VOLUME 16 NO.4
July – August, 1953

Journal of

MILK and FOOD TECHNOLOGY

Official Publication

International Association of Milk and Food Sanitarians, Inc.

Compare First Cost!
Compare Operating Cost!

Your Best Buy

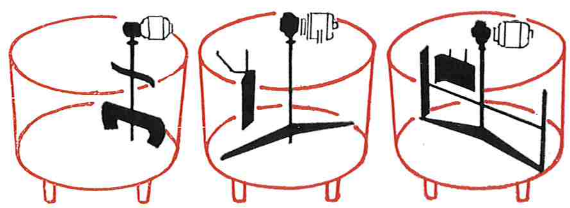
SERIES 40
MULTI-PROCESS TANKS

Get the facts and figures! You'll find that CP Series 40 Multi-Process Tanks are a good deal—any way you look at it.
Fast heating and cooling gives you maximum capacity per unit. This is the result of the high heat exchange efficiency of their stainless steel inner wall construction and removable spray ring (exclusive with CP) that distributes heat or cooling medium evenly over tank wall.
CP Series 40 Multi-Process Tanks are available for prompt delivery now—to get *you* started on lower processing costs *this* season. Capacities from 50 to 1000 gallons. See your CP Representative.

HEAT | **COOL** | **HOLD**
PASTEURIZE

All These
- MIX
- CREAM
- CHOCOLATE MILK
- STARTERS
- FLUID MILK
- CHEESE MILK
- *EVEN BUTTERMILK!*

AGITATORS TO SUIT ANY PRODUCT REQUIREMENT



Standard Series 40 Agitator — Special Wide Sweep Agitator for buttermilk, mix and general processing. — Special Scraper Blade Agitator for extremely heavy-bodied products.

Especially designed for maximum agitation efficiency to meet varying product requirements, CP two-speed agitators can be furnished to meet particular product requirements. With versatile CP Series 40 Multi-Process Tanks you get maximum *usable* capacity, from fewer tanks.

THE *Creamery Package* MFG. COMPANY

GENERAL AND EXPORT OFFICES: 1243 West Washington Blvd., Chicago 7, Illinois

Atlanta • Boston • Buffalo • Chicago • Dallas • Denver • Houston • Kansas City, Mo. • Los Angeles
Minneapolis • Nashville • New York • Omaha • Philadelphia • Portland, Ore. • St. Louis • Salt Lake City
San Francisco • Seattle • Toledo, Ohio • Waterloo, Ia.

CREAMERY PACKAGE MFG. CO., OF CANADA, LTD.
267 King St., West, Toronto 2, Ontario

THE CREAMERY PACKAGE MFG. COMPANY, LTD.
Mill Green Road, Mitcham Junction, Surrey, England

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

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

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

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

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

Journal of

MILK and FOOD TECHNOLOGY

INCLUDING MILK AND FOOD SANITATION

Official Publication

International Association of Milk and Food Sanitarians, Inc.

VOL. 16 — JULY – AUGUST — No. 4

Contents

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

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

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

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

One of a series of
informative advertisements

The Need for Economical Sanitizers in the Dairy Industry

by

William A. Hadfield
Technical Service Department
Pennsylvania Salt
Manufacturing Company

It is generally recognized that the primary requirement of a sanitizer for treating dairy utensils and equipment to kill bacteria is that it reduce the bacteria population on cleaned surfaces to a safe public health level. To be acceptable for all practical purposes, however, a sanitizer must also be economical to buy and use.

Chlorine solutions supply necessary bacteria control at low cost. For example, a dairy farmer can prepare four gallons of a 200 ppm chlorine solution from B-K Chlorine-Bearing Powder for only one cent; and four gallons provide sufficient solution to meet average farm requirements for one day. This amount of solution is that which is needed for sanitizing milk utensils and wiping the udders and teats of cows.

Dairy plants can also prepare chlorine sanitizing solutions for relatively small sums when B-K Chlorine-Bearing Powder is used. Thus, large surfaces of tanks, vats, and coolers as well as connecting lines, clarifiers, homogenizers and HTST pasteurizers may all be sanitized for as little as ten to fifteen cents per day when requirements do not exceed one-hundred gallons of the solutions recommended.

More information on this subject, or bulletins and leaflets on cleaning and sanitizing all plant and farm equipment—including data on C-I-P milk lines and bulk holding tanks—are available without charge from the makers of B-K Chlorine-Bearing Powder. Write to Pennsalt Chemicals, 330 Widener Building, Phila. 7, Pa.

Deadly against bacteria... Safe for all-purpose use...

HYAMINE SANITIZERS

These are typical of the variety of pathogenic and non-pathogenic organisms killed by HYAMINE—whether they are gram-positive or gram-negative—bacilli or cocci.

Homes, restaurants, farms, food plants, packing houses, poultry houses, dairies . . . these are but a few of the places where bactericides made with HYAMINE quaternary ammonium compounds may be used. HYAMINE compounds are also used in pharmaceuticals and cosmetics.

Three grades are available—HYAMINE 2389, HYAMINE 1622, and HYAMINE 10-X—all have high potency, are essentially odorless, non-toxic and non-irritating in "use" concentrations. Phenol coefficient determinations according to A.O.A.C. procedures show typical results on these bacteria—and are tabulated at right.

HYAMINE is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.

Phenol Coefficients of HYAMINE 2389

	Dilution Bactericidal in 10 min. at 20°C. Hyamine 2389	Phenol	Phenol Coefficient
Serratia marcescens	1:20,000	1:80	250
Salmonella typhosa	1:25,000	1:90	280
Micrococcus pyogenes var. aureus	1:30,000	1:60	500
Streptococcus pyogenes (C-203)	1:50,000	1:100	500
Pseudomonas aeruginosa	1:15,000	1:80	185

There is a fund of helpful practical data on HYAMINE uses waiting for you. A postcard telling us about your specific sanitizing problems will bring you full information promptly.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

Editorial Notes

WANT TO BE A SANITARIAN?

We have been hearing quite a bit lately about Sanitarians "hiding their lights under a bushel." What is implied, of course, is that Sanitarians do not do an effective job of making known to the world facts about the services they perform for their fellow men. We have been told we do not command the speaker's rostrom before parent teachers groups, civic clubs, or women's clubs. We are told we do not obtain front page space (unless it's something unpleasant!) in our local newspapers, nor have invitation spots on the radio. Think of what a sanitarian could show and explain in the way of informing the public about his work through the use of television!

Have you ever thought about what you might do in helping build up the professional status of the milk and food sanitarian? There are very few schools offering a complete well-balanced curriculum in milk and food sanitation. If so, how did most of us get into this work? Some of us, we might say, simply stumbled into it, others of us have adapted ourselves to it by related training, and others have made a real effort to develop their knowledge and abilities for the demands of the work. This observation points up that we are failing to do the one thing most important to the future of all sanitarians and the organization, that of interesting young people in the profession of the Sanitarian as a vocation.

It is well known in collegiate circles that certain commercial activities are facing up to the fact there will be a very serious shortage of personnel with the desired technical training for their operations. The chemical industry, for example, is growing at a rate such that the need for technically trained men will be three times greater in a few years than that at which they are being trained in colleges. The National Chemical Manufacturers Association has arranged to publish a booklet to explain to parents, to high school students and teachers, and to college people, the opportunities of chemists in this rapidly growing industry.

Unless young people are told about the work of the Sanitarian, and unless the young people are attracted to this area of work, the status and level of accomplishment of the Sanitarian must suffer.

A bold approach to this problem was undertaken this past year by The Wisconsin Milk Sanitarians Association. Through its Committee on Subscriptions and Advertising, a study was made of the potentialities of interesting young people in the Agricultural High Schools of the State in the work of the Sanitarians as a vocation. There are, it developed, some 280 agricultural high schools in the State of Wisconsin. A program was instituted by the Committee of attempting to place a subscription to the *Journal of Milk and Food Technology* in every agricultural high school in the State. On the basis of county areas, members of the Association in various districts were asked to serve on the Committee and extend their efforts in procuring a subscription to the Journal for each of the agricultural high schools in their respective areas. The participation in this work is truly a labor of love, and a test of the abilities of a Sanitarian, and as a salesman. The objective of this program is to enable students in and from the agricultural areas the better to become familiar with the developments in milk sanitation technology and to become aware of the potentialities of the profession of the modern sanitarian; further, the availability of the Journal should provide material for the faculty staff of the various schools.

The Wisconsin Committee has successfully arranged for subscriptions now going to 40 of the schools in the State. A good start has been made in this objective by this Committee, and further progress is forseen. A majority of the subscriptions were gratis and made possible by dairy organizations in the immediate area of the school. This project is full of potentialities. It serves the association, and it teaches young people something they want most to know—for what should I train? The Wisconsin Association of Milk Sanitarians Committee recommends this as a project of action and of service to all the brother affiliate organizations.

K. G. Weckel

PROFESSIONAL—WHAT PRICE?

Are we really professional-minded or do we merely like to be rated "professional" by the groups that have arrived—the physicians, engineers, chemists, bacteriologists, and other learned groups? Do we want the veneer or the substance? It is a worthy ambition to aspire for the respect of our professional colleagues and to be accorded the recognition in kind by the public. But like everything else of value, a price is exacted. Are we willing to pay for it? If so, what is the price?

Knowledge is certainly a primary demand. Of course, we must know a lot of facts about foods and the conditions under which they are and should be produced and handled. All of this is implied under the category of information. A workman in a plant or a farmer's helper has this. Knowledge is all this plus a lot more. The plus content is at least as great as the information content: it includes all that vast field of scientific and technological and social and economic and political training and experience which enables the possessor to be able to apply his store of information to the public need. This means that he must know all that is needed for the people to get a safe, nutritious, clean, attractive, and reasonably economical food under regulation that is constructive. This kind of knowledge is not all learned in a book. It starts with work of college (or equivalent) grade and is supplemented with post-graduate study and then is rendered practical by field experience. Finally, it is topped off by being humanized, so to speak; here the sanitarian has acquired a feeling of sympathy with and understanding of human needs and prejudices of all kinds of people—not just people in the abstract but persons.

Creativity comes next. This is man's answer to what he sees as a need and a remedy. The requirement is intelligent thinking, imagination, interest, and industry to meet the need. Most people do their work in a routine sort of way. They never ask themselves why do they do this or that, nor what does such and such a thing mean, nor what was the significance of some unexpected new experience. The latter is the key to advance in knowledge. Pondering of such observations, then examination of them in the light of our experience, points the way to an idea as to how to remedy the difficulty. Creativity is always possible, sooner or later, because life is in process of change from the known into the unknown—from the present into the future.

Leadership is the quality of knowing more about a situation than is commonly recognized and knowing what to do about it in a convincing and remedial way, then doing something about it. This characteristic has its opportunity to reveal itself in situations where the unexpected has happened. The great occasion is encountered in routine work; something happens that needs the action of a person for correction or prevention of it; it comes unannounced and if the opportunity is not recognized, passes on. As Pasteur said, "Discovery comes to the prepared mind,"—discovery of opportunity as well as natural phenomena. Knowledge, intelligence, interest, industry, all fuse into a motivating principle. "Knowledge begets confidence; confidence begets enthusiasm; enthusiasm conquors the world." Leadership recognizes opportunity when it comes hastening along.

Responsibility is the trait that drives a person to meet a need, whether or not some one else is looking. It comprises integrity, honesty, trustworthiness, conscientiousness, solicitude. It occupies itself to do well the immediate task. It can be counted on when needed. It looks around to see whether there is danger impending. It stimulates the long-view outlook. It is personified in the lonely figure on the watchtower. It is the vision of greatness brought down to dwell among men.

These four horsemen—knowledge, creativity, leadership, responsibility—constitute a powerful force to apply to food sanitation. Can food sanitarians team up with such a combination of aggressive and constructive might? Certainly! Will they?

J. H. SHRADER

A NEW HEALTH HAZARD

Change is just as certain as death and taxes. Life is like that. It just does not stand still. Just as sure as we think that at long last we have worked out a solution to our health problems, lo and behold, we find that the processes of life have engendered an entirely new set of conditions not anticipated. Right now, we face a water shortage. A trend toward drought conditions in these days of increasing sanitary-mindedness is disconcerting, to say the least.

Two recent books[1] reveal that our water supply is being exhausted more rapidly than it is being replenished by natural means. Cosmic processes are the first cause: Lake Tulare which was navigable by steam a century ago is now dry; the water table at Baltimore has dropped 150 feet within historic times; the deciduous forests of Arizona have disappeared; the snow line on Popocatapetl is noticeably receding; the Sahara Desert is advancing a kilometer every year; and the intake of the Grand Canal in China is 50 feet above the river level.

In addition to these natural processes over which we have (not yet!) any control, there are the lavish and wasteful uses by people. Bathing, laundering, household uses, etc., are reported to utilize the amazing figure of 100 gallons a day per person. Every toilet flush uses 6 gallons. Moreover, drinking, air conditioning, garbage disposers, sprinklers, etc., still further exact their water demand.

Industry, on the per capita basis, uses 1300 gallons a day. For example, 1½ million gallons of water are used to produce 1 ton of bromine (or about 5,000 pounds of water for every pound of bromine). To produce a ton of steel, 65,000 gallons of water are used, and 200,000 for a ton of rayon, and 600,000 for a ton of rubber.

The situation is aggravated by the forced pumping of water from the artesian basin. This not only lowers the water table but creates a negative hydraulic pressure, thereby allowing saline seepage (important especially along the Gulf Coast) to contaminate the fresh water remaining. Over-grazing in the cattle country and deforestation have removed factors which have heretofore operated to hold back water to soak into the ground but now lost in the run-off.

The authors point out that a difficulty in effecting a workable and remedial water development and control policy lies in the multiplicity of governmental agencies which have some degree of jurisdiction over the water supplies. It is reported that only 7 out of the 48 states are bounded by natural divides, and their laws are often in opposition to each other.

In the first place it would seem that if this trend of water depletion continues, we jeopardize safe practice in food production and its sanitation. A let-down in these areas—and health is engendered.

We urge that sanitarians face up to the responsibility of taking a statesman-like long view of their objectives and of the public need. Maybe these matters could be brought to the attention (with some degree of urgency) of one of the national investigatory agencies (say, the National Research Council or one of the planning boards). Nothing of a corrective nature is likely to be done unless and until some responsible organization or the aroused public outcry (a la New York City's recent experience) forces remedial action. The industrial groups may take the initiative in their personal behalf. Why should not the sanitarians do this in the public's behalf? Why wait—and pay for doing too little, too late?

J. H. SHRADER

1. *Water, Land, and People*, by B. Frank and A. Netboy. Published by A. A. Knopf, New York, 1950. *Water—Or Your Life*, by A. H. Carhart. Published by J. B. Lippincott Co., Philadelphia and New York, 1951.

THE EFFECTS OF ANTIBIOTICS ON THE BACTERIAL PLATE COUNTS OF NORMAL RAW MILK*

E. I. Stoltz, and D. J. Hankinson

R. T. Vanderbilt Co., Norwalk, Conn., and University of Massachusetts, Amherst, Mass.

Dr. Edwin I. Stoltz, a graduate of the University of Connecticut received both the M.Sc. and Ph.D. degrees from the University of Massachusetts. At the present time Dr. Stoltz is a research Microbiologist with the R. T. Vanderbilt Co., Norwalk, Conn.

Antibiotics, that may be found in milk as a result of mastitis therapy or by their direct addition, could control and even cause a decrease in the numbers of bacteria in raw milk. This could result in the acceptance of poor quality milk as an acceptable high grade milk if judged solely by bacteriological standards. Public health officials, veterinarians, milk producers and dealers, and pharmaceutical manufacturers all should be made aware of this serious problem.

Antibiotics, such as penicillin, streptomycin, aureomycin, and tyrothricin, have been used to treat bovine mastitis. It has been reported by various investigators [2, 7, 12] that the carry-over of small residual quantities of antibiotics into a market milk supply may be great enough to retard growth of the bacterial flora of raw milk. Also, many milk sanitarians[3] believe that the deliberate addition of antibiotics to raw milk will reduce the number of bacteria. This procedure, however, may result in the acceptance of poor quality milk at the milk plant, if the milk is judged solely by bacteriological standards.

Up to the present time there have been two reports[4, 12] of the action of antibiotics on the bacterial counts of raw milk, both of which were confined to penicillin. The object of this study was the investigation of the influence of various antibiotics used in the treatment of bovine mastitis upon the bacterial plate counts of raw milk.

Literature Review

It has been suggested by Calbert[3], Foley and Byrne[4], and Wilkowske and Krienke[12] that the presence of antibiotics in a milk supply, whether secreted from a diseased animal undergoing antibiotic therapy or added by the farmer directly to the milk as preservative, would tend to mask the presence of poor quality milk by reducing the bacterial population.

Foley and Byrne[4] investigated the possibility of using penicillin as an adjunct to the preservation of the quality of raw milk, but found that it was not too effective in controlling the bacterial count. Calbert[3], in a discussion of the problems of antibiotics in milk, stressed the fact that persons doing laboratory control work on raw milk samples have noticed sudden drops in the bacterial plate counts, which were attributed to the presence of small quantities of antibiotics in milk supplies.

Wilkowske and Krienke[12] investigated the influence of penicillin in milk on total and coliform bacterial plate counts. These investigators found that the presence of 0.1 unit of penicillin per ml of raw milk lowered the normal bacterial growth at 10°C. A higher concentration of the antibiotic was sufficient to retard bacterial growth for three days. They also noted that, because of the nominal cost of penicillin, it is not unlikely that the antibiotic may be used by unscrupulous producers to mask poor quality milk, and estimated that the addition of 1.0 unit of penicillin per ml of milk would cost approximately one-half cent per gallon of milk at current prices.

Methods and Materials

Raw antibiotic-free milk was collected in sterile containers immediately after the milk was delivered to the University dairy plant for subsequent processing. The plating medium was Tryptone Glucose Extract Agar (Difco, dehydrated), with milk added, as recommended by Standard Methods[11] for the estimation of total bacterial plate counts of raw milk.

The desired volume of antibiotic-free raw milk was poured aseptically into sterile flasks that were then closed with sterile rubber stoppers. In each trial of an antibiotic, four flasks of milk were used. Varying levels of antibiotic were added to each of three flasks of raw milk, and the fourth flask was used as the antibiotic-free control.

The work was planned so that not more than one hour elapsed between the time the milk was collected and the time the antibiotic was added to the sample. During this period the milk was kept refrigerated at 7°C. The milk samples were tested bacteriologically immediately after the appropriate concentration of the antibiotic was added (recorded as O-hours) to the individual flasks. The samples of milk were then held at 7°C and plated from appropriate dilutions at 12-hour intervals for a total holding period of 48 hours. All plates were incubated at 37°C for 48 hours and counted. The counts reported are the average of the bacterial counts of three different trials for each level of every antibiotic tested.

Experimental Results

Penicillin. An antibiotic stock solution was prepared from a vial containing 200,000 units of crystalline penicillin (sodium salt). From this stock solution appropriate concentrations were prepared as follows: 1.0, 0.1, and 0.01 unit per ml of milk.

The bacterial counts of raw milk plated at 12-hour intervals for a total holding period of 48 hours in contact with each concentration are shown in table 1. The results indicate that penicillin in all concentrations studied was effective in controlling the bacterial popula-

*Contribution No. 850, Mass. Agric. Exp. Sta.

TABLE 1—THE EFFECT OF PENICILLIN ON THE BACTERIA PLATE COUNTS OF RAW MILK*

Time hrs.	Counts per ml			
	Control	Penicillin 1.0 unit per ml	Penicillin 0.1 unit per ml	Penicillin 0.01 unit per ml
0	9,000	7,000	10,400	9,400
12	49,300	13,800	19,000	32,000
24	187,000	153,000	152,000	153,000
36	733,000	163,000	198,000	265,000
48	3,870,000	287,000	373,000	608,000

*Averages of three trials.

tion of raw milk stored at 7°C. The greatest inhibition of the total bacterial plate counts was observed in the higher concentrations of the antibiotic.

Streptomycin. A stock solution of streptomycin was prepared from a 1-gm vial of crystalline streptomycin (calcium chloride complex). The stock solution was further diluted to obtain the following concentrations in milk: 5.0, 1.0, and 0.1 mg of streptomycin per ml.

The results in table 2 indicate that streptomycin is a very effective antibacterial agent for the organisms in normal raw milk. In all concentrations studied, an immediate lowering of the plate count was observed. Inhibition lasted through the 12-hour holding period before the counts began to increase. The lowest concentration, 0.1 mg per ml of milk, was nearly as effective as the 5.0 mg and 1.0 mg levels through the 36-hour plating.

Penicillin and Streptomycin in Combination. New preparations now in use for the treatment of mastitis contain two or more antibiotics such as "Penstrep" or "Pendistrin" which contain both penicillin and streptomycin. The broad antibacterial spectrum of such antibiotic preparations is advantageous in the initial therapy of bovine mastitis, since it is effective against both Gram-positive and Gram-negative bacteria, either of which may be the causative agent of the disease.

The concentrations of combined penicillin and streptomycin were prepared by the direct addition of each antibiotic to the raw milk as described previously for each separate antibiotic. The following concentrations per ml of milk were used; 1.0 unit of penicillin and 5.0 mg of streptomycin, 0.1 unit of penicillin and 1.0 mg of streptomycin, or 0.01 unit of penicillin and 0.1 mg of streptomycin. The results are shown in table 3.

In all concentrations of penicillin-streptomycin studied, the bacterial counts were greatly lowered through the 24-hour plating. At the end of 36 hours the counts still had not regained the level of the control sample at 0 hours. From these results, this combination of antibiotics would certainly be effective in masking poor quality milk.

Aureomycin. The concentrations of aureomycin in the experimental milk samples were 0.5, 0.25 and 0.1 mcgm per ml of raw milk, respectively; the samples were made from capsules containing 250 mg of crystalline aureomycin hydrochloride. Aureomycin, which has a wide antibacterial spectrum[10], was effective in inhibiting growth of the bacteria of normal raw milk, as indicated by the results in table 4.

In all concentrations of aureomycin, the bacterial count was suppressed through the 36-hour plating. After 48 hours the counts were still lower than the control sample, indicating that aureomycin was effective in controlling the bacterial population of raw milk. The lower levels of aureomycin were slightly less effective in controlling the bacterial numbers of raw milk than the high concentration of 0.5 mcgm per ml of milk.

Tyrothricin. Tyrothricin, which is made up of the two components, gramicidin and tyrocidin[6], has been widely used for treating bovine mastitis. The solutions of tyrothricin in this study were prepared from crystalline defatted tyrothricin and diluted to obtain the following concentrations of the antibiotic in raw milk: 5.0, 1.0, and 0.1 mg of tyrothricin per ml.

All concentrations of tyrothricin were effective in controlling the number of bacteria (table 5). The lower levels of tyrothricin were not as effective in inhibiting growth of bacteria in normal raw milk as the 5.0 mg concentration of the antibiotic. Although the counts slowly increased with time, the presence of the antibiotic was still evident

TABLE 2—THE EFFECTS OF STREPTOMYCIN ON THE BACTERIAL PLATE COUNTS OF RAW MILK*

Time hrs.	Counts per ml			
	Control	Streptomycin 5.0 mgm per ml	Streptomycin 1.0 mgm per ml	Streptomycin 0.1 mgm per ml
0	7,800	2,700	2,400	4,000
12	49,000	2,200	2,300	3,700
24	133,000	8,000	18,300	9,200
36	612,000	10,500	44,200	35,000
48	3,870,000	16,100	37,300	219,000

*Averages of three trials.

as noted by comparing the counts of the antibiotic-free control sample with the samples containing tyrothricin.

Discussion

The results of this investigation indicate that the presence of antibiotics in the milk supply is of considerable importance to the dairy industry, since minute concentrations of antibiotics in the milk might tend to mask the presence of poor quality milk by reducing the numbers of bacteria. Concentrations of antibiotics used in this study were representative of residual quantities likely to occur in pooled herd milk following antibiotic therapy of a few diseased animals[1, 5, 8, 9].

The bacteria count of raw milk containing concentrations of 1.0, 0.1, or 0.01 unit of penicillin respectively, was effectively controlled when the milk was held under refrigeration for 48 hours at 7°C. The results seem to indicate that the action of penicillin and other antibiotics tested in this study is immediate and probably continues during the 48-hour incubation period at 37°C. This is evident from the counts made at 0-hours of the antibiotic-free control sample and the samples containing antibiotic.

When streptomycin was added, even at the low concentration of 0.1 mg per ml, significant reduction of the bacterial numbers of raw milk for 48 hours was observed. It is quite evident that many of the bacteria of fresh milk are of the Gram-negative type and, therefore, quite sensitive to the antibacterial action of streptomycin.

The broad antibiotic spectrum provided by the combined penicillin and streptomycin preparation showed that the antibiotic was effective in controlling the bacterial numbers of raw milk for at least 48 hours. In the three concentrations tested, the numbers of bacteria decreased markedly for 24 hours and then slowly began to increase with time.

Aureomycin, when present in concentrations of 0.5, 0.25, and 0.1 mcgm per ml of milk, also was effective in inhibiting the growth of the bacteria of raw milk through the 36-hour period. The greatest increase in bacterial numbers occurred between the 36- to 48-hour platings, apparently indicating that the bacteria were beginning to resist the inhibitory action of the antibiotic.

Tyrothricin, at levels of 5.0, 1.0, and 0.1 mg per ml of milk, was very effective in decreasing the numbers of bacteria in raw milk compared to the antibiotic-free control sample.

The experimental data indicate that small concentrations of antibiotics, found in milk as a result of mastitis therapy or by its direct addition, could control and even cause a decrease in the numbers of bacteria in raw milk. This could result in the acceptance of poor quality milk as an acceptable high grade if it were judged solely by bacteriological standards. City and state officials, veterinarians, milk producers, dealers, and pharmaceutical manufacturers should be made aware of this serious quality control problem.

Conclusions

1. Concentrations of antibiotics in levels that might be found in market milk supplies were tested for their effects on the bacterial numbers of normal raw milk.

2. The antibiotics studied were penicillin, streptomycin, penicillin and streptomycin in combination, aureomycin, and tyrothricin.

3. All antibiotics, in the concentrations studied, were found to inhibit the growth of bacteria in raw

Continued on Page 166

Table 3—The Effects of Penicillin-Streptomycin on the Bacterial Plate Counts of Raw Milk*

Time hrs.	Counts per ml			
	Control	Penicillin 1.0 unit and Streptomycin 5.0 mg per ml	Penicillin 0.1 unit and Streptomycin 1.0 mg per ml	Penicillin 0.01 unit and Streptomycin 0.1 mg per ml
0	8,600	1,200	3,300	6,000
12	8,300	450	1,200	3,000
24	12,300	550	1,400	1,500
36	20,000	2,300	6,000	6,300
48	90,000	6,000	17,300	26,000

*Averages of three trials.

Table 4—The Effects of Aureomycin on the Bacterial Plate Counts of Raw Milk*

Time hrs.	Counts per ml			
	Control	Aureomycin 0.5 mcgm per ml	Aureomycin 0.25 mcgm per ml	Aureomycin 0.1 mcgm per ml
0	14,000	12,000	12,400	12,400
12	16,900	11,700	12,000	14,900
24	142,000	26,000	34,000	46,000
36	414,000	52,000	59,000	76,000
48	1,847,000	179,000	358,000	903,000

*Averages of three trials.

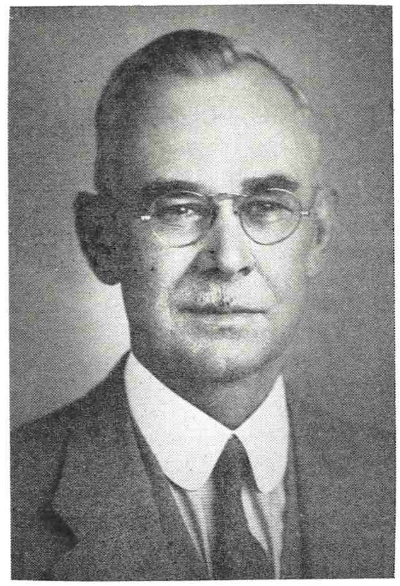
THE GASTROENTERITIS OUTBREAK AMONG DELEGATES AND GUESTS, THIRTY-EIGHTH ANNUAL CONVENTION

International Association of Milk and Food Sanitarians, Inc.

Glenwood Springs, Colorado, September 26-29, 1951

George W. Stiles, B.S., M.D., Ph.D., F.A.P.H.A.

Chief Laboratory Section, Colorado State Department of Public Health Denver, Colo.



George Whitfield Stiles, B.S., M.D., Ph.D., for the past five years has been Chief, Laboratory Section, Colorado State Department Public Health; now, Laboratory Research Consultant there. Previously he was employed by the Bureaus of Animal Industry and Chemistry, U. S. Department of Agriculture, over 45 years. Approximately 70 papers published on subjects of diseases transmissable from animals to man; sanitation, milk, water, oysters, poultry and animal disease diagnosis.

Member American Association Advancement of Science, Society American Bacteriologists, Fellow American Public Health Association; American Medical Association, U. S. Livestock Sanitary Association; Phi Kappa Phi. Born June 14, 1877, Orangeburg, N. Y., Married, Member Methodist Church, Resience 725 Newport, Dever 20, Colorado.

The gastrointestinal outbreak at the Glenwood Springs Convention was apparently caused by the consumption of contaminated fricassee turkey served at the noon day meal on September 27, 1951.

