VOLUME 16 NO. 3
May — June, 1953

Journal of

MILK and FOOD TECHNOLOGY

Official Publication

International Association of Milk and Food Sanitarians, Inc.

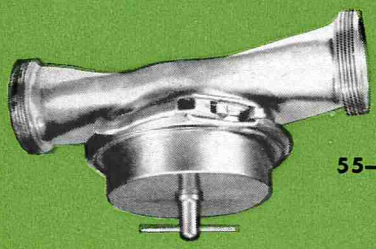
31-15F—STREAMLINE REDUCER

12HR—COMPLETE UNION

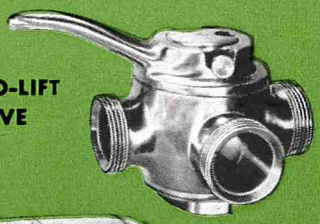
28BX—SWEEP TEE

2F—90° SWEEP ELL

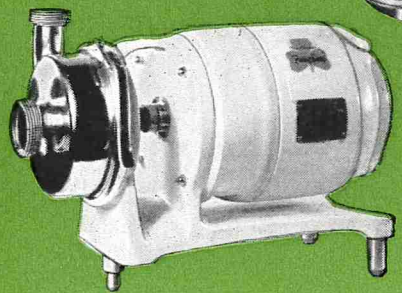
7—TEE



55—MAGNETIC TRAP



11CPL—AUTO-LIFT PLUG VALVE



TRI-CLOVER PUMPS—Available in a full corrosion-resistant line for practically all sanitary and industrial applications.

Try TRI-CLOVER

QUALITY *Stainless Steel Sanitary Fittings*

. . . available from STOCK

HERE is an opportunity for you to bring your sanitary liquid conveying lines up to date—with Tri-Clover Stainless Steel Sanitary Fittings.

Available in a complete line of types and sizes, from 1 in. through 4 in., Tri-Clover Sanitary Fittings represent the very highest quality. Precision fabrication methods and workmanship responsible for this quality are both costly and time-consuming . . . but the excellent, long-term service obtained in actual installations prove beyond doubt these methods are well worth while.

Tri-Clover Sanitary Fittings, Valves, Pumps, Tubing and Specialties are available from stocks carried by leading jobbers all over the country.

See your nearest TRI-CLOVER distributor for further details.

Tri-Clover® MACHINE CO.
Kenosha, Wisconsin

RIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

Try TRI-CLOVER

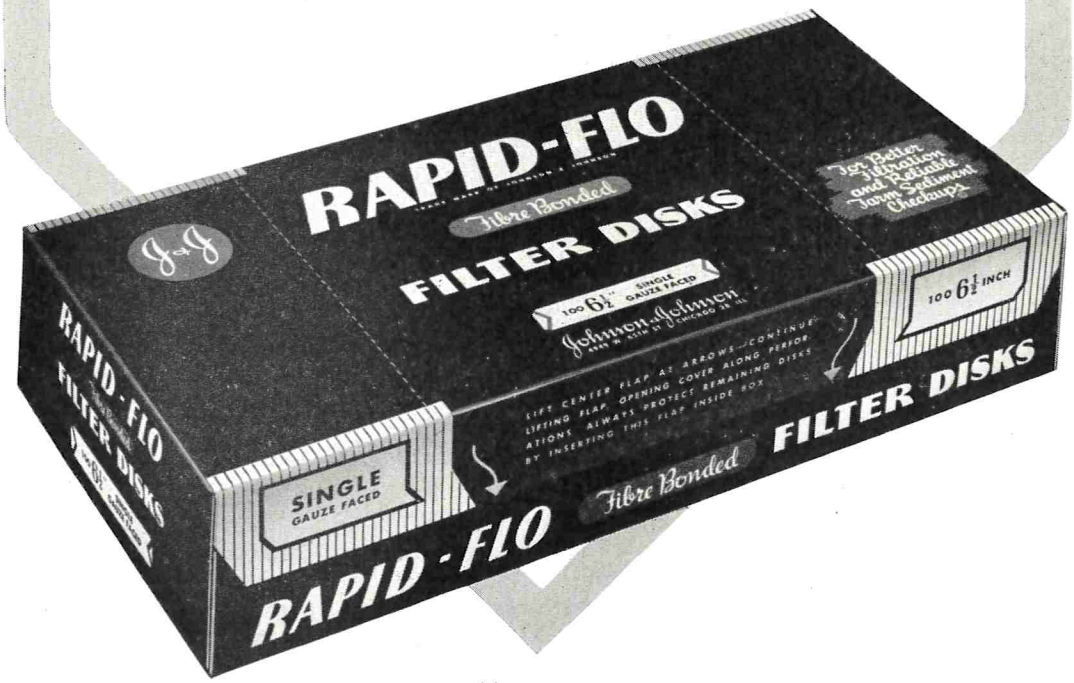
FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

THE Complete LINE

S153

PRODUCERS' CHOICE

FOR QUALITY MILK PRODUCTION



RAPID-FLO© J-J *Fibre-Bonded* FILTER DISKS

According to a new survey of over 175,000 farmers from coast to coast, made by an independent research organization, those who replied reported using Rapid-Flo filter disks—2 to 1 over the next 4 brands *combined!*

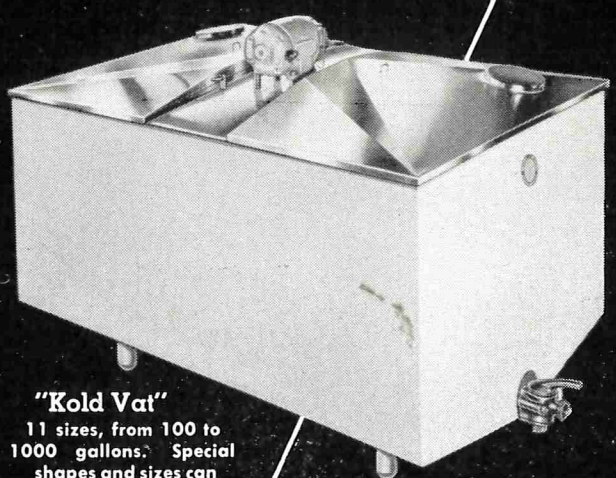
This reflects the efforts of sanitarians who have continuously worked for improved quality milk production and who endorsed the Rapid-Flo Farm Sediment Check-Up. The hundreds of dairy officials who have recently toured the Johnson & Johnson factory in Chicago, to inspect the J&J Quality Control program in action, saw at firsthand the research and manufacturing safeguards that have earned the confidence of producers.

The combined efforts of Sanitarians and the Rapid-Flo Quality Program help make the job of improving milk production more certain—a fact recognized by producers everywhere. It's paying off at the receiving platform.

FILTER PRODUCTS DIVISION Johnson & Johnson 4949 WEST 65th STREET CHICAGO 38, ILLINOIS

"Kold Vat"

DOES SO MANY JOBS SO RAPIDLY... SO WELL



"Kold Vat"
11 sizes, from 100 to 1000 gallons. Special shapes and sizes can be furnished.

For example, Cherry-Burrell "Kold Vat" rapidly and thoroughly mixes, blends, cools, and stores an almost endless variety of liquid products. Light syrups and emulsions, extracts, fruit and vegetable juices, flavors, pharmaceutical products and beverages—just to name a few.

And if you need a refrigerated vat, you can have "Kold" surface for freon, ammonia, or refrigerated water. The features below tell why "Kold Vat" saves mixing time, draining time, cleanup time.

Fast Cooling—Mixing: **Shape of vat and agitator produces rapid movement of product over large, refrigerated surface; prevents "patterned" flow; mixes fast without adding air or disturbing product structure.**

Completely Sanitary: **Generously pitched stainless steel lining, large radius corners, cone-type outlet assures fast and complete draining. Outlet and valve meet sanitary codes.**

Easy to Clean: **All stainless product surfaces easy to reach because of low rail and vat dimensions. Hinged, removable covers; removable agitator. No hard-to-clean bottom support agitator bearing.**

For complete information about versatile "Kold Vat," see your Cherry-Burrell Representative. Or Write your Branch or Associate Distributor.

CHERRY-BURRELL CORPORATION
427 W. Randolph Street, Chicago 6, Ill.
Equipment and Supplies for Industrial and Food Processing
FACTORIES, WAREHOUSES, BRANCHES, OFFICES OR DISTRIBUTORS AT YOUR SERVICE IN 56 CITIES

The Journal of Milk and Food Technology (including Milk and Food Sanitation) is issued bimonthly beginning with January number. Each volume comprises six numbers. Published by the International Association of Milk and Food Sanitarians, Inc., with executive offices of the Association at Ritz Building, 12½ East Broadway, P. O. Box 437, Shelbyville, Ind.

Entered as second class matter at the Post Office at Shelbyville, Ind., March 1952, under the Act of March 3, 1879.

EDITORIAL OFFICES: J. H. Shrader, Editor, 23 E. Elm Ave., Woolaston 70, Mass; H. L. Thomasson, Managing Editor, P. O. Box 437, Shelbyville, Ind.

Manuscripts: Correspondence regarding manuscripts and other reading material should be addressed to the Editor, J. H. Shrader (address above).

Booklet entitled "JMFT Style-book" can be obtained from the Editor for the use of contributors of papers.

Business Matters: Correspondence regarding business matters, advertising, subscriptions, orders for single copies, etc., should be addressed to H. L. Thomasson (address above).

Subscription Rates: One volume per year
Individual non-members, Governmental and Commercial Organization subscription, 1 yr. $5.50
Public, Educational and Institutional Libraries, 1 yr. $3.00
Single Copies 1.00

Orders for Reprints: All orders for reprints should be sent to the executive office of the Association, P. O. Box 437, Shelbyville, Ind.

Membership Dues: Membership in the **International Association of Milk and Food Sanitarians, Inc.,** is $5.00 per year, which includes annual subscription to the **Journal of Milk and Food Technology,** (including **Milk and Food Sanitation**). All correspondence regarding membership, remittances for dues, failure to receive copies of the **Journal,** changes of address, and other such matters should be addressed to the **Executive Secretary** of the Association, H. L. Thomasson, Box 437, Shelbyville, Indiana.

Journal of

MILK and FOOD TECHNOLOGY

INCLUDING MILK AND FOOD SANITATION

Official Publication

International Association of Milk and Food Sanitarians, Inc.

VOL. 16 — MAY – JUNE — No. 3

CONTENTS

• *One of a series of informative advertisements*

Over-all Requirements of Sanitizers for the Dairy Industry

by
WILLIAM A. HADFIELD
Technical Service Department
Pennsylvania Salt
Manufacturing Company

Sanitizers acceptable for general use may fail to meet the special requirements of the dairy industry. A glance at these requirements explains why. Chemical sanitizers for treating cleaned dairy utensils and equipment must not only reduce the bacteria population to a safe public health level but must also meet these special requirements:

1. Impart no chemical residue to milk and other dairy products.
2. Produce no off flavors nor odors in milk and other dairy products.
3. Be non-injurious to dairy metals when used as directed.
4. Be non-irritating to cows' udders and teats and farmers' and dairy plant operators' hands.
5. Not interfere with starter culture activity in the production of acidity for special milks and cheeses.

Chlorine solutions prepared from B-K Chlorine-Bearing Powder in concentrations containing 200 ppm available chlorine meet the above requirements when applied to farm dairy utensils or dairy plant equipment by rinse, flow, or spray methods.

The solutions mentioned above provided a 99.9% bacteria kill within 30 seconds where representatives of the Gram positive and negative groups of bacteria were used as the test organisms. These observations were made with the Johns' Glass Slide Technic, and the Weber-Black Method.

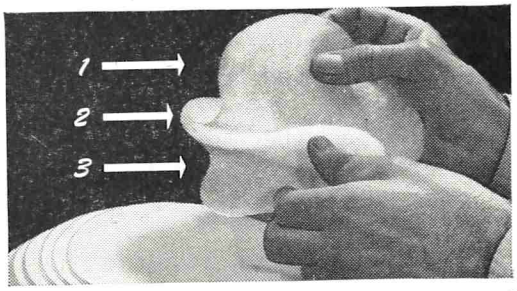
These tests help to explain why dairy farmers using B-K Chlorine-Bearing Powder, good housekeeping methods, and proper cooling are able to deliver milk to dairies that meets local and state sanitary requirements.

Bulletins and leaflets on cleaning and sanitizing all plant and farm milk equipment—including latest information on C-I-P milk lines and bulk holding tanks—are available without charge from the makers of B-K Chlorine-Bearing Powder. Write to Pennsalt Chemicals, 301 Widener Building, Philadelphia 7, Pa.

PROTECT MILK QUALITY THREE WAYS
SAVE MONEY, TIME AND LABOR

WITH *Perfection* DUBL-CHEM-FACED MILK FILTER DISCS

"Tripl-Filtring"®



1—THE TOP SURFACE *Filters*
2—THE CENTER AREA *Filters*
3—THE BOTTOM SURFACE *Filters*

Only DUBL-CHEM-FACED Filter Discs provide this "Tripl-Filtring" action . . . fast and thorough . . . at less cost . . . fewer filters required . . . dependable protection of milk quality is assured three ways!

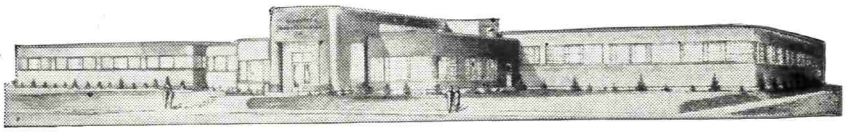
NO OTHER FILTER DISCS CAN CLAIM TO FILTER MILK BETTER

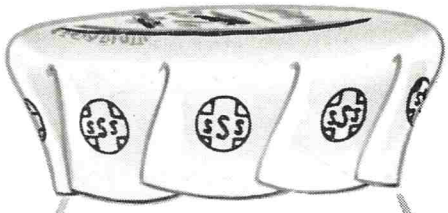
Milk filters generally depend solely on a single thickness of filtering cotton to catch sediment as milk passes through. In DUBL-CHEM-FACED "Tripl-Filtring" construction, however, two important "extras" are provided, because in addition to the super-thick center area of specially carded cotton, the toughened TOP and BOTTOM surfaces both act as filters, too! Highest quality, low in cost, easy to use, popular with top grade milk producers . . . worthy of your endorsement.

Write for samples

SCHWARTZ MANUFACTURING CO., Two Rivers, Wisconsin

Manufacturers of Perfection, Blue Streak, Elgrade, and DUBL-CHEM-FACED Filter Discs, Rolls, Bags and Tubes . . . Fray-Seal Cheese Bandages and Circles . . . and a complete line of cotton goods for the Dairy Industry.





10 public health reasons why milk bottles need both cap and sealon hood

1. Sterilized at the time of application.
2. Covers all of the pouring area.
3. Greater insulation against temperature rises and bacteria growth, provided by air space between cap and hood.
4. Prevents accidental spilling after hood is removed.
5. Identification possible even after hood is removed.
6. Prevents contamination of homogenized milk in warm weather when it may expand and run down inside of hood.
7. Facilitates special caps for straws in schools.
8. Eliminates casein formations by permitting spraying off excess milk from valves which otherwise would remain on pouring surface.
9. Assures clean pouring surface by eliminating possibility of milk becoming trapped between bottle top and hood.
10. Tamperproof – cannot be resealed after once being opened.

The Sealon milk bottle closure is one of the many sanitary paper packaging products manufactured by Sealright. Others are: Thermorex frozen food containers, Kone and Sealking paper milk bottles, Containers for bulk ice cream, Hot Drink cups, Ice Cream cups, Alservis Containers.

Sealright

sealon hood closure

We use SEALRIGHT SANITARY SERVICE for Your Protection

OSWEGO FALLS CORP. • SEALRIGHT CO., INC., FULTON, N. Y. • KANSAS CITY, KANSAS • SEALRIGHT PACIFIC LTD., LOS ANGELES, CALIFORNIA
CANADIAN SEALRIGHT CO., PETERBOROUGH, ONTARIO, CANADA.

Roccal SANITIZING AGENT

Reg U S Pat Off and Canada
BRAND

Measures up in every way as the quaternary of choice

In the Dairy Industry, more than any other industry, the importance of using only the best in sanitizing methods cannot be over-emphasized.

In Roccal, the *original* quaternary ammonium germicide, the dairy industry is offered a product that is laboratory controlled and tested. The uniform quality of Roccal means uniformly good results in doing a proper sanitizing job.

Roccal is a powerful germicide. In recommended dilutions, it is non-poisonous, non-irritating to the skin, virtually odorless and tasteless.

In the dairy, Roccal can be used for every sanitizing job. For tank trucks, weigh tanks, pasteurizers, separators, bottle filling and capping machines, to keep walls and floors sanitary.

Try Roccal for just one week and watch your bacteria counts go down . . . down . . . down! Write us for new booklet describing Roccal's uses in the dairy plant and on the producing farm.

USES IN DAIRY INDUSTRY

To Sanitize:

- MILKING MACHINES
- TEAT CUPS
- COOLING TANKS
- TANK TRUCKS
- MILK CANS
- WEIGH TANKS
- PASTEURIZERS
- SEPARATORS
- BOTTLE FILLING MACHINES and AS HAND and TEAT WASH

In recommended dilutions Roccal is:

- ☑ POTENT
- ☑ NON-POISONOUS
- ☑ TASTELESS
- ☑ ODORLESS
- ☑ STAINLESS
- ☑ NON-IRRITATING
- ☑ NON-CORROSIVE
- ☑ STABLE

Insist on Genuine Roccal SANITIZING AGENT

Reg U S Pat Off and Canada
BRAND

Offices in principal cities throughout the United States.

Sterwin Chemicals INC. 1450 Broadway, New York 18, N. Y.

SUBSIDARY OF STERLING DRUG INC.

Distributed in the Dairy Field by Cherry-Burrell Corp. and other leading dairy supply houses.

FORTIFY ALL YOUR MILK WITH DELTAXIN® THE PUREST KNOWN FORM OF VITAMIN D_2

There's nothing like it for SPEED!

Cemac has speed that no other fillers can match . . . regardless of what products are being run.

And with faster operation at the filler, there's more pep in your entire operation. You get your money's worth from all of your equipment. Costs are lower. Time is saved. And your profits take a nice step upward.

Ask your Crown Representative to *prove* that Cemac can give you the finest filling you've ever had. And, remember, Cemac in combination with the P-38 Dacro Cap gives you the finest operation of all.

CROWN CORK & SEAL COMPANY

Machine Sales Division • Baltimore 3, Md.

How close does your filler come to these average CEMAC speeds?

CREAM LINE MILK	135 BPM
HOMOGENIZED MILK	130 BPM
CHOCOLATE MILK	125 BPM
20% CREAM	120 BPM

NOTE: These are rated capacities for Cemac 28 . . . but *they are exceeded* in dairies from coast to coast, throughout the daily run.

Cemac VACUUM MILK FILLER

The Greatest Performer of them all

Built in 3 sizes:

CEMAC 10
CEMAC 14
CEMAC 28

Editorial Notes

THE NATIONAL RESEARCH COUNCIL REPORTS ON THE SANITARY MILK CONTROL STUDY*

The piecemeal type of "research" that has heretofore characterized much of the investigative studies in the field of milk sanitation over the past forty or fifty years is revealed by the findings of the comprehensive research that was sponsored and supervised by the Committee on Milk Production, Distribution, and Quality of the Agricultural Board and the Food and Nutrition Board of the National Research Council, conducted by Dr. A. C. Dahlberg, Dr. H. S. Adams, and Mr. M. E. Held. Here is an excellent example of the results of research that is worthy of that pretentious name.

The milk of eight cities (Birmingham, Boston, Houston, Louisville, Minneapolis, Rochester, N. Y., Sacramento, and Washington, D.C.) was analyzed and tested in a single laboratory, and inspections were made by the same personnel so that all data would be comparable. The results are written up and discussed in a bulletin of 174 pages with 91 tables and 13 forms. The findings attest the wisdom of the decision to make the study, and the results fully justify the expenditure. Like all well-planned research projects, it reveals that our information is so inadequate or actually false in some fields that further investigation is necessary to correct present practices and apply new sounder methods.

The study is reported in condensation of three papapers printed in pages 142–148 of this issue. For convenience, we arrange the findings in groups as follows:

Confirmation of Existing Information

"Oxidized" flavor was not the most prevalent off-flavor in aged market milk and was not correlated with low bacterial content.

Keeping quality was not correlated with any factors of sanitation or season of the year.

The ascorbic acid content of milk drops to one-third or so of that of the freshly drawn milk.

Sanitary regulations were not a major cause of differences in the retail prices of milk.

Milk produced on large farms generally carried lower bacterial counts than did milk from small farms.

Sediment tests on shippers' milk at plants were invalidated as indication of degree of cleanliness in milk production by reason of farm straining.

No public health reason warrants the differences in the bacterial standards for milk, and indicates the practicability of 200,000 per ml as a reasonable pre-pasteurized standard.

Predominantly the trend in pasteurization practice is toward HTST, and only one sanitary grade of pasteurized market milk.

No thermoduric coliforms were found.

No positive phosphatase pasteurized milk was found when pasteurized under the following conditions:

		Maximum	Minimum	Average
Milk	LTLT*	147°F	143°F	144.4°F/36 min.
regular	HTST*	165°F	161°F	162.6°F/16.3 sec.
Homo-	LTLT	158°F	144°F	148.6°F/37.3 min.
genized	HTST	175°F	162°F	165.4°F/18 sec.
Cream	LTLT	.....	.....	154.3°F/37.8 min.
	HTST	.....	.....	168.3°F/16.6 sec.

*LTLT=Low Temperature, Long Time
*HTST=High Temperature, Short Time

The essentials of sanitary milk production are:

(1) healthy cows and absence of pathogenic bacteria;
(2) cleanliness of cows and utensils, with use of hot water;
(3) prompt cooling in mechanical refrigerators to 50°F or below;
(4) flavor control; and
(5) balance between inspection and use of samples.

More attention should be given to methods instead of much present detail of plant and equipment.

New Information Discovered

Milk must be stored colder in winter (33°F) instead of the present yearly average of 44°F to keep down the bacterial count of pasteurized milk.

Psychrophils predominate in winter.

Milk flavor was better when stored at 33°F than at 44°F, and when it carried high bacterial content.

The freezing point of milk was found to be −0.540°C instead of the A.O.A.C. calue of −0.550°C, thereby invalidating the tolerance value of −0.5335°C.

The content of solids-not-fat seemed to have some relation to the geographical region of production, thus indicating that standards should be reviewed.

The essentials for the production of milk of high sanitary quality can be accomplished through a small number of concise regulations rigidly enforced.

Industry fieldmen were more effective in influencing quality production than were the field programs of health departments.

No relation was observed between bacterial content and the flavor of fresh pasteurized milk.

No relation was observed between sanitary farm regulations and storage bacterial counts or flavor.

Future Action Indicated

1. Streamline our regulations to delete unnecessary requirements.
2. Review our analytical standards of milk composition.
3. Review the whole question of sanitary milk standards to improve keeping quality.
4. Elucidate causes of non-feed flavor defects.
5. Improve production practices to avoid flavor defects.

J. H. Shrader

*Dahlberg, A. C., Adams, H. S., and Held, M. E. *Sanitary Milk Control and Its Relation to the Sanitary Nutritive and Other Qualities of Milk*, Publication 250, National Academy of Sciences—National Research Council, Washington, D. C., 1953.

THE PITTSBURGH RESTAURANT PROGRAM*

H. J. DUNSMORE

Bureau of Sanitation, Department of Public Health, Pittsburgh, Pa.

In carrying out the Pittsburgh restaurant program, a fact-finding survey was initially made to determine the extent and cause of the problem. This survey revealed that the most important factors did not have to deal with money, structure, or equipment, but rather with attitudes on the part of the inspection staff and the proper rapport between restaurant owners and the inspectors. This decay in moral fiber had developed over a long period of time and was very deep-seated. The years from 1948 until 1951 were spent in intensively rebuilding a proper attitude between the industry and the inspectors. This was done primarily through in-service training and by a good deal of assistance from the training forces of the USPHS. A very cooperative press assisted materially in keeping the public and staff, along with the industry, informed and on their toes as to what was occurring. A fact-finding survey by the USPHS in March, 1952, at the request of the Pittsburgh Health Department, disclosed that there had been a 35 percent improvement in restaurant sanitation.

I consider it an honor and a distinct pleasure to be asked to appear on your program here in Minneapolis to discuss "The Approach to the Administrative Problems in Restaurant Sanitation in an Urban Area."

First, I must confess that I do not pretend to know the answers, and it is with reservation that I discuss the program that is being carried out in Pittsburgh lest somebody might consider me so presumptuous as to hold this program up as an ideal. The progress that was made was accomplished by the restaurant owners and the inspection staff; not by any one individual.

SANITARY CONDITIONS AT START

It might be well to take a few minutes to paint a word picture describing the situation at the start of the program in the fall of 1948. In September, 1948, the City Council passed the Restaurant Grading Ordinance with the provision that grading should be instituted on January 1, 1950. Also in September, 1948, the City employed an experienced public health engineer to direct the program. There were 25 food inspectors on the Health Department staff to supervise some 2700 eating and drinking places. There was no record system, no inspection form, and no field equipment for the inspectors, such as flashlights, thermometers, etc.

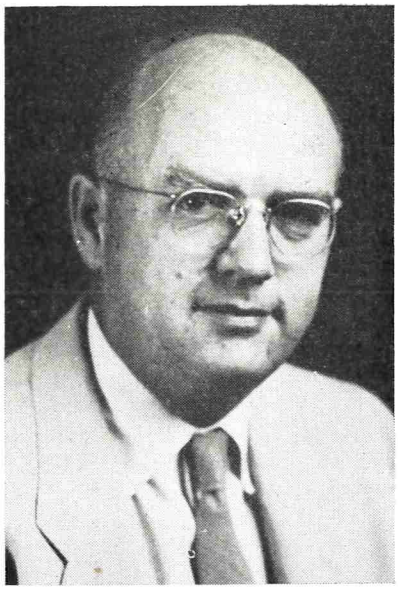
In order to provide a non-partial statistical base-line, against which we could measure improvement, the U. S. Public Health Service was asked to make a survey of the status of the restaurants. This was completed in January, 1949. The survey determined our restaurant status to rate 55 percent. Some of the items that were most frequently found to be in non-compliance were:

toilet facilities	78%
lavatory facilities	72%
lighting	66%
bacteriological treatment of eating and cooking utensils	88%
storage of utensils	61%
floors	69%
rat proofing	49%
construction of equipment	60%

In addition to these facts found by the survey, the Health Department showed specific details, such as potato peelers and meat slicers that had not been disassembled, and personnel within the establishment not knowing how to disassemble such equipment. Dishwashing machines were found not having an adequate supply of hot water, and rarely were they installed with a booster heater; inefficient detergents were used, such as soap made from grease and fats resulting from cooking. Dipper wells for ice cream scoops were practically non-existent, open sugar bowls prevalent. Cats were present in approximately 50 percent of the establishments. There were improvised facilities for locker rooms for employees, such as a convenient hook in the kitchen, toilet room, or storeroom.

Milk was being dipped from 5-gallon cans with long-handle dippers or pumped through some improvised syrup pump or other insanitary device. The same was true for cream. Food was often found stored in the refrigerator, uncovered, and exposed to contamination from drip and condensation.

One then raises the question as to why conditions, such as are enumerated here, prevail? The majority of restaurant owners are sincerely interested in running clean establishments. It is their business and they have pride in it. It was a case of not being able to recognize carelessness because of living so closely with these insanitary practices. There was a lack of proper rapport between the restaurant owner and the inspector. Too often



Herbert J. Dunsmore was raised on a dairy farm in central Michigan, received his engineering degree from Michigan State College in 1933 (Major in Civil Engineering with a sanitary option), and worked with the Calhoun County Health Department from 1938 to 1948. This county is the largest unit of the W. K. Kellogg Foundation Community Health Project.

During the 1946-47 school year, he attended the University of Michigan, Public Health School, where he received a MPH degree. From 1944 to 1948 he was administratively responsible for the restaurant grading program in Battle Creek, as well as other activities of the Bureau of Sanitation. In September 1948 he entered the City of Pittsburgh Health Department, in charge of the Bureau of Sanitation.

*Presented at the 39th Annual Meeting, *International Association of Milk and Food Sanitarians, Inc.*, Minneapolis, Minn., September 18-20, 1952.

the inspector would be greeted with "come back later; I'm busy now."

Some of the other factors that cause these conditions are the owner's natural resistance to change, too much government.

The most important positions within the restaurant—so far as sanitation is concerned—are those with the least job pride: the porter, dishwashing machine operator, bus boy, etc.

Our records show that, of 25,000 people employed in the restaurant industry, 5,000 are new each year and an additional 5,000 are shifting from one establishment to another. While we have not analyzed the statistics by positions held within the industry, it seems obvious that these new people and the ones who change positions most frequently, also are the ones who have the least job pride and are most closely associated within sanitation. A combination of these factors is largely responsible for the lack of proper sanitation standards in the establishments.

Many administrative techniques have been tried over a period of years to improve these conditions. Early in 1948, raids had been made on restaurants, particularly during the evening hours, for the purpose of finding violations in dish sterilizing. When no chlorine was found in the sterilizing water, warrants were issued, arrests made—as many as 15 or 20 arrests in a single night—with considerable fanfare from the newspapers. Other police procedures had been used for years, but they had little or no effect on improving sanitation. A new system and new technique had to be employed.

NEW PLAN

The first thing that was done was to have in-service training programs for the inspection staff. A team from the Field Training Center at Troy, N. Y., was sent in to give a two-weeks course in restaurant sanitation. Approximately a half day a week for the following 6 months was taken in round table staff meetings, going over each item of the ordinance to make sure that every individual on the inspection staff knew and understood the requirements, and knew the public health reasons "why."

During these sessions an inspection form was developed, a record system set up, inspectors were equipped with a brief case, complete set of equipment which included flash lights, 2 thermometers (a maximum registering and a 0° to 220°F standard thermometer), chlorine test kits with starch iodide method and sample bottles—swab and slants, two light meters were purchased for the use of all the inspectors, a Duaflex camera, and bacteriological equipment.

The training classes had the effect of lifting the sights of the inspectors, giving them more confidence in their ability. This increased their job pride and gave the inspector more prestige with the restaurant owners and his colleagues on the inspection staff.

Concurrently with these training sessions, meetings were held in neighborhoods throughout the city, which were attended by 50 to 80 percent of the restaurant owners. Twenty-five such meetings were held to discuss the restaurant ordinance, explaining what was expected of industry, and to give them a chance to ask questions. Many questions were asked and a better understanding of what was expected resulted.

A community-wide educational program was carried on through radio, newspapers and illustrated talks before the women's clubs, service clubs, and other community organizations.

Every opportunity was extended to train the inspection staff and improve their qualifications which was of real benefit in aiding them to earn status. The size of the inspection force was reduced from 25 to 16, taking advantage of those inspectors who showed the most willingness to learn and enthusiasm and aptitude for their work.

RETARDING LEGAL ACTION

In May, 1949, after six months of this intensive program, the Western Pennsylvania Restaurant Association took legal action in the form of an injunction against the Health Department to enjoin the Department provisions of the ordinance. Members of this Association are some of the larger operators in the City and they should be in a position of leadership to the industry. A few of their members used newspaper advertising and table placards with a highly emotional appeal which boomeranged and alerted the citizens to the fact that the restaurants exhibiting these folders were against grading which meant to the customers they were against cleaning-up.

The outcome of this litigation is well-known to all of you. The lower court enjoined the Department. This decision was appealed to the Supreme Court of Pennsylvania by the City. The Supreme Court, in turn, handed down a very important and far-reaching opinion. I doubt if it could have been made broader by a group of food sanitarians themselves, had they been asked to write it. Remember, this was a unanimous opinion of a group of legal minds. Miss Anne X. Alpern, City Solicitor, deserves high praise for her presentation of the case.

In relation to the grading provision of the ordinance the Court stated: ". . . . certainly it would not only be the right, but even the duty of the authorities to inform the public as to the conditions found on such inspections . . . .".

Another point raised was the legality of the grade B, since the state law is the non-grading type of ordinance and only "A" restaurants are supposed to be licensed. Under consideration of this phase the court ruled that ". . . . . , therefore, the City may properly license a grade "B" restaurant in order to give it a reasonable opportunity to bring its operations up to the grade "A" standard; if it fails to do this the license granted to it may be revoked at any time . . . . .".

Those places indicating the most enthusiasm for remodeling and improving were given first attention. Many establishments asked for a complete and detailed survey and started at once to employ architects, contractors, equipment houses, etc., to aid in bringing their facilities into full compliance with the ordinance. This voluntary attitude and

action did a great deal to bolster up the program; it raised the inspectors' status and helped to build their morale and it stimulated other members of the restaurant industry to do likewise—it became infectious. During the 16 months period that the ordinance was in effect prior to grading, it is estimated that the restaurant industry spent approximately $3,000,000 in improvements to comply with the ordinance. Subsequently there was a substantial group of operators that had complied and were vigorous supporters of the ordinance and determined to see to it that their competitors complied. This group of operators were most anxious that the courts would sustain the city's grading ordinance. The restaurant industry as a whole did not oppose the ordinance. The hotels, the liquor dealers, the druggists, and many of the restaurant owners were actively behind the ordinance and were embarrassed by the litigation taken by a few.

