended in person. As a result, the community has become milk conscious resulting in a constantly growing encouragement to the dairymen to keep up the good work and to continue their improvements by improving sanitation equipment and conditions each year. They have now attained the highest rating on the Pacific Coast, which means perhaps as high a rating as is found anywhere in the country.

In 1936 the rating went over the 90 percent requirement for the accredited list, and Astoria became the second city in Oregon to attain this rating, Portland being the other city. In 1937 the rating was raised, and again in 1938. In 1939 the average rating for Astoria was 98 percent, but dropped in 1940 to 96 percent. This rating is based on the twenty six items of sanitation required under the United States Public Health Service Standard Ordinance. It is interesting to note that Seaside, the second city of size in Clatsop County and the principal coast and beach resort, followed in Astoria's footsteps two years ago, and also adopted the United States Public Health Service Standard Ordinance under the same plan and conditions as Astoria. Last year Seaside received a rating of over 85 percent, but this year stepped up to the same rating attained by Astoria—96 percent. So that now Clatsop County has two cities on the accredited list, and two of the three cities in Oregon to hold this honor.

EFFECT ON CONSUMPTION

Our interest and work in the market milk supply for these two cities has had its effect in encouraging and stimulating a larger consumption of milk, shown by the fact that the consumption has risen from 0.7 pint per person to 1.3 pints. This has been done largely through our work in securing the support of our public schools in teaching the value of milk as diet in their health work throughout the grades and to some extent in high school. The industry maintains a fund for educational purposes of this kind and much publicity is given through the local press and radio. The local union of milk employees has fostered, for several years, an annual dance raising each year upwards of one thousand dollars for supplying milk to undernourished children in the schools. In fact this has become

so popular that many children now buy milk daily at school, at a nominal cost, thus increasing the milk consumption in the schools each year as this program progresses.

As stated the dairymen take care of this inspection and publicity work themselves by paying into the city ½c a pound butterfat in addition to the ½c a pound butterfat paid in to the Milk Control Board for the support of the milk control work. So this work is done without one cent of cost to the State or City, and without any raise in price to the consumers. The results have unified and coordinated the work of the market milk industry in these two cities. A fine spirit of appreciation and cooperation has been built up among the dairymen in their individual dealings that has made the whole community milk conscious, fostering a confidence that is very conducive to a continually growing appreciation and value of milk in our daily diet. Of course we have many problems yet to solve. And we are continually on the alert to effect plans that will help us to cut corners and reduce the costs of production and distribution in our efforts to hold the price of milk to the consumer where the maximum consumption can be secured and at the same time give the producer a fair price for his milk.

Without the support of the milk Control Act and its assurances to the producer of a fair price covering the cost of production at all times, the above work could not have been accomplished. For these dairymen could not have gone to all this expense in time and money without some assurance that their product would have ready sale and at a price that would warrant their building and equipping to meet the demands of sanitation as set forth in the United States Public Health Service Standards Ordinance and demanded by the consuming public.

Notes on Milk and Restaurant Sanitation from the APHA meetings*

At the annual meeting of the American Public Health Association in Detroit, a joint session of the Laboratory, Engineering and Food and Nutrition Sections with the Michigan Association of Sanitarians was devoted to a general discussion of restaurant sanitation.

Dr. R. V. Stone, County Health Department, Los Angeles, California, spoke on *Routine Inspection Procedures.* William K. Walter, New York State Agricultural Experiment Station, Geneva, presented a paper prepared in cooperation with Dr. George J. Hucker, chief in research at the Station, on *Laboratory Determination of Sterility in Drinking and Eating Utensils,* describing a new technique which might be called the agar disc method for examining flat surfaces such as dinner plates.

Walter D. Tiedeman, chief of the Bureau of Milk Sanitation, New York State Department of Health, discussed *Dishwashing Regulations and Methods of Enforcement.* He stressed the importance of cleansing as compared with disinfection or sterilization, advised the enactment of simple regulations prescribing standards to be attained, and suggested the use of visual examination and laboratory tests to determine whether or not results met the prescribed standards.

F. W. Gilcreas, associate sanitary chemist, New York State Department of Health, presented a paper on *The Results of Laboratory Studies of Methods for the Cleansing of Eating, Drinking and Cooking Utensils,* in which he reported important work in progress at the Division of Laboratories and Research in testing and classifying detergents or washing compounds used in public eating and drinking establishments.

A joint session of the Laboratory and Food and Nutrition Sections was devoted to the general subject of milk and milk products. Of particular interest was the paper by Drs. B. W. Hammer and H. C. Olson, of the Iowa Agricultural Experiment Station, on the production of phosphatase by various microorganisms in dairy products and the consequent limitation of the value of the phosphatase test in determining pasteurization of the milk used in preparation. Only in freshly prepared products in which phosphatase has not had an opportunity to develop would the test be reliable.

Mr. Gilcreas presented a report on a comparative study of the Scharer field phosphatase test. When performed by experienced workers the test is sufficiently accurate to warrant its use as a guide in the routine control of pasteurization. Since under uncontrolled field conditions the same degree of sensitivity and precision could not be attained, the test should be checked at frequent intervals in comparison with the more precise laboratory technique.

*From *Health News,* New York State Department of Health, Dec. 9, 1940.

What an Inspector Should Look for in Making Dairy Cattle Physical Examinations

C. U. Duckworth

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The route taken by the dairy inspector in preparation for the work is extremely varied. Unlike law, medicine, engineering, and the arts, no special course of preparation is available for the dairy inspector. He must look to several sources for his education and training.

A graduate veterinarian has an excellent education for the sanitary and health features of the dairy control program, but must obtain his technical education on dairy production and manufacturing from some other source. On the other hand, the graduate in dairy husbandry obtains the needed information on technical dairy subjects, but must look elsewhere for his training in veterinary, sanitary, or health features of the work. In either case, the veterinarian or the graduate in dairying must obtain additional preparation from other fields.

A relatively large number of men are engaged in dairy control activities with much credit to themselves and the work, but have not had the advantage of a college training. It is all the more credit to such individuals who have been able to acquire the needed technical information through "the school of hard knocks." These men particularly must look to a variety of sources for the information necessary for the proper conduct of their work.