Ninety three persons became ill with servere abdominal cramps, frequent explosive diarrhea and gaseous distention of the abdomen. The onset of illness varied from 8 to 18 hours. Laboratory findings from the fragments of food served showed the turkey specimen harbored excessive numbers of the paracolon group.

The frequency of food poisoning cases at public or other gatherings constitutes a challenge to the sanitarian and public health official, not only to determine the cause of these unfortunate experiences, but to prevent occurrences of this character.

The convention of the International Association of Milk and Food Sanitarians at Glenwood Springs, Colorado, was no exception. Here some 350 delegates and guests were gathered to discuss and promote the welfare of the various industries represented. Those present on this occasion comprised a notable list of persons from 35 states and territories. As commented by Homer Calver[3] "A precise demonstration of how food poisoning works" became an uninvited part of the program.

Epidemiology

Preliminary observations made by Dr. Harry A. Sauberli* indicated that the possible cause of the gastroenteritis outbreak began at the noonday meal served at the Convention Hotel on Thursday, September 27, 1951. For brief designation, this will be called the *Inquiry Meal.* In order to establish the likely source of infection and persons involved, the following questionnaire accompanied by a letter of explanation was submitted to about 350 guests.

Many persons attending this meal became ill during the following night.

Results From The Questionnaire

Of the 350 questionnaires submitted, approximately 80 percent were answered. An analysis of these replies showed the following:

Ate the Inquiry Meal, which included a turkey dish called "chicken" by some, noonday, at the Convention Hotel, Thursday, September 27	155
Persons made ill	93
Persons not sick	52
Persons who ate the noonday meal, no turkey, not ill	10
Individuals who ate elsewhere, not ill	68
Delegates who arrived and left before September 27th, or arrived after September 27th, not ill	28
Lady guests attending a noonday lunch at Aspen, September 27, not ill	28
Miscellaneous persons who were ill but did not eat *Inquiry Meal*	11

The people classified in the last item of miscellaneous persons ascribed their illnesses to various causes. One implicated swimming, another became ill two days later, enroute home. Two people, man and wife, suspected that the "change of water" caused slight dysentery. Another sickened on September 25th. One had cramps "one hour". Another lady became quite ill, but had not eaten the *Inquiry Meal.* Three other persons did not give specific details.

Illness Among The Kitchen Help

One of the delegates made the following statement in reply to a written personal inquiry:

"The information came in a casual way while at breakfast when one of the persons at the table mentioned the fact that he was ill during the night. The waitress serving at this table overheard the conversation and remarked that nearly all the kitchen help were also ill during the night. She was then asked if the help had some of the buffalo meat served the previous evening and she replied that the leftover turkey or chicken from lunch (September 27th) was served to the employees for dinner."

Similar statements were obtained later through interviews with several persons who worked in the kitchen during the convention. One of the male cooks employed in the kitchen definitely affirmed that the diced turkey *was not* adequately cooked after it was prepared with sauce and noodles. He further testified the last tray of fricassee turkey returned to the kitchen after the noonday meal was "bubbling and fermenting." Consequently he

*Director, Local Health Services Division, Colorado State Department of Public Health, Denver, Colorado.

and his wife refused to eat it and they were not ill. However, he said that other help who ate the turkey became sick.

These observations reported by the cook would account for the apparent absence of illness among those persons who ate the *Inquiry Meal* early, as against those who came late to it. The evidence tends to show that the stock turkey was contaminated when diced and that the noodle sauce added without subsequent cooking permitted rapid multiplication of gas-producing organisms in the fricasseed turkey when placed on the steam tables.

Incubation Period

The incubation period in the persons made ill ranged from about 8 to 18 hours following the *Inquiry Meal.* Since the meal was served from 12 to 2 P.M., a slight variation in the time could be accounted for, depending on the actual time the meal was consumed. Apparently the majority of the victims became ill shortly before or after midnight following the midday repast. In staphylococcus toxin intoxication, the onset of illness is usually from 2 to 4 hours after exposure; hence the longer incubation period would suggest some other type of infection.

Symptoms

Many afflicted persons reported severe abdominal cramps, explosive diarrhea, sharp stomach pains, and gaseous distension of the abdomen. In exceptional instances there was slight nausea, headache, and dizziness during the diarrhea bouts. One man reported he went to the toilet 13 times during the 30 hours illness. His symptoms began at 3 A.M. on the 28th of September. Another person had two helpings of the turkey fricassee. He had "extreme diarrhea, chills, fever, and was sick 3 days—onset began at 3 A.M. on the 28th." Generally speaking there was no real vomiting aside from occasional nausea, such as might be expected in staphylococcus toxin poisoning.

The duration of illness varied from 2 to 12 hours or longer. Some cases lasted 2 days or more, but the majority less than 24 hours. Those who ate of the turkey dish "sparingly" report slight attacks in contrast to those who ate "heavily" and experienced reactions.

Bouquets and Brickbats

Those answering the questionnaires were helpful in supplying interpretative comments. Numbers expressed great interest in the methods and results of the investigation. Eight quotations indicative of the types of comments have been selected for presentation here.

"I was sorry to hear about this outbreak and sincerely hope no one thinks evil of your state. The Colorado Committee worked hard for the Convention's success and seeing each one had a fine time."

"Rather a sad commentary to a group of international food sanitarians."

"In our party of four we had one total abstainer from alcoholic beverages, one very light 'indulger' and two heavier drinkers (not to excess) The 'teetotaler' and the light drinker both had fairly violent attacks of diarrhea during the night of September 27th; of the other two, one had no reaction and the other only a slight attack nearly 24 hours later. All ate approximately the same articles of food." (Comment by the author: Persons who drink heavily may eat less, or the alcoholic content could have retarded development of the organisms, depending on the quantity and concentration.)

"I thought at the time that the water was at fault in causing the dysentery, but later concluded the turkey was perhaps the source of trouble."

"The epidemiology would seem to me to indicate a *Salmonella* or dysentery type of thing."

"Noticed unnecessary hand contamination of dishes by food service personnel at all times."

"I am sure it was the noon dinner Thursday, September 27th. My three roommates went fishing and missed the dinner Thursday, but arrived for the buffalo supper. I ate the noonday meal and was the only sick person in the room."

"I am pleased that your department has taken a keen interest in following up this food illness. There is much to be done by health departments in getting a better understanding in the underlying cause of gastroenteritis resulting from eating man-contaminated foods. It appears that more emphasis needs to be placed upon sanitary methods of preparing, processing, and serving as well as storing foods."

As requests for reference copies of the questionnaire were received from various persons, a mimeographed supply has been prepared for distribution.

Laboratory Findings

Glenwood Springs Water Supply

Since several persons attending the Convention suspected an impure municipal water supply, the records in the Colorado State Department of Public Health Laboratories were checked for the bacteriological results during the year 1951. There were 33 samples of water submitted from the municipal supply of Glenwood Springs during 1951 for purity examinations. Of this number 6 were reported "unsafe," because of coliform organisms, according to standard methods of water examination. Fourteen of the 33 samples, however, showed slow lactose fermenters which did not ferment in brilliant green. These 14 samples are classified as follows:

7 samples showed gas in 1 of 5-10 cc portions

2 samples showed gas in 3 of 5-10 cc portions

3 samples showed gas in 4 of 5-10 cc portions

2 samples showed gas in 5 of 5-10 cc portions

Glenwood Springs used unfiltered water from two natural streams, No Name Creek and Grizzly Creek. The installation of an adequate filtration plant has been repeatedly recommended by the Colorado State Department of Public Health.

At times of freshets or the spring runoff, the supply may be turbid, carrying considerable organic matter consisting of leaves and other trash, and cause an unpleasant taste, especially during periods of high chlorination. The water is collected in a series of two storage tanks. The city has provided a system of chlorination which operates more or less continuously—possibly varying in strength, depending on the acceptance or complaints of the local citizens. The Convention Hotel uses the municipal water supply of Glenwood Springs.

According to U. S. Weather Bureau reports there were no storms of any consequence at Glenwood Springs during the convention period that would have affected the quality of the town supply. It was reported, however, that a snowstorm occurred the previous week.

As an impure city water supply could be reflected in the health of the citizens, an inquiry was sent to Robert R. Livingston, M.D., local Health Officer of Glenwood Springs, who replied as follows.

"In checking back on my records I do not find any undue evidence of gastrointestinal upsets at the time you mentioned. Because of the possibility that I might have issued telephone prescriptions without seeing the patient I also had the drugstores check their prescription files with essentially the same results."

Food Specimens

On the morning of Tuesday, October 2, 1951, five samples of food remnants were delivered to the author in person by the chief food sanitarian of the State Department of Public Health. This material was collected on the previous Friday, September 28th, from the refrigerator in the Convention Hotel. The samples were kept under refrigeration until delivery to the laboratory. The first 4 samples were collected in sterile glass containers but the turkey specimen was wrapped in waxed paper. In the selection of material from the turkey, both light and dark portions were removed aseptically from the inside.

Laboratory Technique and Bacteriological Results

The technique used by the author was as follows:

One gram portions of each sample were weighed into sterile mortars diluted with 9 cc sterile saline, triturated, and diluted in multiples of ten, to one to ten-millionth of a gram. From each dilution 1 cc portions were seeded into lactose broth, also planted on nutrient agar. The cultures were incubated at 37° C for 48 hours, then at room temperature 2 days before final counting. The results were:

From 48-hour lactose broth tubes, seeded with 1-10,000,000 gram of ground raw buffalo meat and turkey specimens streaked on S. S. agar* plates, several cultures were recovered and sent to the Enteric Bacteriological Laboratories of the Communicable Disease Center, Public Health Service, Chamblee, Georgia. Later it was realized that cultures on S. S. media should have been made direct from the various dilutions of the food specimens for the possible recovery of *Salmonella* organisms; since these species could have been overgrown in a mixed broth culture.

The organisms were identified by Edwards[5] as intermediate paracolon from the buffalo meat, and as *E. coli* and aerogenes-like paracolon V. P.+ from the turkey specimen. Similar strains of these two turkey species of organisms were subsequently recovered from the Glenwood Springs municipal water supply from an unsafe sample submitted to the Colorado State Laboratory April 27, 1952, and also confirmed by Edwards[6].

Comments on Food Specimens

No. 1361—Ground raw buffalo meat showed rather a high bacterial content including gas producers, probably greater than in miscellaneous samples of market hamburger examined in past years by the author. Due to the length of time intervening between collection and delivery, considerable multiplication of the initial organisms doubtless occurred.

The buffalo meat came from a Wyoming herd. One animal was slaughtered at a Denver packing plant under supervision of a Denver City Veterinarian on September 18, 1951, and held in the cooler 38 hours. On September 20th, the 600 pound carcass was trucked to Glenwood Springs; delivered to the Convention Hotel butcher and placed under refrigeration one week prior to serving.

No. 1362—The specimen of the cooked buffalo burgers and gravy was practically sterile except for development of a few heat-resistant spore bearing organisms.

It is estimated at least 400 persons ate one or more of the 3 kinds of barbeque buffalo dinner (stew, roast or barbeque) served by the Convention Hotel during the evening of September 27th; some were guests of the hotel, others resided elsewhere. Of the 52 persons who ate the *Inquiry Meal* at noon on the 27th, and were not ill, 44 of these guests ate the buffalo evening meal and escaped infection. In addition to these, 87 other persons reported eating the buffalo products without subsequent illness.

No. 1363—Freshly prepared potato salad on September 27th. Since food poisoning cases have been previously reported from contaminated potato salad, suspicion was directed toward this item on the menu. The comparatively low bacterial content, including that of the gas producers, tended to eliminate this item as a major factor in causing the illness. Doubtless the bacterial count was much less at the time of serving 5 days prior to examination.

Further analysis of questionnaire reports showed that 36 of the 52 persons eating the *Inquiry Meal,* who did not become ill, also ate the potato salad served during the evening buffalo barbeque without ill effects.

Likewise 19 of the 28 persons attending the Aspen luncheon on September 27th ate potato salad during the evening barbeque meal and remained well.

No. 1364—The high acidity of the homemade salad-dressing doubtless accounted for the failure of organisms to develop from this product.

No. 1365—The writer has scarcely recovered from the shock received at the time of attempting to count the number of colonies (Quebec Colony Counter) after 4 days de-

*A highly selective medium used for the isolation of *Shigella and Salmonella* organisms.

SPECIMEN NUMBER AND KIND	TOTAL COUNT PER GRAM	GAS IN LACTOSE
1361—Ground raw buffalo meat	620,000,000	1-10,000,000
1362—Cooked buffalo burgers and gravy	90 spore bearing colonies	No gas 1-10
1363—Potato salad, freshly prepared	4,300,000	1-1000
1364—Home made salad dressing	No growth 1-10 gram	No gas
1365—Large portions two cooked turkeys, breast and bony carcass	Est. 10,000,000,000	1-10,000,000

velopment of nutrient agar plates. The number of colonies on culture dishes seeded with 1-10,000,000 gram of turkey specimen were conservatively estimated at *ten billion* organisms per gram, of which two hundred million appeared to be of the gas producing varieties. This is the largest number of organisms ever observed by the author in a food product during a half century of laboratory procedures.

No evidence of a single staphylococcus type of colony was recognized.

Even though the specimen of cooked turkey collected on September 28th was kept under refrigeration until examined 4 days later, doubtless there was a considerable increase in the number of organisms per gram during this interval. However, allowing for a reasonable bacterial development, the initial germ content of the turkey on the day of serving must have been tremendous.

Since the fricassee turkey appears to be the criminal involved in causing this gastrointestinal outbreak, a more elaborate story seems justified as follows:

DETAILED HISTORY OF THE INCRIMINATED FRICASSEE

The Convention Hotel purchased eight tom turkeys from a lot originating at Modesto, California. They were dressed and packed under veterinary supervision, Grade A fowls, weighing about 24 lbs each. These turkeys were frozen in California, shipped to a Denver Commission merchant in refrigerated trucks. The eight turkeys delivered to the Convention Hotel were not allowed to thaw between freezing in California and delivery to the hotel.

Three frozen turkeys from the lot of eight were allowed to thaw over night, September 25th, at room temperature, and the whole turkeys were cooked in a large steam kettle under 15 lbs pressure for about 1½ hours beginning at 2 P.M., on September 26th. After cooking, the hot turkeys were reported by the head chef as "properly cooled" in cold water for at least one hour, then placed under refrigeration at 38-40°F at 7 P.M. the same evening and left there until the following day.

We presume the turkeys were completely sterilized during the cooking process, but the matter of cooling these turkeys subsequently in cold water of doubtful purity is a mooted question.

The author believes a hot 24-lb turkey would absorb considerable water during its exposure in cold water, and if organisms of the colon-paracolon type were present in the water, this could account for at least some of the contamination found in the remnants of turkey submitted for bacteriological examination.

About 9 A.M. September 27th the flesh from two and one-half cold turkeys was diced in one inch cubes and placed in shallow steel pans at 10 A.M. The recipe for serving 200 guests the fricassee called for approximately 50 lbs of boned turkey, a gravy made of 5 gallons of broth from previous day's cooking of turkeys, and 5 lbs of egg noodles; seasoned with salt and white pepper, and thickened with flour.

The gravy and noodle mixture was heated and poured over the diced turkey about 10:30 A.M., then placed on a portable steam table until ready for serving. Each "Bain Marie" (water bath or double boiler) held two shallow trays of turkey, and there were four sets of trays served during the two-hour meal period. The heat applied to the steam tables was provided by "canned heat." As to this stage, a difference of opinion was expressed. The head chef says he instructed the second cook to boil the diced turkey before adding the fricassee sauce. In a personal statement to the author, however, the first cook declared the diced turkey mixture *was not* subsequently cooked; only the hot mixture was poured over the cold turkey before placing on the steam table.

The head chef further stated "unless new cans of sterno are lighted, it is possible for heat to drop from extreme or steaming hot to slow incubating temperature. Cooks do not always watch this and sometimes guests coming in late complain of cold food or barely lukewarm."

One guest said, "The turkey was very hot when served." Another stated that "The turkey was warm—just right for incubation of anything in colon or other *Salmonella*."

When interviewed, a chef in one of Denver's leading hotels stated that a contaminated dish of creamed turkey or chicken can "sour in one hour" on the average steam table, and that he always recooks such articles of food about every thirty minutes to insure adequate safety.

Another possible source of contamination was indirect contact with the uncooked ground buffalo meat, probably handled by the same help whose hands might have carried paracolon organisms to the turkey meat during its preparation. A strain of intermediate paracolon from the raw buffalo meat was identified by Edwards[5].

The question of human carriers must always be considered in food infections of the character under consideration. However, because the Convention Hotel closed on October 5th, and the help scattered to widely separated areas, stool specimens could not be secured from any of the kitchen help. The same was true for the guests who were ill. Several days elapsed after the outbreak of illness occurred before the gravity and extent of the illnesses became apparent. The guests had returned home and it was too late to secure stool specimens from Denver delegates to be of any material value.

FURTHER REVIEW OF THE SCIENTIFIC OPINIONS AND LITERATURE

Under ordinary circumstances the paracolon group of organisms are considered non-pathogenic; however, there seems to be some question as to their role in certain gastrointestinal disturbances, and especially when consumed in extremely large numbers.

Edwards[5] of the Enteric Bacteriology Laboratories, in reporting the aerogenes-like paracolon V.P. from the turkey specimen (No. 1365) commented:

"It was not meant to infer in the report made on these organisms that they were not the cause of the food infection. What was meant was merely that these organisms are not well understood and have not been definitely incriminated as a cause of food poisoning. When they were present in the meat in the numbers which you indicate, they certainly would cause trouble if they have any pathogenic properties whatsoever. I am in agreement with you that the action of the organisms of the enteric group is dependent largely upon dosage. Certainly the dosage was high enough in this instance."

A more complete review of the scientific opinions and literature is presented in the following section of this paper:

A personal communication from Dunlop [4] says:

"The pathogenicity of paracolons still remains in some doubt, although certain types are becoming recognized as possible etiological agents in gastroenteritis."

In her studies on paracolon bacilli, Mushin[9] comments as follows:

"A review of literature shows that when cases of gastroenteritis could not be traced to known pathogens of *Salmonella* and *Shigella* groups, various other types of bacteria came under suspicion. One of the groups of organisms to attract attention were the paracolon bacilli.

"In the course of this study it became apparent that a number of paracolon strains exhibited variations in their cultural characters, bio-chemical reactions and antigenic structure.

"The results establish that some strains are undoubted human pathogens and others have the ability to establish themselves in the intestinal tract without manifesting clinical symptoms."

Mushin further cites:

"An investigation of gastroenteritis occurring in a Royal Australian Air Force (R.A.A.F.) Camp in Victoria showed that paracoli bacilli were isolated from stools of patients with greater frequency than other recognized pathogens."

She concludes by saying:

"The results of our studies on the role of paracolon bacilli in intestinal flora point to some strains as etiological agents."

Following a turkey dinner served to students and faculty members and their families, Hart[7], Director, Bureau of Preventable Diseases, State of Connecticut, Department of Health, reports an outbreak of gastroenteritis in a boarding school as follows:

After an incubation period of 7 to 18 hours 19 students reported to the infirmary with abdominal pain and diarrhea. The investigation made by Dr. M. E. Reidge disclosed that approximately one-half of those partaking of the dinner were acutely ill. The turkey had been cooked the day before serving, refrigerated over night, but kept at room temperature several hours after slicing. An organism of the paracolon group was isolated from the leftover turkey meat.

In their studies on paracolon organisms, Barnes and Cherry[1] observed a relatively mild outbreak of diarrhea occurring among 52 patients in certain wards of the United States Naval Hospital.

The chief symptoms were abdominal cramps, nausea and vomiting. The incubation period averaged 12 hours after eating leftover corn pudding, the suspected but not proven article of diet. Rectal swabs from a number of patients revealed a group of biochemically and serologically related organisms of the paracolon group.

Stuart *et al.*[11] say:

"The question of the pathogenicity of coliform organisms has received considerable comment in recent literature and several outbreaks of gastroenteritis have been attributed to normal or aberrant types. Proof of pathogenicity is difficult to obtain because of the lack of susceptible animals. Our opinion, after nearly four years work in this field, is that paracolon organisms can cause a mild or acute gastroenteritis of short duration."

Rhodes[10] reports:

"A small outbreak of diarrhea which involved five patients in a mental hospital. An organism showing the characteristics of the paracolon bacillus was isolated from all of these cases. Agglutinins to the organism were present to significant titres in the sera of all patients, suggesting that this race of the paracolon bacillus was the etiological agent in this outbreak."

Brandly[2] states among other things, that of 232 outbreaks of food poisoning, other than botulism and chemical food poisoning, reported as occuring in 1945 by the U. S. Public Health Service, 47 were associated with poultry meat products, or approximately 20 percent.

Organisms of the paracolon group, as well as *Salmonellae,* are frequently found in diseased poultry, including turkeys, by the United States Bureau of Animal Industry laboratories. In past years, while in the Bureau service, the author has recovered many strains of these types in fowls. In some cases it was believed paracolon bacilli were the causative agent in the death of the birds.

In view of the cooking process, it is believed unlikely the causative organism in the present epidemic was originally present in the turkeys.

SUMMARY AND CONCLUSIONS

Of the 155 persons who ate the noonday meal on September 27th, 1951, at the Convention Hotel, Glenwood Springs, Colorado, 93 became ill with gastroenteritis following eating fricassee turkey.

The incubation period ranged from 8 to 18 hours, and the duration of illness from 2 to 12 hours or longer. Persons who became ill complained chiefly of severe abdominal cramps, frequent explosive diarrhea, sharp stomach pains, and gaseous distension of the abdomen.

The water supply of Glenwood Springs shows occasional *unsafe* samples, and could be much improved by filtration and adequate chlorination.

Remnants of food samples, especially the turkey, collected after the noonday meal, developed excessively large numbers of gas-producing organisms belonging to the colon-paracolon group. The weight of evidence would indicate the fricassee of turkey was the guilty agent responsible for the gastrointestinal outbreak.

The contamination of the turkey dish doubtless followed the cooking process the day before serving. Immersion of the hot, whole turkey carcasses into cold water of doubtful purity was considered one source of infection with paracolon bacilli. Further contamination of the turkey meat could have occurred during the dicing and preparation with sauce the day of serving. Apparently the diced cold turkey, covered with hot sauce, was not adequately cooked before placing on the steam table. Additional rapid multiplication of bacteria in the turkey dish must have occurred on the steam tables during the 2-hour noonday serving period, as those who ate early seemed to have escaped infection, while the guests who came late to dinner became ill.

A review of available literature and medical opinion indicates the paracolon group of organisms may be responsible for the occurrence of gastrointestinal outbreaks under certain circumstances, although not normally considered pathogenic. Excessive number of paracolon bacilli in a perishable food product is a factor to be considered in such instances.

COLORADO STATE DEPARTMENT OF PUBLIC HEALTH

State Office Building, Denver, Colorado

November 15, 1951

Please complete and return the following questionnaire concerning the gastroenteritis outbreak during the 38th Annual Convention of the International Association of Milk and Food Sanitarians, Inc., held in Glenwood Springs, Colorado, Wednesday–Saturday, September 26-29, 1951, to Geo. W. Stiles, M.D., Chief, Laboratory Section.

Name: .... Street Address: .... City: .... State: ....

1. a. State date of arrival at Glenwood Springs. ....
   b. State date of departure. ....
   c. Place of residence while in Glenwood Springs (Hotel). ....

2. a. Were you in your usual health on arrival at the convention? .... Yes ( ) No ( )
   b. If not, briefly state the nature of your illness. ....
   ....

3. a. Did you develop diarrhea during the convention? .... Yes ( ) No ( )
   b. If so, enter date and hour the illness began. Sept. .... at .... a.m. .... p.m. ....
   c. Briefly describe the symptoms. ....
   d. State the duration of the attack. ....

4. a. Did you eat all of your meals at the Convention Hotel? .... Yes ( ) No ( )
   b. If not, enter meals eaten elsewhere.

   Sept. .... Meal: .... Place: ....
   Sept. .... Meal: .... Place: ....
   Sept. .... Meal: .... Place: ....
   Sept. .... Meal: .... Place: ....

5. If you ate the following meals at the Convention Hotel, indicate the items of food below.

a. Items Served at Convention Hotel, Noon, Sept. 27	Turkey (supposed chicken) a la king ( )	Peas .... ( )	Coffee .... ( )
	Cottage cheese salad .... ( )	Bread .... ( )	Cream .... ( )
		Butter .... ( )	.... ( )
		Ice cream .... ( )	.... ( )
		Milk .... ( )	.... ( )
b. Items Served at Convention Hotel, Evening, Sept. 27	Black Canyon cheese .... ( )	Buffalo Meat:	.... ( )
	Cottage Cheese .... ( )	Stew .... ( )	.... ( )
	Potato salad .... ( )	Roast .... ( )	.... ( )
		Barbeque .... ( )	.... ( )
c. Items Served at Other Times or Other Places	....	....	....
	....	....	....
	....	....	....

6. Add any other comments or data which may throw light upon the cause of the outbreak. ....
....
....
....

REFERENCES

1. Barnes, L. A. and Cherry, W. B., A Group of Paracolon Organisms Having Apparent Pathogenicity. *Am. J. Pub. Health,* **36**, 481-483, (1946).

2. Brandly, J. P., Editorial: Waterborne and Foodborne Diseases in the United States. *J. Am. Vet. Med. Assn.,* **111**, 394, (1947).

3. Calver, Homer N., *Health Officers News Digest,* XVI, p. 16, Oct. (1951).

4. Dunlop, Stuart G., Associate Professor of Bacteriology, University of Colorado School of Medicine, Personal communication 2-1-52.

5. Edwards, Philip R., *Federal Security Agency, Public Health Service, CDC,* Enteric Bacteriology Laboratories, Chamblee, Georgia, 1-17-52.

6. Edwards, Philip R., *Federal Security Agency, Public Health Service, CDC,* Enteric Bacteriology Laboratories, Chamblee, Georgia, 5-7-52.

7. Hart, J. C., Gastroenteritis, *Public Health Reports,* **66**, 1372, (1951).

8. Kaler, E. A., Personal Communication 1-1-52.

9. Mushin, Rose, Studies on Paracolon Bacilli, *Aust. J. Exp. Biol. and Med. Sciences,* **27**, 543-556, (1949).

10. Rhodes, A. J., A Small Outbreak of Diarrhea Associated with the Paracolon Bacillus. *J. Hygiene* **42**, 99-102, (1942).

11. Stuart, C. A., Wheeler, K. M., Rustigian, R., and Zimmerman, A., Biochemical and Antigenic Relationships of the Paracolon Bacteria. *J. Bact.* **45**, 101-119, (1943).

ACKNOWLEDGMENTS

The author wishes to commend the splendid cooperation and assistance given by Mr. Philip Shaiman, President of the Colorado Hotel Association, Inc.; Mr. E. A. Kaler, Head Chef, Colorado Hotel; O. J. Wiemann, Sanitarian of the Colorado State Department of Public Health; Harold J. Barnum, Denver Bureau of Health and Hospitals; Dr. Stuart G. Dunlop, University of Colorado School of Medicine; Dr. Philip R. Edwards, Federal Security Agency, Chamblee, Georgia; and Miss Eleanor L. Richie, Director, Research and Statistics, Colorado State Department of Public Health, for assistance in editing.

THE EFFECTS OF ANTIBIOTICS

Continued from page 159

milk when stored for 48 hours at 7°C.

4. The addition of antibiotics to raw milk would result in receiving poor quality milk as an acceptable grade of milk at the dairy plant, if judged solely by bacteriological standards.

ACKNOWLEDGMENTS

The authors wish to thank the following firms for supplying the antibiotics in this study: Aureomycin by Lederle Laboratories, Inc., Pearl River, N. Y.; Penicillin by Merck and Company, Rahway, N. J.; Tyrothricin by Sharp and Dohme, Inc., Glenolden, Penna.; and Streptomycin by Merck and Company, Rahway, N. J.

TABLE 5—THE EFFECTS OF TYROTHRICIN ON THE BACTERIAL PLATE COUNTS OF RAW MILK*

Time hrs.	Counts per ml			
	Control	Tyrothricin 5.0 mg per ml	Tyrothricin 1.0 mg per ml	Tyrothricin 0.1 mg per ml
0	14,000	10,400	12,400	12,200
12	18,000	10,000	12,000	16,000
24	142,000	10,900	17,900	75,200
36	414,000	11,000	27,000	110,000
48	1,850,000	53,250	160,000	640,000

*Averages of three trials.

REFERENCES

1. Bell, W. B., Flora, C. C., Reaves, P. M., and Holdaway, C. W. Aureomycin Concentration in Milk Following Intramammary Infusion and Its Effect on Starter Activity. *J. Dairy Sci.,* **34**, 675-679 (1951).

2. Bryan, C. S. Problems Created for the Dairy Industry by Antibiotic Mastitis Treatments. *Mich. Agric. Exp. Sta. Quart. Bul.,* **33**, 223-228 (1951).

3. Calbert, H. E. The Problem of Antibiotics in Milk. *J. Milk and Food Tech.,* **14**, 61-64 (1951)

4. Foley, E. J. and Byrne, J.V. Penicillin as an Adjunct to the Preservation of Quality of Raw and Pasteurized Milk. *Ibid.,* **13**, 170-174 (1950).

