SEPTEMBER, 1959
Vol. 22 No. 9

Journal of

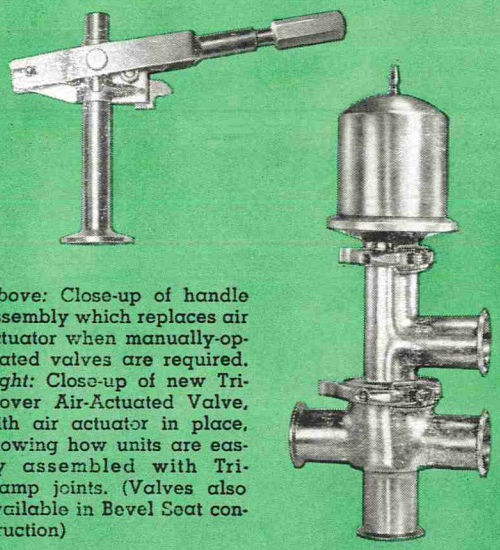
MILK and FOOD TECHNOLOGY

Official Publication

International Association of Milk and Food Sanitarians, Inc.

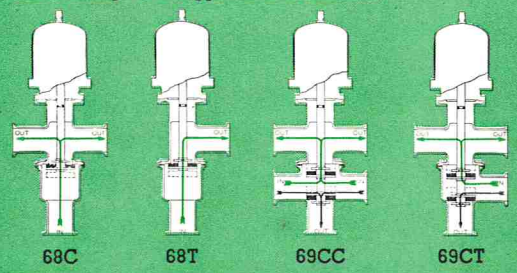
TRI-CLOVER *Air Actuated* VALVES

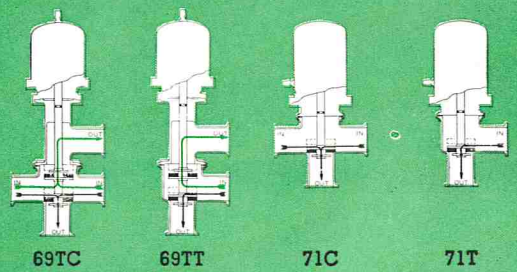
to meet a wide range of Dairy, Food and Beverage processing operations



Above: Close-up of handle assembly which replaces air actuator when manually-operated valves are required. *Right:* Close-up of new Tri-Clover Air-Actuated Valve, with air actuator in place, showing how units are easily assembled with Tri-Clamp joints. (Valves also available in Bevel Seat construction)

The drawings below show the various Tri-Clover Air-Actuated Valve arrangements available. The *black* arrows show inlet and outlet ports when the plug is in the "UP" position. Inlets and outlets when the plug is lowered to the "DOWN" position are indicated with the *green* arrows. Valves are available in 1½" and 2" O.D. sizes as standard. Data on sizes up to 4" available on application. (Note that both single-acting and double-acting valve types are available.)





Tri-Clover Division's Air-Actuated Sanitary Valves permit easy application of automation and automatic control to many phases of processing and cleaning operations in the dairy, food, and beverage industries. These efficient, air-actuated valves can be locally controlled . . . or remote-controlled from any plant area. Advanced design makes them ideal for use in completely automated installation, such as recirculation operations for in-place cleaning . . . or in a single operation, such as on a filling machine. Manufactured from type 304 stainless steel, these efficient, remote-controlled valves offer fast, positive liquid flow control in any line location, with accurate local or remote control.

Built to extremely high sanitary standards, Tri-Clover Air-Actuated Sanitary Valves assure maximum uninterrupted flow, with a minimum of agitation and friction.

For full details, write for Bulletin A-658, or see your nearest Tri-Clover Distributor.

TRI-CLOVER

LADISH CO.

Tri-Clover Division

Kenosha Wisconsin

IN CANADA: Brantford, Ontario
EXPORT DEPT.: 8 South Michigan Ave.,
Chicago 3, U. S. A. Cable: TRICLO, Chicago

-858

Profitable Brands Start With Cherry-Burrell

Smart shopper. Taking home plenty of dairy foods. And choosing the best tasting brands. She knows her family will eat more of healthful dairy foods when she can count on quality.

Chances are the brands she chooses are processed with Cherry-Burrell equipment. A consistently good product is Cherry-Burrell's business. The kind of product that earns and keeps consumer preference. A quality product that sells well, makes profit for you.

In-plant profits, too. Processing that product more efficiently and at lower cost is another Cherry-Burrell specialty. One of the more important profit producers to come from C-B Research and Development Engineers is a modern materials handling system. Cherry-Burrell's complete line of conveyors, chain, stackers, unstackers, automatic casers and automatic combining and diverting equipment will substantially reduce your handling costs.

A Cherry-Burrell Sales Engineer will study your operation, work with factory specialists if needed, and help you convert to a modern, cost-cutting materials handling system.

His services are yours without obligation regardless of your final decision. Let him show you how you can increase your profits. Call him today.

Your only complete source of profit-engineered dairy equipment, service and supplies. Sales and service in 58 cities.

CHERRY-BURRELL
CORPORATION
CEDAR RAPIDS, IOWA

Dairy • Food • Farm • Beverage • Brewing
Chemical • Equipment and Supplies

The Journal of Milk and Food Technology (including Milk and Food Sanitation) is issued monthly beginning with the January number. Each volume comprises 12 numbers. Published by the International Association of Milk and Food Sanitarians, Inc., with executive offices of the Association, Blue Ridge Rd., 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. C. Olson, Jr., Associate Editor, Dept. Dairy Husbandry, University of Minn., St. Paul, Minn.; H. L. Thomasson, Managing Editor, P. O. Box 437, Shelbyville, Ind.

Manuscripts: Correspondence regarding manuscripts and other reading material should be addressed to J. C. Olson, Jr., Associate Editor, Dept. Dairy Husbandry, University of Minn., St. Paul, Minn.

"Instruction to Contributors" can be obtained from the Editor for the use of contributors of papers.

Journal of

MILK and FOOD TECHNOLOGY

INCLUDING MILK AND FOOD SANITATION AND MILK TECHNOLOGY

Official Publication

International Association of Milk and Food Sanitarians, Inc.

REG. U. S. PAT. OFF.

Vol. 22 September No. 9

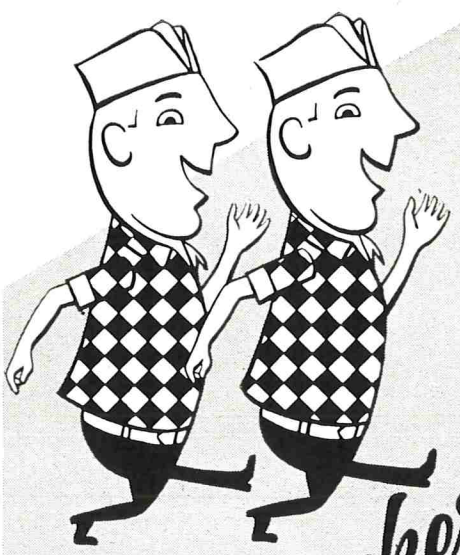
Contents *Page*

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. ---------- $8.00
Public and Educational Libraries, 1 yr. ---------- $6.00
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 **$7.00 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.



Startermakers in Step with the Times

USE MATRIX

PERFECT MOTHER CULTURE MEDIA

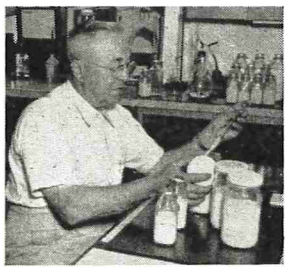
PRETESTED FOR GROWING *Perfect* MOTHER CULTURES

Does Not Contain Culture Organisms

Matrix is the modern sure-result way of preparing mother cultures. It's simple, convenient, time-saving — but above all, you can be certain of highest activity and a true-to-character propagation of the original culture strain. Matrix is the perfect growth media . . . packed in 2.5 oz. sterile envelopes in handy dispenser cartons. You merely add 540 cc. of water. Be in step with the times . . . use Matrix — perfect mother culture media.

"I get better results and uniformity with MATRIX," says Karl Renter,

Kolb-Lena Cheese Co., Lena, Illinois, maker of famous "Kolb Camembert," "Delico Brie," "Old Heidelberg" and other fine cheeses. Winner of over a score of awards, cups, and ribbons. "I like using Matrix a lot better than the old way."



3 special Matrix calibrated culture flasks and a package of disposable pipettes will be included without charge with your first order. Complete step-by-step instructions.

Handled by the Best of Jobbers Coast-to-Coast

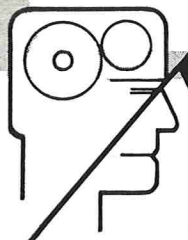
GALLOWAY-WEST COMPANY, FOND DU LAC, WIS.

KLENZADE

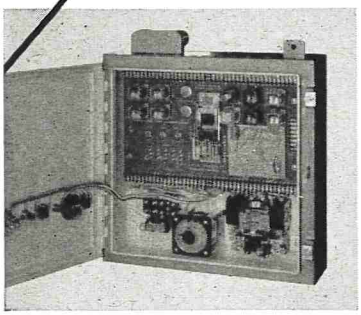
KLENZMATION®

Automated Cleaning of

STORAGE TANKS AND BULK PICK-UP TANKS

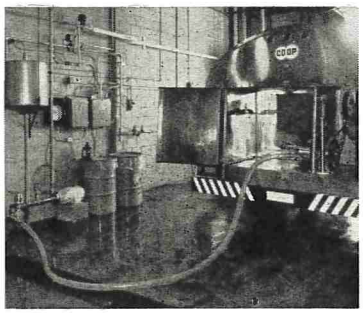


Pre-Engineered "Package" AUTOMATION SYSTEMS



KLENZMATION CONTROL CENTER

Complete automation components ready for installation. Fully automatic system pre-engineered to reduce costs. Provides complete cleaning cycles with controlled detergent and water usage. Automatic time and temperature control. Also new improved Klenz-Spray units for cleaning bulk pick-up tanks and storage tanks. Only Klenzade offers this wide choice of selective components and matching systems.



KLENZMATION TANKER WASHING INSTALLATION

Most Versatile Systems Yet Devised

Write for Illustrated Literature

KLENZADE **KLENZADE PRODUCTS, INC.**

Systematized Sanitation ALL OVER THE NATION

BELOIT WISCONSIN

PRESIDENTIAL ADDRESS[1]

Franklin W. Barber, President

Fellow members and guests, you have been officially welcomed by Dr. Haynes, but I, too, would like to extend a welcome to one and all to our 46th Annual Meeting. We are particularly pleased to welcome the members of the Colorada Health Officers Association and those members of the 3A Standards Committee who, after several days of arduous committee deliberations, are extending their stay to be with us.

It was eight years ago that our Association had the pleasure of meeting here in the mountains of Colorado, and although I was unable to be present, I am told that it was an outstanding meeting in many ways. Once again our Rocky Mountain Association has invited us to meet with them. I know that the program committee has worked hard and long to bring to our meeting interesting and able speakers to discuss the many problems of interest to us all. I am sure we all will gain much from this meeting. So once again, welcome to Glenwood Springs.

As we travel along the road of day to day activities, it is only natural that we turn to the guide posts left by those who have gone down that road before us. Thus, in attempting to determine what a presidential address should be, I carefully studied the addresses presented by those who occupied this position before me. A history of progress is unfolded by reading again the reports of each of these men—the story of our Association as it has grown and developed. It is evident from these past reports that now is the time for another guide post to be placed for such guidance as our successors may consider advisable.

First, let us look back over the year and touch upon the highlights of our activities. It is becoming increasingly evident that our Association is well known in the world of the sanitarian, as we are continually being asked to participate in the meetings of many organizations related to our fields of interests. Consequently our members have represented IAMFS at many meetings this past year. For example, there were the conferences sponsored by the National Health Council, one on Recruitment of Personnel in the Health Field in New York and one on Manpower Shortages in the Field of Health at St. Louis; the 1959 National Health Forum in Chicago; the conference on Media Certification at St. Louis; the conference of the American Standards Association in New York; two meetings sponsored by the Food and Drug Administration in Washington, to mention but a few. Of particular interest is the honor bestowed upon our Association by appointment of IAMFS to the Joint Expert Committee on Milk Hygiene of the World Health Organization and the Food and Agriculture Organization. In 1956, Dr. C. K. Johns and John Faulkner were Chairman and Rapporteur, respectively, of the Committee at meetings held at Geneva, Switzerland. At this year's meeting of the Committee, your President was appointed Chairman and Dr. C. K. Johns Rapporteur.

We also participated, at the invitation of the American Dairy Science Association, in the preliminary planning meetings toward inviting the International Dairy Congress to hold their 1962 meetings in the United States. Unfortunately an earlier invitation by Denmark was accepted and the 1962 meetings of the International Dairy Congress will be held in that country. Probably further attempts will be made for an invitation to be extended for the 1965 meetings to be held in this country.

We have continued our affiliaton with the American Association for the Advancement of Science, Keep America Beautiful, the Dairy Remembrance Fund and the Sanitarians Joint Council. In addition, all of our committees have been active, as you shall soon hear by their committee reports which will be given throughout the meeting.

Special mention should be made at this point regarding the activities of the Advisory Committee on Association Activities, Programs and Administrative Practices. This commttee was appointed last year by Harold Robinson during his term as President. John Faulkner was appointed chairman of this nine man committee whose specific assignment was to study current activities, programs and administrative practices of the Association and to develop recommendations for consideration by the Executive Board, concerning changes which might be made to improve services rendered the membership. This committee has worked hard and long this year on the many problems presented to it. At this point I should like to express my thanks and those of the Executive Board to all the members of this committee who have spent many hours in their deliberations. It is the interest and untiring effort of men such as these that makes our organization strong and of great value to the sanitarian.

The amendments to our Constitution and By-Laws approved at our last annual meeting were approved by mail vote and are now a part of our Constitution. These amendments call for changes in the functioning of the Affiliate Council. I would like to empha-

---

[1]Presented before the 46th Annual Meeting of the International Association of Milk and Food Sanitarians, Inc., August 26, 1959 at Glenwood Springs, Colorado.

size here the importance of the Council. Since this group must be a strong and active unit it is important that each affiliate be represented at meetings of the Council because it is here that you, the members, can make known your wishes and desires. Make certain that your affiliate is represented at each meeting of the Council. Guide your representative by expressing your ideas and wishes. It is through him and the Council that our Association can best serve you.

During this year the employment contract with our hard working, never tiring Executive Secretary, better known as "Red," was renewed. Here let me say we are all greatly indebted to our "Red." He has served our Association well. We appreciate his efforts.

I am sure that some of you will be pleased to know that a contract has been signed with a new printer for publication of our Journal. It is hoped that many of the problems related to printing the Journal will be eliminated by this move. The first two issues publsihed by the new printer show a decided improvement.

This brings me to the area in which your Executive Board has been most concerned during the past year. Many hours of deliberation and volumes of correspondence have passed between us in our attempts to evaluate the functions of the organization as they relate to the needs of and service for you, the members. Harold Robinson in his presidential address a year ago emphasized the fact that soon consideration would have to be given the problem of an increase in dues. This, then, has been our prime concern during the past year.

Since an increase in dues affects us all, let us take a moment or two and look carefully at the whys and wherefores of such a move. You have all seen in the Journal the proposed amendment to the By-Laws of our Constitution calling for an increase of two dollars per year in our dues. You no doubt also read the open letter stating the reasons for this move. I believe that these facts should be repeated so that all may understand.

At the outset it should be stated that our progress during the past eight years has been exceptional. Financially, we have advanced from a deficit in 1951 to a sound financial condition for the last several years. Membership has increased from 2100 to more than 4400; Journal circulation has climbed from 3200 to better than 5400 copies per issue; our affiliates have increased in number from 11 to 29; and the contacts of our Executive Secretary with the affiliates has more than doubled during this period, 1951 to 1959. All of this has been accomplished without any increase in dues.

With such a fine record behind us some may ask, "Why now, an increase in dues?" On second thought, I am not so certain that this question will be asked, for I am sure that none of us have escaped the spiralling costs that have become a part of the national economic picture during recent years. With our Association too, the costs have risen: costs of printing, paper, postage, clerical help, travel, legal and professional fees have steadily increased. For example, in 1952 printing and publishing the Journal cost $7,892; in 1958, the cost was $15,742. Postage in 1952 was $350—in 1958 it was $1,645. Costs in 1959 were higher than 1958 and the printing contract for the coming year shows an increase cost of about $170 per issue. Until now, the profits from the operation of the Journal have been sufficient to absorb these increased expenses and still allow a profit to be shown for the combined operations of the Association. However, this profit has gradually decreased over the past few years and will not be sufficient to meet increased costs and also permit us to continue to improve our operations as they should be improved.

But it is not the increased costs of operation alone that necessitate this increase in dues. We all recognize that our organization must continue to grow and that continued growth only can be brought about by improvements in our operation.

Publication of the Journal of Milk and Food Technology is one of our most important functions. It is believed that improvements can be made in the Journal such as broadening the scope of coverage to include more articles on food and general environmental sanitation features; increasing the general appeal of the Journal to the membership with "grass roots" articles and an expanded News and Events section with items about people and our affiliates; establishing an editorial policy that would help the sanitarian formulate opinions based upon the backing of our Association; effecting prompt and timely reporting and publication of the Journal to keep the membership informed as things happen; improving the typographical clarity of the Journal; and in every way make our Journal an informative, current and authoritative publication.

