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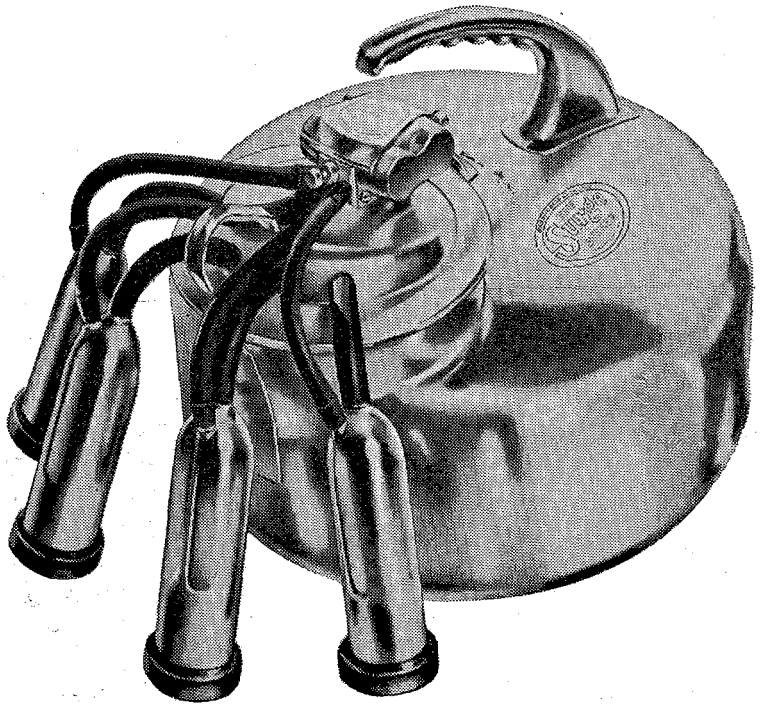
Journal of

MILK and FOOD TECHNOLOGY

Official Publication

International Association of Milk and Food Sanitarians, Inc.

SURGE



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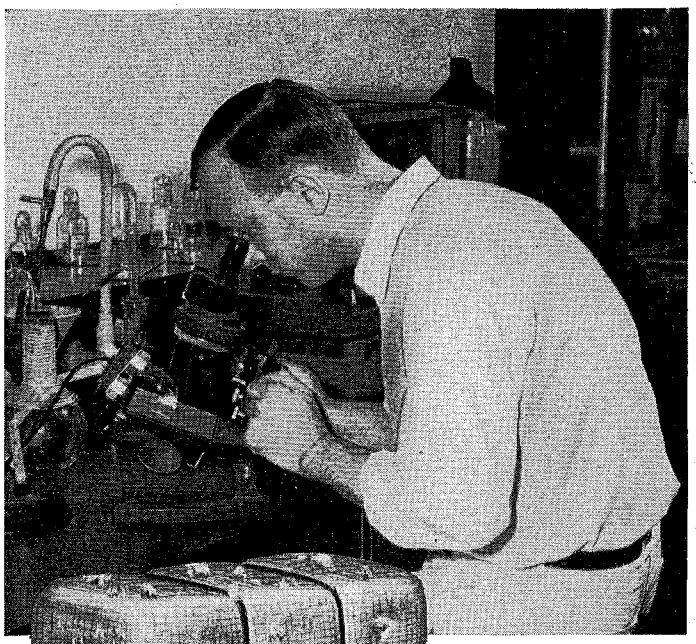

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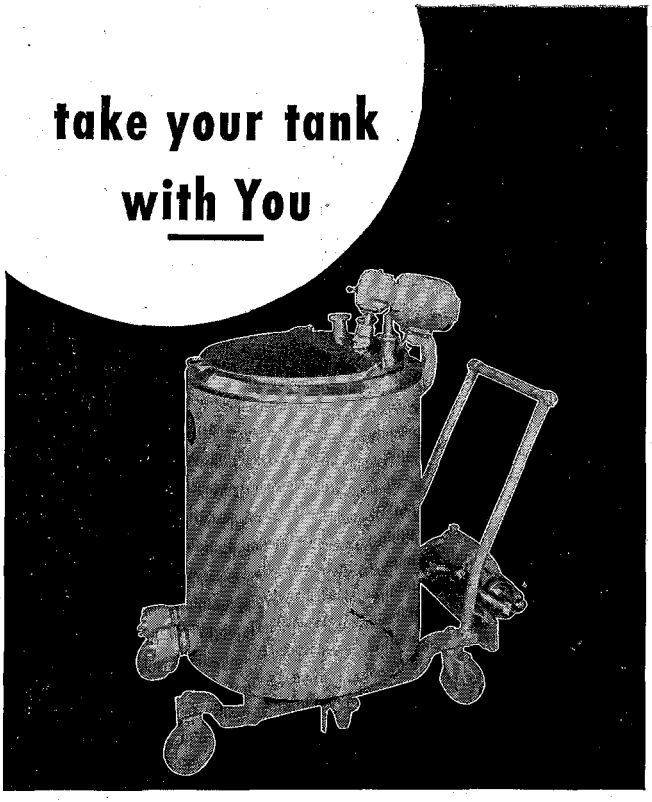

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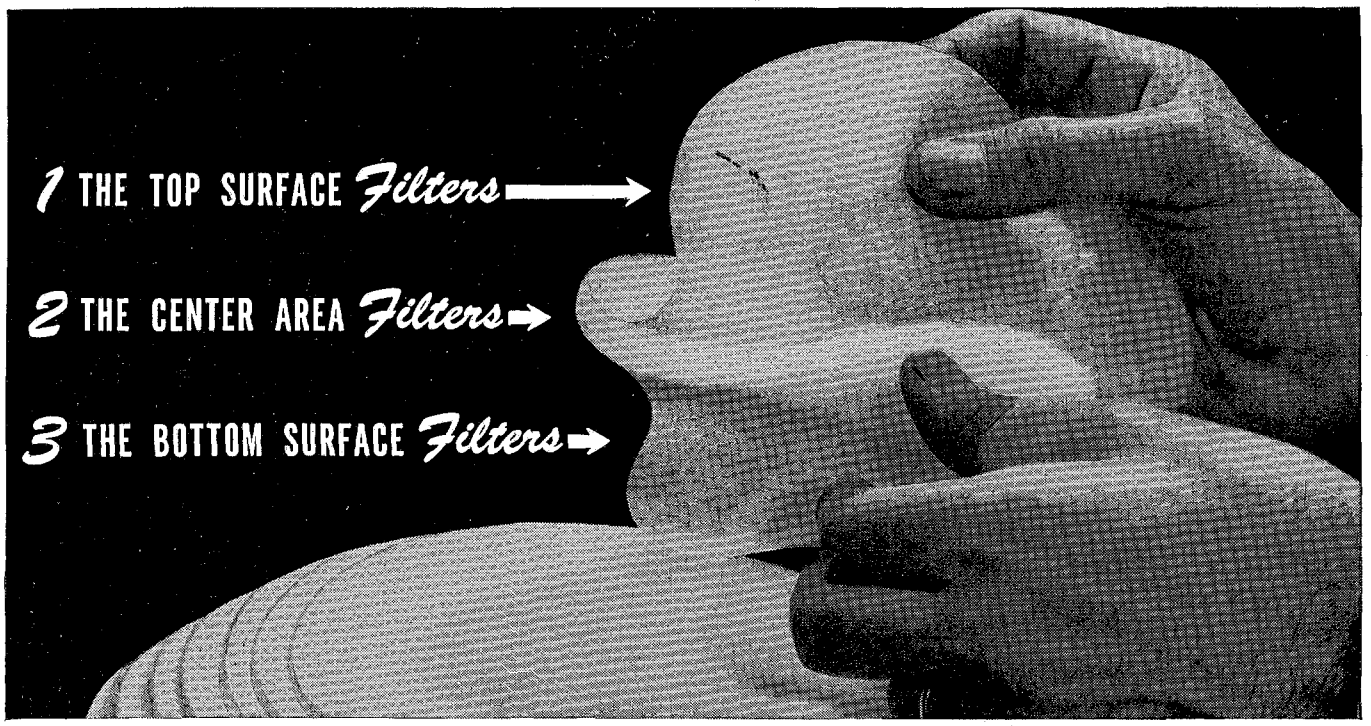

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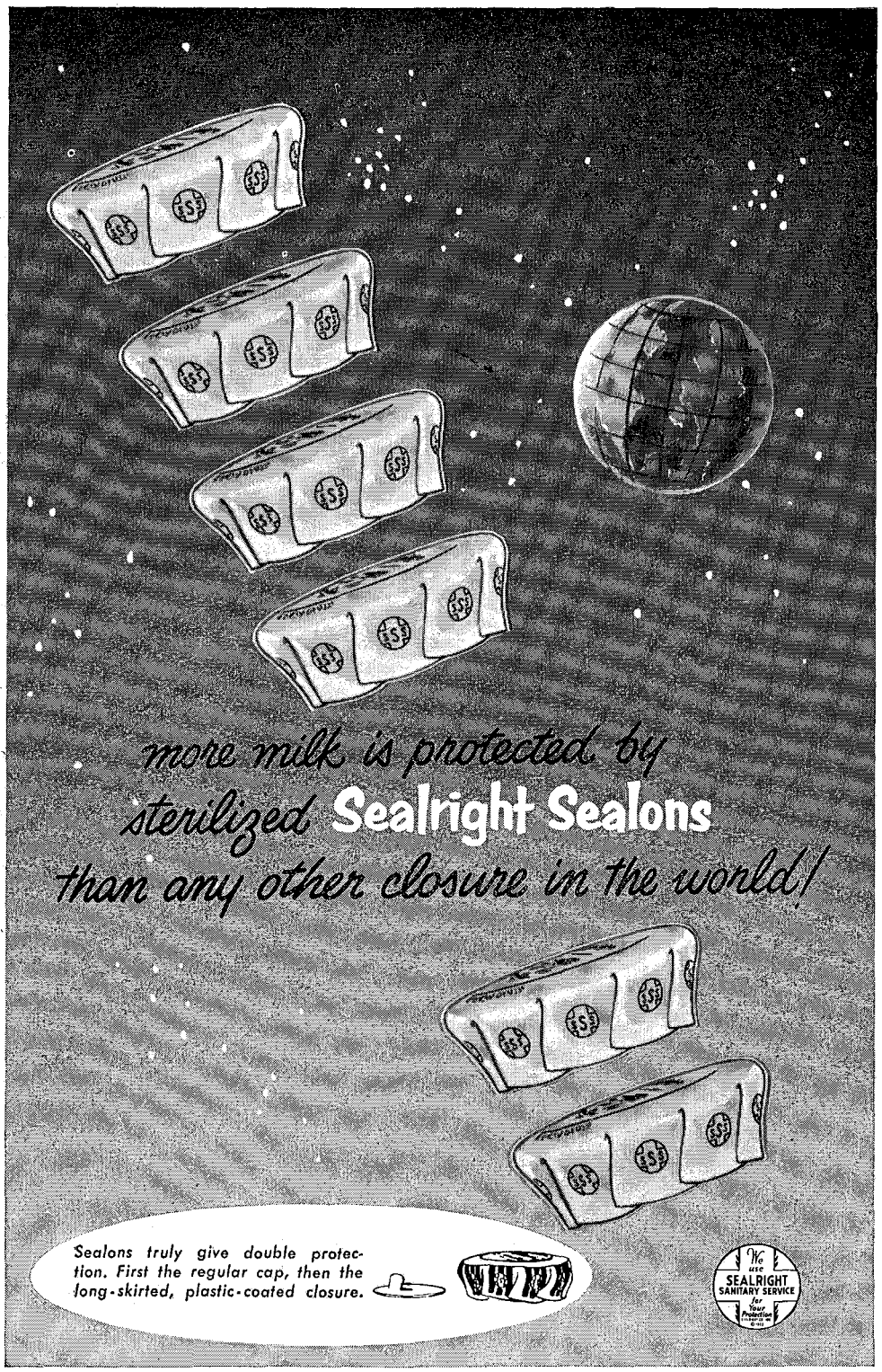
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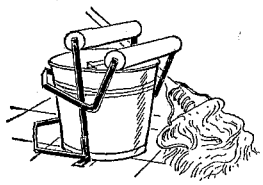

