Association News

INTERNATIONAL ASSOCIATION OF MILK SANITARIANS

The 28th annual meeting of the International Association of Milk Sanitarians will be held in Jacksonville, Florida, on October 25, 26, and 27. Mr. H. N. Parker of Jacksonville has been appointed chairman of the local committee. The headquarters hotel will be announced later.

The program of this meeting will contain some items of unusual interest. No milk sanitarian can afford to miss it. Plan now to attend.

Back copies of the annual reports of the International Association of Dairy and Milk Inspectors for the years 1927, and 1929 to 1936 inclusive may be purchased, as long as the present supply is available, at a price of $5.00 plus postage for the set, or for single copies $1.00 including postage.

C. S. Leete, Secretary-Treasurer

NEW YORK STATE ASSOCIATION OF DAIRY AND MILK INSPECTORS

President Kern expects to call a meeting of the Executive Committee in the near future to discuss the program for the next annual meeting. Suggestions from members as to subjects they would like to hear discussed are invited and should be forwarded to the secretary.

W. D. Tiedeman, Secretary-Treasurer

MASSACHUSETTS MILK INSPECTORS' ASSOCIATION

At the annual meeting held in Worcester, Mass., on January 4th and 5th, the following officers were elected:

Vice-president, John B. Enright, Lawrence, Mass.
Secretary-Treasurer, Robert E. Bernier, Cambridge, Mass.

Executive Committee:
A. R. Tolland, Boston, Mass.
George A. Planagan, Lynn, Mass.
Patrick C. Bruno, Revere, Mass.

R. E. Bernier, Secretary-Treasurer

CERTAIN DAIRY PRODUCTS EXEMPTED FROM IMMEDIATE FORMULATION OF FEDERAL STANDARDS

Under the provisions of the new Federal Food, Drug, and Cosmetic Act, the Secretary of Commerce is authorized to promulgate reasonable definitions and standards of identity for any food under its common or usual name. In the absence of such definitions, any food that contains two or more ingredients may declare them on the label. Inasmuch as the Secretary has not yet had time to formulate standards for all such foods, he has announced exemption for a period of two years a number of foods including the following:

Evaporated milk
Cheeses
Sweetened condensed milk
Oleomargarine
Milk
Milk chocolate
Malted milk
Milk bread

During this period, the above foods are exempt from a declaration of each ingredient although it does not exempt them from stating the presence of any artificial flavoring, artificial coloring, or chemical preservative.

J. H. Shapley

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.

AN INSTITUTE TO APPRAISE EQUIPMENT PERFORMANCE

Many papers and committee reports have been presented at meetings of milk dealers, ice cream manufacturers, milk sanitarians, public health engineers, and health officers, describing the application of new control procedures or the performance of new dairy plant equipment. A survey of any milk equipment exposition reveals the great differences of opinion as to the kinds of equipment that are believed to be the best for handling certain operations. Manufacturers of dairy machinery, concerns furnishing laboratory apparatus and materials, and producers of various supplies make strong claims as to the excellence of their products in the fields of their respective applications. However, the determination of compliance is left to the individual judgment of each purchaser, interested milk sanitarian, or control official.

The Committee on Sanitary Procedure of the International Association of Milk Sanitarians, in collaboration with the trade associations, is expected to reduce much of the confusion (1, 2, 3). However, its work as now projected lies in the field of only designating the principles that should be incorporated in design. It calls attention to needed developments. It "accepts" designs of construction. However, it does not attempt to specify details. It is unable to determine performance and degrees of compliance with claims of manufacturers. The judgment of experts is highly desirable to point out existing needs, to indicate where new developments are necessary, and to generalize on design. Their work would be greatly facilitated, however, and their findings far more authoritative if physical means were provided for determining whether particular equipment and supplies actually do comply with the claims of their producers.

Such a service should not in any way conflict with the work of laboratories engaged in research on dairy equipment, as for example, the engineering laboratory for dairy equipment research in the National Institute of Health. These latter serve as valuable sources of information for the above committee. When these laboratories are governmental, they usually are not authorized nor are they interested in undertaking performance studies on all pieces of equipment that are offered, and in issuing certificates showing the degree of compliance with published standards. The same principle which now is used in certifying colors for use in foodstuffs should be more widely applicable in certification of bacteriological culture media, incubators, and other laboratory supplies. The service would show whether any product does or does not meet accepted standards. The claim of a manufacturer that his model of pas-
teurizer does embrace the accepted performance specifications should be subjected to proof in an engineering laboratory. Such an institution should be sponsored by the International Association of Milk Sanitarians, and its operations directed by the Committee on Sanitary Procedure.

England has its National Institute for Research in Dairyng, at Shinfield, Reading. Scotland has its Hannah Dairy Research Institute at Kirkhill, Ayr. Germany has its Dairy Research Institute at Kiel. Here, all kinds of dairy equipment are subjected to thorough test, and official reports are published, somewhat in parallel to those of our National Bureau of Standards. In Germany, every new design of equipment must be subjected to test, and may not be sold until its behavior and durability are approved.

Regulation and restriction of developments are not desired by us. But experience does indicate that we need the organization of an institution for testing any equipment or supply (such as pasteurizer, can or bottle washer, filter, detergent, tank cap, laboratory incubator, culture medium, glassware, hood, etc.) which is voluntarily presented by any manufacturer who wants to secure the unbiased technical judgment of the group. The data would be published by the manufacturer (within certain limits), or not, according to previous agreement. The results would be available for acquainting prospective buyers, milk sanitarians, health officers, or other interested persons with the facts concerning the effectiveness, durability, and degree of compliance of the articles with fundamental standards, and also with the claims of the manufacturers. Such reports would be the last word for milk control officers who must approve new installations and supervise operations.

When participants in the formulation of committee reports or responsible officials have before them the plans of equipment to be installed in a plant, we urge that they make a mental comparison of the ultimate effect upon the industry, upon their own profession, and upon the general public of rival and competing claims, as compared with the effect of similar claims when supported by a recognized institution of research. They should unite in sponsoring the organization of such an undertaking. This is not the time to offer suggestions as to details. They can develop later.

At present, the concept is what we must consider. Let the establishment of such an institution be an objective of the International Association of Milk Sanitarians.


Inter-

The word ‘International’ as applied to the name of the International Association of Milk Sanitarians indicates that its membership is open to and is comprised of persons of various nations, commonly interested and employed. International is applied to the scope of the Association more definitely defined at least one phase of the organization, i.e., the international interchange of information concerning the fundamentals of milk sanitation and milk technology. This is also true of the international and inter-provincial relationships of the Association. The Association is international in fact, having members from Mexico, Cuba, the British Isles, Canada, and the United States. Since its organization in 1911, the Association has held a position of prestige. Within the past year the membership has almost doubled.

Inter-relationship is established and developed between the official and commercial milk sanitarians and technologists through active and associate membership in the Association. Both groups are mutually interested and interdependent in those matters with which the Association is concerned.

Inter-association relationship is greatly fostered through the medium of the Journal of Milk Technology, the official publication of the International Association of Milk Sanitarians. As of present record, eight state and area associations of milk sanitarians and technologists have designated the Journal as their official publication. This official and commercial inter-relationship is advanced and made more universal. The Journal is an intermediate factor in fostering and interlinking this inter-relationship even beyond the individuals and groups in the several associations, for now the paid circulation includes seventeen countries. This has been accomplished within the interim of its first year of existence. Interlinking of milk sanitarians and technologists and the interchange of knowledge and experience is afforded through the meetings of the International Association of Milk Sanitarians. The interesting and instructive formal programs introduce the newer knowledge, and discussions of the topics permit opportunity for interpretation, interview, and interpretation. This knowledge is also inter-communicated through the Journal of Milk Technology.

The International Association of Milk Sanitarians together with its official publication, Journal of Milk Technology, is the intermediary which makes possible interchange for the advancement of milk sanitation and milk technology, and for the awakening of ambition and ideals in the minds of men in similar fields of endeavor. May its usefulness become ever more valuable and its service increase.

W. B. P.

West Virginia Association of Milk Sanitarians

When men, engaged in the daily round of milk inspection and supervision, seek to be associated with others occupied in similar and allied fields both at home and abroad, they evince their broad vision, a constructive interest in communal welfare, and a healthy ambition to avoid the dulling effects of provincialism. Their communities benefit from patent factors for improving the public health and for raising the level of dairy technology. The West Virginia Association of Milk Sanitarians, active organization in a state where milk inspection and dairy technology have taken charge of the march for several years, is the eighth state and area association to name the Journal of Milk Technology as its official publication. This addition to the fellowship of progressive milk sanitarians and technologists is heartily welcomed with the confidence that mutual benefit will be derived, and public health and milk technology advanced.

J. H. S.

West Texas Section of Public Health Association

Experience teaches that sometimes we can be so close to a problem that we lose perspective. In milk inspection, distortion of our sense of proportion may cause us to over-emphasize non-essentials or to neglect new factors. Avoidance of such difficulties is facilitated by associating ourselves with new groups who may not be bound by our climate or by out-moded practices. Accordingly, we are glad that the West Texas Section of the Texas Public Health Association has designated the Journal of Milk Technology as their official organ. The aggressiveness, enthusiasm, and splendid quality of their personnel is personified in our President Ehlers, of Austin, Texas. We cordially greet these new friends from the great open spaces, and hope that their influence and example may inspire the inspectors of other states in the great Southland and the Southwest to associate themselves with their fellow milk inspectors in a broad-gauged program of milk quality improvement.

J. H. S.
Report of the Committee on Communicable Diseases Affecting Man *

I. A. Merchant, Chairman

Iowa State College, Ames, Iowa

The report of this committee is composed of the statistics on milk-borne epidemics which have been reported through public health authorities to the sanitary section of the United States Public Health Service (1). Canadian data were obtained from a report by Defries (2) entitled, “Survey of Certain Milk-borne Diseases in Canada.” Both of these reports contain much information relative to milk-borne disease which cannot be presented in this report, and it is suggested that those interested in this subject should consult the above references.

This Committee report, also, is composed of contributions by the various members of the committee on subjects which they think are pertinent and which may need clarification.

In Table 1 are recorded the epidemics of the different diseases which were observed during 1937. As is usually the case, typhoid fever holds first place with 15 epidemics. This disease caused all deaths, 11, which were reported from the United States. Streptococcal infection runs typhoid a close race in the number of epidemics, if scarlet fever and septic sore throat are combined. In this disease, we note the greatest number of cases, 986, as opposed to 161 cases of typhoid fever. There were 14 epidemics of gastroenteritis, assuming that food poisoning, gastroenteritis, and diarrhea, may be grouped under that term. It seems that there is no uniform term which may be used in reporting these three diseases. All three are covered by the term, gastroenteritis. The etiologic agent, however, is the important item in milk-borne epidemics of this type. Is the disease caused by staphylococcus toxin, Salmonella enteritidis infection, or is it paratyphoid fever? The sources of the infection in each instance are apt to be different. None of the three terms used in Table 1 give any indication as to the etiologic agent; in fact, any one of the three may be represented in any one or all of the conditions. Unfortunately, the causal agent is often underestimated, hence the use of a term which the health authority favors. Canada was the victim of rather severe typhoid epidemics during 1937, and this disease again is to be noted as the cause of a majority of the deaths.

In Table 2 the origins of the epidemics which occurred in the United States are recorded. It is obvious that in milk-borne disease, the carrier presents the gravest problem. In some instances the carriers were human and bovine. This was particularly the case in scarlet fever. The origins of 13 of the epidemics were undetermined, which represents a real handicap for control officials. The role of the cow as a carrier in milk-borne disease is usually confused with the streptococcal and staphylococcal infections. The typhoid fever epidemic which occurred in England and which received so much attention last year and was found to be of bovine origin. The cows involved had wafted through a stream into which raw sewage was allowed to flow. The role of the cow as a carrier of Salmonella organisms was revealed in the report by Conbeare and Thorton (3) of an epidemic of food poisoning which occurred in Wiltshire, England, in 1936 involving over 100 persons, chiefly school children. Investigation showed that the causal organism was a Dublin type Salmonella. Human carriers were sought in vain. The cows of the milk producing herd were tested serologically for agglutinins for the organism. Three of them gave significant reactions. The feces of the three cows were examined. From one of the cows an identical strain of the organism was recovered. The milk supply was undoubtedly infected through contamination with feces by the faulty operation of the mechanical milking plant.