5. Hansen, H. C., Wiggins, G. E., and Boyd, J. C. Modern Methods of Mastitis Treatment Cause Trouble in the Manufacture of Fermented Dairy Products. *Ibid.,* **13**, 359-366 (1950).

6. Irving, G. W. and Herrick, H. T., *Antibiotics.* Chemical Publishing Co., Brooklyn (1949).

7. Kastli, P. Storiingen in der Milchverarbeitung durch die Mastitis Behandlung mit Penicillin. *Scheiz. Arch. Tierneilk,* **90**, 685-695 (1948).

8. Krienke, W. A. Effects of Various Drugs in Milk from Mastitis Treated Cows. *South. Dairy Prod. Jour.,* **47**, 37, 132-134 (1950).

9. Krienke, W. A. Milk from Mastitis Treated Cows. *The Butter, Cheese and Milk Prod. Jour.,* **41**, 32-34 (1950).

10. Lederle Laboratories. *Aureomycin,* a Review of the Clinical Literature. American Cyanamid Co., Pearl River, New York (1950).

11. *Standard Methods for the Examination of Dairy Products.* Ed. 9, American Public Health Association, New York (1948).

12. Wilkowske, H. H. and Krienke, W. A. Influence of Penicillin in Milk on Total and Coliform Bacteria Plate Counts. *J. Milk and Food Tech.* **14**, 92-94 (1951).

RAINES—1902-1953

Mr. Raines was born in 1902 in Montague County, Texas. He died on March 29, 1953, as the result of an automobile accident which occurred on March 28, 1953.

The period from 1920 to 1937 was spent in several industrial positions in Bowie, Texas. From 1937 to 1943, he was Milk Inspector for the Texas State Department of Health. From 1943 until August 1951, he was Chief Field Milk Supervisor for the Bureau of Food and Drugs, State Department of Health. From August 1951 until his death, he was with the Oak Farms Dairies of Dallas, Texas, as Supervisor of Milk Quality Control.

He was held in esteem as a sincere and conscientious public servant. Much of the progress in milk quality control in Texas is due to Mr. Raines working with Mr. Pearson. Both men were highly respected by the industry and the public. Past-President (of this Association) Ehlers writes: "Through the passing of Mr. Raines the state has lost one of its outstanding milk authorities."

He is survived by his wife, one daughter, a granddaughter, a son-in-law, and other relatives not of his immediate family.

THE RELATION BETWEEN SPECIFIC GRAVITY AND SOLID CONTENT OF RECONSTITUTED SKIM MILK*

J. Babad and A. Shenhav-Hetman

Dairy Research Laboratory, Agricultural Research Station, Rehovot, Israel.

It was found that there is a linear relationship between the specific gravity of reconstituted skim milk and its total solids content, in total solids concentrations ranging between 7-30%. On this basis a formula is given for calculating the total solids content of reconstituted skim milk with an accuracy of ±4%.

Introduction

The specific gravity of milk depends on two variables: the dissolved solids-not-fat content which raises the specific gravity, and the fat content which lowers it. When determining the specific gravity of skim milk, the problem is simplified since the fat factor is virtually eliminated.

The determination of the specific gravity is very simple in practice, requiring no complicated apparatus and little time. It may be determined by means of a hydrometer calibrated for milk—the lactometer, by means of the Westphal balance, or with the specific gravity bottle—the pyconometer, the latter giving the most accurate results. However, since the lactometer is more convenient, it is generally used by dairymen, and its accuracy is sufficient for most industrial and commercial purposes.

The practical importance of specific gravity determinations led to extensive research in this field. Several lactometers were designed with modifications of scale and range to accommodate variations in temperature and concentration of total solids. The most widely used are those of Quevenne, Soxhlet, Vieth, and Gerber. Average room temperature was assumed to be 15.5°C (60°F), and most lactometers are calibrated to this temperature. Special tables were prepared for calculating the specific gravity of milk at 15.5°C from measurements taken at other temperatures.

About forty formulae for calculating the relation between the specific gravity, fat, and solids-not-fat of milk, have been published during the last century. Richmond's formula with some modification by Hehner[2] is generally applied today.

The milk shortage in Israel led to the increased use of milk powders for drinking and cheese-making. Therefore the specific gravity determination of reconstituted milk, both in concentrations approximating that of fluid milk and in more concentrated preparations, became particularly significant. The literature concerning milk powders and reconstituted milk cites but two papers on this subject.

Evenson and Ferris[3], working on the viscosity of reconstituted milk as compared with that of fluid milk, mention specific gravity determination (with Quevenne lactometer) in relation to total solids, without giving any details.

In another paper by Palmer and Dahle[5], dealing with the chemical and physical properties of reconstituted milk, the variations of its specific gravity were found to be of the same order as those of fluid milk. Numerical data, however, were not given.

The present work was undertaken to provide data on the relationship between the specific gravity and the total solids in reconstituted skim milk, in concentrations ranging from that of skim milk (about 8 percent) to double the normal total solids content of whole milk (about 26 percent). Determinations were therefore made in aqueous solutions containing 7-30 percent skimmilk powder, in order to cover the whole practical range. This was necessary in order to standardize the composite milk[1] and the cheese milk used in Israel since 1950. The experiments in the upper range of total solids were important as it was intended at first to distribute twice-normal concentrations of composite milk, permitting the housewives to dilute it themselves[1].

Experimental

Skimmilk powder was weighed on an analytical balance, reconstituted in a small volume of water in a Waring Blendor, and diluted to 500 ml in a volumetric flask. In making percentage calculations the moisture content of the milk powder was considered (usually 5 to 6 percent moisture). In order to avoid the formation of air bubbles and foam (and perhaps the Recknagel phenomenon) the sample was heated to 68°C for 30 minutes. (Usually a drop or two of capryl alcohol (secondary octyl alcohol) was added to aid in foam prevention.) This also provided pasteurization when the measurements had to be postponed to the next day.

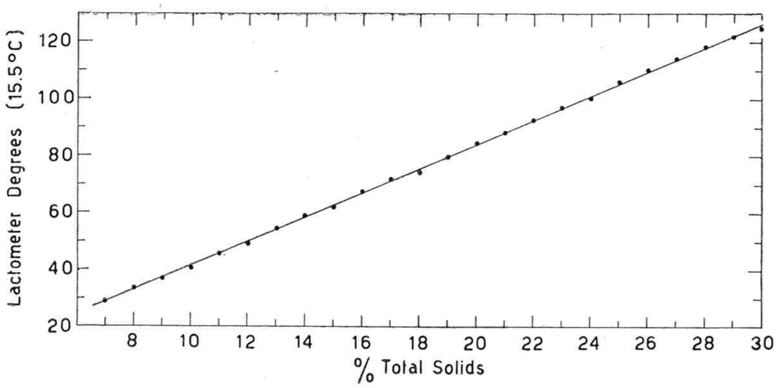
A standard Sprengel - Ostwald pycnometer was used for the specific gravity determinations, by the generally accepted procedure. All measurements were made at 15.5°C, in triplicate.

Results

The results obtained are shown in figure 1, where the lactometer de-

J. Babad, Drs. Ing., graduated from the Technische Hochschule of Vienna and the University of Utrecht. He has been the head of the Dairy Research Laboratory, Rehovot, Israel, since 1933. His main work was in initiating the production of hard cheese and storage butter in Israel. He has published with co-workers many papers in different fields of dairy research, more recently especially on the use of dry milk in dairy products. He lectures on dairy chemistry at the Faculty of Agriculture, Hebrew University, and serves as Dairy Advisor to the Ministry of Commerce and Industry, Government of Israel.

*) This work was carried under a grant of the Food Division, Ministry of Commerce and Industry, Government of Israel.



grees L*, calculated from pycnometer measurements at 15.5°C, are plotted against the percentage of skim milk powder in the reconstituted milk. Each value given in the graph represents nine determinations of reconstituted skim milk each of three milk powders. It may be seen that the graph is linear.

The following formula was derived from the values shown in figure 1.

I. $L = 4.25\ T.S. - 1.25$

or

II. $T.S. = 0.235\ L + 0.294$

where L stands for lactometer degrees and T. S. for % of total solids.

There was full agreement between the experimental values and those calculated from the formula, with due consideration for the standard deviation.

Table 1 presents the reproducibility of the results.

*) L: lactometer degrees = 1000 x specific gravity − 1000.

*) Standard deviation $= \pm \sqrt{\dfrac{\Sigma d^2}{n-1}}$

d = deviation from average

n = number of determinations

The differences between the various milk powders are not large, as may be seen from table 1, and they are of the same order of magnitude as those encountered in fluid milk.

Similar results are given by Lawrence[4], who determined the relation between the specific gravity and total solids of whey.

It seems evident, therefore, that for practical purposes the total solids content of reconstituted skim milk may easily be calculated from its specific gravity, with the aid of an appropriate hydrometer the formula given above.

The invaluable assistance of Mr. Y. Levine in this work is gratefully acknowledged.

REFERENCES

1. Babad, J. and Shenhav-Hetman, A. The Keeping Quality of Composite Milk, *J. Dairy Res.*, 19 (1): 63-71 (1952).
2. Eldson, G. D. and Walker, G. H. Richmond's *Dairy Chemistry*, Charles Griffin and Co., London, p. 121 (1942).
3. Evenson, O. L. and Ferris, L. W. The Viscosity of Natural and Remade Milk. *J. Dairy Sci.* 7, 174-188 (1924).
4. Lawrence, A. J. The Relation Between Specific Gravity and Total Solids of Whey. *Austr. J. Dairy Tech.* 1, 48-49 (1946).
5. Palmer, L. S. and Dahle, C. D. Chemical and Physical Properties of Remade Milk. *J. Dairy Sci.*, 5, 1-13 (1922).

TABLE 1. THE REPRODUCIBILITY OF THE DETERMINATIONS

% milk-powder in solution (T.S.)	Average L from pycnometer measurements at 15.5°C.	Standard deviation*)
7	28.8	0.78
8	33.5	1.46
9	36.7	0.48
10	40.1	0.42
11	45.6	1.26
12	48.8	0.72
13	54.3	0.81
14	58.9	0.46
15	62.8	2.21
16	67.4	1.26
17	71.7	1.83
18	74.1	2.82
19	79.3	0.53
20	84.1	2.27
21	88.5	1.56
22	93.0	1.85
23	97.2	0.44
24	100.1	1.70
25	105.8	1.29
26	110.3	0.75
27	113.6	1.45
28	118.0	0.74
29	122.1	0.39
30.	124.6	1.38

ODIORNE IS NAMED MANAGER OF CANCO PLANT AT LEMOYNE

Raymond J. Odiorne of Baltimore, Md. has been named manager of American Can Company's new can-making plant at Lemoyne, Pa., R. B. Thompson, manager of manufacture for the container-making firm's Atlantic Division, announced.

Odiorne already has assumed his duties at the new plant. The Lemoyne plant is one of 58 operated by Canco in the United States, Canada and Hawaii. When in full operation, it is expected to employ 450 to 475 persons.

The new plant manager went to work for Canco as a floorman in the Hudson factory at Jersey City, N. J. in July of 1930. He spent the next 18 years there, serving successively as assistant foreman, foreman, assistant general foreman, assistant to the plant manager, and general foreman.

Odiorne has been assistant manager of the company's Maryland factory at Baltimore for the past two years.

SANITARY PROBLEMS RELATED TO POULTRY PLANT OPERATIONS*

HUGH L. TEMPLETON, *Technical Director*

Fairmont Foods Company, Omaha, Nebraska

Poultry plant sanitation starts with the purchase of only healthy birds. The eviscerating plant must be so arranged that air currents are counter to the flow of the birds. Hot evisceration gives a sanitary and acceptable product. Plant walls and floors must be smooth for easy sanitizing. Present day equipment is manufactured with sanitation problems in mind, but this does not mean that the plant operator can omit the careful inspection of his equipment. Making a vent cut that does not puncture the intestines is the most important sanitary problem of the eviscerating operation. An ample supply of chlorinated potable water is essential.

The term "Poultry Plant Operations" is rather all-inclusive. One can consider the big commercial flocks, hatcheries, broiler projects, poultry evisceration, and poultry canning as all in the class of poultry plants; and therefore, they have sanitary problems. In this presentation we will limit ourselves to the problems which are encountered in the modern eviscerating plants.

GENERAL SANITATION

In connection with sanitation there are problems of rodent and insect control which are really separate from sanitation in a certain sense, but they still belong with sanitation. I will not attempt to discuss these in any detail because they are problems which are worthy of extended discussions in their own rights. Suffice it to say that the problems of rodent and insect control which are found in any food plant apply to poultry plants, and the same precautions must be observed.

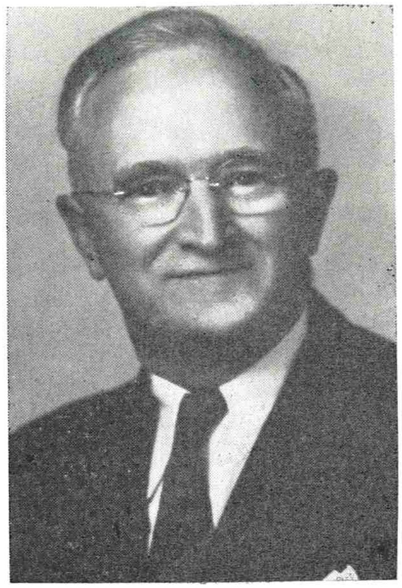
One has only to read the *Notices of Judgment* of the Food and Drug Administration to be impressed with the number of times that seizures are made because a food product is prepared in a plant, or under conditions, which make it possible for the product to be contaminated due to unsanitary conditions within the plant.

In order to handle the sanitary problem which arises in any poultry plant, it is necessary that some one person be made responsible for maintaining the proper sanitary conditions within the plant. This person should have authority to make the changes that he feels are necessary, and he certainly must have the backing of the executives of the organization, otherwise his efforts will be wasted. We find that most plant operating personnel are quite willing to do their part in maintaining sanitary conditions if they know why they are to do certain things and what the results will be. Someone has to be able to educate the plant personnel on the precautions that must be taken.

Plant operators should instruct their buyers and handlers that they are not interested in the purchase of diseased poultry. There are, of course, certain diseases which cannot be recognized in the live fowl, and these are removed later when the eviscerated fowl is inspected. However, any fowl showing any evidence of disease at time of purchase should not be put into feeding batteries. They should be destroyed immediately and the body handled so as to eliminate any possible contamination.

There are two types of eviscerating operations in general use at this time: the hot method in which the fowl is eviscerated immediately after picking, and the cold method in which the fowl is chilled or frozen and thawed again before evisceration. Since eviscerated poultry first came on the market, the demand for this type of poultry has continued to increase, and the New York dressed type is now almost obsolete. We are now, I believe, entering a new stage in which the demand for cut-up chickens and pieces or segments may represent a third phase in the poultry industry. If one maintains good sanitary conditions in the eviscerating operations, the problem of maintaining sanitary conditions for the cut-up birds is then another step and does not require particular stress.

The hot evisceration of poultry is in the interest of better quality in the finished product, because the intestinal tract is removed before it has any opportunity to contaminate with off odors the meat surrounding it. It does offer greater problems in sanitation because in most instances the poultry is fed in or near the same building in which it is eviscerated.



Dr. Hugh L. Templeton obtained his B.A. 1921; M.S. 1922; and Ph. D. 1925—all in the University of Wisconsin. His major was organic chemistry with agricultural bacteriology and dairy chemistry.

Employed by U.S.D.A. Forest Products Laboratory in 1925-1926. During 1926-1937 he was the Chas. Pfizer & Co., Inc., Industrial Fellow in Dairy Industry, University of Wisconsin, working on the use of citric acid and its salts in dairy products.

In 1937-1940 he was employed by the Roberts Dairy Co., Omaha, Nebraska, and since 1940 has been with Fairmont Foods Co., Omaha, Nebraska, where he became Technical Director in 1946. His interests are research and development work on dairy and poultry products.

With the cold process of evisceration, the poultry may be killed, picked, and packed in one location; and take to another location, entirely separate, for evisceration. The eviscerating plant was designed and planned solely for purposes of evisceration, and did not encounter the problems which are inherent with the other type of installation.

Since the hot eviscerating method is becoming much more popular and wide-spread, we must consider the sanitary problems which arise in this operation. As mentioned previously, the feeding of the poultry, as well as killing and picking,

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

is probably done in the same building in which the evisceration takes place. In the feeding and killing rooms there will always be a certain amount of dust from the feed and from the feathers of the bird. This means that the eviscerating department must be separated from the preliminary operations by a tight wall in which all doors are self-closing and with a minimum amount of space for pass doors to permit the movement of birds through the wall into the eviscerating section.

The birds may be fed for a few days previous to slaughter in feeding batteries. It is important that these feeding batteries be cleaned regularly as soon as the birds are removed from them. This cleaning should be done in a room which is separated from all other operations to prevent the dust and fecal material from being spread through the building. An attempt should be made to salvage the fertilizer from the pans. If this is done the droppings should be stored in containers isolated from the building. In small towns which are not equipped with adequate sewage disposal systems, it is imperative to find some one who is willing to remove the droppings from the plant and use them for fertilizer.

SLAUGHTER

Birds that are to be slaughtered the next day are usually fed the evening of the day before slaughter. Water is supplied. This, of course, is done to reduce the amount of material in the intestinal tract. At time of slaughter the bird is removed from the feeding battery, and suspended by both legs in moving shackles with head downward. There are various methods of killing, the common one being to sever the jugular vein as near the head as possible. This may be preceded or followed immediately by electric stunning. This latter operation is intended to reduce the struggling of the fowl, loosen the feathers, and possibly minimize the spattering of blood and flying dust from the feathers. In a plant with a large kill regularly, the salvage of the blood may be worth consideration. A large killing operation in a small town with inadequate sewage facilities will certainly put a real load on the sewers by the amount of blood sent to the disposal plant. As an approximation, the blood from one fifteen-pound turkey or four head of chickens is equivalent to one person in BOD estimations. The area of the plant over which the blood may spatter should be of such material and finish that it can be cleaned regularly to give minimum opportunity for blood to dry and to produce stains on the wall. The circulation time of the blood in the living fowl is about ten seconds. Actually, in killing, more time than that must be allowed for the blood to drain from the extremities and the capillaries. Most installations allow at least forty-five seconds for the fowl to bleed before it reaches the scalding tank.

FEATHER REMOVAL

The method of removing feathers from the bird has changed through the years. Not too long ago, dry picking was considered the only proper procedure. This was a very slow process and left many pinfeathers on the bird. It was abandoned in favor of scalding. There has been a lot of work done on this subject to determine the proper temperature at which a bird should be scalded in order to get the best results. Variations in the scalding temperature range from below 130°F, which is known as a semi-scald, to temperatures above 150°F, which is known as a high-scald. The in-between range is generally spoken of as slack-scalding. The temperatures that are used are largely dependent upon the type of bird being scalded and the final form in which it is to be sold. The highest scalding temperatures permit the much more rapid picking of the bird, but damage the appearance of the skin. Immersion, and/or spray type scalders are used in plants today. In one of the latest installations which I have seen pictured, both types of scalding are used. The body is spray-scalded and the neck and the bracelets about the hocks are immersion-scalded to give the best results. Normally, the water used in the scalding tank, or in the spray process, will contain some wetting agent to assist in the penetration of the water through the feathers. With the spray scalder, of course, the hot water is picked up from the area underneath the scalder and re-circulated. No matter which method is used, the scalding water is sure to become contaminated, and care must be taken to get rid of the dirt and feathers which accumulate. Some of this can be done by regulating the amount of in-flow which enters the scalder to make up for that lost. At least once a day the sludge should be removed from the bottom of the scald tank by drawing off the water through the bottom valve. In view of the treatment which the fowl receives after leaving the scald tank, the contamination from the scald water may not be too great if these precautions are taken.

Feather removal is practically all automatic in a plant of any size. The rotating rubber fingers which are used for the removal of feathers, need attention. They can be sources of surface contamination unless they are kept clean. Feathers hard to remove are usually plucked by machines which are operator-controlled. The wax dipping, which was practiced for some years for the removal of pinfeathers, is becoming obsolete due to the very doubtful sanitary condition of the wax.

As soon as possible after the bird is killed, it is advisable to arrange some place in the line where the contents of the crop may be removed and the fecal material forced out of the vent by pressure on the abdomen.

The carefully picked bird should then be very thoroughly washed with whirling rubber fingers operating in a cold water spray, or other approved methods. In a small plant such a piece of equipment may not be available. The use of a hose with a spray nozzle, with water under as much pressure as possible, will probably do an equal job. The pressure is essential to make sure that all foreign material is dislodged from the body of the bird. It is advisable to chlorinate the water used for washing the birds at approximately 10 ppm. The chlorine will improve the sanitary condition of the surface.

At this point, any fowl that are intended for New York dressed style of packing should be allowed to cool, and is then ready for sorting according to weights and grades before final packing. As soon as the birds are packed in the proper containers they should be frozen as rapidly as possible. Plants that are not equipped for hot evisceration may pack New York dressed style for shipment to other plants. Some plants may pack New York dressed and freeze during the season of heavy operations in order to have a supply of poultry on hand which can be thawed out and eviscerated at a later date when the supply of poultry for hot evisceration is limited.

Evisceration

The frozen birds are prepared for evisceration by removal from the boxes and placing in tanks through which cold water is circulating in such a manner that the tank is kept overflowing. The time factor will depend upon the size of the bird. Normally, an over-night immersion is ample.

It is evident from the foregoing that hot evisceration can result in some very substantial savings in refrigeration, and as we have mentioned earlier in this talk, hot evisceration does give a better finished bird.

We are now ready to start the actual eviscerating operations. Some years ago the operator of a large and well-patronized tea room, specializing in fried chicken, wrote an article on why her tea room was so successful. She emphasized the fact that she had visited plants of a number of possible suppliers, and had selected as the plant for her supply the one that did the most sanitary job of evisceration. After seeing a number of different eviscerating plants, one can easily realize the reasons why this tea room operator made the selection that she did.

The first step on the evisceration line is an inspection of the fowl for pinfeathers. Those which are improperly "pinned" are put to one side for more attention. In one style of installation the skin of the neck is cut completely around at the head, and then slit to the base of the neck. The oil sack is removed and the bird is suspended by the neck and feet so that the back is horizontal and parallel to the floor. In this way the bird is kept away from any surfaces which might offer contamination. The shackle chain moving across the eviscerating table is synchronized with trays which travel around the table so that a tray is directly underneath the bird in the shackle to carry the viscera past the inspector. From the standpoint of sanitation, the vent cut is the most important operation in the evisceration of fowl. The size of the bird, its age, and condition, as well as the speed of the line, will all have a bearing upon the ease with which this cut can be made without puncturing the intestines. Recently there have been advertisements of electrically operated vent cutters which are reported to eliminate the danger of intestinal perforation. We have not seen any of these in actual operation, nor have we visited with anyone who has seen them. The abdominal cut must be as long as possible, but should be centered in the abdomen so as to give a better appearance of the finished bird if it is to be sold as a whole eviscerated product and not as a cut-up. The person making the abdominal cut must be accurate and careful as well as fast enough to avoid holding up the eviscerating operation. Carelessness can ruin any visitor's reaction to a clean, well-operated plant.

Removal of the viscera from the abdominal cavity should be carefully done so as not to break the intestines. Experienced operators can remove the complete alimentary tract as a unit. This procedure permits the inspecting veterinarian to see the entire viscera of the bird at the same time that the carcass is passing before him. He is able to decide whether the entire bird shall be passed for food, condemned, or portions condemned. Following the inspection, the gizzard, liver, and heart are removed from the viscera. Care must be taken not to get the content of the gaul bladder on the liver. The contents of the gizzard are removed separately from any other operation. All giblets are thoroughly washed and then wrapped in parchment or other suitable material, if to be sold with the entire bird; otherwise, the giblets are packaged in suitable separate containers.

When the bird and viscera reach the end of the inspection table the contents of the tray are dumped into a hopper which conveys them to another floor away from the actual eviscerating operations. Then the tray continues under the table where it is subjected to washing and sanitization before it reaches the front end of the table for another trip.

Packing

The interior of the bird is then given another inspection, and any parts not previously removed are taken out either by hooks or by suction. The head and feet are removed, and the bird is suspended in the shackle by one wing for the final inspection and washing.

An ample supply of potable cold water is essential at this stage in the operation. The outside of the bird is washed by a special device known as an outside bird washer, or similar equipment, which will insure the complete washing of the outside with a small amount of brushing to remove any adhering material. As a sanitary precaution, use water which has been chlorinated to at least 10 ppm. Twenty ppm should be used if there are no complaints made by the personnel in the plant. Some may complain that this much chlorine effects the eyes and nose.

The bird is now ready either for packing as such, or to go to a cut-up table where it will be cut into parts for packing. If the bird is to be packed as a unit, it is normally wrapped in some type of a foil or film sack or other material which protects it from surface contamination. The box in which it is packed should be kept in a clean, dry place, so that it will not become moldy and offer possible contamination of the bird packed in it. The same thing applies to the storage of boxes for cut-up poultry.

In the foregoing, we have attempted to give a rather quick outline of the operations which are involved in the evisceration of poultry. We have pointed out some of the sources of contamination, and we would like to give a few of the precautions which we feel must be emphasized.

Precautions Suggested

Hand washing facilities should be amply provided so that people working on the inspection table, or anywhere else, can wash their hands whenever necessary with a minimum amount of movement from their place because they may slow up the operation if they have to walk very far. Floors should be kept dry to avoid slipping. Any material that falls on the floor should be immediately removed, and all floors should be given a very thorough cleaning and sanitizing treatment at night, or whenever the operation is completed. All viscera, after leaving the inspection table, should be handled in such a manner that it will not become fly-infested or become a possible source of rodent infestation. Normally, the viscera can be sold to rendering plants, the price received depending upon the current prices for meat scrap or tankage and fat.

In the dairy industry we use certain tests which give a picture of the sanitation and sanitary practices employed within a plant. These are applicable to a poultry eviscerating operation. If you want to know the amount of airborne contamination that is in any room, filter some water, place it in a shallow pan, and allow the pan to remain uncovered in the room that you are checking for a definite length of time. At the end of the test period filter the water again and examine the filter pads for foreign material. You may be surprised at what you find, and it may show you that the sanitation is not all that you think it is.

The effectiveness of the final washing operation may be checked by making small agar plates in light foil containers which can be applied with the agar surface down on the skin of the bird. After being in contact with the surface of the bird for a brief interval, the agar plate is removed and placed in a sterile petri dish where it is incubated as normally done in bacteriological work. The presence of large numbers of bacteria on such a plate will indicate very promptly that the washing is not being done properly, or that the water has been poorly sanitized. Regular chlorine content determinations of the water should be made to insure the proper chlorine content.

We must remember that it is much easier to maintain a high sanitary standard than to suddenly be forced to change from what is a pretty sloppy one to one which will meet with inspection of qualified inspectors.

The use of black light at night will certainly show up all poorly cleaned areas, as well as rodent runs and other possible sources of contamination.

Swabs made of wall areas, conveyor belts, and other flat surfaces, scrubbing a definite area each time, and plating the material which is removed by the swabs, will also reveal the thoroughness and effectiveness of the cleanup job.

It has often seemed to me that the cleanup crew is one of the most neglected, but one of the most important groups in any plant. Too often the cleanup crew is composed of the last hired employees, and those who are considered incapable of doing anything else. Actually, the work of the cleanup crew may determine the reaction which the visitors will have to your plant. If the cleanup crew does not do a good job, and no one takes the effort to explain to them why they are expected to do a good job, you can be almost certain that the job that they do will be as sloppy as they think they can get by with and not meet with criticism. Certainly, someone should make the effort to explain to the cleanup crew why they are doing each job and what the significance of the various things they do mean in the final analysis of your sanitation program. Do not limit the cleanup crew to the plant only, but have them, or some crew, look after the surroundings. You must remember that any visitor to any plant is impressed either favorably or unfavorably by the condition which he notes as he approaches the plant.

In addition to the appearance value, a good thorough cleaning of the surrounding area will eliminate possible sources of rodent and fly infestation.

The health of the personnel in the plant must be considered. People appearing with sores on the hands or arms should not be permitted to work on the eviscerating line. The same is applied to people who have serious head colds and are sneezing and coughing all of the time. It is expected that each new employee will be given a health examination before they are put to work. However, you cannot always expect to have a medical examination each day, so the man in charge of the different operations must check with his employees to make sure that their health will permit them to work in his department. Possibly some changes may be made between departments to permit those who are not in physical condition to work in one department, to work in another.

Since so many of the operations are done by the personnel, it is only wise that they be checked regularly to make sure that they are clean and not possible sources of contamination to the products which they are handling. The employer should provide ample toilet facilities so there can be no valid excuses.

There is one general test which can be applied to any product, particularly by the plant operator or those in charge of plant operation and sanitation. After seeing the operation, knowing what is done, and how it is done, are you still willing to eat the products that come from your plant?

Sanitary control is an essential if we are to hope to build and maintain a reputation for a quality product.

Speaking from the standpoint of industry, we must do all in our power to increase the demand for eviscerated poultry, because I am sure that everyone will agree with me that eviscerated poultry offers the housewife an excellent opportunity to get what she wants, and at the same time have the assurance that it will have been handled under conditions that are uniformly observed to produce a product which will meet her approval.