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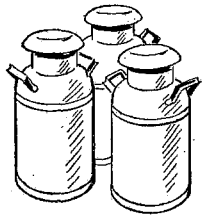

Good sanitation procedures and healthy cows are *both* necessary to produce good milk. Cleaning is easy and fast when detergent-sanitizers containing HYAMINE and TRITON are used. These compositions have consistently helped farmers produce low bacteria-count milk. Reports on field trials and on the wide-spread use of HYAMINE-TRITON detergent-sanitizers on dairy farms will be sent at your request.

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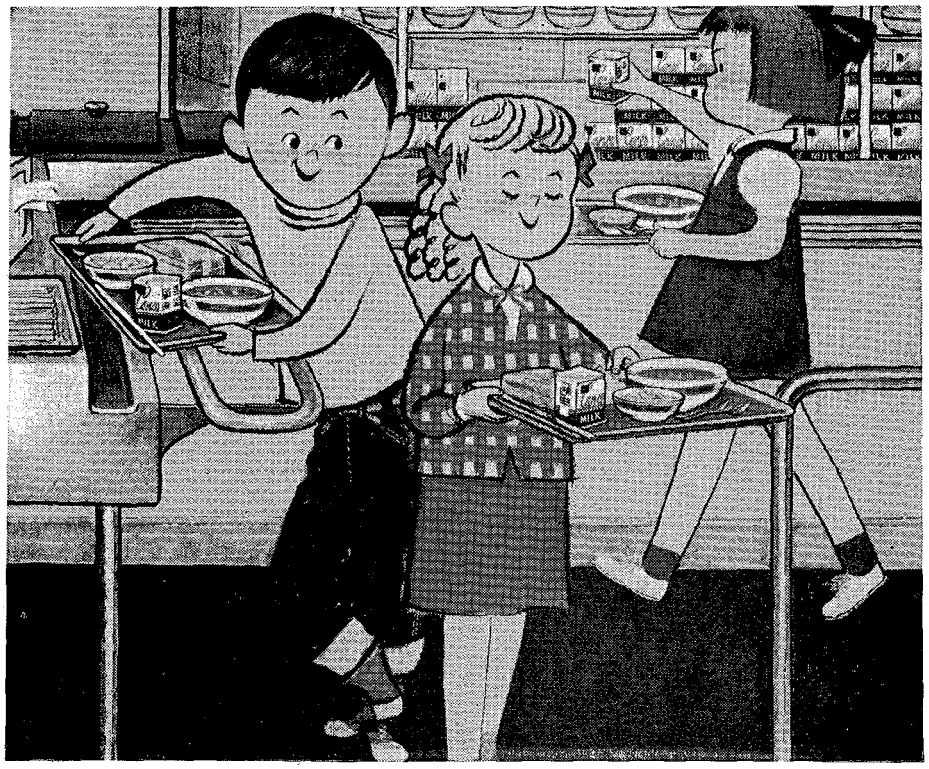

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Editorial Notes

SELLING SANITATION — A SALESMAN TALKS TO SALESMEN

*Condensation of address by George A. West, Milk Plant Specialities Corporation, Rochester, New York)

Whether we know it or not, we are all in the business of selling—be it selling ourselves, selling our product, or selling knowledge and understanding through ideas. The salesman likewise influences the human behavior of individuals, as they work in their environment. He is interested in motivating desire for his products, acceptance of his mission, or ideas to the point of satisfaction and ultimate use.

When selling a tangible product that can be seen, it is comparatively simple to explain to the prospective purchaser through the use of samples, demonstrations, literature, and other devices, the product which he has to offer. Whether you call yourself a salesman, a sanitarian, a teacher, or a public relations man, you are in the business of selling.

In order to be better salesmen in our chosen fields, this knowledge should consist of the following "Knows":

Know your company.
Know your products.
Know your mission.
Know your customers.
Know your procedures.
Know your problems.

Know Your Company

Whether it be the Health Department, a college, or a commercial firm serving the dairy industry, it is important to know and believe in the agency you are serving. No man ever made a good salesman who did not thoroughly believe in the company or agency he represented. Get to really know your company, agency, or institution; know its policies, its reputation and what it stands for.

Know Your Products

In order to be a good salesman, one must know what he is trying to sell. If you are selling an idea, you should be so thoroughly conversant with that idea that you will be able to tap deep reservoirs of knowledge gained by training and experience which have been accumulated through the years. The sanitarian who does not know his basic fundamentals of sanitation has little chance or expectation of having his ideas accepted by a producer, a hauler, or a milk plant operator.

Know Your Mission

Unless you have a mission of belonging and being accepted from the standpoint of the service which you render through your sanitation programs, use of commercial products, or educational or extension services, it will be difficult to get someone else to see your point of view. You must believe in your product in order to be an effective salesman. The salesman that is enthusiastic about his work, his mission of service, his company or agency, his products, his profession as a worthwhile contribution to society, has gained a most valuable ally in the business of selling sanitation.

Look in any well ordered business or building plant or dairy farm and you will see that the one who carries out good order is usually the one who understands good sanitation. Everything in its place and a place for everything. This should be the mission of a sanitarian to bring about good order in the milk business over the things which are his concern. The universe has been based upon order, from the atom or lowly one-celled plant to the movements of the sun, moon, and stars, so that orderliness is one of the first concepts of sanitary selling.

Know Your Customers

It is important that you know your producers, your dealers, the public, and customers and most important of all, know how to get along with people. Fortunately for all of us, we are not made alike nor do we think or act alike. When you are trying to influence a dairy farmer you must know his attitudes, habits, and feelings, and must understand his basic problems and fit your sales talk to meet his needs, or render services which will make your next visit welcome. In a milk plant, the sanitarian must be prepared to cope with the managerial or executive type mind in his manner of dress, approach, time consumed, and explanation of his mission.

We all hear a lot today about public relations. This is merely the sum total of personal relations between you and me, our associates, and the world in which we live. The sum total of these relationships in one company, educational institution, or health agency makes up the respect which the people in the community have for that organization. The sanitarian has an obligation to himself, his employer, and his community to further this type of trade mark in creating a professional respect for the sanitarian while selling sanitation throughout the milk industry.

It has been said that the truest way to success is to tackle the hardest jobs each day first. It is easy to be a "putteroffsky." A "Do it now" philosophy pays off in better results. There is probably not a man in this room who has not had difficulties with some of the people with whom he has had to deal. A little objective attention to each individual as you call on them will do much to prepare yourself for subsequent visits and smooth over these relationships.

Why We React Like We Do

Some years ago a book was written on "Why We Behave like Human Beings." In knowing your customers, it is important to know that the same basic emotions affect him as affect you. The three

*Condensation of address delivered to the 30th Annual Conference of the New York State Association of Milk Sanitarians, Syracuse, N. Y. Sept. 22, 1953.

primary emotions common to all of us, psychologists call fear, anger, and disgust. No man ever sold sanitation on the fear complex unless it was the fear that his competitor would get the better of him, or that he would lose his market through high bacteria counts. That type of fear is the fear which a good sanitary salesman can emphasize to create the behavior in that individual he so desires. The second primary emotion, anger, is one which everyone of us has experienced. It is sometimes brought about by sarcastic, insinuating, intimidating, and threatening remarks or behavior. The third primary emotion of disgust certainly does not belong in the kit of selling aids of the salesman. In each of these emotions, they can be used both for good or evil as you choose. The prospective customer who is disgusted because of the time you are consuming, because of your appearance, because of your approach and attitude, has already made up his mind that he wants no part of you, your product, or your ideas. On the other hand, if you can convince this man that he has been neglecting something to the extent that he becomes disgusted with himself, you may motivate him to take the desired action either through following your plan of action, accepting your ideas, or buying your product.

The three secondary basic emotions which the psychologist describes are those of dejection, wonder, and elation. The selling of sanitary services, products, or ideas cannot be done in a spirit of dejection. The counterpart is enthusiasm which is a characteristic of most successful salesmen today.

Keen observation on your part through sight or conversation may uncover the cause of dejection with the man to whom you are talking. He may have lost a close member of his family, have illness in the home, or lost part of a crop through a hailstorm. To overcome this feeling of dejection, it is necessary to transplant the counterpart emotion, elation. A knowledge of his hobbies, his interests, his family, or some other concern may be the "open sesame" in getting him to talk, forget his troubles ,and to get him in an acceptable mood for your mission. A concern by the sanitarian when things seem to be going wrong on a farm or milk plant does a lot to convince the operator that the world is not all against him at the moment and give you the opportunity to explain your mission.