The type of milk or milk product most often involved (see Table 3) again was proven to be sweet milk which was consumed in its raw state. In the few instances where pasteurized milk was involved, investigation revealed that the process was faulty or contamination occurred subsequent to pasteurization. Milk products are so rarely the cause of epidemics that it may be of interest to relate the conditions under which they were involved.

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* Presented at the 27th Annual Meeting of the International Association of Milk Sanitarians, Cleveland, Ohio, Oct. 19-21, 1938.

** Typhoid, Scarlet fever and Paratyphoid A.

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TABLE 1.

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Number of Epidemics</th>
<th>Cases in Community</th>
<th>Cases using Suspected Supply</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITED STATES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typhoid fever</td>
<td>16</td>
<td>15</td>
<td>208</td>
<td>161</td>
</tr>
<tr>
<td>Scarlet fever</td>
<td>1</td>
<td>1</td>
<td>389</td>
<td>324</td>
</tr>
<tr>
<td>Septic sore throat and scarlet fever</td>
<td>2</td>
<td>2</td>
<td>645</td>
<td>512</td>
</tr>
<tr>
<td>Septic sore throat</td>
<td>1</td>
<td>1</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>10</td>
<td>10</td>
<td>435</td>
<td>435</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>2</td>
<td>2</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>2</td>
<td>2</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>45</td>
<td>2150</td>
<td>1705</td>
</tr>
</tbody>
</table>

| CANADA                        |                     |                    |                               |        |
| Typhoid fever                 | 3                   | 3                  | 79                            | 79     | 15     |
| Paratyphoid B                 | 3                   | 3                  | 35                            | 35     | 4      |
| Undulant fever                | 1                   | 1                  | 182                           | 182    | 0      |
| Total                         | 15                  | 15                 | 296                           | 296    | 17     |
| Grand total                   | 36                  | 36                 | 2001                          | 2001   | 28     |

* Indicates more than one type involved.

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TABLE 2.

Origin of Milk-Borne Epidemics in United States

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cases</th>
<th>Carrier</th>
<th>Water</th>
<th>Undetermined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typhoid</td>
<td>14*</td>
<td>14*</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>Scarlet fever</td>
<td>11</td>
<td>11*</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>Paratyphoid A</td>
<td>3</td>
<td>3</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>Scarlet fever &amp; S. sore throat</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>Septic S throat</td>
<td>2</td>
<td>2</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>3</td>
<td>3</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>1</td>
<td>1</td>
<td>1*</td>
<td>1*</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>2</td>
<td>2</td>
<td>1*</td>
<td>1*</td>
</tr>
</tbody>
</table>

---

TABLE 3.

Type of Milk or Milk-Product Involved

<table>
<thead>
<tr>
<th>Disease</th>
<th>Sweet milk</th>
<th>Cream</th>
<th>Ice Cream</th>
<th>Cheese</th>
<th>Choc. milk</th>
<th>Raw</th>
<th>Past.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typhoid</td>
<td>14*</td>
<td>1*</td>
<td></td>
<td></td>
<td>1</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Scarlet fever</td>
<td>11</td>
<td>11*</td>
<td>1*</td>
<td>1*</td>
<td>1</td>
<td>1</td>
<td>1*</td>
</tr>
<tr>
<td>Paratyphoid A</td>
<td>3</td>
<td>3</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Scarlet fever &amp; S. sore throat</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1*</td>
<td>1*</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Septic S throat</td>
<td>2</td>
<td>2</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
<td>2</td>
<td>2*</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>3</td>
<td>3</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
<td>2</td>
<td>2*</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>1</td>
<td>1</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
<td>2</td>
<td>2*</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>2</td>
<td>2</td>
<td>1*</td>
<td>1*</td>
<td>1*</td>
<td>2</td>
<td>2*</td>
</tr>
</tbody>
</table>

* Indicates more than one source involved.
involved. It is significant that all the epidemics produced by milk products were gastrointestinal in nature. Four were caused by home made ice cream and four by cheese.

Two epidemics of diarrhea in Chicago were traced to cheese imported from Italy. These were so unusual that the brief description of them as given in the U. S. Public Health Service report (1) may be quoted. Number one: "On the fifth and sixth of February, 1937, eleven people reported illness after having consumed Romano (imported) cheese. The symptoms were nausea, cramps, vomiting, diarrhea, and chills. The onset was four hours after eating, and the duration forty-eight hours. The cheese was imported from Italy and shipped to a wholesaler in Chicago, and by him sold to local delicatessens. C.H.D.

One would be inclined to think that these epidemics were due to staphylococcus toxins, judging from the period of onset of symptoms following consumption of the cheese.

The states in which milk-borne epidemics occurred in 1937 are shown in Table 4. It is observed that last year, before, California and New York led in the number of epidemics. We call attention again to the fact that this is not because two states are lax in milk control efforts, but quite the contrary, which may explain why more epidemics were reported.

The need of milk sanitation in small communities appears to be substantiated by Table 5 which shows the total number of cases in these communities. In 1937 further substantiated the 1936 report (5) of this committee that as many persons affected show rash as those who do not. Cases showing rash are called septic sore throat, and those not showing rash are called septic sore throat, both groups having sore throat and other symptoms in common. It appears likely that the separation of these diseases, as is done in this report, is unnecessary, and that this disease should be referred to as "streptococcal infection" or some other suitable term.

One of the characteristics of this infection is the greater number of cases which are found in the mature age group. Commenting on the question, "Why do not more children get milk-borne infections?" the July 18, 1938 issue of Health News of the New York State Health Department offers the following explanation:

"Studies of large numbers of epidemics, in this and other states, have revealed that a preponderance of victims with ages over fifteen years is one of the characteristics of milk-borne outbreaks of septic sore throat. Apparently the age distribution of patients in these outbreaks ordinarily fol-

Table 4.
Distribution of Milk-Borne Epidemics by States—1937

<table>
<thead>
<tr>
<th>State</th>
<th>Typhoid</th>
<th>Scarlet fever</th>
<th>S S Throat</th>
<th>Septic sore throat</th>
<th>Food poisoning</th>
<th>Gastroenteritis</th>
<th>Diarrhea</th>
<th>Total cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>2(15)</td>
<td>3(18)</td>
<td>1(250)</td>
<td>6(63)</td>
<td>1(75)</td>
<td></td>
<td>2(29)</td>
<td>1(315)</td>
</tr>
<tr>
<td>New York</td>
<td>2(17)</td>
<td>1(100)</td>
<td>3(29)</td>
<td>7(75)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ohio</td>
<td>2(12)</td>
<td>1(41)</td>
<td>2(35)</td>
<td>1(75)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missouri</td>
<td>2(15)</td>
<td>1(9)</td>
<td>1(312)</td>
<td>3(27)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Texas</td>
<td>2(15)</td>
<td>1(9)</td>
<td>1(312)</td>
<td>3(27)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td>1(2)</td>
<td>1(37)</td>
<td>1(300)</td>
<td>2(39)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michigan</td>
<td>1(2)</td>
<td>1(37)</td>
<td>1(300)</td>
<td>2(39)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>1(1)</td>
<td>1(37)</td>
<td>1(300)</td>
<td>2(39)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figures in parenthesis represent total cases.

Table 5.
Population Groups Affected by Milk-Borne Epidemics

<table>
<thead>
<tr>
<th>Year</th>
<th>Typhoid</th>
<th>S S Throat</th>
<th>Scarlet fever</th>
<th>Gastroenteritis</th>
<th>Diarrhea</th>
<th>Total cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1937</td>
<td>1 (14)</td>
<td>1 (14)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
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<tr>
<td>1938</td>
<td>1 (14)</td>
<td>1 (14)</td>
<td>1 (24)</td>
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<td>1939</td>
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<td>1940</td>
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<td>1 (24)</td>
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<td>1 (24)</td>
</tr>
<tr>
<td>1941</td>
<td>1 (14)</td>
<td>1 (14)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
</tr>
<tr>
<td>1942</td>
<td>1 (14)</td>
<td>1 (14)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
</tr>
<tr>
<td>1943</td>
<td>1 (14)</td>
<td>1 (14)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
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<tr>
<td>1944</td>
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<td>1 (14)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
</tr>
<tr>
<td>1945</td>
<td>1 (14)</td>
<td>1 (14)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
</tr>
<tr>
<td>1946</td>
<td>1 (14)</td>
<td>1 (14)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
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<tr>
<td>1947</td>
<td>1 (14)</td>
<td>1 (14)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
<td>1 (24)</td>
</tr>
<tr>
<td>1948</td>
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<td>1 (14)</td>
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Table 6.
Milk-Borne Epidemics in United States—1923-1937

<table>
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<tr>
<th>Year</th>
<th>Typhoid</th>
<th>Scarlet fever</th>
<th>S S Throat</th>
<th>Gastroenteritis</th>
<th>Diarrhea</th>
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</table>

Figures in parenthesis represent total cases.

Milk Supplies in Small Communities, which revealed that a large percentage of the cities of this size do not have adequate milk sanitation organizations.

A few years ago a report of this Committee presented a tabulation of the total number of milk-borne epidemics which had occurred in the United States since the origin of this committee. Similar data are presented in Table 6 covering the period 1923-1937. The total number of cases in these outbreaks, 25,291 cases and 767 deaths, represent a great deal of human suffering.
lows quite closely that of the population in the community where the outbreak occurs. For example, the 1930 census showed that the proportion of individuals over fifteen years of age in the state was 75.3 percent, and the same average proportion prevailed in the epidemics studied. It also appears from our studies of milk-borne outbreaks, that the impression most of us have had in the past, there is very little difference between persons of different ages so far as consumption of milk is concerned. We know, of course, that almost the entire diet of young infants is milk, yet it is comparatively rare for them to contract scarlet fever or septic sore throat with milk-borne outbreaks. This probably is explained by the fact that there are more numerous, closer, and less restrained than among adults.

In what we call "contact" outbreaks of scarlet fever—where the disease is spread simply by contact between individuals, it is quite different. Here the age distribution is practically reversed, as compared with milk-borne outbreaks. This apparently is due to the fact that the nursing children, generally speaking, are more numerous, closer, and less restrained than among adults.

It should, perhaps, be added that the responsibility for the outbreaks which raised this question was not only on the milk supply but on one particular cow contributor thereto. There was no guess-work involved. The milk was one that had been infected with the human type of streptococcus.

The need of a definite identification of the streptococcus which is found in a milk-borne epidemic is imperative, and the identification of the streptococcus found in the udder of the suspected cow is equally so. Two committees of the American Public Health Association, the Committee on Milk and Dairy Products and the Committee on Diagnostic Procedures and Reagents, have sought to formulate methods which will make identification of streptococci an undoubted procedure. It is certainly hoped that this will be accomplished, for the cow should not be accused unjustly merely because the harbors hemolytic streptococci, which are symptoms of a disease of the udder. The complexity of streptococcal milk-borne infection and the difficulty of ferreting out the source of infection, is illustrated by the following epidemic (6):

"On May 2, 1938 a small outbreak of sep-
Dairymen want to understand the things they are supposed to do. They want to know why they should do them and how doing them will help prevent disease. Here are the reasons:

1. Have all cows tuberculin tested. Cows have tuberculous which is caused by a kind of germ. The germs are given off with the milk and can infect other cows or children who drink the milk. That is one reason. Another is that tuberculous cows are not profitable. So much of the food they eat must be used to combat the disease that milk production is cut down. This may not be noticed unless accurate record is kept, but it is true. Cows with advanced tuberculosis cut down. This may not be noticed unless they are advised to do. They want to know the reasons:

   a. Accurate record is kept, but it is true. Cows with advanced tuberculosis cut down. This may not be noticed unless they are advised to do.

   b. Tuberculous cows are not profitable. So much of the food they eat must be used to combat the disease that milk production is cut down. This may not be noticed unless accurate record is kept, but it is true.