When an inspector enters the dairy premises, his attitude and methods will be reflected by his previous experience and training. Of course, all inspectors regardless of training and experience are required to observe the fundamentals of clean milk production on each occasion, such as, clean milking, cleaning and sterilization of the equipment, cooling and holding of the product, proper condition of the buildings and their surroundings, and the health and condition of the cows.

However, unless one follows a definite and rigid procedure in the method of conducting inspections, it is easy to overlook certain fundamental requirements. The dairy inspector who is also a veterinarian would probably not overlook the physical condition of the cattle. It might even be the first thing that he would observe. The inspector trained in the technical phase of dairying would probably not overlook the methods employed at the dairy. The efficient inspector will not overlook either.

HEALTH OF COWS

I do not recall ever having seen a written comprehensive guide for dairy inspectors in conducting physical examinations of cattle. Neither do I recall having ever heard of any such instructions or guide having been disseminated in any form. Perhaps the inspector cannot be altogether blamed for any delinquencies with which he may be guilty in this respect.

Let us start first with the realization that the health of the cow is essential to pure milk production; and second, that the health of the cow must not be left to chance, but must be determined by the best means available. We must know rather than assume that the physical condition of the cow is satisfactory.

Insofar as tuberculosis and contagious abortion are concerned, their diagnosis and control are strictly one of veterinary practice. There are, however, a rather wide variety of diseases or abnormal conditions in cattle inimical to pure milk production that can be detected by the

trained layman. It is not expected that the dairy inspector will encroach upon the field of veterinary therapeutics in connection with his official activities. It is important that the inspector realizes where his duties in that respect leave off and where those of the veterinarian begin.

The lay inspector may be timid in passing judgment on manifest diseases or abnormal conditions, but he need not be, for when in doubt the dairyman can always be referred to a veterinarian for diagnosis.

It may sound trite to say that before one can successfully detect abnormal conditions, he must be familiar with the normal, but I believe that the statement deserves careful consideration. I say this because even in the case of dairy inspectors in some instances their interest in dairy cattle, per se, may be very casual. Obviously, the more experience one has had with dairy cattle and the more interest manifested in them by the individual, the more familiar one should be with the normal animal.

The inspector should form the habit upon entering the barn where the cows are held during milking, or elsewhere, of observing each animal for manifest evidence of disease. His procedure should be thorough and habitual. The examination should be made both from the rear and from the front of the animal. Where cows are in the corral or can be observed in the field, a physical examination should be conducted as well. If abnormal conditions are detected or suspected, the animal or animals should be confined or removed for closer observation and if the findings justify, excluded from the milking string.

The Agricultural Code states that milk shall be obtained from healthy cows. Regulation XXI of the Agricultural Code also states among other things, a milk inspection service in order to secure and hold the approval of the State Department of Agriculture must provide for the physical examination of all cattle producing milk to be sold in its jurisdiction. This shall consist of a general physical examination, or manifest evidence of diseases, such as, enlarged glands, mastitis, pyometra, tuberculosis, open sores, ulcerated teeth, abscesses, etc.

ENLARGED GLANDS

Any enlarged gland is abnormal and may be due to local or systemic conditions. A normal gland, if superficial, blends with the inner surface of the skin and underlying tissues and is not apparent from observation and may not even be detected by palpation or feeling. An enlarged gland is an inflamed gland, or one that has become chronic caused by a previous inflammation. The significance of an enlarged gland depends upon its location, extent, and acuteness of inflammation.

For the most part, any enlarged gland in the region of the head will justify close observation. They are more likely to occur in the vicinity of the jaw. Here we have enlarged lymphatic glands due to general systemic infections, or local bacterial or mechanical irritations, due to such foreign objects as foxtails, or we may have an enlargement of the parotid or submaxillary glands and adjoining bone structure due to fungus infestations, actinomycosis, commonly called lumpy jaw.

Without an attempt at specific diagnosis it is good procedure to eliminate from the milking herd any animal having enlarged glands which are shown to be acutely inflamed or hot to the touch, or from which there is a discharge of pus or serous matter of any nature whatsoever.

In the posterior region the principal glands that become enlarged are in the inguinal region, or inner surface of the flank near the udder. An enlargement of these glands is usually secondary, due to an inflamed udder or mastitis and the abnormal condition of the udder will usually be more apparent than the condition of the glands which are more or less concealed from view.

MASTITIS

The second condition we are asked to observe is mastitis. Volumes could be written upon the subject of mastitis, but our treatment will be limited to detection

by lay physical examination; that is, the abnormal appearance or condition of the udder recognizable from observation, or by feeling, or from the appearance of the milk, which may be watery, lumpy, or stringy. If the udder appears enlarged, hard or hot to the touch, the animal should be considered guilty until proved innocent.

No hesitancy should be shown in removing cows with visible evidence of mastitis or highly suspicious of the condition until a clean bill of health has been obtained from a reputable veterinarian. Of course, mastitis may exist without any physical evidence, but that is a control matter entirely outside the realm of physical diagnosis.

PYOMETRA

Pyometra is the medical term for an infected uterus, more specifically one in which there is evidence of pus. Pyometra is most commonly caused from an infection resulting from after birth or some infection incident to calving. The evidence of this condition may not be readily apparent in its early stages, or from casual observation. Conclusive evidence consists in the pus-soiled appearance of the external genitals or the straining of the animal with or without the discharge of pus. A history of recent calving may be helpful in the recognition of suspected cases. Obviously, an animal suffering from pyometra should be excluded without delay. It is certainly to the dairyman's interest to secure competent veterinary assistance.

TUBERCULOSIS

With the present status of tuberculosis control, animals showing physical evidence of the disease are rare indeed and I do not believe that under the present circumstances the subject is of sufficient importance to justify further development.

ULCERATED TEETH

Ulcerated teeth may be evidenced by drooling at the mouth, tenderness in eating, or from a disagreeable breath. "Even Bossies' best friends will not tell them." A definite diagnosis necessitates an examination of the mouth and teeth. If present, ulcers are usually readily observed. Where ulcerated teeth occur, veterinary attention is indicated. Foxtails lodged around the tongue and inside the cheek may cause an irritation producing symptoms simulating ulcerated teeth. Removal usually produces relief.