The next secondary emotion of wonder is one which many people experience particularly when listening to sales talks. They are wondering what the gadget costs, what it's all about, how it works, wondering whether it will do the job, and they are wondering whether it is what they want. Many producers wonder why we have such crazy regulations, wonder why the inspectors have to adhere so close to the written letter of the law and ignore the spirit of the law. Good sanitary salesmen will ferret out these or anticipate these wonders in people and find out what is the corrective measure to make them see his point of view. By dispelling suspicion, doubt, fear, dejection, and reactionary thinking, the sanitary salesman can marshall his ideas to influence the behavior of his client in a climate of mutual understanding to bring about proper action and the desired result.

I can well remember the time when I was in the enforcement field, one of our milk dealers fought and resisted the purchase of an automatic bottle filler. After two years of stubborn resistance, he finally purchased the automatic filler. When I next visited his plant, I expected a cold reception. Instead, the dealer greeted me with open arms, shook my hand vigorously with a smile on his face and said. "Why in Hell didn't you make me buy this two years ago!" I felt that I had failed because I was insisting on the law rather than on the time-saving elimination of back-breaking work which he was saved by the installation of the automatic filler. We now receive the same response from dairymen installing the bulk farm tanks, thereby now saving the heavy labor of handling milk in cans. I think many of us try to sell regulations instead of trying to sell service, timely tips, marketing aids, time-saving devices, etc. which will help the producer or dealer make more money, save labor, and produce better products.

One of the important things in selling is in knowing what to do or say at the right time. When the farmer or dealer signs your score sheets on field work, is he doing it as a perfunctory necessity required by law or is he doing it because he feels that you are his friend offering your services with good advice so that he can do a better job, produce better products, and save money or make money by following your sanitary ideas? Many of us need to get out of the rut of routine habit, of not knowing where we are going or why. We need to take a renewed look at our laws and regulations, our procedures and objectives, and enter the business of selling sanitation.

KNOW YOUR PROBLEMS

In the game of life, there are problems everywhere. Many are in the dairy industry, and these create sales resistance so far as selling sanitary programs are concerned. If the man in the front office wants profits, there may be authorized and nonauthorized short-cuts established which may interfere with proper sanitary procedures. The sanitarian, whether he be in industry or government, must be able to single out the important sanitary hazards or problems and show the manager or operator of a farm or milk plant that it is a matter of good business to keep the premises orderly and in clean sanitary condition; to see that in the milk plant, adequate clean toilet facilities and wash rooms are provided; that proper equipment is installed; that proper cleaning materials are used; and that fly control measures are adequate.

The sanitarian sees things from the sanitary aspect which he has made a part of his life's profession. Not everyone sees sanitation through his knowledge and experience, his trained eyes, or procedures. Selling sanitation is to get these points across. While visiting a plant, you may have experienced such an instance where the manager was looking at the operation of a soake-type bottle washer or the failure of the operator to run it properly, but failed to notice that the steam pressure was down, the water at a very low temperature having a direct bearing on the sanitary condition of the milk bottle the machine was supposed to deliver. It is the duty of the sanitarian to point out these sanitary loop holes and pitfalls in the normal daily operation of milk handling at the farm, on the milk truck, and in the milk plant. The operator should be guided in doing his job better, in meeting regulations, and have a feeling of satisfaction after a visit from a field sanitarian.

The well informed, well equipped, and experienced

sanitarian knows the problems and has been keeping up to date by reading current literature, attending training programs, conventions, and other instructive meetings. He is prepared and in a position to advance modern and latest information on some of the things which he knows will render a service or help his producers and dealers do a better job in producing cleaner, safer, and more wholesome products.

Selling sanitation is a challenging one that is ever changing due to new inventions and technical research. To keep pace with this progress, selling sanitation to the industry is the duty of every sanitarian today if he wishes to enjoy and keep the title of sanitarian which he has earned and so richly deserves.

J. H. Shrader

SANITARY SCIENCE NEEDS MORE FACTS

The recent constructive research findings of the National Research Council on sanitary milk control* have made substantial contributions toward the scientific validity of our milk control practices. This strengthens greatly their legality; health department regulations, based as they are on expert opinion under the police power of the health authorities, are only as strong and permanent as the degree to which they are supported by established scientific knowledge. It has taken us about forty years to reach this stage. Through all the intervening years, papers have been printed by the dozens each giving a little experimental data on which has been based a lot of opinion. Substantiated facts are what have been needed.

A great volume of papers on various aspects of milk and food control are continuing to pour forth. Many of these present experimental data or technological observations. Few are presented with the degree of thoroughness that makes them authoritative even within the limits of their own presentation. Their data need to be checked by the work of others before it can be accepted as authoritative.

Here is a field that could well be served by much of the man-power in our institutions of learning. Students have to be given assignments in the learning process. We suggest that they be given repeat jobs on various of the scientific studies that are regularly reported. All published data anyhow has to be checked and discussed and modified here and there, "line upon line, precept upon precept, here a little, there a little . . ." until the significance of the data has been boiled down, so to speak, to its dependable value. Techniques have to be restated in terms that are more understandable to the other fellow. All this requires time, more work, broader interest and skill in technique and interpretation.

It is recognized that caution must be exercised in interpreting results from student undertakings. Certainly, that is one of the reasons why we have instructors (and editors—a sort of necessary evil!). But they would surely be doing a useful service and contributing to the advancement of knowledge if they would encourage more student participation.

Such a procedure would be a fruitful source of something else—new ideas. Instructors of youth are frequently amazed at the depths of insight that young people bring out. A fresh outlook, some new blood, are sorely needed in the food field. Yes, we need some more original thinking. Let's feed the problems to the students. Then, let's stand braced to receive all kinds of ideas, the crazy and the good. And then, let's analyze what comes forth for their values. May Heaven (or something) save us from obscurantism, from lightly brushing off dissentient ideas, from failing to recognize the diamond in the rough. Pay dirt in the field of ideas is so rare that we might well invest some effort to test out these possibilities.

J. H. Shrader

*See this Journal, May-June, 1953.

ANNOUNCEMENT OF CONTINUATION OF THE SANITARIANS AWARD

It is a real pleasure to be able to announce that The Sanitarians Award, consisting of a Certificate of Citation and a cash award of $1,000, will again be offered at the next annual meeting of the Association, at Atlantic City, New Jersey, in October, 1954. The Award is administered by the Committee on Recognition and Awards. It is sponsored jointly by The Diversey Corporation, Klenzade Products, Inc., Oakite Products, Inc., Pennsylvania Salt Manufacturing Company, and The Mathieson Chemical Corporation.

Complete information on the rules of selection of the candidate for The Sanitarians Award is available from the Executive Secretary of The International Association of Milk and Food Sanitarians. Every member of the Association is requested to give consideration to serving as a nominator for that individual whose service and contribution as a milk and food sanitarian have been outstanding. In brief, the essential points in the procedure and rules for selection of a nominee as a candidate for the Award are as follows:

ELIGIBILITY

To be eligible for The Sanitarians Award, a nominee shall have made meritorious contribution in the field of milk and food sanitation to the public welfare of a county or municipality, in the United States or Canada, and shall be currently employed by a county or municipality as a professional Dairy or Food Sanitarian or both. The work on which the Award is

Continued on Page 90

FORTY-FIRST ANNUAL MEETING

HOTEL MORTON — ATLANTIC CITY, N.J., OCT. 21-23, 1954

THE EFFECTS OF ANTIBIOTICS IN MILK ON THE HUMAN INTESTINAL COLIFORM BACTERIA [a, b]

E. I. STOLTZ[c] AND D. J. HANKINSON
Department of Dairy Industry, University of Massachusetts, Amherst

As a result of antibiotic therapy for bovine mastitis, minute concentrations of antibiotics are carried over into the milk supply which may then be used as fresh fluid milk or the manufacture of dairy products. From the results obtained with residual levels of streptomycin and aureomycin in market milk, it is concluded that the population of coliform bacteria in the intestinal tract of humans can be reduced by the ingestion of these antibiotics.

The object of this study was to determine the effects of antibiotics, in concentrations likely to be found in milk supplies, on the human intestinal coliform flora. It has been speculated by some nutritionists that the presence of antibiotics in the fresh fluid milk supply may have a detrimental effect on the health and well being of the consumer since it is understood that certain vitamin requirements of man are supplied in some measure by bacteria inhabiting the human intestinal tract. The antibiotics tested were penicillin, streptomycin, and aureomycin, which have been found in milk as a result of chemotherapy for bovine mastitis.[1, 2, 3]

Another consideration is that the intestinal flora (perhaps including pathogens) may become resistant to the antagonistic activity of antibiotic, because of their continued exposure to small residual amounts of these substances. It was reported by Pratt and Dufrenoy,[4] and Sokoloff[5] that bacteriostatic concentrations of antibiotic might cause the bacteria to become subsequently resistant to high levels of the antibiotic during essential disease therapy.

METHODS AND MATERIALS

Ten male students volunteered as subjects to determine the effects of various antibiotics, in levels that may be found in market milk supplies, on their intestinal coliform bacterial counts.

For the pre-experimental control period, coliform bacterial counts were made for five consecutive days with the subjects on a diet free of antibiotics. No other diet restriction was imposed. During this phase of the study, the bacterial counts were simultaneously made on three separate media. The media employed were: Endo's, MacConkey's, and Violet Red Bile agars, which are widely used and accepted for the identification, isolation, and differentiation of coliform bacteria.[6]

Each subject brought his stool specimen to the laboratory for daily examination, and the specimen as sampled as soon as possible. Using a sterile spatula, one gram of the feces was aseptically weighed and transferred to a 99-ml dilution bottle. The fecal suspension was then poured aseptically into a sterile metal cylinder of a Waring Blendor and agitated for 10 seconds to get the solids into solution. The fecal suspension was further diluted as needed and plated into three sets of petri dishes to which either Endo's, MacConkey's, or Violet Red Bile agar was added. The plates were incubated at 37°C for 24 hours and then counted. All counts reported are the averages of the bacteria counts for five consecutive days. Only red-colored colonies were counted as typical *E.coli* colonies.