2. Sell no milk from cows with garget. Inflammation of the udder, also called mastitis, mammitis, caked udder or garget, is caused by germs. Any one of several kinds of germs may cause the disease. Some germs cause garget and may not cause disease in man. The germs of at least two diseases in man may cause garget in cows. These diseases are septic sore throat and scarlet fever. A cow with garget due to one of these germs gives off many millions of the germs in the milk. The result is an outbreak of disease among the human consumers.

   a. A cow with garget due to one of these germs gives off many millions of the germs in the milk.

   b. The result is an outbreak of disease among the human consumers.

When a cow has garget, it is not possible to say off-hand that the germ causing it will cause disease in man. Nor is it possible to be sure that garget will not cause disease in man. In view of this uncertainty, the milk should not be used. Besides, all garget milk is suspect. Nobody wants to drink suspect milk. Garget milk should not be used even though it were certain that the germs would not cause disease among the consumers. In fact, all milk from garget cows should be removed from the herd to protect other cows from infection.

3. Keep all persons with sore throat away from cows and milk. Sore throat is caused by germs. Three common germs that cause it are the germs of septic sore throat, scarlet fever, and diphtheria. In addition, these germs may also infect a cow. For the protection of the cow, all persons with sore throat should be kept away. Besides, a person with sore throat may get germs into the milk he handles. For example, coughing over a milk pail may cough germs into the milk. Germs may also be sneezed into the milk. The hand, after covering a cough or sneeze, may convey germs to the cow or the milk. By all means, then, persons with sore throat should be kept away from cows and milk to prevent an outbreak of disease among the milk consumers.

4. Keep all sick persons away from cows and milk. A sick person may have a disease that can be carried by milk. An attack of typhoid fever or paratyphoid fever comes so gradually that the patient may be ill several days before he finally gives up and goes to bed. Such a patient may easily cause a milk-borne outbreak. Any person or cow that has been away from handling milk while ill. Germs from an infected finger or hand may be of a kind that will infect a cow or a human consumer of her milk. In that case the disease may be spread from a ulcer or boil on the hand of a milk handler. In order to take no chances, all sick persons should be kept away from cows and milk. At least, all milk should come from healthy cows and be handled by healthy handlers.

5. Require all handlers to wash their hands before milking. The milk handler may carry a disease germ "carrier" and not know it. A "carrier" is a person who has disease germs in his body but is not ill. He is often the vehicle for conveying disease germs to man. In view of this fact, a cow with garget should be removed. The germs of typhoid fever and paratyphoid fever are conveyed by the discharges from an infected finger or hand. A sick person or cow that has been away from handling milk while ill. Germs from an infected finger or hand may be of a kind that will infect a cow or a human consumer of her milk. In that case the disease may be spread from a ulcer or boil on the hand of a milk handler. In order to take no chances, all sick persons should be kept away from cows and milk. At least, all milk should come from healthy cows and be handled by healthy handlers.

   a. A cow with garget should be removed. The germs of typhoid fever and paratyphoid fever are conveyed by the discharges from an infected finger or hand.

   b. A sick person or cow that has been away from handling milk while ill.

   c. Germs from an infected finger or hand may be of a kind that will infect a cow or a human consumer of her milk. In that case the disease may be spread from a ulcer or boil on the hand of a milk handler.

   d. In order to take no chances, all sick persons should be kept away from cows and milk. At least, all milk should come from healthy cows and be handled by healthy handlers.

   e. The result is an outbreak of disease among the human consumers.

MILK-BORNE OUTBREAKS OF DISEASES

An average of about one milk-borne outbreak of disease per week is reported in this country. A total of 104 such outbreaks were reported for the years 1926 and 1927. In Connecticut 15 milk-borne outbreaks were reported during the 7 year period from 1923 to 1929. These outbreaks included 4 of septic sore throat, 6 of typhoid fever, 3 of scarlet fever and 2 of paratyphoid fever. In addition to these there have been many cases of tuberculosis among infants and children who drank milk from tuberculous cows.

While investigating these outbreaks it was learned that in the case of septic sore throat and scarlet fever some one with sore throat had milked the cows or handled the milk before the outbreak had occurred. Whether germs passed directly from handler to farm or from farmer to cow and thence to the milk was not ascertained in all cases. In the typhoid and paratyphoid outbreaks a disease "carrier" had handled the milk without washing his hands. Thus the simple preventive measures herein recommended are based upon facts ascertained by investigating milk-borne outbreaks.

PASTEURIZATION KILLS GERMS

Another fact brought out by investigating these outbreaks is that pasteurized milk was not responsible for the spread of disease in any of the outbreaks. It is well known that pasteurization kills the disease germs in milk, provided the process is properly carried out. The milk must be heated enough and kept long enough to kill the germs. In Connecticut the law requires heating to 145 degree Fahrenheit and holding within three degrees of that temperature for thirty minutes. Pasteurization will continue to be our main safeguard against milk-borne outbreaks of disease. In fact, for large supplies where pasteurization is not practical, the simple measures herein recommended will help safeguard consumers from milk-borne disease.

SICK PERSONS NOT TO HANDLE MILK

The handling of milk or milk utensils by a person ill with a communicable disease, or who cares for a person ill with such disease, is prohibited by state law. Each dairymen must report promptly to the local health officer any case or suspected case of communicable disease on a milk farm.

Any one with sore throat is a suspected case of communicable disease. By promptly reporting such a case the dairymen can obtain expert advice in regard to handling the situation.

Regulation 17 of the Sanitary Code requires the local health officer to transmit such report immediately to the State Department of Health. Representatives of the State Department of Health and of the State Dairy and Food Commissioner are always available for investigation and advice upon request of the local health officer.

I. A. MERCHANT, Chairman
PAUL B. BROOKS
R. V. STONE
LESLIE C. FRANK
F. L. MICKLE
HORATIO N. PARKER
A. R. B. RICHMOND
J. G. HARDENBERGH

REFERENCES

1. United States Public Health Service, Sanitation Division. Outbreaks of disease caused by milk and milk products as reported by health authorities as having occurred in the United States in 1937. Mimeographed report.


Sanitation of Products Added to Frozen Desserts *

P. H. Tracy **

University of Illinois, Urbana, Illinois.

Pasteurization of the mix from which commercial ice cream is manufactured has come to be a standard practice. Further precautions to protect the sanitary quality of ice cream by using proper methods of washing and sterilizing the plant equipment are routine procedures in all modern ice cream plants. Under such conditions of operation there should be little question about the sanitary qualities of commercial ice cream. However, the possibility of contaminating ice cream with the materials ordinarily added at the freezer, such as flavoring and coloring, has not been fully appreciated. The various kinds of fruits, nut meats, and candies that make up our daily diet are generally accepted by the consumer without question as to their sanitary qualities. The possibility of the transient laborer who harvested the box of berries we serve for dinner having septic sore throat or sprue, his colonic flora, being responsible for a cold or diarrhea, does not often excite us. We, as consumers, give little thought to the history of the nut meats we buy for the dinner party, even though they may have been touched by the hands of an infected worker. The ice cream industry has accepted these materials in much the same way, assuming that they are not dangerous to health.

For the purpose of getting first-hand information as to how some of these products, whose history is unknown to the user, are actually prepared for market, visits were made to the ice cream manufacturer in shelled form. The nuts were peeled, in order to remove the kernels without badly shattering them, and the nuts appeared to be boiled before cracking. They are then permitted to dry until the shell is brittle but the kernels are still moist enough to be removed without breaking. The cracking may be done either by hand or by machinery. In one plant visited, the workers were Italian men, women, and girls. In another plant, colored women and girls were employed. The operation of the plant required the workers to wash their hands and sterilize them by dipping them in a weak chlorine solution each time they came into the room. As far as could be learned, the workers are not subjected to periodic health examinations. In some of the southern states where shelled nut meats are prepared for marketing, much of the cracking is done in the homes of workers where the family is employed, and the resulting meats are not put to the microorganisms that can develop on the meats, we are concerned with the practical matters of the problem, and not with the theoretical aspects.

Pecan Nut Meats

In a survey conducted at the Illinois Experiment Station (1) it was found that 65 percent of the pecan meats collected from ice cream plants supported bacterial growth, 75 percent were contaminated with molds and 50 percent of the samples gave a positive test for Bacillus coi. It was evident from the data secured that a safe form of treatment and one that would reduce the possible contamination from the meats is desirable. Various methods of treating the meats were tried, such as washing with cold water, hot (180° F.) water, boiling water, boiling salt solution, alcohol (95 and 70 percent), dry heat, hot (180° F.) and boiling sucrose solutions of 25-75 percent concentrations and hot (208° F.) and boiling (240° F.) butter. Of these methods, the sucrose and salt solutions, and butter and dry heat treatments were found to be the most promising, as far as the flavor of the pecans was concerned. Nut meats were inoculated with a fast-growing organism of the colon group. They were then treated by the methods found to be most promising, and in the exception of the dry heat treatment (250° C. for 2 minutes), they all reduced the count on the meat from 3,000,000 to less than 60 per gram.

The tinclet flavor that develops in nut meats was diminished appreciably by treating the meats for 15 seconds in a 15 to 30 percent sucrose solution followed by drying for 2.5 minutes at 250° C. When stored for one week in ice cream, the sucrose-sugar treated meats retained their crispness and flavor. The butter-treated meats resembled the control in both flavor and texture. The meats receiving the dry-heat treatment were crisp but they had a roasted flavor which was more evident after being added to the ice cream. The samples treated in the boiling 20 percent salt solution were crisp and had the best flavor of all the samples; however, in the ice cream the kernels were sufficiently salty to be objectionable. By adding 1 percent of salt to the sucrose-sugar solution in which the meats were dipped, a slightly better flavor was produced in the ice cream. This treatment was considered the most desirable.