A group of citizens from the Community filed a brief for Amici Curiae. The groups included—

North Side Community Council

Hill District Community Council

Health and Welfare Federation of Allegheny County

Allegheny County Federation of Women's Clubs

Legislative Council of Western Pennsylvania

Council of Medical Social Service Boards

Junior Chamber of Commerce of Pittsburgh

Pittsburgh Section, National Council of Jewish Women

I quote directly from a portion of their brief:—

"Affirmance of the decree of the lower Court means, to these organizations, that an assault, in the only really promising form, upon a highly dangerous public health menace is beyond the competence of this or any other city in the Commonwealth. We believe that such a holding would be not only incorrect under the law, but also a threat to all effective protection of the public health."

REVIEW OF IMPROVEMENT PROCEDURE

Let us pause now, and review the events which assisted in bringing about this improvement.

In June 1949, approximately 50 members of the restaurant industry were invited to a meeting attended by Messrs. Hollis, Fuchs, and Robinson of the USPHS, as well as the Health Officer and Public Health Engineer. This meeting was called for the purpose of trying to find the underlying causes as to why the industry was taking legal action against the department, and to determine if there was any satisfactory way of settling the differences of opinion without going to court. Many helpful suggestions came out of this meeting, and as a direct result of it, an Administrative Practices Committee of seven members of the restaurant industry was appointed by the Health Officer. This committee met for the first time in August 1949, and then every week or 10 days until November. This committee helped the Department to understand better what really was going on within the restaurant industry. Likewise, it provided a medium through which the Health Department could get its program across to the restaurant industry. At one time, prior to the actual court-room hearing of the case, this committee had worked out a compromise solution to grading, which was acceptable to the City but unacceptable to the group of restaurant owners involved in the litigation.

The U. S. Public Health Service loaned a food and milk consultant (Stephen Koelz) to the Health Department for a period of one year for the purpose of assisting in carrying out the food program and to explore new techniques in the field of education, and to determine the amount of effort necessary from in-service training and supervision viewpoints to bring about an effective program. In carrying out this assignment the Food Consultant was given a free hand in relation to his contact with the staff and the restaurant owners, without responsibility in relation to administration and matters of policy.

Several effective techniques were developed. The most comment and enthusiasm on the part of the restaurant industry was caused by the classes conducted in the establishments, in which each member of the restaurant personnel contributed his knowledge to the class. This pointed out the inter-relationships of the jobs, showing that each employee had an important function that must be carried out properly so that all of the employees could benefit by each other's work. After several such meetings, a demonstration class was held for the restaurant owners, at which 250 restaurant operators were present.

Another effective procedure was in the judicious use of the camera, taking about 1200 feet of colored film to show the "before and after" effects of the program. This was shown to many restaurant groups and greeted with a great deal of enthusiasm.

The Food Consultant also was successful in interesting the leading newspaper in developing a feature article for a Sunday roto section, with photographs showing the good and bad features in restaurant sanitation. Many hours were spent by the Food Consultant with each inspector, in staff meetings with all the inspectors to synchronize their ideas on each item of inspection, particularly as it related to disassembling equipment in the establishment, and familiarizing the staff with equipment and standards for equipment that were new to them.

ESTOPPAGE INJUNCTION

On December 31, 1949, Common Pleas Court of Allegheny County enjoined the Health Department from enforcing the grading provision of the ordinance which was to go into effect the next day. As a result of this court decision, several restaurant operators cancelled orders for construction work and sent back equipment that already had been purchased.

Within the next 60 days the Health Department conducted hearings for approximately 50 restaurants, in which 9 licenses were suspended, 8 revoked, and the remainder placed on probation—a specific time being given to clean up. These hearings were adequately covered by the three daily newspapers and developed considerable community response. Also, this increased the importance of the inspector's position in the establishment and gave the inspector greater status than he previously had.

In March, 1950, a committee was appointed by the Health Officer to develop standards for interpretation of the state law, which for all practical purposes, is the non-grading USPHS recommended restaurant ordinance. This committee was made up of three men each from the Western Pennsylvania Restaurant Owners Association, the Pittsburgh Hotels Association, Allegheny County Retail Druggists Association, and the Allegheny County Retail Liquor Dealers Association, as well as three members of the Health Department: The Health Educator, the Food and Milk Consultant, and the Public Health Engineer.

This committee developed an interim program, with the principle of self-inspection in mind. It was agreed that it might be considerable time before litigation on the Supreme Court case would be completed and that during this period of time some kind of award, plaque, or symbol could be exhibited by those restaurants that were following the self-inspection program. An eight-page folder, explaining this program and illustrating the Code of Interpretation, was developed.

This committee agreed that the licenses, which were to be renewed on July 1, would not be re-issued unless the establishment complied fully with this Code of Interpretation. A numerical percentage point system was developed, in which establishments having a score of 90 percentage points or more would be granted a license.

As a result of this procedure, 561 (or 20 percent) of the licenses were withheld. The department waited 30 days—until August 1—before starting legal action against these restaurants for operating without a license. Notice was sent to 44 establishments, informing them that an injunction was to be filed against their establishments in the Common Pleas Court in 8 days, for not having corrected the violations that were enumerated on the several previous inspections. This gave the owner time to consult with the City Solicitor's office and the Bureau of Sanitary Engineering Services, and with his lawyer, to determine what could be done.

In each case, the restaurant owner, with his attorney, was in the office the following day, In all cases, the establishment voluntarily closed to make such alterations or repairs as were necessary to bring it into compliance. To some, that meant closing for only 2 or 3 days, a few others were closed for a week or two and the employees given their annual vacation, and, in a few cases, the restaurants were closed for as long as six weeks to make extensive alterations. Again, this procedure was adequately covered by newspaper stories informing the public and other restaurant operators what was going on.

As a result of the legal action and the newspaper coverage, the other 517 operators brought their establishments into compliance within the next 30 days so that by September 15, all establishments were operating with a license, or were not operating.

Inspection Improvements

About every 6 to 9 months the inspectors' districts were changed. This also seems to be an effective procedure. As inspectors would go into new areas, they would see different problems that the former inspector either had overlooked or failed to note on his report. It also kept each inspector on his toes because he knew he would be in the district a relatively short time, and none of them wanted the succeeding inspector to find violations that they had overlooked. This developed a healthy spirit of competition on our staff. In a few cases, the inspector would wear out his welcome, or, because of the pressure of the program which forced operators to make extensive alterations to their restaurants, feelings would become strained. This was relieved by the shift of districts as the new man would carry no onus with him.

Concurrently with the training program a record system was developed, permitting comparison, item by item, of each area. Each inspector was assigned approximately 150 restaurants and, in tabulating the results of their inspections in each area, it was obvious that there was a wide difference in interpretation of the ordinance by the various inspectors: e.g. one man called floor violations 98 percent of the time, while 2 others called this item in non-compliance 34 percent and 38 percent of the time. Average for the total group was 71 percent non-compliance.

On equipment, one inspector found this item in non-compliance 94 percent of the time, while 3 others found it in violation 3 percent, 12 percent, and 17 percent of the time, and the average for the group was 44 percent of the time.

One inspector called the item of housekeeping in violation 95 percent of the time, while another found it in violation only 7 percent of the time. The group average for non-compliance on this item was 56 percent.

Through tabulation of these results and discussing them in staff meetings, getting expressions from the inspectors as to what was a violation of these items, the differences of opinion were ironed out. It is incumbent on the Health Department so to administer and supervise the program that each owner is treated fairly and alike.

A record system was set up in which each establishment had an individual folder with the color of green, yellow, or red to indicate the sanitation status of the establishment, and using a small flag on the heading as a visible means of indicating when the establishment was last inspected. This gave a simple color picture of the status of the establishment, as well as being able to make certain that all the establishments had been inspected.

A suspension type of folder was used for this purpose; this helped the clerical personnel in maintaining the files in a neat and orderly manner.

Control Program

On January 2, 1951, the Supreme Court handed down its decision, permitting the city to grade restaurants. From that point on, the restaurant program took on a new approach. The Court decision removed all doubt, both from the Health Department and the restaurant industry, as to where we stood on the matter of grading. The responsibility to grade was squarely up to the Department. It seem-

ed wise to grade as rapidly as possible, consistent with thoroughness and uniformity.

On February 15, 1951, grading was started. During the first ten days 200 "A"s were posted on establishments that were known by the Department to be the most nearly ready for this grade. No establishment was graded until a complete inspection was made the day it was graded to make sure that all items were in compliance. The final inspection prevented many potential A restaurants from attaining this grade at this time.

After ten days the inspectors started posting "B"s, concentrating on "B"s nearly entirely, and several days later started posting "C" grades. Seventy-seven "C"s were posted in 5 days. An equal number of restaurants closed their establishments to improve the sanitation status rather than post the "C" grade. The policy of the Department was to give each restaurant operator a choice: either to post the "C" grade or close the establishment as of the day it was inspected.

By May 15, 2200 of the 2235 establishments were posted. By July 1, every public eating and drinking place in the city was posted. These last few ultimately received "A"s. They remained ungraded for a period of several weeks, during which time extensive alterations, which were already under way, were completed. The policy of the Department was to withhold a grade from those places that obviously were making a serious effort to comply, rather than post a "B" or a "C" grade on them during this construction.

Again, during this period, an intensive campaign of newspaper articles appeared daily, letting the public and other restaurant operators know the actions of the Health Department. It was obvious to everybody that the places that received "A"s first were ready and those who had to wait 60 to 90 days, because of construction or last-minute changes, were known to be fixing up, trying desperately to comply with the "A" standards.

From an administrative viewpoint the Department's policy was one to try to encourage the industry to attain the "A" rating, rather than do anything that might discourage the individual operator to strive for other than the best.

The final results were approximately 40 percent (900) "A", and 60 percent (1100) "B". Since the original grading, there has been a 15 percent change in grades—either down-grading or up-grading of various establishments—but the total remains 40 percent "A" and 60 percent "B".

Approximately 4 "C"s are posted each week. Only 3, of all the posted "C"s, failed to upgrade before the 30 days expired. The average length of time for upgrading from "C" has been 3 to 5 days. In 3 instances the restaurants went out of business at the end of 35 to 40 days. No "C" operator has been taken into court for prosecution. Only 2 operator removed the "C" from their window without permission, but they were restored promptly and no further problem of this kind developed.

PUBLIC RELATIONS

The grading of restaurants is an effective administrative device which is a two-pronged tool, putting not only the Health Department but the restaurant industry on their toes. The grade on a restaurant is notice to the public of the Department's evaluation of the sanitation in that particular establishment. The public has its own impression of the evaluation, and is not hesitant to let the Department know if it thinks that the restaurant is improperly graded or does not deserve the grade that is displayed. Letters, phone calls, visits to the office, etc., let the Department and the individual inspector know that certain types of violation are obvious and repulsive, but still occur in some establishments.

The public likes grading and has said so on many occasions. Restaurant owners have expended a great deal of time, effort and money to inspire confidence in "eating out" on the part of the public. They have found the grading program to be the most effective tool in accomplishing their purpose. One operator, who was an official of the Restaurant Owners Association, had this to say: "It makes little difference what we think of grading; it is much more important to us what the public thinks of it."

In March, 1952, a second survey was made of our restaurant inspection program by the USPHS at the request of the Health Department. Fortunately the same team that made the original survey was assigned to make the second one. Their findings showed a substantial improvement in the status of restaurants—a 35 percent increase in our rating, or from 55 to 75.

Some of the comments that the survey staff made while here were very significant, at least to me. One was that the attitude of the restaurant owners towards the Health Department is much improved. Our inspectors are more sure of themselves. There is a healthy respect on both sides and a seriousness regarding restaurant sanitation that did not prevail during the former survey.

The survey staff said that the inspectors' approach was a friendly one, but genuinely full of business. I was most happy to have this particular report because it is exactly the attitude that I had hoped our staff did exhibit.

During the last six years Institutions Magazine has given awards annually for the winners in their "Food Service Contest." According to their statement the award is a symbol of advancement and achievement in sanitation and food service efficiency.

In 1952, 44 such awards were given throughout U. S. and 2 to establishments in Pittsburgh, namely: Kaufmann's and the H. J. Heinz Company. In 1951 the Hotel Webster Hall of Pittsburgh received such an award, and in 1949 the Dutch Henry restaurant of Pittsburgh received a similar award. These restaurants are proud as we are of their accomplishments. Two of these operators were members of the administrative practice committee referred to above.

The vigorous support of the Mayor and Council and their continued active interest in the restaurant program, is but a part of

(Continued on page 135)

MILK ORDINANCE AND CODE 1953 RECOMMENDATIONS OF THE PUBLIC HEALTH SERVICE*

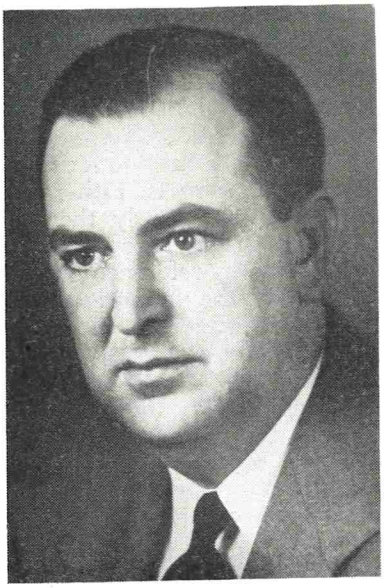
JOHN D. FAULKNER, BS, MSPHE** AND MILTON E. HELD, BS**

The new edition of the Public Health Service Milk Ordinance and Code represents the first complete revision since 1939. Many significant changes and modifications have been made therein to keep abreast of advances in the fields of dairy technology, veterinary medicine, and public health. Among the most significant changes are strengthening of the provisions relating to brucellosis control in dairy herds; inclusion of methods for the cleaning-in-place of milk plant pipe lines; changes in the requirements for the cooling of milk on dairy farms; and an option that health departments may accept, subject to official check, industry's laboratory results of tests of raw milk for pasteurization. The 1953 Milk Ordinance is a mandatory-pasteurization type; however, a list of the changes to be made to permit the sale of Grade A retail raw milk has been included for those communities unwilling to require compulsory pasteurization. A new feature is the inclusion of a separate Appendix which contains much of the explanatory material formerly scattered throughout the Milk Code.

The 1953 edition† represents the twelfth major revision of the Public Health Service Recommended Milk Ordinance and Code since the Standard Milk Ordinance was first published in 1924. Since the publication of the last previous edition in 1939, the Public Health Service had received numerous proposals for changes submitted by State and local health authorities, agricultural agencies, the dairy industry, equipment manufacturers and others. Among these proposals were those submitted by the Committee on Milk Regulations and Ordinances of the International Association of Milk and Food Sanitarians. The most important of the suggested changes were summarized and submitted to State and local health authorities of areas operating under the USPHS Milk Ordinance, as well as to others, for their comment. Upon receipt of the comments of State and local authorities, a detailed compilation of all suggested changes together with significant comments thereon, was submitted to the Public Health Service Milk and Food Sanitation Advisory Board for their consideration. This compilation totaled 150 typed pages. The Advisory Board met in June 1947 and recommended the acceptance of a large number of the proposals. Included therein were several changes designed to meet conditions in areas whose regulations were not equivalent to those contained in the USPHS Milk Ordinance.

The changes recommended by the Advisory Board were incorporated into a revision of the 1939 edition of the Milk Ordinance, which was published in multilithed form in April 1949. Comments received from many States and municipalities relative to some of its provisions necessitated further revision of the Milk Ordinance proper before work could be commenced on the interpretive code.

In the development of the Milk Code many problems were encountered which required further investigation and study, and consequently delayed completion of the Code. Technical developments, and advancements in dairy science, public health, veterinary medicine, and related fields, were most rapid during the ten-year period, 1940-1950; and it was desired to take cognizance of these developments in the new edition. This was done to the fullest extent possible. The new edition, which is entitled "Milk Ordinance and Code—1953 Recommendations of the Public Health Service," is now available.†



John D. Faulkner was born in New Bern, North Carolina, in 1911. He attended North Carolina State College, Raleigh, North Carolina, from which he graduated in 1933 with the degree of Bachelor of Science in Mechanical Engineering. He also attended the graduate schools of the University of North Carolina and the University of Michigan, and received his Master of Science degree in Public Health Engineering from the University of Michigan.

During the period 1935-1941, Mr. Faulkner was employed by the North Carolina State Board of Health, serving as Chief of the Milk Sanitation Unit from 1939 until he was called to active duty with the Army of the United States in December 1941.

In 1946 Mr. Faulkner joined the staff of the Institute of Inter-American Affairs and was assigned to Brazil, where he held the position of Chief Sanitary Engineer and Assistant Director of the Institute's Brazilian Health and Sanitation Program. In 1949, he was commissioned in the Public Health Service and was assigned to the Milk and Food Branch as its Assistant Chief. In October, 1951, upon the reassignment of Mr. A. W. Fuchs, he became the Chief of the Milk and Food Branch.

Mr. Faulkner has served on the Executive Board of the International Association of Milk and Food Sanitarians for the last three years, and is at the present time President-Elect of the Association.

The remainder of this paper will be devoted to a discussion of the most significant changes and modifications, as compared to the 1939 edition.

*Presented by Mr. John D. Faulkner before the Annual Meeting of the Texas Public Health Association, Galveston, Texas, February 17, 1953.

**Chief and staff member, respectively, Milk and Food Branch, Division of Sanitation, Public Health Service, U.S. Department of Health, Education and Welfare.

†The 1953 edition of the *Milk Ordinance and Code*, Public Health Service Publication No. 229, is now available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at the cost of 75c per copy.

GENERAL PROVISIONS

The original form and method of presentation used in the 1939 and earlier editions have been retained; however, the 1953 edition is divided into four major parts, rather than three as was previously the case. These parts are as follows: Part I, The adoption-by-reference or short form; Part II, the unabridged form of the Ordinance; Part III, the interpretive code; and Part IV, Appendixes, which is new.

The most significant changes in the general provisions relate to mandatory pasteurization, streamlining of the interpretive Code, and the inclusion of nine appendixes.

The 1953 edition has been developed as a mandatory pasteurization ordinance; however, for those small communities which still find it necessary to permit the sale of retail raw milk, that option is allowed. A list of the necessary amendments which must be incorporated for the sale of retail raw milk to be permitted is presented at the end of Part II, the unabridged U. S. Public Health Service Milk Ordinance.

Part III, the U. S. Public Health Service Milk Code, has been streamlined. Obsolete material has been eliminated, while much of the useful explanatory material, formerly scattered throughout the 1939 edition of the Code, has been gathered into the completely new section, Part IV, Appendixes, where it is organized according to subject matter. Thus, the revised Code is limited, for the most part, to statements of "public-health reason" and "satisfactory compliance" for each requirement of the Ordinance. The new Appendixes contain explanatory material as well as detailed requirements on such items as water supply, excreta disposal, BAI regulations, and pasteurization plant tests. The Appendixes are referred to in the Code, and are considered an integral part thereof.

Another change is that the revised edition has been so developed that either a "degrading" or a "non-degrading" form may be adopted. The "non-degrading" form is enforceable by permit suspension, court action, or both. The "degrading" form is enforceable by all of the above means, and, in addition, through degrading of the supply. The use of the Grade A designation is a fundamental principle of both forms. In the "degrading" form, Section 8 allows the choice of prohibiting or permitting the regular sale of grades lower than Grade A pasteurized.

REVISIONS MADE IN THE ORDINANCE AND CODE (PARTS II AND III)

Section 1. *Definitions.*

The principal changes and additions are as follows:

In the definition of "Milk", the solids-not-fat content has been increased from 8 to 8¼ percent. Also, the definition of "Vitamin D Milk" now specifies that vitamin D milk must contain 400 USP units of vitamin D per quart.

Definitions have been added or amended for the following products: "Light Cream, Coffee Cream or Table Cream;" "Whipping Cream;" "Light Whipping Cream"; "Heavy Cream, or Heavy Whipping Cream"; "Half and Half"; "Reconstituted, or Recombined, Half and Half"; "Whipped Cream"; "Concentrated Milk"; "Concentrated Milk Products"; "Dry Milk"; "Nonfat, Fat-Free, or Defatted Milk"; "Skim-Milk Solids"; "Nonfat Dry-Milk Solids;" "Flavored Milk"; "Flavored Drink, or Flavored Dairy Drink"; "Flavored Reconstituted Milk"; "Flavored Reconstituted Drink, or Flavored Reconstituted Dairy Drink"; "Cultured Buttermilk"; "Cultured Milk"; "Reconstituted, or Recombined, Skim Milk"; "Cottage Cheese"; and "Creamed Cottage Cheese". Since the development of Grade A standards for dry milks has not been completed, "Dry Milk" and "Nonfat Dry-Milk Solids" have not been included in the list of milk products subject to grading.

A definition for "Fortified Milk and Milk Products" has also been included as a footnote, for incorporation by those communities which desire to permit the sale of milk and milk products fortified with vitamins and/or minerals, in addition to "Vitamin D Milk." It is desired to point out, however, that the Public Health Service does not advocate the indiscriminate fortification of milk and milk products with vitamins and/or minerals, other than vitamin D. This position is in accordance with the views of the American Medical Association and the National Research Council.

"Cottage Cheese" and "Creamed Cottage Cheese" have been included in definition K, "Milk Products," but may be exempted from the grading provisions, as is explained in a footnote.

In the definition of "Pasteurization," the high-temperature short-time temperature requirement has been increased from 160°F. to 161°F.

Under definition M, the watering of milk is deemed adulteration. Also, a definition P-2, "Milk Hauler," has been included in Section 1.

Reduction tests, both methylene-blue and resazurin, are no longer recognized in the definition, "Average Bacterial Plate Count, Direct Microscopic Count, and Cooling Temperature." Communities finding it necessary to permit use of reduction tests may do so by amending definition S, in accordance with a footnote.

Section 2. *The Sale of Adulterated, Misbranded, or Ungraded Milk or Milk Products Prohibited.*

This section now includes a provision that, in an emergency, the sale of ungraded milk or milk products may be authorized, provided such products are labeled "ungraded." An emergency is defined as a general and acute shortage in the milkshed, not simply one distributor's shortage, and may be declared for a limited time only. This new statement is a broadening of the emergency provisions formerly included in Section 11 of the 1939 edition.

Section 2 also provides that any adulterated, misbranded, and/or improperly labeled milk or milk products may be impounded by the health officer, and disposed of in accordance with State law. The presence of antibiotics, chemical bactericides, or other unapproved additions shall constitute adulteration.

Section 3. Permits.

A milk hauler, as defined in Section 1, must secure a permit under the terms of Section 3, unless he is an employee of a producer, distributor, or milk plant operator, or any other person to whom a permit has been previously granted.

Any permit may be suspended for interference with the health officer in the performance of his duties, as well as for violation of the terms of the Ordinance.

Section 4. Labeling.

Only the identity of the producer dairy is now required on cans delivered to a milk plant which receives only one grade of raw milk for pasteurization, and which immediately dumps, washes, and returns the cans to the producer dairy. In cases where several pasteurization plants are operated by one firm, no objection is made to the use of a common firm name on milk bottles or containers, provided that the location of the plant at which the contents were pasteurized is also shown, either directly or by a code or permit number. Identity-labeling requirements may be interpreted as permitting plants to purchase in the final container, and distribute under their own label, milk and milk products processed and packaged at another plant, provided the name and address of the processing plant are included on the label. If approved by the health officer, a code or permit number may be substituted for the name and address.

In the case of "Vitamin D Milk," the number of USP units per quart must be shown on the label. In the case of concentrated milk or milk products, the label must show the volume or proportion of water to be added for recombining in the home.

Homogenized milk or cream may not be mixed with milk, skim milk, or cream which has not been homogenized, unless the product is labeled "homogenized" and conforms with the standards for homogenization in Section 1 (J).

The requirement of the 1939 edition, that restaurants, soda fountains, etc. shall display a placard stating the lowest grade of milk sold, has been deleted from the revised edition.

Section 5. Inspection of Dairy Farms and Milk Plants.

All milk producers and distributors must permit the health officer access to all parts of the establishment, and distributors must furnish, for official use upon request, a record of the actual quantities of milk and milk products of each grade purchased and sold, a list of all sources of milk and milk products, records of inspections and tests, and pasteurization time and temperature records.

A footnote (21) has been included which, if adopted, permits the health officer to accept the results of periodic industry inspection of producer dairies, provided such inspection is a supplement to and not a substitute for official inspection, and provided, further, that the health officer satisfies himself that such industry inspection is performed in accordance with the terms of the Ordinance.

Section 6. The Examination of Milk and Milk Products.

This section of the 1953 edition includes a number of important changes. At least four samples of homogenized milk, as well as four samples of regular milk and cream, must be analyzed during each 6-month period. It is also required that other milk products be sampled in approximate proportion to the volume sold, but not less than once during each 6-month period.

In the case of raw milk for pasteurization, the health officer is authorized to accept the test results of industry or commercial laboratories which he has checked periodically and found to be satisfactory. These non-official laboratory examinations are not intended to be a complete substitute for official control, but a supplement thereto. If such laboratory results are accepted, the health officer is required to examine at least one sample per 6-month period of each producer's milk supply. This provision does not apply to pasteurized milk and milk products.

A coliform count standard of not more than 10 per ml has been included for pasteurized milk, cream, half and half, etc. (Sec. 7). Because it is impracticable to compute a logarithmic average when any of the counts are zero, as may sometimes occur in the case of coliform counts, and since an arithmetic average of coliform counts that may vary over a wide range is unreasonable and undesirable, the coliform standard has been established on the basis that not more than one of the last four coliform counts shall exceed 10 per ml. It is felt that this is a liberal standard which is justified for an initial program, but which might well be made more stringent in the future. The new edition also permits the adoption of this 3-out-of-4 method for determinations other than coliform counts. A footnote (25) to be incorporated into the Ordinance has been included for communities desiring to utilize this method.

Section 6 states that, in all cases, milk must show efficient pasteurization, as evidenced by a satisfactory phosphatase test (Sec. 7). In case the phosphatase test shows improper pasteurization, the probable cause shall be determined and corrected before milk or milk products from the plant concerned can again be sold as pasteurized milk or milk products.

Section 7. The Grading of Milk and Milk Products.

Bacterial Standards: The bacterial plate or direct microscopic clump count standard for grade A raw milk for pasteurization has not been changed, and remains at 200,000 per ml as delivered from the farm. A new standard has been inserted limiting the count at any time after dumping and before pasteurization to 400,000 per ml. This new standard is in recognition of the inevitable increase in count resulting between receipt from the producer and pasteurization, particularly where the milk is transported from a receiving station to a pasteurization plant. When a community permits the use of reduction tests, the corresponding methylene-blue reduction times are 5½ and 4¾ hours, respectively, as determined by the modified inverted test described in "Standard Methods," and the corresponding resazurin reduction standards are 2¾ hours and 2½ hours to P 7/4, respectively.

The most significant changes and additions in the items concerned with production and handling of raw milk for pasteurization are as follows:

Item 1*r. Cows—Health*: All milk for pasteurization must come from herds located in a modified accredited tuberculosis-free area, which has been tested not more than 6 years before adoption of the Ordinance and at least every 6 years after such test. However, herds located in an area failing to maintain such accredited status or having an incidence of bovine tuberculosis exceeding 0.2% must be accredited by the BAI as tuberculosis-free, or otherwise must pass an annual tuberculin test. Within a period not to exceed 3 years, all milk or milk products for pasteurization must come from herds certified by the State Livestock Sanitary Authority as following either Plan A or Plan B approved by the BAI for the eradication of brucellosis. All additions to the herds must be brucellosis-free; tests and retests shall be made, and any reactors disposed of in accordance with the requirements of the BAI, USDA. Cows which show complete induration in one quarter need not be excluded from the milking herd if the affected quarter is completely dry and inactive.

Item 4*r. Milking Barn—Floors—Animals*: Tight wooden floors in the milking portion of the barn are no longer acceptable for existing installations. No swine or fowl are allowed in the barn, and other animals, if kept in the barn, shall be confined in stanchions, stalls, or pens, which must be kept clean and in good repair.

Item 6*r. Cow Yard*: Provisions concerning loose-housing of cattle are incorporated into this item. They provide that in such areas, manure droppings shall be removed, or clean bedding added, at sufficiently frequent intervals to prevent the accumulation of manure on cows' udders and flanks. Manure, soiled bedding, and waste feed may not be maintained in such manner that the manure pack is not properly drained or does not provide a reasonably firm footing for the animals. No attempt was made to include detailed specifications for loose-housing, pen-stabling, etc., although numerous groups recommended that such action be taken. Our reasons for not doing so were based on our belief that the general items adequately covered the sanitation requirements of the various systems.

Item 8*r. Milk House or Room—Construction and Equipment*: The previous requirement that none of the milk-house operations be conducted elsewhere has been modified to permit cleaning and bactericidal treatment of pipeline milkers in place, if approved by the health officer, in such manner as to comply with the provision of Items 13r and 14r.

Of particular interest is the change in the milk house vestibule requirement [Sub-item 8r(e)]. This has been modified so that, when the milking barn or parlor is used only for milking and the feeding of concentrates, and not for the housing of cattle, a direct opening into the milk house may be permitted when a solid, self-closing door, opening outward from the milk house, is provided. When a vestibule is required, it must have two self-closing doors, so arranged that both doors will not be open at the same time. Such doors may swing inward, outward, or both ways, and at least one of them must be solid. The milk-house screening, cleanliness, and drainage provisions apply to vestibules.

The Ordinance recommends that water should be piped into all existing milk houses, and requires that it must be piped into all milk houses hereafter constructed, reconstructed, or extensively altered. An exception is made where it is not possible to obtain an adequate supply on the premises [Sug item 8r (e)].

Item 9*r. Milk House or Room—Cleanliness and Flies*: When insecticides are used for milk-house fly-control purposes, care must be exercised to protect the milk and milk-room equipment from contamination by the insecticide.

Item 11*r. Water Supply*: A private water supply must now comply with the standards of the State health authority, and at least the minimum requirements outlined in an Appendix (D). At least one inspection shall be made semi-annually to determine compliance with requirements. Samples for bacteriological examination must be made upon initial approval of the physical structure, and thereafter when any repair or alteration has been made. A number of changes have also been made in the construction requirements for private water supplies. Existing pits must meet minimum specifications; pumps may be located in residential basements not subject to flooding; and a driven or drilled well may be located closer than 10 feet to a residential basement.

Item 12*r. Utensils—Construction*: This item now includes a statement that all milking machines, including pails, heads, milk claws, milk tubing, and other milk-contact parts, must be so constructed as to be easily cleaned. Under this provision, pulsators, air tubing, and vacuum lines are not normally considered as milk-contact parts.

Item 14*r. Utensils—Bactericidal Treatment*: The revised edition has been changed to permit the use of chemical bactericides other than chlorine, subject to the approval of the health officer. Such approval shall be based on satisfactory tests. Also, this item now provides that large equipment may be given bactericidal treatment by spraying, in which case the concentration of the chemical bactericide should be doubled. The storage of rubber parts of milking machines in a 0.5% lye solution, followed by a rinse before using, now constitutes satisfactory bactericidal treatment. A final chlorine rinse has been found unnecessary for rubber parts so treated.

Item 15*r. Utensils—Storage*: When the health officer has approved the cleaning-in-place of pipeline milkers, only those parts which need be removed for proper cleaning must be stored in the milk house.

Insecticides, drugs, or other toxic materials shall be stored in such manner as to preclude the possibility of contaminating equipment, milk-contact materials, and other supplies.

Clean milk cans, after delivery to the dairy farm, must be stored in

the milk house within a reasonable time. Unprotected storage along the highway constitutes a violation of this item.

Item 19r. Milker's Hands: This item now requires that no person with an infected cut or lesion on hands or arms shall milk cows, or handle milk or milk utensils.

Item 22r. Removal of Milk: The 1939 edition prohibited the straining of milk in the dairy barn; however, in the new edition, straining of milk in the barn is allowed under certain protective conditions.

Item 23r. Cooling: One of the most significant changes relates to the cooling of milk for pasteurization. The new Ordinance requires that such milk must now be cooled to 50°F. or less within 2 hours after completion of milking, and must be maintained at that temperature until delivery, unless it is delivered to a milk plant or receiving station within 2 hours after completion of milking of the herd. Communities which find it necessary to do so may, however, substitute 60°F.; but, in order to be recognized as having adopted this Ordinance without downward revisions, a proviso must be inserted in the Ordinance that the 50°F. cooling requirement shall become effective within 5 years from the date of adoption.

Item 24r. Vehicles and Surroundings: Items 24r, "Bottling and Capping", and 25r, "Personnel-Health," of the 1939 edition were concerned with retail raw milk, and have been deleted. The material formerly contained in Item 26r has been transferred to a new Item 24r, entitled "Vehicles and Surroundings."

Requirements for bulk milk transportation tanks or vats are noted in Item 24r, but are referenced to Items 12r, 13r, and 14r, which are concerned with construction, cleaning, and bactericidal treatment. This has been done to avoid double penalty in the case of a violation of one of these latter items.

Screening Tests; In recognition of the importance of industry quality-control programs, the 1953 edition contains a recommendation that each plant or receiving station conduct quality screening tests, with follow-up visits by plant fieldmen where indicated. Such tests may include odor, temperature, strainer-dipper, sediment, and laboratory pasteurization or thermoduric counts. It is suggested that these tests be made monthly or oftener, and that abnormal or otherwise unsatisfactory milk be rejected.

Definition of Grade A Pasteurized Milk: There have been no changes in the bacterial count standard for grade A pasteurized milk; however, as previously mentioned, a coliform standard for pasteurized milk of not to exceed 10 per ml has been added.

The most significant changes in the requirements concerned with the pasteurization of milk are:

Item 3p. Doors and Windows: This item has been clarified so that the actual presence of flies inside the plant shall now be considered as a violation of Item 5p, and item 3p refers only to physical facilities for the exclusion of flies from the plant interior.