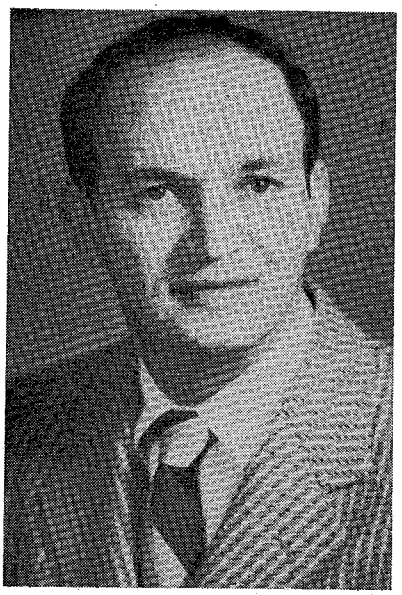
After determining the average number of coliform bacteria in the stool of each subject while on a diet free of antibiotics, the subjects were then given a specific concentration of antibiotic for a period of five consecutive days. This period was designated as the "antibiotic experimental" period.

The following levels of antibiotics in 500 ml of milk were given daily to the subjects: 0.1 or 1.0 unit of penicillin, 0.5 or 1.0 mgm of streptomycin, 0.25 or 0.50 mcgm of aureomycin per ml of milk. The antibiotic was prepared from the commercial product as supplied by the manufacturer. The total amount of milk given to the subjects was based upon a daily consumption rate of one pint (500 ml) of milk per day for the average young male adult. The concentrations of antibiotic given experimentally to the subjects were based upon the findings of other investigators who have reported residual levels of antibiotic in milk[1, 2, 3]

The post-control period was started 15 days after the last antibiotic milk had been given to the subject. This time period was believed sufficient to exhaust the antibiotic from the intestinal tract. The methods employed in this period were as described except that the subjects were kept on a diet free of antibiotics.

RESULTS

Penicillin, at 0.1 and 1.0 unit per ml of milk, had little effect on the intestinal coliform counts during the period of antibiotic feeding (table 1). This was the expected result inasmuch as *E. coli* is known



Dr. Edwin I. Stoltz received his B.S. degree in Bacteriology from the University of Connecticut in 1948. He then received the M.S. degree in Bacteriology and Public Health in 1950 and the Ph.D. degree in 1952 from the University of Massachusetts. Dr. Stoltz is now associated with the R.T. Vanderbilt Chemical Company where he is engaged in doing research and development work in the field of fungicides and bactericides.

(a) Contribution No. 870, Massachusetts Agricultural Experiment Station.
(b) This work subitted in partial fulfillment of the Ph.D. requirements by the senior author, University of Massachusetts. Amherst.
(c) Present address: R. T. Vanderbilt Co., Norwalk, Conn.

TABLE 1—THE EFFECTS OF PENICILLIN ON THE HUMAN INTESTINAL COLIFORM BACTERIA*

Testing period	Counts/gm Endo agar	MacConkey agar	Violet Red bile agar
	Subject No. 1		
Before	1,565,625	1,264,750	1,590,000
Penicillin 0.1 unit/ml	2,516,000	3,290,000	3,615,000
After	6,400	6,400	6,800
	Subject #2		
Before	5,400,000	6,500,000	6,640,000
Penicillin 0.1 unit/ml	1,780,000	1,676,000	1,790,000
After	212,000	333,000	293,000
	Subject #3		
Before	64,460,000	73,500,000	59,000,000
Penicillin 1.0 unit/ml	56,700,000	57,600,000	60,700,000
After	35,500,000	36,750,000	39,500,000

*Averages of duplicate examinations daily over 5 days in each testing period.

TABLE 2—THE EFFECTS OF STREPTOMYCIN ON THE HUMAN INTESTINAL COLIFORM BACTERIA*

Testing period	Counts/gm Endo agar	MacConkey agar	Violet Red bile agar
	Subject #4		
Before	5,610,000	6,330,000	4,580,000
Streptomycin 0.5 mgm/ml	640,000	440,000	720,000
After	20,700,000	20,000,000	21,200,000
	Subject #5		
Before	12,800,000	12,400,000	13,600,000
Streptomycin 0.5 mgm/ml	62,580	42,600	42,600
After	5,420,000	5,460,000	5,680,000
	Subject #6		
Before	1,800,000	2,600,000	2,900,000
Streptomycin 1.0 bgm/ml	603,000	602,000	662,560
After	31,600,000	46,200,000	47,200,000
	Subject #7		
Before	65,450,000	53,990,000	68,980,000
Streptomycin 1.0 mgm/ml	527,000	803,000	927,000
After	52,400,000	61,800,000	58,400,000

*Averages of duplicate examinations daily over 5 days in each testing period.

to produce penicillinase which destroys penicillin. However, the two subjects receiving 0.1 unit per ml showed greatly decreased counts for the period following antibiotic administration. No logical explanation can be offered for this unexpected reduction. There was no similar occurrence with any of the other antibiotics studied.

The streptomycin studies with four subjects, reported in table 2, indicate that this antibiotic was highly specific in inhibiting the growth of the coliform bacteria in the human intestine. Streptomycin is known to be very effective against intestinal coliform bacteria. In every case during antibiotic therapy the counts were drastically lowered compared to the results of the pre-antibiotic control period. The lower level of 0.5 mgm per ml was as effective as 1.0 mgm per ml. The numbers, however, increased markedly during the post-antibiotic period when the subject's diet was free from any source of antibiotic.

Aureomycin, which has a wide antibacterial spectrum, was ingested by three subjects. The results appear in table 3. Aureomycin was very effective in reducing the numbers of intestinal coliform bacteria during the antibiotic period. The only exception was subject No. 9, who later was found to be suffering from chronic colitis. This condition explains the high number of coliform organisms in the stool. Fifteen days after the last antibiotic feedings, the numbers of coliform bacteria increased, corresponding to the counts of the pre-control specimens.

DISCUSSION

Since antibiotics are widely used in the treatment of bovine mastitis, it is important to know whether residual antibiotics have any effect on the intestinal flora of persons ingesting the milk. From the results obtained with residual levels of streptomycin and aureomycin in market milk, it is concluded that the population of coliform bacteria in the intestinal tract can be reduced by ingestion of these antibiotics. No attempt was made to correlate the studies with biosynthesis of vitamins, hence it is not known whether the reduction in numbers of bacteria would be sufficient to reduce the amount of

TABLE 3—THE EFFECTS OF AUREOMYCIN ON THE HUMAN INTESTINAL COLIFORM BACTERIA*

Testing period	Counts/gm Endo agar	MacConkey agar	Violet Red bile agar
	Subject #8		
Before	85,020,000	67,600,000	66,600,000
Aureomycin 0.25 mcgm/ml	15,800,000	15,740,000	15,800,000
After	77,400,000	75,600,000	76,600,000
	Subject #9		
Before	999,000,000	1,100,000,000	839,000,000
Aureomycin 0.25 mcgm/ml	1,585,000,000	1,440,000,000	1,467,000,000
After	344,000,000	344,000,000	342,000,000
	Subject #10		
Before	4,600,000	4,950,000	3,796,000
Aureomycin 0.50 mcgm/ml	298,000	330,000	296,800
After	4,800,000	5,000,000	4,600,000

*Averages of duplicate examinations daily over 5 days in each testing period.

certain vitamins available to the host. It is apparent that great differences occur between individuals and also day to day in the same individual in the population of coliform bacteria in the intestinal tract. It is reasonable to assume that there is a minimum number of bacteria required to produce minimum vitamin requirements and that practices which serve to reduce the number may at some time be injurious to the host. This suggests that the indiscriminant use of antibiotics for the treatment of mastitis might have an adverse effect on the nutrition of persons consuming milk from such cows.

SUMMARY

Residual levels of penicillin, streptomycin, and aureomycin in market milk were tested for their action on the intestinal coliform bacteria of ten human subjects. The results indicate that the presence of concentrations of 1.0 mgm (500 mgm per day) or 0.1 mgm (50 mgm per day) of streptomycin per ml of milk, and 0.50 mcgm (250 mcgm per day) or 0.25 mcgm (125 mcgm per day) of aureomycin per ml of milk, significantly lowered the number of human intestinal bacteria, with the exception of one subject who was suffering from chronic colitis. Penicillin was without effect except for an unexplained reduction in numbers following but not during antibiotic ingestion by two subjects. It is reasoned that the presence of certain antibiotics in milk would then cause a decrease in the synthesis of beneficial vitamins to the extent that these are contributed by the growth of bacteria in the human intestinal tract.

ACKNOWLEDGMENTS

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STUDY OF FEDERAL FOOD, DRUG, AND COSMETIC ACT

This Act is the principal statute of the United States Food and Drug Law. Instruction in it is now provided by the Harvard Law School, at both undergraduate and graduate levels.

A 91-page legal study of this Act by editors of the *Harvard Law Review* in its February issue. This is the first law review study of the kind, and promises to have a basic educational effect in the law school world and elsewhere. For it is a modern and comprehensive legal study of this Act, of great value to all interested; and there is nothing that presently compares with it.

The Food Law Institute, Inc. has ordered two thousand reprints of this study, for wide distribution; and they will bear its imprint. Each FLI trustee and advisory lawyer will soon receive a copy; and additional copies will be given on request. The International Association of Milk and Food Sanitarians, Inc., is a member of this Institute.

PROCEDURE FOR THE SEPARATION, DETECTION, AND IDENTIFICATION OF THE MORE COMMON VEGETABLE GUMS IN DAIRY PRODUCTS, WITH SPECIAL REFERENCE TO ALGINATES

HERMAN N. BUNDESEN, M.D., AND MATHEW J. MARTINEK, B.S.,
Board of Health, City of Chicago

A procedure is presented for detecting the more common vegetable gums in dairy products. Alginates are separated, in the presence of other gums, by precipitation as algenic acid and redissolving from the protein precipitate with a saturated solution of magnesium sulphate. Alginates are identified by their color reaction with ferric sulfuric acid reagent. The characteristics and test reactions to aid in the detection and differentiation of other gums are given. The various gums can be identified in concentrations as low as 0.1 gram per 100 grams of product.

INTRODUCTION

A method is here presented by which alginates, in the presence of other gums, can be separated from dairy products, such as cultured milks, sour cream, chocolate drink, and ice cream. The method is based upon our finding that alginates, in the form of precipitated algenic acid, form soluble salts with magnesium ions.

We have adopted, with certain changes, the method of Racicot and Ferguson,[1] also described with modifications, in the *Methods of Analysis of the Association of Official Agricultural Chemists*[2] under the heading: "Gums in Soft Curd Cheese." By this method, trichloroacetic acid is used to precipitate protein, keeping the gums in solution. Alcohol is then used to precipitate the gum from the protein-free solution. Although this method is satisfactory for the separation of most gums from dairy products, it fails to separate the alginates because trichloro-acetic acid precipitates both the proteins and the alginates. By our procedure, the algenic acid is recovered from the protein solids by redissolving with a saturated solution of magnesium sulfate.