Since treated pecan meats must be stored until used, a study was made of the practicability of various storage methods using pecans that had been treated with hot and boiling sucrose solutions to which 1 percent of salt had been added. Samples of the treated meats were then stored at 36° F. (humidity 80 percent) (Continued)
sometimes used day after day without
solutions of eleven different colors were
of coloring solution may be returned to
the stock solution, thus possibly seeding
vor, texture, and color of those meats
stored in a tin can with a cheesecloth
covered. The measuring graduates are
found the counts to vary from
cream plants ranged from
organisms. Mold growth was particularly
storage period. In general, the addi­
tion of microorganisms, although
particuliarly bad in .the
temperature. The
growth in the
samples was slow at first, in most
Gases
were placed in dark glass bottles for
experiments covered a period of
ten weeks, The storage temperatures
were 40°, 80°, and 100° F. The re­
sults are given in Tables 1, 2, and 3 (the
data on sample No. 3 is representative of
that on all the others):
The bacterial counts of the samples
stored at room temperature increased
rapidly. While the growth in the 40° F
samples was slow at first, in most cases
at the end of ten weeks there was little
difference between the growth of these
samples and those stored at room tem­
perature. The rate of growth at 100° F
was much slower, indicating this tempera­
ture was too high for most of the or­
ganisms. Mold growth was particularly
bad in the 80° and 100° F samples. The
addition of 0.1 of 1 percent of sodium
benzoate did not prevent the multipla­
tion of microorganisms, although the
growth was somewhat less, particularly
during the early part of the ten-week
storage period. In general, the addi­
tion of 10-25 percent of alcohol pre­
vented the growth of bacteria. Only one of
the 68 experimental samples fermented
brilliant green bile. Air contamination is
not an important source of bacteria of
the color group.
In another series of experiments using
water solutions of the eleven dyes noted
### TABLE 2

**Relation of Air Contamination and Storage Temperature to the Number of Microorganisms in the Colors with 0.1 of 1 Percent Sodium Benzoate Added as a Preservative.**

<table>
<thead>
<tr>
<th>Color No.</th>
<th>1 week</th>
<th>2 weeks</th>
<th>4 weeks</th>
<th>6 weeks</th>
<th>8 weeks</th>
<th>10 weeks</th>
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<tbody>
<tr>
<td></td>
<td>Bacteria</td>
<td>Mold</td>
<td>Bacteria</td>
<td>Mold</td>
<td>Bacteria</td>
<td>Mold</td>
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<td>20</td>
<td>0</td>
<td>60</td>
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<td>8</td>
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<td>0</td>
<td>410</td>
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<td>15,100</td>
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<tr>
<td>9</td>
<td>0</td>
<td>0</td>
<td>450</td>
<td>0</td>
<td>370,000</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>1,200</td>
<td>0</td>
<td>90,000</td>
<td>0</td>
<td>55,000</td>
<td>0</td>
</tr>
</tbody>
</table>

**Colors stored at 40°F.**

| Color No. | 1,200 | 0     | 90,000 | 0     | 55,000 | 0     | 290,000 | 0     | 3,000 | 0 | 130,000 | 0 |

**Colors stored at 80°F.**

| Color No. | 1,200 | 0     | 90,000 | 0     | 55,000 | 0     | 290,000 | 0     | 3,000 | 0 | 130,000 | 0 |

**Colors stored at 100°F.**

| Color No. | 1,200 | 0     | 90,000 | 0     | 55,000 | 0     | 290,000 | 0     | 3,000 | 0 | 130,000 | 0 |

* Indicates sub-surface mold growth.

### TABLE 3

**Relation of Air Contamination and Temperature of Storage to the Microorganisms Present in Colors to Which Various Amounts of Alcohol Were Added.**

<table>
<thead>
<tr>
<th>Percent alcohol added</th>
<th>1 week</th>
<th>2 weeks</th>
<th>4 weeks</th>
<th>6 weeks</th>
<th>8 weeks</th>
<th>10 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bacteria</td>
<td>Mold</td>
<td>Bacteria</td>
<td>Mold</td>
<td>Bacteria</td>
<td>Mold</td>
</tr>
<tr>
<td>10%</td>
<td>30</td>
<td>0</td>
<td>350</td>
<td>0</td>
<td>10</td>
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<td>15%</td>
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<td>30</td>
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</tr>
<tr>
<td>25%</td>
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<td>0</td>
<td>50</td>
<td>0</td>
<td>20</td>
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**Color No. 3**

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<tr>
<td></td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>25%</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>25%</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
</tr>
<tr>
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<tr>
<td>Stored at 80°F.</td>
<td></td>
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<tr>
<td>Stored at 100°F.</td>
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<table>
<thead>
<tr>
<th>Color No. 6</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>25%</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>25%</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
</tr>
<tr>
<td>Stored at 40°F.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stored at 80°F.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stored at 100°F.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Indicates sub-surface mold growth.
above and three shades of colors in water solution with 0.1 of 1 percent of sodium benzoate, 20 ml. of each solution were poured into a sterile graduate and then poured back into the bottle again once each week. No attempt was made to protect the pouring lips of the bottle against air contamination. The growth of bacteria and mold, in general, was found to be noticeably less than in those experiments in which the graduates were not sterilized before using.

In a third series of experiments, the samples were not disturbed except when the weekly bacteriological samples were taken. While there was some growth of mold and bacteria, the numbers were much less than in either of the two previous experiments.

In all the experiments, 0.1 of 1 percent of benzoate of soda failed to inhibit bacterial growth to any great extent. In further studies, bacterial growth was found even with as much as 2 percent of the benzoate.

Three different shades of coloring materials were inoculated with *E. coli* and *Staphylococcus aureus*, and incubated at 57° C. Although the number of these organisms was found to decrease rapidly, at the end of seven weeks some of the organisms were still living.

During the storage of the color solutions, weekly checks were made on the color intensity, using a Bausch and Lomb colorimeter. Five of the eleven colors were found to deteriorate during storage. The greatest change occurred in the samples stored at 100° F., and the least change occurred at 40° F. The rate of change was independent of the number of organisms present, the effect appearing to be one related to time and temperature of storage.

Thinking that it might be desirable to pasteurize color solutions periodically before the last in the bottle was used, an experiment was performed in which five color solutions were each heated at 145°, 160°, and 180° F. for 30 minutes, five different times. Between each heating, the solutions were cooled to 50° F. and sampled. Single heating at any of the three temperatures did not affect the quality of the color. In only one case did the second heating at 145° F. injure the colors. But the intensity of the color of the materials heated to 160° and 180° F. was changed at the second and subsequent heatings.

**METHODS OF PREPARING FRUITS AND FLAVORING MATERIALS**

Ordinarily little consideration is given to the flavoring materials such as fruits and extracts as a possible source of bacterial contamination of ice cream. However, since much of the fruit used is fresh or frozen packed, the possibility of contamination from this source should not be overlooked. Frozen pack strawberries secured from commercial ice cream manufacturers varied from 10 to 67,000 bacterial counts of Staphylococci picked up on the Urbana market gave counts ranging from 300 to 830,000, and two of the samples fermented brilliant green bile.

It is commonly recognized that fruit preserved by heat does not impart as desirable flavor to ice cream as fresh fruit. However, it was thought that it might be possible to apply a limited amount of heat to the fresh or frozen pack fruit and certain other flavors, and make them safe from a sanitary point of view without serious injury to their quality.

A series of experiments were performed in which the heat treatments employed were in most cases effective in reducing the bacterial content of the fruits (see Table 4). The injury to the flavor of the strawberries and raspberries (red, black, and purple) caused by heating to 145° F. for 30 minutes was not noticeable after the berries were added to ice cream. Likewise, heating to 160° F. for 15 minutes gave satisfactory results, but a cooked flavor resulted when the berries were heated to 180° F. for 5 minutes or to 212° F. momentarily.

Fruits, such as peaches that need to be peeled, must be pasteurized before using and should not present much of a sanitary problem. For experimental purposes, the standard method of dipping the peaches in boiling water for 1 minute and cooling with cold water in order to remove the skins, was used. The pits were then removed, and the fruit sliced and mixed with sugar at the rate of 4 parts of fruit to 1 part of sugar. The fruit-sugar mixture was boiled for 3 minutes. This procedure not only destroyed most of the organisms present but also produced a product with a good flavor.

Counts under 100 per gram were obtained on bananas that were prepared by mixing the sliced fruit with sugar (4 parts fruit to 1 part of sugar). The results are given in Table 4. The flavoring extracts used were pasteurized by boiling for 5 minutes, and should be used within 24 hours. The flavoring extracts contain sufficient alcohol to prevent the growth of bacteria from serious bacterial growth.

**CONCLUSIONS**

An attempt has been made to show that it is possible for dairy plant operators to improve the sanitary qualities of ice cream by paying more careful attention to the way in which they prepare and care for the flavoring and coloring materials used in their ice cream. The following procedures have been found helpful in this respect:

1. Nut meats should be pasteurized by boiling sugar solution (approximately 50 percent) to which has been added 1 percent of salt, for 15 seconds, and then dried at 250° C. for 2½ minutes. Prepared nut meats are best stored in glassine bags or tinned cans at room temperature.

2. Color solutions should be made using 180° F. water, and should be placed in clean sterile bottles. These bottles should be kept covered and should be stored at 40° F. while not in use. The containing gradients should be washed and rinsed with hot (180° F.) water each day before using. Unused portions should not be returned to the stock solution. Stock solutions should be prepared fresh weekly. Old solutions should not be used without first heating to 145° F. for 30 minutes.

3. Ingredients handling fresh fruits should have clean hands and clothing. All equipment used in handling fruit should be cleaned and disinfected before use. Fruits with delicate flavors such as fresh strawberries and raspberries can be satisfactorily pasteurized by being mixed with sugar and heating to 145° F. for 30 minutes. If necessary, certain flavor extracts can be heated to 145° F. for 30 minutes without serious injury to the flavor.
Public Health Aspects of Fruits, Nuts, Colors, and Extracts Used in Frozen Desserts

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Most of the ice cream today is made from pasteurized mix, considered by milk sanitarians as a necessary practice to ensure the safety of the ice cream. The mix consists of the various products such as whole milk, skim milk, cream, butter, evaporated milk, powdered milk, sugar, and gelatin or some other stabilizer. There are in the finished product, the ice cream, other ingredients besides those present in the pasteurized mix. Such ingredients as flavoring extracts, fresh fruits, preserved fruits, berries, candies, syrups, nut meats, and others are a necessary part of ice cream. These ingredients cannot be added before pasteurization. They are added to the mix at the time of freezing and, therefore, do not receive the protection of pasteurization.

The sanitary quality of these ingredients has frequently been questioned by dairy sanitarians. Newman in 1930 (1), Fabian in 1930 (2), and Smallfield in 1933 (3) have examined many of these ingredients to determine their bacteriological condition. They found that these ingredients may harbor a large bacterial population and thus contaminate the pasteurized ice cream mix.

The study reported in this paper is of similar nature as the studies referred to above. Its purpose was to accumulate further evidence and to suggest remedies where needed.

The samples of these ingredients were taken in the regular ice cream plants mostly from the opened containers in which they were kept while in use. Some of the ingredients were fresh while others were old, being used occasionally and meanwhile kept in store room or refrigerator. The samples, therefore, were representative of the ingredients as these were being used.

The bacteriological examination consisted of agar plant counts, yeast and mold counts, and the determination of the presence of coliform organisms. For the bacterial plate counts, regular standard agar containing 2 percent dextrose was used. The agar was acidified with tartaric acid to pH 4.5. For the determination of the coliform organisms, brilliant green bile broth in fermentation tubes was used. The development of gas in the closed arm was recorded as positive. No attempt was made to hunt for pathogenic microorganisms.

In addition to the taking of samples and examining them bacteriologically, the ice cream plants were inspected, especially with regard to the care and storage facilities for keeping these ingredients. Visits were also made to several establishments, in which these ingredients are prepared, to investigate the sanitary practices and the environment under which some of these ingredients are being prepared.

A summary of the results of the bacteriological examinations of a part of the samples is presented in Table 1. Of the 297 samples reported, 164 harbored bacteria, 24 had an abundance of coliform organisms, and 107 had yeast and molds.

The various flavoring extracts which were dissolved in alcohol were for the most part free from bacteria. Vanilla samples were of interest because they invariably contained some bacteria, mostly spore producers.
TABLE 1
Microbial Condition of Certain Ice Cream Ingredients

<table>
<thead>
<tr>
<th>Product</th>
<th>No.</th>
<th>Percent samples showing</th>
<th>Range of mold count</th>
<th>Percent showing mold</th>
<th>Range of bacterial counts (per ml or per gram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Newman, R. W., and Reynolds, A. F. Bac-</td>
<td>5</td>
<td>5.0</td>
<td>0-250</td>
<td>70.5</td>
<td>9,700,000 (250)</td>
</tr>
<tr>
<td>2. Maracchino cherries</td>
<td>10</td>
<td>11.1</td>
<td>0-470</td>
<td>70.0</td>
<td>1,000,000</td>
</tr>
<tr>
<td>3. Nutrients</td>
<td>20</td>
<td>20</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
<tr>
<td>4. Frozen pack strawberries</td>
<td>15</td>
<td>15.5</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
<tr>
<td>5. Caramel color solution</td>
<td>13</td>
<td>13.1</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
<tr>
<td>6. Blue color solution</td>
<td>14</td>
<td>14.0</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
<tr>
<td>7. Green color solution</td>
<td>15</td>
<td>15.3</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
<tr>
<td>8. Yellow color solution</td>
<td>12</td>
<td>12.0</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
<tr>
<td>9. Orange color solution</td>
<td>25</td>
<td>25.2</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
<tr>
<td>10. Vanilla extract</td>
<td>10</td>
<td>10.0</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
<tr>
<td>11. Miscellaneous (Plant 1)</td>
<td>20</td>
<td>20.1</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
<tr>
<td>12. Miscellaneous (Plant 2)</td>
<td>20</td>
<td>20.1</td>
<td>0-250</td>
<td>70.5</td>
<td>1,000,000</td>
</tr>
</tbody>
</table>

* Different ingredients from a plant where they were properly cared for.
** Different ingredients from a plant where they were neglected.