ABSCESSES

An abscess is a circumscribed collection of pus in any part of the body. An external abscess is as conspicuous on a cow as a manure pile on a dairy and I might add equally as unsightly. An abscess may be open or closed. In an open abscess there is a discharge of pus, but a closed abscess usually has a soft, doughy feeling upon pressure of the hand. In either case the animal has no place in the dairy herd and is a subject for veterinary surgery.

In addition to the conditions listed in Regulation XXI of the Agricultural Code, cows showing extreme emaciation regardless of the cause should be removed from the dairy herd.

GENERAL

The abnormal conditions reviewed are those more apt to be observed by a dairy inspector in conducting physical examinations of dairy cows, but they are by no means the only ones that may be encountered.

Where any abnormality occurs that visibly affects the condition of the cow, or lends itself to a possible contamination of the milk, the animal should be excluded and where any question occurs with respect to the specific nature of any such conditions, veterinary counsel is to be advised.

Briefly you are the eyes of the consumer. In your examination just imagine that the consumer is standing at your elbow and observing the animals with you. If the animal in its physical appearance is offensive to the senses the consumer would not want milk from it; therefore, it should be excluded from the milking string.

Court Decisions

Filled Milk Act Held Valid*

(Kansas Supreme Court; *Carolene Products Co.* v. *Mohler, Secretary of Agriculture, et al.*, 102 P. 2d 1044; decided June 8, 1940.) The so-called filled milk statute of Kansas made it unlawful "to manufacture, sell, keep for sale, or have in possession with intent to sell or exchange, any milk, cream, skim milk, buttermilk, condensed or evaporated milk, powdered milk, condensed skim milk, or any of the fluid derivatives of any of them to which has been added any fat or oil other than milk fat, either under the name of said products, or articles or the derivatives thereof, or under any fictitious or trade name whatsoever." This law was challenged as being unconstitutional by a company selling a product found by the trial court to be made by adding pure, refined coconut oil and certain vitamin concentrates to fresh, sweet skimmed milk and then reducing the mixture by evaporation until it consisted of 20 per cent milk solids other than fats, thoroughly sterilized and free from bacteria. The plaintiff's action sought to enjoin the State secretary of agriculture and State dairy commissioner from enforcing the said statute. The defendants contended that the statute was enacted by the legislature in the lawful exercise of the police power, that it was not unreasonable or arbitrary, and that it did not deprive the plaintiff of its property without due process of law. The lower court held the act constitutional and, on appeal by the plaintiff, the Supreme Court affirmed the judgment of the court below.

*From *Pub. Health Repts.* 55, 1834 (1940).

Court Opposes Injunction to Raw Milk Dealers

Raw milk dealers in West Virginia applied for an injunction in the Thirteenth Judicial Circuit Court of Judge J. F. Bouchelle, Charleston, West Virginia, against the enforcement of regulations for the grading of milk by the State Department of Health. The judge held that such an injunction "would not be granted because of the disruption in the enforcement of rules and regulations under statutes so vital to the welfare of the whole population of the state concerning an essential food, undoubtedly adopted and promulgated after deliberate and considered study by the departments of the state government charged with the duty and vested with the authority to do so . . ."

"The authority of the Public Health Council and the Department of Health to promulgate and enforce rules and regulations under the public health laws, and particularly with relation to the cleanliness, safety and purity of milk and milk products, is plenary and paramount . . ."

Regulations of City Health Department Must Not Violate State Law*

New York Court of Appeals; *S. H. Kress & Co.* v. *Department of Health of City of New York*, 27 N. E. 2d 431; decided April 26, 1940.) By statute the State of New York had set up a complete and comprehensive scheme for controlling the manufacture and sale of frozen desserts, which included ice cream. There were provisions regarding, among other things, licensing and the adoption by the commissioner of the department of agriculture and markets of regulations to supplement and give full effect to the law, which latter stated that such regulations should establish "sanitary regulations pertaining to the manufacture and distribution of frozen desserts." Pursuant to the authority given him by the statute the commissioner adopted a regulation prohibiting the manufacture of frozen desserts in the cellar of any building in the State unless special permission therefor should be granted by him. The owner of a department store in New York City was granted permission by the commissioner to manufacture frozen desserts in the cellar of its premises for sale at retail, and the company then applied to the Department of Health of New York City for a permit to manufacture and sell at retail frozen desserts. Such a permit was refused because of a regulation of the city health department prohibiting the manufacture or exposing of frozen desserts in a cellar but empowering the board of health to make exceptions under certain conditions as to cellars used for such purpose before July 11, 1933. Such exception did not apply in the instant case. The city regulation had been adopted in accordance with the power conferred by the State legislature on the city department of health to adopt sections of the sanitary code and regulations thereunder not inconsistent with the constitution or laws of the State. It was conceded by city health department officials that the cellar involved was "without an equal in the city."

The court of appeals said that the question presented was whether the city could, on such facts, forbid that which the State had specifically permitted. It then went on to say that a municipality which was empowered to adopt health regulations could, in spite of general regulations by the State, adopt additional regulations or requirements where there was a real distinction between the city and other parts of the State. Such additional regulations had to be based upon special conditions existing in the city. But the court's view was

that that was not the situation in the instant case. Said the court: "The State has gone over the whole field. The State has designated an official who is empowered to grant a permit after he has made an inspection and found the premises to be sanitary. After the issuance of such a permit, nothing remains to be done. The State having covered the whole field, the city may not make regulations of its own, inconsistent with the laws of the State, and prohibit the manufacture of frozen desserts in a cellar even though the cellar is sanitary and the manufacture of frozen desserts therein has been authorized by the State."

*From *Pub. Health Repts.* 55, 1693 (1940).