Hugo Sommer—1900-1953

Dr. Hugo Sommer, Professor of Dairy and Food Industries, University of Wisconsin, passed away suddenly Friday, May 8, at Madison, Wisconsin. Dr. Sommer was born in Timothy, Wisconsin, and attended the Sheboygan, Wisconsin, High School. He attended the University of Wisconsin, where he majored in biochemistry. He received his doctorate degree in 1922. He joined the staff of the Department of Dairy Industry as Associate Professor in 1924, at the age of 24.

Dr. Sommer was the author of several text books, including *The Theory and Practice of Ice Cream Making* and *Market Milk and Related Products*. He received the Borden Award for outstanding work in Dairy Manufacturing in 1942, Dr. Sommer was a member of Alpha Zeta, Gamma Alpha, Sigma Xi, Phi Lambda Epsilon, The American Chemical Society, The American Dairy Science Association, THE INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, and The Wisconsin Dairy Technology Society. His survivors include his wife and two sons, Warren and David.

K. G. Weckel

MILK and FOOD SANITATION

CHANGING RESPONSIBILITIES IN MILK AND FOOD TECHNOLOGY*

Harry G. Hanson

Executive Officer for Program Office of the Surgeon General, Washington, D. C., U. S. Public Health Service

Harry G. Hanson, Assistant Chief Sanitary Engineering Officer of the U. S. Public Health Service, was born in Crookston, Minnesota, and received his early education there. He earned his B. S. in Chemical Engineering at North Dakota State College and his M. S. in Sanitary Engineering at Harvard. Entering sanitation work with the North Dakota State Department of Health in 1937, he became Assistant Director of Sanitary Engineering in 1940 and later Director. Commissioned in the Public Health Service in 1942, he served as Executive Officer for Malaria Control in War Areas and subsequently the Communicable Disease Center in Atlanta, Georgia, until 1949. For the next five years he served as Executive Officer to the Surgeon General of the Public Health Service. In his new position, he will endeavor to carry forward the environmental health work of the Public Health Service.

Among the challenging possibilities for improving milk and food practices are: pinpointing sanitation efforts on genuine health hazards; establishment of standards of nutrient quality in foods; assumption by private enterprise of more responsibility for food sanitation; application of modern science to the reclamation of community food wastes; bringing up to date the epidemiology of food-borne disease and adjusting control measures accordingly.

Hydroponic famring, photosynthesis of algae in sewage oxidation ponds to produce cattle feed—and thus beefsteak—; radiation sterilization of food; complete meals in sealed packages; and the application of positive health measures such as fluoridation of drinking water and enrichment of food are but examples of the rapid change in our technology.

Introduction

It is a real pleasure for me to return to my native state, especially to talk with you about milk and food. Having been raised in the Red River Valley of Minnesota—the "Breadbasket of the World"—I have much more than a casual interest in the production of food.

Your Association has selected a most appropriate place in which to hold its 39th Annual Meeting. The cooperation that is being fostered here in the Midwest by those concerned with milk and food—agriculture, health, industry, and the universities—is a most encouraging thing. Without this kind of pioneering such developments as the interstate milk shippers' program—in which 27 states are now participating—would not be possible. As the speed with which society is moving increases and the complexity of doing business increases, this kind of teamwork is becoming more and more necessary if milk and food technology is to keep pace with the rest of progress.

Much of sanitation is taken for granted. Control of germ diseases has been accomplished to such a degree that today few people give even a passing thought to whether the water drawn from a tap is safe, whether the milk in a restaurant is safe, whether the meat in the market is safe. Even the eclairs, custards, and their relatives now enjoy a respectable reputation.

This would not be so today were it not for the patient and unrelenting work of the past century—the search for the causes of communicable diseases, the development of preventive measures and of programs of inspection, education and correction—that have been carried forward by the water, milk, and food technologists. The situation tomorrow will require this same constant vigilance, and in addition many new measures made necessary by the increasing complexity of our expanding technology.

Holding the Line

This constant vigilance remains our first basic responsibility. It is a "line-holding" operation. It should and does change in technique, in efficiency and effectiveness, and in the share of our time that is devoted to it.

Your employer, public or private, depends on you to examine, constantly and critically, the things you are doing, to recommend discontinuing less productive procedures and adding the more productive. The natural tendency of most of us is to keep on doing what we have been doing, until our employer or some other external force causes us to change. This may be an unpleasant shock and an embarrassing realization that we have not been alert to the needs of our own jobs.

The Changing Calculated Risk

The accelerated advance of technological progress has had a parallel impact on milk and food technology. Since our milk and food codes first came into use about thirty years ago, communicable diseases have greatly declined. We have only about one-fourteenth as many reported typhoid fever cases as we had thirty years ago, and only one-third as many cases of scarlet fever, notwithstanding a twenty-five percent increase in population. The death rates for these two diseases have dropped even more dramatically—to one seventy-fifth of the former rate for typhoid, and one fiftieth of the former rate for scarlet fever. Advances in sanitation have greatly reduced the chances of contracting these diseases, and advances in medicine have reduced even more chances of dying from them.

Advances in Milk and Food Control

Our facilities for producing, pro-

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

cessing, and distributing milk and food are rapidly improving. Animal diseases are declining with improved veterinary practices. Our equipment is easier to operate, easier to clean, and much more reliable. Detergents and sanitizers are more efficient and their action better understood. Production and processing plants of all kinds incorporate features which make their sanitation more practicable. Working in close relationship, the milk and food industries, the universities, and the regulatory agencies have been principally responsible for these advances.

The numbers of milk and food technologists are continually increasing, and more and more scientists are being attracted to this field. A better balance of service between rural and urban areas, and between production, processing, and distribution, is also being achieved. Of particular significance is the addition to the staff of milk and food industries, large numbers of technicians concerned with the quality and safety of food products.

Today, both industry and the public are much better informed and more conscious of the health implications of milk and food. Thousands of food handlers have been trained in the techniques of food safety. While there may be a high rate of turnover among this group in any single establishment, the knowledge they have acquired remains with them in another establishment and in the home. More important, and less transient, is the foundation laid with management itself, for management is the continuing force upon which the public must and does depend for protection.

Taking Inventory of Our Present Activities

These changes have operated effectively to reduce the hazards from unsafe food. They have changed the calculated risk quite significantly. Since the public looks to you as its front line of defense against these hazards, you should ask yourselves if the present line of defense is in good order. Are the implements of modern design taking advantage of new knowledge? Are they manned by persons whose knowledge and training are satisfactory? Have we been revising our strategy to attack at the most vulnerable points, in order to make the best use of every ounce of our resources?

Our resources for health defense are limited. They equal only a tiny fraction of expenditures being made for military defense. Nevertheless, our resources for milk and food sanitation are sizable within the field of public health. The fact is that more than 50 percent of public health expenditures for environmental sanitation are spent on milk and food. Your responsibility is to see that this money is always well spent—that it is in fact preventing disease as effectively as funds being spent for other public health preventive measures.

Toward this end I believe our responsibilities and activities should be shifting in a number of ways.

Sharpening the Focus

First we need to sharpen the focus of what we are now doing. Milk and food procedures, like all sanitation procedures, are closely connected with cleanliness and aesthetics. They may or may not contribute significantly to prevention of disease or illness. And while few would challenge the desirability of most things we do for cleanliness or aesthetics, an objective evaluation of expenditures for prevention of illness from milk or food must necessarily be on the basis of their effective contribution toward that end.

There are, I believe, great potentials for economy and effectiveness to be attained by pin-pointing our efforts.

The evolution of malaria control is a forceful example. It was in 1895 that Sir Ronald Ross discovered that malaria was transmitted by mosquitoes. Thus, malaria control started by directing efforts at killing all mosquitoes—a formidable and expensive task. The first refinement came some ten or fifteen years later when Italian workers discovered that only *Anopheles* mosquitoes transmitted malaria. These mosquitoes were not present in all parts of the world, and further had selective breeding and living habitats. This refinement in approach made possible savings of 75 percent or more, and greatly increased the feasibility of control. Some years later, Dr. Paul Russell discovered that a single species of *Anopheles* was responsible for most of the malaria transmission in the United States. This sharper focus—species sanitation—further reduced costs and increased feasibility. This new knowledge gained was not completely applied, however, for some years. In fact, it was not until World War II mobilization began that full use was made of species sanitation. Its effectiveness and economy were demonstrated clearly during the next five years—so clearly in fact that interest in malaria eradication began to grow. With the advent of DDT this dream was given potential substance. Le Prince had demonstrated in Panama that malaria control could be achieved by killing adult mosquitoes—mosquitoes on the wing. The principle was given full effect by spraying long-lasting DDT on the interior walls of dwellings where the vector mosquito was likely to rest before or after biting humans. Both rural and urban families could now receive protection—at a price they could afford to pay. The success of this final pinpointing is now a matter of history, for malaria virtually has been eradicated from our country—by continuously sharpening the focus of our efforts.

Measurement of Results

Infectious diseases have been reduced to levels where it is difficult for us to demonstrate our year to year progress in their control. This has been pointed out clearly in the recent study by the American Public Health Association of sanitation practices in local health departments[1]. Morbidity and mortality figures indicate to us only our long-range progress. Specifically, we are without a good yardstick—such as the profit and loss yardstick of business—to measure the results of our milk and food sanitation efforts in terms of reducing illness. Improvement in the precision and application of milk and food sanitation ratings can give us a better idea of how effectively we are obtaining compliance with our sanitary requirements. While efforts along this line are being intensified, we need to find better ways of evaluating our control measures in terms of increased health or decreases in disease, if we are really to know whether we are progressing or are merely going around in circles.

Need for Better Epidemiology

Interest in epidemiology suffered an unfortunate decline as the major germ diseases were brought under control. More recently, however, we have come to recognize that infectious and communicable diseases are not gone, but that their manifestations may be more subtle, especially where they are of virus origin. The consequent resurgence of interest and activity in epidemiology is encouraging. This gives us hope that the epidemiological bases for milk and food control may be brought up to date, thus making possible more intelligent reevaluation of our requirements and improvement of our control measures.

This Association is to be commended for its efforts to improve the investigation and reporting of food-borne outbreaks. Your Committee on Animal Diseases Affecting Man is giving increased attention to this problem. When we study the annual reports and find that in successive outbreaks at the same institution involving several hundred people, neither the causative agent nor the contaminated food was identified, we realize the inadequacy of our present epidemiological methods.

The two principal groups of organisms at which our food—as differentiated from milk—control efforts are aimed today are *Staphylococcus* and *Salmonella*... Both of these occur so universally in our environment that some have raised serious doubt as to whether we can ever hope to eliminate, for example, contamination of bulk foods in the raw state. Even if this were possible technically, there is question that we could afford the cost. We turn then from what is ideally desirable to what is more practical—the prevention of multiplication and growth of the organisms to keep their numbers below the levels of dosage—and we need to know more about those levels—which are likely to produce illness. Some of you may disagree with this approach. I am conscious, when I suggest it, of what Samuel Johnson wrote of a contemporary whose manuscript he had just read: "The good portions he likely stole from someone else, the rest, which is bad, is presumably his own."

SPECIFIC CONSIDERATIONS FOR IMPROVING OUR TECHNIQUES

Refrigeration is one of the most important factors in food sanitation. While we go to great lengths to insure strict adherence to temperature requirements in milk processing, we have much less effective control over refrigeration of other foods. Our standards are lower, and our means of knowing whether requirements are being met are less adequate. In general, recording thermometers and dated temperature charts are not widely used to guide us with respect to the environment within the food refrigerator. Nor do we have specifications for the sizes, shapes, and conductivity of containers in which foods are placed, so we can be assured that the body of a given food will reach a specified temperature in a specified time. Toward the other end of the temperature range, we need increased use, for example, of meat thermometers to be sure that we are killing, not incubating, organisms which cause illness.

Speaking of meat, it is hardly necessary to call your attention to the need for improved sanitary practices in the poultry industry. Likewise the meat industry should assume responsibility for eliminating the insanitary practices still found in some meat processing establishments, both large and small.

Of the 347 reported food-borne outbreaks in 1950, at least half of them—and approximately half the resulting cases of illness—occurred in places which are not generally covered by established public health control programs. They occured mostly in private homes, schools or colleges, penal institutions, hospitals, and at public gatherings. We can combat these outbreaks by more intensive education; but certainly, we should also give a good deal more direct attention to these places which now receive very little or none of our attention. In order to do so, we may have to "delegate" more responsibility to public eating and drinking establishments and to food industries for enforcement of standards of sanitary practice in their own establishments. The humble housewife, as she pays the grocery bill and in turn possibly even the taxes which may defray part of your salary, some day may ask why the meat she has just purchased is not required to be "U. S. or State Inspected," like that which is sold by the restaurant next door.

Revolutionary changes are taking place today in milk and food production, processing, packaging, and distribution. Fruit juice processing is undergoing intensive research, especially in the development of new freezing and heating methods for preserving juices without impairment of taste. Dried milk and skimmed milk are assuming new roles in our daily diet. Radiation sterilization of food bobs in and out of our conversation; whole meals are packaged in cellophane. The loaf of bread you used to be able to "test" by the "squeeze method" sometimes seems to defy the laws of elastic limits. Even the time honored and almost universally established methods of milk pasteurization are giving way to new methods which provide equal protection against pathogens and also hold promise of keeping the milk fresh for months instead of days—without refrigeration. Such developments will mean many changes in our public health practices.

POSITIVE ASPECTS OF FOOD

Thus far we have been talking about the negative aspects of food—the hazards connected with its use. There is a positive side to food which is—or should be—of interest and concern to us.

As pointed out by Wilder[2], "the human body requires for growth, maintenance and productive activity a mixture of foods of good nutritional quality—in other words, a diet which will supply at regular intervals a minimum of each of 30 or more nutrients." With all the possible combinations and variations of this number of nutrients we can see that the positive effects of food on life, vigor, mental alertness, resistance, and reaction of the body to disease, is a complex matter. It is one which is not yet completely understood. Nevertheless, a great deal is known about nutrition, and some of the proven principles are being applied. Among applications which you will identify readily are the use of vitamins with the consequent eradication of diseases like pellegra, the use of iodized salt to prevent goiter, and the fluoridation of drinking water to reduce tooth decay. These are positive applications, as distinguished from practices like chlorination of water supplies, pasteurization of milk, and high temperature treatment of the foods we preserve.

The positive food practices we have mentioned are merely the initial steps in a vast new field of endeavor. In the first place, most of what has been done—such as in the enrichment of white flour and bread—has been on a voluntary basis. Moreover, in order to obtain the most widespread benefits, the population must be educated to know what to buy for what purposes. This education process is expensive, and, more serious, it may not reach the groups who need it most.

We are well aware of the natural resistance in a democracy to mandatory requirements. Nevertheless, there are numerous examples of public willingness to accept such requirements when they can be shown to be of the greatest good to the greatest number. The minimum butterfat content of milk prescribed in most milk control ordinances is an example of a positive requirement that has won public acceptance. So are the requirements in more than half the states that all white baker's bread, and all family flour, be enriched. Before the development and issuance by the Food and Drug Administration of a standard for enriched flour, there were some 17 kinds of fortification. The regulation accompanying the standard brought welcome order out of chaos.

The net result in the case of both milk and bread has been good. Along the way, however, a number of problems arose. The fortification of bread in some cases was so minimal that it was hardly worthy of the term. The baker who honestly fortified his product was subjected to unfair competition—because the general public was not in a position to differentiate. Since there are almost no limits to what can be added to such universal vehicles as milk and bread, public confusion and loss of faith can easily result.

Development of Standards

All of us are familiar with the fact that the processing of food can change its nutritional qualities. There is sufficient loss of vitamins in the roller milling of wheat into white flour to make restoration through enrichment advisable; vitamins and amino acids may be altered even with greatly improved canning processes. The public is, therefore, still faced with some dilemma in knowing when they are buying the right thing.

The experience of England in World War II is very significant in pointing to some possible answers. Faced with heavy curtailment of food imports, the government found it necessary to assume responsibility for the character and distribution of foods. Such vulnerable groups as the sick, pregnant women, children, and persons doing exceptionally heavy work received adequate amounts of basic foods such as milk, meat and eggs and distribution of all such foods was strictly rationed. It was required that bread (made from undermilled flour) further be enriched with calcium, and that margarin be fortified since they had almost no butter. The result of this total program was that people who previously were not getting minimum acceptable amounts of certain nutrients were now getting them. Indexes of health which had worsened in previous wars were actually improved. Infant mortality, maternal mortality, and tuberculosis death rates dropped; the health of the people was demonstrably improved in other ways.

We have touched on some of the parallel developments in this country with respect to food itself. Much more remains to be done. On the food equipment side some noteworthy progress has been made. First, there are the "3A" standards for dairy equipment. More recently, there is the cooperative arrangement through which the National Sanitation Foundation will promulgate national standards for dairy and food service equipment. The development of these standards is made possible by the joint participation of the industry and its task forces, six national organizations interested in the health aspects of food, and the Foundation. Like the "3A" standards, these standards will meet a long and urgently felt need. The INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS is to be commended, not only for their participation in the "3A" and NSF programs but also for providing leadership in their formulation.

With this fine precedent established, would it not be possible to establish a parallel mechanism for standards of quality—specifically minimum nutrient quality—for basic foods? As illustrated by the early chaos regarding enriched flour, a label—such as fortified or enriched—can mean a lot of different things. You have an opportunity here to give real meaning to the word "quality" by establishing, in collaboration with national groups skilled in the science of nutrition, minimum standards of nutritive quality for those foods which are consumed in quantity by almost everyone. The interest of the public in a matter so vital to life and death, is such that we can hardly afford to be guided by a policy of "let the buyer beware."

Chemicals in Foods

In this chemical age we cannot escape the influence of chemicals on our daily lives. The Select Committee to Investigate the use of Chemicals in Foods and Cosmetics – the Delaney Committee – has sought among other things to determine the effect of chemicals on the health and welfare of the Nation[3]. The Committee's reports have been released and many of you are familiar with them.

It is clear that we need more research to determine the acute and chronic toxicity of chemicals which are to be added to foods. Not so clear is the division of responsibility between industry and Government for the basic research in toxicity leading to the development of standards of maximum allowable concentration; and the promulgation and enforcement of such standards. As these questions are subjected to the free and open debate of a democratic society, answers will emerge. As milk and food technologists representing a broad cross section of the parties at interest you have a major responsibility to assist in the development of a sound public policy.

Reclamation of Community Food Wastes

Another related field of development we should be thinking about is the salvage or reclamation of community food wastes. It has been said that some countries could live on what we throw away. Composting of garbage and other organic refuse is, for the first time, being seriously considered in this country. We can expect, as the necessary processes are developed, that many communities will adopt this practice and thus convert their wastes to a valuable humus-fertilizer that can be returned to the soil. Such a development may hold real promise for effective control of trichinosis, vesicular exanthema, and other human or animal diseases. Another example is the current research on recovery of organic materials in sewage by growing algae in photosynthetic sewage oxidation ponds. The algae may be a valuable cattle food. The whole process thus may be considered one which salvages the fixed nitrogen contained in sewage and converts it to beefsteak. Hydroponic* farming for the production of raw vegetables is moving forward rapidly in other areas of the world and may not be as far in the future for this country as it may seem now.

More and more we can see that our activities in milk and food are closely related to other activities in health and sanitation. Thus we share in a mutual responsibility for integrating our work with the broad effort in health.

The milk and food industry is moving forward in high gear. If we are to keep up with it we will have to find ways to get more miles to the gallon. We can do this by critical examination to eliminate that which is not strictly essential; and by administrative and technical research to do the essential things more efficiently. This should make available funds which will permit us to develop new techniques to meet new problems as they emerge; and to probe the unknown so these new problems will not truly be new but rather ones which we intelligently anticipated.

If we equip ourselves to accept change, our job will be easier. We should change our requirements as the conditions underlying them change—or as fuller knowledge points to a changed approach. Two recent examples come to mind in this connection: First, the development of a modified interpretation of milk ordinance requirements in relation to anthrax in cattle; and second, recognition by both the National and North Central States Brucellosis Conferences that while ideally we should, and in many areas do, obtain our market milk from brucellosis-free cattle, the ultimate goal must be reached without bringing economic ruin to the producer. They have recommended requirements which provide satisfactory health and economic protection, while moving positively toward the desirable goal of virtual brucellosis eradication.

*Editor—Soil-less agriculture, using nutrient solutions.

It is this spirit of change that we need to preserve a dynamic milk and food-technology in a constantly changing society. For in this business "when we're through changing, we're really through."

REFERENCES

1. *Sanitation Activities in Local Health Departments,* American Public Health Association, 1952.

2. Wilder, Russell M., M. D., *Environment in Nutrition* (The George R. Sidenberg Memorial Lecture of the New York Academy of Medicine, New York City, January 30, 1952.)

3. *House of Representatives Report No.* 2356, 82nd Congress, 2nd Session.

HAROLD WAINESS RESIGNS FROM GOVERNMENT SERVICE TO BECOME MILK AND FOOD CONSULTANT

Harold Wainess, Chief Sanitary Officer of the Chicago Health Department, on leave from his duties as Regional Milk and Food Consultant of the U. S. Public Health Service, has resigned from both organizations to enter private practice as a milk and food consultant at 228 North LaSalle street, Chicago, Illinois.

After over ten years of service with the U. S. Public Health Service, he will specialize in assisting manufacturers of various types of equipment used in the milk and food industry and in industrial sanitation in order to aid them in operating and building equipment that will meet the various public health requirements of governmental bodies throughout the United States.

He will also be engaged in problems of public health relative to the operation of various milk and food and industrial processes that will result in the production of products acceptable both to the public and public health authorities.

Associated with Mr. Wainess will be two laboratories in the fields of biochemistry and bacteriology.

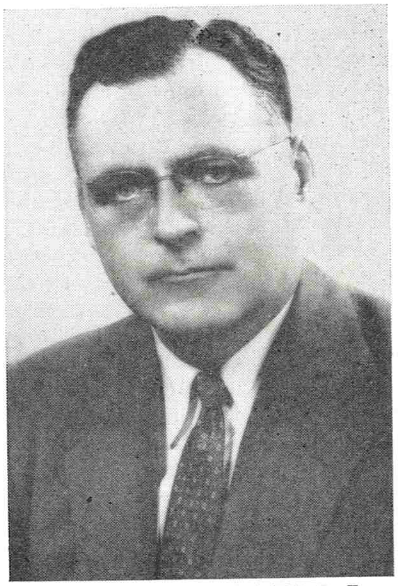
Mr. Wainess was associated with the U. S. Public Health Service since 1943 and has worked in the capacity of a milk and food consultant for them in California, Oregon, Washington, Arizona, and Regional Offices comprising the midwestern and southern states.

Prior to that, he was employed in various capacities in the dairy industry, and has spent a number of years as a trouble shooter for the York Corporation, York, Pennsylvania.

He holds a Master of Science degree in Agriculture from Purdue University, and a degree in Bacteriology from Brooklyn College.

Among the many organizations in which Mr. Wainess has membership are the 3A Sanitary Standards Committee of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, the American Public Health Association, the American Dairy Science Association, the Society of Illinois Bacteriologists, and the Chicago Public Health Engineers.

He is also a consultant to the Baking Industry Sanitation Standards Committee, and has published many papers in the fields of milk and food sanitation.



PENNSALT APPOINTS C. E. BROOKER ASSISTANT SALES MANAGER OF FOOD INDUSTRIES

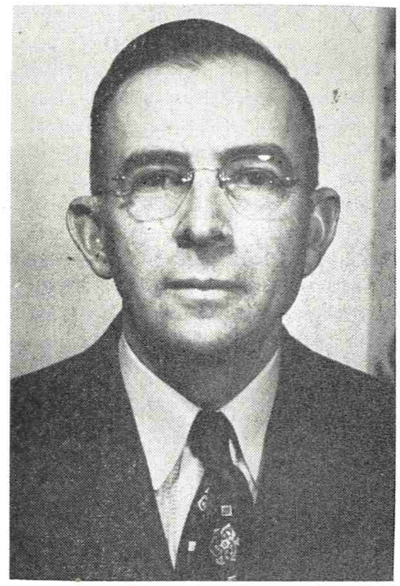
Charles E. Brooker has been appointed Assistant Sales Manager of the Food Industries Department of the Pennsylvania Salt Manufacturing Company, it was announced today by S. H. Crounse, Sales Manager of the Department.

A graduate of Syracuse University with a B. S. degree in Chemistry, Mr. Brooker formerly was with the Solvay Process Company of Syracuse for 17 years.

STUDY OF A GAS HEATER FOR PRODUCING HOT WATER AND STEAM IN THE DAIRY FARM MILKHOUSE

W. S. Mueller and W. T. Geenty, Jr.[1]

University of Massachusetts, Amherst, Massachusetts



Dr. W. S. Mueller is Associate Professor of Dairy Industry at the University of Massachusetts, where he has been on the Experiment Station staff since 1931. A graduate of the University of Illinois, he received the M.S. degree from Rutgers University and the Ph.D degree from University of Massachusetts. Prior to his present position, he held the Edible Gelatin Manufacturers' Research Society of America fellowship at the University of Massachusetts. His numerous publications deal with gelatin, dairy products, antioxidants, nutritive value of cocoa and chocolate, quaternary ammonium germicides, and detergent-sanitizers.

Dairy farmers have a real problem in providing hot water at not too great a cost. A gas heater producing hot water and steam for dairy farm use was studied to determine (1) the time to produce hot water and steam, (2) the uniformity of temperature within the steam chest, (3) the efficiency in killing E. coli **in 10-gallon milk cans, (4) the fuel efficiency of the heater, and (5) the cost of operation. The authors believe that a gas water heater of the type investigated could lend itself satisfactorily to New England dairy farms.**

Introduction

It is generally agreed that many of the bacteria that may get into milk come from the utensils previously in contact with the milk. Therefore, it is important in the production of high quality milk that utensils be washed clean, and then sanitized either by heat or with a suitable chemical agent. Without the proper facilities, the cleaning and sanitizing operation is a tiresome daily chore for the dairy farmer. The cleaning operation is much easier when a two-compartment wash sink, an ample supply of hot water, a brush, and a good cleaning powder are available. Since heat is the only method of sanitization permitted by some cities in the production of certain grades of milk, hot water or steam are essential. Yet hot water is one of the main deficiencies on many dairy farms. No doubt, dairy farmers have a real problem in providing hot water at not too great a cost.

The purpose of this investigation was to determine whether or not gas water heaters of a certain type can be used effectively and efficiently on New England dairy farms.

Brief Description of Sterilizing Unit

The sterilizing unit tested in this study (figure 1) includes a water heater*, a two-compartment wash sink with steam jet attached, and a sterilizing chest large enough to hold six 10-gallon milk cans. The unit, designed for small or medium size dairy farms, was considered the most adaptable model for the average dairy farm in New England.

The heater consists of a steel shell, enclosing a double coil through which water flows, and a gas burner for either compressed tank gas, butane, propane, natural gas, or manufactured gas. The burner is always operated with the gas valve wide open. The temperature of the water is controlled solely by a water flow-regulating needle valve. Partial closing of the valve reduces the rate of flow, increasing the temperature to a point where steam is produced. The heater is equipped with a check valve and a safety valve.

The steam chest is made of 24-gauge galvanized steel metal, 29" by 45" by 28" high. A steel metal rack or false bottom is set so that the top of the rack is 2-¾ inches from the bottom of the chest.

The wash sink is made up of 20-gauge galvanized steel metal. It has two compartments, each of 20-gallon capacity, and a drain table through which the steam jet protrudes.

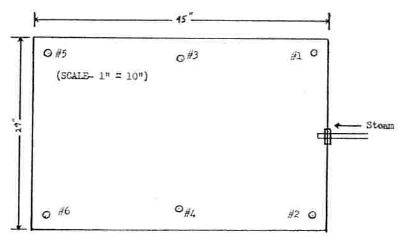


Figure 2

Figure 2. Position of thermocouples in steam chest. (Top view).

General Plan of Study

The study included three parts: (1) the control of such variable factors as temperature and pressure of the water and gas, which affect the performance of the heater; (2) the effectiveness of the unit, as measured by its bacteria-killing power, or sanitizing capacity; and (3) the efficiency of the heater, i.e., a consideration of the amount of steam and hot water produced in relation to the amount of heat (energy) supplied by the fuel, the cost of the fuel, and the time taken to produce the steam or hot water.

Control of Variables

A pressure regulating valve set for 24 pounds was installed in the water line to assure a reasonably uniform water pressure.

The water was measured with a water meter, graduated to the smallest division of 0.1 gallon, with an accuracy of minus 2.2 percent.

Bottled propane gas with an energy rating of 2500 Btu per cubic foot was used as fuel. It was measured with a meter with smallest graduations in 0.1 cubic foot.

The temperature of the water in the efficiency tests was recorded by a Foxboro Multi-Record machine. One temperature bulb was placed in the inlet water pipe and another bulb in the outlet pipe from the water heater. Temperatures were recorded alternately between inlet and outlet approximately every twelve seconds.

Thermocouples attached to a

---

[1]This article is based upon a Master's thesis presented to the Graduate School by W. T. Geenty, Jr., June 1951. Published as contribution No. 869 of the Massachusetts Agricultural Experiment Station.

*Malsbary No. 15.