We all know that the relationship between our Association and our affiliates is the basis for a strong organization. In this area liason can be improved in a number of ways: for example, frequent contacts with the affiliates by the Executive Secretary and by members of the Executive Board to correlate the activities of affiliate and Association committees, to provide assistance on registration of santarians, to aid in planning programs and activities when requested, and to bring about a strong active affiliate council. Improved Journal coverage of affiliate activities will keep the membership informed and do much to maintain a closer working relationship between As-

sociation and affiliates. The stronger and more active the affiliates, the stronger will be the Association as a whole.

The need for these improvements has been recognized for some time. They are important to our future and can be effected only by providing additional help to the present Journal and Association staff. Such a move, of course, involves additional expenditure of funds which can be derived only through an increase in dues. We believe these improvements are necessary for the advancement of our Association. We hope that you, too, can see the advantages and will be ready to vote on this amendment at the annual business meeting. In the meantime, if you wish more information, we of the Executive Board are ready at all times to provide it for you.

PROBLEMS CREATED BY THE PRESENCE OF ANTIBIOTICS IN MILK AND MILK PRODUCTS—A REVIEW

E. H. Marth and B. E. Ellickson

Research and Development Division

National Dairy Products Corporation

Glenview, Illinois

Introduction

The presence of antibiotics in milk and milk products has produced problems of concern to the dairy industry and to public health officials. This paper will attempt to summarize information on that subject. Information has previously been summarized (*33*) on levels of antibiotics in milk and milk products, effects of dairy manufacturing processes on antibiotics and the attitude of the Food and Drug Administration on antibiotic-contaminated milk supplies.

Dairy Industry Problems

The largest single problem of the dairy industry created by the presence of antibiotics in fluid milk is slow or complete absence of acid production by bacterial starter cultures employed in the manufacture of a variety of products. Other problems may be encountered in the ripening of cheese or in the use of dye reduction tests to determine the quality of milk which contains antibiotics.

Serious outbreaks of yeast mastitis have been noted in cows previously treated with penicillin (*19*). The treatment of such infections with heretofore unused antibiotics or drugs may bring about problems for the dairy industry different from those encountered thus far.

Starters

The results of studies on concentrations of different antibiotics needed for the partial or complete inhibition of activity by various pure or mixed starter cultures are tabulated in Tables 1, 2, 3, and 4.

Results obtained by various workers on levels of penicillin needed in milk for the partial or complete inhibition of mixed or pure starter cultures are summarized in Table 1. The following conclusions can be drawn from the data: (*a*) *Streptococcus lactis* and *S. cremoris* appeared to be more resistant to penicillin than *S. thermophilus;* (*b*) of all the pure cultures listed, *S. thermophilus* seemed to be the least resistant to penicillin; (*c*) the lactic streptococci were partially inhibited by the presence of 0.0017 to 0.1 unit of penicillin per ml. of milk and completely inhibited by 0.025 to 1.0 unit of penicillin per ml. of milk; (*d*) *Streptococcus durans* was inhibited completely by the presence of 0.10 unit of penicillin per ml.; (*e*) the lactobacilli appeared to be more resistant to penicillin than the streptococci; (*f*) *Lactobacillus lactis* and *L. helveticus* appeared to be less resistant to penicillin than most strains of *L. casei, L. acidophilus* and *L. bulgaricus;* (*g*) the lactobacilli appeared to be partially inhibited by the presence of 0.03 to 0.6 unit of penicillin per ml. of milk and completely inhibited by 0.05 to 5.0 units of penicillin per ml. of milk; (*h*) there was considerable variation in penicillin resistance between strains of the same species of *Lactobacillus;* (*i*) a micrococcus was completely inhibited by the presence of 0.05 unit of penicillin per ml. of milk; (*j*) *Propionibacterium shermanii* was less resistant to penicillin than the lactobacilli and *Leuconostoc citrovorum* appeared to be approximately equal to the lactobacilli in resistance; and (*k*) resistance of mixed cultures to penicillin ranged between that of the streptococci and the lactobacilli.

Changes in morphology of lactic streptococci may be associated with penicillin inhibition. Involution forms of *S. lactis and S. cremoris* have appeared in the presence of the antibiotic concentrations (*21*). Antibiotic levels which caused nearly complete inhibition of the cultures, produced marked increases in the length of the cells. The cocci emerged as elongated rods, apparently because of difficulty in cell division. Similar morphological changes were also observed when *S. lactis* and *S. cremoris* were grown in milk which contained 0.30 unit of penicillin per ml. (*16*). Streptococci in yogurt appeared swollen and existed in longer chains when 0.1 unit per ml. of penicillin was present (*16*). In recent work, Baughman and Nelson (*3*) found that cells of *S. thermophilus* tended to form long chains in concentrations of penicillin as low as 0.03 unit per ml. The gram-positive staining reaction of *S. lactis* and *S. thermophilus* was reversed by exposure to various low concentrations of penicillin. Several tests for the presence of penicillin in milk have been based on the lack of resistance to the antibiotic on the part of the lactic streptococci and rods (*32, 36, 44, 46*).

Data reported by various workers on levels of chlortetracycline needed in milk for the partial or

TABLE 1 — THE CONCENTRATION OF PENICILLIN NEEDED IN MILK TO INHIBIT VARIOUS PURE AND MIXED CULTURES AS REPORTED BY DIFFERENT AUTHORS

Pure or Mixed Culture	Level of Antibiotic Needed for Inhibition		Reference
	Partial	Complete	
	(units/ml.)	(units/ml.)	
Streptococcus cremoris	0.05-0.10	0.5	28
Streptococcus cremoris	0.05-0.10		22
Streptococcus cremoris		0.1-1.0	27
Streptococcus cremoris	0.07	0.15	22
Streptococcus cremoris		0.1-0.25	34
Streptococcus durans		0.10	41
Streptococcus lactis		0.1-1.0	27
Streptococcus lactis		0.25-0.50	34
Streptococcus lactis		0.05	41
Streptococcus thermophilus	0.0017-0.17		35
Streptococcus thermophilus		0.025-0.05	34
Streptococcus thermophilus	0.01		17
Streptococcus thermophilus-H		0.05	41
Streptococcus thermophilus-T		0.05	41
Lactobacillus acidophilus	0.3-0.6		51
Lactobacillus bulgaricus	0.3-0.6		51
Lactobacillus bulgaricus-488		0.10	41
Lactobacillus bulgaricus-444		0.10	41
Lactobacillus bulgaricus-R		0.30	41
Lactobacillus bulgaricus-V71		0.20	41
Lactobacillus bulgaricus-V12		0.05	41
Lactobacillus casei	0.3-0.6	2.0	51
Lactobacillus casei		1.0-5.0	34
Lactobacillus casei		0.05	39
Lactobacillus helveticus		0.1-1.0	27
Lactobacillus helveticus	>0.3		2
Lactobacillus helveticus		0.25-0.50	34
Lactobacillus lactis-A		0.05	41
Lactobacillus lactis-B		0.05	41
Lactobacillus lactis-V104		0.05	41
Lactobacillus lactis-431		0.30	41
Lactobacillus lactis-kw		0.30	41
Lactobacillus lactis-V109		0.05	41
Lactobacillus lactis-MYC		0.05	41
Leuconostoc citrovorum	0.4-0.8	1.6->1.6	28
Micrococcus-8406		0.05	41
Propionibacterium shermanii	0.1		17
S. lactis + *S. cremoris*	0.012-0.096		5
S. lactis + *L. citrovorum*		0.1	18
S. lactis + *L. dextranicum*		0.1	18
S. lactis + *L. bulgaricus*		1.00	41
Butter culture	0.017-0.17		35
Buttermilk starter	0.1		30
Cheese starters (2)[a]	0.05-0.16	0.32	45
Cheese starters (6)[a]	0.05-0.10	0.50	28
Cheese starter	>0.10	>0.10	24
Cheese starter	0.20		50
Cheese starter	0.10		14
Cheese starter		0.02-10.0	38
Cheese starter	0.10		42
Cheese starter	0.10-0.20		4

[a]Two and six different cultures tested respectively.

TABLE 2 — THE CONCENTRATION OF CHLORTETRACYCLINE NEEDED IN MILK TO INHIBIT VARIOUS PURE AND MIXED CULTURES AS REPORTED BY DIFFERENT AUTHORS

Pure or Mixed Cultures	Level of Antibiotic Needed for Inhibition		Reference
	Partial	Complete	
	(micrograms /ml.)	(micrograms /ml.)	
Streptococcus durans		0.20	*41*
Streptococcus lactis		0.05	*41*
Streptococcus thermophilus	0.001-0.01		*35*
Streptococcus thermophilus-H		0.3	*41*
Streptococcus thermophilus-T		0.3	*41*
Lactobacillus bulgaricus-488		3.0	*41*
Lactobacillus bulgaricus-444		5.0	*41*
Lactobacillus bulgaricus-R		3.0	*41*
Lactobacillus bulgaricus-V71		2.0	*41*
Lactobacillus bulgaricus-V12		0.3	*41*
Lactobacillus casei		0.05	*41*
Lactobacillus lactis-A		1.0	*41*
Lactobacillus lactis-B		1.0	*41*
Lactobacillus lactis-V104		3.0	*41*
Lactobacillus lactis-431		0.5	*41*
Lactobacillus lactis-kw		1.0	*41*
Lactobacillus lactis-V109		0.3	*41*
Lactobacillus lactis-MYC		1.0	*41*
S. lactis + L. citrovorum		10.0	*18*
S. lactis + L. dextranicum		10.0	*18*
L. lactis + L. bulgaricus		10.0	*41*
Butter culture	0.01-0.1		*35*
Cheese starter	0.2		*24*
Cheese starter		0.5	*30, 31*
Cheese starter		0.25	*6, 7*
Cheese starter		1.0	*26*
Cheese starter	0.25		*42*
Cheese starter	0.02		*37*

complete inhibition of mixed or pure starter cultures are summarized in Table 2. The results appear to indicate the following: (*a*) the streptococci, in general, were less resistant to chlortetracycline than the lactobacilli; (*b*) variations in degree of resistance existed between different strains of the same species of *Lactobacillus;* (*c*) mixed starter cultures were somewhat more resistant to chlortetracycline than the streptococci and somewhat less than some of the lactobacilli.

TABLE 3 — THE CONCENTRATION OF STREPTOMYCIN NEEDED IN MILK TO INHIBIT VARIOUS PURE AND MIXED CULTURES AS REPORTED BY DIFFERENT AUTHORS

Pure or Mixed Culture	Level of Antibiotic Needed for Inhibition		Reference
	Partial	Complete	
	(micrograms /ml.)	(micrograms /ml.)	
Streptococcus thermophilus	0.05-0.10		*35*
Streptococcus thermophilus	5.0		*17*
Propionibacterium shermanii	5.0		*17*
S. lactis + L. citrovorum		10.0	*18*
S. lactis + L. dextranicum		10.0	*18*
Butter culture	0.1-0.2		*35*
Cheese starter	0.04		*37*

Table 3 presents a summary of data reported by various workers on concentrations of streptomycin needed in milk for the partial or complete inhibition of mixed or pure starter cultures. The data seem to indicate the following: (*a*) considerable variation in resistance of cultures existed according to the limited available data; and (*b*) mixed starter cultures studied

TABLE 4 — THE CONCENTRATION OF DIFFERENT ANTIBIOTICS NEEDED IN MILK TO INHIBIT VARIOUS PURE AND MIXED CULTURES AS REPORTED BY DIFFERENT AUTHORS

Antibiotic	Pure or Mixed Culture	Level of Antibiotic Needed For Partial Inhibition[a]	Reference
		(micrograms /ml.)	
Bacitracin	*Streptococcus thermophilus*	0.05-0.10	*35*
	Butter culture	0.10-0.20	*35*
Chloramphenicol	*Streptococcus thermophilus*	0.05-0.10	*35*
	Butter culture	0.10-0.20	*35*
	Cheese starter	0.02	*37*
Neomycin	*Streptococcus thermophilus*	0.10-1.0	*35*
	Butter culture	0.10-1.0	*35*
Oxytetracycline	Cheese starter	0.01	*37*
Tetracycline	*Streptococcus thermophilus*	0.001-0.01	*35*
	Butter culture	0.01-0.1	*35*
Tyrothricin	Cheese starter	1000.0	*42*

[a]No data given on concentration of antibiotic needed for complete inhibition.

appeared to be more susceptible to streptomycin than pure cultures.

Limited data on the inhibitory effects of various other antibiotics on pure and mixed starter cultures are summarized in Table 4. From the data presented it is evident that: (*a*) S. *thermophilus* was partially inhibited by the presence in milk of 0.05 to 0.10 ug. per ml. of bacitracin or chloramphenicol, by 0.1 to 1.0 ug. per ml. of neomycin and by 0.001 to 0.01 ug. per ml. of tetracycline; (*b*) butter cultures were partially inhibited by the presence in milk of 0.10 to 0.20 ug. per ml. of bacitracin or chloramphenicol, 0.10 to 1.0 ug. per ml. of neomycin or 0.01 to 0.1 ug. per ml. of tetracycline; and (*c*) cheese starters were partially inhibited by the presence in milk of 0.02 ug. per ml. of chloramphenicol, 0.01 ug. per ml. of oxytetracycline or 1000 ug. per ml. of tyrothricin.

Cheese

Cheese can sometimes be made from milk which contains antibiotics by: (*a*) increasing the size of the inoculum; (*b*) lengthening the period required for acid production; or (*c*) increasing the amount of salt added.

Whitehead and Lane (*50*) made a series of cheddar cheeses from milks with different levels of residual penicillin. When 0.05 unit of penicillin per ml. of milk was present, there was an average delay of 25 minutes in acid production during manufacture but no differences in composition or taste were noted in the ripened cheese. The presence of 0.10 unit of penicillin per ml. of milk resulted in a delay of 34 minutes in acid production and yielded ripened cheeses some of which had a low acidity (pH above 5.0), pasty body, and fermented or yeasty aroma. When 0.15 unit of penicillin per ml. was present, the delay in acid production was at least 35 minutes and in seven out of eight instances it was impossible to reach a normal final acid content in a reasonable length of time. The ripened cheeses all had a high pH value, pasty body and yeasty flavor. The presence of 0.2 unit of penicillin per ml. of milk resulted in slow acid production before and after salting. No cheeses were made and allowed to ripen. When 0.5 unit of penicillin per ml. of milk was present, acid development ceased in the milk soon after the rennet was added.

Wessner (*49*) reported that acid production by a mixed culture (*Streptococcus lactis, S. cremoris* and *S. diacetilactis*) during the manufacture of cheese was retarded 0, 2, 3.5, 9, 15, 19.5, 31.5 and 38 minutes by the presence in the milk of 0.01, 0.02, 0.03, 0.05, 0.08, 0.10, 0.15, and 0.20 unit of penicillin per ml., respectively. Cheeses were examined when they were three months old and the following observations were made: (*a*) cheeses made from milk which contained 0.02 unit of penicillin per ml. were discolored, cracked, strongly putrified and had a pH value of six; (*b*) a reduction in penicillin content to 0.12 unit per ml. of milk yielded cheeses similar to those just described; (*c*) milk with 0.08 unit of penicillin per ml. yielded cheese similar in appearance and odor to that described in (*a*) above but with a pH value of 5.8; (*d*) cheeses made from milk with 0.04 unit of penicillin per ml. showed signs of a butyric acid fermentation, had a pH value of 5.6 and some were cracked and slightly putrid; (*e*) a butyric acid fermentation and a pH value of 5.4 were noted in cheeses made from milk which contained 0.02 unit per ml. of penicillin; and (*f*) cheese that appeared normal and had a pH value of 5.3 was made from milk with 0.005 unit of penicillin per ml.

Hunter (*22*) reported that cheddar cheeses made from milk which contained from 0.07 to 0.10 unit per ml. of penicillin were slightly sweet, weak and lumpy or curdy at 14 days. After three months, the cheeses had a weak, pasty body and flavors varied from "slightly off" to rancid and fermented.

Kästli (*27*) noted that coliform organisms were able to grow in curd from milk which contained penicillin and their growth resulted in the spoilage of a batch of cheese while in the press.

The presence of chlortetracycline in milk (more than 0.25 ug. per ml.) resulted in retarded acid development, slow flavor development and a weak and pasty body in cheddar cheese according to Bradfield, *et al.* (*8*). They also found it impossible to make cottage cheese from such milk.

Quality Tests

The length of time needed for the reduction of the dye in the methylene blue test for milk quality was increased when concentrations of 0.1 to 0.5 unit of penicillin per ml. of milk was present as shown by results of Hunter (*20*). The reduction time was also prolonged in storage milks which contained antibiotics.

Johns and Desmaris (*25*) found that concentrations of 0.05 and 0.5 unit of penicillin per ml. of milk caused an appreciable delay in the reduction time of methylene blue when added to such milk. The retarding influence was found greatest when the dye reduction time was longest and hence the resazurin test (3 hour completion time) was less affected than the methylene blue test.

The reliability of the phosphatase test was not impaired by the presence of antibiotics in milk (*12*).

Remedial Measures

Several remedial measures to overcome dairy plant problems produced by residual antibiotics have been

proposed. The addition of penicillinase, an enzyme which inactivates penicillin, to milk prior to inoculation with starter cultures has been suggested (*2, 9, 11, 13, 23, 28, 29, 45*). Recommended rates for addition of penicillinase to milk are: (*a*) 0.02 mg. per 100 ml. of milk containing a total of five to ten units of penicillin (*28, 29*); or (*b*) 0.36 part penicillinase for one part of penicillin in milk (*11*).

The use of a heavy inoculum of starter has been suggested by Claybaugh and Nelson (*13*) as another method for use to attempt to nullify effects of antibiotics in milk from which fermented products are to be made.