Preliminary investigations were made to determine at what pH the complete coagulation and separation of the casein occurs without precipitation of the gums. Although the isoelectric point for casein coagulation is known to be at a pH of 4.73, it was found that a more complete coagulation, with subsequent clarification of the whey, occurred at a pH of 3.5, especially if the gums were present in the sample. Tests were made to determine if any of the gums would also precipitate at this pH. One-tenth percent water suspensions of the following gums were prepared: acacia, locust or carob bean, tragacanth, karaya, agar, Irish moss, and alginate. Glacial acetic acid was added drop by drop to bring the solution to a pH of 3.5, the solution being tested after each addition with a Beckmann pH meter. Any suitable pH indicator-paper can also be used in place of the meter. None of the gums were found to precipitate at this PH. It was also found that in some instances some of the alginates were occluded in the coagulated casein, whether the coagulation occurred at pH 4.73 or 3.5. Therefore, the lower pH was chosen as the most suitable for our purpose.

PROCEDURE FOR THE SEPARATION OF GUMS FROM DAIRY PRODUCTS

Samples of cultured milk (acidophilus), sour cream, chocolate milk, and ice cream were prepared, one of each to which nothing was added, one of each to contain sodium alginate, one of each to contain one of the other gums, and one of each to contain both sodium alginate and one of the other gums, a total of 36 samples. The maximum amount of any of the gums added was 0.1 gram per 100 grams of sample.* These samples were individually analyzed for gums by the following procedure:

Add 100 ml of hot water to 100 grams of sample in a 250-ml beaker. Add glacial acetic acid, drop by drop, testing the mixture with a Beckmann pH meter after each addition. Continue this procedure until a pH of 3.5 is reached. Heat the sample on a hot water bath at 70°C until complete coagulation of the casein occurs, indicated by clearing of the solution. Remove any fat which separates during the heating process by cooling the mixture, adding a small quantity of petroleum ether, rotating the beaker, and decanting the ether solution. Repeat this ether treatment after intervals of heating until most of the fat is removed. Filter the mixture or centrifugalize at 2000 rpm, or both, depending on the clarity of the solution.

If centrifugation is resorted to, in order to facilitate a better removal of the lower liquid portion from the solid upper layer, a "pipette guard"[3] can be inserted into the centrifuge tube or bottle. In place of the "pipette guard," a piece of glass tubing, 8 mm inside diameter, can be used. Insert the tube into a slotted rubber stopper and insert the stopper into the centrifuge tube or bottle, allowing the tube to extend one inch above the bottle. Close the glass tube

*This concentration of gum gives distinctly positive tests and is the minimum amount that would be added ordinarily to dairy products.

Dr. Herman N. Bundesen was educated at Northwestern University, and the U. S. Army Medical School, 1911. He became health officer in the Chicago Department of Health in 1914, and then Assistant Bureau Chief and City Epidemiologist. In 1922, he was appointed Commissioner of Health, and has been President of the Chicago Board of Health since 1931. He is a member of numerous medical and civic commissions and professional associations, and has written and lectured extensively on medical subjects, particularly child health.

with a small rubber stopper at the lower end. After the material is centrifugalized, push the bottom rubber stopper out of the tube with a pipette inserted through the tube. Remove the lower liquid layer by means of the pipette. Recover, also, the coagulated protein, designated as "B," which is to be analyzed for alginates.

Evaporate the solution obtained after centrifugation to 50 ml on the steam bath, cooling and treating with 15 ml of freshly prepared (50% by weight) trichloro-acetic acid solution. By this treatment, protein in solution is precipitated with the algenic acid. The solution contains the other gums. Centrifugalize the solution at 2000 rpm for 15 minutes. If the solution after centrifugation is cloudy, incomplete precipitation of the protein is indicated. In this case, redissolve the precipitate in 50 ml of hot water and reprecipitate with trichloroacetic acid. Again separate by centrifugation. Designate the deproteinized solution as "A" and later test for gums other than alginates. Designate all of the precipitated residues as "C" and later test for alginates.

To the solution marked "A," preferably in a graduated cylinder, add five times its volume of 95% alcohol. Allow any precipitate formed to settle by standing over night. If gums are present in less than 0.1%, the standing over night is necessary to obtain complete precipitation. The nature of the precipitate from the alcoholic solution may give some clue as to what gum is present. (This will be discussed later.) Carefully decant all of the supernatant alcoholic liquid, other than the bottom 50 ml containing the precipitated gum, and discard.

Shake the remaining liquid with the gum to loosen the gum adhering to the cylinder, pour into a 50-ml centrifuge tube and centrifugalize at 2000 rpm for 5 minutes. Wash the residue a few times with 20 ml of 70% alcohol, shaking well, centrifugalizing and draining the supernatant liquid each time to remove all traces of lactose. Dissolve the residue, designated as "D," in 35 ml of hot water, and save for the identification of the gums other than alginates.

Treat the residue "C", which contains the alginates if present, with 25 ml of saturated magnesium sulfate solution and heat on the water bath for 20 minutes. By this treatment, alginates are dissolved while the proteins are not. Centrifugalize the solution as described previously and save the clear solution. Discard the residue. Treat the solution with five times its volume of 95% alcohol in a cylindrical graduate. At this point, the magnesium sulfate separates out of the solution as crystals and quickly settles to the bottom of the cylinder. To remove the magnesium sulfate crystals, immediately decant the supernatant liquid into another cylinder before the gums can settle, and allow to stand over night. Decant the supernatant alcohol liquid, other than the bottom 50 ml containing alginates, and discard.

Shake the remaining solution containing the alginates to loosen the adhering gum, pour into a 50-ml centrifuge tube, and centrifugalize at 2000 rpm for 5 minutes. Wash the residue with 70% alcohol, as described above, to remove any lactose that might be present. Designate this residue as "E", save, and later test for alginates.

If alginates are not found in residue "E" after the identification tests are made, the casein residue "B", obtained from the original solution "A" may contain alginates, due to occlusion in the casein and, therefore, should be tested for alginates with the magnesium sulfate solution as described above. The treatment of residue "C" in most instances is unnecessary, except in the case of sour cream and ice cream.

VERIFICATION TESTS TO ESTABLISH THE PRESSENCE OF GUMS

Use the solution marked "D" for these tests.

1. To prove the absence of lactose, boil eight drops of the gum solution with 5 ml of Benedict's Qualitative Solution. A negative test, that is, no reduction, indicates the absence of lactose.

2. To prove the absence of protein, perform a Biuret test. Add 1 ml of 10% sodium hydroxide to 1 ml of gum solution. Then add 0.5% copper sulfate solution, drop by drop, noting the color after each addition. The absence of violet color indicates the absence of proteins.

3. To prove the presence of gum, perform a Molisch carbohydrate test. Add 2 drops of a 10% solution of alpha-naphtol in chloroform. Underlay the mixture with concentrated sulfuric acid. A red ring at the unction of the two liquids indicates the presence of carbohydrates.

If above tests No. 1 and No. 2, are negative and the solution after hydrolysis gives a positive Benedict's test, the presence of vegetable gums is established. To hydrolyze the solution, transfer about 12 ml of solution "D" to a 50-ml beaker, add 2 ml of concentrated hydrochloric acid, and boil gently for 2 minutes. Perform Benedict's qualitative test, using 8 drops of the hydrolyzed solution. A positive test indicates the presence of gums.

4. To further prove the presence of gums, perform Tollens' test on a 5-ml portion of the hydrolyzed solution. Transfer 5 ml of the solution to a test tube, heat to boiling, and add a few crystals of phloroglucinol. A cherry red or deep amber color indicates the presence of gums. The Tollens' test gives a yellow colored solution which turns purple on standing if alginates are present, instead of the cherry or deep red color obtained with other gums.

5. Another test is that of Seliwanoff. Transfer 5 ml of the hydrolyzed solution to a test tube, heat to boiling, and add a few milligrams of resorcinol. A red color indicates the presence of gums.

Perform all of the above-described tests on residues "B" and "C" by taking a small portion of the residue, dissolving in hot water, and performing all of the verification tests on the solution before and after hydrolysis to determine the presence of alginates. The balance of residues "B" and "C" is saved for the identification test.

IDENTIFICATION TESTS FOR GUMS

The character of the precipitate from alcohol may give some indication of the gum present. Following

TABLE 1.—TEST REACTIONS TO AID IN THE DIFFERENTIATION OF VEGETABLE GUMS

To 3 ml of the Unknown Solution "D" (not hydrolyzed), add 0.5 ml of *Million's Reagent.*

Group I	*Group II*	*Group III*
Solution gelatinizes; may be: Irish moss, Agar, Locust bean	*Voluminous flocculent precipitate forms which does not settle;* may be: Tragacanth	*Powdery or curdy precipitate forms;* may be: Acacia, Karaya

To 3 ml of the Unknown Solution "D" (not hydrolyzed), add the following reagents:

Sodium tetraborate, 4%	Potassium hydroxide, 10%	Phosphoric Acid, Conc.
Solution gels: Locust bean is indicated. All other gums are not affected.	*A bright yellow precipitate forms:* Tragacanth is indicated.	*Solution turns pink:* Karaya is present.
	Solution gels: Irish moss is indicated.	
	A white precipitate forms: Karaya is indicated.	

To 3 ml of Unknown Solution "D" (not hydrolyzed), add the following: Million's Reagent

A precipitate forms which dissolves in excess of reagent: Acacia is indicated.

are the important characteristics:

Acacia produces a fine granular, non-adherent precipitate which settles to the bottom.

Locust or carob bean gives a stringy, opaque, non-adherent precipitate.

Tragacanth gives a long, stringy, adherent precipitate.

Karaya gives fine filamentous, non-adherent particles.

Irish moss gives a translucent, stringy, adherent precipitate.

Agar gives a heavy flocculent, adherent precipitate.

Alginates give a white, flocculent precipitate which settles to the bottom.

Table 1 gives the reactions of some of the gums to aid in their differentiation.[4]

Following are some of the specific reactions of gums which may help to identify them.

Acacia: With one drop of Millon's reagent, a white precipitate forms slowly. No precipitate will form if an excess of Millon's reagent is added, as in the case of Irish moss.