Item 5p. Miscellaneous Protection from Contamination: This item now requires that all poisonous substances must be stored and handled in such manner as not to contaminate the milk, milk products, ingredients, containers, equipment, or other supplies.

This item also includes a new provision that milk and milk products must be standardized before pasteurization, unless pasteurized milk or milk products are used for standardization, in which case certain protective conditions must be observed.

Item 7p. Water Supply: Several new provisions have been included in this item. A safe water supply cannot be cross-connected with an unsafe or questionable water supply, or other source of possible pollution; condensing water for milk evaporators must be from an approved source; and samples for bacteriological examination must be collected at not less than semi-annual intervals when the supply is from a private source.

Item 9p. Sanitary Piping: One of the most significant changes in the Milk Ordinance and Code is concerned with acceptance of permanent-type milk pipelines, and the following detailed requirements relating thereto have been included. Permanent-type milk pipelines must be self-draining, and (a) have joints provided with self-positioning, flexible gaskets of non-toxic, low-absorption material, and of such design as to form a flush, interior joint; or (b) have self-positioning joints, of such design and finish as to form a smooth, flush interior; or (c) have all joints welded and smoothly polished on the interior face, and be provided at all changes in direction, with welded crosses equipped with removable caps, or removable elbows, or welded elbows provided with inspection openings of adequate size. The return recirculating lines must be of the same or equivalent material and construction. The use of rubber or similar materials in the milk pipeline system is permitted only when necessary to prevent leakage, although short lengths of hose may be used for connection purposes during cleaning operations.

Item 10p. Construction and Repair of Containers and Equipment: Single-service containers must be fabricated or processed in such a manner that they will meet the bacteriological standard of not more than 1 per ml of capacity. The times and temperatures for bactericidal treatment of such containers set forth in the 1939 edition have been deleted. A suggestion has also been included that health officers may accept new dairy equipment which meets the 3-A Sanitary Standards, as reported from time to time in the *Journal of Milk and Food Technology,* as being in compliance with the Milk Ordinance and Code. This statement is not intended, however, to recommend the replacement of existing equipment which complies with the Ordinance.

Item 12p. Cleaning and Bactericidal Treatment of Containers and Equipment: This item has been revised, similarly to Item 14r, to permit the use of approved chemical bactericides other than chlorine compounds. Also, as mentioned above a suggested procedure for the cleaning-in-place of milk pipelines, which has been demonstrated to be satisfactory, has been included; and

The most significant changes and additions in the items concerned with production and handling of raw milk for pasteurization are as follows:

Item 1r. *Cows—Health*: All milk for pasteurization must come from herds located in a modified accredited tuberculosis-free area, which has been tested not more than 6 years before adoption of the Ordinance and at least every 6 years after such test. However, herds located in an area failing to maintain such accredited status or having an incidence of bovine tuberculosis exceeding 0.2% must be accredited by the BAI as tuberculosis-free, or otherwise must pass an annual tuberculin test. Within a period not to exceed 3 years, all milk or milk products for pasteurization must come from herds certified by the State Livestock Sanitary Authority as following either Plan A or Plan B approved by the BAI for the eradication of brucellosis. All additions to the herds must be brucellosis-free; tests and retests shall be made, and any reactors disposed of in accordance with the requirements of the BAI, USDA. Cows which show complete induration in one quarter need not be excluded from the milking herd if the affected quarter is completely dry and inactive.

Item 4r. *Milking Barn—Floors—Animals*: Tight wooden floors in the milking portion of the barn are no longer acceptable for existing installations. No swine or fowl are allowed in the barn, and other animals, if kept in the barn, shall be confined in stanchions, stalls, or pens, which must be kept clean and in good repair.

Item 6r. *Cow Yard*: Provisions concerning loose-housing of cattle are incorporated into this item. They provide that in such areas, manure droppings shall be removed, or clean bedding added, at sufficiently frequent intervals to prevent the accumulation of manure on cows' udders and flanks. Manure, soiled bedding, and waste feed may not be maintained in such manner that the manure pack is not properly drained or does not provide a reasonably firm footing for the animals. No attempt was made to include detailed specifications for loose-housing, pen-stabling, etc., although numerous groups recommended that such action be taken. Our reasons for not doing so were based on our belief that the general items adequately covered the sanitation requirements of the various systems.

Item 8r. *Milk House or Room—Construction and Equipment*: The previous requirement that none of the milk-house operations be conducted elsewhere has been modified to permit cleaning and bactericidal treatment of pipeline milkers in place, if approved by the health officer, in such manner as to comply with the provision of Items 13r and 14r.

Of particular interest is the change in the milk house vestibule requirement [Sub-item 8r(e)]. This has been modified so that, when the milking barn or parlor is used only for milking and the feeding of concentrates, and not for the housing of cattle, a direct opening into the milk house may be permitted when a solid, self-closing door, opening outward from the milk house, is provided. When a vestibule is required, it must have two self-closing doors, so arranged that both doors will not be open at the same time. Such doors may swing inward, outward, or both ways, and at least one of them must be solid. The milk-house screening, cleanliness, and drainage provisions apply to vestibules.

The Ordinance recommends that water should be piped into all existing milk houses, and requires that it must be piped into all milk houses hereafter constructed, reconstructed, or extensively altered. An exception is made where it is not possible to obtain an adequate supply on the premises [Sug item 8r (e)].

Item 9r. *Milk House or Room—Cleanliness and Flies*: When insecticides are used for milk-house fly-control purposes, care must be exercised to protect the milk and milk-room equipment from contamination by the insecticide.

Item 11r. *Water Supply*: A private water supply must now comply with the standards of the State health authority, and at least the minimum requirements outlined in an Appendix (D). At least one inspection shall be made semi-annually to determine compliance with requirements. Samples for bacteriological examination must be made upon initial approval of the physical structure, and thereafter when any repair or alteration has been made. A number of changes have also been made in the construction requirements for private water supplies. Existing pits must meet minimum specifications; pumps may be located in residential basements not subject to flooding; and a driven or drilled well may be located closer than 10 feet to a residential basement.

Item 12r. *Utensils—Construction*: This item now includes a statement that all milking machines, including pails, heads, milk claws, milk tubing, and other milk-contact parts, must be so constructed as to be easily cleaned. Under this provision, pulsators, air tubing, and vacuum lines are not normally considered as milk-contact parts.

Item 14r. *Utensils—Bactericidal Treatment*: The revised edition has been changed to permit the use of chemical bactericides other than chlorine, subject to the approval of the health officer. Such approval shall be based on satisfactory tests. Also, this item now provides that large equipment may be given bactericidal treatment by spraying, in which case the concentration of the chemical bactericide should be doubled. The storage of rubber parts of milking machines in a 0.5% lye solution, followed by a rinse before using, now constitutes satisfactory bactericidal treatment. A final chlorine rinse has been found unnecessary for rubber parts so treated.

Item 15r. *Utensils—Storage*: When the health officer has approved the cleaning-in-place of pipeline milkers, only those parts which need be removed for proper cleaning must be stored in the milk house.

Insecticides, drugs, or other toxic materials shall be stored in such manner as to preclude the possibility of contaminating equipment, milk-contact materials, and other supplies.

Clean milk cans, after delivery to the dairy farm, must be stored in

the milk house within a reasonable time. Unprotected storage along the highway constitutes a violation of this item.

Item 19r. *Milker's Hands*: This item now requires that no person with an infected cut or lesion on hands or arms shall milk cows, or handle milk or milk utensils.

Item 22r. *Removal of Milk*: The 1939 edition prohibited the straining of milk in the dairy barn; however, in the new edition, straining of milk in the barn is allowed under certain protective conditions.

Item 23r. *Cooling*: One of the most significant changes relates to the cooling of milk for pasteurization. The new Ordinance requires that such milk must now be cooled to 50°F. or less within 2 hours after completion of milking, and must be maintained at that temperature until delivery, unless it is delivered to a milk plant or receiving station within 2 hours after completion of milking of the herd. Communities which find it necessary to do so may, however, substitute 60°F.; but, in order to be recognized as having adopted this Ordinance without downward revisions, a proviso must be inserted in the Ordinance that the 50°F. cooling requirement shall become effective within 5 years from the date of adoption.

Item 24r. *Vehicles and Surroundings*: Items 24r, "Bottling and Capping", and 25r, "Personnel-Health," of the 1939 edition were concerned with retail raw milk, and have been deleted. The material formerly contained in Item 26r has been transferred to a new Item 24r, entitled "Vehicles and Surroundings."

Requirements for bulk milk transportation tanks or vats are noted in Item 24r, but are referenced to Items 12r, 13r, and 14r, which are concerned with construction, cleaning, and bactericidal treatment. This has been done to avoid double penalty in the case of a violation of one of these latter items.

Screening Tests; In recognition of the importance of industry quality-control programs, the 1953 edition contains a recommendation that each plant or receiving station conduct quality screening tests, with follow-up visits by plant fieldmen where indicated. Such tests may include odor, temperature, strainer-dipper, sediment, and laboratory pasteurization or thermoduric counts. It is suggested that these tests be made monthly or oftener, and that abnormal or otherwise unsatisfactory milk be rejected.

Definition of Grade A Pasteurized Milk: There have been no changes in the bacterial count standard for grade A pasteurized milk; however, as previously mentioned, a coliform standard for pasteurized milk of not to exceed 10 per ml has been added.

The most significant changes in the requirements concerned with the pasteurization of milk are:

Item 3p. *Doors and Windows*: This item has been clarified so that the actual presence of flies inside the plant shall now be considered as a violation of Item 5p, and item 3p refers only to physical facilities for the exclusion of flies from the plant interior.

Item 5p. *Miscellaneous Protection from Contamination*: This item now requires that all poisonous substances must be stored and handled in such manner as not to contaminate the milk, milk products, ingredients, containers, equipment, or other supplies.

This item also includes a new provision that milk and milk products must be standardized before pasteurization, unless pasteurized milk or milk products are used for standardization, in which case certain protective conditions must be observed.

Item 7p. *Water Supply*: Several new provisions have been included in this item. A safe water supply cannot be cross-connected with an unsafe or questionable water supply, or other source of possible pollution; condensing water for milk evaporators must be from an approved source; and samples for bacteriological examination must be collected at not less than semi-annual intervals when the supply is from a private source.

Item 9p. *Sanitary Piping*: One of the most significant changes in the Milk Ordinance and Code is concerned with acceptance of permanent-type milk pipelines, and the following detailed requirements relating thereto have been included. Permanent-type milk pipelines must be self-draining, and (a) have joints provided with self-positioning, flexible gaskets of non-toxic, low-absorption material, and of such design as to form a flush, interior joint; or (b) have self-positioning joints, of such design and finish as to form a smooth, flush interior; or (c) have all joints welded and smoothly polished on the interior face, and be provided at all changes in direction, with welded crosses equipped with removable caps, or removable elbows, or welded elbows provided with inspection openings of adequate size. The return recirculating lines must be of the same or equivalent material and construction. The use of rubber or similar materials in the milk pipeline system is permitted only when necessary to prevent leakage, although short lengths of hose may be used for connection purposes during cleaning operations.

Item 10p. *Construction and Repair of Containers and Equipment*: Single-service containers must be fabricated or processed in such a manner that they will meet the bacteriological standard of not more than 1 per ml of capacity. The times and temperatures for bactericidal treatment of such containers set forth in the 1939 edition have been deleted. A suggestion has also been included that health officers may accept new dairy equipment which meets the 3-A Sanitary Standards, as reported from time to time in the *Journal of Milk and Food Technology,* as being in compliance with the Milk Ordinance and Code. This statement is not intended, however, to recommend the replacement of existing equipment which complies with the Ordinance.

Item 12p. *Cleaning and Bactericidal Treatment of Containers and Equipment*: This item has been revised, similarly to Item 14r, to permit the use of approved chemical bactericides other than chlorine compounds. Also, as mentioned above a suggested procedure for the cleaning-in-place of milk pipelines, which has been demonstrated to be satisfactory, has been included; and

certain requirements to be met by C-I-P systems are specified.

Item 16*p. Pasteurization*: A major change in the organization of the Code has been made through the revision of Items 16p and 17p. Requirements applicable to the 30-minute hold-method of pasteurization are now completely segregated from those applicable to high-temperature short-time pasteurization. In addition, that portion of Item 17p of the 1939 edition which was concerned with pasteurizers employing regenerative heating has been transferred to Item 16p. All material relating to temperature-control instruments and devices, regardless of type of system, has been grouped together [sub-item 16p (a)], as has the material relating to recording-thermometer charts [sub-item 16p (e)].

Many other changes have been adopted to improve the specifications of Item 16p which are related to such items as insurance of adequate holding time, regenerator pressures, other features of automatic pasteurization systems, use of booster pumps, equipment tests, pasteurizer valves, etc.

Item 17*p. Cooling*: Certain design and construction requirements for surface-coolers, which were exempted for existing installations in the previous edition, are now mandatory for all surface-coolers. Tight-fitting covers are now required for all surface-coolers regardless of location.

Item 18*p. Bottling and Packaging*: This item, entitled "Bottling" in the former edition, has been changed to "Bottling and Packaging," and has been expanded to include requirements necessary for single-service packaging machines.

Item 20*p. Capping*: This item has been changed to require single-service containers to be so constructed that the contents and pouring lip are protected from contamination during handling and storage; and that nothing on top of the container can contaminate the contents or pouring lip when the containers are opened. This latter provision does not become effective until January 1, 1955.

Item 21*p. Personal—Health*: This item has been expanded to require health examinations for employees of receiving stations.

Item 23*p. Vehicles*: The title of this item has been changed from "Miscellaneous" to "Vehicles." Requirements have been included covering the operation of milk tank-cars and tank-trucks. Such tanks must also comply with the construction, cleaning, bactericidal treatment, storage, and handling requirements of Items 5p, 10p, 12p, 13p, and 14p.

Section 8. *Grades of Milk and Milk Products Which May Be Sold.*

This section now restricts the sale of market milk to certified-pasteurized and Grade A pasteurized.

Section 11. *Milk and Milk Products from Points Beyond the Limits of Routine Inspection.*

This Section now provides that acceptance of milk supplies, from points beyond the limits of routine inspection by the jurisdiction enforcing the Ordinance, shall be based upon the following: (1) The supply must be produced and processed under regulations which are substantially equivalent; (2) the supply must be under routine official supervision at the source; and (3) the supply must have been awarded a milk sanitation rating equal to that of the local supply, or if lower than that of the local supply, equal to 90% or more on the basis of the PHS rating method. Final approval of such supplies shall be dependent upon results of laboratory examinations of the milk as received.

PART IV APPENDIXES

Nine appendixes have been included in Part IV which provide detailed information for the sanitarian, dairyman, and plant operator. In addition, specifications related to specific items of the Ordinance are included in certain of the appendixes, and must be complied with. The titles of the various appendixes are as follows:

Appendix A.—*BAI Regulations for Tuberculosis and Brucellosis Control.*

Appendix B.—*Dairy-Construction and Operation.*

Appendix C.—*Excreta Disposal.*

Appendix D.—*Water Supply.*

Appendix E.—*Chemical, Physical, and Bacteriological Examinations.*

Appendix F.—*Bactericidal Treatment.*

Appendix G. — *Pasteurization - Plant Equipment.*

Appendix H. — *Pasteurization - Plant Equipment Tests.*

Appendix I.—*Forms and Records.*

In addition to the principal changes which have been discussed above, many other changes and modifications of lesser importance have been made, but time does not permit a discussion of these. It is also desired to point out that, in the interest of uniform interpretation, a special effort was made to clarify the intent of all "satisfactory compliance" items in the Milk Code.

For your information copies of the Milk Ordinance and Code—1953 Recommendations of the Public Health Service (PHS Publication 229) will be forwarded within the next few weeks to all State health departments, and to the local health departments of those communities which have adopted the 1939 edition. Individuals desiring copies can obtain them from the Superintendent of Documents, Government Printing Office, Washington, D. C.

TIME—TEMPERATURE STUDIES OF THE INACTIVATION RATE OF BRUCELLA ABORTUS STRAIN 2308 IN MILK*

H. G. Foster, Jr.,† S. A. Lear, and H. J. Metzger

Department of Dairy Industry

Rutgers University

New Jersey

Experimental data relating to the destruction of B. abortus (2308) in milk by heat are presented.

It was observed that B. abortus (2308) was killed in 23 minutes at 142.7°F. and in 14 seconds at 161.6°F. when the preheating time was zero.

A practical mathematical method for evaluating the lethal effects of the preheating, holding and cooling parts of the heating curve on the organism is discussed.

Review Of The Literature

Published information concerning the time-temperature relationships for the inactivation of *Brucella abortus* in milk has been of two types: laboratory studies of the times and temperatures in the range of vat pasteurization, and studies of commercial vat and high-temperature short-time pasteurization. Evans[4] found that B. *abortus* was killed at 125°F for 30 minutes and at 145°F for 30 seconds. Carpenter and Boak[3] heated suspensions of the cultures of human, porcine, and bovine strains of *B. abortus* and found that all strains of B. *abortus* tested were killed at 140°F for 20 minutes. Park[6] noted that *B. abortus* was killed at 140°F for 10 minutes and at 142°F for 7.5 minutes, and that at 145°F for 5 minutes no viable cultures could be found. Bartram[2] reported one bovine strain of *B. abortus* that survived 140°F for 20 minutes and a second strain that survived 142°F for 30 minutes.

The purpose of this investigation was to determine whether *B. abortus* (2308) is killed at 143°F for 30 minutes and at 160°F for 15 seconds.

*Paper of the Journal Series, New Jersey Agricultural Experiment Station, Rutgers University, The State University of New Jersey, Department of Dairy Industry.

†Present address—Swift and Company, Research Department, Chicago, Ill.

Experimental Methods

A *B. abortus* culture (2308) obtained from the United States Department of Agriculture, Beltsville, Maryland, was used in all trials. It was the second transfer of an isolation made from the supramammary lymph gland of cow number 2308. Four-day-old cultures from the second transfer on Difco-Tryptose agar were suspended in skimmed milk M/20 phosphate buffer mixture[9] and lyophilized. Vials of lyophilized culture were held at −18°F until used.

Inoculated plates and Blake bottles were incubated at 98.6°F in an atmosphere of approximately 10 percent carbon dioxide. Four-day cultures grown on Difco-Tryptose agar in Blake bottles inoculated with lyophilized cultures were suspended in physiological saline solution and standarized for concentration in a Pfaltz and Bauer photometer, Model B, against a standard suspension of *B. abortus*, strain 19, obtained from the U.S. D.A., Beltsville, Maryland. The suspensions were standarized to contain approximately 15 x 10^7 organisms per ml. All cultures were checked with Gram stain and found to be negative.

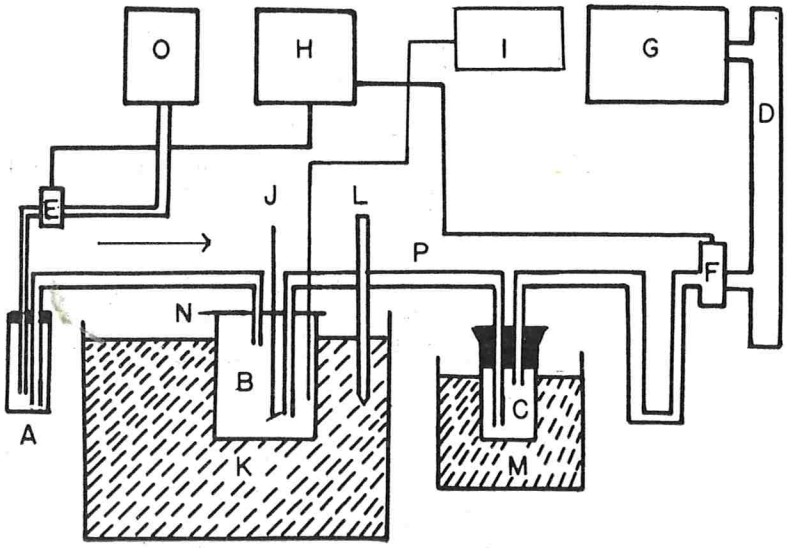


FIGURE 1

Figure 1 (A) test tube for holding the inoculum. (B) two-liter stainless steel beaker for holding milk during the holding period. (C) tubes for holding milk during the cooling period. (D) vacuum header. (E) solenoid valve on the pressure line operated by the timing device. (F) solenoid valve on the vacuum line operated by the timing device. (G) vacuum pump. (H) electric timing device. (I) strip chart recorder. (J) stirring rod. (K) constant temperature water bath. (L) thermometer. (M) ice-water bath. (N) lucite cover. (O) pressure pump. (P) sampling tube.

Before trials with *B. abortus* (2308) were started, the mixing efficacy of the equipment shown in figure 1 was determined by substituting methylene blue dye for the inoculum.

Fifteen hundred ml of certified raw milk were placed in a stainless steel beaker (B) which was put in a thermostatically controlled water bath (K) accurately controlled to within ± 0.1°C. The milk was heated in the beaker momentarily at 80°C by raising the temperature of the water bath. Then the water bath and milk were allowed to cool to the predetermined temperature. A thermometer (L) which had been checked at the operating temperature with a thermometer certified by the Bureau of Standards and accurate to within ± 0.1°C was used to determine the temperature of the milk in the beaker. The thermometer was then placed in the water bath and the lead from the strip chart recorder (I) was put in the milk. The milk was agitated constantly by a stirrer (J).

Three ml of the methylene blue dye at a strength of one tablet per 5 ml of aqueous solution was placed in test tube (A). The injection of the dye and the sampling of the milk were controlled by an electric timing device which was capable of producing a series of electrical impulses ranging from 1 to 43 seconds and from 1 to 43 minutes. The impulses activated the solenoid valve on the pressure line (E) and 8 solenoid valves on the vacuum line (F) (only one shown in figure 1). At the beginning of the heating trial the timer (H) was started. When the solenoid on the pressure line (E) was activated by the timer (H), air pressure created by the pressure pump (O) forced the dye into the milk. When the timer (H) activated the solenoids on the vacuum line (F), air pressure forced approximately 10 ml of the milk into the cooling tubes (C), since vacuum was created in the tubes when the solenoids were opened to the header. The milk was immediately cooled, since the sampling tubes (C) rested in an ice water bath (M). The cooled samples of milk containing the dye were removed from the water bath and placed in photometer tubes. The concentration of the dye was determined as percentage transmission in a Pfaltz and Bauer Photometer, Model B.

When a suspension of *B. abortus* (2308) was used as the inoculum the procedure was the same except that the cooled samples were held in the refrigerator for 2 hours. Then 0.1 ml samples of the top layer of milk was spread on Difco-Tryptose agar with the recommended crystal violet dye in Petri dishes. The Petri dishes were incubated at 98.6°F in an atmosphere of approximately 10 percent carbon dioxide.

In the one-minute preheating time trials the apparatus shown in figure 2 was used.

A covered stainless steel beaker (A), held tight by C clamps, containing 100 ml of a milk suspension of *B. abortus* (2308) was placed in a water bath (Q). The bath was heated by passing steam through a copper coil wrapped around the beaker and submerged in the water. The steam entered the copper tube at (L) and left at (M) and was controlled by a manually operated needlepoint steam valve. The milk was agitated by a stirrer (K), and time and temperature changes were automatically recorded on an electronic strip chart recorder (J)*. The time and temperature were further checked by a stop watch and a thermometer accurate to within ± 0.1°C. At approximately 3 seconds or 2 degrees centigrade below the predetermined holding temperature, 28 pounds of air pressure developed by the pressure pump (H) forced the milk through 10 feet of ¼" copper tubing into the holding container (B). While flowing through the copper tubing submerged in the water bath, the milk attained the correct holding temperature without exceeding this at any time. The air pressure was controlled by a solenoid valve (E) activated by a manually operated electrical switch (R). The procedure for the holding period was the same as that previously described for the trials where preheating was not used.

After trials were completed for the determination of the inactivation point of *B. abortus* (2308) by the plate culture method previous-

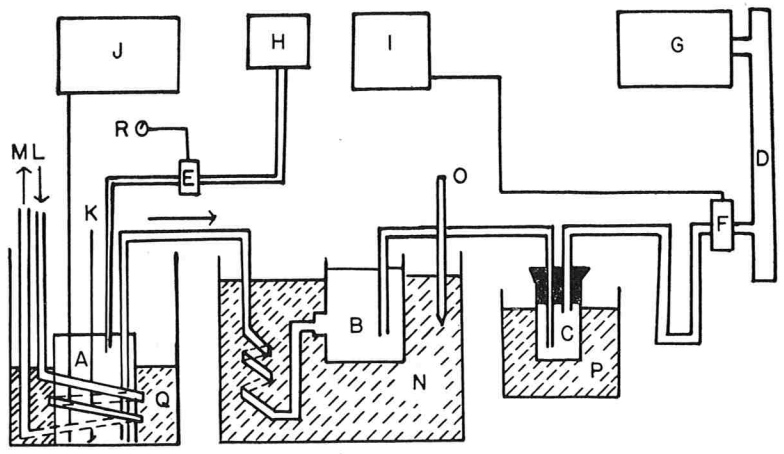


FIGURE 2

Figure 2. (A) container for holding milk during the preheating period. (B) container for holding milk during the holding period. (C) tubes for holding milk during the cooling period. (D) vacuum header. (E) solenoid valve on the pressure line manually operated. (F) solenoid valves (eight) operated by the timing device. (G) vacuum pump. (H) pressure pump. (I) electric timing device. (J) strip chart recorder. (K) stirring rod. (L) steam inlet. (M) steam outlet. (N) constant temperature water bath. (O) thermometer. (P) ice-water bath. (Q) water bath for preheating. (R) electric switch.

*available through the courtesy of Brown Instrument Company, Philadelphia.

ly described, similar additional trials were made at the respective temperatures for guinea pig inoculations for the purpose of checking the results obtained by the plate culture procedure. The heat treated milk samples were held overnight in the refrigerator and then centrifuged at 3100 rpm for 30 minutes. The middle third of the milk was drawn off in a pipette, leaving the top cream layer and the bottom centrifuged layer in the tube. Two ml of this mixture were inoculated into a guinea pig. Since *B. abortus* (2308) organisms were isolated by the plate culture method from milk treated at 161.6°F for 13 seconds but not from milk heated at this temperature for 14 or 15 seconds, pairs of guinea pigs were inoculated with milk previously exposed at 161.6°F for 13, 14, and 15 seconds.

Similar inoculations were completed with milk treated at 149.9°F for 4, 5, and 6 minutes and with milk heated at 142.7°F for 20, 23, and 26 minutes. An uninoculated guinea pig was used as an additional control.

At the end of 4 weeks, blood samples were obtained by ear bleeding and heart stabbing. The guinea pigs were killed and the spleens removed. The spleens were cut into 6 pieces and cultured on test tube slants of Difco-Tryptose agar with added crystal violet. These tubes were incubated at 98.6°F for 5 days. Agglutination tests were made on the blood with a standard antigen obtained from the U.S.D.A., Beltsville, Maryland.

EXPERIMENTAL RESULTS

Tests with the strip chart recorder demonstrated that no drop in temperature occurred when the dye solution was forced into the milk. The time range within which *B. abortus* was inactivated in milk at a specified temperature was determined, and eight samples were then taken within the range at equal intervals to determine the end point.

The results of these experiments are shown in table 1. Actual measurements were obtained in Centigrade degrees but were converted to Fahrenheit degrees to facilitate comparisons.

The results of the guinea pig trials agreed in all cases with the plate culture results. Guinea pigs inoculated with milk from which *B. abortus* organisms were isolated by the plate culture method reacted in the agglutination test at a dilution of 1:50 but not at a dilution of 1:100, and *B. abortus* organisms were isolated from their spleens. One guinea pig inoculated with milk heated at 161.6°F for 13 seconds failed to react to the agglutination test, and no organisms could be isolated from its spleen. All other guinea pigs, used as controls, were negative.

Straight line preheating was used in the preheating trials. One minute preheating time was selected because it provided an approximation of the preheating time used in many commercial high-temperature short-time pasteurizers. The end point for the destruction of *B. abortus* (2308) was determined as the point of no growth by the plate method. The results of these trials are presented in table 2.

Ball[1] has constructed the following formula for determining the holding time necessary to inactivate bacteria when time is consumed in preheating and cooling:

$$t_{HAA} = U - \frac{0.01\ A_{RTRA}}{HT-IT} \quad \frac{0.01\ A_{CTCA}}{HT-FT}$$

the right hand member of the equation refers to the effect of cooling. As lethal value of the cooling period was calculated to be in the range of one ten-thousandth of a minute, the cooling effect was considered negligible in this study. The calculated holding time necessary to inactivate *B. abortus* (2308) in milk with one minute of preheating time was determined from the formula

$$t_{HAA} = U - \frac{0.01\ A_{RTRA}}{HT-IT}$$ where

t_{HAA}=time, in minutes, milk is held at holding temperature, HT, under different conditions of heating.

TABLE 1

TIME AND TEMPERATURE NECESSARY TO INACTIVE BRUCELLA ABORTUS (2308) IN MILK

Number of determinations	Holding temperature °F.	Holding time	
		Plate culture	Guinea pigs*
4	142.7	23 min.	23 min.
4	149.9	4 min.	4 min.
3	160.0	21 sec.	—
4	161.6	14 sec.	14 sec.

*One determination on duplicate guinea pigs.

TABLE 2

EFFECT OF PREHEATING TIME ON THE INACTIVATION RATE OF BRUCELLA ABORTUS (2308) IN MILK

Number of determinations	Preheating time sec.	Holding temperature °F.	Experimental holding time	Calculated holding time
3	60±2	142.7	23.0 min.	22.9 min.
3	60±4	149.9	4.0 min.	3.9 min.
3	60±2	160.0	18.0 sec.	18.0 sec.
3	60±3	161.6	12.0 sec.	11.3 sec.

U=time, in minutes, necessary to inactivate *B. abortus* at holding temperature.

AR=arbitrary constant

tRA=time, in minutes, consumed in rise of temperature of milk to holding temperature.

HT=holding temperature of pasteurization process.

IT=initial temperature of milk.

A sample calculation is shown below where HT equals 161.6°F, tRA equals one minute and U equals 0.23. The U value was obtained from graph I.

$$tHAA = 0.23 - \frac{[(0.01)(400)\ 1]}{[\ 161.6 - 86.0\ ]} = 0.20$$

The data in tables 1 and 2 were used to construct the curves in graph 1.

The broken line curve on graph 1, which shows the effect of one minute preheating time on the rate of inactivation of *B. abortus* (2308) in milk, was constructed and located by points determined experimentally. These points agree with those calculated according to Ball's[1] formula as shown in table 2. The high degree of agreement noted between the calculated holding times and the experimental holding times supports Ball's thesis. The amount of lethal heat furnished by preheating in respect to the total lethal heat for any given process may be calculated and expressed as a percentage of the total lethal heat if the rate and the time of preheating are known. The equation

$$tHAA = U - \frac{0.01\ ARtRA}{HT-IT} \quad \frac{0.01\ ACtCA}{HT-FT}$$

has been modified to calculate the lethal effect of the preheating time and express it as a percentage of the total lethal heat. Thus:

$$PRA = \frac{ARtRA}{U(HT-IT)}$$

PRA=percent of required lethal heat.

AR=arbitrary constant.

HT=holding temperature of pasteurization process.

IT=initial temperature of milk.

tRA=time, in minutes, consumed in rise of temperature of milk.

HtCA=time consumed in decline of temperature in minutes.

FT=final temperature of milk after cooling.

U=time, in minutes, necessary to destroy microorganism at holding temperature.

In the case of *B.abortus* (2308) with one minute preheating time and a holding temperature of 161.6°F, the percentage of lethal heat furnished would be 23.

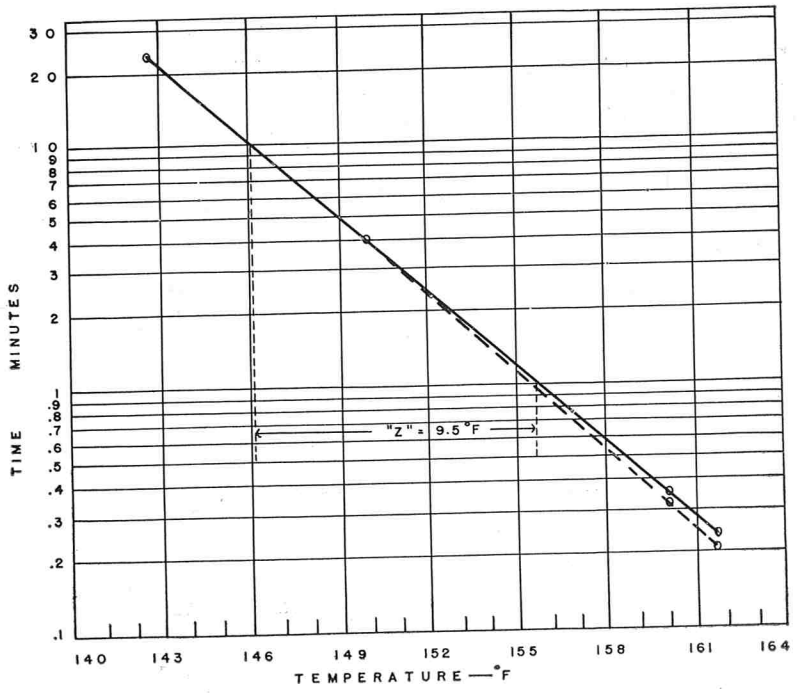
$$PRA = \frac{(400)\ \ (1)}{0.23\ (161.6-86.0)} = 23$$

A similar calculation shows that 15 percent of the total lethal heat required to destroy *B. abortus* (2308) at 160°F was contributed by a one minute preheating period.