The third method suggested to overcome the antibiotic problem is the development and use of starter cultures which are resistant to antibiotics. Katznelson and Hood (*28*) reported the development of a penicillin resistant starter which was able to coagulate milk in the presence of three units per ml. of penicillin and which retained its resistance through 20 passages in the absence of penicillin. Success in developing penicillin resistant starters was also reported by Trembath (*45*). Auclair (*2*) found it possible to slightly increase the resistance to penicillin of *Lactobacillus helveticus.*

Shahani and Harper (*40, 41*) found that oxytetracycline-resistant cultures of *Streptococcus lactis* coagulated milk in 12 to 14 hours while sensitive cultures did so in six to eight hours. The addition of glucose-1-phosphate; fructose-1, 6-diphosphate; coenzyme 1 or lactase to the milk resulted in an appreciable acceleration of acid production by the resistant strains. No appreciable increase in acid production was noted when phosphorylase, aldolase or adenosine triphosphate (ATP) was added to the milk. It was believed that resistant strains failed to form sugar-phosphate esters during the early stages of incubation and hence failed to produce substantial quantities of lactic acid. Acid production appeared to be directly related to the phosphorylation system of the organisms.

It was further reported (*41*) that four cultures of *Lactobacillus lactis* became resistant to 10 p.p.m. of tetracycline after passage through milks which contained increasing concentrations of this antibiotic. Starter cultures which were carried in milk media with a high surface to depth ratio tended to develop a natural tolerance to higher concentrations of various antibiotics (*41*).

Removal of penicillin from milk by washing the fat fraction proved impractical (*9*) and addition of cystein (*28*) failed to inactivate penicillin present in raw milk.

PUBLIC HEALTH PROBLEMS

The public health problems which may be associated with the presence of antibiotic residues in milk and milk products are as follows: (*a*) exposure of the consumer to antibiotic resistant udder pathogens which may be present in unpasteurized milk products; (*b*) development or aggravation of antibiotic hypersensitivity in consumers; (*c*) alteration of the intestinal flora of consumers and thereby bring about a reduction in vitamin synthesis; and (*d*) alteration of the intestinal flora of consumers to permit the growth and establishment of antibiotic resistant strains of pathogenic microorganisms.

Cheese made from milk obtained from cows previously treated for mastitis by means of penicillin and streptomycin has been incriminated as the source of antibiotic resistant micorococci and streptococci which caused infections in consumers (*1*).

The number of coliform bacteria in the intestinal tract of persons was markedly reduced by the ingestion of 500 ml. of milk which contained either 0.1 mg. per ml. of streptomycin or 0.25 ug. per ml. of chlortetracycline, acording to Stoltz and Hankinson (*43*). The authors have postulated that the antibiotic induced reduction of intestinal organisms would result in the reduction of vitamin synthesis in the intestinal tract.

Broad spectrum antibiotics (the tetracyclines), neomycin, streptomycin (orally), bacitracin and polymyxin are poor sensitizers and hence their presence in milk is of minor concern to hypersensitive or potentially hypersensitive consumers (*48*). The presence of pencillin in milk, however, is of major concern in regard to the hypersensitivity of the consumer (*10, 48*). It was further reported (*48*) that in a survey of 30 authorities in the fields of antibiotic therapy, allergy and pediatrics, the majority felt that concentrations of penicillin found in market milk might cause hypersensitive reactions in "exquisitely sensitive" persons. These same authorities also expressed the views that concentrations of antibiotics found in fluid milk were unlikely to modify the oral or intestinal flora, cause the emergence of resistant strains of pathogenic bacteria or provoke sensitization in an insensitive consumer. Recently allergic dermatitis was noted in patients who had consumed milk which was contaminated with penicillin (*15, 47*).

SUMMARY

The presence of antibiotics in milk has created problems of importance to the dairy industry and to public health officials. Problems of the dairy industry include failures: (*a*) in the curdling of milk and in natural cheese ripening during its manufacture; (*b*) in acid and flavor production during the manufacture of buttermilk and similar products; (*c*) of starter culture growth when propagated in reconstituted skim

milk; and (*d*) of some quality control tests to give valid results. Suggested remedial measures for these problems include: (*a*) development of antibiotic-resistant starter cultures; and (*b*) addition of penicillinase to neutralize penicillin in milk.

Public health hazards associated with consumption of antibiotic-contaminated milk and milk products include: (*a*) allergic responses; (*b*) changes in intestinal function; and (*c*) development of antibiotic-resistant pathogenic bacteria.

REFERENCES

1. Anonymous. Antibiotic-resistant Organisms in Cheese. J. Am. Med. Assoc. **159**: 1788. 1955.

2. Auclair, J. Action inhibitric de la penicilline sur les lactobacilles utilises dans la Fabrication du Gruyere. Lait **31**: 121-133. 1952.

3. Baughman, R. W. and Nelson, F. E. Effect of Penicillin upon the Morpology and Gram-staining Characteristics of *Streptococcus lactis* and *Streptococcus thermophilus*. J. Dairy Sci. **41**: 706. 1958.

4. Baumgarntner, H. Die Penicillinbehandlung des Euters. Schweiz. Arch. Tierheilk. **89**: 215-240. 1947.

5. Berridege, N. J. Penicillin in Milk. III. The Effect of Low Concentrations of Penicillin on the Rate of Acid Production by Starter Cultures. J. Dairy Research **23**: 348-354. 1956.

6. Bradfield, A. Effect of Mastitis Curatives on Cheese Making. Proc. 28th Ed. Conf. Vermont Dairy Plant Operators and Milk Distributors. pp. 23-25. 1949.

7. Bradfield, A. The Effect of Mastitis Curatives on Cheese Making. Can. J. Comp. Med. Vet. Sci. **14**: 127. 1950.

8. Bradfield, A., Resi, L. A. and Johnstone, D. B. The Presence of Aureomycin in Milk and its Effect on Cheese Making and Starter Activity. J. Dairy Sci. **35**: 51-58. 1952.

9. Broggler, H. Juncher, H. O. and Magnusson, I. Nogle undersøglser over anvendeligheden af penicillinholdig maelk. Maanedsskr. Dyrlaeger **62**: 217-223. 1951.

10. Bryan, C. S. Problems Created for the Dairy Industry by Antibiotic Mastitis Treatments. J. Milk and Food Tech. **14**: 161-162. 1951.

11. Chapman, H. R. The Addition of Penicillinase to Milk of Cows Receiving Penicillin. Dairy Ind. **21**: 970-971. 1956.

12. Churchill, E. S., Drury, A. R., Lewis, B. D., Frank, C. L. and Bryan, C. S. A Report on the Modified Phosphatase Method of Detecting Antibiotic Substances in Milk. Milk Plant Monthly **40** (4): 28-31. 1951.

13. Claybaugh, G. A. and Nelson, F. E. The Effect of Antibiotics in Milk: A Review. J. Milk and Food Tech. **14**: 155-160. 1951.

14. Dumais, R. L'effect nuisible de la penicilline dans ce lait sur les ferments lactiques et le fromage Cheddar. Quebec Lait **10**: 14-16. 1951.

15. Erskine, D. Dermatitis caused by Penicillin in Milk. Lancet **1**: 431-432. 1958.

16. Galesloot, T. E. Invloed van penicilline op de morfologie van yoghurt-en zuurselbacterien. Een methods on snel te kunnen vaststellen of penicilline de waarschijnlijke oorzaak is geweest van een gerende zuurvorming in yoghurt en zuursel. Ned. Milk Zuivetijdschr. **10**: 64-70. 1956.

17. Hargrove, R. E., Walter, H. E., Malkames, J. P. Jr., and Maskell, K. J. The Effect of Penicillin and Streptomycin on Swiss Cheese Starters. J. Dairy Sci. **33**: 401. 1950.

18. Harmon, L. G. Antibiotics in Milk. Texas J. Sci. **3**: 167-179. 1951.

19. Havmand, H. C., Jepsen, A. and Overby, A. J. Two Years of Collective Mastitis Campaign in Cooperative Dairies with Practical Control of Penicillin-induced Starter Failures by Use of Penicillinase or Penicillin Resistant Starter. Roy. Vet. and Agr. Coll., Copenhagen, Den. Bull. 47. 1955.

20. Hunter, G. J. E. A note on the Effect of Penicillin in the Reductase Test for Milk Quality. J. Dairy Research **16**: 149-151. 1949.

21. Hunter, G. J. E. The Effect of Penicillin on Lactic Streptococci. J. Dairy Research **16**: 39-45. 1949.

22. Hunter, G. J. E. The Effect of Penicillin in Milk on the Manufacture of Cheddar Cheese. J. Dairy Research **16**: 235-241. 1949.

23. Jepsen, A. and Overby, A. J. The Disturbing Effect of Penicillin Milk in the Dairy Industry and Proposals of Some Technical Methods for the Elimination of Failures. Studies on the Inactivation of Penicillin by Means of Penicillinase. Ned. Melk Zuitveltijdschr. **5**: 157-185. 1951.

24. Johns, C. K. Differences in Sensitivity of Lactic Starters to Antibiotics. J. Dairy Sci. **36**: 1241-1247. 1953.

25. Johns, C. K. and Desmaris, J. G. The Effect of Residual Penicillin in Milk on the Dye Reduction Tests for Quality. Can. J. Agr. Sci. **33**: 91-97. 1953.

26. Johnstone, D. B. Effect of Aureomycin Upon Acid Production by Cheese Starters. Bacteriol. Proc. p. 26. 1950.

27. Kästli P. Störungen in der Milchverarbeitung durch die Mastitis - behandlung mit Penicillin. Schweiz. Arch. Tierheilk. **90**: 685-695. 1948.

28. Katznelson, H. and Hood, E. G. Influence of Penicillin and other Antibiotics on Lactic Streptococci in Starter Cultures Used in Cheddar Cheese Making. J. Dairy Sci. **32**: 961-968. 1949.

29. Katznelson, H. and Hood, E. G. Penicillin in Relation to Acid Production in Milk by Starter Cultures Used in Cheddar Cheese Making. Science **109**: 490-491. 1949.

30. Krienke, W. A. Drugs, Mastitis and Acid Starters. Am. Milk Rev. 12 (6): 54, 56. 1950.

31. Krienke, W. A. Effects of Various Drugs in Milk from Mastitis-Treated Cows. Southern Dairy Prod. J. **47** (5): 37, 132-134. 1950.

32. Lemoigne, M. Sanchez, G. and Girard, H. Caracterisation de la pencilline et de la streptomycine dans le lait. Lait **33**: 15-16. 1953.

33. Marth, E. H. and Ellickson, B. E. Antibiotic Residues in Milk and Milk Products. J. Milk and Food Tech., 22: 3, 1959.

34. Meewes, K. H. and Paslawski, S. Untersuchungen über den Einfluss keimhemmender Substanzen auf Milchsäurebakterien. Kiel. milchwirtsch. Forschungsber. **3**: 543-549. 1951.

35. Moeller-Madsen. A. and Bendtsen, G. Nogle antibiotica's haemmende virkning paa almindelige syrevaekker, *Streptococcus thermophilus og Thermobacterium helveticum* Danish Gov't. Research Institute on Dairy Ind. Bull. 105, p. 72. 1956.

36. Neal, C. E. and Calbert, H. E. The Use of 2, 3, 5-Triphenyltetrazolium Chloride as a Test for Antibiotic Substances in Milk. J. Dairy Sci. **38**: 629-633. 1955.

37. Overby, A. The Effect of Various Antibiotics in Milk Following Intramammary Infusion. Nord. Veterinärmed. **4**: 993-1004. 1952.

38. Scott, R. Destruction of Starter Activity by Penicillin. Dairy Ind. **15**: 1260-1262. 1950.

39. Shahani, K. M. The Effect of Heat and Storage on the

Stability of Aureomycin in Milk, Buffer and Water. J. Dairy Sci. **40**: 289-296. 1957.

40. Shahani, K. M. and Harper, W. J. Differences in the Acid Production and Phosphorus Metabolism of Oxytetracycline Sensitive and Resistant Organisms. Appl. Microbiol. **6**: 9-14. 1958.

41. Shanhani, K. M. and Harper, W. J. The Development of Antibiotic Resistance in Cheese Starter Cultures. Milk Prod. J. **49**: 15-16, 53-54. 1958.

42. Stoltz, E. I. and Hankinson, D. J. Antibiotics and Lactic Acid Starter Cultures. Appl. Microbiol. **1**: 24-29. 1953.

43. Stoltz, E. I. and Hankinson, D. J. The Effects of Antibiotics in Milk on the Human Intestinal Coliform Bacteria. J. Milk and Food Tech. **17**: 76-78. 1954.

44. Treccani, V. Methodo rapido per la determinazione degli antibiotici nel latte destinato al caseificio. Ann. Microbiol. **5**: 93-97. 1953.

45. Trembath, R. H. Effect of Penicillin in Milk on Starter Cultures. Australian J. Dairy Technol. **5**: 143-146. 1950.

46. Ullberg, S. Antibiotica i Mjolk. En snab bestammings metod. Nord. Veterinarmed. **4**: 1061-1077. 1952.

47. Vickers, H. R., Bagratuni, L. and Alexander, Suzanne. Dermatitis caused by Penicillin in Milk. Lancet **1**: 351-352. 1958.

48. Welch, H. Problems of Antibiotics in Food as the Food and Drug Administration Sees Them. Am. J. Pub. Health **47**: 701-705. 1957.

49. Wessner, P. Penicillin in Cheesemilk and Its Inactivation with Penicillinase. Intern. Dairy Congr. Proc., 13th Congr. **3**: 1121-1129. 1953.

50. Whitehead, H. R. and Lane, D. J. The Influence of Penicillin on the Manufacture and Ripening of Cheddar Cheese. J. Dairy Research **23**: 355-360. 1956.

51. Wilkowske, H. H. and Krienke, W. A. Influence of Penicillin on the Lactic Acid Production of Certain Lactobacilli. J. Dairy Sci. **34**: 1030-1033. 1951.

A FIELD STUDY OF THE SANITARY CARE OF MILKING EQUIPMENT ON DAIRY FARMS[1]

H. V. Atherton

Animal and Dairy Husbandry Department

The University of Vermont, Burlington

The rapid conversion to cooling of milk in bulk on farms and the increasing emphasis on flavor and keeping ability as measures of milk quality have resulted in renewed efforts to ensure the proper sanitary care of milking equipment on farms. Many authors have cautioned that quality evaluations based on bacterial analyses alone have serious limitations, especially for milk cooled in farm bulk tanks. This situation was well summarized by Jansen of the New York Department of Health when he wrote "None of the deck or laboratory tests reveal many of the unsanitary conditions on the farm which knowledge can only be gained by occasional farm inspection and veterinary examination" (2).

The literature on the selection and use of chemical agents for cleaning and sanitizing in the milkhouse has been extensive in recent years. Yet the evidence of improper cleaning is apparent to anyone making careful inspection of milking utensils. Tracy (3) states, "Granted that we are close to perfection in preventing the spread of disease through our milk supplies, there remain certain problems related to the control of the type of contamination that has a bearing upon such factors as good keeping quality, appearance, flavor changes, and problems of an esthetic nature."

Past work at the Vermont Experiment Station has taken us into the milkhouse of many farms in the area where milk was cooled in bulk tanks. Despite a general lowering of bacteria counts on farms following conversion to bulk cooling, many farmers discovered that the bulk tanks showed a continued buildup of milkstone. The question was raised whether cleaning compounds presently available were suitable for cleaning bulk tanks. We were asked to evaluate present compound cleaners being offered as bulk tank cleaners or to find some more effective cleaner or method of cleaning.

Casual examination showed the concern of these farmers was well founded. Closer inspection made it apparent that the bulk tank was not the only piece of milk-handling equipment so affected. In fact, milkstone deposits were frequently visible on both metal and rubber milk-contact surfaces. Although most farmers were spending considerable time on cleaning chores in the milkhouse, the result frequently was not to their satisfaction. Regular milkstone removal was necessary in nearly all operations in order for the farms to meet inspection requirements. Conversations with fieldmen, inspectors, and representatives of the chemical companies made us aware that the situation was not confined to our region but, instead, was common throughout the dairy areas.

With the promise of cooperation from several of the suppliers of dairy cleaners in the Northeast, a general survey was made of cleaning habits on farms having bulk tanks in the area. Later, workers from the Vermont Experiment Station studied several cleaning and sanitizing procedures with the cooperation of a number of farmers who agreed to follow certain procedures during a six-month period of study. The purpose of this study was to determine whether or not milking equipment could be kept clean using cleaning materials commercially available in the manner recommended by the manufacturers of these cleaners.

Procedure

The Survey

During our continuing studies on milk quality as influenced by the bulk cooling system, we have found a large number of farmers on whom we can depend for cooperation. A group of those who had cooperated with us in the past were approached with the basic plan of a six-month study to evaluate several cleaning and sanitizing routines. Twenty-five of these agreed to work with us in the study and each assisted our team of two or three workers in an inspection and survey of existing conditions and practices in his milkhouse.

The survey consisted of visual and/or "blacklight" (ultraviolet) inspection of all milk-contact surfaces in the milkhouse to determine their physical condition and cleanliness. "Blacklight" inspection was accomplished by brushing the tank with water containing a fluorescent dye (Primuline NAC), allowing the walls to dry for a few minutes and then rinsing the tank thoroughly by hose. The walls were then permitted to drain dry and the surfaces studied with a "blacklight" unit. The procedure, materials, and fa-

[1]Journal Series Paper Number 86 of the Vermont Agricultural Experiment Station.

and sanitizing milking equipment were recorded. The quantity and temperature of available hot water was also noted. Water hardness and the bacteria counts on milk from each farm were available in the laboratory as the result of earlier studies on bulk milk quality.