Locust or Carob Bean: Iodine solution, when added to a solution of the gum, produces a purplish coloration. A 4% sodium tetraborate solution causes the gum solution to gel. No other gum reacts in this way.

Tragacanth: A deep yellow, stringy precipitate is formed when the gum solution is boiled with 4 drops of a 10% ferric chloride solution. Acacia gives a faint yellow tinge. Other gums do not. A stringy precipitate is formed on heating the gum solution with Schweitzer's reagent.*

Karaya: A white precipitate is formed when one drop of 10% potassium hydroxide solution is added to the gum solution. The precipitate settles out on standing four to five minutes. This differentiates karaya from other gums which take a much longer time to settle.

A pink coloration develops when a solution of the gum is boiled either with concentrated phosphoric acid or concentrated hydrochloric acid.

Agar: Iodine solution gives a violet red color when added to a solution of this gum (U.S.P. test[5]). Other gums do not give this color, but dextrin does give a positive test.

Irish Moss: A 10% ferric chloride solution produces a light colored, opaque precipitate which forms immediately. Irish moss gives a stringy, opaque precipitate with a 10% thorium nitrate solution. If a firm transparent precipitate is formed, pectin may be present.

ALGINATES: The residues "B" and "C" are tested for alginates as follows: Dry the residue by warming the tube in hot water and blowing air into it until there is no further odor of alcohol. Dissolve the dry residue by shaking with 0.2 ml of N/10 sodium hydroxide. Add 1ml of ferric sulfuric acid reagent*, shake, and let stand at room temperature. If alginates are present, within a few minutes to several hours, depending upon the amount of algenic acid present, the solution will turn pink, deepening to cherry red, and finally becoming a deep purple. None of the other gums interfere with this test nor do starch and gelatine.

CONCLUSION

A procedure is presented for detecting the more common vegetable gums in dairy products. The various gums can be identified in concentrations as low as 0.1 gram per 100 grams of product.

Tests indicate that the milk in farm bulk tanks can be tested for sediment by using a 1 quart mixed milk sample and concentrating the sediment on ¼ the area of a stand-

*(Prepare Schweitzer's reagent by adding a solution of copper sulfate to a solution of sodium hydroxide, leaving a slight excess of sodium hydroxide. Separate the copper hydroxide by filtering and thoroughly wash with water. Dissolve the washed precipitate in concentrated ammonium hydroxide with heating. Cool the solution, filter and keep in the dark. Prepare a fresh solution each time just before use.)

*(Prepare the ferric sulfuric acid reagent by precipitating ferric hydroxide from ferric chloride solution with ammonium hydroxide. Wash the ferric hydroxide until neutral and dry in a steam bath. To the dry ferric oxide, add concentrated sulfuric acid, shake, and allow the solution to stand for several days. Decant the clear sulfuric acid solution from any excess ferric oxide.)

Continued on Page 105

A STUDY OF MIXED MILK SAMPLE METHODS OF SEDIMENT TESTING USING OFF-THE-BOTTOM STANDARDS AND EQUIPMENT, FOR POSSIBLE USE WITH FARM BULK MILK HOLDING TANKS *, **, ***

B. J. Liska and H. E. Calbert
Department of Dairy and Food Industries
University of Wisconsin, Madison, Wisconsin

Tests indicate that the milk in farm bulk tanks can be tested for sediment by using a 1 quart mixed milk sample and concentrating the sediment on ¼ the area of a standard sediment disc or by using a 1 pint sample with the sediment concentrated on ⅛ the area of a standard disc. Off-the-bottom sediment standards can be used for evaluating the grades of these modified discs. Results of these modified tests are comparable to those obtained by the present standard off-the-bottom method on ten gallon cans.

It is mandatory in several states that milk, as it is received from producers, be tested for sediment at regular intervals.[2, 3, 4] The standard off-the-bottom method of testing for sediment in milk has been devised for use when milk is handled in ten gallon cans.[1] This method is not applicable to farm bulk milk holding tanks for numerous reasons. Some of these are:

1. The ratio of bottom surface area to total volume varies with the type and size of farm bulk milk tank.

2. The design of the tanks to allow for complete drainage of milk causes sediment to settle out in an uneven pattern.

3. On many farm holding tanks the mechanical agitator is set in operation whenever the refrigeration mechanism is in operation. This does not allow a definite period of quiescence needed for settling out of sediment.

4. There is difficulty in using the standard off-the-bottom sediment pumps because the depth of farm bulk milk tanks in some cases exceeds the over-all length of the sediment pump. This adds to the problem of getting representative results.

It is apparent that a mixed milk sample for the sediment test would be most practical for use with farm bulk milk holding tanks. It also would be desirable if the same standards and equipment used for the off-the-bottom sediment tests could be used for sediment testing of mixed milk samples.

This study had two main objectives. The first was to determine the volume of a mixed milk sample that was needed to give a sediment test comparable to the off-the-bottom method. The second objective was to compare mixed milk sediment testing with off-the-bottom sediment tests using currently accepted standards for off-the-bottom sediment tests.

Volume of Mixed Milk Sample to Duplicate Off-The-Bottom Test

For each series of the observations in this study, 40 gallons of milk were placed in a 50-gallon round vat, and a known amount of standard sediment was added. The contents of the tank were mechanically agitated by an agitator operating at 48 RPM. The agitator was kept in operation throughout the period of sampling. After a 5-minute period of agitation, 10 gallons of milk were withdrawn into an ordinary milk can and held for two hours. A standard off-the-bottom sediment test was made on the can following this period of quiescence.

Simultaneously with removal of the 10-gallon sample of milk from the tank, pads were prepared containing the sediment from various volumes of mixed milk from the tank. A Perfection Vacuumatic Filter was used to draw the milk through the cotton discs and deposit the sediment on the area of the disc with a 1.25-inch diameter. Five pads, each containing the sediment from one quart of mixed milk, were made. Next a like number of pads were prepared each containing the sediment from two quarts of the mixed milk in the tank. This was repeated for the same number of pads using 3, 4, 5, and 6 quarts of the mixed milk sample per pad. This group of pads, 5 pads each containing the sediment from one quart of mixed milk, 5 pads each containing the sediment from two quarts of mixed milk, etc., at 1 quart intervals up to the last 5 pads which each contain sediment from six quarts of mixed milk sample was compared to the standard off-the-bottom pad taken from the 10 gallon sample drawn off at the start. Judges were instructed to compare the pads as follows:

H. E. Calbert

1. If the mixed milk sample pad appeared to contain less sediment than the corresponding off-the-bottom pad it was scored as minus (−).

2. If the mixed sample pad appeared to contain approximately the same amount of sediment as the corresponding off-the-bottom pad it was scored equal (=).

3. If the mixed sample pad appeared to contain more sediment than the off-the-bottom pad corresponding to it, a score of plus (+) was given the pad.

This procedure was carried out with varying amounts of standard sediment in the milk ranging in concentrations from 20 mg per 10 gallons of milk to 75 mg per 10 gallons. The results of these observa-

*Approved for publication by the Director of the Wisconsin Agricultural Experiment Station.

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TABLE 1. VOLUME OF MIXED MILK FOR SEDIMENT TEST TO DUPLICATE OFF-THE-BOTTOM TEST

	Volume of mixed milk sample					
	1 Qt.	2 Qt.	3 Qt.	4 Qt.	5 Qt.	6 Qt.
No. of observations	100	100	100	100	100	100
No. with less sediment than O.B.* pad (−)	100	98	62	7	3	0
No. with more sediment than O.B.* pad (+)	0	0	0	16	68	95
No. with same sediment as O.B.* pad	0	2	38	77	29	5
% of agreement with O.B.* pad	0%	2%	38%	77%	29%	5%

*O.B. signifies off-the-bottom

tions appear in table 1.

These results indicate that the highest percentage of agreement between the mixed milk sample pads and standard off-the-bottom pads is reached when a pad contains the sediment from 4 quarts mixed milk sample.

These findings are in general agreement with those of Watson.[5] He has devised a sediment test for farm bulk milk holding tanks by using a one pint sample of mixed milk and concentrating the sediment from this sample on one-eighth the area of a standard 1.25 in. sediment pad.[6] Watson's method is based on conclusions from his previous work that the sediment from a one gallon sample of mixed milk is equivalent to the sediment from a one pint sample taken off-the-bottom of a ten gallon can of the milk.

GRADING SEDIMENT PADS WITH VARIOUS AREAS EXPOSED TO VIEW

The use of a one gallon sample of mixed milk for a sediment test would not be very practical. It would involve special equipment and require extra time when testing the milk in the farm bulk holding tanks. By using a smaller sample and concentrating the sediment on a proportionately smaller area, it would be possible to use standard sediment testing equipment. One method would be to use a standard 32 oz. (1 quart) sediment tester with a sediment pad having a diameter of 0.64 in. This would give a filtering surface of approximately one-fourth the area of the standard pad. Another possibility would be to use the 16 oz. (1 pint) sediment tester and a filtering surface of 0.44 in. diameter (approximately one-eighth area of standard pad).

A limitation of the use of this type of equipment for sediment testing mixed milk samples from farm bulk milk tanks would be the ability of the observer to evaluate these reduced area sediment pads in terms of currently recognized grades for standard off-the-bottom pads.

The following experiment was devised to determine the ability of judges to grade sediment pads with reduced areas, using the same standards as for the off-the-bottom sediment test.

Standards used for comparison in this study were those established by the Wisconsin State Department of Agriculture for grading standard off-the-bottom sediment pads.[4] In these standards, a No. 1 standard disc shall contain no sediment, a No. 2 standard disc shall contain 0.5 mg of sediment, the No. 3 disc shall contain 2.5 mg of sediment and the No. 4 disc shall contain in excess of 2.5 mg of sediment. The standard sediment used in making the sediment pads was prepared according to Standard Methods.[1] Ten persons from the departmental staff were chosen to evaluate each series of sediment pads.

Sediment pads were prepared, using rapid flow cotton discs, according to Standard Methods.[1] These were purposely made to resemble the four standard grades, namely, No. 1, No. 2, No. 3 and No. 4 or reject grade.

Judges were instructed to rate the pads as follows: All pads containing less sediment than a standard grade 3 pad were to be rated to the nearest grade. Those with more sediment than a grade 3 were to be placed in grade 4.

A total of 480 observations were made of the prepared sediment pads with the entire area of the pad exposed to view. As shown in table 2,427 observations as to the grade of the pads were correct.