To make the above calculations, the inactivation rate curve, which is not influenced by either the preheating or cooling times, must be known.

In this study the effect of preheating time was considered to be negligible, since the volume of the inoculum used is very small in relation to the amount of heated milk; 3 milliliters of inoculum and 1500 milliliters of heated milk. It can be assumed that the inoculum reaches the temperatures of the milk immediately upon completion of mixing. The slope of the inactivation rate curve (graph 1) may be expressed as the number of degrees of temperature, either in Centigrade or Fahrenheit, through one log cycle of time. When the slope is expressed in this manner, it is called the "Z" value. The "Z" value obtained for *B. abortus* (2308) is 9.5°F in this study.

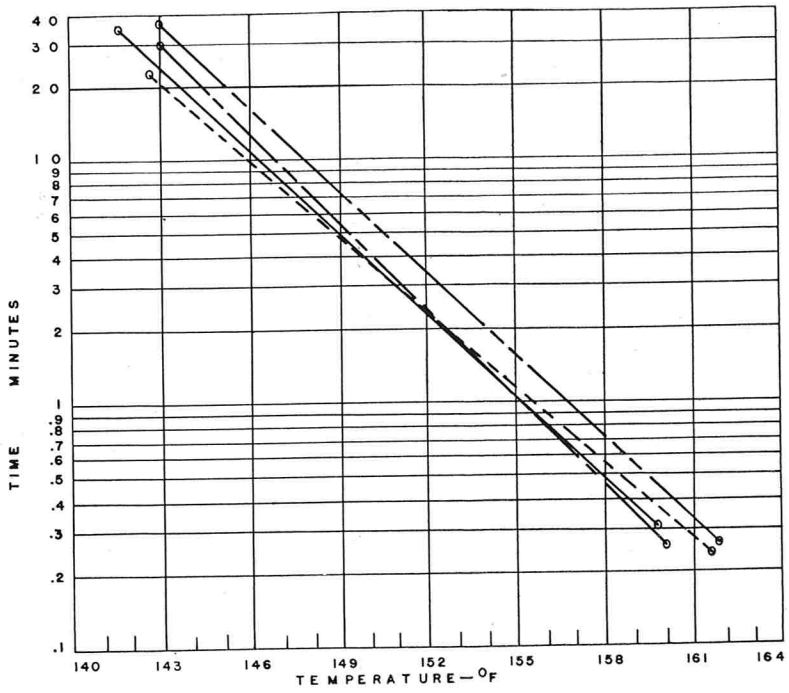
Sanders and Sager[7] reported that the Public Health Service standards allow considerable less margin of safety at 160°F than at 143°F and that it seems desirable to increase the margin of safety at 160°F. The "Z" values of the inactivation rate of the phosphatase enzyme, the inactivation rate of *B. abortus*, and the inactivation rate with respect to the Public Health Service[8] recommendations for pasteurization are expressed in graph 2.



GRAPH I EFFECT OF ONE MINUTE PREHEATING TIME ON THE INACTIVATION RATE OF BRUCELLA ABORTUS STRAIN 2308 IN MILK

——— ZERO PREHEATING TIME

— — — — ONE MINUTE PREHEATING TIME



GRAPH 2 A COMPARISON OF THE PASTEURIZATION STANDARDS AND THE INACTIVATION RATE OF THE PHOSPHATASE ENZYME AND BRUCELLA ABORTUS STRAIN 2308 IN MILK

---------- BRUCELLA ABORTUS (2308) CURVE "Z"= 9.5°F
———————— PHOSPHATASE CURVE LEAR & FOSTER (5) "Z"= 8.8 °F
———— — — PHOSPHATASE CURVE SANDERS & SAGER (7) "Z"= 8.7 °F
———— — — U.S. PUBLIC HEALTH SERVICE RECOMMENDED PASTEURIZATION STANDARDS (8) "Z"= 8.3 °F

The "Z" values for the inactivation rate of the phosphatase enzyme are almost the same, although Lear and Foster[5] used the New York City Health Department Laboratory Test and Sanders and Sager[7] used a test developed experimentally by them. These curves are differentiated by position but not by slope. The significance of a "Z" value of 9.5°F for *B abortus* as compared to a "Z" value of 8.8°F for the phosphatase enzyme is that the "Z" value of 8.8°F implies a higher relative sterilizing value for a high temperature as compared to a low temperature in a given process.

In the range of high-temperature short-time pasteurization the position of the phosphatase curve of Sanders and Sager is higher than the inactivation curve of *B. abortus* (2308). The conclusion may be drawn from a careful examination of graph 2 that the pasteurization standard at 160°F is not equal in lethal value to the pasteurization standard at 143°F with respect to the enzyme phosphatase and *B. abortus* strain 2308. Inspection of the position of the curves at the region of high-temperature short-time pasteurization suggests the hypothesis that a negative phosphatase test by the New York City Health Department Laboratory method would not insure the inactivation of *B. abortus* (2308), whereas a negative phosphatase test by Sanders and Sager's method would. Workers at the New Jersey Agricultural Experiment Station plan to study this possibility.

CONCLUSIONS

1. When the preheating time was zero, *B. abortus* (2308) was killed in 23 minutes at 142.7°F and in 14 seconds at 161.6°F.
2. When the preheating time was 1 minute, *B. abortus* (2308) was destroyed in 23 minutes at 142.7°F and in 12 seconds at 161.6°F.
3. Straight line preheating of one minute duration contributed 15 percent and 23 percent of the total lethal heat required to inactivate *B. abortus* (2308) at 160°F and 161.6°F respectively.
4. The "Z" value for *B. abortus* (2308) was found to be 9.5°F.
5. The data indicate that in the region of high-temperature short-time pasteurization a negative phosphatase test by the New York City Health Department Laboratory method would not insure the inactivation of *B. abortus* (2308) whereas a negative phosphatase test by Sanders and Sager's method would.

BIBLIOGRAPHY

1. Ball, O. C., Short-Time Pasteurization of Milk. *Ind. Eng. Chem.* **35**, 71-84 (1943)

2. Bartram, H. T., The Effect of Pasteurizing Temperature on (A) *Brucella abortus* and (B) *Brucella abortus* Agglutinins in Milk. *Cornell Vet.* **21**, 360-367 (1931).

3. Carpenter, C. M., and Boak R., Summary of Some *Brucella abortus* Studies. *Ibid*, **18**, 204 (1928).

4. Evans, A. C., The Large Numbers of *Bacterium abortus* var. *lipolyticus* which may be Found in Milk. *J. Bact.* **2**, 185-189 (1917).

5. Lear, S. A. and Foster, H. G., The Rate of Phosphatase Inactivation in Milk. *J. Dairy Sci.*, **32**, 509-514 (1949).

6. Park, W. H., Thermal Death Points of Streptococci. *Amer. J. Pub. Health*, **18**, 710-714 (1928).

7. Sanders, G. P. and Sager, O. S., Heat Inactivation of Milk Phosphatase in Dairy Products. *J. Dairy Sci.* **31**, 845-857 (1948).

8. *The Milk Ordinance and Code Recommended by the United States Public Health Service.* 1939 edition.

9. Verwey, W. F., The Stability of *Brucella abortus* vaccine Desiccated by Lyophilization. *Report of 48th Annual Meeting of the United States Livestock Sanitary Association*, 68-73 (1944).

A BACTERIOLOGICAL AND CHEMICAL STUDY OF ICE MILK [1] [2]

R. W. Ripper, V. D. Foltz, and W. H. Martin

Kansas Agricultural Experiment Station
Kansas State College, Manhattan, Kansas

Fifty-four pint samples of a frozen product, defined by Kansas law as ice milk, were examined for sanitary qualities and composition. The average quality of these samples was found to be equal or superior to state and local regulations for ice cream, ice milk, and similar products. Although containing less fat, the large amount of milk solids and low overrun make the caloric value of ice milk almost equal to that of ice cream. The data obtained indicate the use of quality materials, proper sanitation, and care in the manufacture and marketing of this product.

The sale of ice cream and ice milk directly from the freezer in a semifrozen or soft form has become increasingly popular in recent years. In some states the soft product is required to meet the minimum standards for ice cream. In other states where ice milk is legalized, the product usually contains less butterfat, more milk solids, and considerably less overrun than ice cream.

In some states[9] a low fat content (3-6%) is permitted, serum solids usually run 14 to 16 percent and the sugar is standardized to 15 to 16 percent. The standards committee of the International Association of Ice Cream Manufacturers[4] has proposed a standard for ice milk of not less than 2 percent nor more than 3.5 percent fat in the finished ice milk, and total milk solids of not less than 11 percent. It is also proposed in this standard that the product contain not less than 1.3 pounds of food solids per gallon and weigh not less than 4.5 pounds per gallon.

Examination of the various state standards for ice milk indicates a lack of uniformity in the standards, particularly as they relate to the percentages of ingredients.

Due to the widespread interest in ice milk, the study here reported was undertaken to obtain information relative to the composition and sanitary quality of ice milk as it is being merchandised today.

Procedure

Fifty-four pint samples of the frozen product sold under such trade names as "Dairy Custard," "Dairy Delight," "Dairy Freeze," "Dairy Queen," "Dari-Ann," "Frigid Queen," "Frosty Creme," "Jersey Cow," "Keen Kreme," "Melofreeze" and "Zesto," were purchased from retail outlets in 18 Kansas towns. These samples were transported to the laboratory refrigerated with dry ice in an insulated jacket and held in the frozen state prior to analysis.

Bacterial counting procedures used were those outlined in Standard Methods[8]. The Barber modification of the Newman-Lampert method of staining as described by Elliker[1] was used for the direct microscopic count. Comparative butterfat determinations were made on each sample by the Mojonnier ether extraction method and the Minnesota modification of the Babcock test for fat in ice cream. Total solids were determined by the method outlined by Mojonnier and Troy[5]. Sediment was determined, scored, and classified according to the method as outlined in Standard Methods[8].

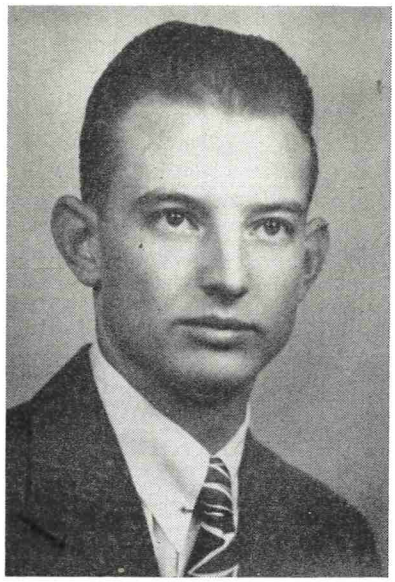
Acidity was titrated with N/10 NaOH and calculated as lactic acid. The Scharer field phosphatase test as outlined in Standard Methods[8] for determining pasteurization efficiency was run on all samples. The net weight of each pint sample was determined and the amount of overrun was calculated by the use of 9.2 pounds per gallon as the weight of the mix from which the product was made. The caloric value per pint of sample was calculated on the following basis. It was assumed that the product contained 14 percent added sugar and 0.3 percent stabilizer. It was also assumed that the milk solids contained 54 percent lactose and 39 percent protein, according to Turnbow, Tracy, and Raffetto[10]. Caloric values used were as follows: Protein—4 calories per gram; carbohydrates—4 calories per gram; and fats—9 calories per gram.

The information obtained from the analysis of 54 samples of ice milk for bacterial content, percent butterfat, percent total solids, percent acidity, pasteurization efficiency, sediment content, calculated overrun, net weight, and fuel value is presented in the tables which follow.

Results

The results of the bacterial analysis on the 54 samples are shown in table 1.

The total plate count of 46 of the 54 samples was below 50,000 (table 1) and 43 samples had direct microscopic counts of 200,000



Mr. Richard W. Ripper graduated from Kansas State College, Manhattan, Kansas, in May, 1950, where he received his B.S. degree, with a major in bacteriology. Following graduation he served as a graduate assistant in the Department of Bacteriology and in August, 1951 received the M.S. degree from Kansas State College. For the past year he has been employed as an instructor in bacteriology at Kansas State College, while taking additional work toward a Ph.D.

[1] [2]Contribution No. 271, Department of Bacteriology and No. 203, Department of Dairy Husbandry.

Table 1 — Bacterial counts on 54 samples of ice milk

Total plate count/ml			Direct microscopic count			Coliform count		
Range	No.	%	Range	No.	%	Range	No.	%
less than 10M	32	59.2	Less than 40M	4	7.4	0	22	40.7
10.1M-50M	14	26.9	40M-200M	39	72.2	1-5	15	27.8
50.1M-100M	3	5.6	200M-400M	7	13.0	6-10	3	5.6
Over 100M	5	9.3	over 400M	4	7.4	over 10	14	25.9
Total	54	100.0	Total	54	100.0	Total	54	100.0

or less. Forty of the 54 samples had coliform counts of 10 or less.

The arithmetic and logarithmic average total plate counts were calculated and found to be 29,100 and 9,300, respectively. The arithmetic average microscopic count was 156,000 cells per ml and the logarithmic average was 122,000 cells per ml.

The presumptive coliform count on violet-red-bile agar ranged from 0 (22 samples) to 7,500 coliform colonies per ml (1 sample). The arithmetic average of 234 coliform per ml resulted from a large number of 0 counts and a high maximum count. However, a logarithmic average of 1.84 coliforms per ml was obtained by using the logarithm of 0.1 for all counts of 0.

The results of the fat and solids tests made on the 54 samples of ice milk are presented in tables 2 and 3, respectively.

Only 3 samples contained less than 5 percent fat and the majority (78 percent) contained between 5 and 6 percent fat (table 2) as determined by the Mojonnier method.

Fat percentages as determined by the Minnesota method were generally lower than those obtained by the Mojonnier method. The maximum percentage of butterfat as determined by the Mojonnier method was 6.39 percent with a minimum of 4.34 percent and an average of 5.77 percent. The maximum percentage of butterfat as determined by the Minnesota method was 5.8 percent, with a minimum of 3.8 percent, and an average of 5.1 percent.

A statistical analysis, using Student's t-test on pairs of observations, showed that the percent of fat by the Mojonnier method was 0.6 percent (odds approximately 99 to 1) higher on the average than that obtained by the Minnesota method.*

Total solids as determined by the Mojonnier method are presented in table 3.

Forty-eight (89%) of the 54 samples contained between 31 and 34 percent total solids (table 3). The maximum, minimum, and average total solids were 35.54, 29.21, and 33.85 percent, respectively.

Forty-eight (89%) of the 54 samples contained less than 0.2 percent titrable acidity (table 4). The maximum acidity found was 0.29, the minimum 0.05, and the average 0.16 percent.

Of the 54 samples all except 2 scored less than 0.2 mg sediment on the basis of the United States Public Health Service score card. This would indicate that, in the preparation of the mixes, care had been exercised to exclude extraneous matter.

In all cases the phosphatase test reading was less than 2 N.Y.C. units, which indicates proper pasteurization and no subsequent contamination with unpasteurized dairy products.

The net weights and calculated overruns are recorded in table 5.

The maximum, minimum, and average weights were 463, 293, and 387 grams per pint of product as purchased on the open market. The calculated overruns ranged from a minimum of 13 percent to a maxi-

*Statistical analysis by Statistics Laboratory of Kansas State College.

Table 2—Butterfat tests on 54 samples of ice milk.

Range in percent	Mojonnier test		Minnesota test	
	Number	Percent	Number	Percent
3.5–4.0	0	.0	2	3.7
4.1–4.5	1	1.8	1	1.8
4.6–5.0	2	3.7	26	48.2
5.1–5.5	7	13.0	17	31.5
5.6–6.0	35	64.8	8	14.8
6.1–6.5	9	16.7	0	00.0
Total	54	100.0	54	100.0

Table 3—Total solids content of 54 samples of ice milk

Percent total solids	Number of samples	Percent of samples
29–30	4	7.4
31–32	10	18.5
33–34	38	70.4
35–36	2	3.7
Total	54	100.0

TABLE 4—TITRATABLE ACIDITY AND SEDIMENT ON 54 SAMPLES OF ICE MILK

Percent acid	Number	Percent	Milligrams of sediment	Number	Percent
.00–.10	6	11.1	0	3	5.6
.11–.15	18	33.4	0–.19	42	77.7
.16–.20	24	44.4	.20	7	13.0
.21–.30	6	11.1	over .20	2	3.7
Total	54	100.0	Total	54	100.0

TABLE 5—NET WEIGHT AND CALCULATED OVERRUN ON 54 SAMPLES OF ICE MILK

Grams per pint	Number	Percent	Percent overrun	Number	Percent
276–300	1	1.9	11–20	3	5.6
301–325	1	1.9	21–30	14	25.9
326–350	4	7.4	31–40	22	40.7
351–375	15	27.7	41–50	11	20.3
376–400	16	29.6	51–60	2	3.7
401–425	12	22.2	61–70	1	1.9
426–450	3	5.6	71–80	1	1.9
451–475	2	3.7	81–90	0	0.0
Total	54	100.0	Total	54	100.0

TABLE 6—CALCULATED FOOD ENERGY VALUES ON 54 SAMPLES OF ICE MILK

Calories per pint	Number of samples	Percent of samples
401–450	1	1.8
451–500	1	1.8
501–550	6	11.1
551–600	17	31.6
601–650	17	31.6
651–700	11	20.3
701–750	1	1.8
Total	54	100.0

TABLE 7—AVERAGE VALUES FOR 54 SAMPLES OF ICE MILK

Test	Average
Total plate count	9,300 per milliliter
Coliform count	1.84 per milliliter
Microscopic count	122,000 per milliliter
Fat (Minnesota)	5.1 percent
Fat (Mojonnier)	5.77 percent
Total solids (Mojonnier)	33.85 percent
Acidity (titrated as lactic acid)	0.16 percent
Sediment score (A.P.H.A. standard)	less than 0.2 milligram
Phosphatase (N.Y.C. units)	less than 2 units
Net weight	387 grams per pint
Calculated overrun	34 percent
Calculated caloric fuel value	609 calories per pint

mum of 78 percent with an average of 34 percent.

The calculated caloric values per pint are presented in table 6.

As calculated, the caloric values per pint were found to range from a maximum of 738 calories to a minimum of 440 calories, with an average of 609 calories per pint.

A summary of the averages of all analyses are presented in table 7.

DISCUSSION

A bacterial standard of 50,000 per gram for both pasteurized ice cream mix and frozen dessert has been proposed in the United States Public Health Service *Frozen Dessert Ordinance and Code*[2]. A standard of not more than 100,000 colonies per ml, according to the National Research Council[6], has been recommended by many governing agencies.

Of the 54 samples studied, 85 percent gave a plate count of less than 50,000 bacteria per ml, and 91 percent of the samples less than 100,000 bacteria per ml.

A coliform count of zero in frozen desserts is required by certain agencies, according to the National Research Council[6]. Shadwick[7]

states that a coliform count of 10 or less is an acceptable standard. Of the 54 samples examined, 41 percent met the standard of zero coliform and 74 percent met the standard suggested by Shadwick.

A comparison of the logarithmic averages of the plate counts and microscopic counts gave a ratio of 1-13. These results fall well within the range of other reported comparisons in which ratios of from 1-1 to 1-44 were recorded.

Although the Mojonnier fat test and the Minnesota modification of the Babcock test for fat were run on each sample, the Mojonnier test was taken as the standard since it is accepted as the official method in Standard Methods[8]. According to section 65-720 of the General Statutes of Kansas 1949[3] "ice milk" must contain less than 10 percent milk fat. All 54 samples tested met this requirement.

The average of total solids content for all samples was 34 percent. This is slightly in excess of the minimum of 33 percent required for ice cream according to Kansas Statutes[3] Fourteen samples (25.9%) were below that minimum.

An ice cream mix made from fresh ingredients should have an acidity of between 0.16-0.20 percent acid as lactic acid, providing neutralization has not been practiced; an acidity above this range would indicate microbial activity. Acidity below this range would indicate that some neutralizer probably has been added. Of the 54 samples examined, 6 samples (11 percent) showed acidity of more than 0.20 percent, which may indicate previous bacterial acitivity. Also, 18 samples (33 percent) showed acidity below 0.14 percent, indicating possible neutralization of the mix.

Although there are no official sediment standards for frozen desserts, it is desirable to have a product which is entirely free of extraneous material. Considering certain manufacturing problems, however, it is almost impossible to attain this goal. Forty-five of the samples (83 percent) contained less than 0.2 mg of sediment per 100 grams of product. This arbitrary value was chosen because it is the smallest measure of sediment above zero, according to the Sediment Score Chart outlined by Standard Methods[8]. Only 2 of the 54 samples examined contained more than this amount.

A phosphatase score of less than 2 N.Y.C. units is equivalent to the score obtained by heating milk to a temperature of 143°F for 30 minutes. Pasteurization appeared to be adequate in all cases as measured by this index.

With a mix which weighs 9.2 pounds per gallon and an overrun of 33 percent, the weight per pint would be 392 grams. The maximum, minimum, and average weights of the pint samples examined were 463, 293, and 387 grams, respectively. The heaviest sample weighed 76 grams (19.7%) more than the average of all samples, whereas the lightest sample was 94 grams (24.3%) less than the average of 387 grams.

The calculated overrun was based upon the net weight of each sample and the assumption that one pint of mix weighed 522 grams. The optimum overrun for such products is about 30-35 percent, as compared to overruns of 70-100 percent for most ice cream. Of the 54 samples, 47 (87%) ranged from 20-50 percent overrun, with an average of 34. The great variation in the overrun values probably was due to the type of freezer used.

The calculated energy values, based upon the actual net weight and an assumed standard mix formula, averaged 609 calories per pint for the 54 samples. The calculated caloric value of "ice cream" with a mix composition of 12 percent fat, 10 percent milk solids-not-fat, 15 percent added sucrose, and 0.3 percent stabilizer, with 70 percent overrun, is 627 calories per pint. The calculated caloric value of ice milk with a mix composition of 6 percent fat, 13 percent milk solids-not-fat, 14 percent added sucrose, and 0.3 percent stabilizer, with an overrun of 35 percent, would be 617 calories per pint. The difference in overrun and composition offset each other and make the energy values of the two products almost equal.

CONCLUSION

From the data obtained on 54 samples of a frozen dairy product sold in 18 Kansas towns under various trade names, all samples would qualify as "ice milk" as defined by Kansas law.

The average sanitary quality of these samples was found to be equal to, or superior to, state and local regulations for ice cream, ice milk, and similar products. This sanitary quality was shown by the low bacterial counts, low acidity, and almost complete freedom from extraneous matter.

The results of the coliform counts and phosphatase tests definitely indicate that efficient pasteurization and careful handling after pasteurization were practiced in most cases.

Although the product contains less fat than ice cream, the large amount of milk solids and lower overrun make ice milk almost equal to ice cream in caloric value.

The data indicate the use of quality materials, efficient pasteurization, adequate refrigeration, and proper sanitation of all equipment in the preparation and sale of a high percent of the retail samples of ice milk.

LITERATURE CITED

(1) Elliker, P. R., *Practical Dairy Bacteriology*. 1st ed., McGraw-Hill Book Co., New York, 1949.

(2) *Frozen Desserts Ordinance and Code*, item 24-p. May 1940 ed. U.S.P.H.S., Washington, 1940.

(3) *General Statutes of Kansas* 1949. Topeka, Kansas.

(4) *International Association of Ice Cream Manufacturers*, Bulletin No. 702, (1951), Washington, D. C.

(5) Mojonnier, T. and Troy, C. H. *The Technical Control of Dairy Products*. 2nd ed., Mojonnier Bros. Co., Chicago, 1925.

(6) National Research Council Bulletin 121. *Sanitary Milk and Ice Cream Legislation in the United States*. National Research Council. Washington, 1950.

(7) Shadwick, G. W., Coliform, their significance and control in ice cream making. *Proceedings of the 44th Annual Convention of the International Association of Ice Cream Manufacturers*. Volume 2, 1948.

(8) *Standard Methods for the Examination of Dairy Products*. 9th Edition. A.P.H.A., New York, 1948.

(9) Tracy, P. H. and Moore, D. *The Ice Cream Trade Journ.*, **46**, 30 (1950).

(10) Turnbow, G. D., Tracy, P. H., and L. A. Raffetto. *The Ice Cream Industry*. 2nd ed. John Wiley, New York, 1947.

THE EFFECT OF SELECTED ANTIBIOTICS UPON THE SURVIVAL OF MICROORGANISMS IN RAW AND PASTEURIZED MILKS

GEORGE SHIVELER AND HARRY WEISER

Department of Bacteriology, The Ohio State University
Columbus, Ohio

Data are presented showing that 5 units of penicillin, and 10 ppm of streptomycin and aureomycin respectively, when added to milk, inhibit bacterial growth.

REVIEW OF LITERATURE

Curran and Evans[1] studied the action of penicillin on selected spore-forming bacteria in milk. They concluded that this antibiotic had no particular application in the preservation of milk.

Similar studies by Foley and Byrne[2] indicated that penicillin had very little value in preserving high quality milk produced and handled under good sanitary practices. Moreover, since bacterial multiplication takes place very slowly in this kind of milk, action of penicillin would not be effective against this type of bacterial growth.

EXPERIMENTAL METHODS AND MATERIALS

Antibiotics Used

Pure crystalline G. penicillin, containing 100,000 units per 60 milligrams, was used in preservation of milk. The product was obtained from Merck and Co., Inc.

Dehydro-streptomycin (2 grams) was selected as the third antibiotic in the study on preservation of milk. The compound was obtained from the Heyden Chemical Corp.

Aureomycin crystalline (500 mg) was included in this study. It was obtained from the Lederle Laboratories Division, New York City.

Procedure

Laboratory pasteurization of the raw milk was done in flasks or large test tubes. The amount of milk used depended upon the antibiotic being incorporated. The milk was heated to 145°F in a controlled water bath and the temperature held for 30 minutes.

The milk samples were held at 20°C for 72 hours. Standard plate counts were made on each milk sample before and after the different antibiotics were added in accordance with Standard Methods.

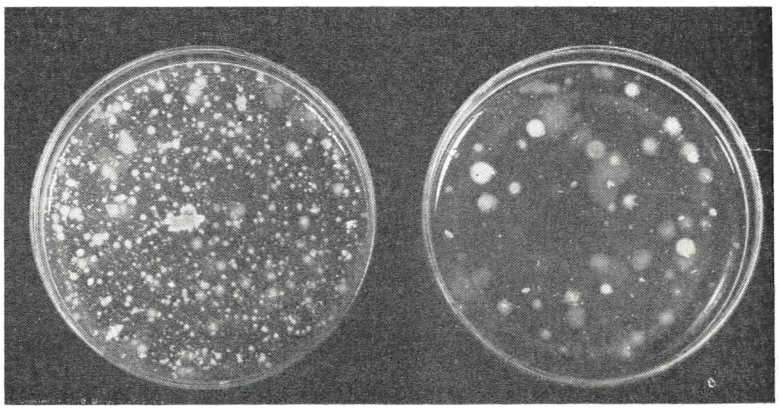
EXPERIMENTAL RESULTS

The Effect of Penicillin

One tenth ml of sterile distilled water containing 100 units of penicillin was added to 20 ml of milk. This gave a final concentration of 5 units of the antibiotic per milliliter of milk. Table 1 shows the results obtained.

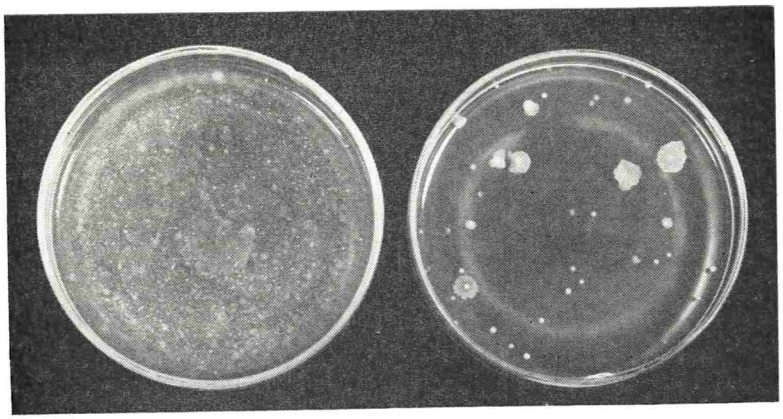
The bacterial counts were significant in the control when compared to the milk with penicillin. Many investigators have concluded that penicillin appears to be most active when the organisms are in an active stage of multiplication. Raw milk with penicillin added showed a reduction of the microflora up to 48 hours when compared to the control samples. Moreover, the antibiotic may be responsible for bacteriostasis as shown in the initial count. When the antibiotic was added to milk and pasteurized simultaneously, it seemed to be more effective as compared to pasteurized milk and penicillin added. Pasteurized milk with no antibiotic added gave better results up to 24 hours than milk treated with

Dr. H. H. Weiser, food microbiologist, Department of Bacteriology, the Ohio State University, Columbus, Ohio. A graduate of the Ohio State University where he obtained a B. Sc. and a M. Sc. degrees in bacteriology and biochemistry, then his Ph.D. from Iowa State College. He is the author of numerous publications in food microbiology and laboratory manuals in this field.



NO PENICILLIN — 5 U. PENICILLIN/ML

Agar Plates Showing the Effect of Penicillin on the Total Plate Count of Pasteurized Milk Incubated at 20°C. for 48 hrs.



No STREPTOMYCIN 10 U. STREPTOMYCIN/ML

Agar Plates Showing the Effect of Streptomycin on the Tcta1 Plate Count of Pasteurized Milk Incubated at 20°C. for 48 hrs.

penicillin. No doubt the effectiveness of the pasteurization process is enhanced slightly when it is carried out with milk containing penicillin.

The Effect of Streptomycin

Two milligrams of streptomycin, in the dry state, were added to 200 ml of milk, giving a total of 10 ppm streptomycin. The remainder of the process was carried out as described in the preceding experiments with penicillin. The results are recorded in table 2.

No appreciable reduction in the bacterial counts were noted in the raw milk with streptomycin as com-

TABLE 1—INFLUENCE OF PENICILLIN ON THE BACTERIAL COUNT IN RAW AND PASTEURIZED MILK HELD FOR 72 HOURS AT 20°C. (BACTERIAL COUNTS REPRESENT AN AVERAGE OF 5 SAMPLES AND ARE REPORTED AS THE NUMBER OF BACTERIA PER MILLILITER)

	Storage temperature 20°C.			
	0 hr.	24 hr.	48 hr.	72 hr.
Raw milk no penicillin	12,600	Innum.*	Innum.	Innum.
Raw milk penicillin 5 u./ml.	6,000	133,000	1,190,000	Innum.
Pasteurized milk no penicillin	90	1,600	Innum.	Innum.
5 u. Penicillin/ml. + pasteurization	100	3,200	16,400	Innum.
Pasteurization + 5 u. penicillin/ml.	210	4,800	32,000	Innum.

* Too many to count

TABLE 2—INFLUENCE OF STREPTOMYCIN ON THE BACTERIAL COUNT IN RAW AND PASTEURIZED MILK HELD FOR 72 HOURS AT 20°C. (BACTERIAL COUNTS REPRESENT AN AVERAGE OF 5 SAMPLES AND ARE REPORTED AS THE NUMBER OF *BACTERIA* PER MILLILITER)

	Storage temperature 20°C.			
	0 hr.	24 hr.	48 hr.	72 hr.
Raw milk no streptomycin	15,100	Innum.*	Innum.	Innum.
Raw milk 10 ppm streptomycin	14,800	780,000	Innum.	Innum.
Pasteurized milk no streptomycin	1,150	24,300	Innum.	Innum.
10 ppm streptomycin + pasteurization	101	1,600	46,000	Innum.
Pasteurization + 10 ppm streptomycin	400	1,350	29,400	Innum.

* Too many to count

TABLE 3—INFLUENCE OF AUREOMYCIN ON THE BACTERIAL COUNT IN RAW AND PASTEURIZED MILK HELD FOR 72 HOURS AT 20°C. (BACTERIAL COUNTS REPRESENT AN AVERAGE OF 5 SAMPLES AND ARE REPORTED AS THE NUMBER OF BACTERIA PER MILLILITER).

	Storage temperature 20°C.			
	0 hr.	24 hr.	48 hr.	72 hr.
Raw milk no aureomycin	4,200	980,000	Innum.*	Innum.
Raw milk 10 ppm aureomycin	5,600	75,000	Innum.	Innum.
Pasteurized milk no aureomycin	140	1,400	Innum.	Innum.
10 ppm aureomycin + pasteurization	220	41	500	280,000
Pasteurization + 10 ppm aureomycin	40	105	1,530	580,000

* Too many to count

pared to the control samples. When the milk was pasteurized with the antibiotic present, the results were significant up to 24 hours when compared to pasteurized milk and then streptomycin added.

The Effect of Aureomycin

The third antibiotic used in attempting to improve the keeping quality of raw and pasteurized milk was aureomycin. Except for a few minor changes, the procedure followed was identical with that used for the other antibiotics. Two milligrams of aureomycin were added directly to each 200 ml milk sample in order to obtain approximately 10 ppm of the antibiotic in the milk. Table 3 indicates the results obtained on the samples of milk.

When 10 ppm of aureomycin were added to raw milk, the bactericidal effect was marked after 24 hours as compared to the control raw milk.

Aureomycin had the greatest effect on the microflora of pasteurized milk. The efficiency of the pasteurization process is increased when this process is carried out on milk containing aureomycin. This illustrates the inhibiting action of aureomycin on the thermoduric organisms which usually survive pasteurization temperature.

Photographs were made of milk dilution plates to illustrate the influence of the various antibiotics studied. All photographs of the plates represent a dilution of 1 to 100 of the milk.