Plan of Study

When visual inspection of the milking equipment on these farms had been completed the twenty-five farmers, who had promised cooperation, were divided into five different groups. Assignment to groups was made on the basis of water hardness and the average bacteria count of milk from the farms obtained in the earlier investigations. Selection was also influenced by the knowledge, gained from past experience with these farmers, of the effort individuals were putting into the cleaning operation.

To the best of our ability, each group was made typical of the other four. Each had water ranging from soft (4-5 grains per gallon) to hard (25-30 grains per gallon) and bacteria counts (farm raw) ranging from low (<20,000/ml.) to high (>100,000/ml.) It was also important that no group should have a preponderance of operators lacking interest in farm sanitation.

Cleaning and sanitizing materials for the five groups were selected to give a representative cross-section of available compounds. These groups were established:

1. Alkaline-base quaternary ammonium cleaner-sanitizer
2. Acid-base quaternary ammonium cleaner-sanitizer
3. Non-ionic cleaner plus chlorine sanitizer
4. Alkaline cleaner plus chlorine sanitizer
5. Iodophor

The several chemical companies selling farm cleaners in the area agreed to furnish cleaning compounds as needed for a six-month study. Each company sent a representative to work with us at the start of the program. Experiment Station workers, with the assistance of these representatives inspected and cleaned all milk-contact surfaces, using a combination of acid and alkaline cleaners to remove milkstone deposits. Pumice was used to remove deposits which remained after the cleaning operation. Worn rubber parts and brushes, which were worn or missing, were replaced at no expense to the farmer. These workers also cleaned the vacuum lines in the barns (in many cases for the first time in an indeterminate period). Thus, all milk-contact surfaces were clean (to "blacklight" inspection) and each farm had all the brushes needed to keep them clean at the start of the study.

The company representative provided all the chemicals needed for milkhouse sanitation and thoroughly explained the recommended method for use of his products to the farmer and/or person responsible for milkhouse cleaning chores. The recommended procedure was intended to permit each farmer, insofar as possible, to continue his basic cleaning method. Thus, those who preferred to store rubber parts wet, were instructed how to *properly* use the basic procedure in a wet storage system. Those wishing to store rubber parts dry were told the procedure to follow to maintain equipment in this manner. They were advised to make up their wash solutions in plastic pails and clean the tank from the pails, a practice which none had been following previously. The representative also revisited the farms early in the study to answer any questions the farmer had and to correct any deviations from the suggested procedure.

For six months, workers from the Experiment Station visited the farms about twice monthly to discuss cleaning procedures with the farmers and to replenish the supply of cleaning compounds. Observations on the state of cleanliness of milking equipment were made at each visit. Milk samples were taken at approximately monthly intervals in sterile 250 ml., ground-glass stoppered bottles from the thoroughly agitated supply of milk in the tank at the time of the visit. The iced samples were taken to the laboratory and plated immediately to determine Standard Plate (32°C.), Laboratory Pasteurized, and Psychrophilic counts by procedures described in Standard Methods (1) using Difco Plate Count Agar.

At the end of the study period, a second careful examination was made to determine the cleanliness of the milk-contact surfaces by visual and/or "blacklight" inspection. The farmer was asked to estimate the amount of time necessary to clean his milking equipment and time required to clean his bulk tank. Finally, each farmer (or person responsible for cleaning) was asked for general comments on the system of cleaning and sanitizing he had been using and on his reaction to the system as a general cleaning procedure.

RESULTS

The Survey

The initial survey revealed that few farms had the basic needs to conduct a proper sanitation program. Cleaning equipment found on the farms was, for the most part, inadequate, in poor shape, or inconvenient to use. None of the farms had the brushes or burrs necessary to clean all milk-contact surfaces. Many of the brushes in evidence were so badly worn they were ineffective in cleaning. Sinks, or other washing facilities, were generally too small and five of the 25 farms did not have a serviceable sink in the milkhouse. Lighting and heating were generally quite in-
cilities (sink, brushes, rods, etc.) used in cleaning

adequate. Few farmers regularly clean vacuum lines in the barn or boil rubber parts in lye.

Cleaning compounds used in normal cleaning operations varied widely with most of the standard trade names in evidence. It was apparent that in many instances no specific system was followed. Frequently, 8 to 10 (in one case 13) different kinds of cleaners and/or sanitizers were found in the milkhouse. Many compounds were used without regard to their specific purpose. In some cases, sanitizers were used for cleaning and then cleaning compounds were used as sanitizers. Also, a cleaner-sanitizer would be used as a cleaner, followed by a different cleaner-sanitizer as a sanitizer.

Blacklight inspections showed that milkstone buildup was similarly located in most tanks. There was a heavy buildup on the bridge and covers, at the milk line of the first milking, and in a narrow band around the rim of the tank. Light deposits were observed on the agitator and middle of the tank walls. Milking utensils (pails, heads and strainers) frequently showed deposits, especially in bends, dents and hard-to-reach places. Rubber parts (inflations, hoses and gaskets) also showed variable deposits of milkstone. In general, all the farms showed some milkstone in one place or another.

We were asked to conduct this study because most of the farmers were aware that even though they were spending a considerable amount of time in cleaning milking equipment, milkstone buildup was a definite problem. However, none of them was aware of the extent of the difficulty. Cooperation was eagerly given when the farmers saw the milkstone deposits revealed by close visual or "blacklight" inspection.

The Study

Twenty-three farms completed six months of the program; one dairy herd was sold, and two brothers operating separate farms consolidated their operation. There was an average of 47 cows per farm with a range from 20 to 104. Rubber parts were stored dry on 13 farms and stored wet on 10 farms (5 in lye, 4 in cleaner-sanitizer, 1 in chlorine). A total of 108 bacteria analyses were made on the milk from the 25 farms during the period of study.

Bacteriological results are summarized in Tables 1 and 2. Table 1 shows that about 28 per cent of the 108 Standard Plate Counts were below 10,000/ml., and 82 per cent were below 50,000/ml. The average of the counts obtained in this study is only 38 per cent as high as that of the counts on 79 determinations made on milk from the same farms during a similar six-month period of the previous year. Although results are not as complete on these farms when milk was delivered in cans, the counts obtained during the study period were only about 30 per cent of the total (Standard Plate) counts when the farms were cooling milk in cans. The laboratory pasteurized counts were less than 8 per cent of those obtained when milk was cooled in cans and only 20 per cent of those found during the previous year. Only one farm out of 25 had an average laboratory pasteurized count over 1000/ml; 12 farms were under 100/ml. Psychrophilic counts were about 71 per cent of the average for milk cooled in cans but were more than double the psychrophilic counts obtained the previous year.

TABLE 1. A COMPARISON OF THE FREQUENCY OF OCCURRENCE OF STANDARD PLATE COUNTS OBTAINED DURING THE STUDY PERIOD WITH THOSE RECORDED IN A SIMILAR PERIOD OF THE PREVIOUS YEAR.

	Previous Year		Study Period	
Total Counts	No.	%	No.	%
<10,000	3	3.8	30	27.8
10,000- 20,000	8	10.2	28	25.9
21,000- 30,000	6	7.6	11	10.2
31,000- 40,000	6	7.6	13	12.0
41,000- 50,000	11	13.9	6	5.5
51,000- 60,000	5	6.3	5	4.6
61,000- 70,000	11	13.9	3	2.8
71,000- 80,000	5	6.3	5	4.6
81,000- 90,000	3	3.8	0	—
91,000-100,000	3	3.8	4	3.8
>100,000	18	22.8	3	2.8
Total	79	100	108	100

It is evident from the data in Table 1 that the system of cleaning had very little influence on the bacteria counts. Although the farms included in Group 1 received the lowest average counts during this peiod, excellent results were obtained at nearly all farms. In several cases, group averages were increased through the influence of the few farmers who made little effort to follow recommended procedures. These results showed individual farmers in each of the groups who lowered their counts substantially from the previous year's record. The method of storing rubber parts did not appear to have any influence on the bacteria counts of raw milk during this study.

Of the 108 individual Standard Plate Counts made during this study and reported on Table 1, only three exceeded 100,000/ml while 54 per cent were under 20,000/ml and 82 per cent were below 50,000/ml. Of the 79 determinations made on these 25 farms dur-

TABLE 2. SUMMARY OF BACTERIA COUNTS ON 25 FARMS BEFORE AND AFTER FARMERS RECEIVED SPECIFIC INSTRUCTIONS ON CLEANING METHODS.

	Can Cooling (1951-53)			Previous Year (Bulk)			Study Period		
Producer	SPC (x1000)	Past. (x10)	Psy. (x10)	SPC (x1000)	Past. (x10)	Psy. (x10)	SPC (x1000)	Past. (x10)	Psy. (x10)
1	21	140	170	42	300	110	19	13	360
2	——	——	——	36	32	120	12	3.6	66
3	120	110	150	77	25	7.4	18	29	17
4	——	——	——	5.4	5.5	11	4.8	5.9	12
5	——	——	——	44	20	360	7.1	4.0	62
Group I Log. Ave.	49	120	160	31	30	52	11	8	50
6	——	——	——	92	110	190	54	9.9	820
7	30	68	160	220	14	26	22	9	120
8	190	180	210	69	85	220	13	11	150
9	51	61	80	50	8.2	11	33	6.1	40
10	46	110	55	71	150	29	21	8.8	78
Group II Log. Ave.	60	95	110	88	44	50	25	8.8	140
11	——	——	——	74	47	4.9	20	14	16
12	——	——	——	11	28	21	8.8	11	33
13	100	69	450	56	77	22	54	10	17
14	——	——	——	46	360	29	88	24	17
15	——	——	——	220	49	870	42	9.6	1800
Group III Log. Ave.	100	69	450	54	71	36	32	13	120
16	53	96	380	25	18	9	4.8	4.9	96
17	140	130	230	82	230	59	150	110	1200
18	58	110	63	80	45	31	46	6.9	90
19	——	——	——	39	100	69	4.2	14	28
20	——	——	——	240	120	690	40	5.8	410
Group IV Log. Ave.	70	110	170	68	74	60	23	13	160
21	14	48	32	280	54	270	27	51	150
22	80	35	41	37	17	20	18	13	43
23	96	1600	51	36	68	13	17	12	17
24	99	660	310	27	65	3	19	7.1	640
25	280	560	460	33	590	34	13	16	32
Group V Log. Ave.	79	250	100	50	76	24	18	16	74
All Producers	69	140	140	55	55	42	21	11	100

Key:
SPC = Standard Plate Count
Past. = Laboratory Pasteurized Count
Psy. = Psychrophilic Count

ing the same period of the previous year, only 43 per cent of the individual counts were under 50,000/ml and 22.8 per cent were over 100,000/ml.

Since this improvement in bacteriological quality was of general nature and occurred on nearly all farms regardless of cleaning and sanitizing procedure followed, it is apparent that this must be due to improved practices rather than to the particular chemicals used for cleaning and sanitizing. The reason the psychrophilic counts showed slight to significant increases over the results of the previous year is not apparent at this time.

The bulk tanks on the 23 farms were clean to visual inspection after six months. All tanks except one showed some buildup with *blacklight* but none of the tanks had serious deposits. Early in the study, a heavy film developed in the machines and on the bulk tank walls at one farm having water with relatively high carbonate hardness. This deposit was removed with milkstone remover, then substitution of sodium hypochlorite for calcium hypochlorite prevented any reappearance.

Although treatments for milkstone removal had been routine on most farms previously, this was the only farm using milkstone removers during the six-month period. Yet milkstone buildup was so slight that it wasn't noticeable by visual inspection and only barely observed under *blacklight*. There is a strong possibility that some of the buildup might be apparent rather than real. Since this method measures water-retaining capacity rather than buildup, per se, it would appear likely that slight corrosion under long existing milkstone deposits might retain some of the fluorescent dye and thus appear as milkstone.

Any differences noted among groups during the concluding survey were of minor nature. Since film formation was barely perceptible in all tanks, it is interesting to note that farmers in Groups III and V estimated their average daily cleanup time at 42 and 43 minutes while average cleaning time estimates in the other three groups ranged from 56 to 65 minutes daily. Estimated time spent in daily cleanup ranged from 22 minutes to 120 minutes (average 37 minutes) with ¼ to ⅓ of the total time spent on the bulk tank. Total time spent in cleaning did not appear to have much influence on final results since the individual spending the most time (two hours daily) also had the highest average bacteria counts during the period. Many of the larger operators accomplished their daily cleanup in less than an hour while operators of small farms spent as much or more time, probably because they had the time to spend.

Interestingly enough, many of the farmers reported they were doing the cleanup job in less time using our recommended procedures than had been necessary under their former "system." There was a decided preference for one-step cleaning and sanitizing methods. All the farmers in Groups I, II, and V indicated they intended to continue using the combined cleaner-sanitizer procedures followed during the study. Only one person from Groups III and IV said he would continue the two-step process of cleaning and sanitizing dairy equipment as recommended for the study; all others declared an intention to change to (or in some cases to return to) the single step cleaner-sanitizer procedure.

DISCUSSION

This six-month study has demonstrated that the dairy industry must do a great deal more educational work with farmers with respect to proper cleaning practices. Chemical cleaning has not been properly explained to those who are doing the cleaning in the milkhouse. Consequently, there is tremendous confusion about such terms as "cleaners," "sanitizers," "detergents," etc. and their use in the sanitation of dairy equipment. Few farmers realize the importance of maintaining the strength of the sanitizing solution if they use wet storage of rubber parts.

There was an almost uniform improvement of bacteriological quality and an equally uniform decrease in milkstone formation demonstrated during this study regardless of the type of chemicals used for milkstone sanitation. This would indicate that the methods for maintaining a satisfactory state of milkhouse sanitation are known and readily available. The products necessary for the job are on the market and newer ones are being added each year. Thus, it appears that cleaning problems exist either because the information has not been carried to the farm where the cleaning is done or the dairy industry has not insisted that desirable practices be followed routinely. As Tracy (3) points out, "Complacency is our biggest worry."

It was interesting to note that there was no apparent increase in milkstone buildup or in bacteria count as the study period progressed. This would indicate that the methods and chemicals used were showing routinely satisfactory results and thus should continue to give satisfaction as long as the recommended procedures were followed. Another interesting development was that, while frequent repeat calls were necessary during the first few weeks to correct deviations from recommended cleaning procedures, the desired cleaning habits were quickly formed and continued. Thus, our visits to the farms during the last half of the study were primarily to take samples and replenish the supply of chemical products.

As has been noted in earlier publications, quality evaluations based on bacterial data of fresh raw milk

samples alone can be inadequate or even misleading. The initial survey for this study demonstrated that bacteria counts give little indication of conditions in the milkhouse. A further problem is that most farmers who are producing milk with low bacteria counts resist suggestions for improved cleaning practices even when visible milkstone deposits are present.

Another problem which was brought to our attention during this study concerns the lack of heat in the majority of milkhouses in the area. It seems unlikely that we will have proper cleanup of dairy equipment in the many milkhouses where spilled water freezes on the floor or where workers have to wear heavy winter clothing during cleanup as so frequently happens during the winter months in the northern areas.

The influence of farm water supplies on cleaning problems in the milkhouse must be recognized. Limited water volume, insufficient pressure and inadequate amounts of hot water clearly contribute to cleaning difficulties and resulting formation of milkstone deposits. Frequently the bulk tank could not be properly rinsed because of limited pressure in the water supply. Few farms had enough hot water to fulfill all the needs of modern farming practices. The feasibility of softening the water supply used for cleaning should be investigated.

ACKNOWLEDGEMENT

The technical assistance and products furnished by the suppliers of dairy cleaners in the Northeast are greatly appreciated. Special thanks should be extended to the Cowles Chemical Company, Cleveland, Ohio; Diversey Corporation, Chicago, Illinois; Klenzade Company, Beloit, Wisconsin; Pennsylvania Salt Manufacturing Company, Philadelphia, Pennsylvania; and the West Disinfecting Company, Long Island City, New York for their continued interest in this work.

The cooperation of the farmers, who worked with us in this study, is also acknowledged with many thanks.

BIBLIOGRAPHY

1. American Public Health Association. Standard Methods for the Examination of Dairy Products. 10th Edition. American Public Health Association, New York. 1953.

2. Jansen, J. F. Preliminary Report of Quality Control Study of Cans vs. Cold Wall Tanks. New York State Dept. of Health Bulletin. 1953.

3. Tracy, P. W. New Developments in Sanitation Problems in the Dairy Industry. Klenzade Nineteenth Educ. Seminar. Washington, D. C. 1957.

IS YOUR FOOD CONTROL PROGRAM WORKING?[1]

H. S. Adams, Director

Sanitary Science Courses

Indiana University School of Medicine

Indianapolis, Ind.

Program Effectiveness Varies

The title of this paper makes two assumptions. First, that some food control programs are working poorly, and secondly, that others are productive and are doing well. As one studies food control across the nation, this is just about the case.

Normally, one is not interested in poor programs unless there are lessons to be learned. These lessons usually are negative and largely involve errors to be avoided. However, as a point of contrast and to emphasize effective elements of good programs, which will be discussed later, let us consider some factors on the debit side of the ledger. One of the first is the failure on the part of some public health and other officials at the administrative level to realize and recognize the total food control problem. Let me cite an example. One Eastern state has so ignored and forgotten food sanitation that there are hundreds of recreational camps, hotels and summer resorts which never have had a detailed survey of their food service facilities. This is a state quite well noted for progressive approaches toward other environmental and preventive medical problems, yet for about a decade there has existed a noteable lack of leadership in this important area at the State level. Because there is lack of leadership and direction from the State, local programs too are suffering. As a consequence food control, in a large part, is a token service if it is a service at all.