The same pads were rearranged, then covered with a piece of white paper having a round opening 0.64-inch diameter This left an area exposed to view equivalent to approximately one-fourth of the total area of the pad. Standards used for comparison were covered in the same manner. Judges were instructed to rate these pads as they normally would full size pads.

As shown in table 2, of the 480 observations, the correct grade was given in 429 instances.

Again this same lot of pads was rearranged and covered with pieces of white paper. This time the papers had openings of 0.44-inch diameter, thus exposing approximately one-eighth the area of the standard pad. Standards were covered similarly and pads were graded. The results of these observations are shown in the last column of table 2. It will be noted that 430 correct grades were given out of the total of 480 observations.

The per cent of correct observations was 88.96% when the entire area of the sediment pad was graded, 89.38% when one-fourth the area was graded, and 89.58% when only one-eighth the area of the pad was exposed. The conclusion may be drawn from the above data that there is no significant difference in the number of correct observations when either the entire, one-fourth or one-

TABLE 2. GRADING PREPARED OFF-THE-BOTTOM SEDIMENT PADS WITH VARIOUS AREAS EXPOSED TO VIEW.

	Portion of area exposed		
	Entire Area	¼ Area	⅛ Area
No. of observations	480	480	480
No. of correct grades	427	429	430
% of grades correct	88.96%	89.38%	89.58%

eighth of the area of the sediment pad is exposed to view. It must be noted, however, that these pads were especially prepared to represent one of the standard grades. No doubt the percent of correct observations would be greatly reduced if pads containing, say more sediment than a number two but less than a number three, had been included in this group for grading.

USE OF STANDARD AND MODIFIED METHODS OF SEDIMENT TESTING

This last group of experiments was devised to test the applicability of using the modified methods of testing mixed samples of milk for sediment and comparing them with the off-the-bottom method.

The sediment pads for this series were prepared as follows: known amounts of standard sediment, ranging from 10 mg per 10 gallons of milk to 150 mg per 10 gallons of milk, were added to 40 gallons of milk in a 50-gallon round vat.

The contents of the vat were agitated by a mechanical agitator operating at 48 RPM for 5 minutes. After this period of agitation 10 gallons of milk were withdrawn, with agitator in operation, into an ordinary milk can. This can of milk was allowed to stand for two hours and a standard off-the-bottom sediment test was made on it. Beginning immediately after withdrawal of the ten gallon can of milk a series of mixed milk sample tests were made on the milk remaining in the tank, with agitator in operation. "Small disc" pads were prepared by concentrating the sediment from one quart of the mixed milk on one-fourth of the normal area of the standard sediment pad. To accomplish this a stainless steel disc with an opening in the center of 0.64-inch diameter was soldered into a sediment pump head. The cotton pads were placed on top of the stainless steel disc and a quart mixed milk sample forced through them by use of a 32 oz. sediment tester. Other sets of "small disc" pads were made by concentrating the sediment from one pint of the mixed milk on one-eighth the usual area. Here a stainless steel disc with an opening in the center of 0.44-inch diameter was soldered into the sediment pump head used, and a one pint sediment tester used. In this manner by reducing the size of the mixed milk sample and the area of the sediment pads, these procedures theoretically are equivalent to using a one gallon mixed sample.

TABLE 3. GRADING SEDIMENT PADS FROM IDENTICAL MILK BY OFF-THE-BOTTOM AND MODIFIED METHODS.

	Off-the-bottom Pads	1 Qt. mixed Sample ¼ area	1 Pt. mixed Sample ⅛ area
No. observations	320	1360	1360
No. observations in agreement	269	1172	1132
% of observations in agreement	84.07	86.18	83.24

The samples of milk were discharged through the cotton discs into a different container to keep the concentration of sediment in the milk uniform throughout sampling. The pads were mounted on separate cards and evaluated by a panel of judges. The results of this experiment are shown in table 3.

Of a total of 320 observations of sediment pads from off-the-bottom This represented 84.07 per cent of the observations in agreement. When grading the sediment pads from 1 quart mixed milk samples, the judges agreed in 1172 observations out of 1360. This represented an agreement of 86.18% An agreement of 83.24% was reached when grading the sediment pads from 1 pint samples of mixed milk. In this case the judges agreed on the grade of 1132 pads out of 1360.

All grades ranging from 1 to 4 were represented in the above groups of sediment pads. It can be concluded from the above data that approximately the same degree of accuracy can be obtained when using the modified mixed milk sample method of sediment testing as would be obtained with the standard off-the-bottom sediment test.

CONCLUSIONS

The merits of the sediment test for grading milk are influenced by many factors. Weckel[7] summarizes these as follows:

"1. Geographic, climatic, and physical conditions prevailing at time of milking.

"2. Characteristics of the milk at the time of performing the sediment test.

"3. Procedure or performance of the test for extraneous material.

"4. Interpretation of the completed test."

Since the sediment test is subject to many factors that might influence its accuracy when used for grading milk, the variations introduced in order to adapt the sediment test to new types of dairy equipment should be kept to a minimum. Standards and methods for making the sediment test on 10-gallon cans of milk have been generally accepted. If these same standards and the same equipment with only slight modifications, can be used for sediment testing of milk in farm bulk milk holding tanks, the confusion created by the establishment of new sets of standards and new methods of testing will be avoided.

The use of a mixed milk sample for sediment testing farm bulk milk holding tanks is necessary if currently accepted standards for off-the-bottom sediment tests are to be continued in use. The findings above have shown that the greatest agreement between the mixed milk sample and the off-the-bottom sediment test can be obtained when a 4-quart sample of mixed milk is used. This same relationship has been observed by other workers in this field. By reducing the sample of mixed milk and also reducing correspondingly the size of the filter area, it is possible to obtain mixed milk samples from holding tanks using standard sediment testors. This may be accomplished by the use of the 32-oz. testor with a modified filtering area of one-fourth the size of the standard sediment disc or with the 1-pint sediment testor and a filtering area of one-eighth that of the standard disc.

The data obtained under the limitations of this research work indicate that judges are able to evaluate the grade of these modified sediment discs with about the

same degree of accuracy as obtained with the standard off-the-bottom sediment pads. The same standards as are currently accepted for the off-the-bottom sediment test can be used for evaluating the sediment pads obtained by these modified methods.

SUMMARY

Taking into consideration all the normal variations in any test such as the sediment test, it appears that farm bulk tanks can be tested for sediment by using the "small disc" mixed milk sample method of concentrating the sediment from one quart of mixed milk on one-fourth the area of the normal sediment disc or that from one pint on one-eighth the area of a normal disc. Off-the-bottom sediment standards can be used for evaluating the grades of these modified discs. The results can be compared to those obtainable by the present standard off-the-bottom method on ten gallon cans. A careful procedure must be followed, using a sediment pump in good working condition checked for accuracy according to Standard Methods. By taking the sediment tests on farm bulk milk tanks with the "small disc" mixed sample method, accuracy expected can be as good as the ability of the person to evaluate the pads according to present standards.

ACKNOWLEDGMENT

To all the staff members who were so generous with their time in being members of the judging panel.

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34TH ANNUAL MEETING NATIONAL HEALTH COUNCIL

The 1954 National Health Forum, to be held at the Hotel Statler, New York City, as part of the thirty-fourth annual meeting of the National Health Council March 24 to 26, will focus on "Changing Factors in Staffing America's Health Services."

Announcement that this year's Forum would concern itself with the knotty problem of how to assure adequate health personnel for the nation was made by Dr. William P. Shepard, vice president of the Metropolitan Life Insurance Company, appointed Forum chairman by Albert W. Dent, president of the National Health Council and president of Dillard University, New Orleans.

Dr. Franklin D. Murphy, Chancellor of the University of Kansas, will speak at the dinner which will close the Forum on Thursday evening, March 25. As dean of the University's School of Medicine before he took his present position in 1951, Dr. Murphy instituted the "Kansas Rural Health Plan" which has been hailed all over the country as a means to bringing better medical care to small town and country dwellers.

The Kansas program is three-fold, involving expansion of the Medical School's facilities to permit increased enrollment, help to doctorless communities in planning a "medical workshop" to attract a practitioner, and making post-graduate courses more readily available to all doctors in the state.

The National Health Council, a coordinating body among 42 national organizations and professional societies in the health field, sponsors the National Health Forum each year.

Dr. Shepard said that the Forum, through group discussions, would give special consideration to such "changing factors," affecting most or all of the health fields, as the growing emphasis on rehabilitation, changing military requirements, increase in the number and variety of occupational health programs, and greater importance of vocational counselling.

"We anticipate wide interest in the meeting because nearly everyone trying to get a health job done often finds himself handicapped or even hobbled by staffing problems," said Dr. Shepard, who has had wide and varied experience, including the direction of a local health department and a 10-year chairmanship of the American Public Health Association's Committee on Professional Education.

He is now a member of the Health Resources Advisory Committee, Office of Defense Mobilization, and is a former president of the American Public Health Association and of the National Tuberculosis Association. He was for twenty-five years clinical professor of public health and preventive medicine at Stanford University Medical School.

Philip E. Ryan, executive director of the Council, said that the accommodations available for the meeting are somewhat limited and the rule must therefore be "first come first served."

"Through the cooperation of the Council's member organizations reservation blanks will be mailed rather widely as soon as a preliminary program can be printed," said Mr. Ryan. "Obviously we cannot reach everyone in the health, education, and vocational guidance fields who may care to attend. Any one wishing to make sure there is room for him or her at the Forum should write the Council now, and a reservation blank will be mailed promptly."

BACTERIOLOGICAL STUDIES OF A FARM BULK MILK HANDLING SYSTEM[1, 2]

E. H. MARTH, J. E. HUNTER AND W. C. FRAZIER
Department of Bacteriology, University of Wisconsin, Madison

Studies were conducted on the bacteriology of a farm bulk milk handling system. The sanitary condition of two bulk cooling tanks was tested by the swab-contact method. Milk samples were taken under various conditions of storage to determine the time of agitation required to permit representative sampling for bacteriological testing. The milk was sampled for bacteriological analysis after one and two days of storage in the bulk tanks to determine the effect of every-other-day pickup. The milk was sampled at the farm and at the dairy plant to determine the effect of tanker transportation.

Results from these studies indicated that the flat open surfaces of the cooling tanks were generally cleaned in a satisfactory manner but that valves required special care in cleansing. Ninety seconds of agitation permitted representative sampling for bacteriological tests under all test conditions. Neither every-other-day pickup nor tanker transport adversely affected milk quality in the system being studied.