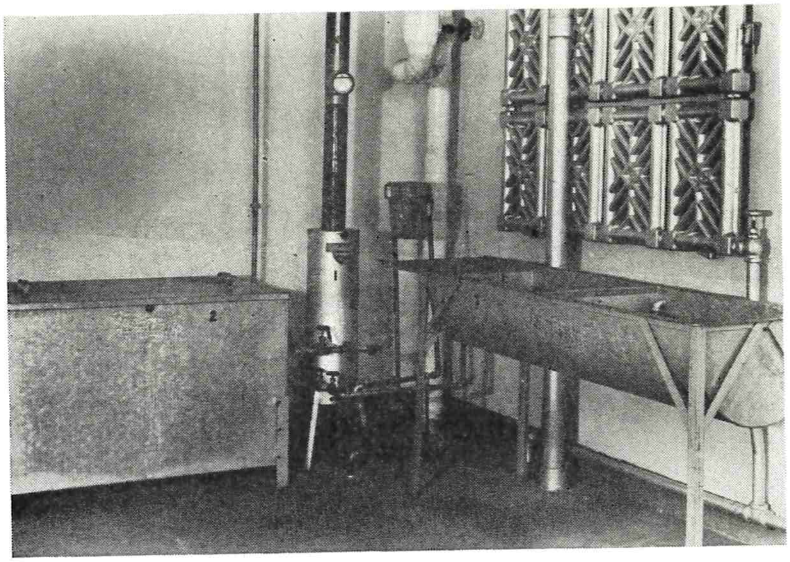


Figure 1

1. Water heater 2. Steam chest 3. Wash sink

Leeds-Northrup indicating potentiometer measured the temperature of steam within the steam chest, and the temperature of milk cans when placed inside the steam chest or over the steam jet. The accuracies of the temperatures registered or indicated by the thermocouples were checked against a standard thermometer, and a correction factor was established for each thermocouple.

Effectiveness of Unit

Uniformity of temperature within the steam chest. Figure 2 illustrates the top view of the position of six thermocouples, which were clamped into position either one-half inch from the false bottom or at the top of the chest, 22½ inches above the false bottom.

Table 1 lists the temperatures within the steam chest at the time the steam entered, and every 5 minutes thereafter until the end of the test, which was 45 minutes. The various positions reached a temperature above 200 degrees F five minutes after the steam had been introduced into the chest.

No significant differences in temperature were noted for the various positions in the steam chest, indicating no air pockets or "dead spots" within the chest.

No advantage was noted in changing the steam inlet position from the center of the side of the chest to the bottom of the side or to the center of the bottom.

TABLE 1—UNIFORMITY OF TEMPERATURE WITHIN THE STEAM CHEST*

Time from entrance of steam into chest (minutes)	Temperatures recorded by thermocouples in various positions**					
	#1 (°F)	#2 (°F)	#3 (°F)	#4 (°F)	#5 (°F)	#6 (°F)
			Top of chest			
Start	138.5	146.5	157.5	162.5	167.5	172.5
5	205.1	207.1	207.8	208.9	209.5	209.6
10	210.5	210.6	210.6	210.6	210.6	210.9
15	210.5	210.5	210.6	210.5	210.8	210.8
20	210.2	210.5	210.5	210.5	210.8	210.8
25	210.2	210.5	210.5	210.5	210.9	210.8
30	210.2	210.3	210.5	210.5	210.5	210.5
35	210.3	210.4	210.5	210.5	210.5	210.5
40	210.2	210.4	210.4	210.4	210.5	210.5
45	210.2	210.3	210.5	210.5	210.5	210.5
			Bottom of chest			
Start	106.5	125.5	142.5	138.5	159.5	163.5
5	202.7	205.4	207.5	207.7	208.8	209.5
10	211.0	211.1	211.4	211.4	212.2	212.2
15	212.2	212.2	212.3	212.2	212.4	212.4
20	212.1	212.1	212.3	212.2	212.5	212.5
25	212.1	212.1	212.3	212.2	212.4	212.4
30	212.0	212.0	212.2	212.1	212.4	212.4
35	212.0	212.1	212.3	212.2	212.5	212.5
40	211.9	212.0	212.3	212.2	212.5	212.5
45	211.9	211.9	212.3	212.2	212.3	212.3

*Position of steam inlet—center of side as shown in figure 2.
**Thermocouples were read in the order of their position with approximately 2 minutes between the first reading and the last.

Since all six thermocouples could not be read at the same time with the equipment available, the thermocouples were read in their numerical order, and position 6 was read approximately 2 minutes after position 1. Thus, during the time the temperature within the chest was still rising, the first thermocouple read indicated a lower temperature than the last one read.

Temperature of milk can within the steam chest and over the steam jet. The purpose of this test was to find out how long it would take to raise the temperature of a 10-gallon milk can to a effective sanitizing temperature, when the milk can was placed in the steam chest or set over the steam jet.

The writers are aware that it is very difficult to measure the temperature of the metal surface of the can accurately. Various methods have been suggested for making such measurements, but all have their limitations. For this study, the thermocouples were held in contact with the can surface by the use of small magnets. While this method does not give as close a contact as is obtained when soldering the thermocouple to the can, no doubt the results are accurate enough for most practical purposes.

One thermocouple was placed in the center of the bottom of the can and another on the inside lip of the can. For the test within the steam chest, the can was inverted and placed in the chest away from the steam inlet. Two thermocouples were held by a ring stand near the can in the chest. The can and ring stand were in a position similar to that of thermocouples No. 5 and No. 6 illustrated in figure 2. Four milk cans, turned upside down, were placed between these test positions and the steam inlet. In the test over the steam jet, the can containing the thermocouples was set over the jet on the wash sink.

The tests were run at the recommended rate of about one pint of water per minute. Temperatures were recorded at the start of the test, immediately after the steam was introduced into the chest or into the can, and every five minutes thereafter until the end of the test.

Table 2 indicates that the surface of the inside of the milk can was heated almost as rapidly as the steam chest itself. It will be noted that while the temperature was still rising within the chest, the temperature at the top of the chest was lower than that at the bottom of the can, and the temperature at the bottom of the chest was lower than that at the can lip. This apparent discrepancy is due to the time lag in making the temperature readings. Even with four cans between the steam inlet and the test can, the temperature on the inside surface of the can was over 200°F 5 minutes after the steam entered the chest.

Table 3 lists the temperature of the inside surface of the can steamed over the steam jet as more than 200°F within 15 seconds after the steam had been injected into the can.

Effectiveness of the unit in killing Escherichia coli. A more conclusive test of the effectiveness of the unit would be its actual killing of a test organism. *E. coli* was selected as the test organism because of its usually nonpathogenic character and because its thermal death point is higher than the nonspore-forming pathogenic bacteria in milk. This study was conducted under very adverse conditions to approximate any unfavorable conditions that might arise on a dairy farm. Milk cans were selected as experimental utensils because of the difficulty in their cleaning and sanitization. The cans selected were dented and somewhat rusty, and some had splits and open seams. The cans were inoculated very heavily with the test organisms and were not washed before the test.

Growth on 24-hour slants of *E. coli* was suspended in a 20-percent glycerol in water solution. One hundred milliliters of the prepared uniform suspension was pipetted into each of 12 milk cans (10-gallon ca-

TABLE 3—TEMPERATURE OF MILK CAN OVER STEAM JET

Position of thermo-couple	Start (°F)	Steam* enter (°F)	+5 min (°F)	+5 min (°F)
Can bottom	89.8	207.0	213.5	214.7
Can lip	85.1	212.2	213.4	214.5

*The temperature readings were made about 15 seconds after the steam entered the can.

TABLE 2—TEMPERATURE OF MILK CAN IN RELATION TO STEAM CHEST TEMPERATURE*

Position of thermo-couples	Start (°F)	Steam enter (°F)	+5 min (°F)	+5 min (°F)	+5 min (°F)	+5 min (°F)	+5 min (°F)	+5 min (°F)
Top of chest	79.9	132.5	193.6	210.9	212.8	213.5	214.0	214.0
Bottom of chest	78.7	104.5	200.4	212.2	213.5	213.5	214.1	214.1
Can bottom	78.8	110.5	200.9	212.4	213.5	213.6	214.0	214.0
Can lip	80.4	116.5	202.4	211.8	212.9	213.4	213.9	213.9

*Position of steam inlet—center of side as shown in figure 2.

pacity) to be tested. The cans were shaken according to *Standard Methods for the Examination of Dairy Products*[3] and then drained until no more drippings appeared.

The number of organisms in each inoculated can to be steamed was estimated by determining the number of organisms by Standard Methods[3] in two of the unsteamed inoculated cans.

Two of the inoculated cans were placed in an inverted position in the steam chest. The can covers were placed on the bottom of the chest next to the cans, and the steam chest lid was set in place. Steam was diverted into the chest for 3 minutes, with the flow of supply water regulated to approximately one pint per minute. After 3 minutes, the steam was diverted from the chest, which was opened to allow the steam to escape (not recommended for actual practice), and the cans and covers were removed as soon as possible. The cans were immediately cooled by rinsing the outside surface with cold tap water. Sterility tests were made according to Standard Methods[3]. This procedure was repeated, exposing two cans for 5 minutes, and two cans for 10 minutes in the steam chest. In a similar manner, cans and covers were exposed for 15 seconds and 30 seconds over the steam jet, each time cooling the cans and making sterility tests according to the steam chest tests.

Results of this test, listed in table 4, indicate that the sterilizer can accomplish effective sanitization with a good margin of safety either by steaming the cans 3 minutes in the steam chest or by holding them 30 seconds over the steam jet. Farrall *et al.*[2] have reported that an efficiency of 99 percent kill is all that can be expected of any farm sterilizer.

TABLE 4—EFFECTIVENESS OF STERILIZING UNIT IN KILLING *E. coli*

Treatment	Average number of colonies per can and cover*	Percentage kill
No heat treatment (control)	4 billion	
3 minutes in steam chest	1800	99.99+
5 minutes in steam chest	1700	99.99+
10 minutes in steam chest	1100	99.99+
15 seconds over steam jet	1,504,000	99.96+
30 seconds over steam jet	1600	99.99+

*Four 10-gallon milk cans were used for each treatment.

Efficiency of Heater

Fuel efficiency. The fuel efficiency of the heater in producing hot water was determined by measuring the temperature rise of the water with a recording thermometer during a 15-minute test period. At the end of the test period, the amount of water, as recorded in gallons by the water meter, was converted into pounds, and the Btu utilized by the water and supplied by the propane gas were calculated. The percent efficiency was then calculated by dividing the amount of heat supplied by the gas into the amount of heat utilized by the water and multiplying by 100.

The fuel efficiency of the heater in producing steam was not measured because when water at 212°F is turned into steam at the same temperature, the heat of vaporization (970.4 Btu) must be added for every pound of water thus converted; and there was no convenient way for determining the amount of water in the steam produced.

Because the temperature of the tap water varies considerably with the season of the year, the fuel efficiency tests were run both in winter, when the water temperature was about 53.5°F, and in summer when the water temperature was about 74.4°F.

According to the tests made in the winter (table 5), the heater was found to be approximately 70 percent efficient in fuel consumption, which is considered good efficiency for any gas heater. Since the results of the summer efficiency tests were similar to those in the winter, the data for the summer tests are not included in the table.

Time efficiency. The time efficiency for the water heater was considered as the time taken to produce hot water and steam. It was found that from the time of lighting the burner, steam could be produced in less than 2 minutes when the inlet water temperature was about 74°F and in less than 3 minutes when the inlet water temperature was about 53°F. Since the heater produces hot water before generating steam, it takes even less time to produce hot water than steam.

Calculation of Heating Cost

The cost of heating water for washing and rinsing utensils and for producing steam for sanitizing were calculated for an average size dairy farm. Ewell[1] reported that 10 gallons of water at 120°F for washing utensils, and 10 gallons of water at 150°F for rinsing utensils were needed twice a day for an average size dairy farm of about 20 cows. According to table 4, three minutes in the steam chest is sufficient to sanitize the utensils. However, the utensils may be left in the chest a few minutes after the steam is turned off to increase the safety margin and to conform with certain public health regulations. The utensils would also have to be steamed twice a day.

The amount of gas to produce this daily requirement of hot water and steam was found to be 22.5 cu. ft. or 2.73 lbs. Thus the gas requirement for one year is approximately ten cylinders of 100 lbs each. On the basis that one cylinder of butane gas costs $8.25, the cost per year is $82.50 or about 23 cents per day. Heating the water would cost about 18 cents per day, and producing the steam would cost an additional 5 cents per day.

DISCUSSION

In areas where the water is very hard, large deposits of water scale would be formed in the coils of the heater, lowering the fuel efficiency considerably. In such hard water areas, it is recommended that the dairy farmer use a water softener and keep an extra heating coil on hand. The manufacturers of the

TABLE 5—FUEL EFFICIENCY TEST IN WINTER

Water regulating valve setting (notches)	Length of test (minutes)	Water heated (gallons)	Average temperature of water (degrees F) inlet	outlet	Gas consumed (cu. ft.)	Btu supplied	used	Efficiency (percent)
72.0	15	22.30	52.5	121.5	7.025	17,560	12,820	73.0
35.0	15	20.90	52.5	124.0	6.920	17,300	12,450	72.0
17.0	15	16.85	53.5	141.0	6.920	17,300	12,280	71.0
15.0	15	15.60	53.5	147.0	7.020	17,550	12,150	69.2
15.0	15	15.65	53.5	147.5	7.025	17,560	12,250	69.8
12.5	15	13.95	54.5	159.0	6.870	17,180	12,140	70.7
12.0	15	13.35	53.0	163.0	6.880	17,200	12,230	71.1
11.0	15	12.35	53.5	172.0	6.900	17,250	12,190	70.7
10.5	15	11.30	55.0	184.0	6.870	17,180	12,140	70.7

heater make provision for having the coils cleaned at a convenient service point and at a nominal charge.

It was observed in the study that if the milk cans were removed from the steam chest while still hot, they would remain damp for a long time if stored in the inverted position. But if the cans were placed right side up, they would dry very thoroughly within a few minutes; this concurs with observations of other investigators. Therefore, it is recommended that if the cans are to be stored for any length of time before being used, they should be first placed right side up and, when dry, inverted on a rack.

SUMMARY AND CONCLUSIONS

1. A gas heater producing hot water and steam for dairy farm use was studied to determine (1) the time to produce hot water and steam, (2) the uniformity of temperature within the steam chest, (3) the efficiency in killing *E. coli* in 10-gallon milk cans, (4) the fuel efficiency of the heater, and (5) the cost of operation.

2. Steam and hot water were produced in less than two minutes in the summer and less than three minutes in the winter.

3. The temperature within the steam chest was found to be very uniform.

4. The position of the steam inlet had little effect on the temperature throughout the steam chest.

5. The temperature on the inside surface of the milk cans followed the temperature rise in the steam chest very closely.

6. Under the conditions of the test, reasonably effective sanitization could be accomplished by steaming 3 minutes in the steam chest or 30 seconds over the steam jet. Increasing the time to 5 minutes and 45 seconds respectively would give a safer margin.

7. The heater was 70 percent efficient in converting the heat (energy) of the fuel.

8. The fuel cost of producing hot water and steam for cleaning and sanitizing utensils on an average size dairy farm (approximately 20 cows) is calculated to be about 23 cents per day. Heating the water would cost about 18 cents per day and the cost of producing the steam would be an additional 5 cents per day.

9. It is believed that a gas water heater of the type investigated could lend itself satisfactorily to New England dairy farms.

ACKNOWLEDGEMENTS

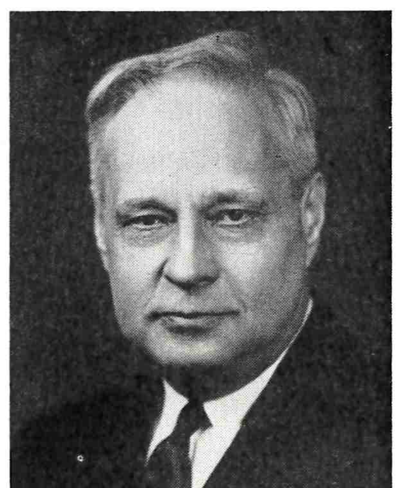
The authors wish to express their appreciation to H. N. Stapleton and I. J. Pflug of the Department of Agricultural Engineering for their interest and counsel in this study.

REFERENCES

1. Ewell, H. M. Trouble Shooting—Hot Water and the Better Milking Program. *American Milk Review*, 9, 38-42 (1947).

2. Farrall, A. W., Garver, H. L., Kable, G. W. Krueger, W. C., and Mudge, C. S. Dairy Equipment Sterilization with Electricity. *Agr. Eng.*, 9, 383-387 (1928).

3. *Standard Methods for the Examination of Dairy Products.* 9th ed. American Public Health Assoc., N. Y. 1948.



William H. Hottinger, Jr., assistant secretary and general counsel of Bowey's, Inc., was elected president of the Flavoring Extract Manufacturers' Association at its recent convention. The convention, the forty-fourth annual meeting, was held in Atlantic City, N. J., May 11-13.

LOOSE HOUSING FOR DAIRY CATTLE*

S. A. Witzel

University of Wisconsin, Madison, Wisconsin

Proven favorable to housing for high producing dairy cows, cold loose housing at the Wisconsin Station has shown the way to specialized dairy farming in the Midwest. This system allows free, active cows to wait on themselves and bring the milk to the elevated stall milking parlor. Here the operator quickly and effectively milks his cows with the aid of a cleaned in place milk pipeline which carries the milk to the refrigerated bulk tank in the milk room. Success requires careful planning, a workable layout, effective equipment and an operator willing to adjust himself and his herd management practices to his new system of housing.

Today for the dairy farmer who is interested in a free and easy way of handling his dairy herd where all bottlenecks are removed, where quality milk can be produced, and where there is almost no limit to herd size, loose housing complete with milking parlor, pipeline milking, and bulk milk handling is the practical answer. Eleven years of research at the Wisconsin Station has shown that loose housing, properly planned and operated**, can serve as well or better in housing the dairy cow than the stanchion barn. The test periods were six months in length and covered the winter housing period. In a cold loose housing system, cows have less health disturbances and a better recovery record than cows in stanchions. Here there was an absense of injuries such as injured udders and teats, abscessed hocks, and swollen knees. Loose housing exposes cows to sunshine, fresh air, and exercise which tends to make them rugged.

Relative Production

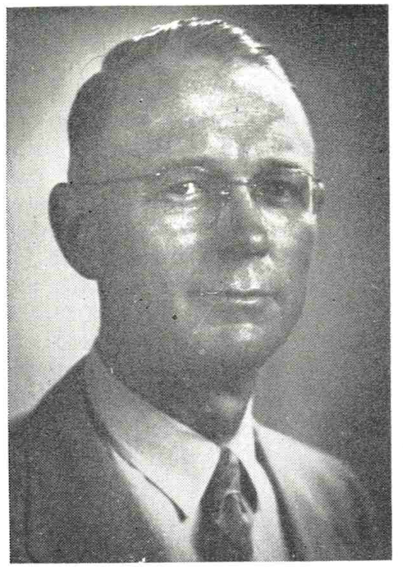
The 17 cows in the cold loose housing barn consumed about 5 percent more roughages and about the same amount of concentrate as the 17 cows in the stanchion barn. In terms of total digestible nutrients, after allowance was made for the additional increase in weight of the loose housing herd, this latter herd produced a pound of 4 percent fat corrected milk with 99.7 percent of the feed required in the stanchion barn. In other words, there was no penalty to pay for exposure to cold weather. This was further emphasized by daily and weekly comparisons of the production of these high producing Holstein cows with the outside temperature and weather conditions. Temperature and weather had no effect upon production based upon 4 percent fat corrected milk.

Milk production for nine years of the experiment showed that the loose housing herd produced 100.58 percent of the amount of milk produced by the control herd in the stanchion barn. From these tests it is concluded that cows in a loose housing system will do equally well as compared to cows in a stanchion barn. Perhaps freedom from injuries and the more rugged condition of the cows in a loose housing system would tend to give the loose housing herd a decided advantage over a long time period.

Milk quality at the project, while good from the start partly through the use of effective cooling, has improved for the loose housing herd as the arrangement of the loose housing system, the equipment, and the management has improved. The first year when the feeding area was bedded, the cows were difficult to keep clean, and the milk delivered at the plant had an average raw milk count of 21,821 per ml as compared to an average count of 7,439 for the stanchion barn. By cleaning the paved feeding area daily and rebuilding the mangers so no forage could be wasted, the cows gave up the practice of lying down on the bare floor in the feeding area. This helped to keep the cows clean. Good management of the bedded area by turning under the droppings and adding fresh bedding and limited clipping of udder and flanks all aided in keeping the cows surprisingly clean.

Other steps in the road to progress included adoption of open, cold loose housing after trying warm, confined loose housing with a third test herd housed in an insulated loose housing barn for 3 years. This insulated loose housing barn was operated as an open, cold loose housing barn for the last 5 years, the same as the original non-insulated barn that was used throughout the entire test period for the cold loose housing herd. Open, cold loose housing helped keep the cows cleaner. The barn lot was paved for an area of a little over 100 square feet per cow where the cows remained in periods of soft ground conditions. The concrete barn lots were scraped at frequent intervals with a tractor except when frozen.

The milking parlor was originally a 4-stall floor level parlor with all north light. Two bucket milkers



Stanley A. Witzel, born and raised on a North Iowa dairy and livestock farm, attended Rudd Consolidated Schools and graduated in 1922; graduated in Engineering from Iowa State College in 1927 and received a graduate degree in Engineering from the University of Wisconsin in 1930. Served as Extension Engineer in Farm Structures to 1937, then transferred to resident teaching and research in Farm Structures. Chairman North Central Regional Technical Subcommittee on Dairy Cattle Housing, 1946 to 1953. Registered Professional Engineer. Experienced Wisconsin dairy farm operator.

*Panel discussion presented at 39th Annual Meeting of the *International Association of Milk & Food Sanitarians, Inc.*, Minneapolis, Minn., Sept. 18-20, 1952.

**A cooperative dairy cattle housing project by the University of Wisconsin, the United States Steel Company, 93 funds of the Agricultural Research and Marketing Act and the United States Department of Agriculture.

NORTH CENTRAL REGIONAL PROJECT NC—3
LOOSE HOUSING
DAIRY FACILITIES SCORE CARD
JUNE 1, 1952

JSB
7/17/52
Confidential

Farm Operator.. Date....................................

Address .... Plant Receiving Milk.......................................

Your score is...

This form to be posted in milk house
Do not remove.

Milking Room

Unsatisfactory	Item Number	Perfect Value	Allowance
----------	1. *Floors and alleys,* impervious & sound 2, clean 5	7	----------
----------	2. *Walls,* surface smooth 2, clean 2	4	----------
----------	3. *Ceiling,* smooth 1, clean 3	4	----------
----------	4. *Gutters,* sloped 2, drains provided 1, clean 2	5	----------
----------	5. *Ventilation,* remove odors 2	2	----------
----------	6. *Light,* adequate artificial (1 watt per sq. ft.), 1, natural (4 sq. ft. per stall) 1, clean 2	4	----------
----------	7. *Feed,* adequate containers and dust controlled 2	2	----------
----------	8. *Cleaning, equipment, storage,* clean 2, convenient 1	3	----------
		31	----------

Milk Room

Unsatisfactory	Item Number	Perfect Value	Allowance
----------	9. *Floors,* sound 1, clean 2	3	----------
----------	10. *Walls and ceilings,* surface smooth 1, clean 2	3	----------
----------	11. *Ventilation,* adequate natural 1, mechanical 1	2	----------
----------	12. *Openings,* screened 2	2	----------
----------	13. *Storage for supplies,* adequate 1	1	----------
----------	14. *Light,* natural (min. 8 sq. ft.) 1, artificial (1 watt per square foot) 1	2	----------
----------	15. *Washing facilities,* 2	2	----------
----------	16. *Water supply,* hot 2, cold 1	3	----------
----------	17. *Milk handling equipment,* adequate 1, clean and sanitary 3	4	----------
		22	----------

Resting Area

Unsatisfactory	Item Number	Perfect Value	Allowance
----------	18. *Condition of resting area,* cows clean 6, no other animals, 2	8	----------
----------	19. *General requirements,* free from watering devices 2, free from silage feeding 2, free from hay feeding 2	6	----------
----------	20. *Lighting,* 1 sq. ft. glass or door area for each 20 sq. ft. of floor area 1, artificial 100 watts per 500 sq. ft. of floor area 1	2	----------
----------	21. *Holding area,* clean 4, provision for summer holding area other than on bedded area 2	6	----------
----------	22. *Fly control,* Manure removed often enough to control flies 5	5	----------
		27	----------

Paved Barnyard

Unsatisfactory	Item Number	Perfect Value	Allowance
----------	23. *General requirements*: clean 4, sloped and barnyard drainage removed 4	8	----------
----------	24. *Roof drainage,* away from barnyard 2	2	----------
		10	----------

Miscellaneous

Unsatisfactory	Item Number	Perfect Value	Allowance
----------	25. *Toilet and shower,* clean 2, vestibule between toilet and milk room or milking room 3	5	----------
----------	26. *Water supply,* clean and protected 5	5	----------
		10	----------

Possible 100
Your Score ------

were used by the two operators. This room was later enlarged for south windows and cross ventilation. Eight floor level stalls were used to hasten the concentrate feeding and milking the cows. Six cows could be let out, and let in and fed at a time, instead of two. Finally, a 4 elevated stall, tandem type milking parlor complete with milk line milking, bulk milk cooling, and bulk milk transport to market was provided.

For comparison, the control herd in the stanchion barn is being milked in a cleaned-in-place milk line, and the milk is cooled and held in a second bulk tank separate from the milk produced by the two loose housing herds being milked in the milking parlor.

This past winter the bacteria count on the milk from the milking parlor and loose housing herds was under 2000 per ml. The weighted averages of bacterial counts of quarter samples showed 3,573 per ml for the milk from the stanchion barn and 2,334 per ml for milk from the pen barns. The conclusions as reported by Dr. Frazier and his staff, reached as a result of bacteriological investigations are:

(1) There is no significant difference in numbers or kinds of bacteria in milk as it leaves the udders of the cows in stanchion barn housing as compared with milk from cows in loose housing.

(2) There is no indication that abnormality of milk from apparently normal quarters is greater in milk from one type of housing than from the other.

(3) Milk of equally satisfactory bacteriological quality can be produced from cows housed in either a stanchion barn or in a pen barn.

Good milking technique can be easily followed in the milking parlor. A sanitizing solution is metered into the warm wash water for washing udders and rinsing teat cups. A reversible flow vacuum type cleaning arrangement is being used for in-place cleaning of the pipeline. The operator in this 4-stall parlor has worked on dairy farms, in cheese factories, and milk plants all of his life. He is an excellent operator and, as he says, due to his age he couldn't think of continuing at dairying if it wasn't made easy for him with the milking parlor and its equipment.

Further tests regarding the effect on milk quality of skip-a-day pick up, where fresh warm milk is added to cold milk from a previous milking, along with all other aspects of bulk milk handling are being studied in a project still to be completed. While there are problems in bulk milk at the farm level, their solution will come as research, the development of equipment, and practice in the field permit.

There can be little doubt that with small or larger herds housed in properly planned, well managed loose housing systems complete with sanitary milking parlors and bulk milk from cow to plant, milk of uniformly high quality can be produced. Perhaps the advent of 100 percent dairy farms is all but here for this region. Perhaps a 100 percent grassland dairy farmer would have time to get his manure hauled to the fields before fly season. His crops of grass could be harvested and preserved when the greatest feeding value could be obtained. He could have more time to be a dairy farmer and he would have more milk income from his well managed, perhaps somewhat larger herd producing quality milk. All this he can do with less time and less fatigue. His family can help as the all important milking chore becomes safe and easy.

Dairy Chores

For the other dairy chores, hay, stored at ground level can be quickly rolled into the manger. Some may move the manger and make hay feeding all but self feeding. In the same way, adequate bedding stored above or in the open, cold bedded area is easy to apply daily and as required. For clean cows and the use of a minimum amount of bedding, there should be no watering, feeding, holding, or concentration of traffic in the bedded area. Here careful management will save additional bedding if droppings are turned under once or twice daily. Chopped bedding is much easier to load out and spread than long bedding and it seems to go further.

Silage feeding is best arranged in a separate manger so hay and silage can be fed at the same time to simplify chores and save time. If enough manger space for hay and silage can be provided so all of the cows and heifers can eat at feeding time, the feeding space provision should be adequate. This would require about 1½ feet of manger space per animal for silage and another 1½ feet for hay. If both are fed at the same manger, 30" is sufficient space per cow. If the silage is from well eared corn, it may be that some cows will pick out the ears. In this case, enough silage feeding space should be provided to permit all animals to eat at feeding time. Otherwise, a deep feed manger having a large quantity of silage for self feeding throughout the day will be less likely to freeze during cold weather. To control boss cows, remove horns and equip feeding mangers with vertical posts 5 to 8 feet apart or "V" notches through which they must place their heads to eat.

Several plans for a labor-saving silage feeding operation have been devised by dairy farmers and research workers. Perhaps the mechanical silo unloader discharging into a large self-feeding manger would be one practical method many would like. Others may prefer the trench silo with tractor-mounted fork and if the distance is too great for direct delivery to feed manger one may use a self-unloading wagon for transfer of silage from trench silo to feeding manger. While snow and cold weather may be a problem, the trench silo protects the silage from freezing and it can be filled with less man hours per ton than the tower silo. The fact remains that one needs a good location for the trench silo. It must be accessible every day in the feeding season. For those on level land, perhaps the larger stack silo will have a place.