Fresh fruits and berries always contain some bacteria. As a rule, the coliform organisms were absent, but yeasts and molds were always present, occasionally in large numbers.

Of the various ingredients, the coloring solutions may contain the largest number of organisms, molds, and at times fairly large numbers of bacteria.

While some of these ingredients may harbor quite a large number of bacteria, the increase in bacterial counts of ice cream due to their presence is generally small. The real interest of sanitarians lies in the fact that these organisms can be trans­mitted by the food. The increase in bacterial counts of ice cream due to the presence of such organisms was noted with concern.

As seen from the table, there were quite a number of samples harboring coliform organisms. Where these came from was not determined but probably in most cases they were of human origin. If this group of organisms can be transferred from the hands of the operators to the food products, the same thing might happen in a case of such bacteria as urged for inclusion in the milk ordinance. Unfortunately, the results of this study give no information as to the presence of such organisms in these ingredients.

The visits of the writer to a number of establishments where some of these ingredients were handled and prepared convinced him that the possibilities of contaminating the ingredients with pathogenic organisms were great.

These ingredients cannot be put into the ice cream mix prior to pasteurization, therefore, some other method of treatment must be employed to make them safe.

Three different suggestions might be offered. First, some inspection and regulation should be made of the establishment where these ingredients are prepared. This is a responsibility not only of dairy inspectors but of health officers in general. Some of these ingredients are used in other foods besides ice cream and some of them such as nut meats are consumed directly.

Second, the dairy inspector should see that the various ingredients are kept in an acceptable storehouse or in a refriger­ator in ice cream plants. The importance of this is well illustrated by the data in Table 1. The ingredients in Plant 1, No. 13, came from an ice cream plant where the ingredients were kept at room temperature. In Plant 2, No. 14, the ingredients came from an ice cream plant where they were kept on shelves, unprotected from dust and at room temperatures.

Third, some of the ingredients should receive a bactericidal treatment before they are used. For example, nut meats may be so treated (4) that they will be prac­tically free from bacteria.
Condensed and Evaporated Milk with Reference to Ice Cream

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In the commercial manufacture of ice cream, the addition of milk solids not fat has long been an established practice. The standardization of the mix so that it contains the amount of butterfat required by law is of course necessary. The addition of sugar and flavor to suit the demands of the consumer as well as the addition of milk solids not fat to produce a smoother body are of great interest to the manufacturer.

The adjustment of the ratio between water and total milk solids in the mix is an important factor in the manufacture of a good-bodied ice cream. This adjustment usually requires the addition of from 2 to 3 percent of milk solids not fat. The source of such solids in the ice cream mix may come from condensed milk products such as evaporated, sweetened condensed, or plain condensed. These may be made either from whole milk or skimmed milk as the situation demands. From the standpoint of sanitation, we shall consider the manufacture of the condensed products in the order named. It is of interest to consider their method of manufacture and their possible importance as a source of contamination that might be reflected in the bacteria counts.

**EVAPORATED MILK**

According to Federal standards: "Evaporated milk is the product resulting from the evaporation of a considerable portion of the water from skimmed milk to which sugar (sucrose or sucrose and dextrose) has been added. It contains not less than 24 percent of milk solids."

In the manufacture of these products, the process consists of heating the milk either whole or skimmed, in the hot well or heater, to 200° to 210° F. During the heating process, sucrose is added in sufficient amounts to give a sucrose content in the finished product of from 43 to 46 percent. The milk is then concentrated in a vacuum pan and boiled until the desired concentration of milk solids is obtained. The milk is maintained as in the case of evaporated milk and the boiling temperature varies from 120° to 145° F. for the duration of the process. When the desired concentration has been obtained, the product is pasteurized, then cooled, and stored until packaged. The whole-milk product is usually packed in tin cans, hermetically sealed, and placed on the market. In the case of skimmed milk product, it is usually packed in kegs or barrels. This product, having a total solids content of 72 to 74 percent, contains sufficient sucrose in the water left in the product to make a saturated solution. This condition prohibits the growth of most microorganisms even when held at room temperature for long periods of time.

Modifications of this method are often used when it is to be used for ice cream purposes. Usually it is handled in barrels or large cans, and in some cases combinations of sucrose and dextrose are used. If the product has been properly made, barrels furnish a satisfactory convenience and the product should reach the plant in good condition. However, when the manufacturer prepares a skimmed milk product without the proper care, the quality of the product in the barrel after it reaches the plant may deteriorate before it is used in the mix. This deterioration may be due to insufficient sugar or proper methods of manufacture, especially that of improper heating in the hot well. The system of holding such a product under refrigeration temperature until used will remedy this situation to some extent.

Any modification from the standard procedure may give a product which will not have the necessary preservation factor furnished by the high concentration of sugar. Some manufacturers have found it desirable to prepare condensed skimmed milk containing 50 percent milk solids with only 30 percent sugar. One can readily see that this type of product does not contain sufficient sugar to give the protection that is obtained in the standard product. Such a product would necessarily have to be kept under refrigeration until used if deterioration were to be eliminated. The method of handling such a product varies all the way from storing at 32° F. to freezing solid in a zero degree room and thawing as needed. From a sanitary standpoint, the later method of storing such a product is very satisfactory when properly handled in the plant. However, the problem of thawing a frozen product in such a way as to eliminate bacterial growth is a problem that many plants have not yet solved. Because of this fact, not only the question of the method of manufacture but also the method of handling the product in the plant where the mix is prepared should be given consideration.

**PLAIN CONDENSED MILK**

The manufacture of plain condensed milk, either in the whole or skimmed milk, consists of heating the milk in the hot well to a temperature of 150° to 200° F. at which temperature it is drawn into the vacuum pan and condensed 5 or 4 to 1. This concentrated product, with a total solids content of 53 percent, is stored in ten-gallon milk cans and used very extensively in the ice cream mix. This product is in no way different from whole milk from the standpoint of spoilage. It is readily and must be held under refrigeration. During periods of storage, it is either held at 32° F. or slightly lower, or frozen as in the case of the sweetened condensed milk. On
account of its perishability, one should expect to find the same sort of conditions as in the case of cream or milk in an ice cream plant. Great care must be taken to keep the bacteria from increasing while it is in storage and while it is being handled prior to the manufacture of the mix. Here again the question of melting the frozen product should receive consideration.

In some plants, a product known as super-heated skim milk condensed is used. This product is nothing more nor less than plain condensed, just described, which is heated under vacuum by the use of live steam to a temperature sufficiently high to coagulate partially the casein, thus making a thick viscous product. The characteristics of this product are very similar to those of plain condensed, and should be handled in the same manner.

HANDLING OF MIX

With the manufacturing methods of these products in mind, one might think as to the condition of the mix when prepared in a plant using the various products. The quality as expressed by the bacterial content shown by the plate method of the ice cream mix before pasteurization would depend entirely upon the quality of the products used in the mix. The effect of the condensed or evaporated milk used in the mix would depend upon the method of manufacture, method of storage, as well as the method of handling the product in the ice cream plant. The only way to determine this condition is to examine the mix before it is pasteurized.

If the process of pasteurization is carried out with suitable equipment and under standard conditions, one would expect to find an ice cream mix with a bacterial count well within the standard suggested by health authorities.

One finds many variations in the method of preparing ice cream mix. One of the interesting points that comes to mind when considering the problem is that of multiple pasteurization. It is generally understood in public health circles that fluid milk is to be pasteurized but once. However, in the products used for the furnishing of milk solids not fat in ice cream mix, especially that of condensed skimmed milk, it is possible for the product to be pasteurized at least three times before the ice cream mix is finally frozen. In other words, milk is received at the plant, pasteurized, separated, the skimmed milk going to the vacuum pan where it is again pre-heated to temperatures well above pasteurizing conditions, held for varying lengths of time, evaporated in the vacuum pan at a temperature approaching the used for pasteurization and for longer periods, and finally packed as a finished product, having had at least two heat treatments at pasteurization temperatures. After this product is placed in the mix, it again receives a heat treatment. It really has been pasteurized or has received a heat treatment equivalent to that of pasteurization at least three times. In many cases, this brings up the question of thermophilic organisms, and may result under certain conditions in a high-count product. In other words, bacterial counts of products such as these may not always give a true picture of their actual condition, as far as the question of sanitation is concerned.

The problem of handling frozen products in the plant during the process of thawing preparatory to using in the mix is of great importance, and should be given much consideration if the bacterial count of the ice cream mix before pasteurization is to be kept at a minimum.

Sanitary Control of Dried Milk *

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Since approximately 3,000,000,000 pounds of fluid milk are converted into dried milk in this country annually, nearly all of which is consumed as food, sanitary control of milk in this form has a place in the public health officials' food control program. Unlike fluid milk, dry milk is used mostly as an ingredient in other foods, is seldom retailed, and is in powder form. These conditions have helped to escape the sanitary control given the fluid form.

Public health officials are accustomed to apply various bacteriological procedures in controlling the sanitary quality of fluid milk. However, additional factors are involved when these procedures are applied for a similar control of dry milk. These may seem to make such control more difficult.

This is due largely to the physical properties of dry milk. A brief review of dry milk manufacture and handling will be helpful at this point. There are several methods of manufacture but the two most common are the use of the atmospheric roller or drum dryer, and the spray dryer. In the former, a thin film of milk is spread over a revolving, steam-heated drum or roller. As the drum rotates, its heat evaporates the water, and the film of dried milk solids is scraped off by a knife. The whole process takes place at atmospheric pressure and at high temperature. In the spray drying process, a descending spray or mist of milk meets a rising current of hot, dry air. The moisture in the tiny droplets of milk is evaporated almost immediately, and the dried milk falls to the bottom of the spray dryer. This almost instantaneous evaporation cools the milk solids so rapidly that not even the lactalbumin is coagulated. It is seen that the latter method gives a more soluble product, because the milk solids are not subjected to a severe heat treatment as in the former method.

Dried milk is usually packed in barrels. The conditions of storage of these barrels of dry milk may affect its sanitary quality. The development of rancidity in dry milk is not likely to be of major importance since most dry milk is made of surplus skim milk, and dry skim milk usually contains not over 1 percent fat. But an off odor, described as "stale" or "sallow", will develop during improper storage. This "off" odor will carry over into frozen desserts or other food products in which the tainted milk powder is used. Dry skim milk is subject to weevil infestation, and should be protected from all types of contamination during storage, and held in a dry, cool place. Uneven storage temperatures are detrimental as they cause sweating with consequent lumping and mold growth. High humidity in the storage room is bad for the same reasons.

Since dry milk is frequently made from surplus skim milk, the sanitary quality of the original fluid milk frequently leaves much to be desired. The plate count of the dried product may or may not reveal the original sanitary quality, depending on the process of drying employed and the age of the dry milk. In this connection a statement by the American Dry Milk Institute (15), referring to the plate count, is important: "It is generally agreed that the bacterial count of dry milk solids is not necessarily an indication of the quality of raw milk from which the dry product is made. The process of manufacture has a direct
Infantile mortality bearing upon the extent to which the bacteria are destroyed.