In another city, with a population of about half a million the health officer confided that he would hesitate to eat in any of the local food service establishments because his department was saddled with a staff of inept political appointees protected by a politically controlled system[1].

For nearly two decades many of us with a deep interest in the public health value of sound food control have been saying over and over again, *Our annual reported figures on outbreaks and cases of food poisoning are so incomplete that they do not begin to approximate the true and actual situation.* To substantiate this statement, look at these facts. In the compilation of statistics relative to food borne outbreaks for the year 1958, ten states reported not a single outbreak. Then, consider this. Two of our most populous states, the first having a population of fourteen million and the second with ten million reported in the same order for 1958, 17 outbreaks and 747 cases and 130 outbreaks and 3758 cases, respectively. In other words, the state with four million less people reported about eight times as many outbreaks and approximately five times as many cases as did the more populous state. When some of our larger cities are considered the situation is no better. For example, four large mid-western cities with a combined population of nearly four million, reported no outbreaks or cases in 1958. One large city in the southwest, with a population of about 700,000 has not reported a single outbreak of food poisoning since 1951[2]. This situation is, of course, entirely unrealistic and futher substantiates the fact that national figures do not represent the true condition.

It is realized that the reporting of food borne outbreaks does not necessarily stamp a program as good or poor. On the other hand, in the case of the two states cited above, one has a mediocre program at best, while the other is making a sincere effort to master its food sanitation problems. However, it can be said categorically that a strong effective program of food control is generally in operation where there is prompt epidemiological study of outbreaks and a careful recording of the facts. It is hardly necessary to point out that the effective program seeks out these facts, takes remedial action, puts preventive sanitation into play to the end that there will not be a reoccurrence of the misfortune.

I assume that at this point you are in general agreement with the thesis, that too many food control programs are weak and badly in need of re-vitalizing. However, before proceeding to consider some of the elements of a vital and productive program, let us look at the scope of the food service industry in terms of gross national product. More than 17 billion dollars are spent annually on meals consumed out side the home. The food service industry is said to rank fourth among all of the industries of the nation. Estimates indicate some seventy to eighty million meals are consumed daily in one or more of our many types of food and drink establishments. Americans today

---

[1]Presented at the 46th annual meeting of the International Association of Milk and Food Sanitarians, at Glenwood Springs, Colorado, August 26, 1959.

eat about one out of four meals away from home. A hundred years ago the ratio was 1 in 200. Forty thousand drug stores offer soda fountain, luncheonette, or meal service and are heavily patronized. In the category of restaurants, cafeterias, snack bars, sandwich shops and the like there are believed to be about 200,000. A further enumeration would be redundant. Suffice it is to say, this is a big business and it is growing bigger. I question very seriously whether our control agencies are growing with the problem. I am concerned that in some places horse and buggy methods are being used in the jet age.

SOME ESSENTIALS OF GOOD FOOD CONTROL

Now, let us examine some of the elements that make for a good program. This is not too easy to do adequately in the time allotted, but some of the points which appear to be most significant will be discussed.

First and foremost, the administrative head of the health department must have some important attributes. He must know what food control is, and must recognize the importance and place of it in the total community health program. He must preserve the stability of the activity by giving it his unqualified support. Since the large majority of public health administrators are men with medical backgrounds, it is quite understandable that food control may not hold as much appeal as *maternal and child health*, *nursing*, or *communicable disease control*. However, the proficient health officer sees all of the various activities in *proper perspective*. This is what is desired. Unfortunately, due to a number of reasons which need not be enumerated here, some look upon food control as a sort of a step-child; one of those routine activities that has to be carried on. Too frequently maintenance of the *status quo* seems to be the prevailing attitude. Of course this results in stagnation because only minimums are met or urgent problems are simply ignored. When a health administrator takes active interest in food control this interest is reflected in the effort and work of his staff. Contrariwise, lack of interest and leadership results in a program that simply drifts on a sea of indecision.

Now, having advanced the thesis that administrative leadership is a prime requisite, let us explore this point further. Here one moves to the operating level. In state departments, in large county units and in municipalities, food control is commonly administered by a division director. What kind of person should he be? As a principle qualification he should be a college graduate with a bachelor's degree in biological or sanitary science. If he has earned a graduate degree this is of course another asset, but in my judgment, it cannot be considered a substitute for several years of successful experience in a good health agency as a staff worker in the field of environmental sanitation. Let it be said with emphasis at this point, that a person with these qualifications should receive a salary commensurate with his ability and responsibility. There is a great deal of talk about the trained sanitary scientist and the yet unknown environmental problems of the future. There is too little talk about good salaries to attract high grade people. The current problem of recruitment would be greatly eased if the salary situation were improved.

In addition to educational qualifications and experience, he must be a person who has administrative capacity, the ability to plan and direct a program, supervise staff employees and recognize new needs as technological changes come about. Finally, he must be able to work with the food industries which come under his supervision. More and more in the regulatory field we see the real need for close working relationships with key people in industry. When amicable relationships are developed, progress is greatly enhanced and the well qualified program director utilizes this important asset.

With leadership such as I have enumerated, it follows that staff sanitarians should be equally capable of carrying on their work in an effective manner. It is axiomatic that if there is good direction and leadership at the top, staff workers will reflect these qualities and a progressive administration will result.

GOOD OPERATIONAL PROCEDURES NEEDED

Now, in the time remaining, I would like to outline some other essentials of good food control. Before doing this however, let us consider briefly the prime objective of such a program. The main purpose is to prevent human injury from infected or contaminated food. The term food as used here also includes drink. This injury may manifest itself in the form of communicable disease, food poisonings, or food intoxication. Harmful preservatives and toxic chemical compounds may get into food from a number of sources. These may cause illness and even death. Food may contain foreign and extraneous matter which makes it unfit for human consumption. These are elementary facts well known to people in the food control field, but these are basic and they bear repetition. I mention them because the first essential of a successful food control program is careful surveillance of the food itself.

A good program then gives close and critical scrutiny to the community food supply. Questions such as the following must be asked. How was the food processed and transported? How was it stored? What unusual conditions may have surrounded its hand-

ling? Was its sanitary quality and wholesomeness impaired? I repeat, *a good program looks at food with a critical eye.* It attempts to eliminate all conditions and circumstances that might despoil it. This is fundamental because in every food law or regulation each stipulation is aimed at surrounding food with every reasonable safeguard.

Another important quality in a good control program is the use of the laboratory. Too frequently about the only sampling that is done is after an outbreak occurs. As far as epidemiological studies are concerned this is entirely proper. While it must be done to determine the possible cause and to institute remedial measures, it is a bit like, "locking the barn after the horse is stolen". What we need to find out is more about the sanitary quality of food before anything happens and as it is offered to the consumer. To do this, food sampling should be instituted. Random sampling can be very revealing when used as a fact finding measure.

This type of recommendation usually brings forth the remark, "but we have no bacteriological standards to go by". This is true, but it doesn't take very long to differentiate between a total count of one hundred thousand organisms per gram and one of ten million. What foods should be sampled? To begin with, select the most perishable types. Sample those that are known to support the rapid and progressive growth of microorganisms. Choose those that are most frequently indicted as the vehicle in food borne outbreaks. Some that might well be selected are hamburger, beef and chicken pot pies, sandwich fillings such as ham, egg and tuna fish salad, creamed poultry, baked ham, gravies, stuffings, creamed sauces and soft custard filled pastries and pies. It may be found, if a hypothetical example may be used, that the bacteria count on chicken pot pies from establishment "A" is fifty thousand per gram, while at establishment "B" the count is five hundred thousand. This immediately poses the question, *What is establishment "A" doing that "B" apparently is not doing?* If a series of samples are taken and high counts result it is then imperative that the most exacting study be made to determine the cause.

It is not the purpose of this paper to list all the details which obviously are involved in the random sampling of food, *but it is the purpose of this paper* to indicate that such a program, when executed with judgement and tempered with good sense, can disclose some significant facts that physical inspection alone generally will not reveal. I am sure at this point that it is clear that I am a strong advocate of food inspection as an entity in itself and not just as an adjunct to establishment inspection.

EVALUATION HIGHLY IMPORTANT

A third important element in a well administered operation is stock taking or evaluation. For example, how did 1958 compare with 1957? Were there fewer defects in food service establishments in 1958 than there were in 1957? What defects appear to re-occur more frequently than others? Is emphasis placed upon factors of greatest sanitary significance? Just counting the number of inspections in a given period of time does not give answers to these questions. Measuring things *quantitatively* is one thing, but measuring them *qualitatively* is quite another. How can these qualitative facts be gathered? One way to do it is to tabulate defects from field inspections sheets. List, in tabular form, the more important items and determine for a six months or an annual period how many times they have been defected. It may be found, for example, that refrigeration has been checked as deficient in ten per cent of all establishments inspected. This would show the need to concentrate more effort on this facility. Perhaps three or six months later a similar review will disclose refrigeration deficiences now running at six per cent. This is a *qualitative* measure. In this instance it shows definite improvement in refrigeration. By the same token it can show lack of progress or reveal sanitation items that remain static. What is advocated, as can be seen, is an analytical approach. With this type of evaluation the division director deals with concrete facts and can plan his program more intelligently. He can point out that defects in certain areas of food service operation seem to persist; that more effort is needed in a given direction. As a consequence, field inspection will become more meaningful and corrections will be made more promptly. With the present emphasis on getting the most from the tax dollar, unit costs, and the efficient use of man power, attention needs to be directed toward a *measure of accomplishment* rather than just a measure of effort. Our basic objective is to bring about beneficial changes in the food establishment environment rather than to make a given number of inspections. (3)

SOME GENERAL RECOMMENDATIONS

The recommendations previously made have been quite specific and have included some suggestions for expediting them. Now some recommendations of a more general nature will be made. Those that follow have been found effective in a good many places. They will be listed numerically but not necessarily in the order of greatest importance.

1. Conduct in-service staff training. One of the common complaints by industry is the lack of uniformity in the interpretation of food ordinance requirements. If the division director interprets

a requirement one way and the field staff another, a confused situation results. The place to debate ordinance interpretations and to arrive at a decision is within the confines of the department, not among food service operators.

2. Observe and study trends. Today the drive-in restaurant, the roadside cafe and drive-in theatre may serve more patrons than many downtown establishments. Industrial and other catering service is currently on the increase, so commissary inspections in this branch of the industry may need to be stepped up. Food and beverage vending is at an all time high and at present continues to show signs of increasing. The vending of meals is here, but it is just in it's infancy. Mobile food units have been in use for some time but they too need careful scrutiny. In other words, know where food volume business is heaviest and adjust activities to meet it.
3. Consider the supervision of non-commercial establishments. If private clubs are not now included, they certainly should be. Employee feeding facilities in banks, insurance companies, department stores and within similar commercial enterprises comprise a sizable segment of the food industry. They should be within the framework of the food control program.
4. Churches, fraternal orders and educational institutions need to be considered. In many large centers, meal volume in these places is amazingly high. Obviously, in the case of these institutions, and with religious affiliated institutions in particular, the approach must be of the educational and consultative type. One sure way to stir up emotional tensions in a community is to use dictatorial methods in the regulation of these highly regarded community institutions. Work in this area is being done quite successfully in a number of places, so the recommendation is not just academic.
5. Enlist the cooperation of industry. A whole discourse could be given on this one recommendation. Suffice it is to say, that key people in the food service industry have a great deal to contribute to the efficient and effective operation of official control. This is a reality in a number of state and local jurisdictions and its outstanding success has been demonstrated time and time again.

SUMMARY

There is still much unfinished business in food control. The magnitude of the problems should be recognized. This paper has discussed some of the elements of a successful program and has pointed up some of the avenues of approach that may and should be used.

REFERENCES

1. Hickey, William V., Unpublished paper, Food Sanitation Programs in the United States. Public Health Committee, Cup and Container Institute, New York, N. Y. June, 1959.

2. Dauer, C. C. Reporting of Foodborne Diseases, unpublished paper. Dept. of Health, Education and Welfare, Public Health Service, National Office of Vital Statistics, Washington 25, D. C. May 1959.

3. Purdom, P. W., Shiffman, Morris A., and Colwell, F. Herbert, Are You Getting the Most Environmental Health Service Out of the Tax Dollar. III. Evaluation of Environmental Health Programs: American Journal of Public Health, Vol. 49:6 June 1959, pp. 739-44.

SANITATION PROBLEMS IN DISASTERS[1]

PAUL A. LINDQUIST, M.D., DEPUTY FOR OPERATIONS, HEALTH SERVICES, AND
K. C. LAUSTER, SANITARY ENGINEER, HEALTH SERVICES
OCDM[2] Operational Headquarters, Battle Creek, Michigan

NATURAL DISASTERS AND ACCIDENTS

From time immemorial man has faced the threat of disaster. Floods, hurricanes, tornadoes, earthquakes, fires and snowstorms are the natural consequence of nature's fury, and when Mother Nature goes on a rampage the consequences are likely to be death, destruction and human suffering. Coupled with this have been human conflicts from the time man learned to wield a club or throw a stone. As man's society has become more complex, the effects of these conflicts have become more widespread, partly because there are more people around to become affected and partly because additional threats, largely of man's own fashioning, are taking place: explosions, train wrecks, plane wrecks, accidents of all kinds, including spills of toxic materials and now the potential accidents of nuclear reactors and the hazards of handling radioactive materials.

We have survived danger in the past, and we will survive danger in the future. The sooner we realize this and take into consideration potential hazards in our planning and thinking, the better will be our chance of survival irrespective of what occurs.

THREAT OF MAN MADE DISASTERS

We in OCDM frequently receive requests for discussions on problems concerning natural disasters, but often the request makes plain that discussions of problems of nuclear warfare are not desired. Just why is this? What is the reason for this failure to face reality? Certainly this isn't in keeping with the pioneer spirit of our American forefathers. This isn't the kind of spirit that resulted in the winning of the West. The hardships endured by our founding fathers, the suffering and deprivation they withstood, and the brawn required for mere survival surely did not come from people with a faint heart or weak spirit. And the dangers they faced were every bit as great, as far as the individual was concerned, as the dangers we face today. Yet they plodded on.

Many people will argue that we know natural disasters will occur. We know we will have a flood, we know there will be fires, we know there will be tornadoes, and hurricanes. True, but are they any more predictable as to time and place, with the possible exception of floods, than the occurrence of war?

No one here wants a war, but the fact remains that potential enemies exist who have the capacity, if they so desire to use it, to wreak untold destruction on this country. In the last half century there have been two world conflicts and there is little evidence as yet to indicate man has learned to exist peacefully. Fortunately in the past we were protected by distance and time to prepare. Today time and distance no longer favor us. The front line would be right here at home.

Probably it is the stark reality of the situation that makes us want to dismiss it. We probably feel that the hydrogen bomb is the ultimate weapon and that warfare unleashed, utilizing such weapons, will mean the end to humanity.

It will certainly mean many changes in our way of life. It will certainly mean we will face many hardships and there will be much death and destruction. But there are likely to be survivors, and these survivors are likely to be in great numbers. True, many cities, whole communities, will be wiped off the map. However, many communities will remain, and it is for the survival of these communities that our planning should be directed. Since it cannot be predicted which will disappear and which will survive, all must assume they will be selected to carry on.

This is not the first time people have thought the *ultimate* weapon has been developed. The following, under the caption, "The Ultimate Weapon" is taken from the Atlanta Constitution, dated June 8, 1894:

It is said that recent experiments made with the new rifles in Germany make it reasonably apparent that the next war will be simply one of extermination. A prominent French writer in a recent article says that the battlefield would at the termination of the engagement be covered with two or three hundred thousand corpses, all crushed and broken, and would be nothing but a vast charnel house. No one would be left to bury the dead, and pestilence would in turn sweep away the country people. Pointing the moral, he adds that the man—emperor, king, or president of a republic— who, under these conditions, would expose the human race to such a fate would be the greatest criminal the world had ever seen. It is tolerably plain that the horrors and butchery which a war would entail are becoming more and more recognized, and that the terrible vista thus opened out is exercising a sobering effect on those who are formerly wont to discuss eventualities with a light heart.

Irrespective of the type of disaster that may befall, whether an act of God or caused by man, whether small, affecting only a few people, or large, affecting many millions, death, destruction and disruption of what we consider essential facilities, resulting in

---

[1]Based on a talk presented by K. C. Lauster before the Indiana Association of Sanitarian's 9th Annual Meeting, Indianapolis, Indiana, June 11, 1959.

[2]Office of Civil and Defense Mobilization.

potential threat to the health and welfare of the people affected, are likely to result. In thinking about how to cope with disasters of any kind, why attempt to segregate them? Why attempt to look on one side and not on the other? The job of the sanitarian is to deal with environmental factors that may affect the health and well-being of the people, and it is his job to view the total problem— not just that part to his liking.

SANITARIAN IN KEY POSITION

The sanitarian is a key person in our complex society. Furthermore, sanitation is now, has always been, and always will be one of the cornerstones of any public health program. Any sanitarian could easily devise a dozen ways of engineering a breakdown in sanitary facilities that would make people sick much faster than the doctors could hope to cure them. Whether these breakdowns are by design through diabolical planning, or accidental producing similar effects, the end result is likely to be the same. Thus the sanitarian becomes even more important in disaster, whether natural or man made, than in normal circumstances. Clearly the man who knows how best to disrupt something is the man who knows how best to repair after disruption has occurred, or to minimize the effects.

Sanitation problems in disaster are becoming more complex as our life becomes more complex. Just a good snowstorm can deliver a knockout punch over a wide area with our present-day dependence upon electricity. Heat, light, refrigeration and all the many labor saving devices we take for granted suddenly become inoperative. In all aspects of our daily life we are becoming less self sufficient and more dependent upon others for essential services. Our interdependence is becoming greater as time goes on. This must be taken into consideration in any planning to cope with disasters.