Milk Sellers Held Liable for Disease from Milk*

(Washington Supreme Court; *Nelson v. West Coast Dairy Co. et al.*, 105 P. 2d 76; decided August 30, 1940.) An action was brought to recover damages alleged to have been sustained as the result of undulant fever contracted from drinking raw milk. The defendants were the operators of a dairy farm, a dairy company operating a dairy in the city of Everett, and a husband and wife who conducted a milk route in Everett. The milk produced on the said dairy farm was sold to the defendant dairy company, which company in turn sold a part of the milk to the defendants conducting the milk route. An ordinance of the city of Everett provided, among other things, that it should be unlawful to sell for human consumption any milk drawn from cows suffering from any disease, or milk containing pathogenic bacteria or disease-producing germs, or milk which was unwholesome or impure. The plaintiff's cause of action was predicated not only on allegations charging the defendants with violation of this ordinance but also on the common-law doctrine governing liability for negligence or breach of warranty in the sale of food unfit for immediate human consumption. The action was tried to the court sitting without a jury and resulted in findings in the plaintiff's favor against the dairy company and the milk-route operators. The action was dismissed as against the dairy farm operators because, while in the trial court's opinion the impurity of the milk produced by them was established by a preponderance of the evidence, the proof further showed that a part of the milk delivered to the plaintiff through the defendant dairy company and milk-route operators was from another source and was likewise infected. On appeal to the Supreme Court the judgment of the trial court in favor of the plaintiff was affirmed.

One contention made by the defendants was that the dismissal of the action as to the defendant dairy farm operators required dismissal as to the remaining defendants, but the appellate court concluded otherwise, saying: "Where articles of food are sold for domestic use and immediate consumption, the law implies a warranty that such articles are sound, wholesome, and fit to be consumed, and if the consumer is made sick through the consumption of such food, he has a right of action against the vendors thereof, either for breach if implied warranty, or for negligence; and in such action it is unnecessary either to allege or to prove scienter." Further, the court said that the consumer's right of recovery was not limited to an action against his own immediate vendor but reached the retailer, wholesaler, producer, and all others who participated in the sale and distribution of such deleterious articles of food.

**Pub. Health Repts.* 55, 1920 (1940).

Rule Michigan Milk Order Unconstitutional

The Michigan Supreme Court, reversing a former Circuit Court decision, has declared the 1939 Michigan milk marketing act unconstitutional, holding that the provisions of appointment of the control board allowed members having a "direct pecuniary interest" to decide on cases coming before it.

This results in all milk marketing orders established by the Board being suspended, affecting markets in Detroit, Kalamazoo, Muskegon, Flint, Bay City and Port Huron.

The Metropolitan Milk Producers' News.

New Books and Other Publications

Essentials of Nutrition, by Henry C. Sherman and Caroline Sherman Lanford. The Macmillan Company, New York. 1940. 418 pages. $3.50.

The authors offer this book as a thoroughly adequate and up-to-date view of the essentials of nutrition. The text assumes no prerequisite training in science. It develops the subject in an interesting, historical way, and explains (as well as this could reasonably be expected in a book of this scope) the role of food in the body without recourse to involved chemistry and physiology. Each chapter carries a list of exercises based largely on the student's own experiences, and also a good list of suggested supplementary readings.

Although it deals with the essentials of nutrition comprised in the body-fuels, the materials for building tissue, and metabolic regulators, it stresses correctively the improvement of life in the cure and prevention of deficiency diseases and subnormality (as affected by mal- or subnutrition), and also constructively in the improvement of already normal health. Its emphasis on the dietary application of the newer knowledge to enhanced fitness brings early to the student the means for applying these principles to everyday living, and, in a stimulating manner, lifts the subject from academic considerations to the broad sweep of a national nutritional policy.

Unfortunately, the discussion of a soft-curd milk leaves the reader under the erroneous impression that all such milk whose curd has been "softened" by artificial treatment has been deprived of some of its valuable calcium.

Useful appendices, glossary, tables and illustrations enhance the value of the book as a text for beginning students in this field, and also for intelligent readers in general who want to review the present position of nutritional studies and applications.

J. H. S.

An Introduction to the Microbiology of Water and Sewage for Engineering Students, by P. L. Gainey. Burgess Publishing Co., Minneapolis, Minn. 283 pages. 1939. $3.00.

This book has been prepared for students of engineering who have had no biological training as a background. In the first 215 pages, the author presents the necessary basic information essential to an understanding of the principles underlying microbiological phenomena encountered in handling domestic water supplies and sewage as they affect public health. Then follows forty laboratory exercises, not devised to train the student in the technical aspects of microbiology but rather to illustrate fundamental principles applicable to water and sewage microbiology. It is planned to occupy the student for nine clock hours a week for eighteen weeks. The text includes studies on bacteria as well as the protozoa and algae. It covers more than the mere biology of these microorganisms; it integrates this with water treatment. The book carries no illustrations because the author recommends use of lantern slides and blackboard drawings to suit the needs of the classes.

J. H. S.

JOURNAL OF MILK TECHNOLOGY

Official Publication of the

International Association of Milk Sanitarians

(Association Organized 1911)

THE JOURNAL OF MILK TECHNOLOGY is issued bimonthly beginning with the January number. Each volume comprises six numbers. It is published by the International Association of Milk Sanitarians, and is printed by The Chronicle Press, Inc., Orange, N. J., U. S. A.

Subscriptions: The subscription rate is $2.00 per volume. Single copy, 50 cents.

Advertising: All correspondence concerning advertising, reprints, subscriptions, and all other business matters should be addressed to the Managing Editor, **W. B. Palmer, 29 North Day Street, Orange, N. J.**

Manuscripts: All correspondence regarding manuscripts, editorials, news items, announcements, and other reading material should be addressed to the Editor, **J. H. Shrader, 59 Winthrop Ave., Wollaston, Mass.**

Membership and Dues: Active membership in the Association is $3.00 per year, and Associate membership is $2.00 per year, including respectively all issues of the JOURNAL OF MILK TECHNOLOGY. All correspondence concerning membership in the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, including applications for membership, remittances for dues, failure to receive copies of the JOURNAL OF MILK TECHNOLOGY, and other such matters should be addressed to the Secretary of the Association, **C. Sidney Leete, State Department of Health, Albany, N. Y.**