However, use of the microscopic technic that shows the dead as well as the living bacteria and likewise the types will tell much concerning the previous history of the product under examination.

The importance of knowing the past history of the product was demonstrated in an outstanding piece of work by Shrader and his co-workers (12) at Baltimore.

Figure 1, which is Chart 1 in Dr. Shrader's paper, summarizes their findings.

The procedure described by Breed and Brew (3) is the most satisfactory method of using the microscopic technic with the powdered milks that dissolve easily. The 1:10 dilution of the powder in distilled water is used for making the smear, and is done by the procedure described in "Standard Methods" for fluid milk.

With samples that are difficultly soluble, it is almost impossible to secure a uniform, finely dispersed suspension in the distilled water blank. As a result, a very uneven film of milk solids is obtained on the slide. Such films not only are frequently washed off during staining, but also clumps of casein often so obscure the bacteria that it is impossible to make a satisfactory examination of the smear.

Such samples may be examined satisfactorily by microscopic technic when 1:10 dilutions in LiOH are used, as described by Prickett and Miller (2). Another method of staining, employing a different fixative and an aniline oil-methylene blue stain, but using the 1:10 dilution in LiOH, has been reported by Schneiter and North (16) to be satisfactory for difficultly soluble milk powders.

Although, as indicated previously, both dehydration and storage tend to reduce the numbers of viable bacteria present in the original, fluid milk, as shown by Supplee and Ashbaugh (17), Macy (1), and others, nevertheless the plate count is an important bacteriological procedure in the sanitary control of dry milk. Not only does it give some idea as to the original flora of the fluid milk, but it also reflects the contamination to which the milk was subjected following drying. For the latter, it is especially important, according to Supplee and Ashbaugh (17), in the case of atmospheric drum-dried milk.

The chief difficulty encountered in the plating procedure is the preparation of satisfactory dilutions of difficultly-soluble powdered milks. It is important to prepare the dilutions so that: (a) the milk fat, if appreciable amounts are present, will not be churned out of suspension, and (b) the poured plates will be as free as possible from undissolved particles of dried milk that may be confused with "pin-point" colonies when the plates are examined after incubation, illustrated in Figure 2.

Spray-dried milk is sufficiently soluble to dissolve with little difficulty in the distilled water dilution blank. However, the less soluble drum-dried powders will dissolve with difficulty in such dilution blanks. If careful warming of the dilution water to 43-45° C. (110-120° F.), before the weighed powder of sample is added, does not put the sample into solution, then the use of an alkaline dilution blank is recommended.

Prickett and Miller (2) reported that their best results in using alkaline dilution blanks to eliminate the particles of milk solids (Fig. 3) by the solvent action of alkali were obtained with LiOH solutions. Although they found the pH values of dilutions of milk powders are slightly increased when LiOH blanks are
used, the pH values of the inoculum medium mixtures seeded with LiOH blanks can be largely controlled by adjusting the reaction of the medium. (They recommend using nutrient agar whose reaction is pH 6.2 to 6.6 if LiOH dilution blanks are employed.) They also showed that further control of the pH is obtained by using LiOH in only the 1:10 dilution, and then employing sterile distilled water blanks for the higher serial dilutions. These authors were unable to demonstrate any germicidal action by the LiOH dilution blanks when used with powdered milk, as shown in Table 1. From this table it is seen that a concentration as high as N/5 LiOH is not germicidal. Since only very insoluble milk powders require this concentration, it is obvious, as has been reported, that no killing effect will be encountered by using weaker concentrations which are satisfactory for most dry milks. Sorensen (15) has confirmed the value of using alkaline dilution blanks in detecting thermophilic contamination in skim milk powders, although he employed weaker concentrations.

Another difficulty in securing satisfactory plate counts of dried milk is that frequently many of the viable bacteria in this product tend to form "spread" colonies. This tendency toward spread colony formation is markedly reduced, according to Prickett (18), by the use of Bacto Tryptone Glucose Extract Agar as the plating medium.

Another bacteriological procedure frequently used by public health officials in controlling the sanitary quality of fluid milk is the test for organisms of the coli-form (Escherichia-Aerobacter) group. Organisms of this group have been reported by Allen (4) and others to be present in powdered milks. In addition to the sanitary significance that may be attached to results of this test, it also helps to determine the efficacy of the heat treatment that powdered milk undergoes in a manner analogous to use of this test in pasteurization control, as recommended by McCrady and Langevin (6).

In powdered milk, most satisfactory results have been obtained when Difco Brilliant Green Bile Broth (2%) has been used as the enrichment medium in the presumptive test. "Standard Methods" should be followed for confirming presumptive tests and reporting results. It has been reported by Miller and Prickett (5) that in samples of powdered milk fairly heavily contaminated with organisms of this group, Bacto Violet Red Bile Agar can be used for their detection as well as to enumerate the numbers present. McCullough and Farrell (14) showed that higher dye concentration in culture media employed for the determination of Escherichia-Aerobacter numbers in milk gives more efficient and satisfactory results.

Due to the increasing prevalence of food-poisoning outbreaks caused by hemolytic staphylococci and streptococci, as reported by Tanner (7), Jordan (8), and others (10, 11), it would seem desirable to say the least, to exclude from frozen desserts products contaminated with these organisms.

In this report some of the more important bacteriological procedures applicable to the sanitary control of dry milks have been briefly discussed. Additional procedures are available, but sufficient evidence has been produced to demonstrate that public health officials have adequate methods at their command to control the sanitary quality of powdered milks. The volume of dry milk annually consumed, amounting to approximately 300,000,000 pounds, warrants such control. Since dry milk is an excellent source of milk solids not only in frozen desserts but also in other foods, it should be used extensively, but this product should be subject to the sanitary control applied to other dairy products.

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Report of Committee on Dairy Farm Methods - 1938 *
F. D. Hoflard, Chairman
Borden Farm Products Co., New York, N.Y.

Another year has gone by, and it is very evident that all our problems relating to dairy farm methods have not been solved. The proper methods of cleaning and storing of milking machines and dairy utensils is still a debatable question.

Cold Water One point which we believe we can all agree upon is that milking utensils should be thoroughly rinsed immediately after use with cold or lake warm water. In order to do this efficiently and remove all the milk, it is absolutely essential that a good, stiff brush be used with the cold or lake water. This practice will also help to reduce to a minimum the formation of so-called milk stone on dairy utensils.

Alkali Solutions Soap or soapy solutions should not be allowed in the cleaning of dairy utensils. Warm alkali solutions should be used whenever necessary.

Hot Water An abundant supply of hot water is essential for washing and sterilizing dairy utensils. In many sections of the country this one feature is being sadly neglected. Your Committee has arrived at the conclusion that hot water on the dairy farm is of equal importance to proper refrigeration of milk. A number of the larger electrical manufacturing companies are becoming interested in the development of proper equipment to be used on dairy farms for this purpose. Insulated, automatic electric heaters of different capacities are now quite common in some localities. An automatic heater insures to a dairymen a sufficient quantity of hot water all at times. In many instances these heaters are located in the cow stables. In the colder cli-

mates this is quite important as it helps to prevent water pipes from freezing.

There are two types of automatic electric heaters on the market, the pressure and non-pressure type. For most purposes the non-pressure type will be found most practical, and can be purchased with a capacity up to thirty gallons. As many dairy farms are not equipped with running water, a supply tank can be arranged to feed the heater. With these non-pressure type heaters, hot water cannot be drawn off unless the valve is opened, thereby permitting the entrance of cold water. Irrespective of whether the pressure or non-pressure type heater is used, they should all be so regulated that the water coming from the heater is not less than 180° F. at any time.

In some sections, dairymen provide other means of heating water, and in such cases these rates may be affected. Regardless of the method provided for furnishing hot water, it is essential to have a sufficient quantity at a temperature not less than 180° F. at the time of use. After dairy utensils have been properly cleaned and sterilized, they should be stored in a clean, dry atmosphere.

Milking machines In spite of the fact that very simple adequate methods have been developed for the care of milking machines, many milk ordinances still insist upon dairymen following more complicated, expensive and time-consuming methods. Your Committee believes that a service can be rendered to the members of the Association by bringing to their attention, the advantages of these simplified methods, thereby enabling milking machine users to produce a better quality product with less trouble and expense.

As one time it was thought necessary to entirely disassemble a milking machine after each use and wash the separate parts in an alkali solution. In some cases where bonuses are paid for milk on a bacterial basis, the bacteria content immediately increases when this method is substituted for either of the following methods: It has been satisfactorily demonstrated that a good quality, clean, low count milk can be produced with either the suction type or lye method of cleaning milking machines. However, when practicing either of these methods, it is absolutely essential that the milking machine be free from all foreign matter at the beginning.

With these machines, the teat cups remaining in the milk pails at the end of milking are thoroughly washed and sterilized by either the suction method or the lye method, the teat cups and milk tubes are then completely filled with a weak solution of common lye. The solution is left in the tubes until near milking, then drained out thoroughly and used to scrub down the milk house floor. The milk pails and pail heads are washed and sterilized along with the other metal utensils as previously described. In order to prevent the rubber tubing from sticking to the metal parts, the milk tube system should be taken apart once a week. Check valves, vacuum lines, etc., should be cleaned regularly.

The fact that no hot water is required for washing and sterilizing the rubber parts makes it well suited to average farm conditions, where only a limited quantity of hot water is available. The lye solution has the following advantages:

1. It prevents the growth of bacteria and kills many of those remaining after the suction rinsing.
2. It removes traces of fat and other milk solids, leaving the rubber parts sweet and clean, and lengthening their life.

**3. Lye can be bought at any grocery or general store, the solution is easily prepared, and costs less than 1½ cents per gallon.
4. Lye solution unlike hypochlorite does not lose its strength when in contact with milk residue or rubber.

As against the advantages mentioned, there are two disadvantages: (1) Lye like other alkalies corrodes aluminum. This method should not be used on machines having aluminum parts in the milk tube system. Aluminum parts are not affected as the solution does not come in contact with them. (2) If the suction rinsing is not done thoroughly, small
amounts of milk residue may remain. The lye solution will then throw down a precipitate of calcium phosphate, and a granular deposit will slowly build up on the inner walls of the inflations. This will rarely be found except under very careless conditions.

The first disadvantage may be met by using sodium metallicite, which does not corrode aluminum, in place of lye. The second can be avoided by using larger quantities of water to rinse the tubes, and particularly by rinsing immediately before the milk has a chance to dry onto the rubber. If it should appear, the deposit can easily be removed by soaking in vinegar or other weak acid.

The solution rack method is strongly recommended in place of the older methods where the tubes were placed in a large crock. Less solution is required, and a fresh quantity of clean solution at full strength is used at each milking. It also avoids trouble due to air pockets in the tubes in the crock method, whereby portions of the tube escape contact with the solution. Less space is also required in the milk house.

A number of milking machines are equipped with large cone-shaped aluminum pails. It has been found that after sterilization these pails are inverted on a rack in the milk house, and very often are found to be moist on the inside during the entire period between milkings. If these pails are inverted for a short time so that most of the water does off and then placed on the side, the inner surfaces will soon become thoroughly dry.

Your Committee wishes to emphasize the importance of immediately scrubbing with a stiff brush, using cold or lukewarm water, all surfaces of the utensils that come in direct contact with the milk. If the utensils are scaled with boiling water, or water not less than 180°F., immediately after the cold water brushing, it may be necessary to wash them with an alkali solution before the hot water rinse.

Another subject which we would like to stress and which was also mentioned in the Committee’s report for 1937 is the question of sediment in milk. The two most important factors in the prevention of sediment in milk are: First, keep on Rudders and flanks of milking cows should be kept short at all times; second, cow beds should be kept clean and free from dust and fine material. Where these precautions are conscientiously followed, sediment in milk is greatly reduced.