For the cleaning of feeding area, barn lots, and bedded area, a tractor equipped with loader and scraper is most important. With this equipment, manure and even snow can be quickly removed as necessary to keep barn and lots open and sanitary. Even calf and hospital pens can be arranged for cleaning with this equipment. During the test period, calves and young stock did well in the cold

Continued on Page 188

BACTERIOLOGICAL EVALUATION OF QUATERNARY AMMONIUM COMPOUNDS ALONE AND IN DETERGENT FORMULATIONS

T. W. Humphreys and C. K. Johns
Department of Agriculture, Ottawa, Canada

Using Escherichia coli as test organism, three quaternary detergent-sanitizers and their constituent QACs were evaluated by modified glass slide and Weber and Black methods at 5°, 20°, and 45°C in artificial hard and distilled waters. QAC activity was reduced by low temperature and water hardness, the latter exerting the greater effect. Each detergent product was more effective than its constituent QAC component alone. Reasons for the earlier endpoints obtained with glass slide method are discussed.

The germicidal activity of quaternary ammonium compounds (QACs) is depressed in hard water[1, 2, 3, 4, 5, 6] and by low temperature[2, 6, 7]. The deleterious effect of water hardness may be overcome either by increasing the QAC concentration or by adding various alkalies to the QAC before dilution in hard water[8]. In most commercial detergent-sanitizers a QAC is combined with a non-ionic wetting agent, alkaline detergent salts, and one of the polyphosphates to sequester hard water ions, permitting cleaning and sanitizing in a single operation. This report concerns the influence of temperature and water hardness on the effectiveness of three commercial detergent-sanitizers and their constituent QAC components as indicated by modifications of the glass slide[9] and Weber and Black[10] methods.

Contribution No. 354, Division of Bacteriology and Dairy Research, Science Service, Canada Department of Agriculture, Ottawa. Adapted in part from a thesis by the senior author presented to the University of Toronto in partial fulfilment of the requirements for the degree of Master of Science in Agriculture.

Materials

Each detergent-sanitizer was a powder. At recommended use-dilution, detergent-sanitizer A[1] contained 50 parts per million (ppm) of Hyamine 1622 (diisobutyl-phenoxy-ethoxy-ethyl-dimethyl - benzyl ammonium chloride) as its germicidal component, whereas B[1] and C contained respectively 50 ppm of B.T.C. and 200 ppm of Roccal (both alkyl-dimethyl-benzyl ammonium chlorides). Each constituent QAC was employed at the concentration occurring in the homologous detergent-sanitizer at recommended use-dilution. To simulate adverse field conditions, artificial hard water (513 ppm Ca) was prepared by combining stock solutions of $NaHCO_3$ and $CaCl_2$ in the necessary ratio with distilled water.

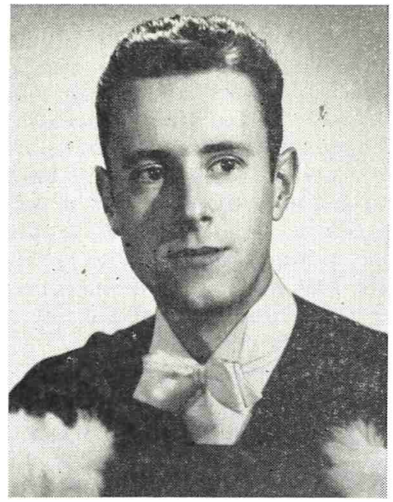
Methods

1. *Modified Glass Slide Method*: The original method,[9] modified here, was developed to simulate practical conditions in the dairy industry where bacteria are present in a partly-dried dilute milk film on washed utensils and equipment. It reflects the combined germicidal and detergent activity of a sanitizing solution.

[1]Products A and B, referred to herein as detergent-sanitizers for convenience were primarily formulated for use as germicidal detergents, with sufficient QAC present to prevent the "build-up" in bacterial numbers frequently encountered in wash waters.

A suspension containing 2×10^8 cells of *Escherichia coli* (BDR 117) per ml was prepared in distilled water containing 10 percent sterile homogenized milk. The lower halves of clean, sterile glass microscope slides were dipped into this suspension and allowed to become partly dried. As controls, at selected intervals one of these contaminated slides was shaken with glass beads in water and the slide and washings plated to determine the average number of cells per slide. The remaining slides were gently agitated individually in 150-ml portions of the germicidal dilutions for periods varying from 2.5 to 160 seconds, then submerged in letheen inhibitor[10].
The time required for 99.99 percent reduction in the average number of cells per slide (endpoint) was selected as a basis for determining the effectiveness of each product.

2. *Modified Weber and Black Method*: Weber and Black[10] developed a method for assessing chemical germicides for food utensil sanitation. In contrast to the glass slide method the bacterial



T. W. Humphreys graduated from the Ontario Agricultural College, in 1949 with a B.S.A. in bacteriology, and subsequently joined the staff of the University of Manitoba as lecturer in bacteriology. In 1950 he joined the food microbiology section of the Division of Bacteriology and Dairy Research at Ottawa. He received his M.S.A. degree from the University of Toronto in 1952 and has been carrying out investigations in the fields of disinfection and food microbiology.

cells are in suspension, and any detergent properties possessed by compounds tested are not reflected. This method, slightly modified, was used here to determine how results would compare with those obtained by the glass slide method.

In the modified procedure, 5 ml of germicidal dilution were combined with 5 ml of a test suspension containing 2×10^6 cells of *E. coli* (BDR 117) per ml in small, wide-mouthed glass jars which facilitated sampling. This cell concentration was considered more representative of the bacterial load likely to be encountered in practice than that used in the original method. To shorten the time required to reach the endpoint and to facilitate comparison, the same reduction in bacteria number (99.99 percent) was employed here as in the glass slide method.

The detergent-sanitizer and QAC dilutions were evaluated comparatively at 5°, 20°, and 45°C in artificial hard and distilled waters with the exceptions of QACs B.T.C. and Hyamine 1622 which were evaluated at 20°C only by the modified

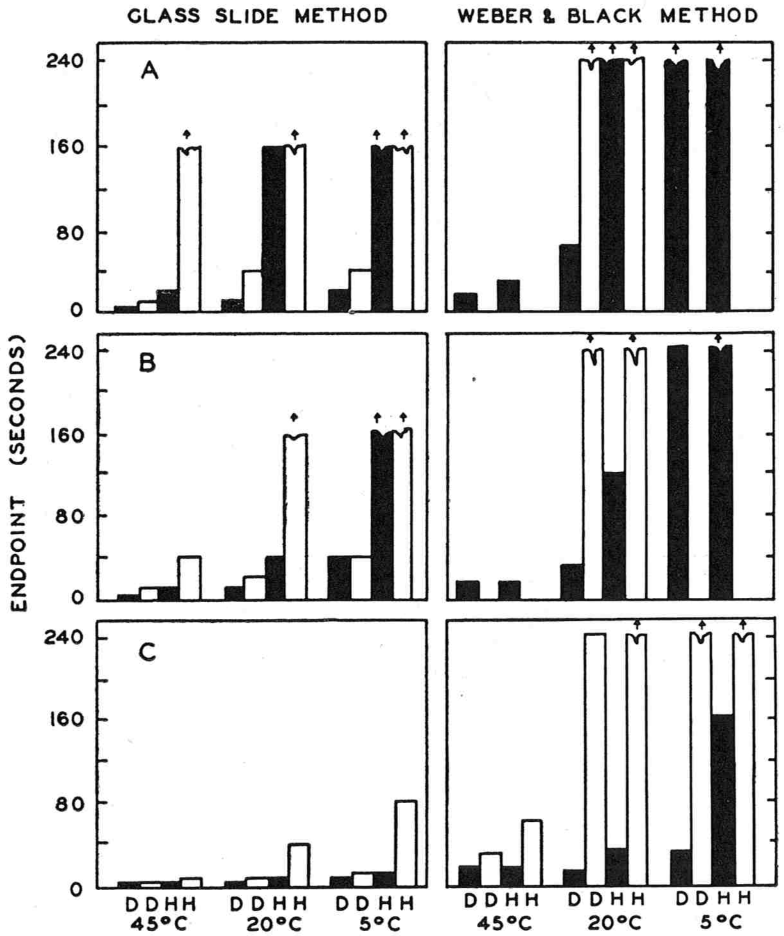


Figure 1

Weber and Black method. The QAC concentrations were confirmed by titration with 0.01 percent Aerosol OT[11].

RESULTS AND DISCUSSION

The results shown in figure 1 indicate that the effectiveness of the QAC was reduced by water hardness and low temperature, water hardness exerting the greater effect. Similar findings have been reported by other workers[1, 2, 3, 4, 5, 6, 7].

Each of the detergent products was decidedly more effective than its constituent QAC component alone. That best results were obtained with product C was to be expected because of its much higher QAC, concentration. Nevertheless, products A and B, containing only 50 ppm of QAC, have performed well under certain conditions, especially at 45°C. Although in their case a "capacity" test might have been preferable, Cantor and Shelanski[12] have shown that QACs are particularly effective where capacity performance is important. In the light of their findings and of our results it is probable that products A and B would function satisfactorily for the purpose for which they were intended.

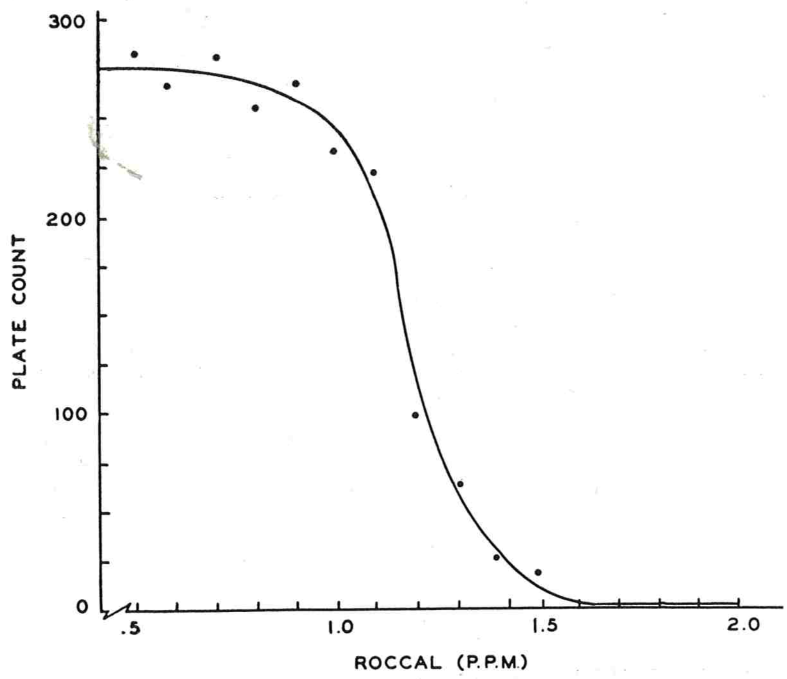


Figure 2

The results by both methods were in substantial agreement regarding the relative effectiveness of the detergent-sanitizers and their constituent QACs. However, the selected end-point was consistently reached more rapidly by the glass slide method.

In the glass slide method, agitation of the slides in the germicide solutions undoubtedly washes off many bacteria. Results[13] show that at least 50 percent of the cells may be washed off contaminated slides when agitated in distilled water containing various detergents, or even in plain tap water. Since the rate of disinfection is largely dependent upon the initial number of organisms on the slides, and a large percentage of these are washed off into the germicide solutions, it is evident that detergent action plays a role in shortening the time required to reach the endpoint by the glass slide method.

In the present work, very low bacteria counts were obtained where portions of germicide were neutralized and plated concurrently with the slides[13]. Evidently the cells washed off the slides are rapidly destroyed by the germicides—in fact, more rapidly than the remaining cells, because of their greater vulnerability to the germicide.

It is doubtful whether the much

larger volume of germicide employed in the glass slide technique as compared with the Weber and Black procedure contributes toward the early endpoints obtained in the former instance. It is generally accepted that disinfection rates are dependent upon the concentration, rather than the quantity, of disinfectant employed. Chaplin[14] substantiated this hypothesis using QACs.

Despite differences in the time required to reach the endpoint, it is significant that both methods have yielded results in otherwise good general agreement; either appears satisfactory for evaluating QACs alone or in detergent formulations.

The shorter exposure period required to reach the endpoint with the glass slide method apparently contradicts the findings reported in earlier studies[3]. Here, a plating technique using 5 x 10^6 cells of *Micrococcus pyogenes* var. *aureus* BDR 490 per ml of germicide showed faster killing for 20 ppm Roccal than was indicated for 100 ppm Roccal by the glass slide method with an initial count of 2 x 10^5 cells per slide. The disagreement in results is explainable in the earlier failure to use an inhibitor to neutralize the QAC. To determine the bacteriostatic level of Roccal for *M. pyogenes* var. *aureus* in agar, 1 ml of a suspension containing 275 cells per ml of the organism was combined simultaneously with 1 ml of Roccal and 8 ml of nutrient agar in petri plates to give final Roccal concentrations ranging from 0.5 to 2.0 ppm. The results (figure 2) show that as low as 1.2 ppm Roccal caused 65 percent, and 1.5 ppm practically 100 percent "bacteriostasis". In the earlier studies[3], where 1 ml of 20 ppm solution was plated, the QAC concentration in the medium would be of the order of 2.0 ppm, an amount considerably in excess of that required for significant bacteriostasis.

ACKNOWLEDGEMENTS

The authors wish to thank Mr. J. G. Desmarais for assistance in carrying out the experimental procedures, and Professor L. A. McDermott for helpful suggestions and criticisms.

REFERENCES

1. Barber, F. W. *J. Milk and Food Tech.* **12**, 257-266 (1949).
2. Butterfield, C.T., Wattie, Elsie, and Chambers, C.W. *Pub. Health Rep.* **64**, 1039-1056 (1949).
3. Johns, C.K. *Can. J. Res.*, F, **26**, 91-104 (1948).
4. Mueller, W.S. and Seeley, D.B. *Soap and Sanit. Chem.* **27** (11), 131-137, 141 (1951).
5. Ridenour, G.M. and Armbruster, E. H. *Amer. J. Pub. Health* **38**, 504-511 (1948).
6. Dvorkovitz, V. and Crocker, C.K. *Soap and Sanit. Chem.* **26**, (9), 114-119 (1950).
7. McCulloch, E.C., Hauge, S. and Migaki, H. *Amer. J. Pub. Health* **38**, 493-505 (1948).
8. Armbruster, E.H. and Ridenour, G. M. *Soap and Sanit. Chem.* **25** (7), 103-105, 135 (1949).
9. Johns, C.K. *Amer. J. Pub. Health* **37**, 1322-1327 (1947).
10. Weber, G.R. and Black, L.A. *Ibid.* **38**, 1405-1417 (1948).
11. Furlong, T.E. and Elliker, P.R. *J. Dairy Sci.* **36**, 225-234 (1953).
12. Cantor, A. and Shelanski, H.A. *Soap and Sanit. Chem.* **27** (2) 133, 135, 137 (1951).
13. Humphreys, T.W. and Johns, C.K. Unpublished data (1952).
14. Chaplin C.E. *Can. J. Bot.* **29**, 373-382 (1951).

CAPTIONS AND FIGURES

Figure 1. Comparison of detergent-sanitizers A, B, and C with their constituent QACs. Key: detergent-sanitizer; ☐ QAC; D, distilled water; H, hard water.

Figure 2. The bacteriostatic level of Roccal for *Micrococcus pyogenes* var. *aureus* in nutrient agar.

LOOSE COW HOUSING

Continued from page 185

barns. A heat lamp placed over a new born calf for a few hours is usually sufficient in the colder weather. It is true that all manure must be removed before fly season. Since the greatest fertilizing value can be obtained by hauling direct to field and plowing down before the nitrogen has escaped, one must plan his field operations to be sure he can meet the deadline for manure removal. It is important to keep a warm manure pack intact through the cold part of the winter, but it may be advisable to haul most of it while the fields are still frozen on some farms.

INDICATED ADVANTAGE

The profit cows are those one adds after he has enough cows in his herd to pay all expenses, including modest wages for himself and for any family help involved. Here with loose housing, more housing capacity can be added to an operating unit at a very low cost. If he has a 4-stall, one-operator milking parlor with a capacity of 30 cows per hour, it is easy to see that another hour of milking a day will add 15 more cows to the herd.

For the young dairyman willing and able to try new ideas and willing to make the necessary adjustments in his thinking, his work, his dairy housing, and his herd management, loose housing holds a real challenge. Here, at low cost, he can establish a profitable dairy farming enterprise with an open road ahead. If he specializes in dairying, all of his effort, his planning, and his capital can be directed to his dairy enterprise. For him, the complete loose housing system with an elvated stall milking parlor, pipeline for milk, bulk cooling, and delivery of milk can save time and eliminate drudgery. It makes a complete system from standing grass to storage, to at least semi-self feeding, quick bedding, tractor scraping, and manure removal with the cows carrying the milk directly to the milking parlor. Here the milk starts its journey as a fluid from the cow to the ultimate bottling and processing plant without ever being lifted by hand until its final delivery to the customer.

There is room for all to take a deep interest in this new development. Believe me, it is new and if needless mistakes are to be avoided, why not let research and science team up to help find the answers. All of these things the sanitarians are doing. It is certainly not necessary to remind you that one's judgment can be no better than his facts. At the Wisconsin Agricultural Experiment Station, members of this Association have already posed enough questions to keep our research staff going for some time. Progress is being made and we sincerely appreciate your interest. With the growing interest of the progressive-minded equipment industry anxiously awaiting the results of every test, there certainly is no loss of time between the date on the research report and the appearance of a product incorporating these findings. It is with genu-

Continued on page 202

3A SANITARY STANDARDS FOR HOLDING AND/OR COOLING TANKS

Formulated by

International Association of Milk and Food Sanitarians, Inc.
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFS, USPHS, and DIC in connection with the development of 3A Sanitary Standards, to allow and encourage full freedom for inventive genius of new developments. Farm Holding and/or Cooling Tanks which are developed which so differ in technique, design, material and construction or otherwise, so as not to conform to the following standards but which are, in the opinion of the manufacturer or fabricator, equivalent or better, may be submitted at any time for consideration by IAMFS, USPHS and DIC.

DEFINITION of Farm Holding and/or Cooling Tank for Bulk Milk: Tank used for the purpose of storing and/or cooling of milk or milk products on the farm.

Tanks as defined above, shall be considered meeting the 3A Sanitary Standards when they comply with the following requirements in (A) Materials and (B) Fabrication. Appendices are also included covering recommendations for Measuring Device and Installation.

A—MATERIAL:

1—The inside lining, covers, bridges, doors, underside of insulated covers or bridges, agitators, tubing for compressed air agitation, inlet and outlet connections, measuring device, distributors, and any other parts coming into contact with milk or milk products shall be of 18-8 stainless steel with a carbon content of not more than 0.12 percent. The surfaces of all such parts shall be at least as smooth as No. 4 mill finish or 120 grit finish properly applied.

2—INSIDE LINING: The inside lining is defined as all surfaces which contain the milk, or which extend above the breast as a cooling surface, and/or is used to enclose the ends, sides, and top, in lieu of bridges or fixed covers. The inside lining shall be made of 18 U. S. Ga. minimum thickness. The weld area and the deposited weld metal shall be substantially as corrosion-resistant as the parent metal. The breast, or that portion of the metal used to join the inside lining proper to the outer vertical wall, shall be considered as coming into contact with the product and shall be of 18-8 stainless steel.

3—INSULATION:

(a) Tanks not provided with integral cooling surface shall be so insulated as to prevent in 18 hours, a temperature rise greater than 3° F. in a tank full of water when the differential between the water and that of the atmosphere is 50° F.

(b) Tanks provided with integral cooling surface for direct expansion or refrigerated water shall be provided with outer shell and automatic temperature control system which will prevent a rise of more than 5°F. of the cooled milk, except when additional milk is added.

(It is recommended that all tanks be provided with insulation.)

4—OUTER SHELL: The outer shell, or that portion of the material covering the exterior of the insulation or heat exchange jacket, shall be of a continuous metal covering which is smooth, sanitary and effectively sealed.

5—OUTLET VALVE: Outlet valve shall be made of 18-8 stainless steel, nickel alloy or other equally corrosion resistant material. "O" rings, when employed, shall be made of a resilient rubber-like material that is nontoxic, relatively stable, relatively nonabsorbent and has a smooth surface.

B—FABRICATION:

1—All milk or milk product surfaces, covers, doors, fittings and accessories, shall be visible to sight easily accessible and readily cleanable when in operating position or when removed.

2—INSIDE LINING: All welds on inside lining and breast shall be ground smooth, and polished to a finish not less than the adjoining surface. All inside corners of bottom, sides, and ends of the inside lining shall have radii of not less than ½ inch. All inside corners of permanent attachments welded to the inside lining shall have minimum radii of ¼ inch. The inside lining shall remain in a fixed position relative to the outer shell or body of the tank, and shall be of such construction that it does not develop any sag, buckle or become distorted under load, or from any other condition of normal use, that would affect the correct measuring of the contents by the measuring device.

The inside lining, with or without longitudinal trough on the bottom, shall be pitched to outlet to effect complete drainage.

3—OUTER SHELL: All exterior seams of the outer shell shall be sealed against moisture and vermin. Unless of corrosion resistant material, the entire exterior surface shall be painted and shall be reasonably smooth.

4—INSULATION: Shall be so installed that it will minimize the change of position of material which may produce voids.

5—THE BREAST, or that portion of the metal used to join the inside lining proper to the outer vertical wall, shall be integral with or welded to inside lining, and shall be sloped or so arranged that all drainage will be toward the outer edge of tank.

6—COVERS, BRIDGES AND DOORS:

(a) Main covers or doors shall be of type which can be opened without removing, and shall be self-draining. Covers or doors shall be provided with a minimum of ⅜ inch flange type protection on all edges, and shall fit as tightly to the tank as practical. When covers or doors are in the opened position, any liquid from the inner or outer surfaces shall not drain into the milk compartment.

(b) Fixed covers located at ends or sides of tank shall not extend more than 12 inches over the surface of the milk and shall have a minimum of ⅜ inch raised flange. Fixed covers shall be so installed that the underside of same shall be visible from the outside of the tank.

(c) Bridges shall not exceed 24 inches in width, shall be pitched to outside edge of tank for complete drainage, and shall have a minimum of ⅜ inch raised flange where edges meet main covers. Bridges shall be so installed that the underside of same shall be visible from outside of tank.

7—OPENINGS: The edges of all openings in the covers or bridges shall be flanged upwards at least ⅜ inch. Openings not continually in use shall be provided with removable covers.

(a) Main covers when fitted for using standard milk can strainers shall have openings with a rim which will properly support the strainer. Such covers for tanks up to and including 150 gal. size, shall be provided with at least one strainer opening; covers for tanks larger than 150 gal. shall be provided with at least two strainer openings. A removable cover shall be provided for each strainer opening, which shall be self-draining to outside edge of cover, and shall have a downward flange of not less than ¼ inch. Cover shall be provided with handle or knob, and same shall be welded in place and weld ground smooth.

8—THERMOMETERS: One indicating thermometer shall be furnished with each farm tank, with a minimum range of 32° to 100° F., scale divisions of not less than 1/16" per 2° and accurate to plus or minus 2° F. at 50° F., protected to withstand temperatures of 0° to 212° F. without damage to accuracy, and shall be located and installed as to permit registering the temperature of the contents when tank contains not more than 20 percent of the calibrated capacity of the tank. Thermometer shall be one of the three following types:

(a) Bulb may be securely fastened in place to outside surface of inside lining, with bulb system connected to thermometer case.

(b) Side or end wall inserted type may be of well type construction when well proper is of 18-8 stainless steel and is welded to inside lining with a ¼ inch minimum radius.

(c) Cover or bridge inserted type shall conform to 3A Sanitary Standards for Thermometer Fittings.

9—OUTLET CONNECTION: The outlet connection shall be sanitary in construction, readily cleanable, with minimum inside diameter of same equal to that of 1½ inch sanitary piping and shall be one of the following types:

(a) Horizontal Outlet Connection: That portion of the metal used to convey product from inside lining to exterior of tank, shall be in a generally horizontal position, with the lower surface of same level or below surface of inside lining bottom and pitched for drainage, and in no case shall the connection be below the exterior bottom of tank. The horizontal outlet pipe may be provided with 3A Sanitary Standard fittings, but the fittings shall not extend more than 2 inches beyond the outer shell of tank.

(It is recommended that all tanks be provided with 1½ inch sanitary outlet connections for uniformity and thus aid the milk hauler.)

(b) When milk is removed through the top of the tank, the sanitary pipe shall be not less than 1½ inch O. D. with bottom end of same located in a suitable well with an outlet as described in B-9a, for drainage.

(c) Vertical Type: The vertical centerline of the vertical outlet which extends through bottom of outer shell, shall be as close as practical to an adjacent wall, and shall terminate with a 90° ell that is integral with the outlet. The horizontal centerline of the ell shall be not less than 4 inches above the floor.

10—VALVE: Valve shall be sanitary in construction, readily cleanable, and shall be one of the following types:

(a) Close coupled compression type with no stuffing box.

(b) Direct connected sanitary valve complying with 3A Sanitary Standards for Fittings.

(c) Close coupled, flanged type plug valve.

Threaded terminals on outlet connections shall be provided with a 3A cap that will cover all threads when tightly in place.

11—DISTRIBUTORS: A distributor used to spread the product over cooling surface that is part of the lining shall have all milk contact surfaces visible to sight, easily accessible, and readily cleanable when in operation position or removed.

12—LEGS: Adjustable legs with sealed bases shall be provided of sufficient size and spacing to carry the tank when full, and to raise the tank sufficiently high to allow for adequate draining, and attachment of fittings. Leg socket exteriors shall be substantially corrosion resistant and readily cleanable. Paint on nonwearing surfaces is considered acceptable. Legs shall be of suitable length to provide a 6 inch minimum clearance between floor and bottom on tanks up to 72 inches in diameter or width, except in the case of V-bottom or round bottom tanks where the outer shell of the tank slopes continuously upward from the outlet centerline, in which case the minimum clearance may be 4" if it increases to 6" within a horizontal distance of not to exceed 12" on each side of this centerline. On tanks over 72" in diameter or width, the minimum clearance shall be 8". Adequate means shall be provided on all adjustable parts so they can be sealed by local authorities, in such a manner that their position cannot be changed without disturbing the seal or seals for the purpose of maintaining the level and location of tank approved at time of calibration.

13 — AGITATORS: Agitation shall be provided of sufficient degree to assure homogeneity within five minutes of operation, and so that the fat content determining at different levels in the tank and at extreme distances from source of agitation will not vary more than plus or minus 0.1 percent butterfat throughout the capacity volume.

The agitating device shall be readily cleanable with all parts constructed so visible inspection can be made from the outside of tank, and shall be one of the following types:

(a) Nonremovable Type: Nonremovable agitator directly connected to motor shaft shall be readily cleanable, with all parts constructed so visible inspection can be made from the outside of the tank, and shall be provided with at least 1 inch space between bottom of inside lining and the near-est point of the agitator blade, except when agitator is hinged with cover. All interior angles of the agitator blades shall have radii of ¼ inch or more. The opening through bridge or fixed cover shall be provided with a 1 inch minimum annular brush cleaning space between shaft and inside surface opening. Inside surface of this opening shall not exceed ¾ inch in vertical depth. Opening shall be protected against dust, oil, insects and other contamination.

(b) Removable Type: Agitator shaft shall be provided with easily accessible, readily demountable coupling of either the sanitary type located inside the tank, or coupling located outside of tank provided same is installed above the protection furnished for shaft opening into tank. All surfaces of bottom support shall be visible when agitator shaft is removed, and bottom support shall not interfere with proper drainage of tank. The opening through bridge or fixed cover shall be provided with a 1 inch minimum annular brush cleaning space between shaft and inside surface opening. Opening shall be protected against dust, oil, insects, and other contamination.

(c) Horizontal Agitators: Shaft shall be provided with sanitary type rotary seal and shall be demountable for cleaning.

(d) Air Agitators: When compressed air is used for agitation of the product, the air shall be processed to remove dust, insects, all extraneous material and objectionable odors, and shall be conveyed to the milk in sanitary piping from a point above the milk surface. The piping used to convey the air shall be designed to prevent siphoning or back flow of milk into air system.

14—COOLING: Farm Cooling Tanks equipped with either direct expansion or refrigerated water cooling surface shall be furnished with sufficient cooling surface in tank and sized Freon refrigerating unit, when testing at 90° ambient temperature for air cooled condensing units, or 120 lb. head pressure for water cooled units, to cool as follows:

(a) Tanks used for everyday pick-up shall cool 50 percent of the rated volume of the tank containing raw milk, from 90° to 50° F. in one hour after the tank has been filled to 50 percent of its capacity, with compressor in operation during filling period. Unit then to cool above volume from 50° to 40° F., in one hour.

(b) Tanks used for every other day pick-up shall cool 25 percent of the rated volume of the tank containing raw milk, from 90° to 50° F. in one hour after the tank has been filled to 25 percent of its volume, with compressor in operation during filling period. Unit then to cool above volume from 50° to 40° F. in one hour.

(c) Water may be substituted for milk when testing (a) or (b) above. For test purposes a maximum filling period of 1½ hours is permissible, the water being added in not less than 5 equal amounts at equal intervals.

(d) When compressor is permanently attached to farm tank, such tank shall be clearly and permanently identified when specifically designed only for every other day pick-up.