DISCUSSION

Penicillin, streptomycin, and aureomycin showed varying degrees of inhibition of the microflora in raw and pasteurized milks under the conditions in which they were used.

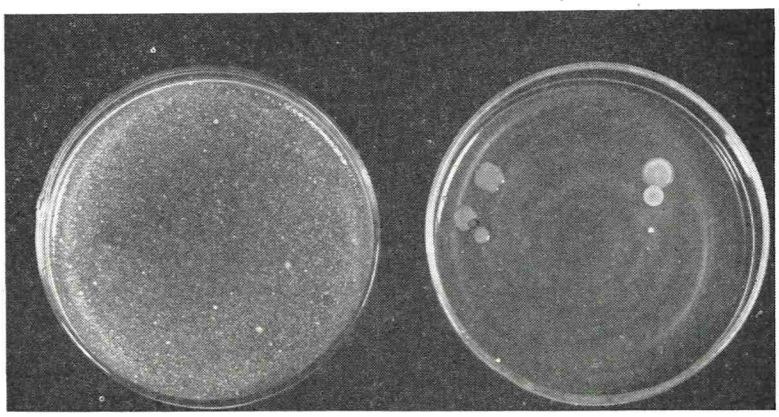
It is possible to anticipate that streptomycin and aureomycin would have a greater inhibitory effect upon the total microflora of raw milk as opposed to that of penicillin. The penicillin should inhibit gram-positive organisms while having little effect upon the gram-negative types while streptomycin and aureomycin are usually effective against both gram-positive and gram-negative organisms.

The antibiotics were more effective in controlling the microflora in milk when used in combination with proper pasteurization. They tend to inhibit the organisms that are capable of surviving pasteurization temperatures.

Bacterial resistance to different antibiotics has been recognized by many investigators. This phenomenon may have an important application in the use of these compounds in the preservation of dairy products.

More studies must be made before the use of antibiotics in dairy products is recommended. Antibiotics should never be used to mask a low grade product or as a

Continued on Page 152



NO AUREOMYCIN 10 P.P.M. AUREOMYCIN

Agar Plates showing the effect of Aureomycin on the Total Plate Count of Pasteurized Milk Incubated at 20°C. for 48 hrs.

MILK and FOOD SANITATION

SELLING SANITATION*

H. M. Ewell

Pennsylvania Salt Manufacturing Co.

Philadelphia 7, Pennsylvania

Since the beginning of time when a rightful order was introduced, establishing proper balance in all things, we find we must still maintain such balance to sell Sanitation, or anything else.

What is the problem?—Bacteria
What is the control?—Sanitation
How is it corrected?—Cleaning and Sanitizing
How is it accomplished?—Proper Methods
Why use it regularly?—Good Habits
What is the result?—Quality Milk
Why is it of interest?—Profit

Since selling is based on four basic fundamental principles, namely Quality, Service, Satisfaction and Profit, the author tells the story of Sanitation.

Here proper balance is indicated again and if we humans hope to do a good job to help keep our industry great, we must develop our personalities to a proper balance also. Most men are capable of much more than their regular efforts and action indicate. The only thing is they lack a plan. A track to run on. Assuming our knowledge and work effort is acceptable, there remains only our personalities and therein lies the key to Selling. If we list only twelve personality traits, namely:

S kill
A bility
L oyalty
E nthusiasm
S incerity
M odern
A ggressive
N eat
S elf Organization
H onesty
I nitiative
P ersistence

you will find a track to run on; by taking the first letter of each trait as listed you have S-A-L-E-S-M-A-N-S-H-I-P. Practice these traits and develop new ones, therein lies the important secret of Selling. Do these things regularly enough to become a habit and it will help keep the proper balance in the bank.

In the beginning, God created heaven and earth. A rightful order was there and then introduced, establishing a proper balance in all things. To insure proper balance in human kind—after Adam, came Eve. The lower forms of life were made to serve man. Birds gave us our first music, and the bees our first sting. I am told that a bee stung Adam and the world has been buzzing ever since.

Now man, alone, was created with an understanding and a free will; consequently, many kinds of men make up the world. Understanding and free will, to my way of thinking, may be better described as "common sense" for it is the lack of it today that troubles the entire world. A man must be a man before he can be a carpenter, a painter, a broker, a sanitarian, a salesman, or a gentleman. He must be a good citizen of his country; he has to live like a human being; a person endowed with personality and character; and it is that which requires "common sense."

A handy man was asked to repair a screen door and hang it. He got the door on wrong. It opened the wrong way. When the lady of the house saw it she remarked, "Why didn't you use your common sense?" He replied, "Common sense is a gift of God; I have technical knowledge only." Mind you, selling sanitation, too, requires this same common sense, but to keep the proper balance between Technical knowledge and common sense perhaps, salesmen should develop both.

What has all this common sense, proper balance, technical knowledge, etc. to do with sanitation? Simply this, if salesmen must develop these to win, we had better establish if there is a basic need in our industry for the sanitation we are trying to sell. Dr. Richard Byrd, President of the University of Maryland, in his address at the Northeastern Dairy Conference in Springfield, Massachusetts, said, "There are two major things in our industry that are most important—first PRODUCTION and second, QUALITY—and we will need all the help we can get to do the job." Proper balance is indicated again.

If we, as salesmen, are going to give help in the field of quality, we too, had better get some sales help, if our service is to be of real value. Some well balanced help will do.

Let's start out with the six serving men of Kipling:

"I keep six honest serving men
They taught me all I knew
They're What and Why and When
And How and Where and Who."

So let's put these men to work:

What is the problem? .....BACTERIA
What is control?.....SANITATION
How is it corrected?.....CLEANING AND SANITIZING
How is it accomplished?.....PROPER METHODS
Why use regularly? ....GOOD HABITS
What is the result? ....QUALITY MILK

Herb Ewell, sales supervisor of the Pennsylvania Salt Manufacturing Company's Food Products Department for most of northeastern United States, has been pioneering in the improvement of dairy products quality through sanitation. for the past thirty years. He has lectured in many eastern agricultural colleges, technology group meetings, and short courses. He is the author of a number of articles on the subject, including one on "Trouble Shooting—Hot water and the Better Milking Program." He is a member of the Dairy Drama Associates, a group of men in the field of dairy sanitation in the Northeast who put across their point by dramatizing actual situations in meetings of sanitarians, field men, and dairy farm groups.

*Delivered at Annual Meeting of the Wisconsin Milk Sanitarians's Association, Madison, Wis., September 4, 1952.

Why of interest? ..... PROFIT

Let's get back to man. The caveman, history tells us, was rough, tough and nasty. He used crude weapons to get what he wanted. Men have the same wants and desires today, but the methods of obtaining them have changed. Cavemen have become gentlemen. Gentle Jesus gave us plant food for thought when he said, "Suffer the little children to come unto me, for theirs is the kingdom of heaven." And the poet's description of a gentleman fits here very well. "A gentleman is just a gentle man, no more, no less. A diamond polished was first a diamond in the rough."

During the evolution of cavemen to gentlemen, certain human desires had to be catered to and great progress has been made. People must want and need things to keep progress in the world. Man thought of an idea; we call him a scientist or a technical man. These ideas, many in number, give people "want satisfaction" which is the thing they buy. It's like pride in industry, those lasting values in man's soul and mind, which in our food industry is QUALITY.

To make these ideas, workmen became skilled. Goods and things were manufactured. While most of us don't actually need the things that science could mass produce, it has become a way of life, and that we might take greater pleasure in it, advertising came into being to tell more of us about it; so modern salesmen became necessary—

To establish QUALITY ....QUALITY
Serve all industry .....SERVICE
Create want satisfaction .....
SATISFACTION
Help everybody make a profit.....
PROFIT

Because we find no mention of salesmen in the early history of the world, it is fair to assume that salesmen are made, not born. Unfortunately the business of selling has not been generally considered nor properly raised to the dignity of a profession. Unlike law, dentistry, and medicine, salesmanship, in most cases, had to be developed by self-training, much practice, and long experience. Salesmen should have a working technical knowledge of his business, but he must not be solely a technician.

I've heard this said about the difference between technical men and salesmen. A technical man is a man who starts out by knowing a great deal about a very little; and as he goes on, learns more and more, about less and less, until finally he knows practically everything about nothing. On the other hand, a salesman is a man who starts out by knowing a very little about a great deal, and as he goes on, learns less and less, about more and more, until finally he knows practically nothing about everything. This may or may not be so. However, proper balance is again indicated.

A salesman is just like a tack. He can only go as far as his head will allow.

There are certain character traits necessary for man to be a success, in any field of human endeavor, and the art of selling is no exception. May I quote Dr. Glenn Frank, former president of the University of Wisconsin, on the subject of salesmanship:

"I suspect that the most important man in the world is a good salesman. I do not mean simply the clerk or commercial traveler, but the man whose whole life is guided by the principles of good salesmanship. The art of civilization is largely the art of salesmanship. Nothing of permanent value has come down to us from the past save by the grace of good salesmanship on the part of somebody. The salesman is not the high priest of a sordid commercialism. The salesman is the sparkplug of civilization."

So ladies and gentlemen, by their traits you shall know them.

Let's review enough of them to serve our minimum requirements for selling sanitation.

SKILL

UNDERSTANDING—JUDGMENT
REASON FOR DOING OR SAYING

Of all the basic skills with which man has been endowed, the one basic skill that has more to do with human understanding, judgment, and the reason for doing or saying things, is the ability to organize and express ideas in writing and speaking.

Colleges teach it but very few learn it. Usually we associate skill with an art, for example, a surgeon with his scalpel, a violinist with his bow, or a magician with his wand. Modern salesmen must develop this skill of expressing ideas. How can he do it? It's not new thinking. Let's quote Francis Bacon.

"*Reading* maketh a full man; *Conference* a ready man, and *Writing* an exact man."

Do all you can with each.

So number one in Selling Sanitation is — Develop a skill that expresses your knowledge in an understanding manner. Say enough, but don't talk too much. Too many men get their tongues in high gear before they get their brains started.

ABILITY

BEING ABLE—CAPACITY
POWER TO PERFORM WHETHER PHYSICAL, MORAL, INTELLECTUAL

There has always been the question: Who ought to be the boss? It's like asking: Who ought to be the tenor in a quartet? Obviously the man who can sing tenor.

While most men are often capable of greater things than they perform, the business of selling sanitation, or anything else for that matter, suggests that we should be on our guard against the temptation to argue directly from skill to capacity and assume when a man displays skill in some feat his capacity is considerable for all.

As the winds and waves are always on the side of the ablest navigators, point number two in selling sanitation indicates there may be luck in getting a selling job but there is no luck in keeping it. It requires ability.

LOYALTY

FAITHFUL TO A CAUSE
TRUE TO A PERSON

A few days after Christmas a six-year-old boy was trudging down San Francisco's crowded Pine Street dragging a glistening new wagon with a tiny baby passenger. The passenger was the statue of the Christ Child from the crib of the neighborhood church. Horrified, the boy's mother ran down the sharply. "But mother," the boy

street and reprimanded her son protested wide-eyed, "I promised the Baby Jesus that if He gave me a wagon for Christmas, He would have the first ride in it."

He prayed to his God—that's being faithful to a cause.

He kept his word—that's being true to a person.

Let those who aspire to be salesmen, grasp this concept and they will have the full meaning of loyalty.

ENTHUSIASM

TO BE INSPIRED—ARDENT

"Nothing great was ever achieved without ENTHUSIASM" — Emerson.

Enthusiasm is the fire under the boiler that keeps the "salespot" hot.

A striking example of enthusiasm happened during the holiday weekend, July fourth. I was teaching my five-year-old grandson how to swim. Sufficient confidence was established to have him put his face in the water and count to ten, and after demonstrating the dead man's float, he was left on the shallow side of the ropes to practice and promised one dollar when he accomplished the feat.

A short time later he came rushing up to me and exclaimed, "Grandpa, I can do the dead man's float and I can do it good." I'll never miss that dollar.

That's the kind of enthusiasm we need in selling sanitation or anything else. If you ever find yourself marked by indifference, sluggishness, lifelessness, or just plain laziness, may I suggest that you take whatever time that is necessary and print in large letters on your bathroom mirror, the words, I AM ENTHUSIASTIC. Then ACT enthusiastic.

SINCERITY

HONESTY OF MIND
FREEDOM FROM PRETENSE

I can best describe the art of being sincere by telling you a short story entitled "Without Wax." Many of the wealthier Romans lived in marble palaces. Often enough a piece of marble would be chipped off, spoiling the beautiful facade and, naturally, a workman would have to be called to make repairs. Sometimes a dishonest workman would fill in the chink with a kind of cement, called wax, an imitation marble. For a while the deception would not be discovered; but after a time the wax would become discolored, revealing the defect. Hence it became necessary to put into contracts for repairs a clause stating that the work should be done *sine cera*, without wax. This, some believe, is the origin of the word sincere.

Sometimes, in our industry, producers have attempted to save time and labor on the clean-up job. For a while the deception would not be discovered, but after a time, the utensils would be coated and bacteria counts run high. Much trouble results. So in the field of sanitation, we must remember that we would never have reason to put the clause *sine cera* in any contract, but rather the sentence, "Sincerum est nisi vas quodcumque infundis acescit," which translated into English means, "Unless the vessel be clean, whatever you pour into it turns sour." Selling sanitation requires that we show the same sincerity we demand of others.

MODERN

PRESENT OR RECENT TIME
NEW-FASHIONED

There is an old Jamaican proverb which reads, "Follow fashion make monkey cut him tail."

Follow fashion make salesmen modern. About the only person that I can think of that does not need salesmanship or modernity is a hermit. He has no need to secure cooperation, respect, and good will of others. He doesn't have to sell his ideas, talents, or personality to anyone else. He has no employer to please, no family to get along with, and no opportunity to make friends.

The rest of us, because we chose not to be hermits, must learn how best to sell ourselves. We must keep up to date. Keep characters bright and clean, and show a friendly, welcoming attitude toward a change, simply to find out what we are going to do when we can't do what we are doing now.

AGGRESSIVE

ACT FIRST—DETERMINED
ENTERPRISING

Do you talk and do or do you only talk.

The danger of being questioned thusly has been eloquently expressed by C. S. Lewis' devil in THE SCREWTAPE LETTERS as he refers to his efforts to tempt the good man: "The great thing is to prevent his doing anything. Let him think, but as long as he does not convert it into action, it does not matter what he thinks."

Selling requires aggressive action always. Think and act. Don't throw yourself to the Devil.

NEAT

APPEARANCE—SELF OR PACKAGE
TASTEFUL AND CLEAN

Two prominent ministers decided recently that in order to get first-hand knowledge of conditions existing among "down and outers" and to ascertain the cause of their inability to get work, they would dress like these outcasts and mingle with them.

In carrying out their plan they were arrested and taken to the police station where a charge of vagrancy was placed against them. The policeman saw them walking down the street. His eye trained from experience, he immediately spotted them and disregarding their protests, ran them in. They were able to establish their identity and were released, none the worse for their experience.

It just goes to show that usually we are judged by our appearance.

In the selling game it is absolutely necessary to look the part because to be successful, it is necessary to have the appearance of being successful.

This applies to products as well as persons—milk, for example. The rules of the game demand good clean appearance of: the cows that make it, buildings where it is handled, trucks that deliver it, and plants that process it. Yes, in the final bottle of milk that is delivered to the doorstep, appearance of the package comes first, even before cream content, keeping qualities, flavor, or safety. To maintain

that proper balance we have been talking about, the field of selling requires that we keep both our appearance and our language neat. Clothes and manners do not make the man; but when he is made, they greatly improve his appearance.

SELF ORGANIZATION

PREPARATION—PERSONAL MANAGEMENT AND BUSINESS STRUCTURE

You know the mind is to the mouth what the microphone is to the loudspeaker because of what flows through the one depends the value of what comes out the other.

There is no substitute for brains. Even a full heart will not make up for an empty head. You simply can't get anything out of your head you haven't got in there, but most men, as we have said, are capable of doing much more than their regular efforts or actions indicate. The only thing they lack is a plan—a track to run on. An organized mind is a prepared mind.

A story is told of a colored boy who had become very proficient with a black snake whip. He could lash out, with either hand and only clip off the leaf or flower he wanted. His boss tried several times but with no success. One day, while on the way to town by the back road, his boss noticed a hornet's nest hanging from the limb of a tree. He called to the colored boy, "Rastus, let's see you clip off that hornet's nest." and Rastus replied, "Not me boss, them's organized."

One brain cell working alone can be clipped off like the leaf or the flower but your organized thinking will represent both the mental and emotional process in their proper order. Think and feel. Daniel Webster, one of the greatest orators of his time, said, "He is an orator who can make me think as he thinks and feel as he feels."

We should increase our knowledge, all possible, but only after we have organized and prepared our current knowledge and given it a track to run on. That's self-organization.

HONESTY

HONOR—INTEGRITY FREEDOM FROM FRAUD

This brings to mind the story of "The Most Important Six Cents We Ever Heard Of." Checking his accounts at the end of the day, Storekeeper Abraham Lincoln discovered that he had over-charged a customer six cents. Lincoln walked six miles to return those pennies and earned the nickname, "Honest Abe."

Integrity in little things builds enviable reputations. It's not so much the years of service, technical research, the acceptance of ideas or improved regulations written that make our industry great, but rather a homely sense of confidence felt by all whom we serve, honestly.

The priceless ingredient of every product is the honor and integrity of its maker. Be honest with yourself. It will help you sell sanitation.

INITIATIVE

AN INTRODUCTORY STEP PRELIMINARY

Several weeks ago I was visiting with H. Clifford Gosslee, Director of The Dairy Division, Department of Farms and Markets, at Hartford, Connecticut. We were discussing sanitation.

"Cliff, I got an idea."

"Let's hear it."

"Many people learn the technical aspects of good sanitation but I wonder if we all really know how to sell it."

"Now that's a good angle for our proposed skit this fall at the Vermont Plant Operators and Managers meeting."

That was the introductory step that prompted me to develop this talk. You got ideas too. May I encourage you to put them to work.

The poet Goethe ably expressed what I would like to say in a short verse entitled, "Begin It."

"Lose this day loitering—'twill be the same story
Tomorrow— and the next more dilatory
Then indecision brings its own delays,
And days are lost lamenting over days.
Are you in earnest? Seize this every minute—
What you can do, or dream you can, begin it.
Only engage, and then the mind grows heated—
Begin it, and the work will be completed."

Since I have learned the importance of this point, Initiative, my motto has been, "DO IT NOW."

PERSISTENCE

EXISTING CONTINUOUSLY ENDURING —CONSTANTLY RECURRING

We need but to recall the fact that good old bossy gives milk twice a day, for the most of the year, to understand the very great need of our persistent effort to keep it clean. It's a fight to the finish.

To settle an argument an Irishman and a colored man agreed to fight it out with their bare hands. It was also agreed that the one that had enough could stop the fight by simply saying "sufficient." The fight was furious. Both were taking plenty of punishment. After about ten minutes, the colored man said, "Sufficient." The fight stopped and Pat said, "Sure and glory be to God, I have been trying to think of that word for the last five minutes."

Persistence. It makes champions. Just fight one more round. The fastest horse or the ablest men will lose out if they do not keep going.

ACTION

There are other traits of character, but for the purpose of this talk, let's use the ones we have developed thus far. We have agreed that—

We should develop the best product that our technical knowledge will allow.

We should render the best service that honest effort will permit.

We should create the best want satisfaction that results in sanitation.

And give it a track to run on, which you will find by taking the first letter of each of these personal character traits—

S SKILL
A ABILITY
L LOYALTY
E ENTHUSIASM
S SINCERITY
M MODERN
A AGGRESSIVE
N NEAT
S SELF ORGANIZATION
H HONESTY
I INITIATIVE
P PERSISTENCE

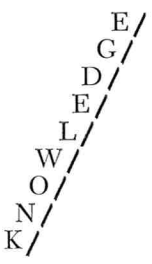
Which is SALESMANSHIP—a good track to run on.

Now that we have a track to run on, what are we going to do? If we just sit there, we will get run over. If you try to build the points all at one time you will be almost as bad off as doing nothing. I recommend that you take just one new trait and practice that for one full week, leaving all others to ordinary chance. Then practice each in turn until you have completed the list, which will take twelve weeks, allowing for you to repeat the list four times a year. Do this faithfully and you will develop your personality to a point never yet dreamed of.

Let's see if these personality traits are not the most important part of the balance in Quality, Service, Satisfaction, and Profit, the points we have already established as necessary for a successful sale.

To build a word picture to tell this story will be similar to constructing a triangle.

Quality—thats what you know or build into a product or service. Knowledge, yes technical knowledge if you will, because the more you know the easier your task; however you don't have to be a college graduate to be an educated man. Let's use the word KNOWLEDGE for the first side of our triangle, thusly,



Service—that's work. The effort or time you put forth to perform. We know some people who stop looking for work as soon as they find a job, but even if you are on the right track you will be run over if you just sit there. To be a success, one must work. Henry Ford said, "Coming together is a beginning; keeping together is progress; WORKING together is success."

This same thought was very well written in Rotary Thunder captioned, "Meet the Success Family."

The father of success is WORK.

The mother of success is AMBITION.

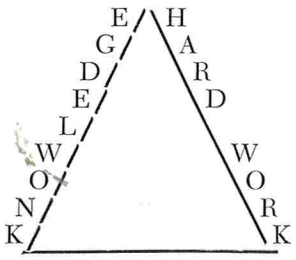
The oldest son is COMMON SENSE. Some of the other boys are Perseverence, Honesty, Thoughtfulness, Cooperation, Enthusiasm, and Foresight.

The oldest daughter is CHARACTER. Some of the other daughters are Care, Cheerfulness, Economy, Sincerity, Courtesy, and Loyalty.

The baby is Opportunity.

Get acquainted with the "Old Man" and you will be able to get along pretty well with the rest of the family.

So HARD WORK is a good word for the second side of our triangle, thusly,



Satisfaction—that has to do with personality; joy of accomplishment; ease of use, as far as products are concerned, and has much to do with—

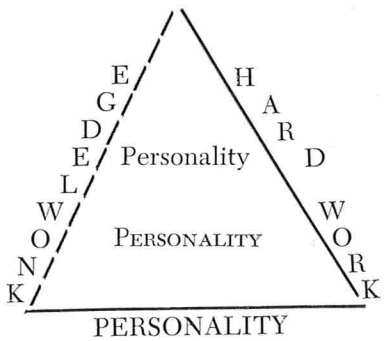
Profit—that's the proper balance in the bank—dollars and cents. Now do we have enough personality to put this triangle in proper balance and support our knowledge and work? It's all measured by the size of your personality—your ability to sell. For example, if we develop our personality to only one third the size of the triangle, we will only make money in proportion. As we increase our ability to perform, our earnings increase automatically.

This brings me to my final message.

Ladies and Gentlemen we started out talking about man; let's wind up the same way.

The best and most important part of every man's education is that which he gives himself. While we make a living by what we get, we make a life by what we give. Man is but a creature composed of body and soul, temporarily using his body for purposes of self expression. When he is mean it shows through his body, he looks mean, he acts mean, he talks mean. A swell fellow exhibits his loyalty and cooperation and it's on that theme I wish to close.

We have said—"Keep all things in proper balance." Let's check if this is true in our way of life—
God gave man his .....LIFE
And to help him live ..... ENERGY
For a full life and greater
happiness ..... EMOTIONS
From the emotions of man, flows



	$	$	$
	$	$	$
	$	$	$
.....		$	$
		$	$
		$	$
.....			$
			$
			$
			$
			$

Therein lies the key to salesman-ship for sanitarians.

(Continued on page 135)

A BOTTLE AGAR METHOD FOR BACTERIAL ESTIMATES

BURDET HEINEMANN AND M. ROBERT ROHR

Producers Creamery Company
Springfield, Missouri

A simplified screening test is described for estimating the bacterial population of Grade A milk. The method employs an anchor-shaped dipper for measuring and sampling milk from the weigh-vat. The sample is transferred directly to prepared dilution bottles. A 0.01 ml milk transfer loop is used to inoculate 3 ml of agar in a 1-ounce screw-cap bottle. The bottle is laid on its side, incubated 48 hours, and the colonies counted. The number of colonies multiplied by 5,000 yields the bacterial estimates. Results compare favorably with the Standard Plant Count.

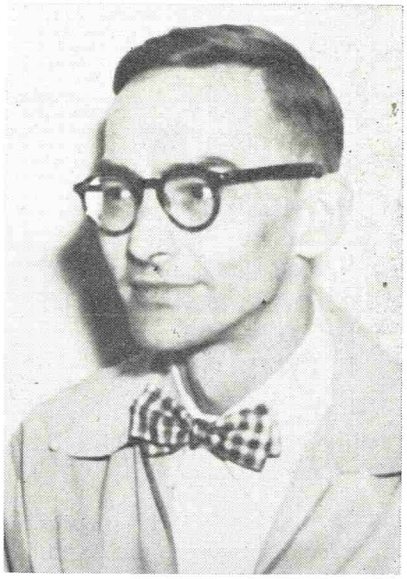
The Standard Plate Count per ml is generally used by health departments as the method for estimating bacterial populations in the grading of milk. When the Direct Microscopic Count is employed, it is generally as a substantiating method or for determining types of bacteria present.

When bulk shipments of Grade A milk are examined to determine compliance with Grade A standards, the Standard Plate Count is almost universally used. It is therefore desirable that the milk from the individual producers be also examined by the same method so that results may be comparable. In order to have adequate control over the quality of the incoming milk, it is also advisable to make bacteria counts at a frequency greater than once a month. This presents a problem of supplies, materials, incubator space, etc., if the Standard Plate count were to be used, particularly where the number of producers exceeds 300.

A method for estimating bacterial populations was therefore desired which would yield results similar to those of the Standard Plate Count and which would permit the examination of large numbers of samples of milk without taxing laboratory facilities.

Various methods have been proposed[2-5] which were tried with some degree of success. However, for one reason or another, none of these methods possessed all the desired characteristics.

The method finally adopted is based on combinations of procedures previously described by other workers in the field. The use of a bottle for agar colony counts was employed in the construction of a kit for making swab counts of



Mr. Burdet Heinemann was born in St. Louis, Missouri. He was graduated from Iowa State College receiving a B. S. degree in bacteriology. He has been associated with Producers Creamery Company of Springfield, Missouri, since 1936, and is now Technical Director of that organization. He is the author of a number of publications dealing with analytical methods for dairy products. He is a member of the International Association of Milk and Food Sanitarians, Inc., the American Chemical Society, and the American Dairy Science Association.

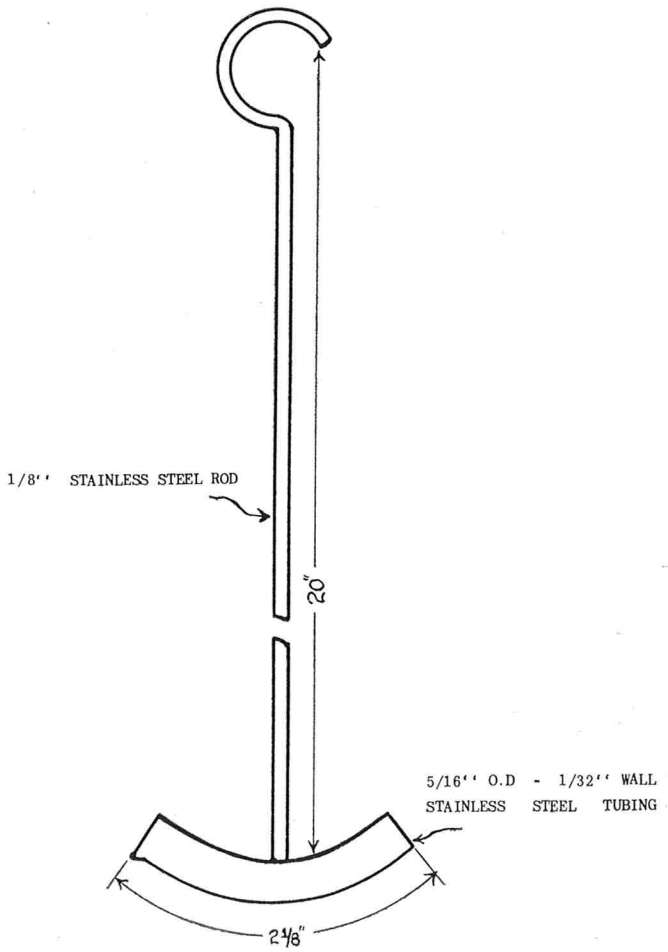


FIGURE 1—CALIBRATED TO DELIVER 1.43cc's MILK AT 60°F.

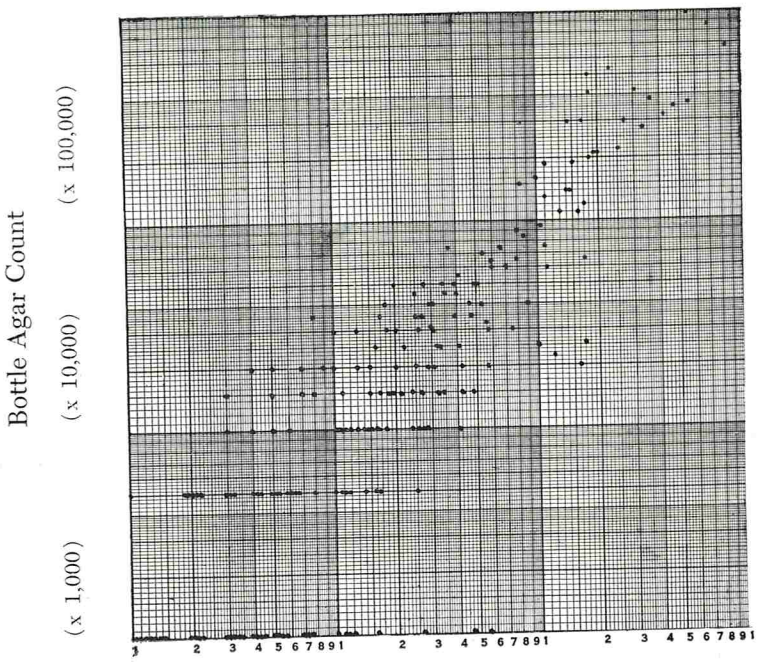


FIGURE 2—Standard Plate Count

equipment and utensils[6]. The use of transfer loops is also well known. To our knowledge, however, the anchor-shaped dipper has not been described previously.

METHOD

Equipment and Materials.

Except for petri dishes, pipettes, dilution bottles, and sampling instrument, the equipment and materials described in *Standard Methods for the Examination of Pairy Products* were used.

The welded 0.01 ml platinum - rhodium transfer loop was calibrated with buffered water and found to contain 0.007 + or — 0.0003 ml. This was done by flaming the loop, weighing the cooled loop, inserting it in buffered distilled water and then re-weighing it immediately.

One ounce Owens Ovals ungraduated prescription bottles with Bakelite screw caps were used in this work. However, the Owens one-ounce Imperial Oblong No. A-6925 with screw caps have been used since and are more desirable.

Two-ounce Owens Ovals graduated prescription bottles with screw caps are used for dilution bottles.

The anchor-shaped dipper is shown in figure 1. This dipper is made from 5/16" O.D. stainless steel tubing about 2¼" long. It is calibrated to deliver 1.43 ml of milk at 60°F. The handle is made from ⅛" stainless steel rod about 20 inches long. It is commercially available.

Procedure

Standard milk agar is prepared and 3 ml dispensed to each of the one ounce bottles. These are then autoclaved at 121°C pressure for 20 minutes. 50 ml buffered distilled water is dispensed to each of the two-ounce bottles which also are then autoclaved.

The above may be done a day or two ahead of usage. When ready for use, the one-ounce bottles containing the agar are autoclaved at 5 lbs. pressure for 1 minute, removed from the autoclave, and held at 45°C in a water bath or incubator until used.

Milk is sampled direct from the weigh-vat after dumping using the 1.43 ml sampler. The sampler is rocked back and forth in the milk to insure absence of air pockets. The sample is then transferred directly to a previously identified two-ounce bottle containing 50 ml of sterile buffered distilled water. After collection of the sample, the two-ounce bottle is returned to an ice bath and the dipper is rinsed in water and then in 100 ppm chlorine solution. When 20 samples have been collected, they are removed to the laboratory. Each bottle is shaken 25 times, and 1 loop of the diluted milk is carefully removed and transferred to the melted agar in the one-ounce bottle, which is properly identified. The agar is gently swirled 10 times, and then laid on its side until the agar has solidified. The loop is rinsed in clear water and then flamed. After every 50 samples, the loop is dipped in sterile dilution water and then into the agar. One bottle containing agar only is also set aside to serve as a blank.

The bottles containing the solidified agar are inverted and placed in the incubator at 35°C for 48 + or — 4 hours. Colonies are counted using the Quebec colony counter. The number of colonies found multiplied by 5,000 yields the bacterial estimate or B.A.C. (Bottle Agar Count). After counting, the bottles are autoclaved for 5 minutes at 5 lbs. pressure, allowed to cool partially, then emptied and washed.

Standard Methods are not followed when reporting counts. Since the B.A.C. is a screening test, the number of colonies multiplied by 5,000 is the count which is reported. However, the area of the agar surface is such that 40 colonies per bottle correspond to 300 colonies per plate. Thus the upper limit that is applied to Standard Plate Counts corresponds to an upper limit of 200,000 by the B.A.C. Colony counts on the agar in the bottle may be estimated with satisfactory precision up to 200 corresponding to a reported B.A.C. of 1,000,000 per ml.