F. D. HOFFORD, Chairman
C. I. CORBIN
G. W. GRIM
C. K. JOHNS
ERNEST KELLY
J. M. LESLIE
RUSSELL PALMER
J. J. REGAN

Latest Developments in Cooling Milk on the Dairy Farm

John E. Nichols
Pennsylvania State College, State College, Penna.

To many dairymen the problem at this time appears to be the sudden realization that the daily production of milk cannot be cooled to a safe low temperature very soon after it is drawn. They do not understand that this, apparently a requirement, long been enforced. Today it is generally conceded that cooling the milk at once, immediately after it is produced, is a necessary factor in the quality problem.

The ordinances and codes issued by municipal and state health authorities require that milk should be cooled. However, there is no uniformity in the requirements of the local municipal authorities. Nearly all milk coolers are electrically operated and automatic in their performance.

Methods Used in Cooling the Milk

The two general methods of cooling milk on the farm are direct immersion and acetone. Direct immersion is practiced by the producer who retails milk directly; or, in certain areas, by a group of producers because the local municipal ordinances stipulate that requirement. Aeration is the cooling of milk by allowing it to flow by gravity over the surface cooler through which either hot water or brine is pumped to reduce the temperature. In direct immersion, milk is cooled by immersing the containers in cold water.

Modern Milk Coolers

The modern milk cooler is designed to meet the requirements of the individual dairyman. Nearly all milk coolers are equipped with condensers that melt milk directly; or, in certain areas, by a group of producers because the local municipal ordinances stipulate that requirement. Aeration is the cooling of milk by allowing it to flow by gravity over the surface cooler through which either hot water or brine is pumped to reduce the temperature. In direct immersion, milk is cooled by immersing the containers in cold water.

Modern Electric Milk Coolers

The modern electric milk cooler is designed to meet the requirements of the individual dairymen. Nearly all milk coolers are electrically operated and automatic in their performance.

Figures 1 and 2 show four types of modern milk coolers which are designed to meet the requirements of the dairymen in solving their milk cooling problem. The automatic operation is thermostatically controlled. The agitation is regulated by clock-mounted on the motor frames.

Improvements in Design

The modern electric milk cooler is designed to be a willing servant and requires very little attention from the dairymen. Figure 3 shows the capacitor motor with the condenser mounted on top, thus eliminating the brushes. The condenser serves its purpose when the motor starts. In order to eliminate the necessity of having to take up the wear of the belt which runs the compressor, the motor is
Two electrically operated milk coolers. The condensing unit of one is located at the side of the cabinet, of the other it is mounted on top left of the cabinet. Both milk coolers are provided with agitators which stir the bath water when milk is cooled.

The complete condensing unit is simply arranged and all parts or coil connections are easily accessible, shown assembled in Figure 4.

Coil arrangement, agitation and water spraying

In direct immersion milk cooling practice, the cans of milk are placed in a cold water bath which is maintained at a low temperature by the evaporating or cooling coil. The coils may be arranged in many different ways. Figure 5 shows the evaporating coils “bunched” concentrically and housed within a thin walled cylinder suspended below the fly wheel of the compressor. When mounted on the milk cooler, it fits into a corner as shown in Figure 6. The agitation of the bath water...
The cooling coil is "bunched" within the thin walled cylinder. The water is forced through the coil, from bottom to top, by a propeller blade which receives motion through a long shaft and its friction pulley which rides on the face of the fly wheel.

is obtained by forcing it through the coil, from bottom to the top, and then distributing it through two pipes along the inside of the cabinet so that the cold water sprays around the neck of the cans. This serves two main purposes, it provides agitation and the milk cans need not be submerged "up to their necks" for rapid cooling of the top portion of the milk.

**HOW DOES MILK COOL IN A CAN?**

When a ten gallon can of milk is submerged in the cold bath, it will cool rapidly and more uniformly if there is sufficient available refrigeration initially and also if the bath water is in motion. It is also important that the can be fully submerged, unless the bath water is sprayed around the neck of the can as described above, all other factors being equal.

Figure 7 shows rate of cooling of ten gallons of fresh milk. The average initial temperature of the milk was 90° F. The temperature of the bath water was 36.5° F. The curves show the temperature of the milk at ten different points, two inches apart, right through the center of the can, measured for twelve hours. The can was fully submerged in water bath which was initially 36.5° F. and agitated for one and one-quarter hours. At the end of the first hour of cooling the top of the milk was approximately 33° F. and the bottom 46.5° F. More heat was removed during the first hour than during the succeeding eleven hours.

**THE WATER TEMPERATURE**

The function of the cold water bath in a milk cooler is to absorb the heat of the milk. When the heat transfer takes place the bath necessarily will warm up. The degree to which it will warm up depends on the quantity of heat transferred from the milk, the quantity of water in the bath and its initial temperature.
A Study of Pasteurized Milk in Rochester, N. Y.,
Employing the Phosphatase Test *

Harold W. Leahy
Health Bureau Laboratories, Rochester, N. Y.

A study of pasteurizing plants supplying milk to Rochester, New York, was made by the Health Bureau to evaluate the phosphatase test for the detection of raw or improperly pasteurized milk. The results of the phosphatase tests were correlated with the data concerning the operation of the plants, as recorded by the inspectors. A comparison of the disappearance of phosphatase with the reduction in numbers of coliform bacteria during the process of pasteurization was also made to determine the relationship of the two tests.

PROCEDURE

Milk inspectors scored each pasteurizing plant, obtained specimens of milk from the holding vats at different stages of pasteurization and submitted them to the laboratory. A sample of milk was taken from each of the following sources: (1) cans of individual producers; (2) holding vats before heating; (3) when the temperature of the milk reached 143° F.; (4) after holding for fifteen minutes; (5) and after holding for thirty minutes at this temperature; (6) the first and last bottles from the bottling machine; (7) bottles of milk and cream pasteurized on the previous day.

In the laboratory, all samples of milk and cream were examined for the presence of coliform bacteria by inoculating Dunham tubes of formate-ricinoleate broth, as described by Stark (1), with 10 cc., 1.0 cc., and 0.1 cc. of each sample. After incubation at 37° C. for forty-eight hours, gas production in any tube was considered to constitute a positive test for coliform bacteria. A modification of the Kay and Graham phosphatase test (2), (3) was made on each sample, as follows: 1.0 cc. of milk was added to 10 cc. of Kay and Graham's disodiumphenolphosphate-sodium veronal buffer solution; a drop of chloroform was added and the mixture incubated at 37° C. for eighteen hours; 0.2 cc. of a 0.4 percent solution of 2,6-dibromoquinonechlorimide in 95 percent ethyl alcohol was then employed to determine if phenol was present. In the case of properly pasteurized milk, only a light grey color appears, while the presence of 0.2 percent or more of raw milk in the sample, undergoing by 1° or 2° F., or decreasing the holding period by five or ten minutes leads to the formation of a blue color, the intensity of which varies with the amount of phosphatase in the sample.

Controls for reading the test were prepared by adding known amounts of phenol to pasteurized milk. Only three standards, containing 0.01 mg., 0.05 mg., and 0.10 mg. of phenol, are required to interpret the test. Milk producing 0.01 mg. or less of phenol was interpreted as "properly pasteurized"; between 0.01 and 0.05 mg., as "slightly improperly pasteurized"; and from 0.05 to 0.10 mg., as "improperly pasteurized." Samples that formed greater quantities of phenol were considered definitely unpasteurized or to contain raw milk. Pasteurized milk, to which 0.2 per cent of raw milk has been added, produces between 0.02 and 0.03 mg. of phenol with the above procedure. Furthermore, it gives results comparable to the more complicated and costly test recommended by Kay and Graham.

* This study was conducted with the cooperation of Mr. George A. West, Supervisor of Food and Sanitation, Rochester Health Bureau. Presented at the Twelfth Annual Meeting of the New York State Association of Dairy and Milk Inspectors, Rochester, N. Y., September 14-16, 1934.
RESULTS

The tests herein described were made on 1563 samples of milk and cream collected from 157 holding vats in 104 pasteurizing plants. The results were then correlated with the information recorded on the inspectors’ score sheets.

A comparison of the results (Figure 1) of the phosphatase and coliform tests showed that the colon bacilli in the milk were destroyed more rapidly than the phosphatase during the preheating and holding periods of pasteurization. While the phosphatase was unaffected by preheating, 84 percent of the coliform bacteria were reduced by 97 percent. The colon bacilli in the milk were destroyed more rapidly than the phosphatase and coliform bacteria were reduced by 97 percent. The colon bacilli in the milk were destroyed more rapidly than the phosphatase and coliform bacteria were reduced by 97 percent.

Of the 129 samples of milk pasteurized on the day previous to inspection, 23.2 percent were positive. This indicates that 18.7 percent of the plants which produced properly pasteurized milk on the day of inspection were operated improperly on the day before inspection. Only 10 percent of the 2816 “street” samples collected for routine examination and tested were found to be improperly pasteurized.

Correlation of the results of the phosphatase test with the data from the inspectors’ score sheets showed that all but three samples of raw milk from the 481 individual cans were positive. Further investigation by the inspectors disclosed that the three negative samples were from “returned” cans of pasteurized milk, presumably from raw milk. One hundred forty-six samples of mixed raw milk from the various pasteurizing plants likewise showed phosphatase activity. The 152 samples of preheated milk showed phosphatase with the exception of one sample which had been exposed to a preheating temperature of 160°F. for fifteen minutes and did not show the presence of the enzyme. The inspectors observed, however, that twenty-seven of the samples had been heated at 144°F. or 145°F. which accounts for the high percentage of negative tests. The other four samples were heated to 143°F., but they may have been mixed with “returned” pasteurized milk, or they may have contained less than the average amount of phosphatase.

Milk was properly pasteurized in all but nine, or 4.5 percent, of the 157 vats examined. In each of the nine exceptions, gross errors in pasteurization were detected by the inspectors. Phosphatase was present in the thirty-minute pasteurized samples from five holding vats, but absent in the first and last bottles from the bottling machines. Pasteurizing temperatures of from 1°F. to 2°F. lower than 143°F. explain the phosphatase activity of the thirty-minute samples. The first and last bottles, as well as the thirty-minute samples from two other plants, were positive. Improper pasteurization at low temperatures, leaks, and moderate foam, explain the positive findings. Finally, in two plants, the thirty-minute samples and first bottles were positive, while the last bottles were negative. In one of these, the pipe line from an overhead pump containing raw milk was left connected during the holding period. In the other, the recording chart registered 1°F. above standard, and the cooler, over which the raw milk was pumped, was not consequently sterilized before cooling the pasteurized milk.

Tests made on 129 samples of milk and cream pasteurized on the day previous to inspection disclosed that thirty, or 23 percent, were improperly pasteurized. Routine examinations of samples from each of the thirty plants had previously been positive. Apparently, twenty-one plants which produced pasteurized milk free from phosphatase on the day of inspection, did not pasteurize properly at all times. In fifteen of these, evidence of faulty operation was found. In the other six, it is suspected that the outlet lines were connected to the bottling machine before the end of the holding period.

DISCUSSION

The results of this study make it possible to classify the pasteurizing plants in Rochester as follows:

Group 1 Nine plants in which multiple faults of operation were found on the day of inspection and which at other times gave positive tests for phosphatase on routine examination.

Group 2 Twenty-four plants in which pasteurization was conducted properly on the day.
of inspection. Routine samples from these plants were positive, however, and there was evidence of faulty operation.

Group 3 Twenty-one plants which pasteurized properly on the day of inspection and showed only occasional positive routine tests.

Group 4 Fifty plants which have never shown a positive phosphatase test or any evidence of improper operation.