(e) The tank shall be provided with automatic refrigerant control mechanism capable of holding the raw milk to within plus or minus 2° F., of the required holding temperature.

APPENDIX

This appendix covers recommendations for (A) Measuring Devices and (B) Installation.

This Appendix includes sanitary requirements for measuring rods, and transparent gauge columns, which may be regarded as supplementary to the sanitary standards pertaining to the tanks. It is anticipated that other means for determining tank contents may be developed and when such a development occurs the formulation of sanitary standards will be initiated as outlined in the first paragraph of the Farm Tank Standards.

A—MEASURING DEVICES

Measuring rods that are immersed in the product, or measuring scales for direct reading transparent gauge columns shall comply with the following specifications for graduation divisions and marks.

Graduations and Marks:

(a) Graduation marks shall read in inches, using divisions that are not smaller than 1/32 inch nor larger than 1/16 inch.

(b) Major graduation marks shall be prominently distinguishable from minor graduation marks, and shall start at the bottom of the rod or scale, measuring upward only.

(c) Graduation marks shall not be wider than 25 percent of the distance between centerlines of adjacent graduation, and shall not be less than 0.005 inch wide.

(d) The volumetric value of the smallest unit on the rod or scale shall not exceed one gallon on farm tanks having a calibrated volume of 500 gallons or less, and shall not exceed 2 gallons on farm tanks with a calibrated volume in excess of 500 gallons.

(e) Each rod or scale shall be stamped by the manufacturer with the serial number of the farm tank or tanks for which the rod is to be used.

(f) One reference point shall be provided on the tank by which the position of the measuring device relative to the tank can be easily verified during and after calibration.

When a measuring device, gauge column, level indicator, flowmeter, etc., is to be used that does not conform to the requirements in this appendix, it is recommended that it be submitted for consideration as provided in the preamble on page one.

1—Measuring Rod for Immersion in the Product:

(a) When this type measuring rod is rectangular in cross section it shall not be less than ¼ inch thick and ¾ inch wide. Whe nany other cross section is used, its smallest dimension shall not be less than ⅝ inch.

(b) The measuring rod shall be supported only in the correct measuring position for which the tank has been calibrated, subject to the provisions in the following paragraph 1 (c).

(c) The maximum swing allowed at the bottom end of the measuring rod shall not exceed:

¾ inch for rods that are not more than 30 inches long,

1¼ inches for rods over 30 inches and not longer than 60 inches,

1½ inches for rods that are over 60 inches long.

(d) Graduation marks shall be permanently applied to immersion type measuring rods and in such a way that the mark is as smooth as the adjacent surface. If milled, scribed or similar marks are used, lines shall not exceed 0.008 inch in depth. When material is added or applied to rod for graduation marks or lines, same shall be relatively stable and nontoxic.

(e) The graduated face of the immersion type measuring rod shall not face the adjacent wall of the tank when the rod is supported in the measuring position.

2—Direct Reading Transparent Gauge Column with Measuring Scale:

A transparent gauge column may be made of either glass, or of transparent flexible tubing that is smooth, nontoxic, relatively nonabsorbent, and that will withstand all normal bactericidal treatment.

(a) A transparent gauge column, when used, shall be installed in such a manner that the milk used for measurement cannot drain back into the tank.

(b) The gauge column shall be supported in such a way that it can be easily replaced in case of breakage.

(c) Means shall be provided so that milk will not stand in the gauge column except when measurements are to be made.

(d) The connection that supplies milk to the gauge column shall be easily demountable and cleanable. When a transparent flexible tube is used as a gauge column no additional connections need be required.

(e) The measuring scale used with a direct reading transparent gauge column, shall be permanently attached to the exterior of the tank.

(f) Such a measuring scale shall have graduation marks that may be milled, stamped, scribed, or otherwise permanently applied to the rod.

3—Calibration Charts:

The manufacturer shall have furnished a Calibration Chart Form showing the manufacturer's name, farm holding tank serial number, divisions corresponding to divisions on measuring device with ample space following each division for inserting the determined volume in each space, in U. S. Gallons, and with sufficient space for field inspector's seal or stamp, signature and date of field inspector's approval. Chart shall be enclosed in a transparent envelope with top and side edges sealed against moisture and appropriate means provided for wall mounting.

B—INSTALLATION

1—Tank shall be so positioned on the floor that any change in the position of such tank shall be readily discerned through the media of scribe marks or other permanent marks on the floor, so as not to alter the calibrated volume of contents after tank has been approved. Painted marks on floor are not considered permanent.

2—The Bureau of Weights and Measures, Department of Agriculture, or other designated authority should be consulted for the method to be followed in calibrating the farm tank.

C A Abele C. A. Abele, Chairman - CSP of IAMFS	June 15, 1953 Date
J. D. Faulkner J. D. Faulkner, Chief - MF-USPHS	June 11 1953 Date
E H Parfitt E. H. Parfitt, Chairman - SSS-DIC	June 16 1953 Date
H S Fielder H. S. Fielder, Chairman - Tech. Committee DISA	6/16/1953 Date

A SURVEY OF CANNED FOODS

REPORT OF THE

SECOND INTERNATIONAL CONGRESS*

The publication of the papers read to the Second International Congress on Canned Foods in Paris, 1951, provides in a single volume a survey of the subject which has never been surpassed in its range and completeness.

Dr. A. G. van Veen, Acting- Director of F. A. O.'s Nutrition Division, deals with 'Food Preservation and World Nutrition;' Dr. C. G. King of the Nutrition Foundation writes of 'The Nutritive Value of Canned Foods' and Dr. L. E. Clifcorn of the Continental Can Company reviews 'Research on Nutrient Retention during Canning." The digestibility of canned foods is the theme of Mons. Fontaine of the Museum National d'Histoire Naturelle and Mme. M. Cannepin of I.P.C. (France).

Technical developments in the canning industries of various countries since the First Congress in 1937 are reviewed in eighteen papers by leading canning technologists of these countries. Special interest attaches to the contributions of Dr. C. Olin Ball who dealt with the progress in processing methods in the U.S.A. between 1940 and 1950, and of Dr. R. H. Lueck and Dr. K. W. Brighton whose peper also covers new products, new canning techniques, and new equipment in the U.S.A.

Legislation in various countries and its effects on canned food are reviewed by Mr. C. L. Hinton of the British Food Manufacturing Industries Research Association; Dr. C. H. Bloedorn writes of food laws and enforcement in the U. S. A.

International standardization of cans under I.S.O. (U.N.O.'s standards organization) is summarized by Mr. G. Weston of the British Standards Institute. Developments in tinplate technology are described by Dr. E. S. Hedges (Tin Research Institute) and progress in tinplate and can manufacture is dealt with by Dr. R. H. Lueck and Dr. K. W. Brighton. New Developments in the manufacture of cans are also described by Mr. F. Jacobsen, Platmanufaktur (Sweden); Mr. T a a r l a n d (Hermetikkindustriens Laboratorium, Norway) writes of the developments in aluminium cans. The bacteriology of 'deliberately non-sterile' canned foods such as anchovies, *foie gras,* and ham, is discussed by Miss Aschehoug (Norway), Prof. Ch. Lepierre (Portugal, and Mons. H. Cheftel (France) and others.

*Condensed from *Tin and Its Uses,* No. 27, November, 1952.

Association News

AFFILIATES OF

International Association of Milk and Food Sanitarians

APPROVED INSPECTORS ASSOCIATION OF SOUTHEAST PENNSYLVANIA

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

ASSOCIATED ILLINOIS MILK SANITARIANS

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

CALIFORNIA ASSOCIATION OF DAIRY AND MILK SANITARIANS

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

CONNECTICUT ASSOCIATION OF DAIRY AND MILK SANITARIANS

Pres., Alfred H. Jackson .... Elmwood
Vice-Pres., Friend Lee Mickle, .. Hartford
Secretary, H. Clifford Goslee, 356 Palm St., Hartford, Conn.
Treas., Curtis W. Chaffe .... Hartford

DAIRY SANITARIANS ASSOCIATION OF THE DEL-MAR-VA PENINSULA

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

DAIRY SANITARIANS ASSOCIATION, OF NORTH CENTRAL PENNSYLVANIA

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

Executive Committee:

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

FLORIDA ASSOCIATION OF MILK SANITARIANS

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

INDIANA ASSOCIATION OF MILK AND FOOD SANITARIANS

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

IOWA ASSOCIATION OF MILK SANITARIANS

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

KANSAS ASSOCIATION OF MILK SANITARIANS

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

MICHIGAN ASSOCIATION OF SANITARIANS

Pres., Winfred L. Ettesvold, Grand Rapids
1st Vice-Pres., Clifford Bracy ......Lansing
2nd Vice-Pres., Jerald Peters .... Sault Ste Marie
Sec.-Treas., Robert Lyons, 303 Bailey St., East Lansing, Mich.
Directors
Past Pres., Lyle Littlefield
Rupert Spaulding — Grey Turney
C. V. Roose — Dale Brooks

MINNESOTA MILK SANITARIANS ASSOCIATION

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

MISSOURI ASSOCIATION OF MILK AND FOOD SANITARIANS

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

NEW YORK STATE ASSOCIATION OF MILK SANITARIANS

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

MEMBERS OF THE BOARD

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

OKLAHOMA ASSOCIATION OF MILK AND FOOD SANITARIANS

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

OREGON ASSOCIATION OF MILK SANITARIANS

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

ROCKY MOUNTAIN ASSOCIATION OF MILK AND FOOD SANITARIANS

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

SOUTH DAKOTA ASSOCIATION OF SANITARIANS

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

VIRGINIA ASSOCIATION OF MILK AND FOOD SANITARIANS

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

Washington State Milk Sanitarians Association

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

Wisconsin Milk Sanitarians Association

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

NEW AFFILIATES

American Indian Sanitarians Association

Pres., Joseph Medina, Bernallilo, N. M.
1*st. Vice Pres.*, Richard Teboe, ... Fort Yates, N. D.
2*nd. Vice-Pres.*, Willis Titla,....Bylas, Ariz.
Sec.-Treas., Frank C. Estes, ... Lower Brule, S. D.
Auditors:
Mike Ford, ... Gallup, N. M.
Louis Zimmerman ...... Rosebud, S.D.

Georgia Chapter of the International Association of Milk and Food Sanitarians, Inc.

Pres., James P. Gibbs .... Atlanta
Vice-Pres., P. L. Musick, ... Athens
Sec.-Treas., Dr. John J. Sheuring, Dairy Dept., U. of Ga., Athens, Ga.

Kentucky Association of Milk and Food Sanitarians

Pres., T. R. Freeman .... Lexington
Vice-Pres., H. L. DeLozier .... Louisville
Sec.-Treas., H. B. Morrison, Dairy Section, U. of Kentucky, Lexington, Ky.

Arizona Association of Milk and Food Sanitarians

Pres., George W. Marks .... Phoenix
Pres.-Elect, Claude C. Cox, Cave Creek
Sec.-Treas., O. V. Cooper, 4103 N. 20th St., Phoenix.
Executive Board Members:
Lane C. Hanson .... Phoenix
M. A. Lang .... Kingman

Ernest Kelly—1886-1953

Ernest Kelly was born in Washington, D. C., in 1886, the son of a Presbyterian clergyman, and died in Orlando, Florida, March 26, 1953.

He obtained his scientific training and education at Cornell University, 1902-1906, and then was employed as Sanitarian in milk plants in Newark, N. J. In 1910, he began his career in the United States Department of Agriculture, in the Section of Market Milk Investigations in the Bureau of Dairy Industry. He was put in charge of the section in 1912; later it became the Division of Market Milk Investigations in the Bureau of Dairy Industry. He retired from the Department as Assistant to the Chief of the Bureau in January 1946 after more than 35 years of government service.

While Mr. Kelly was in charge of the Division of Market Milk Investigations, it worked out many of the basic essentials of dairy sanitation and helped establish the principles in general practice in the industry.

Fundamental research relating to the cooling of milk, transportation, cleaning milking machines, and other sanitation problems was involved. The Division conceived and carried out the first experiments which proved that feed flavors are carried through the blood stream from the body of the cow and into the milk, and that there is a more important cause of strong feed flavor in milk than their absorption from the air. In the early years of the Market Milk work, a score card system was developed for the inspection of dairy farms and city milk plants. It became widely used in the industry. A system of scoring milk and cream was also devised, and competitive contests were widely used as a means of stimulating the production of high quality milk and cream by individual farmers and dairy plants.

Considerable information was amassed concerning the construction, arrangement, equipment, and operation of milk plants. The results of these studies which pointed the way for better arrangement of machinery, more efficiency of labor, and reduced breakage and loss of bottles have become a handbook for many dairies, especially the smaller ones that need a standard for judging economy of operation.

Mr. Kelly initiated and directed the first comprehensive study of the basic requirements for milk production in terms of feed and hours of labor. The results of the study, made in 7 states more than 30 years ago, can be used even today by applying present prices of feed and labor to the basic figures for the locality.

Under his supervision, basic study was made on the homogenization of milk and cream, the curd tensions and digestibility of homogenized milk, and on the relation of certain feeds to the development of oxidized flavor in milk. Following his retirement from the Department, Mr. Kelly maintained his interest in the dairy industry, working frequently with the State extension dairymen, particularly with the 4-H clubs.

He is survived by his widow, two sons, and one brother who is a Presbyterian clergyman.

He was the author of many popular and technical bulletins on dairy problems and the senior author of a standard textbook on market milk. He served as an official in various dairy associations. He was a charter member of the International Association of Milk Inspectors and served as its president in 1920.

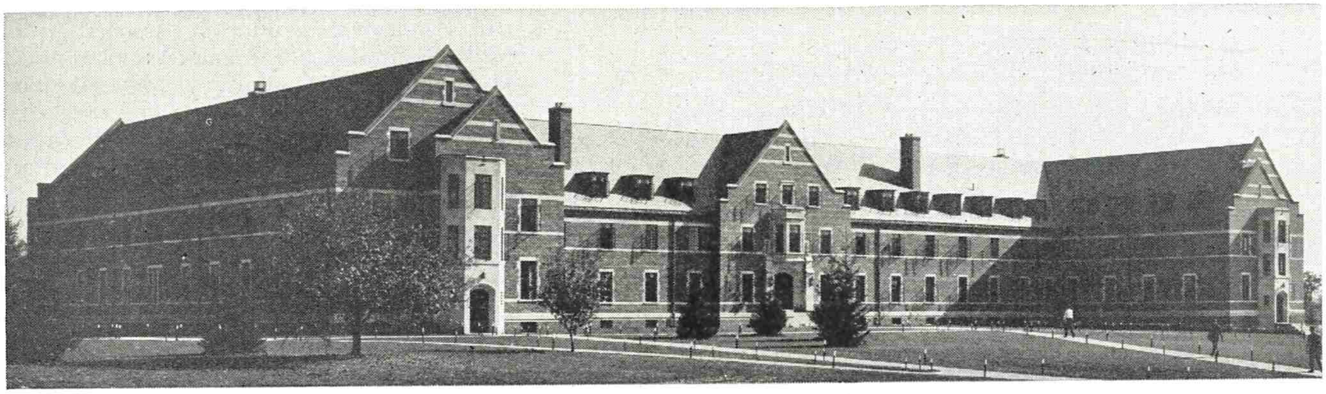
We all rated Ernest Kelly as one of the "elder statesmen" of the Association. We find his name first mentioned in our membership list in the *Fourth Annual Report of the International Association of Dairy and Milk Inspectors,* October 1915, and he is listed as Chairman of the Committee on Methods of Appointment of Dairy and Milk Inspectors and Their Compensation. At that meeting he served as a member of a Reception Committee, and read a paper entitled "The Need of a Medical Inspection of Employees Engaged in the Production and Handling of Milk." At that same meeting, the Association endorsed the work of the Market Milk Investigations. The Association back there had a good press:

"It would be hard to find a body of men whose work affects a wider group of people than the International Association of Dairy and Milk Inspectors."—Editorial, Washington Times, Oct. 27, 1915.

Those were the days when we held three sessions a day. The men were earnest and enthusiastic, and felt their responsibility as pioneers. These men—Ernest Kelly was one of the leaders—laid the foundations for the work and the organization which has eventuated in the present great development of our Association. As Dr. William H. Price writes:

". . . (O)ur good and longtime friend Ernest Kelly . . . merits the highest token of appreciation. . . ."

J. H. Shrader



Phillips-Snider Hall

Program 40th Annual Meeting—Sept. 1-2-3

INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC.

Michigan State College, E. Lansing, Mich.

SCHEDULE OF SPECIAL ACTIVITIES

The location and arrangements for all special activities will be announced at each General Session.

SUNDAY, AUGUST 30

10:00 AM—12:00 Noon	Meeting of Executive Board
1:00 PM—5:00 PM	Meeting of Executive Board
1:00 PM—5:00 PM	Committee Meetings

MONDAY, AUGUST 31

9:00 AM—12:00 Noon	Meeting of Executive Board with All Committees
1:00 PM—5:00 PM	Advanced Registration
2:00 PM—6:00 PM	Meeting of the Council
7:00 PM	Buffet Dinner

TUESDAY, SEPTEMBER 1

9:00 AM—11:00 AM	Ladies Entertainment—Tour of Michigan State College Campus
1:30 AM—3:30 AM	Ladies Entertainment—Tour of Michigan State College Campus
7:00 PM	Chicken Barbecue

WEDNESDAY, SEPTEMBER 2

8:00 AM—5:00 PM	Ladies entertainment—Visit to Greenfield Village and Ford Museum, Dearborn, Michigan
1:30 PM—6:00 PM	Technical Demonstrations (Titles and locations to be provided by Mr. Turney)
2:00 PM—5:00 PM	Meeting of Executive Board with Associate Editors of the Journal
7:00 PM—9:30 PM	Banquet Principal Speaker—Dr. J. G. Hays, Dairy Department, Michigan State College, East Lansing, Michigan Presentation of Citation Award Presentation of Sanitarians Award*—by H. L. Thomasson, Chairman, Recognition and Awards Committee. *The Sanitarians award is sponsored jointly by The Diversey Corporation; Klenzade Products, Inc.; Mathieson Chemical Corporation; Oakite Products, Inc.; and the Pennsylvania Salt Manufacturing Company.

THURSDAY, SEPTEMBER 3

2:30 PM—4:00 PM	Visit to Oldsmobile Assembly Plant, Lansing, Michigan

GENERAL SESSIONS

Location—Fairchild Theater

TUESDAY—SEPTEMBER 1, MORNING

President Harold J. Barnum, Presiding

8:00 AM	Registration
8:30 AM	Movie—*"The Story of Stainless,"* courtesy of Republic Steel Corporation. Presentation of door prizes donated by Approved Inspectors Association of Southeast Pennsylvania, Associated Illinois Milk Sanitarians, California Association of Dairy and Milk Sanitarians, Connecticut Association of Dairy and Milk Sanitarians, and Dairy Sanitarians Association of the Del-Mar-Va Peninsula.
9:00 AM	Addresses of Welcome Dean Edward Harden, School of Continuing Education, Michigan State College W. L. Ettesvold, President, Michigan Association of Sanitarians

9:45 AM Presidential Address, Harold J. Barnum, Denver, Colorado

10:15 AM Appointment of Nominating Committee

10:20 AM Meeting of Milk Section in Giltner Hall Auditorium; and Meeting of Food Section in General Science Building Auditorium

TUESDAY—SEPTEMBER 1, AFTERNOON

1:30 PM—5:00 PM Presentation of door prizes donated by Missouri Association of Milk and Food Sanitarians, New York State Association of Milk Sanitarians, Oklahoma Association of Milk and Food Sanitarians, and Oregon Association of Milk Sanitarians.

Business Meeting, President, Harold J. Barnum, Presiding

(1) Presentation of Special Report of Committee on Constitution and By-Laws

(2) Committee Reports

Advisory Committee on Milk Regulations and Ordinances—C. J. Babcock, Chairman, U. S. Department of Agriculture, Washington 25, D. C.

Applied Laboratory Methods—Dr. L. A. Black, Chairman, Environmental Health Center, 1014 Broadway, Cincinnati 2, Ohio.

Comminicable Diseases Affecting Man—Dr. Ray J. Helvig, Chairman, Milk and Food Branch, U.S.P.H.S., Washington, D.C.

Dairy Farm Methods—Chester Bletch, Chairman Virginia-Maryland Milk Producers Association, 1756 K Street, No., Washington, D. C.

Educational—J. L. Rowland, Chairman, 7905 Bellview, Kansas City, Mo.

Food Handling Equipment—Clarence W. Weber, Chairman, New York State Department of Health, 18 Dove Street, Albany, New York.

Frozen Food Sanitation—Dr. V. C. Stebnitz, Chairman, Chicago Dairy and Food Laboratories, 6930 No. Clark St., Chicago, Ill.

Membership Committee—Hugh E. Egan, Chairman, U.S.P.H.S. Training Branch, 50th Seventh St., N. E. Atlanta, Ga.

Professional Development—H. S. Adams, Chairman, Indiana Medical School, Indianapolis 7, Indiana.

Resolutions Committee—H. L. Thomasson, Chairman, International Association of Milk and Food Sanitarians, Inc., P. O. Box 437, Shelbyville, Ind.

Sanitary Procedure—C. A. Abele, Chairman, 2617 Hartzell Street, Evanston, Ill.

(3) Special Announcements

WEDNESDAY—SEPTEMBER 2, MORNING

President-Elect John D. Faulkner, Presiding

8:30 AM Movie—"*See Yourselves as Others See You,*" an amateur color movie, produced and narrated by C. B. A. (Bill) Bryant, Johnson and Johnson Company, Chicago, Illinois.

Presentation of door prizes donated by Dairy Sanitarians Association of North Central Pennsylvania, Florida Association of Milk Sanitarians, Indiana Association of Milk and Food Sanitarians, Iowa Association of Milk Sanitarians, Kansas Association of Milk Sanitarians, Michigan Association of Sanitarians, and Minnesota Milk Sanitarians Association.

9:15 AM "*A cooperative Health-Agriculture-Industry Approach to the Problems of Sanitation,*" Dr. G. Malcolm Trout, Professor of Dairy Manufacturing, Dairy Department, Michigan State College, East Lansing, Michigan

9:45 AM Report of Nominating Committee

10:00 AM Meeting of Milk Section in Giltner Hall Auditorium; and Meeting of Food Section in General Science Building Auditorium

WEDNESDAY—SEPTEMBER 2, AFTERNOON

1:30 PM—6:00 PM See Schedule of Special Activities

THURSDAY—SEPTEMBER 3, MORNING

First Vice President Ivan E. Parkin, Presiding

8:30 AM Movie—"*Miracle of the Can,*" courtesy of American Can Company

Presentation of door prizes donated by South Dakota Association of Sanitarians, Rocky Mountain Association of Milk and Food Sanitarians, Virginia Association of Milk and Food Sanitarians, Washington State Milk Sanitarians Association, and Wisconsin Milk Sanitarians Association

9:00 AM "*Recent Developments in the Radiation Sterilization of Foods,*" Dr. Samuel A. Goldblith and William C. Miller, Department of Food Technology, Massachusetts Institute of Technology, Cambridge, Massachusetts.

9:30 AM Discussion

9:45 AM "*The National Research Council's Report on A Study of Milk Regulations and Sanitary Milk Control,*" Harold S. Adams, Department of Public Health, Indiana University Medical Center, Indianapolis, Indiana

10:15 AM Discussion

10:30 AM "*Planning a State Program for Restaurant Sanitation,*" Gordon Molyneux, New York State Department of Health, Albany, New York

11:00 AM Discussion

11:15 AM Business Meeting

(1) Election of Officers

(2) Report of Resolutions Committee

(3) Announcement of Plans for 1954 and 1955 Annual Meetings

(4) Installation of Officers

1:00 PM Adjournment

MILK SECTION MEETINGS

Location—Giltner Hall Auditorium

TUESDAY—SEPTEMBER 1, MORNING

Presiding: Dr. Charles Livak, Penn Dairies Inc., York, Pa.

10:30 AM *"Iodine Bactericides in the Dairy Industry,"* Dr. Nathan E. Lazarus, Lazarus Laboratories, Inc., Buffalo, New York

10:50 AM Discussion

11:00 AM *"Establishing and Maintaining Abbotts Quality Milk Control Program,"* Alan B. Miller, Abbotts Dairy Company, Philadelphia, Pennsylvania.

11:20 AM Discussion

11:30 AM *"The Millipore Filter Technique in the Dairy Industry,"* Drs. F. W. Barber, C. P. Burke and H. Fram, National Dairy Research Laboratories, Inc., Oakdale, Long Island, New York

11:40 AM Discussion

11:45 AM *"The New Plate Count Medium in Routine Plate Counts on Milk,"* Drs. F. W. Barber, H. Fram and R. M. DeBaun

12:00 Noon Discussion

WEDNESDAY—SEPTEMBER 2, MORNING

Presiding: Joseph J Donavan, City Health Department, Brookline, Mass.

10:15 AM *"Acceptance of the Use of Pasteurized Laboratory Counts as a Tool for Official Control,"* F. J. Gregarek, Denver Department of Health and Hospitals, Denver, Colorado and George W. Shadwick, Beatrice Food Company, Chicago, Illinois

10:45 AM Discussion

11:00 AM Panel on *"What Milk Sanitarians Should Know About Herd Health Problems."* Panel Members: Dr. W. M. Decker, Michigan State Department of Health, Lansing, Michigan; Dr. J. J. Reid, Department of Bacteriology, Pennsylvania State College, State College, Pennsylvania; Dr. Chester Clark, Dean, School of Veterinary Medicine, Michigan State College, East Lansing, Michigan

11:30 AM Discussion

11:40 AM *"Sampling Milk From Farm Bulk-Milk Cooling Tanks for Fat, Sediment and Bacteria Estimates,"* Dr. H. E. Calbert, Department of Dairy and Food Industries, University of Wisconsin, Madison, Wisconsin

12:00 Noon Discussion

FOOD SECTION MEETINGS

Location—General Science Building Auditorium

TUESDAY—SEPTEMBER 1, MORNING

Presiding: 2nd Vice President Ivan Van Nortwick

10:30 AM *"Food Standards and Their Meanings,"* by Shelbey T. Grey, District Office, Food and Drug Administration, U. S. Department of Health, Education, and Welfare, Chicago, Illinois.

11:00 AM Discussion

11:15 AM *"Food-Borne Illness in the Navy,"* Lt. JG John S. Cook, MC, USN, U. S. Naval Medical School, Bethesda, Maryland

11:45 AM Discussion

WEDNESDAY—SEPTEMBER 2, MORNING

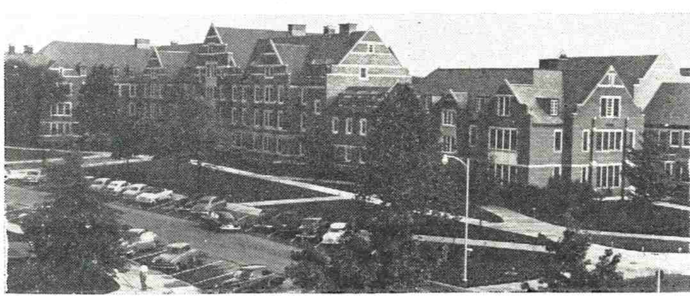
Presiding: Clifford Bracy, Michigan Department of Agriculture, Lansing, Michigan

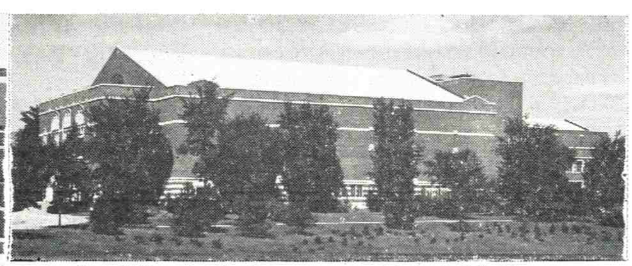
10:15 AM Symposium on *"Sanitation Problems Related to the School Lunch Program."* Panel Members: Dr. Mayhew Derryberry (Moderator), Division of Public Health Education, Public Health Service, U. S. Department of Health, Education and Welfare, Washington, D. C.; Norman E. Tellar, School Lunch Division, Department of Public Instruction, Lansing, Michigan; Herbert Dunsmore, City Health Department, Pittsburgh, Pennsylvania; and Dave Hartley, Food and Drug Division, Indiana State Board of Health, Indianapolis, Indiana

11:00 AM Discussion

11:15 AM *"Problems of Insecticides in Foods,"* Dr. C. C. Compton, Shell Chemical Corporation, Denver, Colorado.

11:45 AM Discussion





Left: Giltner Hall,—Above: Fairchild Theatre.

NOTICE TO ALL MEMBERS

Proposed Revision of the Constitution And By-Laws

INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC.

To: All members of the IAMFS

In accordance with the IAMFS Constitution (Art. VII, Sect. 1) and By-Laws (Art. VII, Sect. 1) this is to notify you of a proposed revision of the Constitution and By-Laws.

After consideration of suggestions made by various members at last year's Annual Meeting, those of a Council Committee composed of L. W. Brown (Wisconsin), C. W. Webber (New York) and P. E. Riley (Illinois), Chairman, and suggestions of a special committee composed of J. D. Faulkner (Washington, D. C.), H. H. Wilkowske (Florida) and H. J. Barnum (Colorado), Chairman, the Executive Board has made a thorough study of the suggestions and proposes the enclosed revision. The major changes are listed below by numbers (upper left hand corner) followed by a list of miscellaneous minor changes and corrections. Where deemed necessary, an explanation is given of major changes.