NO PACKAGE PLAN AVAILABLE

We frequently receive inquiries concerning disaster planning which would lead one to believe that people would like to obtain a complete disaster plan which they can adopt as their own plan. There is no such thing as a ready made disaster plan that can be bought as a paper back edition. And if there were it wouldn't be worth the 35c because it wouldn't be tailored to fit the specific area involved.

Disasters are all different. There is no pat answer. To solve the technical problems one may face in disasters the best answer is to have a well rounded knowledge of the basic principles of sanitation — the same principles that are used day in and day out. These then must be applied with ingenuity to the problems as they arise. Also, if we are to be properly prepared to take care of our daily tasks the knowledge of biological warfare agents, chemical warfare agents, and radioactive materials must be a part of our armamentarium.

Our stock-in-trade is antibacterial operations. The new insecticides that are used daily are first cousins to the chemical warfare agents, the nerve gases. And the sanitarian who does not have knowledge of radiation and can speak about roentgens, curies, microcuries, rems and reps, will soon be replaced by a sanitarian who has the scope to meet with these daily problems.

STUDY OF NEEDS ESSENTIAL

An effective element of military tactics is the element of surprise. Mother Nature apparently utilizes the same tactics. If one expects the flood waters to rush down from the hills washing over the city, probably the first thing that will happen is that sewers become surcharged from high tides resulting in the initial flooding by backed up sewers. If our water systems are designed above the highest known flood level the first thing we know they become overtopped because of higher floods than previously recorded. In the Kansas River flood in 1951 some places were inundated 10 feet above any known previous level. Similarly in Stroudsburg, Pennsylvania, in 1955 no one expected the water supply to be completely knocked out.

In Connecticut, in 1955, run-off records ran to three or more times any previous record, and some records went back well over 100 years. A rain storm in central Pennsylvania a few years ago was estimated at 36 inches in 24 hours. Our country is just too new to have records for a long enough period to provide completely reliable predictions.

So in preparation for these problems we need to study what has taken place, and make adequate allowance in addition. Also we need to study the problems that have arisen and see how they were solved. We must have a good basic knowledge of the principles of sanitation and we must remember that necessity is the mother of invention. Something different is always likely to happen and ingenuity and improvisation will be the order of the day.

INGENUITY NECESSARY

An illustration of this is the situation in Stroudsburg, Pennsylvania, following Hurricane Diane in 1955, when the water supply system was knocked out. Water was being hauled in by tank truck but it was found that many people did not even have a container to carry it in. The mayor thought of milk cartons and called to the Lehigh Valley Cooperative Farmers Dairy at Allentown asking them to send over a supply of cartons. The creamery manager thought a moment and said, "Sure I'd be glad to send over some cartons." "But" he said, "I can send

full ones just as easily as I can send empty ones. I'll just load up a truck of full cartons and send them over." Thus was born one method of providing water to natural disaster victims in a safe and sanitary manner that permitted people to take water to their homes, fully protected, permitted restaurants to open, permitted hospitals to function, and served many other obvious purposes.

In the Kansas City stock yards, in 1951, the hundreds of dead animals soon became a serious problem. How could these water logged decaying carcasses be disposed of when they would fall apart upon any attempt to move them? They were bloated and odors and insects became severe. Here an article of war became the answer. The insertion of a gasoline jelly bomb into the interior of a carcass and touching a match to it resulted in complete cremation.

Burial of the dead becomes an urgent matter particularly in warm weather. This problem was aided in one instance by bringing in refrigerator trucks to retard decomposition until identification could be made.

Among the items in shortest supply in the Cameron, Louisiana, hurricane were snake-bite kits. Further serious problems were caused by nutria (an aquatic rodent) washed in from the swamps, that were attacking and biting people.

A sewage treatment plant in New Jersey was felt to be perfectly secure because the river surely would not overtop the plant itself. But no one thought that an empty settling tank would be floated out of its position by the hydrostatic pressure from below.

An unexpected problem in some New England communities was the necessity to post guards at the dump grounds to keep people away who wanted to go in and salvage the canned goods, furniture, appliances, and other things that had been condemned and discarded. Hasty land fill operations were necessary to eliminate the hazards involved.

Appropriate information programs are vital to keep the people informed of what is safe, what is not safe, and what can be pursued properly. People want to know how to clean up their houses, their basements, and what precautions should be taken. Strange as it may seem they will even be hesitant, many times, about driving non-stop through a flood-stricken area for fear of getting typhoid.

All of this points up the fact that we must consider all types of disaster and their potential for destruction. In floods, it is water, contamination, and damage. In explosions it is blast, heat, and possibly fire. A nuclear accident as in Windscale, England, will spew radioactive material over the landside. Or an accident with isotopes such as occurred in Houston, Texas, will cause radiation hazards. Accidents with insecticides, cyanide or other toxic material are not unknown. A nuclear explosion is merely a combination of these, only greater in magnitude. Thus we must be prepared to cope with all of these environmental hazards in peace as well as war.

Operational Plans Needed

But our technical ability is only one aspect. All the technical competence in the world cannot be effectively utilized in the solution of problems unless it is properly organized and effectively directed. In fact, the principal deficiency that has been observed with respect to disasters has been the lack of operational plans that provide for the coordination and direction of the forces available—an operational plan which specifies who is the boss, the area of responsibility of the various personnel assigned to the organization, what equipment and materials are available, where they are to be found, and how they can be obtained; a plan which provides for a system of communications, who to communicate with, and how; a plan which provides for transportation of both personnel and other resources and also directs the personnel to report back to headquarters on observations so the boss can provide what is needed to supplement the field forces.

Clearly, disaster plans should be developed for all eventualities. The magnitude of the disaster would determine to what extent the organization is mobilized, but this is for the boss to say upon receiving reports from the field. But one plan and one plan only is a desirable objective for coping with both natural disaster and enemy caused disaster.

In throwing this plan into operation procedures of course would vary. It is normal in the solution of any problem to size up the resources in relation to the problem and tackle it accordingly. In natural disasters, resources are usually unlimited. If the local area is not self sufficient it can draw upon the State. If the State needs additional help, it can draw on the Federal Government. For major natural disasters, so declared by the President upon request of the Governor of any State affected, the resources of the Federal Government are available both in personnel and in rehabilitative funds.

In natural disasters it is often found more expedient to discard and destroy rather than attempt to salvage. Our industrial potential makes it so. Furthermore, salvage operations and the cost of controlling such activities are often prohibitive. In contrast, following an enemy attack, the watchwords of the day will be conserve and salvage.

Each Community Should Have A Plan

The National Plan for Civil and Defense Mobilization urges every family to be prepared to exist on its own resources in its own home for not less than two

weeks. Similarly communities should be prepared to be self sufficient for four weeks. For planning purposes no State should expect Federal assistance prior to four weeks following attack. However, Federal aid will be forthcoming as soon as humanly possible.

Let us consider this for just a moment. Ordinarily in meeting with the problems of disaster help can be obtained from unaffected areas. Immediately following a nuclear attack this can not be anticipated. Thus the people within each community should be properly trained and prepared to meet such problems as may arise. Technical know how will be among the most precious resources — the ability to utilize what is available to cope with problems.

To meet extraordinary problems throughout the country, the U. S. Public Health Service has had a reserve for many years. The reserves are called up when needed. Wouldn't it be appropriate for State health departments to have a similar reserve and likewise for local health departments to maintain a ready reserve? These reserves could be enlisted from industry, from educational institutions, and other sources where personnel with appropriate backgrounds could readily assimilate the necessary principles to enable them to supplement the local health department sanitation force. They could be trained in advance and brought into periodic exercises for refreshing their training and putting their knowledge into practice, and they could be utilized in natural disasters. What they may lack in technical background they would make up for by having a knowledge of the area they are serving. A further advantage to such a reserve in each community would be the moral support they could provide to the local health department in the programs it is attempting to foster.

FEDERAL-STATE RESPONSIBILITIES

The responsibility of the Federal Government with respect to enemy attack is shared jointly with the States. The responsibility of the Federal Government in meeting natural disasters is to supplement State and local efforts. Public Law 875 recognizes the need for such assistance in major disasters and provides the authority to the President to make assistance available. By Executive Order the responsibility for administering this Act is placed with the Office of Civil and Defense Mobilization. In providing this assistance, OCDM coordinates the activities of other Federal agencies.

It is also the policy of OCDM to foster the development of State and local organizations and plans for coping with major disasters, and to provide advice and guidance to States and local governments on organization and planning to meet the effects of major disasters and to assure the maximum application of this experience in preparing Federal, State, and local governments to meet the effects of enemy attack. This can best be accomplished as an overall disaster planning activity to encompass both natural disasters and enemy attack.

The act also authorizes, when so declared by the President as a major disaster, the expenditure of Federal money for debris clearance, preservation of life and property, and for the emergency restoration of public facilities. This is a rather limited authorization. If a tornado were to cut a swath through a town a great many houses could be destroyed but it may not hit a school building or any other essential public facility. The principal item eligible for reimbursement under such circumstances would be debris clearance as necessary to resume essential public services.

ROLE OF RED CROSS

The organization chartered by Congress for aiding individuals and families as opposed to governments in natural disaster is the American National Red Cross. It is well organized to assist in natural disasters through its hundreds of local chapters, backed up by competent and experienced personnel within its national organization. Through formal understandings between the ARC and OCDM, the respective responsibilities and functions in natural disasters have been clearly defined.

The Red Cross recognizes that the primary responsibility for public health activities in disaster situations rest with the State and local health officials. For health and sanitation problems, particularly in Red Cross shelters, the assistance of the State and local health officials is earnestly solicited.

SANITARIANS MUST PLAN

It is noteworthy to see the status of the sanitarians throughout the country being elevated. Along with this recognition comes the responsibility for controlling environmental hazards, of whatever nature and from whatever source, which cannot be overlooked. This means that operational planning to meet disasters must become a part of your daily task. It means that you must know what your job is, to whom you report, what is your area of responsibility, who is to work for you, what resources you have at your command, where they are to be found, and how to obtain them. It means that you must have the technical capability to cope with such problems as may arise whether they be biological, chemical, or radiological.

The fate of the Nation may very well lie with sanitarians whether the enemy be nature on the rampage, an element of our industrial complex gone berserk, or an attack by a foreign power. *This is a tremendous challenge which must be accepted without hesitation.*

SUCCESSFUL 46TH ANNUAL MEETING WELL ATTENDED

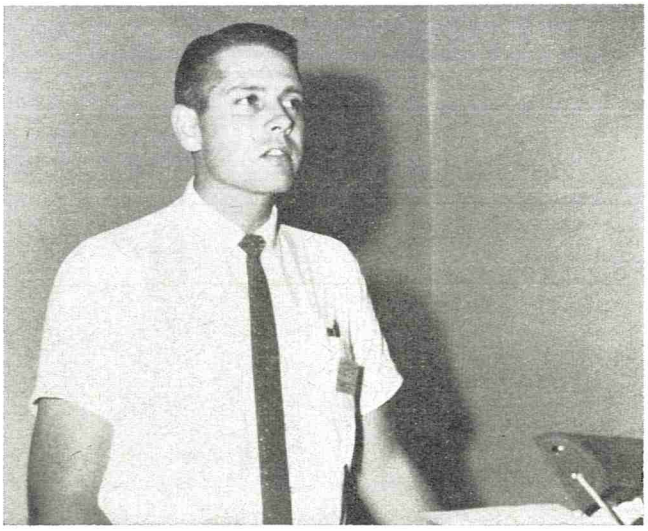
Nearly four hundred IAMFS members and guests attended the 46th annual meeting held at the Colorado Hotel, Glenwood Springs, Colorado, August 26-28. The Rocky Mountain Association of Milk and Food Sanitarians and the Colorado Health Officers Association served as hosts and did an outstanding job in that capacity. Technical papers were timely and interesting and covered a wide range of subjects of interest to all participants.

Prior to the annual meeting, some one hundred persons attended the semi-annual meeting of the 3-A Sanitary Standards Committee when deliberations were held dealing with revised farm tank standards, plastics, batch pasteurizers, can washers, ice cream fillers, cottage cheese fillers, and transport tanks. Many of the 3-A participants stayed over to attend and participate in the annual meeting.

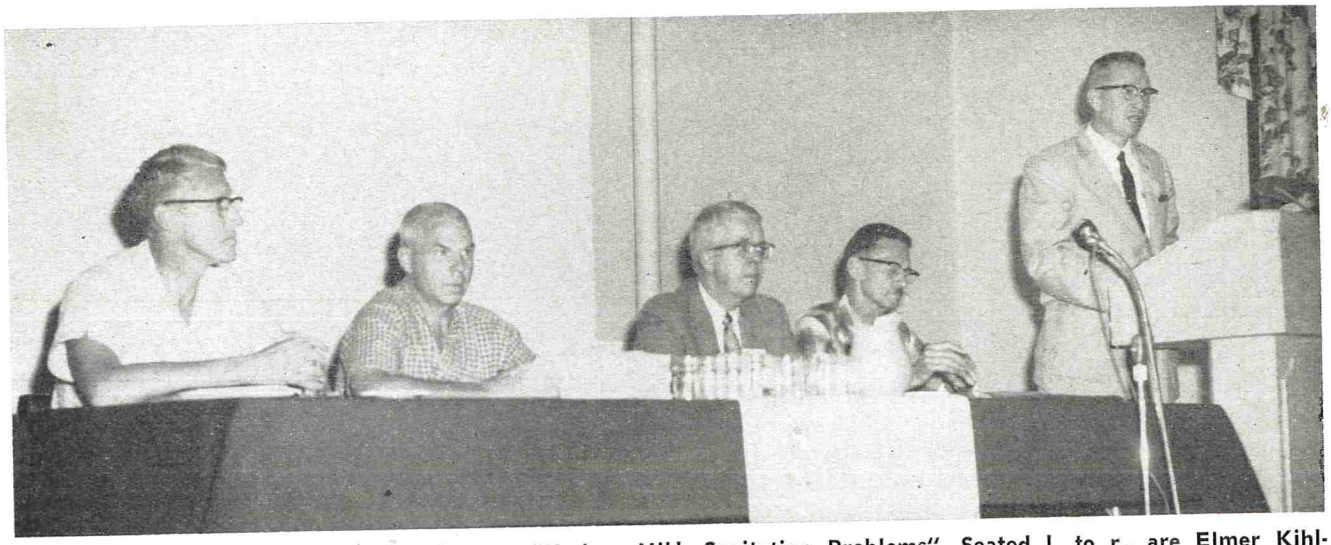
Subjects covered by papers and panel discussions included the following. A keynote address by Dr. John D. Porterfield on the subejct of: *The Sanitarian in Tomorrow's Public Health Program; Staphlococcal Food Poisoning Outbreak due to Cheddar Cheese,* by Dr. S. L. Hendricks of the Iowa State Department of Health; *Sanitation Problems in the New Presseurized Foods,* by Harold Wainess of Chicago; *Q Fever Test Results on Raw Milk and Cream Produced in Wyoming,* by Mike Purko, State Chemist; *Contributions of Milk and Food Research to Public Health,* by Keith Lewis of the Taft Sanitary Engineering Center; *Development and Application of a Food Sanitation Program,* by Jack H. Whitman of the San Diego, California Health Department; *Studies on the Use of Sewage Effluent for the Irrigation of Truck Crops,* by Stuart G. Dunlop, University of Colorado Medical Center; *National Restaurant Association Looks at Food Sanitation* by Jerry Richardson of the National Restaurant Association of Chicago. In addition in-

Dr. John D. Porterfield, Deputy Surgeon General, U. S. Public Health Service, who gave keynote address at the opening general session.

Dr. William S. Haynes, President, Colorado State Health Officer Association, extends welcome in behalf of his group.



Paul Freebairn, President, Rocky Mountain Association of Milk and Food Sanitarians extending welcome to IAMFS members.