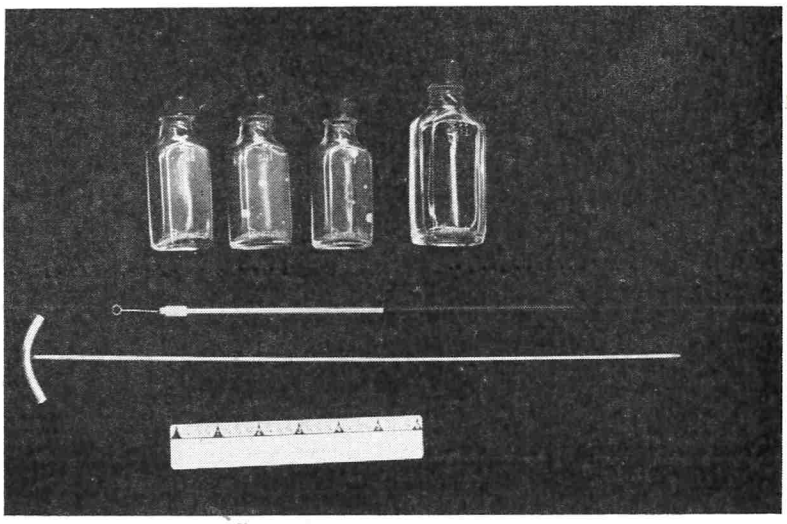
In order to establish the accuracy of the B.A.C. method, 104 samples of Grade A milk were taken in February and 100 samples in July, 1951, and the B.A.C. compared with the Standard Plate Count. The method for the B.A.C. has been described above. The samples of milk for the S.P.C. were taken from the weigh-vat with a milk thief and transferred to sterile sample bottles, all procedures following Standard Methods. Only one plate of each dilution was poured, and only one count by each method was recorded.

RESULTS

Figure 2 shows the relation between the S.P.C. and the B.A.C. The 104 samples taken in February averaged 61,000 for the B.A.C. and 52,600 for the S.P.C. The 100 samples taken in July averaged 84,100 for the B.A.C. and 83,700 for the S.P.C. The grand average for 204 samples was 72,400 for the B.A.C. and 68,800 for the S.P.C. In averaging the B.A.C. results, those bottles showing no colonies were recorded as 1,000 and are also plotted as 1,000 on figure 2.

SUMMARY

The B.A.C. method has been employed routinely once a week for over a year with completely satisfactory results. No unusual difficulty has been encountered due to spreaders, the incidence being normally well below 5%. The method has been found to consume about one-half as many man-hours as the Direct Microscopic Count previously employed. The results obtained with the B.A.C. are comparable with the S.P.C. and thus average counts of individual samples of incoming milk may be compared with the Standard Plate Count of a composite sample of the mixed milk for bulk shipment.



ACKNOWLEDGMENT

The suggestion of Dr. R. P. Myers concerning the use of the Imperial Oblong Bottles as an improvement over the Owens Oval Bottle is greatly appreciated.

Thanks are also due to Mrs. J. G. Parker for making the 100 comparisons between the two methods during July.

REFERENCES

1. American Public Health Association. *Standard Methods for the Examination of Dairy Products,* 9th Ed. Washington, D. C. 1948.

2. Burri, R. The Quantitative Smear-Culture: A Simple Means for the Bacteriological Examination of Milk. *Proc. Worlds Dairy Cong.,* 690-696 (1928).

3. Chamberlayne, E. C. The Jamieson Kit-Its Construction and Use. *J. Milk, Food Technol.* 11, 301-309 (1948).

4. Myers, R. P. and Pence, J. A. A Simplified Procedure for the Laboratory Examination of Raw Milk Supplies. *J. Milk Technol.* 4, 18-25 (1941).

5. Milk Industry Foundation. *Laboratory Manual,* 53-55, Washington, D. C. 1949.

6. Prouty, C. C. and Bendixen, H. A. A Comparison of the Roll-Tube and Standard Plate Methods of Making Bacterial Counts of Milk. *J. Milk and Food Technol.* 7, 5-10 (1944).

PITTSBURGH RESTAURANT PROGRAM

(Continued from page 109)

the larger movement to improve the environment in the City of Pitts burgh. The effective elimination of smoke from the air, extensive re-development of some of the blighted areas, reorganization of the Health Department, and the development of the University of Pittsburgh Public Health School are all symbols of how Pittsburgh is moving ahead toward a better place to live.

You might ask which of the procedures was primarly responsible for this rapid improvement. This I cannot answer. The most valuable outgrowth of the program is the change in attitude on the part of the people involved—the recognition by the restaurant owners and the inspection staff that they have a common purpose: that of striving for continued improvement in restaurant sanitation.

SELLING SANITATION

(Continued from page 132)

a stream of ..... CONFIDENCE
That leads to ..... LOYALTY
And ..... COOPERATION
Take it home to your family,
its ..... LOVE

But let anyone place a barrier to break that stream of Confidence and you have another way of life—
We see it in the world today FEAR
People will ..... GIVE IN
They will ..... RUN AWAY
Or they will ..... FIGHT
Yes, they will even ..... HATE

God forbid that it should ever happen to us here. That's not our way of life. We must learn to keep the proper balance between loyalty and cooperation, thereby doing our part to maintain this American way of life and pass it intact to succeeding generations.

Out in a meadow, on a sunshiny day,
Were two had doddles of new mown hay.
In between where two stubborn mules. Now get this dope
They were tied by their tails with a piece of rope.
Said one to the other, "You come my way
Until I get some of that new mown hay."
"Why, no," said the other. "You come with me
Because I have hay too—Do you see?"
So they got nowhere—Just pawed up dirt
And, Oh by golly, how that rope did hurt!
They turned about those stubborn mules
And said, "We're acting like a couple of human fools.
Let's pull together. I'll go your way."
"Then you come with me and we will both eat hay."
So they ate their fill and liked it too,
And swore they'd be comrades good and true.
When the sun went down they were heard to bray,
"Now this has been the end of a perfect day."

PSYCHROPHILIC BACTERIA—A SANITATION PROBLEM[1] [2]

R. B. Parker, A. L. Coldwell,* and P. R. Elliker

Agricultural Experiment Station, Oregon State College, Corvallis, Oregon

The Weber and Black method for evaluating germicides was used to compare the efficiency of hypochlorite and quaternary ammonium compounds in the destruction of representative psychrophilic bacteria isolated from defective milk products.

Under conditions of the test, hypochlorites displayed a more rapid germicide action than quaternary ammonium compounds against suspensions of the psychrophilic bacteria studied.

The germicidal action of a quaternary ammonium compound was markedly stimulated by the addition of certain complex phosphate salts.

Centralization of dairy processing plants, with the attendant long storage periods of product, has posed a number of definite sanitation problems, especially those with respect to psychrophilic bacteria. Elimination of organisms capable of extensive growth at common refrigeration temperatures is essential if the product is to withstand storage. This fact must be considered in the design of any sanitation practice where these organisms are likely to be encountered.

Reports from various sources have indicated that pasteurized milk and cream, if consumed within a reasonable period of time, are not adversely influenced by psychrophilic bacteria, provided post-pasteurization contamination has been minimized. Burgwald and Josephson[1] concluded that milk of good quality could be expected to retain its bacteriological and flavor qualities for at least four days during summer months and six to seven days during winter months. The findings of Rojeck and Burgwald[9] indicate that most psychrophilic types are eliminated by pasteurization, and their presence in pasteurized milk is associated with improperly sanitized surfaces. Canadian workers[4,5] noted that, while objectional flavors were produced in milk by all of 722 bacterial strains capable of growth at 12.5°C, only four of the total survived pasteurization. Other studies have indicated similar heat sensitivities of various psychrophilic species.

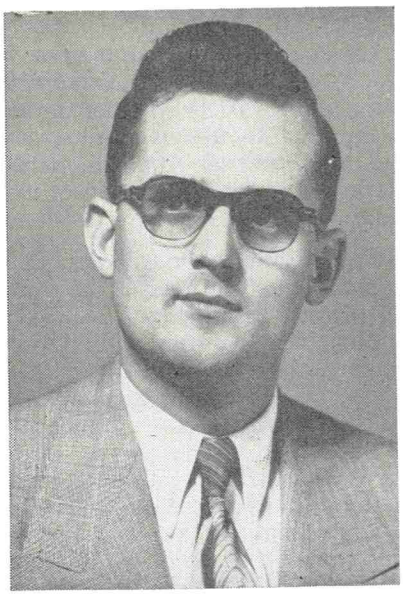
It is significant that not one of the 722 isolations mentioned previously were capable of growth at 35.5°C. Jezaski and Macy[6] incubated platings of creamery water and butter at 8, 20, and 37°C, respectively. Invariably, the plates incubated at 20°C yielded the highest counts. In some instances the plates incubated at 8°C yielded higher counts than those incubated at 37°C. Apparently the so-called "Total Plate Count" may in some instances represent a gross underestimation of the viable bacteria present. Even more important is the consideration that bacteria involved in product deterioration may remain undetected by Standard Methods.

Various species of *Flavobacterium*, *Achromobacter*, and *Alcaligenes* are encountered in refrigeration spoilages, but of all psychrophilic types, those representing the genus *Pseudomonas* are the most troublesome. Erdman and Thornton[5] found an intense bitter defect in milk held at 4.5°C for 15 days. All of the nine cultures found to produce the defect were identified as belonging to the tribe *Pseudomonadeae*. Three were not further classified, but three of the remaining were identified as variants of *Pseudomonas fluorescens*, and three closely resembled *Pseudomonas viscosa*.

The production of "surface taint" on butter by *Pseudomonas putrefaciens* is another example of one of the more offensive spoilages produced by this genus. The typical, cheesy, putrid, or rabbito flavor may appear within a few days in butter held at 50°C. Ripening of the cream with a lactic culture after pasteurization may allow production of sufficient acid to limit growth of the casual organism. In some localities, the defect has been so common as to constitute a serious problem. A New Zealand worker[10] was able to demonstrate the presence of *P. putrefaciens* in 91 out of 1,563 samples of butter. There appeared to be a rather close relationship between the presence of the organism and poor sanitation in the processing plant.

Elliker and Horrall[3] reported that butter became distinctly flat prior to production of the definite "surface taint." They were able to show that the flatness corresponded to destruction of biacetyl. In a later study, Elliker[2] found that a number of other related psychrophilic types affected rapid destruction of the aroma compound.

Pasteurization studies indicate *P. putrefaciens* to be very heat sensitive. Long and Hammer[7] found that even the more resistant forms of this species were destroyed by



Mr. Parker served in the U. S. Army Air Corps, 1943-46. He attended Boise Jr. College, 1947, received his B. S., Oregon State College, June, 1950, and his M.S. in 1951. He now is Research Assistant, Oregon Agricultural Experiment Station, 1950. Recipient 1950 Phi Sigma award. Sigma Xi research honorary.

[1]Paper presented at the 16th Annual Klenzade Educational Seminar, Excelsior Springs, Missouri, March 20-22, 1952.

[2]Published as Technical Paper No. 747 with the approval of the Director of the Oregon Agricultural Experiment Station. Contribution of the Department of Bacteriology.

*Present address: Langlois Cheese Makers, Langlois, Oregon.

an exposure to 61.7°C for 2 minutes.

Various other *Pseudomonadeae* are responsible for rancid, fruity, fishy, and a variety of other defects in butter. *Pseudomonas fluorescens* and *Pseudomonas fragi* are particularly noted for production of rancidity.

Recently two species of the genus *Pseudomonas* and one of the genus *Alcaligenes* have been shown to be responsible for a rapid and often intense surface spoilage of cottage cheese[8]. The nature of the defect may vary from a brownish- or yellowish-tinged slime to a white, translucent film. The physical manifestations may be accompanied by rotten, putrid, or fruity odors. Descriptive terms such as "tapioca," "glassy," and "slick" have been used by the trade. Here, as in the surface spoilage of butter, an extreme flatness or lack of aromatic flavor often precedes the physical spoilage. Three different species of bacteria are associated with the defect in its various forms. The darker spoilage is accompanied by rotten or putrid odors and is caused by an organism identified as *Pseudomonas viscosa*. A lighter-colored defect accompanied by fruity odors is attributed to *Pseudomonas fragi*. The organism causing an almost clear whitish spoilage is classified as *Alcaligenes metalcaligenes*. Pasteurization studies indicate that all three are killed by heating at 143°F for 30 minutes.

Studies on the effect of pH on extent of the gelatinous or slimy defect in uncreamed, unsalted curd indicate that *P. fragi* and *A. metalcaligenes* are effectively retarded at pH 5.0, but *P. viscosa* continues to develop until pH 4.8 is reached. Although exceptions may follow variation in composition of milk, experience has indicated that milk ripened to a titratable acidity of at least 0.55 percent before cutting usually will have a pH of 4.8 or lower. Increase in pH due to creaming will usually vary within a range of 0.2 to 0.35 of one pH unit.

Studies on effect of pH and salt in creamed curd indicate that *P. viscosa* again appears the most difficult to control. This organism is not limited at salt concentrations of less than 2.5 percent until pH is lowered to 4.8. Both *P. fragi* and *A. metalcaligenes* are retarded at pH 5.0 regardless of salt concentration. *P. fragi* is the least salt tolerant, being limited at 2.5 percent salt at pH 5.2. All three species are capable of growth in cheese at pH 5.2 with 2 percent salt content.

Growth of *P. viscosa* produces a greenish yellow pigment which fluoresces strikingly under long-wave ultra violet light (Mineralite or Black Light). Early detection of the defect through keeping quality tests at 15°C is greatly facilitated by the use of this device. Specks of beginning spoilage caused by *P. viscosa* can be seen in this manner when they are still invisible in ordinary light.

The long-wave ultraviolet light also has been of great help in rapid detection of milk stone deposits, especially those embedded in nicks and scratches on cottage cheese manufacturing and packaging equipment. These deposits have been shown to harbor the cottage cheese spoilage bacteria.

Recommendations for control of the above type of spoilage include ripening the milk during setting to a titratable acidity of at least 0.55 percent and maintaining a pH of not over 5.0 in the finished creamed curd. A salt concentration of at least 1.5 percent is also a helpful control measure. Unfortunately acidities and salt concentrations high enough to completely eliminate *P. viscosa* are objectionable to many consumers. Thus, the only satisfactory method of control involves strict plant sanitation to eliminate completely any spoilage bacteria.

Comparative Effect of QAC and NaOCl on Various Psychrophilic Species

The extensive use of quaternary ammonium germicides (QAC) and hypochlorites in dairy sanitation suggested an investigation into the relative merits of these compounds against several important psychrophilic species. All organisms used in the study were originally isolated from some form of defective milk product. Organisms used were *P. viscosa, P. fragi, P. fluorescens, P. putrefaciens*, and *A. metalcaligenes*. The Weber and Black technique for evaluating practical performance of germicides was used in all trials[11]. Alkyl dimethyl benzyl ammonium chloride was selected as the QAC, along with one of the representative commercial sodium hypochlorites. Activity of hypochlorite was determined at pH 9.5 and activity of QAC at pH 7.2.

To evaluate the effectiveness of the compounds under conditions simulating those of water sanitation, low concentrations of germicide were used against an approximate concentration of 20,000 bacteria per ml. Germicide concentrations of 5, 10, 20, and 30 ppm, respectively, were used, and the results of trials with 10 ppm are presented in table 1.

The various psychrophilic species employed displayed a wide range of resistance to 10 ppm QAC. Destruction after 30 seconds exposure at this concentration ranged from about three-fourths destruction of *P. viscosa*, to complete destruction of *P. fragi* and *A. metalcaligenes*. It is notable that the latter two organisms were the only species completely eliminated after the full 300 seconds exposure to 10 ppm QAC. In decreasing order of resistance to QAC, the respective organisms are: *P. viscosa, P. fluorescens, P. putrefaciens, A. metalcaligenes*, and *P. fragi*. All species were effectively eliminated by hypochlorite within the initial 15-second exposure period.

Although not tabulated in this paper, similar gradations of resistance were exhibited by the various species of the other QAC germicide concentrations used. A more outstanding example of hypochlorite activity is presented in data which are also untabulated for the sake of brevity. The data show that all species used in the study were destroyed by a 15-second exposure to 5 ppm hypochlorite.

Table 2 indicates results of a study on the effects of high concentrations of germicide against high concentrations of bacterial cells. It was felt that these conditions more closely approximate those found in equipment sanitation. The data indicate complete inactivation of all strains by a 15-second exposure to 100 ppm hypochlorite germicide. However, when QAC was used as

Table 1—Effect of 10 ppm QAC or NaOCl on Low Numbers of Various Psychrophilic Species

Germicide	Exposure time	Percent destruction of the following species:				
		P. viscosa	*P. fluorescens*	*P. putrefaciens*	*P. fragi*	*A. metalcaligenes*
	seconds	*% kill*	*% kill*	*% kill*	*% kill*	*% kill*
QAC	15	74.1	85.3	97.2	99.8	99.7
	30	76.3	96.5	99.0	100	100
	60	79.6	97.5	99.6	100	100
	120	85.5	98.5	99.8	100	100
	300	88.8	99.3	99.9	100	100
NaOCl	15	100	100	100	100	100
	30	100	100	100	100	100
	60	100	100	100	100	100
	120	100	100	100	100	100
	300	100	100	100	100	100
No. trials		3	2	3	2	2
No. organisms exposed to germicide		13×10^3	12×10^3	12×10^3	12.5×10^3	10.5×10^3

QAC alkyl dimethyl benzyl ammonium chloride

Table 2—Effect of 100 ppm QAC or NaOCl on High Numbers of Various Psychrophilic Species

Germicide	Exposure time	Percent destruction of the following species:				
		P. viscosa	*P. fluorescens*	*P. putrefaciens*	*P. fragi*	*A. metalcaligenes*
	seconds	*% kill*	*% kill*	*% kill*	*% kill*	*% kill*
QAC	15	99.9	99.9	99.9	100	99.9
	30	99.9	100	99.9	100	99.9
	60	100	100	99.9	100	100
	120	100	100	99.9	100	100
	300	100	100	100	100	100
NaOCl	15	100	100	100	100	100
	30	100	100	100	100	100
	60	100	100	100	100	100
	120	100	100	100	100	100
	300	100	100	100	100	100
No. trials		3	2	3	2	2
No. organisms exposed to germicide		8×10^7	8.6×10^7	10.5×10^7	9×10^7	8×10^7

QAC alkyl dimethyl benzyl ammonium chloride

the germicide, a full 300-second exposure period to the same concentration was required to eliminate *P. putrefaciens.* For other species a shorter period sufficed, but only *P. fragi* was destroyed by a 15-second exposure to 100 ppm QAC. At this concentration, *A. metalcaligenes* showed slightly greater resistance to QAC action than at lower concentrations, and it is believed that the slime coat of this organism may serve as a protective mechanism.

Results with QACs on psychrophilic bacteria led to attempts to accelerate or potentiate their germicidal activity. It was observed that distilled or soft water solutions of detergent-sanitizers produced more rapid germicidal action than the constituent QAC alone. This suggested one or more of the detergent compounds in the preparation to be the potentiating agent. Various common detergent agents were investigated for their potentiating effect. The polyphosphates were found to be the active ingredient and one illustration of the effect of simple and complex phosphate salts on quaternary activity is presented in table 3. Results with the simple phosphate are included to provide an example of effect of detergent ingredients other than complex phosphate. Some unpublished reports also have attributed potentiating activity to simple as well as complex phosphate. A pH of 9.5 was chosen, as previous studies had demonstrated increased activity as the alkalinity increased. Also the pH of several of the more representative detergent sanitizers is near this level. Distilled water was used in making up the buffer to eliminate interference by water minerals. Tests were made using the buffer alone, the buffer plus trisodium phosphate, and the buffer plus tetrasodium pyrophosphate.

As is indicated in table 3, the addition of 0.1 percent trisodium phosphate to the buffered solution of QAC did not noticeably increase activity over that obtained with the buffer alone. Addition of the pyrophosphate, however, produced a substantial increase in germicidal activity. For example: with either borate buffer, or borate buffer plus TSP, a period of 60 seconds was required for complete kill of

TABLE 3—EFFECT OF ADDITION OF PHOSPHATE SALT TO QAC ON THE RATE OF DESTRUCTION OF A 24-HR. CULTURE OF P. VISCOSA

Phosphate added to QAC	Time of exposure	Percent destruction with the following concentration of germicide	
		50 ppm	100 ppm
	seconds	*% kill*	*% kill*
None	15	99.6	99.9
	30	99.8	99.9
	60	100	100
0.1% tri sodium phosphate	15	99.6	99.9
	30	99.9	99.9
	60	100	100
0.1% tetra sodium pyrophosphate	15	99.9	100
	30	100	100
	60	100	100

QAC alkyl dimethyl benzyl ammonium chloride

P. viscosa with either 50 or 100 ppm of QAC. When 0.1 percent pyrophosphate was added, only 30 seconds were required for complete kill with 50 ppm QAC, and only 15 seconds when 100 ppm QAC was used. In spite of this marked potentiation, an active hypochlorite preparation appears superior to QACs for destruction of psychrophilic bacteria in water and on equipment. Further studies on potentiation of QACs under hard water conditions will be reported in another paper.

SUMMARY

It is generally agreed that the more important psychrophilic species are eliminated in pasteurization. Thus, for the most part the control of these types seems to resolve itself into a program of efficient sanitation of water and plant equipment. For pasteurized products handled in closed equipment (such as fluid milk and cream), elimination of spoilage bacteria is not difficult. Products such as butter and cottage cheese, however, constitute a more serious problem as they require washing, working, and some degree of manual manipulation with equipment which is often difficult to sanitize.

The results presented in this paper very definitely favor the use of hypochlorite compounds for destruction of psychrophilic bacteria in water and on equipment. It is doubtful, however, that either QAC or hypochlorite would prove effective if employed on a dirty surface. A long wave ultra violet light is recommended for the general detection of milkstone and especially for deposits left in nicks and scratches. The importance of removing these deposits cannot be over-emphasized. They constitute a potential source of all types of organisms and are almost impossible to sanitize. Even 200 ppm hypochlorite is ineffectual when bacteria are protected with a milkstone film.

Practically all psychrophilic species are common soil and water types, and evidence will frequently point to these as the original sources of contamination in instances where refrigeration spoilage is encountered. The chilled water used in washing butter and cottage cheese has proved particularly troublesome in this respect. These data indicate that a residual of 5 to 10 ppm available chlorine will effectively eliminate psychrophilic species unless they are imbedded in a slime layer. The presence of high levels of organic matter in water should also interfere with hypochlorite action, but in this event the

(Continued on page 152)

DAIRY PRODUCTS IMPROVEMENT INSTITUTE, INC. HOLDS SIXTH ANNUAL MEETING

The Dairy Products Improvement Institute, Inc., held its Sixth Annual Meeting in New York City on March 20, 1953. It was the largest and most constructively informative of the series.

The morning was devoted to a panel discussion with H. C. Goslee as moderator. It dealt with the general subject of "Farm Tank Truck Pick-Up of Milk," with papers by Paul Corash, C. W. Weber, and W. S. Arbuckle.

The afternoon session was conducted by Dr. W. E. Krauss, under the topic "The Study of Milk Quality and Milk Regulations of the National Research Council." Papers were presented by A. C. Dahlberg, L. C. Spencer, and J. D. Faulkner, all centering around the report of the comprehensive study of milk regulation as directed by A. C. Dahlberg under the sponsorship of the Food and Nutrition Board, National Research Council.

Dr. Carl W. Larson retires as Managing Director of the Dairy Products Improvement Institute, Inc., with which he has been in his present position since it started six years ago. He was elected to the Board of Directors.

Condensations of the papers follow.

The moderator of the morning session, H. C. Goslee, reviewed the major incidents in the development of the dairy industry. He started in ancient Asia where, previous to the westward trek of the Caucasians, the milk of the mountain goats was adulterated with soy bean juice.

He pointed out the great strides made in the application of engineering and science to the dairy industry, and raised the question as to the possibility of tank truck pickup service introducing many problems analogous to the thirty years of engineering to get continuous flow pasteurization to its present acceptable state. He raised the question: what will become of "the little fellow (the small producer or the small dealer)?"

"Let us all be most straightforward in our acts and deeds and our thinking. Let us disseminate facts and suppress fiction. Without any anticipation of personal glory, let us try the impossible—a place in the project for all, great and small, rich and poor, weak and strong."

GUIDES, STANDARDS, AND REGULATIONS

Paul Corash, B. S., LL. B.

Chief, Milk Division, Bureau of Food and Drugs
The City of New York Department of Health
New York, New York

"We do not believe that the solution to the problem lies in either tank sharing or every-other-day pick-up. We believe that the answer lies in the complete cooling of all milk, morning's and night's, and thus eliminating the need for a delivery deadline at the receiving station. Hauling routes could be made much longer and more pay-load could be hauled per truck. Thus, milk hauling could be a full-time job and only those seriously interested in doing a satisfactory job would stay in it."

The introduction of farm bulk milk handling necessitates a reorientation in our procedure so as to insure that milk quality will not suffer under the new conditions. In deck inspection, the examination of each individual can of milk must be replaced by a more rigid bacteria count standard, now tentatively set by New York City at 50,000 organisms per ml and a 10,000 thermoduric level. The milk house must be large enough to house the tank and clean it. He proposed quarterly veterinary examinations.

"The producer is faced with a new kind of job in caring for a cold wall tank and we think he should be helped as much as possible. On this basis we are asking for at least a monthly inspection by the company fieldman, a weekly bacteriological sample of producer's milk, and a weekly sample from the

Dr. Carl W. Larson received his B.S. at Iowa State College in 1906, his M.S. at Pennsylvania State College in 1911, and his Ph.D. at Columbia University in 1916. He rose at Pennsylvania State College to Professor and Head of the Dairy Department. His work with the Red Cross in France to develop and improve milk supplies for hospitals after World War I brought him commendation from Herbert Hoover. He headed the Dairy Division of the Bureau of Animal Industry. U.S. Department of Agriculture, and became the first chief when the division became the present Bureau.

In 1927 he was elected Manager of the National Dairy Council, after which he became associated with the General Ice Cream Corporation. He was a delegate to the International Dairy Congresses in Sweden in 1911, and London in 1928 He is a member of the American Dairy Science Association, American Association for the Advancement of Science. Alpha Zeta, Sigma Psi, and Gamma Sigma Delta. He was author of *Principles and Methods of Milk Cost Accounting* and co-author of *Dairy Cattle Feeding and Management.* He is a National Director of Boy Scouts, and holds membership in the Cosmos Club of Washington, and the Advertising, Athletic, Rotary, and Torch Clubs in Buffalo. He will continue to reside in Buffalo.

blended supply in the transportation truck. These samples are to be run by the Standard Plate method."

Every-other-day pick-up and use of tanks for more than one producer has introduced other problems. The former presumes on refrigeration to offset bacterial development, and the latter entails loss of identity—a regulatory difficulty.

"Tank handling of producers' milk has a very definite place in our milk industry. It is not a panacea for all the difficulties in milk handling nor is it free of problems. However, it would be a very serious mistake to distort the purpose of farm tanks, try to fit them into a job for which they are not intended, or use them as a cover-up for poor quality milk. It would be most unfortunate for producers and for the industry if over-zealousness and misguided application brought the cold wall tank into such disrepute as to arouse strong opposition even to its most advantageous use."

PRODUCTION AND TRANSPORTATION EXPERIENCE AND PROBLEMS

C. W. Weber, B.S., M.S.
New York State Department of Health

Before the end of the year, it is expected that the number of bulk tank routes in the New York area will equal a dozen. Quality as measured by bacteria counts has shown improvement by bulk hauling; a limit of 50,000 is easily met, many counts running below 10,000.

What is the situation regarding sediment, off-flavor, taste,—who knows, he queries. Mastitis control is less sensitive because of the dilution factor. Frozen milk is not entirely eliminated. He recommends cooling all milk to 45°F within one hour after milking. Some tank trucks may have difficulty in getting to or away from the milk house. Tanks can be kept "immaculate," and with "proper tools, good brushes, a rubber-coated bucket, warm water and a good detergent, a rinse hose, know how and application, there is no reason why the tank should not be kept immaculate. There is still opportunity to change and simplify the design of every tank so it can be more easily cleaned." Churning of fat during bulk transportation poses a problem that needs attention.

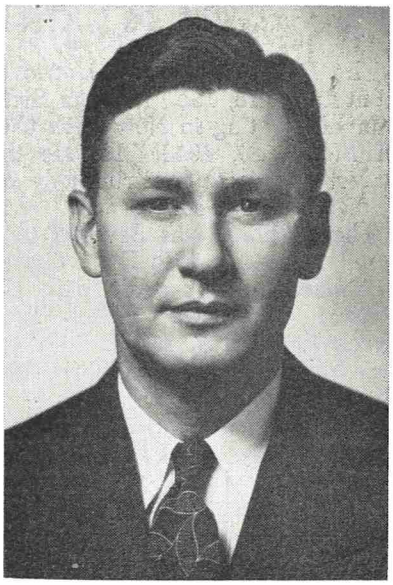
The tankers range in size from 1800 to 3300 gallons. The author thinks that the pump compartment is too small which entails coiling difficulty in cold weather. Both plastic and rubber hose are used but are difficult to clean and require frequent inspection and replacement. With new developments of ball joints, stainless steel piping may be practical. Hose can be kept sanitary by filling the hose immediately after washing and sanitizing with a 0.5 percent lye solution.

CHARTING THE COURSE FOR TOMORROW

W. S. Arbuckle, M.A., Ph. D.

Professor of Dairy Manufacturing University of Maryland, College of Agriculture, College Park, Maryland

The farm holding-tank system has been in use in Maryland for about two years. "There are now over 100 farm holding-tanks installed on Maryland farms and about 180,000 pounds of milk are handled daily by the system. Other tanks are being installed as rapidly as conditions permit. These tanks are serviced by 10 licensed tank trucks and 19 licensed tank truck drivers. The milk is delivered to 6 different milk processing plants from 12 routes. These plants have from 4 to 40 producers delivering milk by the pick-up system, and they receive from 5 to 40 percent of their milk supply from this source. The round-trip length of the routes ranges



from 70 to 140 miles. The capacity of the tank trucks is 1,500 to 2,000 gallons. There are 4 to 10 producers on each route. Some trucks serve as many as 4 routes on E. O. D. pick-up. It is the opinion that another truck should be added when there is need for more than two routes per day per truck. Pick-up time varies from 6:00 am. to 7:00 pm. during the day."

The farm tanks range in size from 150 to 1500 gallons, the average running 300 or 400 gallons. The majority will handle three milkings. These tanks are located on farms having 40 to 270 cattle with milk deliveries of 150 to 800 gallons daily.

"Generally, in converting from cans to holding tanks, the tank capacity is about one and a half times the daily can shipment or 100 gallon-capacity is allowed for each 20 cattle in the herd."

"Each tank truck is licensed as a receiving station, according to the regulations of the Dairy Inspection Service. The tank truck driver has the responsibility of measuring, sampling, and accepting or rejecting milk, and he must qualify for a weigher's-and-sampler's license by passing a practical-and-written examination, especially adapted to the bulk system."

Only limited information is available regarding the effect of bulk milk procurement on the quality of the milk received. The author knows of only one bulk-tank-load so rejected. Fourteen (out of 26) bonus shippers kept below a 15,000-count

and 45°F receiving temperature. A six-month average bacterial count on ten producers showed averages of 20,250 before tank installation, and 9,520 after. Another set during March through August averaged 18,300 before and 19,700 after. Both sets showed that "the quality of milk was maintained and in some cases improved by the bulk system."

"The following are typical of the costs and savings encountered by the producer when installing the farm holding tank:

Size of farm tank	500 gal.	400 gal.	200 gal.
Type of tank	Cold wall	cold wall	Cold wall
Cost of tank only	$2,683.00	$2,450.00	$1,825.00
Installation costs			
Alterations to milk house	$25.00	$25.00	None
Refrigeration changes	$75.99	$735.99*	$550.00*

*Complete new refrigeration hook-up, including new compressors.

Advantages:			
1. Labor-saving per week	No estimate available from producer	12 hours $9.00	7 hours $5.25
2. Product savings volume	1½ percent	1 percent	1 percent
Fat at test increase	0.1 percent	0.2 percent	0.05 percent
3. Savings in hauling charges	0.04 cwt.	None	None
4. Estimated time for savings to pay for tank	28 months	30 months	41 months
5. Savings due to elimination of replacement costs on 10-gallon cans per year	$100.00	$50.00	$30.00
6. Any other savings	.....	$6.80 per month elec.	.....

The producers report that one of the greatest advantages of the farm tank in this market, is better-satisfied help. All agree that they would not want to go back to the use of cans."

HISTORICAL DEVELOPMENT

W. E. Krauss, B.S., Ph. D.

Associate Director Ohio Agricultural Expericent Station
Wooster, Ohio

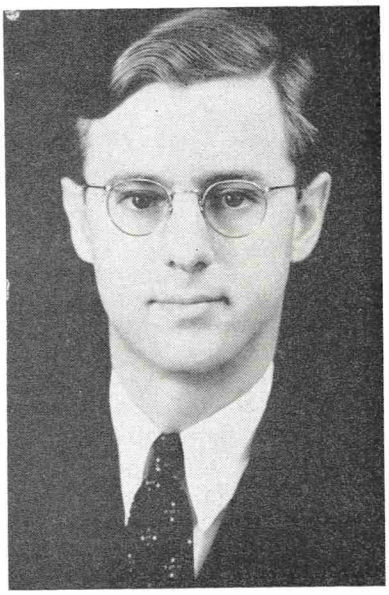
The effort to improve the sanitary quality of milk brought about the enactment of milk ordinances which raised many controversial questions. Lack of definiteness as to what constitutes quality in milk, led to so many contradictions and embarrassing economic situations that the Agricultural Board of the National Research Council requested in January, 1946, creation of a joint committee of the Agricultural Board and the Food and Nutrition Board of the National Research Council "to deal with the milk marketing problem arising from sectional barriers, public health regulations, etc."