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JOURNAL OF MILK TECHNOLOGY

AS THEIR OFFICIAL ORGAN

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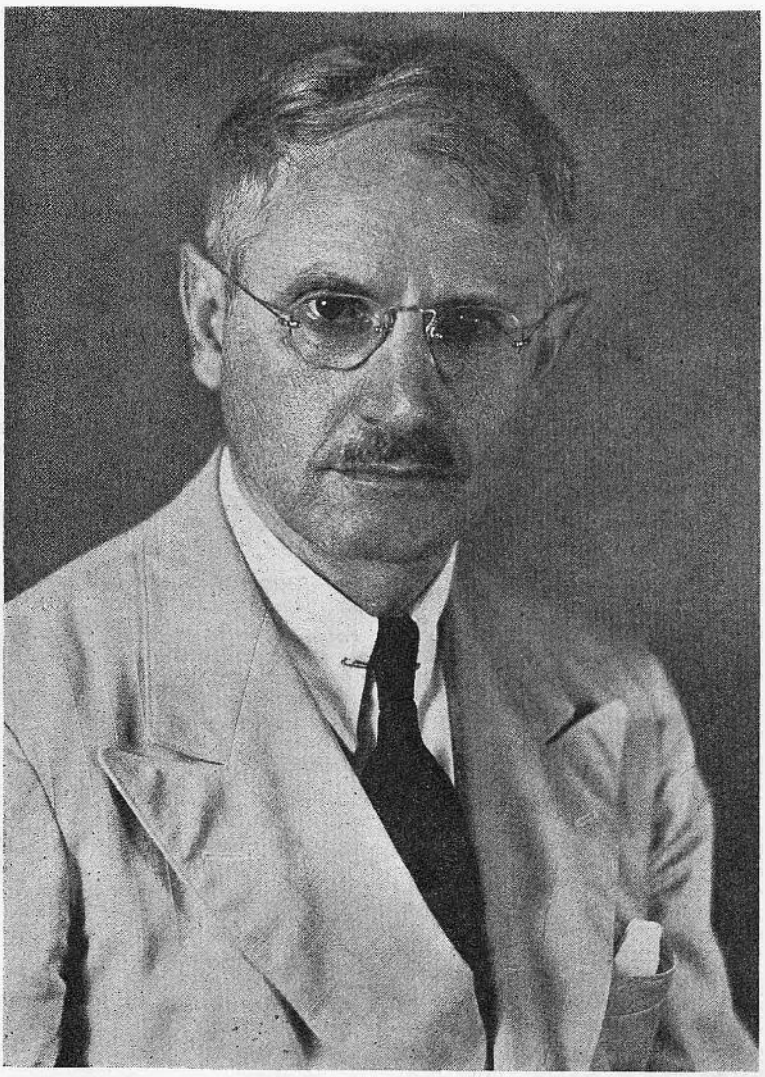
Association News



L. C. Frank
President, International Association of Milk Sanitarians

Chicago Dairy Technology Society

The Chicago Dairy Technology Society celebrated its tenth anniversary at the regular December meeting. The members took this opportunity to pay special tribute to Dr. P. H. Tracy, who during all this time has given much of his time and energy to the organization. In rec-

ognition of this service, he was presented with a Lord Elgin wrist watch suitably engraved.

A very interesting outline of the history of the development of the dairy industry in Illinois was given by Dr. H. R. Ruehe of the University of Illinois. Dr. Tracy reviewed the organization of the Society ten years ago.

The first two presidents of the Society, Messrs. McClelland and Weinreich, were called on by the Master of Ceremonies, Mr. Paul Krueger, for remarks. The annual election of officers was held during the meeting.

J. T. THORNE.

International Association of Milk Sanitarians

A meeting of the Committee on Sanitary Procedure of this Association was held at the State Office Building in New York City on Monday, January 13, 1941. Among the subjects on the agenda were (1) specifications for sanitary motors for food establishments, (2) the acceptability of a plastic lining for milk cans, (3) flow diversion valves, and (4) disposition of milk plant wastes.

Dr. Milton R. Fisher of St. Louis, Missouri; Mr. C. B. Dalzell of Little Falls, New York, and Mr. A. W. Fuchs of Washington, D. C., are new members of this committee. Walter D. Tiedeman has been reappointed Chairman, and W. D. Dotterrer, H. C. Ericksen, George W. Grim, Ralph E. Irwin, John A. Keenan, Paul F. Kreuger, M. E. Parker, Sol Pincus and George Putnam continue as members of this important committee.

The next annual meeting of the IAMS will be held in Tulsa, Oklahoma. The date has not yet been selected, pending announcement of dates of meeting of the American Public Health Association and the International Association of Milk Dealers. The chairman of local arrangements will be Dr. R. Q. Ross.

Metropolitan Dairy Technology Society

At the November meeting of the Metropolitan Dairy Technology Society, Mr. Washington Platt of the Borden Research Laboratory, Syracuse, New York, presented a very interesting talk on "Factors Which Affect the Consumption of Dairy Products."

At the December meeting, Dr. T. W. Workman, Deputy Commissioner of Foods and Dairies, State of Connecticut, Hartford, discussed the latest knowledge on "Short-time High-temperature Pasteurization of Milk." His talk was most stimulating and provoked a large amount of discussion.

For the January meeting, Mr. Milton E. Parker, Beatrice Creamery Co., Chicago, spoke to the Society on the subject, "You Can Count Bacteria but It Is the Kind that Counts."

For the February meeting, Dr. R. Adams Dutcher, Professor of Biochemistry, Pennsylvania State College, is to talk on the subject, "Some Recent Developments in Vitamin Research with Special Reference to Milk and Dairy Products."

O. F. GARRETT,
Secretary-Treasurer.

New York State Association of Dairy and Milk Inspectors

The next annual meeting of the New York State Association of Dairy and Milk Inspectors is scheduled to be held at Buffalo, New York, on September 24, 25 and 26, 1941, with headquarters at the Hotel Statler.

Northwest Association of Dairy and Milk Inspectors

The market milk industry has been established in Astoria, Oregon, on a basis that is very gratifying both to the dairies and to the public. The local press has published some very fine editorials on the work. The policy of the Department is to keep this interest growing and to

direct it towards the consumption of more milk. Last spring the Northwest Association of Dairy and Milk Inspectors came to Astoria for their annual meeting, enabling them to make the dairy tour on "Dairy Day." "This has been a very helpful way of selling our community and *keeping them sold* (Editor—italics ours) on our sanitation work."