The positive phosphatase tests obtained on the routine samples from plants in Groups 1 and 2 were readily explained by the findings of the inspectors, but those obtained on the samples from plants in Group 3 can not be so easily accounted for. Some of them had only a single positive test during a year of intensive routine examination, and it is our opinion that the improper pasteurization in this group was due to occasional errors in operation. Relief or part-time operators, unfamiliar with the equipment, may have been partly responsible. Improper operation occurs more frequently in cases where two grades of milk are handled because of the complicated piping system and multiple operations required. While thirty-four, or 63 percent, of the fifty-four plants in Groups 1, 2 and 3 produced both "Rochester Standard Pasteurized" and "Rochester Guernsey Pasteurized" milk, only eleven, or 22 percent, of the fifty plants in Group 4 pasteurized both grades.

Several faulty conditions were found during this survey which deserve special attention (Table 2). The recording chart in one plant was so mounted on the pasteurizer that the stirrer caused the recording pen to vibrate excessively. The inked line was so broad the temperature could not be read within 3 or 4°F. In another plant, equipped to work "automatically," the operator frequently adjusted the mechanism by hand, because the "automatic" devices failed. The dippings from leaking valves and pipe lines in a third dairy were caught in any available utensil and returned to the pasteurizer after completion of the thirty-minute holding period. In a fourth plant, the operator flushed out the equipment with raw skim milk after the cream was pasteurized. Only two cases of hand-regulated charts were discovered. The faults most frequently encountered were inaccuracies of the thermometer, and the connection of outlet lines to the vats before completion of the holding period. It is also probable that milk was drawn off before the completion of the thirty-minute holding period, although this practice was not actually observed. The bulbs of the thermometers were near the bottom of these vats. Hence, it would be possible for the plant operator to withdraw the milk after twenty or twenty-five minutes of holding at 143°F and still obtain a perfect temperature record without advancing the chart by hand.

**SUMMARY**

During a survey of 104 pasteurizing plants in the city of Rochester, New York, a total of 1563 samples of milk, taken at different stages of the process, were collected from 157 vats, and 2816 samples of milk from distributors. All samples were examined for improper pasteurization by a modified phosphatase test and for the presence of coliform bacteria employing a formate-ricinoleate medium. In the course of a year's study, fifty plants were observed which gave no evidence of improper pasteurization. On the day of inspection, gross defects in pasteurizing methods were disclosed in nine plants, routine samples from which were positive. The pasteurization in twenty-four plants was satisfactory on the day of inspection. Routine samples from these plants, however, were positive and there was evidence of faulty plant operation. With the exception of occasional minor imperfections, the pasteurization in twenty-one other plants was reliable, and routine phosphatase tests were rarely positive.

In conclusion, it may be said that the phosphatase test is invaluable for the detection of improper operation in pasteurizing plants. It should be emphasized, also, that the test for coliform bacteria is equally valuable for the detection of recontamination by contact with unsterilized equipment at the plant. When both tests are employed simultaneously, they are of more value to the milk industry and public health officials than any other combination of tests yet devised for milk control. It is suggested that the conventional bacterial count be discarded in their favor.

**REFERENCES**


**TABLE 2**

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<thead>
<tr>
<th>Data from Score Sheets</th>
<th>Phosphatase Test Positive</th>
<th>Phosphatase Test Negative</th>
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<tr>
<td>Total number of plants in groups</td>
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<tr>
<td>Process samples positive</td>
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<tr>
<td>Samples from previous day positive</td>
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<td>16</td>
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<tr>
<td>Street samples positive</td>
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<td>24</td>
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<tr>
<td>Outlet line connected</td>
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<td>7</td>
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<td>Recorder error greater than 1°F</td>
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<td>8</td>
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<tr>
<td>Low temperature and short holding</td>
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<td>3</td>
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<tr>
<td>Moderate foam</td>
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<td>Excessive foam</td>
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<tr>
<td>Short holding at 143°F</td>
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<tr>
<td>Hand regulated charts</td>
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<td>Overhead pump connected</td>
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<td>Pumped raw milk through pipe lines</td>
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<td>Drippings returned to pasteurizer</td>
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<td>Excessive vibration of recorder</td>
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<td>&quot;Automatic control&quot; adjusted by hand</td>
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<td>Plants having more than one vat</td>
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The Effect of Temperature upon Score Value and Physical Structure of Butter

W. H. E. Reid and W. B. Arbuckle

The temperature at which butter is scored appears to have a definite influence upon its score value and consumer acceptance. Butter ordinarily graded with a high commercial score (i.e., 90 points or higher) will usually give a higher score value at 70° F. than at 40° F., whereas, butter usually given a medium or low score will generally have a higher score at 40° F. and at 70° F.

The explanation for these phenomena appears to be that all flavors are less distinct at 40° F., whereas at 70° F. all flavors are full and enhanced except when the salt content is sufficient to submerge the true characteristic butter flavor.

The score value of butter manufactured from cream of good quality is enhanced as the serving temperature is increased; whereas, the score value of butter manufactured from cream of fair or inferior quality diminishes under similar conditions. According to preliminary trials with butter samples submitted by Missouri manufacturers, the spreading properties appear to be most desirable at 60° F.

Cream Improvement

J. O. Clarke

Mr. J. O. Clarke, Chief, Central Division of the U. S. Food and Drug Administration, urged that more attention be given to sanitation on the farm, at the buying station, and at plants. He indicated that an acidity standard of 1.5 percent might be set down as one of the measuring sticks for quality. Again he brought out that consideration is being given to the mycelia or mold filament count as a means of determining condition of the product, under the new Federal Food, Drugs, and Cosmetic Act, which will take effect in June, when such standards can be adopted.

Significance of Mold Mycelia in Butter

E. H. Parfitt

Mold mycelia in butter were originally studied for the purpose of evaluating their possible relation to the quality of the cream used in the manufacture of butter. It was found that the growth of mold in cream was directly proportional to the surface exposed to air. Other favorable influences involve the factors of time and temperature. Varying amounts of mold mycelia consequently will be found in butter made from cream subjected to a variety of such conditions during the different seasons with the result that no definite correlation between the mold mycelia content and score value of butter has been established or can be indicated. While no definite correlation could be established between the amount of mold mycelia in butter and its score value, in the summer there is a tendency for all butter irrespective of score to have a greater mold mycelia content than during other seasons of the year. Conventional practices used in buttermaking appear to have no influence upon the control of the presence of mold mycelia in butter.

Holding Butter Customers

M. G. Bush

Speaking only of salted butter, the butter industry is doing itself no good in producing butter resembling lard in color rather than at least a straw color which has an appetite appeal and at the same time classifies butter automatically in its true, natural, and distinctive condition.

The general level of butter quality has shown improvement during the last ten years. Some geographical territories, perhaps more favored than others, have shown greater improvement. (To be concluded in July issue)
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Association News

West Virginia Association of Milk Sanitarians

The tentative date for the Annual meeting of the West Virginia Association of Milk Sanitarians is set for October 20, 1939 at Fairmont, West Virginia.

An interesting and successful program of Dairy Schools for the Farmer has been introduced under the guidance of the Association and the Dairy School of West Virginia University. Mr. R. M. Argenbright and Mr. J. B. Brown inaugurated the program at Weston on April 6, 1939.

Representatives of West Virginia University, State Department of Health, and local inspectors met with the Dairymen of the locality for an all day session.

The program included the following subjects:
1. Equipment on the dairy farm.
2. Grooming and caring of the cow.
4. Cooling and storing the milk.
5. Bacterial treatment of milk.

Open forum.

H. E. EAGAN, Secretary.

Connecticut Association of Dairy and Milk Inspectors

The next meeting of the Connecticut Association of Dairy and Milk Inspectors will be held at the Hotel Barnum, Bridgeport, Conn., June 6. The tentative program will deal with the following subjects:

2. Bacterial treatment of milk.
3. The Milk Regulation Board looks into the question of chocolate milk.

H. CLIFFORD GOSSEL, Secretary.

Michigan Association of Dairy and Milk Inspectors

The 11th annual meeting held in Detroit, March 7 and 8, was a great success. Attendance at all sessions was greater than at any previous time. The active interest exhibited at the business meeting showed that the membership is solidly back of the long range program of the Association.

The success of the meeting last fall at the Michigan State College has encouraged the Association to plan for a summer meeting this year. Arrangements for the 1939 meeting will be made by the Standing Committee, Grey Turner, Chairman, and the Sports Committee, Clarence Wright, Chairman.

The Association is steadily growing, as shown by the following figures:

1936 54 members
1937 64
1938 77
1939 (to date) 72 members

New York State Association of Dairy and Milk Inspectors

The Annual Meeting of the Association is scheduled for September 27, 28, and 29, 1939, at Syracuse, N. Y. The headquarters will be the Hotel Syracuse.

W. D. TIEDENMAN,
Secretary-Treasurer.

Association News

Association of Food and Drug Officials

The 43rd Annual Conference of the Association of Food and Drug Officials of the United States will meet at Hartford, Connecticut, September 26 to 29, 1939.

New Creamery Butter Standards

The new official U. S. standards for quality of creamery butter, as promulgated by the Secretary of Agriculture on November 5, 1938, became effective on April 1. These standards were discussed in the JOURNAL OF MILK TECHNOLOGY, May, 1938, p. 19. As pointed out (Ibid. p. 2) we regret that the revised method of scoring does not recognize such important factors of quality as sanitation in production methods, particularly, the proper pasteurization of the cream for buttermaking.

J. H. SHREAR.
The Jacksonville Meeting

In accordance with traditional Southern hospitality and generosity, our friends in Jacksonville, Florida, are planning to make the Twenty-eighth Annual Meeting of the International Association of Milk Sanitarians an outstanding event. The convention will be held at the Hotel Mayflower, October 25-27, 1939.

The personnel of the Florida Committee is as follows:

H. N. Parker, Chairman,
R. B. Becker
J. F. Harper
A. E. Johnson
V. C. Johnson
B. S. Johnston
J. M. Scott
G. E. Stengle
L. M. Thurston
A. H. Williamson
C. H. Willoughby

Horatio N. Parker, the local chairman, has indicated that we are being welcomed by the Governor, the Mayor, the Commissioner of Health, and other representative citizens. The roads are excellent, so we expect that many will drive down and bring their wives. Golfing on palm-treed links! Bathing from such a beach! Trips through that delightful country! Well, we just cannot miss that meeting. We are going.

Write now to the Hotel Mayflower and make your reservations.

Horatio N. Parker,
Chairman, Local Committee

One of the World's Finest Beaches, 600 feet wide.
Jacksonville, Florida

Public Recognition of Achievements in Improved Milk Sanitation

It is generally recognized that we can be so close to a situation that we fail to recognize great achievements in the making. As we view the field of milk sanitation as it exists today, and then in retrospect look at the situation as it was ten to fifteen years ago, we become aware of the distance that we have traveled in the improvement of milk sanitary practices.

These accomplishments have been the result of two lines of development. One of these has come through the small but frequent contributions of sanitarians in their daily routine of supervisory duties. "Precept upon precept; line upon line; here a little, there a little." Conscientious, enthusiastic, and intelligent milk inspection cannot help but occasionally lead to an improvement in some practice of milk handling in the district of the faithful sanitarian. The sum total of all these minor steps builds up a body of knowledge which is large in the aggregate.

The other line of advance comes through the outstanding achievements of individual sanitarians. The field of milk sanitation and technology, like all other lines of human endeavor, is fertile with the possibilities of discovery and development by individuals with adequate training, initiative, and vision. What are some of these outstanding accomplishments?

In the early days of milk inspection and the inauguration of the program for the eradication of bovine tuberculosis, who ever thought that we should achieve anything more than numerous modified accredited areas? Some one had the vision and the persistence to keep the program alive.

Try to visualize milk inspection without the aid of the direct microscopic examination. This one technic has probably exerted more influence in the improvement of milk quality than all other milk supply inspection procedures combined. Its value alone warrants all the appropriations expended by the State of New York for the Geneva Experiment Station—although the latter has made many other contributions in numerous fields.

Some of us recall the time when there was no general recognition that there existed a field for dairy engineering other than what then obtained. A tank was a tank; a pipe that could be dismantled rather easily was generally satisfactory; a valve...