In June, 1946, the newly-formed Joint Committee on Milk Production and Distribution found itself confronted with a wide divergence of opinion as to a definition of milk quality which could provide minimum standards for market milk—the first step, it was felt, in initiating a study of the problem. To obtain the most expert advice and to enlist the interest and cooperation of national scientific, professional, and industry organizations, the following organizations were requested to each nominate one person to serve on a committee to recommend standards for market milk:

American Dairy Science Association
International Association of Milk Sanitarians
American Public Health Association
International Association of Milk Dealers, and the
National Cooperative Milk Producers Federation.

A Committee on Milk Production, Distribution and Quality finally was set up consisting of C. J. Babcock, R. K. Froker, A. W. Fuchs, C. G. McBride (now deceased), Leland Spencer, W. D. Tiedeman, and W. A. Wentworth,

with this author as chairman. John D. Faulkner later replaced A. W. Fuchs. The Director of the Dairy Branch of the Production and Marketing Administration, U.S.D.A., Col. C. J. Babcock, was designated representative of the Department to aid in developing and carrying out the contract. Dr. LeRoy Voris was the efficient executive secretary.



Dr. LeRoy Voris, Executive Secretary, Food and Nutrition Board, National Research Council, practicipated in the administration of the contract with the U. S. Department of Agriculture, and served as Secretary for the committee during the progress of the research. His executive ability is responsible for much of the success of the investigation.

The investigation covered two distinct phases of research:

1. a study and compilation of state statutes and regulations and municipal ordinances and regulations and the associated administrative and enforcement procedures which set up sanitary standards and give rise to regulatory procedures; and
2. an intensive study, including field investigations, laboratory work, and other research methods and activities as are deemed necessary for the purpose of determining the effect upon the quality of fluid milk products of specific sanitary standards and specific regulatory procedures of a selected group of not less than five jurisdictions (milk markets).

Dr. A. C. Dahlberg was made Director of the Project, assisted by H. S. Adams and later by H. E. Held.

In July, 1950, the first phase of the study was reported in *Bulletin* 121, *National Research Council* entitled, "Sanitary Milk and Ice Cream Legislation in the United States." This was a compilation of the data obtained from a study of the regulations and ordinances in 48 states and in 84 cities with populations of more than 100,000. This report constituted the basis for development of the second phase of the project, involving a detailed study of the sanitary aspects of the milk supply of eight major milk markets of the United States: Rochester, Boston, Washington, Louisville, Memphis, Houston, Sacramento, and Minneapolis."

The results of this study have been published, and constitute the subject of the next paper on this panel.

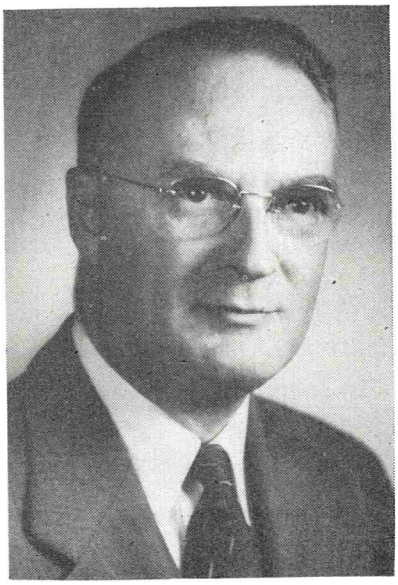
EXPERIMENTAL PROCEDURES AND RESULTS

A. C. DAHLBERG, B.S., M.S., Ph. D.

Professor of Dairy Industry, Cornell University, Ithaca, New York

The research was conducted by a traveling field staff and by a staff located at a central laboratory in St. Paul. After careful deliberation, the cities of Birmingham, Boston, Houston, Louisville, Minneapolis, Rochester, Sacramento, and Washington were selected for this investigation. In the field work conducted in these cities, the equipment, buildings, and methods of milk production and processing were scored by either of two experienced milk sanitarians. Sanitary scorings of farms and milk plants were rated in three grades of satisfactory compliance and a fourth rating of zero.

Samples of raw and pasteurized milk were taken, and the raw milk was analyzed in a local laboratory by our traveling laboratory technician. The pasteurized milk and cream were packed with dry ice and shipped air express to St. Paul where they arrived the following



morning about the time consumers received similar milk at their homes in the city where the samples were collected. The samples generally arrived at 32-40°F. Here in the same laboratories, all samples of milk were tested by the same laboratory technicians and milk judges.

If Official Methods were available, they were always used for bacteriological and chemical analyses. The same four to six men scored all samples of milk for flavor. Each quart of milk was examined only on the day it was opened and an opened bottle of milk was never stored for future tests.

*Grouping of Cities as to Details and Rigidness of Enforcement of Requirements

Enforced on	Group 1 Most rigid and detailed	Group 2 Intermediate	Group 3 Least rigid and detailed
Dairy farms	Birmingham Sacramento Washington	Houston Louisville Minneapolis	Boston Rochester
Milk plants	Birmingham Houston Minneapolis	Louisville Sacramento Washington	Boston Rochester

DETAILS AND ENFORCEMENT OF REGULATIONS

The eight cities were placed in three groups on the basis of details of farm and milk plant regulations. The farm regulations of Group 1* were most detailed, and included some items unusual in other ordinances. Examples of these items were cow yards specified distances from milking barns, exact blue prints for construction of barns and milk houses, flowing water under pressure in barns, two-room milk houses, one selected procedure for sanitizing equipment, hot water at not less than 180°F under at least 15 pounds pressure or live steam in milk houses, etc. Due to the rigid enforcement of a limited number of essential requirements, the milk supplies of these cities in Group 1 were particularly excellent. On the other hand, the regulations of the cities in Group 3 did not require hot or cold water and a wash vat in the milk house for washing dairy farm equipment.

The extent of details and enforcement of milk plant regulations did not always agree in grouping with the farm regulations as milk plant regulations were stressed in some cities more than dairy farm regulations and vice versa.

FACTORS AND REGULATIONS AFFECTING THE QUALITY OF RAW MILK

The quality of raw milk for pasteurization is generally determined by the bacterial content. Only two conditions given in regulations could be definitely associated with bacterial counts. First, it was found that

> generally, those cities which were given high scores for the cleanliness of and effective bactericidal treatment given utensils and milking machines on farms in their producing areas, had low bacterial numbers in both the raw and pasteurized milk. Furthermore, clean barns, sows and milk houses were found generally on the farms with the clean barns, cows and milk houses were less clean on farms where dairymen were not required to have wash vats and hot water in the milk houses; hence, it is concluded that these two items should be required by city ordinances and state laws.

Secondly,

> when the night's milk was received at the plant at any average temperature of 50°F or above, the bacterial counts were noticeably high; hence, the regulations should specify cooling milk on the farm to 50°F or below, except for milk to be delivered to the receiving plant immediately after milking.

It is interesting to note that the milk with the lowest bacterial content was generally supplied to the cities whose dairymen produced the most milk per day per farm.

The milk of no city studied caused any known milk-borne diseases so that research would not establish the essential factors in controlling disease organisms in raw milk. However, it was recommended that the numbers of these organisms be held low or eliminated by such regulations as healthy cows, control of flies, use of potable water and proper disposal of human sewage. Although the cows of all cities generally would be considered to be healthy, there was only limited control of mastitis and brucellosis.

Apparently clean pasteurized milk was sold in all cities due to the efficiency of clarification or filtration in the plants. The actual cleanliness of the raw milk was not ascertained as this determination would need to have been made on the milk before straining on the farm. The data showed

> however, that those producers who cleaned the udders well before milking by washing with water or by wiping with a cloth moistened with a sterilizing solution, supplied their cities with (raw) milk of lowest coliform count, an indication of cleanliness.

There has been, and probably always will be, much difference of opinion regarding the relative merits of dairy farm inspections and of testing milk as received at the plant as methods of insuring the production of milk of high quality. This study has emphasized the need for a limited number of basic farm requirements, such as facilities for sanitizing equipment and cooling milk. The presence of such facilities can be determined by inspection prior to accepting the milk supply. That sanitary conditions on the farm attain a degree of perfection acceptable to consumers and sanitarians, can be ascertained only by inspection.

> However, on an average there was no statistically significant relationship between the number of farm inspections by sanitarians of the health departments and the bacterial counts of the milk.

Nevertheless,

> the bacterial counts of the milk were lower for these cities where there was the smallest number of farms per fieldman employed by the milk companies and producer cooperatives.

The reasons will be evident from the succeeding paragraph.

Examination of the raw milk delivered to the plant is essential to determine if proper physical equipment on the farm is being used correctly to produce high quality milk. Hence, it was not surprising to learn that

> the bacterial counts of the milk decreased as the number of samples of milk tested yearly per producer for bacteria increased.

Generally, health departments tested too few samples of milk for the results to serve as a basis for actual field work with individual producers.

> The laboratories of the milk companies tested five times as many samples of milk of producers as the health departments. When the samples of milk of individual producers, were tested at least twice a month, sufficient information was obtained on milk quality to enable the fieldmen of the milk companies and farm cooperatives and sanitarians of the health departments to work intelligently with dairymen to assure reasonable compliance of the milk with bacterial standards.

It was recommended that routine farm inspections be made twice yearly by sanitarians of the health department and that raw milk samples of each producer be tested twice a month.

There was no definite scientific or public health reason for any exact bacterial standard. Hence, the usual standard of 200,000 bacteria per ml for raw milk, was empirically chosen. A standard of 20,000 bacteria per ml (for pasteurized milk—Editor) is more in line with this raw milk standard than 30,000 per ml as usually stated in ordinances. The reason for this conclusion is the fact that thermoduric bacteria in raw milk averaged two percent and rarely exceeded ten percent of the total count. There is no public health reason to increase the severity of satisfactory sanitary milk regulations when the industry easily and regularly complies with them.

FACTORS AND REGULATIONS AFFECTING QUALITY OF PASTEURIZED MILK

In most cities the milk plant regulations were more detailed, uniform and rigidly enforced than the dairy farm requirements. This ought to be true as any marked deviation from good practice in milk plants could have serious consequences. The basis of actual practice for pro-

cessing a good pasteurized supply may be stated simply as consisting of:

(1) Clean raw milk of good flavor with low numbers of bacteria without excessive proportions of thermodurics,
(2) proper cleaning and bactericidal treatment of equipment and containers,
(3) efficient pasteurization and bottling without recontamination, and
(4) prompt cooling and storage at 45°F or lower.

The two most frequent violations of these essentials occurred in the quality of the raw milk and in the temperature of storage of the pasteurized milk after bottling. Proper adherence to good practice can be ascertained by weekly inspection of the milk plant and of the pasteurized milk by the health department.

The bacterial content of the fresh pasteurized milk of all cities was about 6,000 per ml. The raw milk contained no thermoduric coliform bacteria. The coliform count of the fresh pasteurized milk was less than one per ml; the psychrophilic count was one per ml; and both counts constituted re-contamination after pasteurization. The fresh pasteurized milk, after inoculation with lactic starter, soured as rapidly as milk known to be free from antibiotics, disinfectants, etc.

Feed flavor, usually silage in the winter and grass or weed in the summer, predominated in the fresh pasteurized milk. Nevertheless, the flavor of the fresh milk generally scored good and this good flavor was retained for four days storage at 44°F (actually five days after pasteurization). After seven days at 44°F, the flavor of the pasteurized milk often was not good and some samples scored zero. The flavor of the pasteurized milk of only three cities was good after seven days storage in the refrigerator. The predominating off-flavors in the seven-day-old milk were "unclean" and "oxidized." Milk stored at 33°F scored higher than milk held at 44°F. The quality of the flavor of the fresh pasteurized milk and of the milk after storage in the refrigerator, could not be correlated with the apparent sanitary conditions of milk production and processing.

Bacterial growth occurred in pasteurized milk stored for four days at 44°F but the counts averaged less than the usual standard for fresh pasteurized milk. Such milk was acceptable in sanitary quality. However, after seven days at 44°F the pyschrophilic bacterial numbers were approximately one million which were too high to consider the milk of good sanitary quality. None of the seven-day old samples showed increased acidity. After seven days at 33°F the bacterial counts of the pasteurized milk were lower than in fresh milk. Hence, the temperature of storage is particularly critical in the keeping quality of milk. There was no correlation between the rate of growth of bacteria in pasteurized milk held in the refrigerator and the sanitary quality or total bacterial counts of the raw or fresh pasteurized milk. The bacteria in the pasteurized milk held in refrigerators grew most rapidly in the winter.

There is a real need for determining keeping quality of pasteurized milk in all cities. It is not determined by any tests now made. It is not improved by specific sanitary regulations for all of the milk supplies in this study were sufficiently good to eliminate bacterial growth or contamination in the raw milk as a cause of poor keeping quality of the pasteurized milk. The pasteurized milk kept well enough to permit every-other-day or three-times-a-week delivery. Unless the keeping quality of milk is improved or the milk is stored at colder temperatures than now usually employed, it is obvious that once-a-week delivery of milk should not be encouraged.

NUTRITIVE VALUES

So far as I am aware, this is the first study of the nutritive properties of pasteurized milk of the United States conducted on a nation-wide basis. All of the plants whose milk was sampled in the eight cities studied, processed about 8,000,000 quarts of milk on the days the samples were taken.

The composition of the milk of the eight cities was rather uniform. Standardization of the fat content of some of the milk by adding skim milk or cream occurred in five of the cities. The butter fat content of the milk was 3.81 percent and the solids-not-fat content was 8.62 percent. There were small, statistically-significant differences in the solids-not-fat content of the milk of some cities. These differences were not always due to standardization as milk of the same fat content without standardization in two cities had differences in the percentages of solids-not-fat which were statistically significant.

The protein content of the milk, 3.25 percent, was slightly lower than expected. It is probable that the protein content of milk has decreased during the past 40 or 50 years.

The specific gravity of the milk was exactly as given in most books, namely 1.032. The freezing point of the milk was −0.540°C, a result which is higher than the standard given for normal milk by the Association of Official Agricultural Chemists. The milk of only one city had an average freezing point as low as that given by the Association of Official Agricultural Chemists. The differences in freezing points of milk were statistically significant. The milk supplies were wholesome, safe, and free from adulteration, except that the milk of two processors in one city contained a few per cent of extraneous water.

CONCLUSION

The eight cities studied in this research had healthful, sanitary milk supplies. The sanitary regulations varied widely. The personnel of the health departments cooperated completely in this study and their earnest, sincere efforts to assure a good milk supply for their cities, has been very successful. There is need, however, for all health departments to reconsider their programs to assure a minimum of regulations strictly enforced but with recommended sanitary practices that are not required. The dairy industry must continue to do its full part in producing a milk supply of quality acceptable to consumers and health departments.

1. Dahlberg, A. C., Adams, H. S., and Held, M. E., *Sanitary Milk Control and Its Relationship to the Sanitary, Nutritive, and Other Qualities of Milk. Publication* 250, National Academy of Science-National Research Council, Washington, D. C., 1953.

ECONOMICAL ASPECTS OF THE STUDY OF SANITARY MILK CONTROL

Leland Spencer
Professor of Marketing
Cornell University
Ithaca, New York

This study originated from a recommendation of the first committee, with a predominance of economists, that a second committee on milk quality be set up, and then later the combined committees recommended a thorough study of sanitary milk regulations as related to milk quality.

The final report devotes only two pages to economic considerations. It maintains that sanitary requirements do entail expenses that add to the cost of milk production, processing, and distribution all of which determine how much the consumer must pay. But these are not the major items in retail prices. The report states that reasonable financial satisfaction and stability are essentials of sanitary milk production. Furthermore, the average bacterial content of the milk decreased as the producing farms became larger.

PRELIMINARY COMMITTEE PLAN FOR ECONOMIC STUDIES

A preliminary plan developed by the committee called for a study in three parts, namely:

1. A study of ordinances, regulations, and enforcement.
2. A study of the quality of milk in certain markets as related to the regulations in effect.
3. A study of economic and farm management factors.

Part 1 was carried out as originally planned except that only incidental attention was given to the enforcement of regulations. Part 2 was the subject of the major study with which the forthcoming report deals. Its scope was reduced to come within the limits of available funds, and only eight cities instead of a larger number were studied intensively. Part 3, as previously explained, was divorced from the project for which federal funds were allotted and has not been implemented as yet. What was contemplated by the committee along that line may be of some interest to this audience.

The introductory statement to Part 3 reads as follows: "The regulations (or some of them) add to the capital requirements of dairy farms and plants and to the costs of production and distribution especially as to fluid milk and cream. In some instances, the regulations also restrict the sources of supply for particular markets and the movement of supplies from producing areas. Duplication of inspection and conflicting regulations imposed by different agencies upon common sources of supply may be serious in some areas. . . . The opinion is widely held that some regulatory measures and trade practices do not contribute significantly to the wholesomeness of the milk supply, but tend to increase the cost of milk and to restrict its availability to consumers, and are not in the public interest."

The plan of work for investigating the economic and farm management factors related to sanitary milk regulations was outlined by the committee in the following terms:

"In the selected marketing areas, conduct appropriate economic studies with particular attention to the influence of both essential and non-essential regulatory measures upon capital requirements, labor requirements, and other costs in production and distribution; also the effects of these measures upon the supply of milk available.

"Gather information as to restrictive policies pertaining to areas of inspection, the granting of permits or licenses to producers and distributors, and other factors affecting the availability of milk.

"Trace insofar as practicable the effects of the conditions disclosed in preceding paragraphs upon sources of supplies for the various markets, freight charges, returns to producers, seasonal surpluses and shortages, storage operations, competition among distributors, spreads between producer prices and consumer prices, and the cost and availability of milk."

SANITARY REGULATIONS AS TRADE BARRIERS

Only incidental reference is made in the report of this study to the problem that likely was uppermost in the minds of those representatives of the National Research Council who were chiefly responsible for initiating this committee effort. I refer, of course, to the problem of artificial barriers which tend to restrict the supply and to enhance unduly the price of milk for fluid use in various urban centers. The authors report that: "Conditions of the production of the milk supply of some cities in this study did not conform with the sanitary regulations of others." Two cities, Washington, D.C. and Rochester, New York, are cited as examples, but no estimate is given of the influence of dissimilar regulations upon the sources, availability, or cost of city milk supplies.

It is my impression that the trade barrier problem as related to milk and cream has diminished in importance in recent years, yet it may still be worthy of careful study. The extent to which the movement of milk supplies to markets is impeded or the cost of milk to consumers unduly enhanced by so-called artificial barriers is often exaggerated. Milk producers in areas remote from the large urban centers are told that they would receive measurably higher prices if it were not for such wicked trade barriers. Actually few markets would get their supplies of fluid milk from greater distances if there were no sanitary regulations to be considered. High transportation costs attributable to the bulkiness and perishability of milk are the barriers which prevent distant milk supplies from finding profitable outlets in the eastern cities.

Artificial barriers in the form of restrictive health department regulations or inspection policies do exist in some instances with respect to cream. If all such barriers were eliminated, the principal effect

would be to make cream available to dealers, manufacturers, and consumers at somewhat lower prices. Then the markets would not look so attractive to far-away producers and shippers, but the consumption of cream would be somewhat greater.

DO HEALTH DEPARTMENT REGULATIONS CONTRIBUTE TO NATIONAL SURPLUSES OF DAIRY PRODUCTS?

Probably New York State, with its great urban population, is one of the chief offenders in the matter of using health department regulations to limit the sources of fluid cream. Such restrictions make it possible for farmers within the protected zone to get more for that part of their milk which goes to market as fluid cream. For the year 1952, the monthly prices New York City dealers were required by federal and state ordered to pay for such milk averaged 70 cents per 100 pounds higher than the corresponding price paid by Boston dealers. Boston is a wide-open market and gets large shipments of cream from as far west as Indiana, Wisconsin, and Minnesota. The extra price paid for milk used for making fluid cream by New York City dealers meant an added cost of about $6 per 40-quart can of heavy cream. Reported platform prices of cream in New York during 1952 averaged $8.80 a can, or 27 percent, higher than the Boston price. However, much of this extra cost of product seems to have been absorbed by the distributors who handled it.

Retail prices of cream were only a cent or two higher per half-pint in New York than in Boston. In Buffalo and Rochester, retail prices of cream exceeded the Boston prices by about 4 cents to 7 cents a half-pint, depending upon the grade of cream and whether it was delivered to homes or sold at stores.

Considering all grades of cream and all types of sales outlets, it seems probable that New York City dealers sold cream for about 5 to 10 percent more than Boston dealers received in 1952, and that Buffalo and Rochester dealers got about 15 to 20 percent more than the Boston price.

Only a very rough estimate can be made as to how much the quantity of cream sold was affected by the excess of actual prices charged over open market prices. Some investigations have indicated that consumers change their purchases of cream in almost direct proportion to a change in price. Very little evidence is available concerning the responses of restaurants and other wholesale users to changes in the level of cream prices. Probably the usual over-all adjustment in cream purchases is somewhat less than 10 percent for a 10 percent change or difference in price.

We would get an outside estimate of the effect of artificially enhanced cream prices in New York, Buffalo, and Rochester if we assumed that the total cream sales were depressed by the same percentage that the selling prices of cream in these markets exceeded the Boston prices. On this basis, the answer is that cream sales in the three largest markets of New York State in 1952 were perhaps as much as 78,000 40-quart cans less than they would have been in the absence of an arbitrary restriction of supplies. That much cream would make about 3 million pounds of butter, which is not quite 3 percent of the quantity Uncle Sam has purchased since last November to sustain the market price previously guaranteed by him.

It may be argued with some merit, of course, that lower prices for milk going into fluid cream would necessitate higher prices for that part of the milk supply sold as fluid milk. Just now, however, the milk supplies for all of these markets are more than ample. A slightly lower farm price probably would not cause a shortage.

Producers located too far from the eastern markets to ship fluid milk to them are sometimes told that burdensome national surpluses of butter and other dairy products are caused by the maintenance of artificially high prices for fluid milk through federal or state milk orders. It is asserted that high order prices for fluid milk lower the consumption of milk and thereby create surpluses which compete in the butter, cheese, concentrated milk, and powdered milk markets to the detriment of producers whose milk regularly goes into these manufactured products. Health department regulations have a bearing on this, since they tend to limit the number of producers eligible to participate in the fluid market, and thereby set the stage for over-pricing.

In 1947 milk surpluses in the northeastern milksheds were below normal. In each of the markets, supplies were short in the fall. November surpluses in percentage of the total supplies for Boston, New York, Buffalo, and Rochester were respectively: 8.2 percent, 3.2 percent, 7.2 percent and 5.1 percent. Ordinarily 10 percent to 15 percent of surplus milk is considered necessary to allow for day-to-day fluctuations and lack of even distribution among the many dealers and cooperatives. Further indication of the inadequacy of city milk supplies in the Northeast in 1947 in found in the fact that Boston received considerable quantities of milk from Ohio, Indiana, Michigan, Wisconsin, and Minnesota during the month of November.

Since 1947 milk production in these four marketing areas has increased 22 percent, while fluid sales gained only 3.4 percent. In 1952 the quantity of surplus milk was 3.8 billion pounds, compared with the subnormal surplus of 2.3 billion pounds in 1947. The increase of 1.5 billion pounds in surplus volume since 1947 is a somewhat inflated measure of the contribution of these four city milksheds to the national surplus of manufactured dairy products. It represents 2.9 percent of the total quantity of milk used in the production of manufactured dairy products in 1952.

The formulas used for determining the minimum prices Boston and New York dealers are required to pay for fluid milk each month include supply-demand adjustment factors. As the percentage of surplus increases, the prices are pulled down automatically. This important provision for keeping the supply of approved milk in proper balance with fluid sales has been in effect only a few years. It has already brought considerable reduction in the prices dealers pay for fluid milk. As usual, however, the farmers in these milksheds have not curtailed their production promptly in response to the reduction in prices received.

This very limited effort to evaluate the problem of health department regulations as trade barriers

and Price enhancement made possible in part by such regulations, is of course inadequate. The economic studies originally contemplated by our committee would, I believe, provide the more complete information that would be required as a basis for recommending appropriate solutions of this problem.

PUBLIC HEALTH ASPECTS

PUBLIC HEALTH ASPECTS

John D. Faulkner
Chief, Milk and Food Branch, Division of Sanitation U. S. Public Health Service, Federal Security Agency, Washington 25, D. C.

"In this study the attributes of quality were considered to be (1) freedom from disease-producing bacteria and toxic substances, (2) low bacterial count, (3) freedom from foreign material, (4) good flavor, (5) satisfactory keeping quality, and (6) high nutritive value."

The investigators found that bacterial counts were lowest from farms where utensil sanitation was the greatest. The advantage of using hot and cold water with a two compartment wash vat in the milk house was clearly manifested. Raw milk with the lowest bacterial count was produced on the farms that received the highest scores for clean cows, clean barns, and clean milk houses. The lowest coliform counts were associated with the cleaning and bactericidal treatment of udders.

The straining of milk on the farm invalidated the significance of the sediment test as an indication of clean milking methods. Cooling to less than 50°F was essential unless delivered immediately after milking.

Bacterial standards of milk for pasteurization ranged all the way from 75,000 to 400,000 per ml, the most common being 200,000. There was no reason deduced that warranted the enforcement of lower and lower bacterial standards without public health justification. No statistical correlation was found between the number of farm inspections made by the health department and the bacterial content of the milk. But the count ran lowest in those cities where the number of farms per fieldman of the companies and producer cooperatives were lowest.

No significant relationship was found between the bacterial counts of the milk and the number of samples tested per year by the health departments. However, such a correlation could be drawn on the basis of the industry laboratory work when samples from the producers were examined at least twice a month.

Non-essential requirements. No relationship could be determined between the final quality of the raw milk and such regulatory items as:

(1) specifying that the cowyard of milk house shall be located a certain minimum distance from the milking barn,
(2) detailed specifications for the construction of barns and milk houses,
(3) special requirements for feed storage and walk-ways,
(4) requirements that water under pressure be available in the barn,
(5) requiring that the milk house be divided into at least two rooms, rather than one,
(6) requiring that only a given method be used for bactericidal treatment, or cooling, when there are other methods which give equivalent results, and
(7) specifying that milk must be conducted into the milk house by means of a pipeline.

The plant requirements of the eight cities were more uniform, detailed, and rigidly enforced than were the dairy farm requirements.

The essentials for processing a safe, sanitary milk supply in the plant were considered to be:

1. clean raw milk of good flavor and of low bacterial count without excessive numbers of thermoduric bacteria,
2. proper cleaning and bactericidal treatment of equipment and containers,
3. efficient pasteurization in equipment with adequate controls so as to insure the destruction of all disease-producing bacteria,
4. efficient bottling,
5. protection of pasteurized milk against recontamination,
6. sanitary surroundings, and
7. prompt cooling of the pasteurized milk to 45°F or less, and holding at such temperature.

As regards the detailed requirements for pasteurization, it was found that the plants complied with the regulations, both for equipment and methods, except for a few plants which did not use air-space heaters or which left vat covers open during pasteurization. Laboratory data supported these findings. Phosphatase tests were all negative on milk, and only one cream sample out of a total of 168 samples was positive. (This cream had been pasteurized in the unapproved equipment in a very small plant.)

Equipment for cooling, bottling, and capping was generally satisfactory, and complied with the regulations. Other milk plant equipment was usually found to be in good condition and in compliance with the regulations. Toilet and lavatory facilities were also generally found to be satisfactory. The methods of bactericidal treatment employed usually included hot water, steam, and chlorine, used alone or in combination with one another in overall plant operation. Bottles were generally rinsed with a chlorine solution, but an appreciable number of plants rinsed with city water. Although the pasteurization plants were usually well constructed and in good repair, there were a few plants which were not entirely satisfactory.

Refrigeration temperatures were in general higher than considered good practice. In general, it was found that electrically operated refrigerators for storing milk on dairy

(Continued on page 152)

Association News

AFFILIATES OF

International Association of Milk and Food Sanitarians

Approved Inspectors Association of Southeast Pennsylvania

Pres., Dr. Roy F. Davenport..Philadelphia
Vice-Pres., William Snyder ..... Lebanon
Sec., Clarence M. Moss, 612 S. 24th St., Philadelphia 46, Pa.
Treas., Robert H. Keen .....Lancaster
Ch. Exec. Comm., Dr. C. W. Livak, York

Associated Illinois Milk Sanitarians

Pres., Dr. H. C. Wiley ..... Chicago
Pres. Elect., Harold B. Richie.....Chicago
1st Vice-Pres., Dr. L. E. Booth....Chicago
2nd. Vice-Pres., Al M. Frankovich ..Joliet
Sec.-Treas. P. E. Riley, 1800 W. Fillmore St., Chicago, Ill.
Sergeant-At-Arms, Harry Cohen....Chicago
Auditors
Dr. Richard S. Guthrie .....DeKalb
L. C. Peckham ..... Chicago

California Association of Dairy and Milk Sanitarians

Pres. C. A. Whipple ..... Stockton
1st Vice, William Whitton .... Bellflower
2nd Vice, D. A. Cordray ..... Santa Rosa
Sec.-Treas., E. R. Eichner
Agri. Bldg. Embarcadero & Mission, San Francisco, Calif.

Connecticut Association of Dairy and Milk Sanitarians

Pres., Fred K. Armstrong ..... Branford
Vice-Pres., Alfred H. Jackson ....Hartford
Secretary, H. Clifford Goslee, 356 Palm St., Hartford, Conn.
Treas., Curtis W. Chaffe ..... Hartford

Dairy Sanitarians Association of the Del-Mar-Va Peninsula

Pres., M. T. Harrison ..... Lewes, Del.
Vice-Pres., Wilmer Ulsh ..... Ridgely, Md.
Sec. William Baumgart, 622 East Division St., Dover, Del.
Treas., Steve Racz ..... Goldsboro, Md.

Dairy Sanitarians Association, of North Central Pennsylvania

Pres. James G. Eck ....South Williamsport
Vice-Pres., Galen Furry .....Martinsburg
Treas., Earl F. Hack ..... Mexico
Sec., C. D. Herbster, Selinsgrove,, Pa.

Executive Committee:

Dr. S. M. Ross ..... Williamsport
I. E. Parkin ..... State College
G. C. Kern ..... Milton
Harry T. Daddario ..... New Berlin

Florida Association of Milk Sanitarians

Pres., L. L. Chaffee ..... St. Petersburg
Vice-Pres., C. O. Stoy ..... Miami
Sec.-Treas., H. H. Wilkowske, Assistant Professor of Dairy Manufactures, U. of Florida, Gainesville, Fla.
Past Pres., R. R. Hood ..... Pensacola
Directors:
W. H. Brown ..... Jacksonville
R. D. Lundy ..... Moore Haven
Sam Noles ..... Jacksonville
J. D. Robinson ..... Plant City
H. H. Rothe ..... Gainesville

Indiana Association of Milk and Food Sanitarians

Pres., George White ..... Evansville
Pres.-Elect, Russell Cunningham..LaPorte
1st Vice-Pres. John Schlegel Indianapolis
2nd Vice-President., William Geller, ... Ft. Wayne
Sec.-Treas., Joseph Holwager, 1330 W. Michigan St., Indianapolis, Ind.
Auditors:
Ralph Potesta ..... Hammond
Ronald Brown ..... Richmond

Iowa Association of Milk Sanitarians

Pres., James Evers ..... Cedar Rapids
Vice-Pres., Ray A. Belknap ....Des Moines
Sec.-Treas., F. W. Kreamer, State Dept. of Health, Des Moines, Iowa.

Kansas Association of Milk Sanitarians

Pres. Grove Gilliland ..... Dodge City
1st Vice-Pres., Frank Kelley ..... Parsons
2nd Vice-Pres., John Mullinix ..... Kansas City
Sec.-Treas., Ivan Van Nortwick 1237 Tenn. St., Lawrence, Kansas
Auditors:
Kenneth Ticknor ..... Topeka
Leslie Forward ..... Wichita

Michigan Association of Sanitarians

Pres., Lyle Littlefield ..... Lansing
1st Vice-Pres., Winfred Ettesvold ..... Grand Rapids
2nd Vice-Pres., Clifford Bracy ....Lansing
Sec.-Treas., Robert Lyons Lansing, Mich. (City Hall)

Directors:
C. V. Roose Rupert Spaudling
Jerald Peters.
Past Pres., Milo Wilson

Minnesota Milk Sanitarians Association

Pres., Owen Owens ..... Rochester
Vice-Pres., R. M. Olander .....St. Paul
Sec.-Treas., Dr. J. C. Olson, Jr., 217 Wildwood Ave., Whitebear 10, Minn.
Board of Directors:
Thomas Stibal Ruben W. Koivisto
Leonard G. Sinton Robert R. Dalton
C. H. Mattson A. L. Sjowall

Missouri Association of Milk and Food Sanitarians

Pres. George Bauers ..... Springfield
Vice-Pres. John H. Fritz ....Kansas City
Sec.-Treas., J. L. Rowland, 7905 Bellview St., Kansas City, Mo.

New York State Association of Milk Sanitarians

Pres., Henry W. Lehmkuhl .... Rochester
Vice-Pres., Paul Corash ....New York City
Sec.-Treas., C. W. Webber, 18 Dove St., Albany 6, N. Y.