E. B. CHADWICK,
President.

Texas Association of Milk Sanitarians

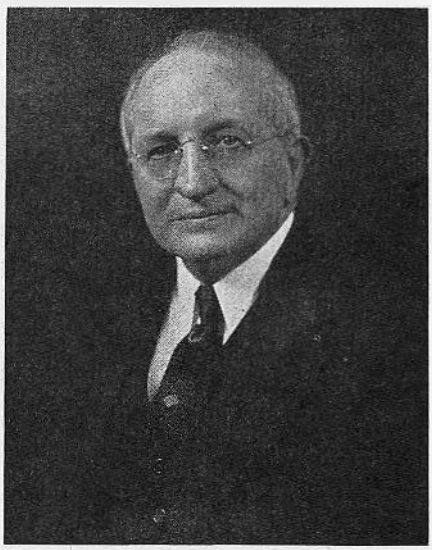
The Texas Association of Milk Sanitarians met at Fort Worth, Texas, on October 1, 1940, and elected the officers named on page 55 of this Journal, together with Mr. Ted Ratcliff, Amarillo, to the Membership Committee, and Mr. F. C. Armstrong, Forth Worth, to the Executive Committee. The members are very enthusiastic for a membership drive, and plans were made to increase the membership in the organization. At this meeting steps were taken to affiliate this organization with the Texas Public Health Association. The next annual meeting of the organization will be held at Corpus Christi, Texas, in October,

TAYLOR HICKS,
Secretary-Treasurer.

Dr. Breed Receives Kiwanis Award

For service to his community and for contributions to the advancement of science and the welfare of mankind, Dr. Robert S. Breed, Chief of the Division of Bacteriology, New York State Agricultural Experiment Station, Geneva, N. Y., and a long-time member of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, received the Kiwanis Distinguished Service Award for 1940. The selection of the award recipient was made by 18 civic and fraternal organizations of the city.

The presentation was made in the presence of 125 members of the club, fellow scientists, and friends at a dinner at the Hotel Seneca. The citation, written by Dr. G. J. Hucker of the Station staff, was read by Dr. E. H. Dickinson of Cortland, following high praise of Dr. Breed as a "scholar, teacher, and Christian gentleman". Dr. Breed's community accomplishments were listed by Mr. Edward J. Cook, well-known Geneva attorney, who asserted that from the time the medalist first came to Geneva in 1913, he has contributed in many ways to the community life. "In his church he has taken an active part and has been and is a bulwark and a pillar in the First Church. He is now an elder and has always been a regular attendant . . . Dr. Breed has



Dr. Robert Stanley Breed

set a fine example of upright living." He has taken an active interest in the work of young people, assisting Mrs. Breed in establishing the summer camp for which the Girl Scout organization has honored him. His chief contribution to humanity has been his work in bacteriology. "The health of this community is better because of Dr. Breed—

the city is a finer and better place to live because of him and his work here".

The International Association of Milk Dealers, through Mr. W. D. Dotterer of Chicago, paid personal tribute to Dr. Breed, asserting, "He has performed great research for the benefit of our industry". Dr. E. G. Kline, of Olean, representing the American Public Health Association, brought greetings and praise. Dr. Breed became a member of this group in 1909, a fellow in 1922, and a life member in 1932. "He has faithfully served the Association in many ways".

His work in editing the *Standard Methods for the Examination of Dairy Products* (formerly known as *Standard Methods of Milk Analysis*) is widely known. Dr. A. C. Dahlberg said, "Dr. Breed is a shining example of the kind of scientist who does not become so wrapped up in his research that his viewpoint of community service becomes warped . . . He has carried research to the ultimate and applied it directly into industry . . . He has given Geneva prominence as one of the first cities in the country to have one grade of milk—a safe milk."

Greetings were brought from Dean Carl E. Ladd of the College of Agriculture of Cornell University. Dr. J. M. Sherman termed him "a citizen beloved by you and by all scientists in the United States and other countries of the world." Continuing, he said, "Few men in the country have been a greater force in bacteriology than Dr. Breed . . . He has served on more committees than any other bacteriologist in the world—committees that have really worked and done things." Congratulatory telegrams were read from many organizations.

After listing over thirty civic, professional, religious, and educational affiliations of distinction, the citation follows:

"The latent tenacity so characteristic of Dr. Breed may be the result of his ancestors' successful storming of Bunker Hill, or more accurately, Breed's Hill; but certainly it was nurtured in the hills of Pennsylvania, later to become more evident in his own life in the schools of Binghamton, to develop in Amherst and to show promise of maturity in Harvard University. He early saw that education could best serve by stimulating others through his personal high standards of living and inspiring younger men and women to so magnify the lofty that the low could find no place in their lives. His contact with young people as a teacher in Allegheny College and later in his professional and religious associations has affected the lives of unknown numbers of men and women. As a teacher he has been inspiring and as a researcher, stimulating. His conservative approach to the amenities of living and his stimulating inspiration to young people will stand as his greatest achievements.

"Dr. Breed's contributions to his science are legion. Early he realized the need for more basic and reliable procedures upon which milk might be graded. The Direct Microscopic (Breed) Method was the result and now is recognized the world over as a standard procedure. The application of this method has affected the quality of countless milk supplies, resulting in a particular service to his fellowmen at large. His long and successful endeavor to improve and maintain the physical conditions of children through a safe milk supply has brought happiness into the lives of children and indirectly into the lives of everyone in his community.

"That bacteria were not easily identified and classified early came to the attention of his well-ordered approach to matters scientific. By an effort, unacquainted with failure, he has become recognized as an international leader in the field of the classification of bacteria.

"The more human side of his contributions to the community are real and significant. The best known of these is his association with Mrs. Breed in their distinguished service to the Girl Scouts, who refer affectionately to him as 'Uncle Bob' and to Mrs. Breed as 'Aunt Peggy.' This endearing and complimentary recognition came as a result of his twenty years of service to that organization in many capacities. His nature study classes gave many a girl a greater appreciation of the outdoors and those who successfully completed the course always were rewarded with a trip to the circus. Parenthetically, he alone felt fully qualified as the chaperon on such occasions.

"His loyal and sympathetic support to his church reflects the qualities which have made him a respected Christian gentleman, an award of which there is no greater and given him many times heretofor by his associates and colleagues.