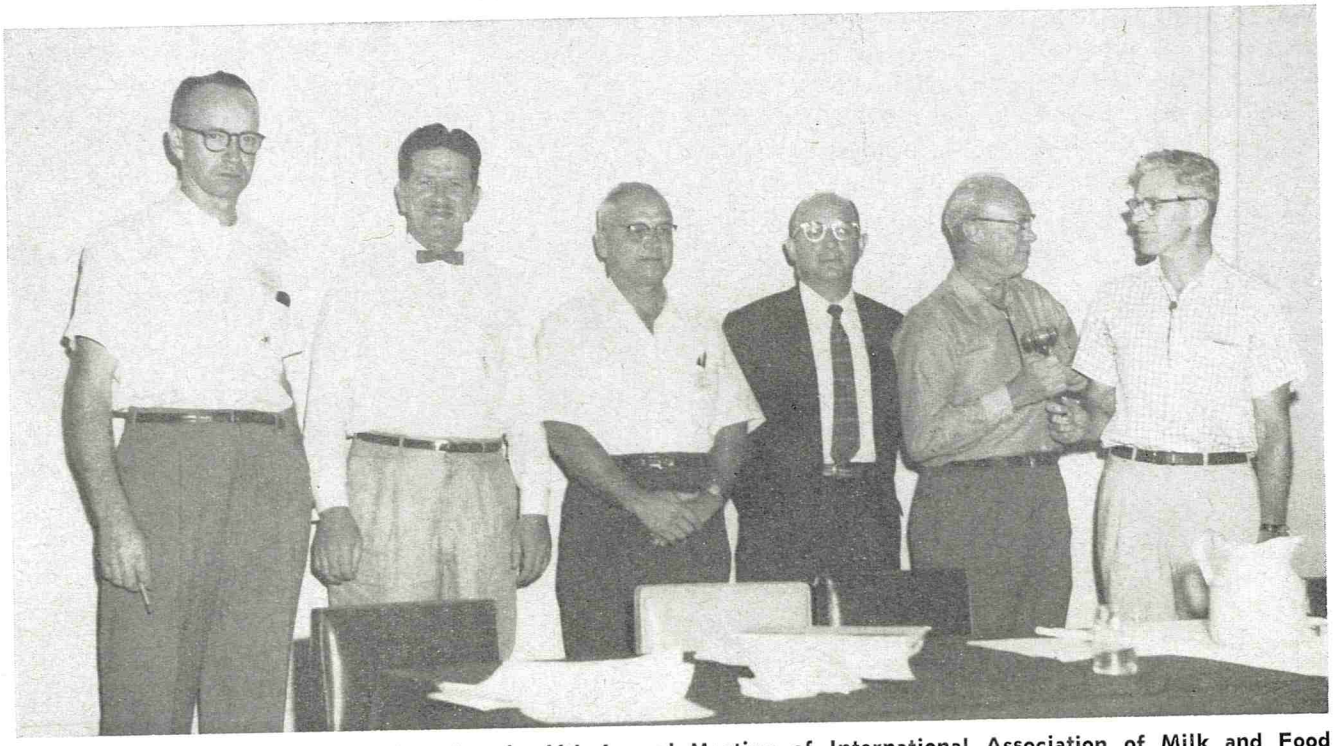


Panel moderated by Dr. C. K. Johns on "Modern Milk Sanitation Problems". Seated l. to r., are Elmer Kihlstrum, Ivan Parkin, James Meany, and Dr. Johns. Speaking is William R. Godfrey.

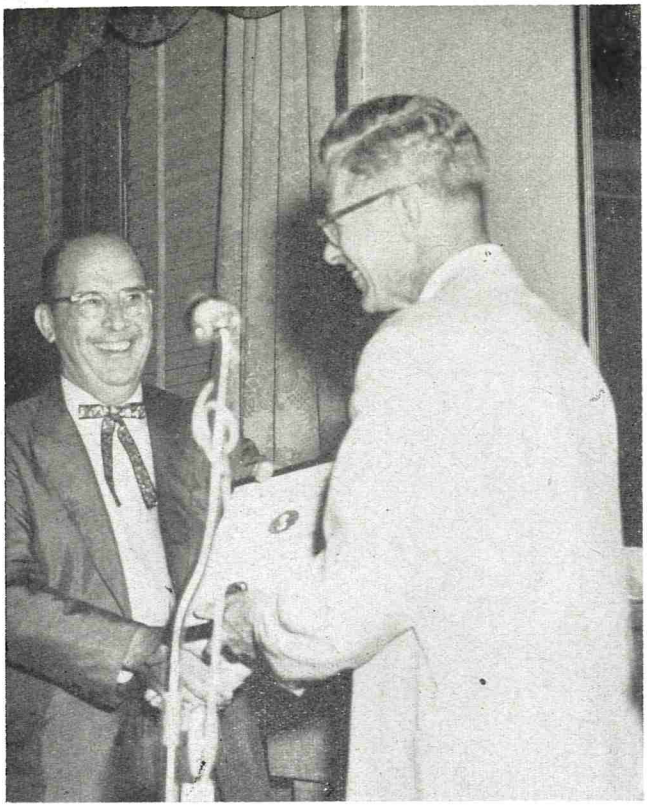
teresting panel discussions were held on the following subjects: 3-*A Sanitary Standards, What are they, how do they work and what are the results.* Dr. E. H. Parfitt moderated the panel. Dr. C. K. Johns moderated a panel which explored the subject; *Modern Milk Sanitation Problems.* The third panel took up the subject, *The Problem of Non-uniformity in Labeling Dairy Products,* with Donald Race as the Moderator.

At the closing session on Friday morning the panel gave its attention to the subject of, *Reorientation of the Sanitarian into the Whole Public Health Program.* This panel was chaired by Dr. John Porterfield and four of the five panelists were medical health officers.

1959-60 OFFICERS OF IAMFS



Here's the lineup of officers elected at the 46th Annual Meeting of International Association of Milk and Food Sanitarians. Left to right: Vincent T. Foley, Secretary-Treasurer; Charles E. Walton, First Vice President; John Sheuring, President Elect; Ray Belknap, Second Vice President; William V. Hickey, President; Franklin W. Barber, Past President.



In recognition of his leadership, Harold B. Robinson (standing, left) receives the Past President Award from Franklin W. Barber, President of International Association of Milk and Food Sanitarians, at IAMFS annual banquet.

Cameron Adams of the Washington State Dept. of Agriculture, was the spokesman for the sanitarians on the panel.

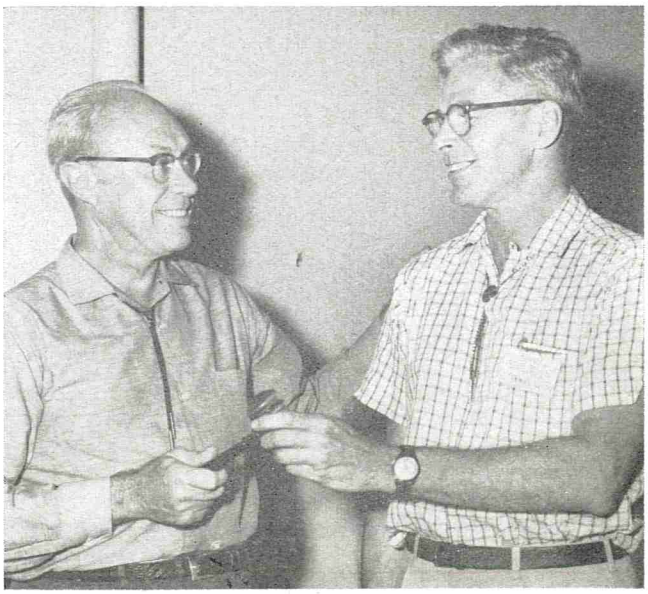
Interspersed with the many fine papers were meaty committee reports. Committees were active during the year and their reports indicated careful study and deliberations on many subjects involving administrative and regulatory procedures for field application. Policies and procedures for the Association were recommended in other committee reports.

At the annual business meeting, one of the main issues was the matter of a recommended dues increase. President Barber, in his Presidential Address, pointed to the fact that costs have risen to the point where the *Association* and the *Journal* are barely meeting current and necessary expenses. It was obvious to all in attendance that dues voted in in the early 50's, could not be expected to carry the higher operating costs of 1959. It was therefore unanamiously voted that beginning January 1960, dues to International would be five dollars through an affiliate instead of the three now in effect and seven dollars for direct members.

Mention should certainly be made of the fine ladies program which was planned by the local arrangements committee. With some one hundred ladies present, several special trips and luncheons were arranged and enjoyed by those in attendance.

The 1960 meeting will be held at the Morrison Hotel in Chicago with the Associated Illinois Milk Sanitarians serving as hosts. This, the 47th annual meeting will be held October 27-29, 1960.

HICKEY RECEIVES IAMFS PRESIDENTIAL GAVEL



William V. Hickey, Paper Cup and Container Institute, New York (left), receives the symbol of his new authority as President of International Association of Milk and Food Sanitarians from retiring President Franklin W. Barber, National Dairy Resetrch Laboratories, Oakdale, L. I., N. Y. Scene is Colorado's Glenwood Springs, where IAMFS's 46th Annual Meeting was held August 26-28.

CANADIAN IS SANITARIAN OF YEAR

William Kempa (standing, right), Dairy and Milk Sanitarian for the City of Regina, Saskatchewan, Canada, receives the Sanitarian's Award of International Association of Milk and Food Sanitarians, at IAMFS's 46th Annual Banquet in Glenwood Springs, Colo., August 27. Award, presented by Paul Corash, Chairman of IAMFS Committee on Recognition and Awards, carries with it check for $1,000.

SANITARIAN'S AWARD AND $1,000 GO TO WILLIAM KEMPA, REGINA MILK SANATARIAN, AT 46TH ANNUAL MEETING

For developing a safe and sanitary milk supply for a growing new community in a comparatively new Canadian province, William Kempa, dairy and milk sanitarian for the city of Regina, Saskatchewan, has been awarded the highest professional honor in his field, the Sanitarian's Award.

Bestowed annually by International Association of Milk and Food Sanitarians, it carries with it a check for $1,000.

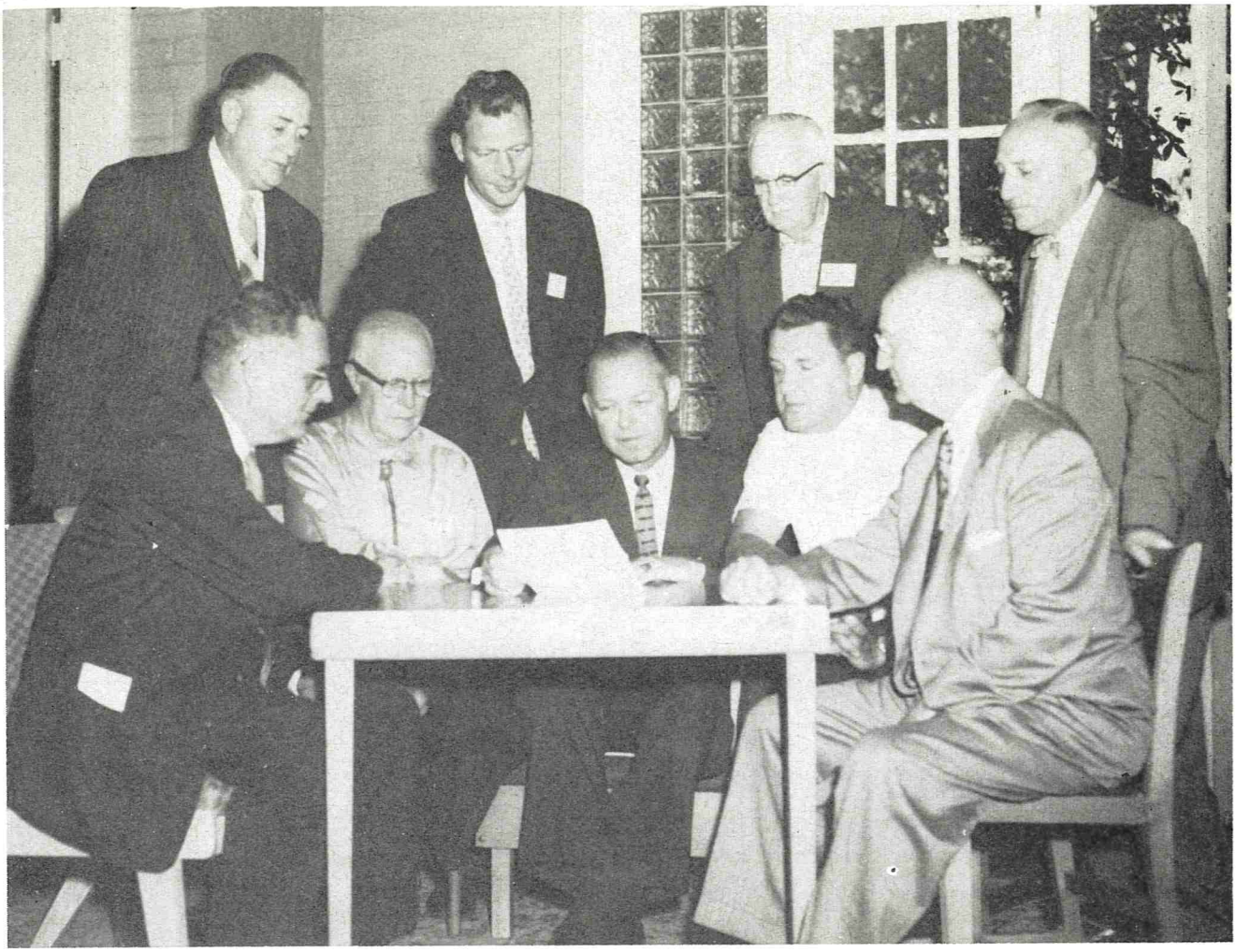
The presentation was made to Mr. Kempa at the 46th Annual Banquet of IAMFS at the Hotel Colorado, Glenwood Springs, Colo., August 27, by Paul Corash, Chairman of the IAMFS Committee on Recognition and Awards, himself an earlier recipient of the award.

Although technically the award goes to the municipal or local sanitarian who has contributed most meritoriously to the health and welfare of his community for the five year period just past, Mr. Kempa's service to his community extends over a 13-year period, Mr. Corash pointed out.

When he joined the Regina City Health Department in 1946, Mr. Kempa was undertaking his first job, having just served in the Canadian Armed Services for four years following his 1942 graduation from the University of Manitoba. He found a city of about 100,000, with a milk shed covering some 4,000 square miles. Grain production was—and still is—the main agricultural interest in the area, and sufficient fluid milk for Regina's needs on a yearly basis was not being met.

Starting literally from scratch, Mr. Kempa recom-

SPONSORS OF SANITARIANS AWARD



Conferring in Glenwood Springs, Colo., on the Sanitarian's Award results are representatives of the five companies which make the award possible. Seated around the table, left to right, are C. E. Brooker, Pennsalt Chemicals Corporation; C. A. Abele, The Diversery Corporation; R. C. Perry, The Diversey Corporation; K. C. Tucker, Oakite Products, Inc.; and A. E. Wennerstrom, Olin Mathieson Chemical Corporation. Standing, left to right, are J. Gordon Simpson of Pennsalt; Mr. Joe R. Ziegler, Olin Mathieson Chemical Corporation; W. J. Dixon, Klenzade Products, Inc.; and Paul Corash, Chairman of the IAMFS Committee on Recognition and Awards.

mended basic requirements for milk shippers, as well as sanitary requirements for milk processors, and began a steady program to get these basic requirements met. For the dairy farmer, he provided advice as well as plans for barns and milk houses. He required that every farmer shipping milk into Regina must have a permit issued only after compliance with requirements. A system of issuing "temporary" permits to those who did not at first qualify, but who indicated they intended to progress to a point where they would qualify, gave incentive to dairy farmers to improve.

In the city, Mr. Kempa began collecting weekly samples of milk from plants and delivery trucks, making monthly inspection of milk plants as well as spot checks, and conducting an *evening school* for milk plant employees. Record-keeping procedures were also instituted.

In the most recent five years—the period for which he received the award—Mr. Kempa has seen the number of permanent certified producers increase from 77 to 111, and the number of *temporary producers* drop from 136 to 96. In the same period in the Regina milkshed, 69 new dairy barns were built and 21 remodeled; and 70 new milk houses were built and 16 remodeled. In 1954, only 10% of the producers had electric milk coolers; by 1958, 65% had them—and, in the April 1958 newsletter which he sent producers in his area, Mr. Kempa wrote, "From now on, anyone planning to purchase a mechanical cooler should first consider the pros and cons of a bulk farm tank."

In the city's milk plants, improved sanitation practices have brought about steady increases in higher quality in dairy products. Samples of standard pasteurized milk, in 1954, tested 67% coliform free; in 1958, 95% of standard pasteurized milk tested was coliform free.

The first Canadian to receive the Sanitarian's Award, Mr. Kempa had not heretofore received any national recognition for his record of service to his community, nor did he know that he had been selected for this highest professional award until it was presented to him.

The Sanitarian's Award is made possible by five companies: Diversey Corporation, Klenzade Products, Inc., Oakite Products, Inc., Olin Mathieson Chemical Corporation, and Pennsylvania Salt Chemicals Corporation. Selection of the recipient is an exclusive function of IAMFS, however, and the firms have no voice in selection or consideration of recipients.

Earlier recipients, and their positions at the time, are:

Paul Corash, Chief of the Milk Division, New York City Health Department (1952).

Dr. E. F. Meyers, Chief of the Milk, Meat and Food Division of Grand Rapids, Mich., Health Department (1953). Since retired.

Kelley G. Vester, Senior Sanitarian of the Rocky Mount, North Carolina, City Health Department (1954).

B. G. Tennant, Chief Sanitarian of the Escambia County Health Department, Pensacola, Florida (1955).

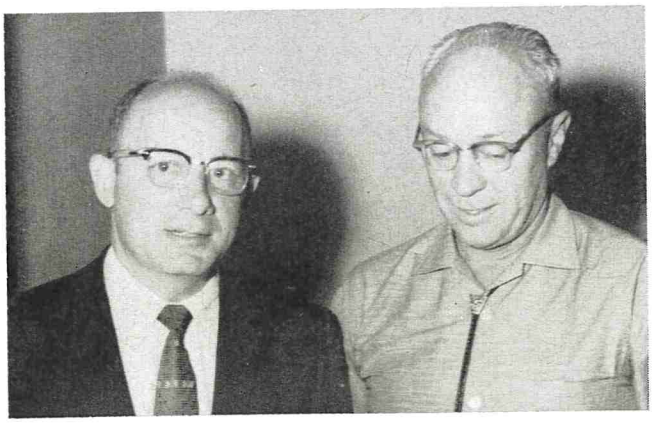
John H. Fritz Chief of the Milk and Food Section of the Kansas City, Missouri, Health Department (1956). Currently with U. S. Public Health Service, Washington, D. C.

Harold J. Barnum, Chief of the Milk Sanitation Services of the Department of Health and Hospitals, Denver, Colo. (1957).

Carl A. Mohr Sanitarian and Deputy Health Officer, Health Department, Green Bay, Wisc. (1958).