This proposed revision will be considered at the next Annual Meeting to be held September 1-3, 1953, in East Lansing, Michigan.

Sincerely yours,
H. H. Wilkowske,
Secretary-Treasurer

---

(1)

Proposed Revision of Constitution and By-Laws (1953)

CONSTITUTION
Article I
ASSOCIATION

There is hereby created the International Association of Milk and Food Sanitarians, Inc., not for pecuniary purposes which shall hereinafter be referred to as the Association.

Explanation: The phrase "which shall hereinafter be referred to as the Association" has been added to clarify the terminology used in the following Constitution and By-Laws.

---

(2)

In all places where appropriate use the word ASSOCIATION when referring to the IAMFS deleting such term as "Parent Association;" and, in all places where appropriate use the wording AFFILIATE ASSOCIATION when referring to any organization affiliated with the IAMFS, avoiding such terms as Affiliate Section or simply Affiliate.

---

(3)

CONSTITUTION
Articles IV and V

Since the material in Article V. (Officers, Executive Board and Council) should come before that in Article IV. (Affiliate Associations) the numbering of these two Articles should be reversed and placed in the proper numerical order.

---

(4)

CONSTITUTION
Article IV (old Art. V.)
OFFICERS, EXECUTIVE BOARD AND COUNCIL

Section 1. The officers of this Association shall be a President, a President-Elect, a First Vice-President, and a Secretary-Treasurer, who shall hold these offices for one year or until their successors are elected or appointed as provided in Section 2. At the termination of each Annual Meeting the President-Elect, First Vice-President and Second Vice-President shall automatically succeed into the offices of President, President-Elect and First Vice-President, respectively. A Second Vice-President and Secretary-Treasurer shall be elected by majority ballot at the Annual Meeting of the Association.

Explanation: Since the Association has employed the services of a Certified Public Accountant it is no longer necessary to have two Auditors elected. The responsibility of the Auditors will rest with the Executive Board.

It has been the practice to have the various officers succeed to the higher office each year, which is essential to the successful and continuing operation of the Association business, for it requires several years for a Board member to thoroughly familiarize himself with the many ramifications entailed.

(5)

Section 2. The Executive Board shall consist of the President of the Association, the President-Elect, the two Vice-Presidents, the Secretary-Treasurer and the immediate two Past-Presidents. The Executvie Board shall direct the affairs of the Association. A majority of the Executive Board shall be composed at all times of members who are officially connected with Federal, State, or Municipal Government or with an educational institution. If the status of any member of the Executive Board changes after election, or during his term of office, or after pro-tem appointment as provided in Article II, Section 5, paragraph F of the By-Laws, so that a majority of members officially connected as stated herein, is not maintained in the Executive Board, then such member shall be deemed ineligible without prejudice for his office and such office shall be declared vacant.

Explanation: The first sentence in old Sect. 2 has been rephrased into the above first two sentences for sake of clarity. The phrase "when not in annual session" has been deleted since this phrase tends to confuse rather than state specifically the responsibility of the Executive Board.

---

(6)

Section 3. The Council shall consist of the President, President-Elect, Secretary-Treasurer, the immediate two Past-Presidents of this Association and the Secretary from each Affiliate Association. The immediate Past-President of the Association shall be Chairman of the Council. The Secretary-Treasurer of this Association shall be the Secretary of the Council. The Council shall cause to be kept a record of its proceedings and shall at the Annual Meeting then in session submit a report to the Executive Board.

Explanation: This section has been revised to include only two Past-Presidents rather than five. Council representation from the Affiliate Associations is limited to one person, the Secretary, rather than having the Council determine its representation "on a quota basis" which has in practice tended toward confusion and too large an organization to be an effective discussion group.

(7)

Section 4. It shall be the duty of the Council to recommend to the Executive Board programs or activities for the Association; provided, that no recommendation of the Council is binding upon the Executive Board.

Explanation: This was formerly Art. II, Sect. 6(B) of the By-Laws which logically should be part of the Constitution. There has been no change except to phrase the wording to make it a complete sentence by itself instead of part of a longer sentence of several parts.

---

(8)

CONSTITUTION
Article V. (old Art. IV.)
AFFILIATE ASSOCIATIONS

Section 1. Members of this Association residing in the same geographical area, and also functioning organizations of milk and food sanitarians or closely related groups whose objectives are consonant with those of this Association, may apply for a Charter as an Affiliate Association under conditions stipulated in the By-Laws.

Explanation: The wording "and milk technology societies." has been deleted since they would still be included in the following phrase "or closely related groups."

The former wording "may form" has been clarified by using instead the phrase "may apply for a Charter as."

---

(9)

Section 2. Delete entire section. This removes from the Council the necessity for voting on new Affiliate Associations, and continues to have the Executive Board as the final authority for granting of Charters to new Affiliate Associations.

(10)

Section 2 (old Sect. 3). Each Affiliate Association shall have one representative on the Council. The representative shall be the Secretary of the Affiliate Association. An alternate representative on the Council may be certified by the Affiliate Association to serve in the absence of the Secretary.

Explanation: This makes the Council essentially a body of Secretaries, *one* from each Affiliate Association which will reduce the size of the Council and cause it to become a more workable advisory body since the respective Secretaries are a logical choice to act as the sole representative of their respective associations.

---

(11)

BY-LAWS
Article II
Duties of Officers, Executive Board and Council

Section 1. The President shall preside at all meetings of the Association and the Executive Board. He shall appoint all committees unless otherwise directed by vote of the Association or by the Constitution and By-Laws, and perform such other duties as usually devolve upon the presiding officer or are required of him by the Constitution and By-Laws.

Explanation: The task of presiding chairman of the Council has been removed from the President and elsewhere in the Constitution (Art. IV, Sect. 3) has been given to the immediate Past-President.

---

(12)

Section 5. (Paragraphs A through I unchanged)

J. The amount of the registration fee for the Annual Meeting shall be fixed annually by the Executive Board and shall be used for defraying the expenses of the Annual Meeting;

Explanation: The last two words "Annual Meeting" replace the wording "Committee on Local Arrangements" thus keeping the structure of the financing within the Association from year to year rather than in a temporary Local Committee.

---

(13)

K. To authorize the issuance or revocation of a Charter to an Affiliate Association.

Explanation: This new paragraph places the responsibility solely within the Executive Board of careful consideration of any application for affiliation and revocation if such becomes necessary.

---

(14)

BY-LAWS
Article II

Section 6. The duties of the Council shall be:

A. To act as an advisory body to the Executive Board;

B. To serve as the means for the interchange of ideas and recommendations on programs, activities and procedures among and between the Affiliate Associations and the Executive Board:

C. To aid in putting into effect policies and programs authorized by the Association and by the Executive Board;

D. To convey to the respective Affiliate Associations information on the activities of the Association;

E. To make a report of its activities to the Executive Board at the Annual Meeting;

F. In order to carry out the above functions and duties of the Council the Chairman of the Council shall appoint such committees as the Council recommends.

Explanation: Completely rewritten in order to clarify the duties of the Council and to incorporate the Council Constitution Committee recommendations which will aid in making the Council a workable organization.

---

(15)

Section 7. Delete.

Explanation: The duties and responsibilities of the Auditors are charged to the Secretary-Treasurer (By-Laws Art. II, Sect. 4) and the Executive Board (By-Laws Art. II, Sect. 5B and 5E).

---

(16)

BY-LAWS
Article III

Section 2. Delete entire section and advance numbering of subsequent sections.

---

(17)

Section 3 (old Section 4). An Affiliate Association may use the expression "Affiliated with the International Association of Milk and Food Sanitarians, Inc." or an equivalent legend that is approved by the Executive Board.

Explanation: The last two words "Executive Board" replace the word "Council" which places this responsibility with the Executive Board rather than the Council which is an advisory body.

---

(18)

Section 4 (old Section 5). Paragraph C. Delete.

---

(19)

Section 5 (old Section 6). Each Affiliate Association shall be represented in the Council by the

Secretary of the Affiliate Association. An alternate member may be certified to serve in the absence of the Secretary at any meeting of the Council.

Explanation: Limits each Council to one representative but authorizes an alternate to insure representation at each meeting of the Council.

----

(20)

Section 7. Delete.

----

(21)

BY-LAWS
Article IV.
Committees

Section 2. Second line, change "three" members to read "seven," which is suggested to insure better geographical representation on the Nominating Committee.

----

(22)

Section 3. Other special committees, and regular continuing committees may be authorized by the Executive Board or by the President for special work or assignment. The need for continuation of such committees shall be subject to annual review of the Executive Board. All appointments to continuing committees shall be made by the President-Elect prior to the Annual Meeting.

Explanation: Revised so as to insure better continuity from year to year by making the next year's appointments before the Annual Meeting. Also, annual review of the membership and activities of the respective committees should insure continued work of the committees and the members of the committees.

----

(23)

Section 5. No member shall serve simultaneously on more than one regular continuing committee.

Explanation: New section added to avoid overburdening industrious individuals as well as distributing the various jobs in the Association to as many members as possible.

MISCELLANEOUS CHANGES AND CORRECTIONS

PLACE	IN PRESENT CONSTITUTION AND BY-LAWS NOW READS:	REVISION CHANGED TO READ:
CONSTITUTION		
Page 1, line 1	CONSTITUTION	CONSTITUTION AND BY-LAWS
Above Art. I.	(nothing)	CONSTITUTION
Under Art. II.	OBJECTS	OBJECTIVES
Art. II, line 1	objects	objectives
Art. V (old Art. IV)	AFFILIATES	AFFILIATE ASSOCIATIONS
BY-LAWS		
Art. I, Sect. 1, line 2	and are	and those
Sect. 2, line 1	Parent	delete
3	Parent	delete
4	Affiliate Section	Affiliate Association
Sect. 3A, line 4	members of	members to
Sect. 8a, line 1	Section 8. (a)	Section 8. A.
1	Parent	delete
3	Parent	delete
4	Affiliate Section	Affiliate Association
5	Affiliate Section	Affiliate Association
Sect. 8 b, line 1	Section 8. (b)	Section 8. B
1	International	delete
2	Affiliate Sections	Affiliate Associations
3	Parent	delete
3	Affiiliate section	Affiliate Association
4	Parent	delete
Art. II, Sect. 4D, line 5	Affiliates	Affiliate Associations
Sect. 5, line 1 & 2	"when the Association is not in session"	delete
Art. III	AFFILIATES	AFFILIATE ASSOCIATIONS
Sect. 1, line 1	acceptance of	issuance of a Charter to
2	Section	Association
1A, line 2	Affiliate Section	Affiliate Association
3	"for a regional or Affiliate chapter"	delete
5	of those	of the
6	Affiliate,	Affiliate Association,
6	also by a	also a
1B, line 1	Affiliate,	Affiliate Association,
2	Secretary-Treasurer	Secretary
5	"the filing of the"	delete
5 & 6	a list in duplicate	

	of its members	the number of members
6	"their addresses"	delete
Sect. 3, line 1	Section 3.	Section 2.
1	cast, of	cast, by
6	provision	provisions
7	Affiliate	Affiliate Association
8	the Parent	this
9	Affiliate Section	Affiliate Association
10	"such reports on membership	delete and add "the name and address of each member"
11	Parent	delete
Sect. 5, Line 1	Section 5. This Charter	Section 4. An Affiliate Association Charter
2	number cast	number of votes cast
3	"of the Parent Association"	delete
5A, line 1	Affiliate	Affiliate Association
2	objectives of the Parent Association	Constitution and By-Laws of this Association
5B, line 1 & 2	"as a section of the Parent Association"	delete
Art. VI, Sect. 1, line 2	Affiliate Section	Affiliate Association
3	Parent	delete

MILK BUYING HABITS SHOW REVERSAL IN TWO DECADES

V. K. Shuttleworth, manager of American Can Company's dairy products division, guest speaker at 17th annual meeting of International Association of Milk Control Agencies.

American housewives have virtually reversed their milk buying habits during the past two decades, V. K. Shuttleworth, of American Can Company, told the 17th annual meeting of the International Association of Milk Control Agencies at Victoria, B. C.

Approximately 95 per cent of all packaged milk was delivered directly to the nation's doorsteps in the early 1930's, but today less than 45 per cent of U. S. families get all their milk via the milkman, Shuttleworth, manager of the container-making firm's dairy division, reported.

The sharp drop in home delivery has seen a corresponding rise in store purchases with the result that more than 40 per cent of U. S. homemakers now buy all their milk at retail stores, he added. About 15 per cent buy both at home and away.

"The introduction of the lightweight, disposable paper container, increasing use of automobiles for shopping and the development of food super markets played major roles in the trend toward greater retail store sales of milk," Shuttleworth explained.

The percentage of milk packaged in paper containers has risen sharply during the past 15 years, he pointed out. In 1938, five years after American Can Company introduced the rectangular paper milk container, less than two per cent of the milk marketed as a beverage was sold in paper cartons. The current trend indicates that over 40 per cent will go to market in paper containers during 1953, he declared.

"Production of paper milk containers by the industry has increased more than ten-fold in the past 13 years," Shuttleworth reported. "Whereas only 750 million paper milk containers were manufactured in 1940, the 1952 production was a record-breaking 8.5 billion units. Another record is expected to be set in 1953, with the total paper units increasing another billion over last year.

FOOD AND NUTRITION BOARD RECOMMENDATIONS IN REGARD TO PUBLIC HEARINGS ON DEFINITIONS AND STANDARDS OF IDENTITY FOR FOODS

The Food and Nutrition Board of the National Research Council appointed in October 1951 a Committee on Definitions and Standards of Identity for Foods with the following membership: H. E. O. Heineman, G. E. Hilbert, J. M. Hundley, H. K. Murer, E. M. Nelson, B. E. Proctor, P. E. Ramstad, H. E. Robinson and R. R. Williams, chairman. The Committee thus comprised 3 members from government, 3 from industry, and 3 from academic institutions. Mr. Roy H. Walters later replaced Mr. Murer and Dr. J. R. Matchett succeeded Dr. Hilbert.

This Committee was charged with the duty to study the utility of and the necessity for food standards, their effect upon research and development of new food products, and the burden and cost of Food Standards Hearings upon government and industry; further to suggest remedies for defects which should not imperil the integrity and safety of the nation's food supply or undermine the effective enforcement of our National Food, Drug and Cosmetic Act.

This Committee, after considering many proposals and after consultations with various interested and informed persons, has made several recommendations to the Board which it believes will be helpful in solving the problems which are involved. Some of these recommendations have to do with means of reducing the number of Hearings for Standards - Making Purposes and reducing the cost and duration of such Hearings. Some have to do with the liberalization and broadening the scope of temporary permits to market meritorious new products which deviate in various ways from existing standards. Some contemplate a greater degree of informal consultation between F. D. A. and industry before new standards are formally proposed.

The Committee has become convinced that certain amendments of the present law are desirable in the interest of reducing the number and duration of Food Standards hearings. The Board understands that various versions of proposed amendments to the Food, Drug and Cosmetic Act are under consideration or in preparation for submission to Congress. Some of these proposals aim at the objectives which its Committee has recommended to the Board.

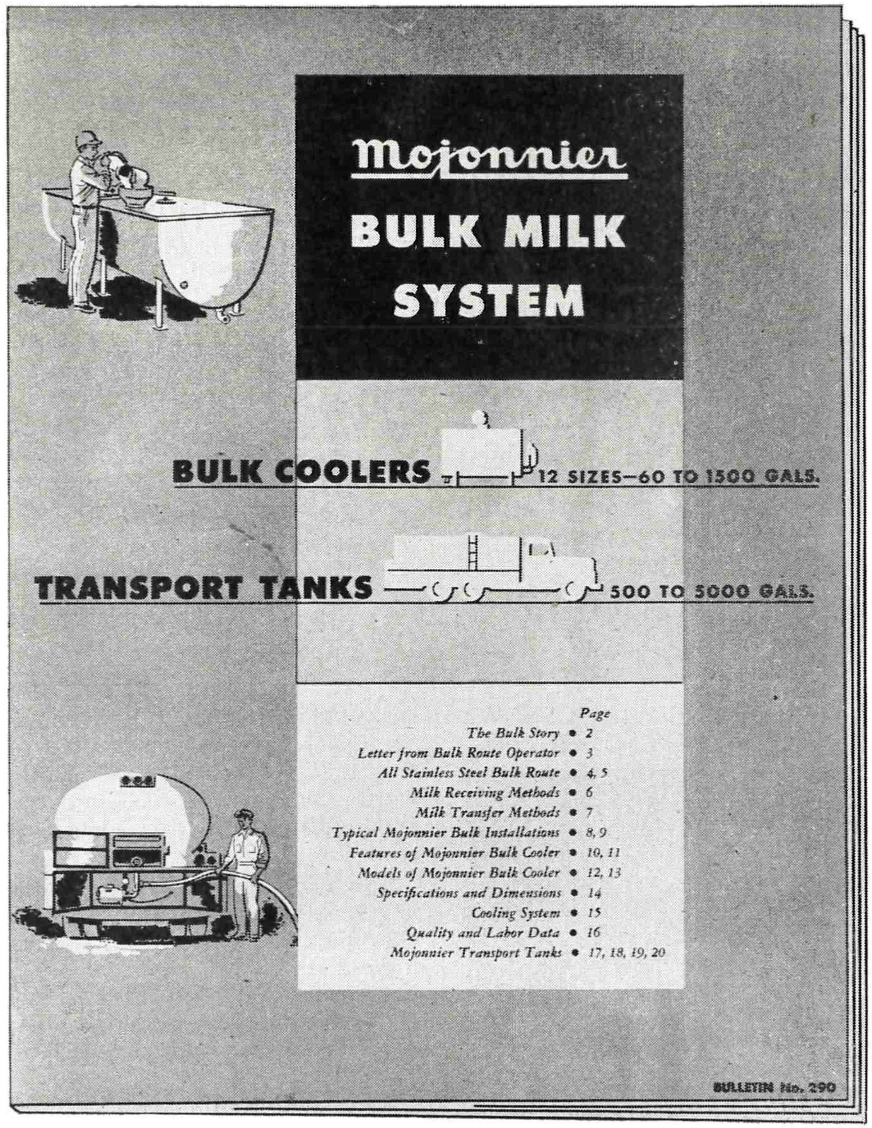
The Board maintains that the determination of the safety of new chemical additives in foods should be made initially by a scientific body and by scientific methods independent of hearings on food standards.

The resolution of facts in regard to the suitability of new chemicals proposed for use in foods separate from Food Standards Hearings will be of great aid in curtailing the length of Hearings. Hearings should also be reduced in number by omitting them when no genuine controversy arises which needs to be resolved.

LOOSE COW HOUSING

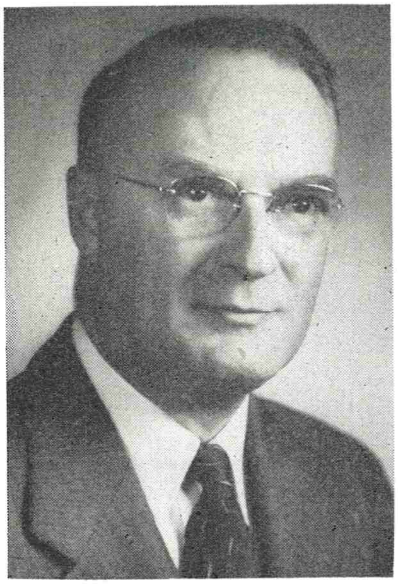
Continued from page 188

ine respect that I wish to recognize the splendid cooperation which the dairy equipment people are giving this new, all important revolution in dairy farming methods.



NEW 20 PAGE BULLETIN ON BULK MILK

A comprehensive twenty page bulletin, covering all aspects of bulk milk, has just been released by Mojonnier Bros. Co. of Chicago. The bulletin is designed as a working guide to those interested in bulk milk. In addition to complete information on all stainless steel Bulk Coolers, the bulletin contains field reports, bacteria count studies, data on sizing of tanks and compressors, dimensions and specifications, cooling data, and a cutaway diagram showing construction features. Also included is a most complete section on pickup tankers with refrigerated pump-out compartments of special design. All who deal with Grade A milk will be interested in this useful and informative report on the bulk milk movement. Copies are available free on request from Mojonnier Bros. Co., 4601 W. Ohio Street, Chicago 44, Illinois. Mention Bulletin 290.



DAHLBERG NAMED BY DAIRY PRODUCTS IMPROVEMENT INSTITUTE

Appointment of Dr. Arthur C. Dahlberg as Advisor to the Board of Directors of the Dairy Products Improvement Institute, has been announced by W. A. Wentworth, President of the Institute.

Dr. Dahlberg as Advisor to the Board succeeds Dr. Carl W. Larson who has served the Institute for the past six years in that capacity. Dr. Dahlberg will continue his present duties and activities as Professor of Dairy Industry at Cornell University.

It was also announced that a Field Director would be appointed at a later date.

Dr. Dahlberg's appointment is effective as of July 1, and the office of the Institute will be moved at that time from Buffalo to a new headquarters in downtown Ithaca, New York.

Established in 1947, the Dairy Products Improvement Institute has since been conducting an intensive campaign, looking towards greater availability and higher quality of dairy products and close cooperation between public health authorities and the industry in the accomplishment of those ends.

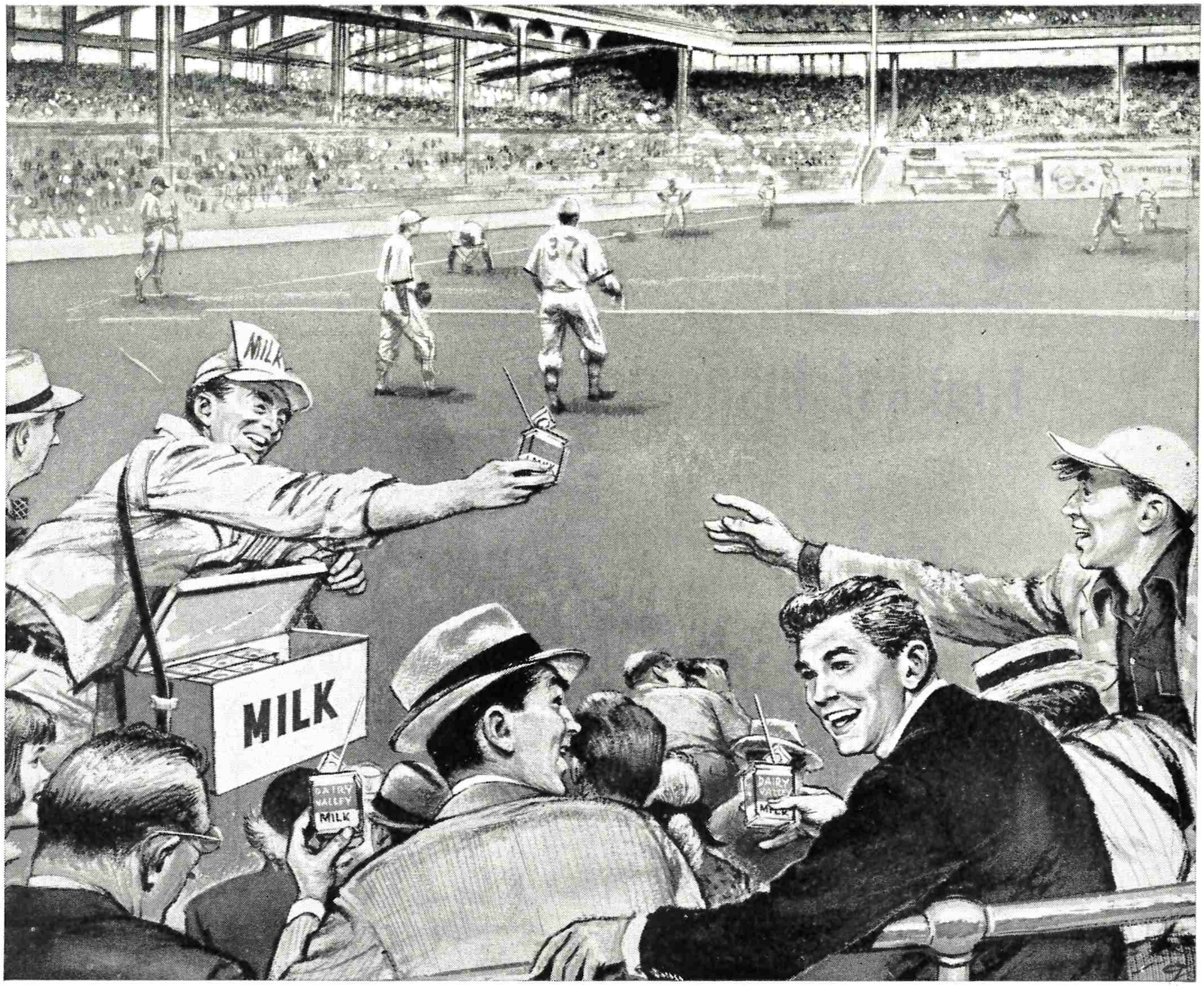
Dr. Dahlberg, Advisor to the Board of Directors, has been a leader in the dairy industry for many years, having served as President of the American Dairy Science Association, President of the New York State Jersey Cattle Club, and Editor of the *Journal of Dairy Science*. Most recently, he was Project Director of the comprehensive study on milk regulations and milk quality sponsored by the Committee on Milk Production, Distribution and Quality of the National Research Council.

Born in Curtis, Wisconsin, he was graduated from the University of Minnesota in 1915. He received his Master's degree from Minnesota the following year, and his Ph. D. from the University of Illinois in 1929.

Dr. Larson, retiring Managing Director, completes nearly fifty years of active leadership in the dairy industry. One-time head of the Dairy Department of Pennsylvania State College, Chief of the Bureau of Dairy Industry and Manager of the National Dairy Council, Dr. Larson announced his retirement at the Annual Meeting of the Institute last March. At that time he was elected to the Board of Directors of the Institute in order that his experience and counsel may continue to be available to the group.

CLASSIFIED ADVERTISEMENT

"MEAT SANITARIAN and DAIRY SANITARIAN WANTED. Two permanent civil service positions to be filled by City of Kenosha, Wisconsin. Starting salary $335 per month. Hospitalization, retirement plan, other benefits. Apply City Manager, Kenosha, Wisconsin."


MILK
MILK
DAIRY VALLEY MILK


ONE QUART
Canco
DISPOSABLE
MILK CONTAINER
Guaranteed by Good Housekeeping
COMMENDED
PARENTS'
MAGAZINE

INDEX TO ADVERTISERS

Notice

Attractive Membership Lapel Button and Decal

Now Available

Convolution — Blue . . . . Circle & Bar — Silver . . . . Field — Blue
Letter "S" — White . . . . Lettering — Blue

ACTUAL SIZE

No. . . . . 3 1/4" Decals @ 25c each =$. . . . .

No. . . . . Lapel Buttons @ $1.00 each = $. . . . .

International Association of Milk & Food Sanitarians, Inc.
Box 437, Shelbyville, Indiana

Notice

Announcing student Membership Rate of $3.00 per year which includes Journal of Milk and Food Technology.

Name ....
Please print

Address ....

....

College or University ....Dept. ....

Under-Graduate Class ....

Application for Membership

INTERNATIONAL ASSOCIATION OF MILK & FOOD SANITARIANS, Inc.

Box 437, Shelbyville, Indiana

Name ______________________________ Date __________
Please Print

Address ______________________________ ☐ New

______________________________ ☐ Renewal

Business Affiliation ______________________________ ☐ Re-instatement

Annual Dues $5.00 ☐ Check ☐ Cash

(Membership Includes Subscription to Journal of Milk & Food Technology.)

(Please Print)

Recommended by ______________________________

Box 437
Shelbyville, Ind.

Subscription Order

JOURNAL OF MILK & FOOD TECHNOLOGY

Name ______________________________ Date __________
Please Print

Address ______________________________ ☐ New

______________________________ ☐ Renewal

Educational & Institutional Libraries (Annually) $3.00. Individual Subscription (Annually) $5.50.

☐ Check ☐ Cash

(Please Print)

I. A. M. F. S. & J. M. F. T.
Box 437, Shelbyville, Ind.

Change of Address

FROM

Name ______________________________ Date __________
Please Print

Address ______________________________

TO

Name ______________________________
Please Print

Address ______________________________

(Please Print)

I. A. M. F. S. & J. M. F. T.
Box 437, Shelbyville, Ind.

Order for 3A Standards

Name ______________________________ Date __________
Please Print

Address ______________________________

( ) Complete Set @ $1.50=__________ ( ) Complete set bound (durable cover) @ $3.50 =__________

Order for Reprints of Articles

Amt. __________ Title ______________________________

Schedule of prices for reprints F. O. B. Shelbyville, Indiana

	1 Page	2 Pages	3 & 4 Pages	6 & 8 Pages	12 P.	Cover
100 or less	$ 8.50	$15.00	$21.00	$30.00	$50.00	$21.67
Add'l. 100's	1.60	1.60	3.00	4.20	7.00	3.37

Completely protects bottled milk . . . convenient in the home

Dacro P·38

- FORMS AN AIR-TIGHT SEAL
- COVERS THE POURING LIP
- LESSENS THE DANGER OF SEEPAGE
- EASY TO REMOVE
- MAKES A PERFECT RE-SEAL

CROWN CORK & SEAL COMPANY

DACRO DIVISION • BALTIMORE 3, MD.