"Mr. Erikson, I present to you for the Distinguished Service Award of Kiwanis my friend, distinguished scientist, community benefactor and Christian gentleman—Robert Stanley Breed." J.H.S.

"Doctor Jones" Says —

Not long ago I met a man—he'd worked hard and made a lot of money and ten years ago he'd retired—decided he'd take things easy and enjoy himself. Instead of its panning out the way he figured 'twas going to—well, the way he put it: it'd been "ten years of boredom." He didn't know what to do with himself. For forty years, more or less—oh, he was interested in his family and he was a trustee or something in the church and all that, but otherwise his only thought had been for the success of his business. He said he'd never had any recreations or hobbies—never learned to play and now, when he had his big opportunity, he found 'twas too late to learn. Maybe there're worse tragedies than that—certainly there's a lot that's more dramatic—but well, being bored occasionally is bad enough; being bored all the time—I can't imagine anything much worse.

You know, a lot of these fellows—I've heard men say, before now, they didn't have time for recreation. I wonder how many of 'em ever stopped to meditate on what that word means: re-creation. If we figure we were worth creating we ought to be able to find the time to do our own re-creating. This combination of mind and body and soul —if you want to call it that—this constitution we've been entrusted with—it's something more'n a piece of machinery. A well-balanced life (what was it Dr. Cabot said there in "What Men Live By"—that book of his?)—it's a mixture, in just the right proportions, of work, play and worship. I'd say he hit it about right.

I guess maybe I'm getting in pretty deep. But, anyway, I can think of a man right now (and a lot of other people have been thinking about him here lately)—a few years ago he took on the toughest job any man ever had. He'd had a serious sickness and folks wondered if he could stand the racket. Well, sir—when his responsibilities get the heaviest, he'll go out and take a swim or he'll knock off and work at his hobby (I won't mention what it is or you might recognize who I'm referring to) and he's standing the strain better'n most of his predecessors did. He knows how to relax. And when he gets ready to retire he won't have to worry about being bored.

What I really started out to say: outside of being born and getting a living and having a religion (and who don't?), one of the most important things in life, the way it looks to me, is developing a hobby. It's like picking a best girl: even a silly one's better'n none, so long as you're suited. You may die young but at least you won't die of boredom.

PAUL B. BROOKS, M.D.

A Comparative Evaluation of an Ice Cream Supply as it Reaches the Consumer. L. K. Crowe and P. A. Downs. Journal of Dairy Science, Vol. 32, No. 7, July 1940, pp. 615-620; *Pub. Health Engin. Abs.* XX, Mi, 47.

"This preliminary study of a limited number of pint samples of vanilla ice cream at all price levels available to the consumer in the trade territory studied does not indicate the reason for the difference in price level when a comparison is made on the basis of the following: net weight of ice cream obtained; calculated overrun in per cent; composition including butterfat, total solids, protein and calculated carbohydrate; bacteria count of either total or colon type organisms; calorific value purchased for a certain expenditure, or quality as determined by organoleptic examination.

"It is recognized that this is not an all-inclusive study of a problem of this character, but it is believed that studies such as this carried out in a market at intervals of six months or one year would tend to bring to the consumer a more uniform product and tend to aid in establishing a sound basis for differences in price per unit quantity of ice cream purchased."

R. A. C.

Why Sealright Means Safer Protection

For Milk and Dairy Products

When the Sealright emblem appears on paper milk bottles, bottle caps and hoods, it means that the product inside that container has been given the finest sanitary protection money can buy. For Sealright spares no effort—no expense—to insure the purity of its products. Look at the snapshots shown on this page. They were taken in the great Sealright plant at Fulton, New York. They show why Sealright products have come to be recognized as the ultimate in sanitary packaging protection.

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EXTRA CLEAN CAPS AND CONTAINERS demand extra clean paper. Sealright takes no chances. Sealright makes its own special highly sanitary paper from pure, new spruce pulp, on equipment used for no other purpose.

IT TAKES HEALTHY WORKERS to make clean containers. Sealright employees attend special hygiene classes, learn to use sanitary care in their work, get health examinations regularly.

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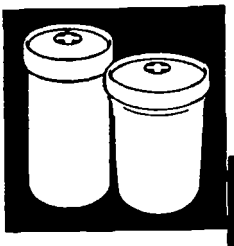

SEALRIGHT
CONTAINERS

Round and Nestyle—for cottage cheese, ice cream and other moist foods.

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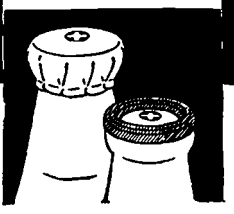
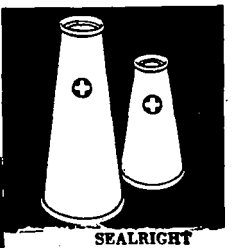
PAPER MILK BOTTLES

The modern, sanitary, business-building container for milk sold in stores.





SEALRIGHT
MILK BOTTLE CAPS

Made in many styles—both cover caps and regular—to suit every capping need.

THIS EMBLEM SAFEGUARDS HEALTH

When you see it on paper milk bottles, bottle caps and hoods, or containers, you know that the manufacturer of the product inside is extra careful of its purity.

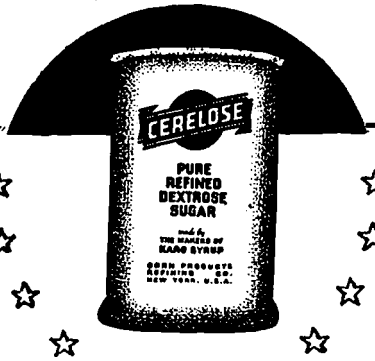
THE STAR WITNESS

The successful growth of any ice cream business depends on the approval of the star witness—the Consumer! And the Consumer has put the stamp of approval on ice cream made with Cerelose, pure Dextrose sugar! **Because—**

1. Ice cream made with Cerelose melts rapidly in the mouth with pleasant, refreshing coolness.
2. Cerelose brings out the true flavor of the natural fruit in fruit flavored ice cream.
3. Cerelose produces a tender texture which makes ice cream taste rich and creamy.

Successful ice cream manufacturers who use Cerelose report that best results are obtained by replacing approximately 25% of the sugar content of the formula with Cerelose.