MEMBERS OF THE BOARD

Fred Uetz ..... New York City
George H. Hopson, D.V.M...Poughkeepsie
Prof. James C. White ..... Ithaca
Mr. Claud Woodward, Past President

Oklahoma Association of Milk and Food Sanitarians

Pres. D. C. Cleveland ..... Durant
1st Vice-Pres., R. Kay Mathews ....Atoka
2nd Vice-Pres., R. L. Howell....Tahlequah
3rd Vice-Pres., Berl Poe .....Muskogee
Sec.-Treas., Tom Green, County Bldg., Room 206, Oklahoma City, Okla.

Oregon Association of Milk Sanitarians

Pres., C. C. Deal ..... Portland
Sec.-Treas., Lawrence J. Christensen 1313 S.E. 12th St., Portland 14, Oregon

Rocky Mountain Association of Milk and Food Sanitarians

(Colorado, New Mexico, Utah, Wyoming, Nebraska, Montana)
Pres., James M. Doughty, Jr. ..... Santa Fe, New Mexico
President-Elect., Eugene Tuttle ..... Ogden, Utah
1st Vice-Pres. Ray Iiams Sheridan, Wyo.
2nd Vice-Pres. Dr. W. A. Hoskisson ..... Salt Lake City, Utah
Sec.-Treas., Peter Stevenson, Rocky Mountain Training Center, 3298 South Holly, Denver 20. Colorado
Auditors:
Hugh Templeton ..... Omaha, Neb.
Thomas McMasters .....Helena, Montana

South Dakota Association of Sanitarians

Pres., Fred Hansen ..... Sioux Falls
Vice-Pres., Ira Dehaai ..... Spearfish
Sec.-Treas., J. F. Tinker, State Dept of Health, Pierre, So. Dakota
Executive Board:
Past Pres. Don Wilson .....Mitchell
Elec. Member, Chas. Halloran, ...Pierre,

Virginia Association of Milk and Food Sanitarians

Pres., E. R. House, ... Norfolk
1st Vice-Pres J. F. Tolley .....Abingdon
2nd Vice-Pres., W. P. Whitmore ..... Woodstock
Sec.-Treas., A. A. Pais
Sec.-Treas., A. A. Pais, State Health Dept.
Auditors:
L. E. Brubaker ..... Chester
E. Lee Everett ..... Suffolk

WASHINGTON STATE MILK SANITARIANS ASSOCIATION

Pres., M. L. Strommer ..... Olympia
Vice-Pres., Robin C. Wilson ..... Seattle
Sec.-Treas., George Andrews, 1626 Smith Tower, Seattle 4, Wash.

WISCONSIN MILK SANITARIANS ASSOCIATION

Pres. Chester L. Anderson ..Oconomowoc
Vice-Pres., J. A. Keenan, Jr. ....Madison
Sec.-Treas., L. Wayne Brown, 421 Chemistry Bldg., U. of Wisc., Madison 6, Wis.
Director (1953-54) Philip C. Newman ..... Beaver Dam
Director (1953) Herman H. Platte ..... Madison & New London

NOTICE

Fourth National Conference of Interstate Milk Shipments will be held at the Statler Hotel, St. Louis, Missouri, on June 9-10, 1953.

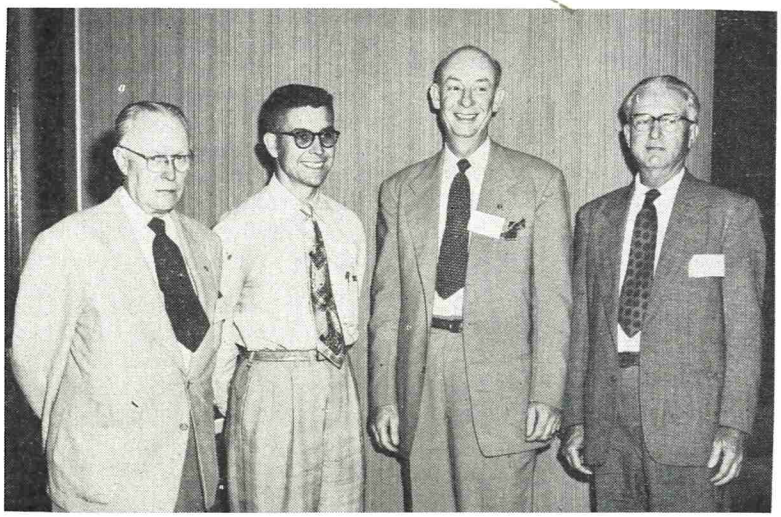
NINTH ANNUAL CONFERENCE REPORT OF THE FLORIDA ASSOCIATION OF MILK SANITARIANS

The Florida Association of Milk Sanitarians met on the University of Florida Campus, March 31 to April 3, 1953, with over 100 in attendance. H. L. Thomasson, the popular executive secretary of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., and his charming wife visited sunny Florida for the first time to attend this meeting. "Red" Thomasson made a big hit with the crowd in his discussion of the activities and organization of the International, and his visit helped win many friends and created a better understanding of the mutual problems facing the Florida Association and its parent organization, the International. "Red" Thomasson was initiated into the Ancient and Honorable Society of Yellow Dogs and is now a card-carrying member of the Florida Pine Stump Kennel.

The milk laboratorians have formed an affiliate section and conducted their annual meeting during the first two days, under the chairmanship of Hugh Butner, Bacteriologist, State Board of Health. The guest speaker for the laboratorians' meeting was Dr. R. P. Myers, Training Section Bacteriologist from the Environmental Health Center, Cincinnati. This short course included discussion, identification, laboratory practice, and interpretation of the coliform tests as well as a discussion and demonstration on the direct microscopic grading of milk.

Dr. E. L. Fouts, Head of the Department of Dairy Science, discussed the problem of vegetable fats in dairy products. Professor W. A. Krienke of the University of Florida dairy faculty reported on research being conducted on the use and application of the Lactometer and Dr. L. E. Mull reported on the overall evaluation of a fiber milk carton. D. A. Dahlberg, Plant Manager, presented a HTST cleaning demonstration. Other faculty members where—Dr. A. P. Black, Head of the Chemistry Department a recognized authority on water treatment who pointed out the importance of giving consideration to water quality in the cleaning and sanitization of dairy equipment. Professor J. E. Kiker, Professor of Civil Engineering, discussed waste disposal for dairy farms and dairy plants, and J. M. Johnson, Extension Agricultural Engineer, lead a panel discussion of Farm Dairy Structures which clearly pointed to the need for greater agreement of all sanitarians in respect to giving approval to various types and arrangements of dairy farm structures.

Mr. C. A. Abele of the Diversey Corporation, by popular demand again appeared on the program and discussed some of the 3-A Standards basic features such as material and fabrication details, and also reported on the latest developments in cleaning dairy equipment by circulation. Sam Noles, milk consultant, State Board of Health, led a dairy farm inspection tour, assisted by Dr. H. H. Rothe, State Dairy Supervisor, Dairy Division of the State Department of Agriculture, both of whom also participated in the Farm Structures panel discussion. L. P. Bickenbach, Florida representative for Mojonnier Brothers Company, discussed and showed slides concerning the sanitary aspects of the bulk milk system. Tom Payne, managing partner of Tekni-Craft, Manufacturers of Taylor Freezers, Rockton, Illinois, discussed counter-freezer sanitation, and C. K. Hill, Florida distributor, demonstrated freezer cleaning.



Left to Right—C. A. Abele, H. H. Wilkowske, H. L. Thomasson, H. H. Rothe.

The Florida Dairy Association, E. T. Lay, Executive-Secretary, sponsored a get-together and entertainment for an evening banquet and door prizes. The other two nights were taken up with a picnic and a business meeting. At the business meeting delegate reports of the Minneapolis meeting were made by H. H. Rothe and H. H. Wilkowske. A newly revised constitution was adopted, and officers and directors were elected for the ensuing year (see page 149).

A proceedings manual containing copies of all papers presented at this meeting is being prepared and distributed to all attending persons by the General Extension Division, University of Florida, who conducted this conference.

H. H. WILKOWSKE,
Secretary-Treasurer

OHIO STATE SHORT COURSE

A milk Sanitarians' Short Course was held at Ohio State University March 16-20, 1953. The Department of Dairy Technology, Ohio State University, the Ohio Department of Health, and the Ohio Department of Agriculture cooperated in carrying out this program.

After being welcomed by Dr. I. A. Gould, chairman, Dept. of Dairy Technology, Dr. K. G. Weckel, Dept. of Dairy and Food Industry, University of Wisconsin, addressed the group. His talk entitled "Problems You and I Must Face" sounded the keynote of the five day program.

In order to better understand and solve the problems a comprehensive training program was followed. Demonstrations and explanations of plant equipment, demonstrations inspections, individual inspections and discussions of these, group discussions of assigned topics and an examination kept the registrants busy 8:30 am until 5:00 pm each day.

The registrants were invited, members of the Ohio Department of Agriculture, state, county, and local health departments, and various dairy plants throughout Ohio.

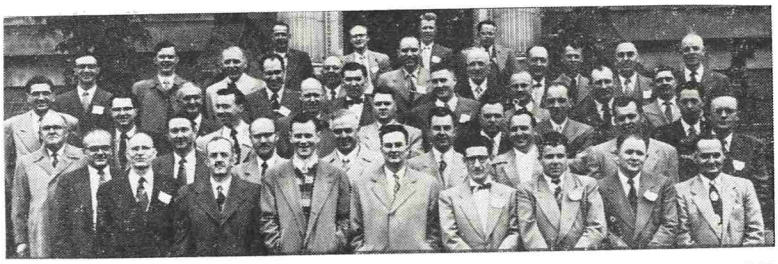
INSTITUTE OF DAIRYING CELEBRATES ITS SILVER ANNIVERSARY

A large and enthusiastic group of dairymen gathered at the State College of Washington at Pullman for an industry conference packed with information and fun. The conference which in recent years has been consistently attracting approximately 300 attendants looked back upon 25 years of continuous growth starting with eight white clad dairymen gathering around the old Simplex churn which was in use in the College Creamery in 1928.

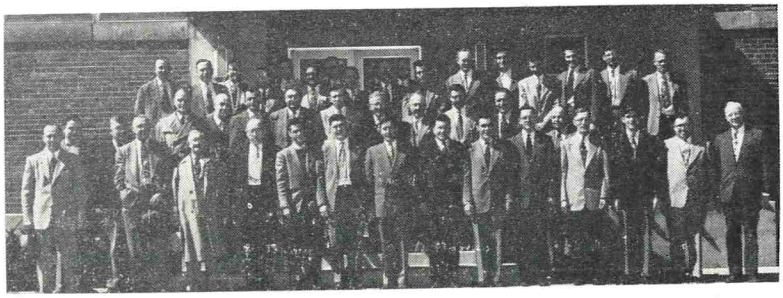
Separate sessions were held by the Washington Milk Sanitarians Association, David Jones, Everett, President, and the Washington Section of the National Association of Sanitarians, under the chairmanship of Professor O. H. Johnson, Pullman.

The new officers are announced on page 150 of this issue.

Mr. Estel Beck of the Yakima City Creamery, Yakima, was chosen to succeed the late Jack Shrader of the Cascade Gold Star Dairies of Yakima as a director of the Washington State Dairy Foundation. Newly elected officers of the Dairy Institute Alumni Association are Al Sturm, Arden Farms Inc., Seattle, President; Lyall Searing, Seattle King County Health Department, Seattle, Vice-President; Dr. H. A. Bendixen, W.S.C., Pullman, Secretary-Treasurer.



Members of the Washington Milk Sanitarians' Association at the Institute of Dairying in Pullman, Washington.



Milk Sanitarians' Short Course, 1953.

MILK SANITARIAN AS HEALTH EDUCATOR IN WHO

All milk sanitarians are health educators. But only a few have acquired the official title, with the world as their field of activity. That, however, is what has happened to Theron H. Butterworth, former Chief Milk Sanitarian in the Texas State Health Department.

In 1944-5 Mr. Butterworth, a member of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., took the University of North Carolina public health course, then headed by Dr. M. J. Rosenau. After completing the course he returned to the Public Health Service, as Health Education Consultant, and in 1948 he was made Assistant Chief of the Service's Division of Public Health Education.

From that position Mr. Butterworth went, in 1951, to the World Health Organization: WHO. At the time of writing he is a health educator on the staff of the Director General of WHO. Their offices are in the Palais des Nations, Geneva, Switzerland.

P.B.B.

PUBLIC HEALTH ASPECTS

(Continued from page 148)

farms was colder than those in milk plants.

The bacterial counts for pasteurized milk ran:

Percentage of raw count:	2 percent
Below 30,000 per ml	91 percent
Below 20,000 per ml	86 percent
Logarithmic average on all counts	5,980 per ml
Coliforms in	less than 1* per ml
Psychrophils	1* per ml

(*recontamination after pasteurization)

The report recommends that health departments make laboratory tests of pasteurized milk at least once a week, and further states that testing should include temperature, sediment, bacterial plate count, coliform count, and the phosphatase test. Analyses for butterfat and specific gravity should also be made, and when the addition of water is suspected the total solids and freezing point should be determined.

Inspections of milk plants in each city revealed violations of what are considered to be essential sanitary requirements.

Tests in pasteurized milk showed that it kept well for four days when properly refrigerated—ample for every-other-day or three-times a-week delivery. However, when kept at 44°F for 7 days, off-flavors and bacteria developed. No relationship was observed between the sanitary conditions of milk production on the farm and the keeping quality of the pasteurized milk.

Sale of raw milk was prohibited in six out of the eight cities studied. Six cities limited sales to only one grade, and only one grade was sold in seven cities.

This study showed that those dairy farms subjected to the most detailed regulations and rigid enforcement procedures produced milk of the best sanitary quality, as measured by its bacterial content. However, the findings indicate that this was due to strict enforcement of a limited number of essential requirements. While many other detailed requirements might be useful, the study concluded that since they are not essential they should be recommended rather than required.

EFFECT OF SELECTED ANTIBIOTIC

Continued from Page 127

substitute for unsanitary practices. There is no particular advantage in adding these compounds to a good quality dairy product.

REFERENCES

1. Curran, H. R., and Evans, F. R., The Activity of Penicillin in Relation to Bacterial Spores and the Preservation of Milk. *J Bact.*, **52**, 89-98, (1946).
2. Foley, E. J., and Byrne, J. V., Penicillin as an Adjunct to the Preservation of Quality of Raw and Pasteurized Milk *J. Milk and Food Technol*, **13**, 170, (1950).

A SANITATION PROBLEM

Continued from Page 139

problem would be so serious as to justify suitable modifications in the water supply system. A thorough cleaning of water tanks and lines may be required in some instances.

LITERATURE CITED

1. Burgwald, L. H. and Josephson, D. V. The Effect of Refrigerator Storage on the Keeping Qualities of Pasteurized Milk. *J. Dairy Sci.* **30**, 371-383 (1947).
2. Elliker, P. R. Effect of Various Bacteria on Diacetyl Content and Flavor of Butter. *Ibid* **28**, 93-102 (1945).
3. Elliker, P. R. and Horrall, B. E. Effect of Growth of *Pseudomonas putrefaciens* on Diacetyl and Flavor of Butter. *Ibid* **26**, 943-949 (1943).
4. Erdman, I. E. and Thornton, H. R. Psychrophilic Bacteria in Edmonton Milk and Cream. I. Numbers. *Can. J. of Technology* **29**, 232-237 (1951).
5. *Ibid.* II. Kinds. *Loc. cit.* **29**, 238-242.
6. Jezeski, J. J. and Macy, H. Cryophillic Organisms in Water and Butter. *J. Dairy Sci.* **29**, 439-452 (1946).
7. Long, H. F. and Hammer, B. W. Classification of the Organisms Important in Dairy Products. III. *Pseudomonas putrefaciens. Iowa Agri. Res. Bul.* 285. (1941).
8. Parker, R. B., Smith, V. N., and Elliker, P. R. Bacteria Associated with a Gelatinous or Slimy Curd Defect of Cottage Cheese. *J. Dairy Sci.* **34**, 887-893 (1950).
9. Rojick, F. A. and Burgwald, L. H. A Study on Psychrophilic Bacteria in Market Milk. *Loc. cet.* **33**, 403 (1950). (Abstract).
10. Thomson, G. I. *Pseudomonas putrefaciens* in New Zealand Butter. *J. Dairy Res.* **17**, 66-71 (1950).
11. Weber, G. R. and Black, L. A. Laboratory Procedure for Evaluating Practical Performance of Quaternary Ammonium and Other Germicides Proposed for Sanitizing Food Utensils. *Amer. J. Pub. Health*, **38**, 1405-1417 (1948).

CONNECTICUT ASSOCIATION OF DAIRY AND FOOD SANITARIANS

Our Association now has 265 members, and all memberships must include affiliate membership in the International and obviously subscriptions to the Journal.

At our coming annual meeting in

May, it is proposed that we change our fiscal year to correspond to the fiscal year of the International. Notice of our Spring Meeting will be released within a few days. The meeting will be held on Wednesday, May 13, at the Waverly Inn, Cheshire, Connecticut. This is a very convenient location and a large attendance is expected.

The great interest in bulk milk cooling at the farm, and tank truck pick-up service throughout the Connecticut Milk Shed makes it necessary to again discuss this subject even though the situation has been reviewed at recent meetings. Other subjects which are closely associated with cold wall tanks and tank truck pick-up, namely, in-place-cleaning, and equipment standards including approval by the 3A Standards Committee, will be discussed.

Representatives from USPHS have been invited to announce the changes in the Standard Milk Ordinance and Code. Another subject for discussion will be the freezing and deep freezing of bakery products.

H. CLIFFORD GOSLEE
Secretary

MYRON C. NELSON

Myron C. Nelson, 36, one of three Sanitarians from the Sioux Falls Health Department injured in a car accident near Highmore on February 18, died in the Miller Hospital on February 26.

Myron was born in Lake Preston and lived in that vicinity until 1949 when he accepted a position with the Sioux Falls Health Department as Food Sanitarian.

He lived at 1714 S. Prairie Ave. in Sioux Falls and is survived by his wife Margaret and three small children, Carolyn, 8, Gary, 4, and Greg, 4 months and his parents, Mr. and Mrs. Mons Nelson of Sioux Falls. He was a member of Our Saviour's Lutheran Church in Sioux Falls.

Myron was a conscientious, hard-working representative of public health in Sioux Falls. In addition, he carried on an interested responsibility in community and state affairs. At the time of his death he was attending Augustana College part-time and would have had his B.S. degree in June.

The loss of Myron C. Nelson is a very real one among the circle of public health workers in South Dakota.

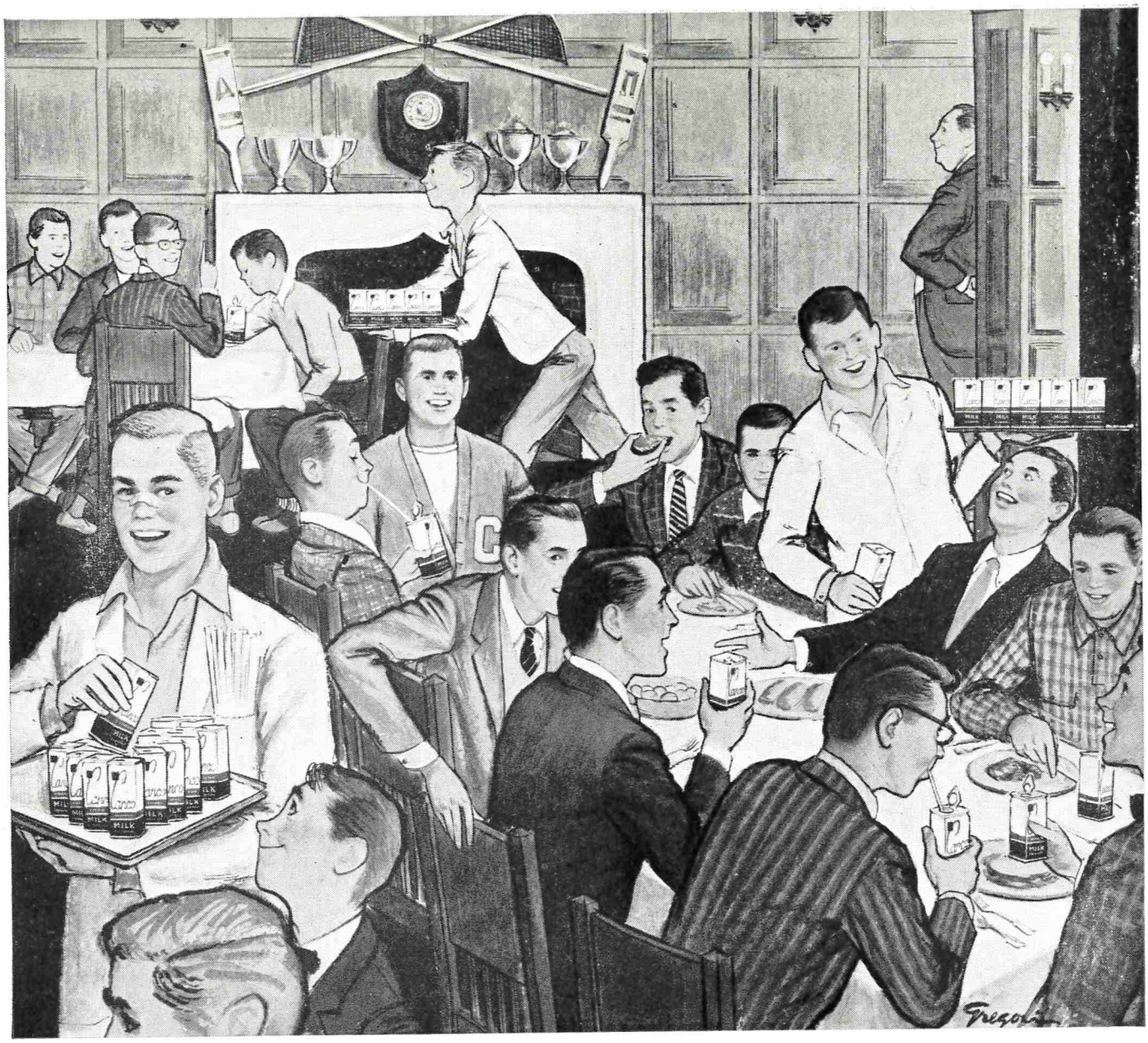
RECORD ATTENDANCE AT KLENZADE 17th ANNUAL SEMINAR

More than 600 persons attended the Klenzade 17th Annual Educational Seminar recently held at Kellogg Center, Michigan State College, East Lansing, Michigan. Registrants included leaders in the dairy and food industries, prominent scientists, bacteriologists, public health officials and sanitarians, from practically every region of the United States.

Kellogg Center, famous throughout the United States as an ultra-modern hotel as well as a training center for hotel and restaurant management students, proved to be an ideal meeting place for the ever-growing Seminar. More than a dozen spacious and ideally equipped meeting halls were available for the panel meetings, and luncheons and dinners were served with a dispatch that would do credit to any one of the country's largest hostelries.

More than 100 sanitation specialists and prominent educators were represented in the roster of guest speakers.

The three day meeting consisted principally of panel sessions beginning at 8:00 o'clock in the morning and continuing to 5:30 p. m. each day. These sessions covered specific topics including high temperature equipment cleaning, can washing, corrosion of food equipment, corrosion of food utensils, circulation or inplace cleaning, dairy farm sanitation, sanitation chemistry, sanitation bacteriology, institutional sanitation, mechanical dish washing, canning plant sanitation, and egg and poultry plant sanitation. Evenings were devoted to consulting panels whereby many nationally known authorities were made available for consultations on specific problems. Smorgasbord was served every evening at 10:00 p.m. and a closing banquet was enjoyed by all present.



Why you can be proud of this picture

If you are a public health official, you can take pride in the fact that fresh, healthful milk is now available almost everywhere in its most convenient form . . . in the Canco disposable milk container.

Much of the credit for this advance must go to public health officials, since it is you who recognized early that the disposable milk container is one of the great milestones on the road to better milk distribution.

So acceptable is this container today, that billions are produced by Canco each year, and the demand from homes . . . offices . . . factories . . . schools . . . is constantly growing.

Canco appreciates your support of the disposable milk container —the container that helps people live better.

CONTAINERS . . . to help people live better

AMERICAN CAN COMPANY CANCO

INDEX TO ADVERTISERS

Notice

Attractive Membership Lapel Button and Decal

Now Available

Convolution — Blue . . . . Circle & Bar — Silver . . . . Field — Blue
Letter "S" — White . . . . Lettering — Blue

ACTUAL SIZE

No. . . . . 3 1/4" Decals @ 25c each =$. . . . . .

No. . . . . Lapel Buttons @ $1.00 each = $. . . . . .

International Association of Milk & Food Sanitarians, Inc.
Box 437, Shelbyville, Indiana

Notice

Announcing student Membership Rate of $3.00 per year which includes Journal of Milk and Food Technology.

Name .....
Please print

Address .....

.....

College or University ..... Dept. .....

Under-Graduate Class .....

Application for Membership

INTERNATIONAL ASSOCIATION OF MILK & FOOD SANITARIANS, Inc.

Box 437, Shelbyville, Indiana

Name ..... Date .....
Please Print

Address ..... ☐ New

..... ☐ Renewal

Business Affiliation ..... ☐ Re-instatement

Annual Dues $5.00 ☐ Check ☐ Cash

(Membership Includes Subscription to Journal of Milk & Food Technology.)

(Please Print)

Recommended by .....

Subscription Order

Box 437
Shelbyville, Ind.

JOURNAL OF MILK & FOOD TECHNOLOGY

Name ..... Date .....
Please Print

Address ..... ☐ New

..... ☐ Renewal

Educational & Institutional Libraries (Annually) $3.00. Individual Subscription (Annually) $5.50.

☐ Check ☐ Cash

(Please Print)

I. A. M. F. S. & J. M. F. T.
Box 437, Shelbyville, Ind.

Change of Address

FROM

Date .....

Name .....
Please Print

Address .....

TO

Name .....
Please Print

Address .....

(Please Print)

I. A. M. F. S. & J. M. F. T.
Box 437, Shelbyville, Ind.

Order for 3A Standards

Name ..... Date .....
Please Print

Address .....

( ) Complete Set @ $1.50 = ... ( ) Complete set bound (durable cover) @ $3.50 = ...

Order for Reprints of Articles

Amt. ..... Title .....

Schedule of prices for reprints F. O. B. Shelbyville, Indiana

	1 Page	2 Pages	3 & 4 Pages	6 & 8 Pages	12 P.	Cover
100 or less	$ 8.50	$15.00	$21.00	$30.00	$50.00	$21.67
Add'l. 100's	1.60	1.60	3.00	4.20	7.00	3.37

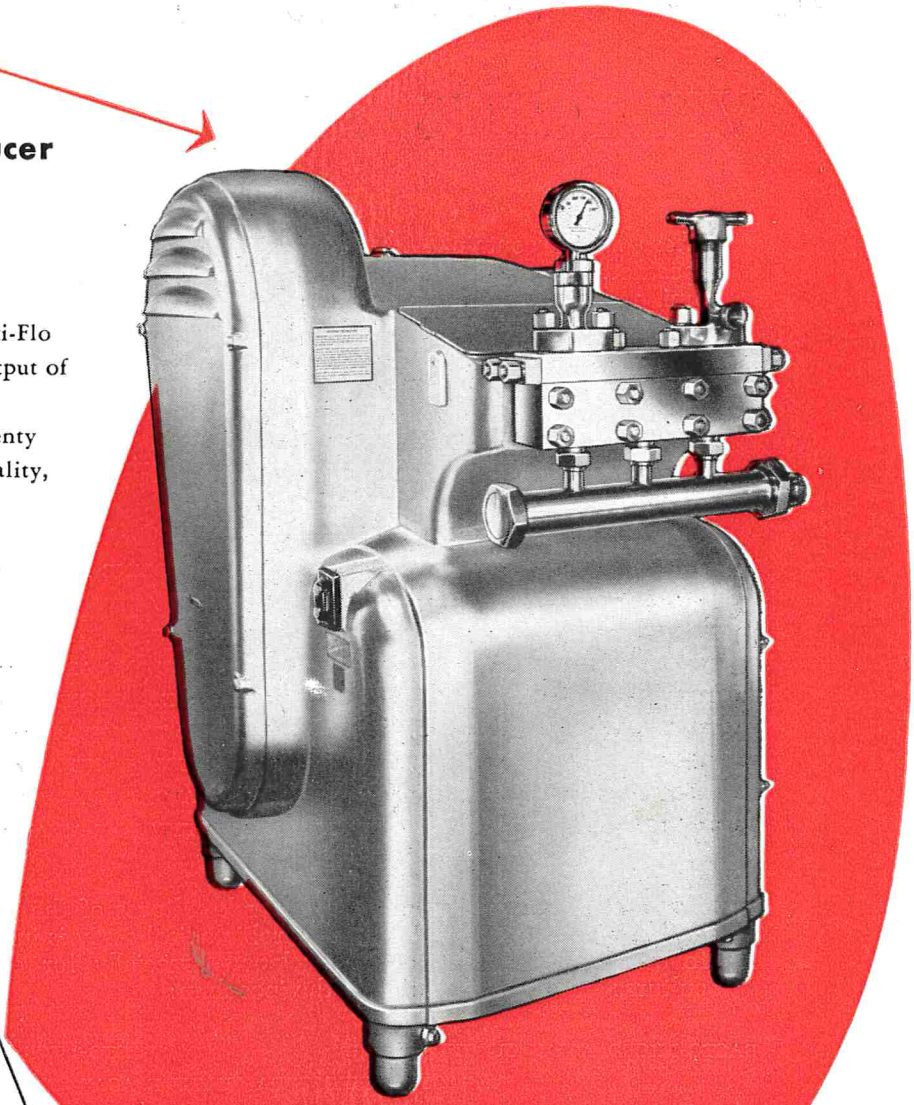
Presenting

THE NEW Multi-Flo 2500 Gallon per Hour HOMOGENIZER

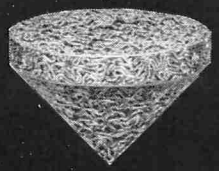
Here's a new, big producer that's easy to use, easy to clean, and holds down costs

With this new, BIG capacity CP Multi-Flo Homogenizer, you can handle the output of a 20,000 pound per hour HTST Pasteurization system easily, with plenty of reserve capacity. You'll get the quality, fine taste and appearance for which products processed with CP Homogenizers are noted—and all with profit-building economy.

Whatever your requirements, from 125 g.p.h. to 2500 g.p.h., you'll find CP has a Multi-Flo Homogenizer that fits your needs... with all the features that give you superior homogenization at low cost. Write for the interesting details today.



CP's latest contribution to modern, high-efficiency dairy operation



Featuring

THE CP SINGLE-SERVICE VALVE

The original and exclusive replaceable valve that lets you have *new homogenizer performance* with uniform quality on every run—and costs only pennies!

THE *Creamery Package* MFG. COMPANY

General and Export Offices: 1243 W. Washington Blvd., Chicago 7, Illinois

Sales Branches: Atlanta • Boston • Buffalo • Chicago • Dallas • Denver • Houston • Kansas City, Mo. Los Angeles • Minneapolis • Nashville • New York • Omaha • Philadelphia • Portland, Ore. St. Louis • Salt Lake City • San Francisco • Seattle • Toledo, Ohio • Waterloo, Iowa

CREAMERY PACKAGE MFG. CO. OF CANADA LTD.
267 King Street, West, Toronto 2, Ontario

THE CREAMERY PACKAGE MFG. COMPANY, LTD.
Mill Green Road, Mitcham Junction, Surrey, England

DIFCO

Bacto-Dehydrated Media for Microbiological Assay of

VITAMINS and AMINO ACIDS

These media contain all the necessary nutriments for the growth of specified test organisms for the microbiological assay of vitamins and amino acids except for the component under assay. These basal media require only the addition of specified increasing amounts of the vitamin or amino acid being assayed to obtain a growth response which may be measured by acidimetric or turbidimetric methods for the construction of standard curves. The vitamin or amino acid content of the material under assay is determined by adding appropriate concentrations of the test substance to the basal medium and comparing the growth response obtained with that of the standard.

BACTO-RIBOFLAVIN ASSAY MEDIUM
BACTO-NIACIN ASSAY MEDIUM
BACTO-THIAMIN ASSAY MEDIUM
BACTO-PANTOTHENATE ASSAY MEDIUM
BACTO-B_{12} ASSAY MEDIUM USP
BACTO-CS VITAMIN B_{12} AGAR
BACTO-FOLIC ACID ASSAY MEDIUM
BACTO-PYRIDOXINE ASSAY MEDIUM
BACTO-BIOTIN ASSAY MEDIUM
BACTO-CHOLINE ASSAY MEDIUM
BACTO-CF ASSAY MEDIUM
BACTO-TRYPTOPHANE ASSAY MEDIUM
BACTO-LEUCINE ASSAY MEDIUM
BACTO-METHIONINE ASSAY MEDIUM
BACTO-LYSINE ASSAY MEDIUM
BACTO-ISOLEUCINE ASSAY MEDIUM
BACTO-ARGININE ASSAY MEDIUM
BACTO-TYROSINE ASSAY MEDIUM

The method employed in carrying stock cultures of the test organisms and preparing the inoculum for microbiological assay is important. The following media have been developed especially for carrying stock cultures and for preparation of the inoculum:

BACTO-MICRO ASSAY CULTURE AGAR
BACTO-MICRO INOCULUM BROTH
BACTO-NEUROSPORA CULTURE AGAR

BACTO-VITAMIN FREE CASAMINO ACIDS, dehydrated, is an acid hydrolysate of vitamin free casein prepared especially for laboratories investigating microbiological assay of vitamins.

Descriptive literature available upon request

DIFCO LABORATORIES

DETROIT 1, MICHIGAN

Printed in U. S. A.