RAY BELKNAP NAMED SECOND VICE PRESIDENT; VINCE FOLEY RE-ELECTED SECRETARY TREASURER

IAMFS NEW OFFICER AND PRESIDENT



Ray Belknap, Senior Milk Sanitarian, Iowa State Department of Health, Des Moines (left), is elected Second Vice President of International Association of Milk and Food Sanitarians, and thus becomes eligible for the presidency in four years. Newly elected IAMFS President is William V. Hickey, Paper Cup and Container Institute, New York, N. Y. (right).

At the 46th annual meeting of the Association held at Glenwood Springs, Colorado, August 26-28, Ray Belknap of Iowa was elected Second Vice President.

Ray is a graduate of Iowa State College. He is a member of the staff of the Iowa Department of Health and serves as director of milk surveys and certification. Prior to his affiliation with the State Health Department, he was in charge of milk sanitation for the Des Moines, Iowa Department of Health.

He is a past president of the Iowa Association of Milk Sanitarians having held that office in 1953. Currently he is Secretary of the Iowa Association.

He is married, has two boys and a girl and makes his home in Des Moines.

For the office of Secretary-Treasurer, Vincent T. Foley of Kansas City, Missouri was re-elected for another term.

The complete slate of officers for the ensuing year is as follows:

President, William V. Hickey of New York City.

President Elect, John J. Sheuring of Athens, Georgia.

First Vice President, Charles Walton of Laramie, Wyoming.

Second Vice President, Ray Belknap of Des Moines, Iowa.

Secretary-Treasurer, Vincent T. Foley of Kansas City, Missouri.

Harold Robinson as Senior Past President, and Franklin Barber as Junior Past President, will serve with the officers on the Executive Board.

JOHN D. FAULKNER RECEIVES IAMFS CITATION AWARD

The Chief of the Milk and Food Program of the U. S. Public Health Service, John D. Faulkner (standing, right), is presented the Citation Award of International Association of Milk and Food Sanitarians for outstanding service to the Association. Paul Corash, Chairman of the Committee on Recognition and Awards, makes the presentation at IAMFS's Annual Banquet.

IAMFS CITATION AWARD FOR 1959 GOES TO JOHN D. FAULKNER, USPHS MILK AND FOOD CHIEF

John D. Faulkner, Chief of the Milk and Food Program, U. S. Public Health Service, Washington, D. C., was presented the Citation Award of International Association of Milk and Food Sanitarians at the 46th Annual Meeting, August 27, at Glenwood Springs, Colorado.

Bestowed annually by the Association to salute outstanding service to it and to the advancement of the professional status of all sanitarians, the award this year honored a past president and active worker on many of its committees. The citation reads:

"For outstanding services to the Association which include work on the development of 3-A Sanitary Standards for Dairy Equipment, the Chairmanship of the Advisory Committee on Association Activities, Programs and Administrative Practices, membership on the Executive Board and Past President of the Association."

Mr. Faulkner is a North Carolina native, who holds the Bachelor of Science degree in Mechanical Engineering from the University of North Carolina and a Master of Science in Public Health Engineering from the University of Michigan. His professional career has encompassed service with the North Carolina State Board of Health; in Brazil as Chief Sanitary Engineer and Assistant Director of the Health and Sanitation Program of the Institute of Inter-American Affairs; and, since 1949, in Washington, D. C., as a member of the U. S. Public Health Service's Milk and Food Program, which he has headed since 1951.

REVISED FARM TANK STANDARD GETS APPROVAL OF 3-A GROUPS IN COLORADO MEET, AUG. 22-25

Complete agreement on the revised 3-A Sanitary Standard for Farm Milk Cooling and Holding Tanks was reached at the regular semi-annual meeting of the 3-A Sanitary Standards Committees, August 22-25, in Glenwood Springs, Colorado. Action was taken which advanced new or revised standards for eight other items of dairy equipment, and sentiment of the more than 100 men attending was that this was one of the most productive sessions ever held.

Here, in brief summary, are the actions taken in Glenwood Springs:

1. *Farm tanks*—Since the first 3-A Sanitary Standard for Farm Milk Cooling and Holding Tanks was published in 1953, there have been 15 revisions considered before the version arrived at in Glenwood Springs won approval of all participating groups. In brief, the new standard differs from the 1953 version in that it now includes, among other items, provisions for vacuum-type tanks and also specifies improved test procedures covering the cooling of second and subsequent milkings. The new standard will now be signed by representatives of all participating groups, and 12 months following this signing, all tanks which bear the 3-A Symbol must conform to the new standard, not the 1953 standard.

2. *Plastics*—"Tentative 3-A Sanitary Standards for Plastic Materials Used as Product Contact Surfaces, in Multiple Use, for Dairy Processing Equipment," as the proposed standard is known, was approved in its fifth version by representatives of dairy processors (it had previously been approved by equipment manufacturers). It now is to be transmitted in part to committees of sanitarians so that major portions of the draft may be considered for approval at the next semi-annual meeting of the 3-A Committees.

3. *Air under pressure*—"Tentative 3-A Accepted Practices for Supplying Air Under Pressure in Contact with Milk, Milk Products and Product Contact Surfaces," as this proposed standard is known, was approved in principle by representatives of dairy equipment manufacturers and sanitarians. Since this draft differs slightly from an earlier draft approved by processors it will be referred to processor groups at their next meeting for possible ratification, in view of the slight changes suggested. Final approval may or may not be forthcoming at the next 3-A meeting.

4. *Batch pasteurizers*—The ninth revision of a tentative standard for non-coil batch pasteurizers was studied by representatives of processors, after it had been submitted by manufacturers. The processors then returned the draft to the manufacturers for further work before it is submitted to the sanitarians for their consideration.

5., 6., and 7. *Can washers, Ice cream fillers* and *Cottage cheese fillers*—Three tentative standards for these named products met the same fate as did the draft for Batch Pasteurizers.

8. *Rubber covered plug valve*—An amendment to the fittings standard providing for this type of valve

was reviewed by processors and sanitarians and then referred back to manufacturers for consideration of a refinement suggested by the former two groups.

9. *Transport tanks*—An amendment to the existing standard for automotive truck tanks which would extend the length for single-manhole tanks to 36 feet was approved by manufacturers and processors and referred to sanitarians for their consideration.

The 3-A Sanitary Standards Committees are comprised of representatives of dairy equipment manufacturers, dairy processors, and public health sanitarians. With the advice and counsel of the U. S. Public Health Service, and with participation by military agencies and agricultural and educational personnel, they meet every six months to consider the development of voluntary 3-A Sanitary Standards for dairy equipment. If equipment meets these standards, it is generally acceptable to sanitarians and health officials in all parts of the United States and Canada.

Participating groups in the 3-A Sanitary Standards Committees are:

Representing equipment manufacturers—The Technical Committee of Dairy Industries Supply Association.

Representing dairy processors—The Sanitary Standards Subcommittee of Dairy Industry Committee.

Representing sanitarians—The Committee on Sanitary Procedure of International Association of Milk and Food Sanitarians.

Dr. E. H. Parfitt, Chairman of the Sanitary Standards Subcommittee of Dairy Industry Committee, serves by consent as chairman of the three groups during the semi-annual sessions.

SEVERE FOOD POISONING HITS PICNICKERS

A severe outbreak of food poisoning felled an estimated seven hundred and twenty employees and their family at an outing and picnic given by the Miles Laboratories of Elkhart, Ind. The outbreak occurred on Saturday, August 15 at Angola, Indiana where the picnic was held. Hospitals in the general area were filled with patients who ate the incriminated food. The National Guard Armory at Angola was temporarily converted into a hospital to care for victims after they were stricken. There were no deaths, but a substantial number of victims were severely ill.

The menu included sliced ham, potato salad, barbequed chicken, all of which are foods commonly served at large group outings. The food was not adequately refrigerated and was stored, prior to serving, in deep roasters. It was transported in a panel truck to the site and the temperature the day of the picnic was in the high eighties. It remained unrefrigerated for about six hours.

Laboratory examination confirmed the fact that

the ham was the causative agent. Excessively high bacteria counts were found and the outbreak was caused by pre-formed toxins of the staphlococcus organism.

The food was prepared by a local caterer. This is another example of an outbreak where large food masses were prepared and illustrates the fact that common sense methods of food protection were not followed.

Sanitarians are urged to check carefully all catering establishments and their commissaries. Experience such as this illustrate the need for close supervision and instructions in the essentials of safe food handling methods.

SARAH V. DUGAN OF KENTUCKY RETIRES

Mrs. Sarah V. Dugan, who has been Chief of the Division of Foods and Drugs of the Kentucky State Health Department, retired June 30 after nearly forty years of service.

Mrs. Dugan began her career in public health in 1918. She has long been recognized as one of the outstanding leaders and administrators in the field of food and drug control. She worked untiringly and successfully for the passage of the Federal Food, Drug and Cosmetic Act which was enacted by Congress in 1938. Also during her career a statewide program of Grade A milk pasteurization was adopted and was placed in operation through enactment of local milk ordinances by city and county health departments.

In 1957, Mrs. Dugan was the first recipient of the Harvey W. Wiley Award presented by the Association of Food and Drug Officials of the U. S. in recognition of her outstanding service in her chosen field.

She is a past president of the Association of Food and Drug Officials of the U. S. and has served as chairman of the Ohio Valley Food and Health Officials Conference and as president of the South Central States Food and Drug Association. She is also a long time member of the International Association of Milk and Food Sanitarians and has held a number of important committee assignments.

Mrs. Dugan's successor is Shelby Johnson who has been with the Division since 1954. Mrs. Dugan says she plans "to stay at home, at least for awhile," after her retirement. She and her husband live at 1334 Eastern Parkway in Louisville.

Officers and members of International wish her the best in her retirement. Her work for the State of Kentucky and the Nation has been outstanding. She leaves her position with a feeling of deep satisfaction that she has done many things well for the benefit of her fellow men.

PARKIN HONORED—RECEIVES PENNSYLVANIA SANITARAIN AWARD

At the seventeenth annual Dairy Fieldmen's Conference held in July at the Pennsylvania State University, Ivan E. Parkin, Professor of Dairy Science Extension was presented the annual award of the Association as the outstanding dairy sanitarian of the

year. Professor Parkin is a past president of International and was instrumental in organizing the Pennsylvania Dairy Fieldmen's Association.

Some four hundred persons attended the recent conference which considered such subjects as: milk conveying systems, bulk milk handling methods, materials handling, water purification methods and paving techniques for dairy farm barn yards.

At the annual banquet, Earl Warner, of the Warner Dairy Company, Red Lion, spoke on his recent visit to countries behind the Iron Curtain.

NOTICE

The Cumulative Roster of Holders of Authorizations to use the 3-A Symbol, distributed with the July number of the Journal, concluded with the statement: "This list supersides any and all lists previously published." It was not, but should have been, pointed out that discontinued models, at one time authorized to bear the 3-A Symbol, were not included among the model numbers listed, which are limited to those covered by currently valid authorizations.

In event of uncertainty concerning the validity of the 3-A Symbol on a model of equipment not listed in the Cumulative Roster, inquiry may be adressed to:

C. A. ABELE,
Secretary-Treasurer
3-A Symbol Council
2617 Hartzell Street
Evanston, Illinois

Classified Ads

FOR SALE

Single service milk sampling tubes. For further information and a catalogue please write Bacti-Kit Co., P. O. Box 101, Eugene, Oregon.

POSITION AVAILABLE

FOOD AND SANITATION INSPECTOR:

$4848 to $5300. Civil Service car allowance, 5 day week, retirement plan and social security, liberal hospitalization, sick leave and vacation benefits. Apply Director of Personnel, Room 17, City Hall, Kenosha, Wisconsin.

PROFESSIONAL SANITARIANS

Two vacancies, State of Wyoming; Salary Range $408.00 to $580.00, $10.00 per diem, 8c per mile; Food and General Sanitation, five counties each; BS or MPH and minimum 2 years experience.
Contact: A. E. Williamson, Director, Sanitation, State Department of Public Health, Cheyenne, Wyoming.

SANITARY OR PUBLIC HEALTH ENGINEER

State of Wyoming, Staff Position; Salary Range $408.00 to $696.00; BS in Engineering or Masters.
Contact: A. E. Williamson, Director, Sanitation, State Department of Public Health, Cheyenne, Wyoming.

INDEX TO ADVERTISERS

Which of these features do you look for in a HOSE FOR PIPING MILK OR MILK PRODUCTS?

Freedom from Odors and Taste?
Ease of Cleaning and Sterilizing?
Transparency?
Flexibility?
Long Service Life?
Wide Range of Standard Sizes?

TYGON® plastic TUBING

B44-4 combines them all!

Tygon plastic Tubing, Formulation B44-4, has been especially developed to meet the particular needs of dairies and food processors handling milk and milk products. Completely odorless, tasteless and non-toxic, Tygon B44-4 is safe for use with the most sensitive foods. Its hard, smooth bore will not trap bacteria-harboring particles, withstands acid milkstone cleaners, as well as strong sanitizing agents—even over long periods of time.

Tygon Tubing remains flexible throughout the full range of normal operating temperatures. Its glass-like clarity permits visual inspection and control of flow. Non-aging, abrasion-resistant, and with a flex life 10 to 12 times greater than that of rubber, Tygon Tubing B44-4 is available in over 65 standard sizes, up to 4″ I.D.

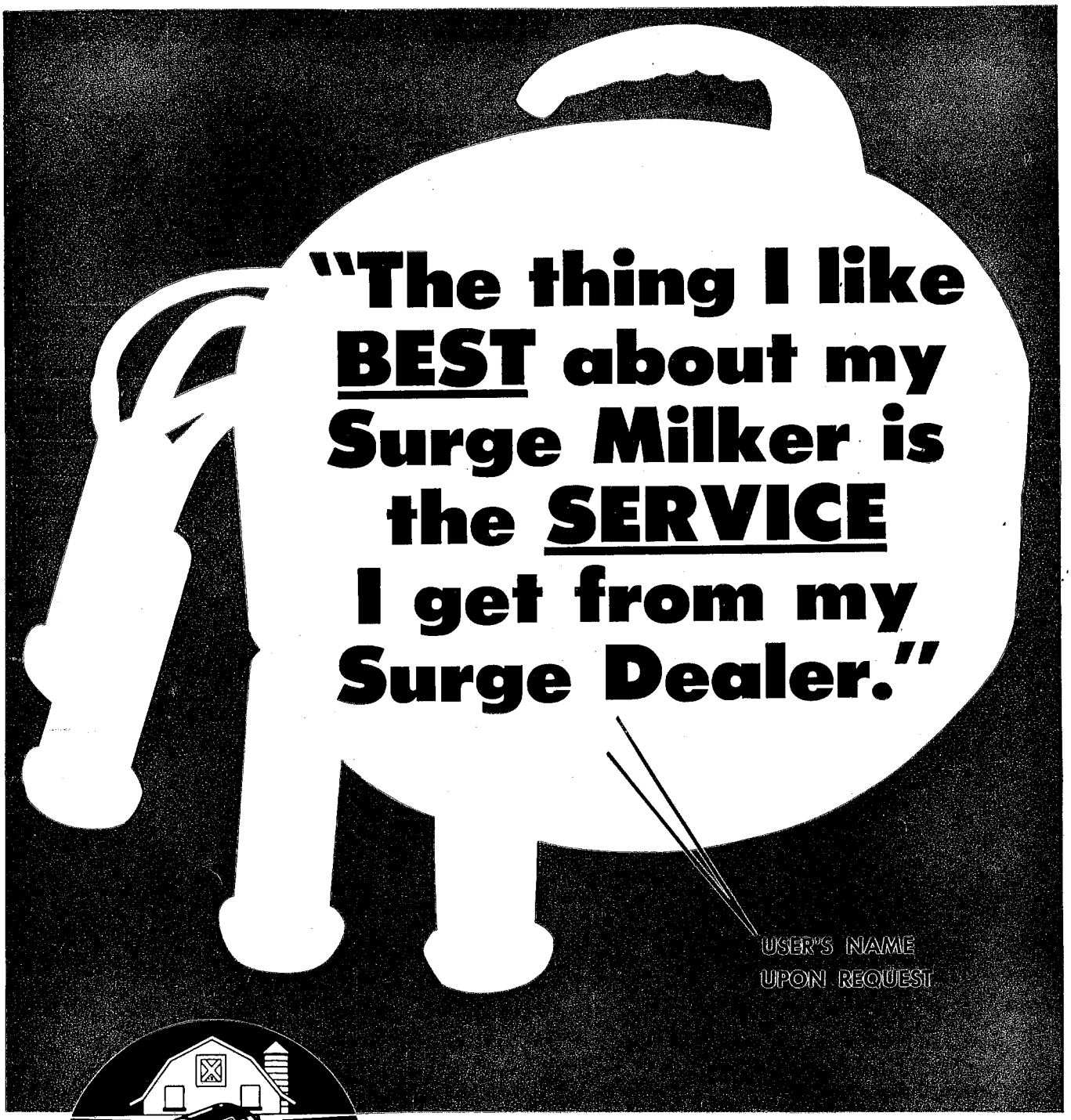
See why more and more dairies and processors of milk products are standardizing on Tygon Tubing B44-4. Get complete information by writing today for free Bulletin T-90R.

442-F

PLASTICS & SYNTHETICS DIVISION

U. S. STONEWARE
AKRON 9, OHIO

OUR 100th YEAR



FARM BETTER ELECTRICALLY

SURGE

BABSON BROS. CO., 2843 W. 19th Street, Chicago 23, Illinois

ATLANTA • DALLAS • KANSAS CITY • MINNEAPOLIS • SACRAMENTO • SEATTLE • SYRACUSE • TORONTO