Full information including technical data will be provided on request

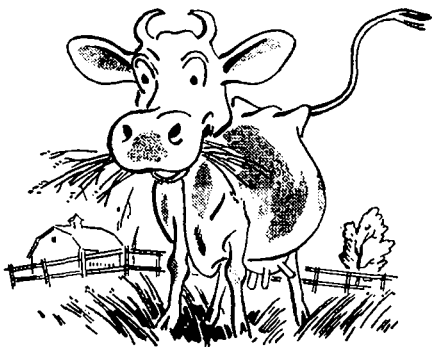


CORN PRODUCTS SALES COMPANY

17 BATTERY PLACE NEW YORK CITY

CERELOSE

PURE DEXTROSE SUGAR



GUESS WHAT! I'M EATING ALUMINUM!

As you probably know, Aluminum occurs in virtually all soil. So grass and grain and other vegetation absorb it. Cows, therefore, eat Aluminum, and small amounts of it go on into their milk.

That makes it easy to understand why Aluminum, widely used for milker pails, does not "act on" milk in any way. The purity, the enzyme and the Vitamin C content are not affected by Aluminum. And the Aluminum pail is not affected by milk.

In fact the only thing, aside from very gradual wear through the years, that happens to an Aluminum Milker Pail is a dulling of the shiny polish that it has when new. That's natural and doesn't hurt a thing. Whether bright or dull in external appearance, an Aluminum Milker Pail is just as friendly to milk.

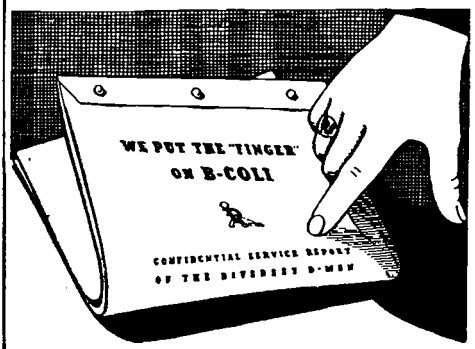
Keeping the pail clean simply means daily scrubbing with cold water, followed by rinsing with hot water, and inverting the pail to dry. Only when this routine is neglected is a cleanser needed to remove accumulated dirt or discoloration. A mild cleanser should be used.

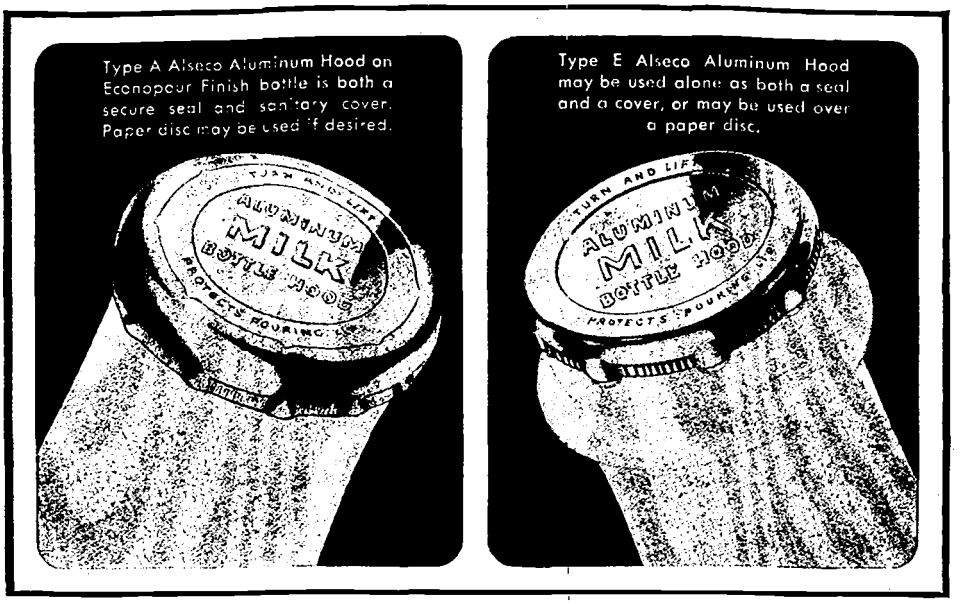
Write for a file of data on the nature and care of Aluminum Milker Pails, and a handy Aluminum ruler and letter opener. THE ALUMINUM COOKING UTENSIL COMPANY, 20 "Wear-Ever" Building, New Kensington, Pa.

WEAR-EVER ALUMINUM TRADE MARK REG. U.S. PAT. OFF.

"Wear-Ever"
Aluminum
MILKER PAILS
Friendly to Milk

Index to Advertisers





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Because Aluminum is non-porous, non-fibrous; affords no breeding place for germs.

Because Aluminum is a non-toxic metal, harmless to man and harmless to milk.

Because Aluminum is waterproof, odorproof and tasteproof.

Because Aluminum can be made into a hood that not only covers the pouring lip but also seals the bottle so securely that the usual paper disc may be dispensed with.

Because Aluminum Hoods are strong enough to withstand common methods of icing cases.

Over 400 dairies serving more than 1,500 communities are successfully using Alseco Aluminum Hoods. Several have used them continuously for ten years. We will gladly supply a list of dairies and cities if you wish to make any inquiries about the performance of these hoods. Aluminum Seal Co., 1347 Third Ave., New Kensington, Penna.

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ALUMINUM HOODS

DIFCO

LACTOBACILLUS ACIDOPHILUS
Isolation and Cultivation

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Bacto-Trypsin Digest Agar is an excellent culture medium for propagation of *Lactobacillus acidophilus*. The medium is prepared according to the formula of Cheplin. It is widely used for estimating the degree of intestinal implantation of *L. acidophilus* and is well suited for isolation of acidolphilus strains and for carrying stock cultures.

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Bacto- Litmus Milk is a useful medium for carrying stock cultures of *Lactobacilli*. The presence of litmus in this medium aids in detecting acid production.

Bacto-Peptonized Milk contains degradation products of the proteins, albumins and globulins of milk. It supports rapid and luxuriant growth of the *Lactobacilli*.

Specify "DIFCO"

THE TRADE NAME OF THE PIONEERS

In the Research and Development of Bacto-Peptone and Dehydrated Culture Media

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Printed in U. S. A.