Much has been written in recent years on the economic and sanitary aspects of bulk milk handling at the farm level, but little comprehensive bacteriological work has been reported on farm bulk milk handling systems. This report is based on bacteriological studies of various aspects of a bulk milk handling system in use at a University of Wisconsin farm. The bacteriology of the farm milk pipelines of this system has been discussed in another paper.[4]

Most reports have indicated that the use of bulk tanks on farms has improved milk quality. In a two-day comparison of can milk with bulk milk delivered to a dairy plant, Bartlett[1] reported that the can milk had an average plate count of 180,000 bacteria per ml while the bulk milk averaged less than 30,000 bacteria per ml. Reductions of 55 percent and 65 percent in bacteria counts of milk when can systems were converted to bulk systems of milk handling have been reported by Nelson.[6]

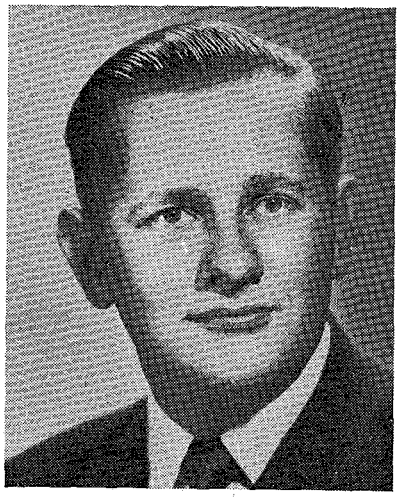
The milk in the bulk tanks generally has been sampled for testing after an agitation period of three or four minutes. In its 1952 tentative 3-A Standards for Farm Bulk Holding and/or Cooling Tanks, the Dairy Industry Committee[2] recommended 5 minutes of agitation before sampling. For bulk tanks constructed in compliance with 3-A tentative standards, Liska and Calbert[3] found that 60 seconds of agitation generally permitted representative sampling for butterfat testing. Directly related to the use of bulk cooling tanks is the tanker transportation of milk from the farm to the plant. The 1953 Public Health Service *Milk Ordinance and Code*[5] established requirements for equipment and procedures connected with bulk transport.

One of the advantages of bulk cooling of milk is the rapidity with which milk is cooled to a temperature at which bacterial growth is minimized. This makes it possible to lengthen the storage time of the milk on the farm without serious loss in bacteriological qaulity. Studies by Nelson[6] have shown that the bacteria count of milk picked up every other day was not significantly different from that of milk picked up daily from the same farm milk handling system.

METHODS

Two different commercially manufactured stainless steel farm bulk milk cooling and holding tanks were employed for these experiments.

Tank A had a capacity of 220 gallons. The interior dimensions were: length, 47 inches; width, 38.5 inches; average depth at the center of the rounded bottom, 32 inches; and refrigerated wall area, 1,829 square inches. The compressor had a power requirement of two horse power. Freon #12 was the refrigerant. Milk was cooled to 38°F as rapidly as three milking machine units supplied it to the tank. The agitator in Tank A had two six-inch by two-inch propellor blades which turned at a speed of 115 revolutions per minute.



Elmer H. Marth was born and raised on a southeastern Wisconsin dairy farm. He graduated from the University of Wisconsin in 1950 with a B. S. in Agriculture (Bacteriology) and in 1952 he received an M. S. in Bacteriology. At present he is continuing graduate work at the same institution.

The capacity of Tank B was 150 gallons. Interior dimensions were: length, 50 inches; width, 31 inches; average depth at the center of the rounded bottom, 29 inches; and refrigerated wall area, 1,036 square inches. The compressor was of three-fourth horsepower size, and employed Freon #12 as the refrigerant. Milk was cooled to 38°F at a slower rate in this tank than in Tank A. The agitator was equipped with five flat fins and turned at a speed of 36 revolutions per minute. The fins were arranged parallel to the shaft with three nine-inch by five-inch fins near the bottom of the shaft and two three-inch by six-inch fins near the top.

The bulk cooling and holding tanks were cleansed and sanitized by the following procedure: (a) the tank surface was rinsed with cool water; (b) the surface was brushed clean with the use of an alkaline detergent (every fourth day an organic acid was used in place of an alkaline detergent); (c) the valves and agitators were disassembled and brushed; (d) all parts were given a final water rinse, and (e) just before milking all milk contact surfaces were sanitized with a 200 ppm chlorine spray.

The surfaces of the tank walls, centerboards, covers, valves, and

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2. The research reported herein was conducted as a part of North Central Regional Research Project NC-3, One Story Dairy Barns and Related Structures.

TABLE 1 — SUMMARY OF THE NUMBER OF TIMES THAT SWAB CONTACT TESTS OF THE COOLING TANKS WERE FOUND TO BE SATISFACTORY AND UNSATISFACTORY
These tests were made after cleansing but before bactericidal treatment of the tank surface.

Tank	Results Of SPC Of Swab Tests	Area of Tank Assembly Tested				
		Wall	Agitator	Center-board	Cover	Valve
A	Satisfactory	10	12	13	12	0
	Unsatisfactory	6	4	3	4	15
B	Satisfactory	11	9	12	9	0
	Unsatisfactory	6	7	4	8	17

SPC = Standard plate count
Satisfactory = Less than 100 colonies per eight square inches
Unsatisfactory = More than 100 colonies per eight square inches

agitator blades were tested by the standard swab-contact method[8] as an indication of the thoroughness of the cleansing procedure. The tests were made after cleansing but before sanitizing since interest was in the evaluation of the effectiveness of the cleansing methods on the different parts of the bulk tank.

The milk in the tanks was sampled under various conditions to determine the best position and time of agitation for taking representative samples. The milk was sampled at the four corners and at the cover sampling port after periods of agitation varying from zero seconds to five minutes, after periods of undisturbed holding of two and twelve hours, and after the addition of one, two, three, and four milkings to the tanks. The 12-hour period was selected as being longer than the usual time (9 or 10 hours) that the milk would remain undisturbed between stopping the agitator and the start of the next milking. Duplicate plates for standard plate counts were made from the milk samples as recommended in Standard Methods.[8] An analysis of variance[7] of the results was made to determine the minimum time of agitation required to permit representative sampling of the milk in bulk tanks for bacteriological testing.

The milk from the bulk cooling tanks was hauled to the receiving plant in an insulated tank trailer. After the milk was unloaded at the plant, the tank trailer was rinsed with cold water, scrubbed clean with an alkaline detergent, and rinsed with hot water. Before use the next morning, the tank was sanitized with a 200 ppm chlorine solution. Milk samples were taken from the bulk tank at the barn before the contents were loaded into the tank truck and upon its arrival at the receiving plant 45 minutes later. The milk from one bulk tank made up the entire load in the transport tank. The milk samples were iced and plated in the laboratory for thermoduric, psychrophilic, and standard plate counts.[8]

The milk in the bulk tanks was picked up every 48 hours, that is, after every four milkings. To determine whether any significant increase in the bacteria count had occurred in the milk during either day of holding, samples were taken after the second and fourth milkings were added, and the entire contents of the tank agitated and cooled. These samples were iced and plated for thermoduric, psychrophilic, and standard plate counts.[8]

RESULTS

The 1953 Recommendations of the Public Health Service *Milk Ordinance and Code*[5] established a sanitary standard for dairy equipment after cleansing and sanitizing of less than 100 colonies per eight square inches of milk contact surface in three out of four swab contact tests. Swab contact tests of the milk contact surfaces in the cooling tanks were made to determine the effectiveness of the cleansing procedure on all parts of the tank assembly. The standard of the Public Health Service was not strictly applicable here since the bactericidal treatment of the tank surfaces had not been given at the time of these tests; however, comparison of the swab test results with this standard does give an indication of the effectiveness of the cleansing technique.

Table 1 summarizes the number

TABLE 2 — MODES AND MAXIMUMS OF THE STANDARD, THERMODURIC AND PSYCHROPHILIC PLATE COUNTS
(Per eight square inches of the milk contact surfaces of tanks A and B).

Bulk Cooling Tank	Plate Count	Tank assembly test areas									
		Wall		Agitator		Centerboard		Cover		Valve	
		Mode	Maximum	Mode	Maximum	Mode	Maximum	Mode	Maximum	Mode	Maximum
A	Standard	8	1,800	8	990	4	24,000	8&64*	500	2,000	58,000
	Thermoduric	8	2,000	12	56	8	64	8	340	8	46
	Psychrophilic	8	2,900	8	1,700	8	10,000	8	340	100	300,000
B	Standard	19	600	16	3,600	88	1,200	12	24,000	4,700& 130,000	9,800,000
	Thermoduric	16	400	8	960	8	1,900	8	160	11	200
	Psychrophilic	24	420	8	8,000	20	1,900	8&24	9,800	20,000	13,000,000

*Both numbers reported in double modes occurred with equal frequency.

TABLE 3 — MAXIMUM AND MINIMUM NUMBERS OF BACTERIA
(Per eight square inches on surfaces of a farm bulk milk tank after chlorination).*

	Tank assembly test areas														
	Centerboard			Cover			Agitator			Wall			Valve		
	SPC	PPC	TPC	SPC	PPC	TPC	SPC	PPC	TPC	SPC	PPC	TPC	SPC	PPC	TPC
Maximum	8	24	24	32	16	16	8	16	8	24	8	16	25	31	8
Minimum	0	0	0	0	0	8	0	0	0	8	0	0	2	0	1

*(Results are based on six trials)
SPC = Standard plate count
PPC = Psychrophilic plate count
TPC = Thermoduric plate count

of times satisfactory and unsatisfactory conditions, as compared to Public Health Service standards, were indicated by the test results. These data indicate that the cleansing procedure alone, without chlorination, often resulted in a satisfactory sanitary condition of most of the tank milk contact surfaces.

As is shown in table 2, the modes, or most commonly found values, were very low except for the valve on tank B, but large maximum results were found for nearly all surfaces.

The swab tests indicated that the flat open surfaces on the wall, agitator blades, centerboard, and cover had usually been cleansed satisfactorily. The valve surfaces were not maintained in a satisfactory sanitary condition by routine cleansing only, but when the valve assembly was properly dismantled, cleansed, and allowed to dry, a satisfactory sanitary condition was established.

Experiments indicated that the chlorine treatment of the tank assembly, prior to milking, effected adequate sanitization of all milk contact surfaces. The results of a series of six swab contact tests of tank milk contact surfaces are summarized in table 3.

Representative sampling of the milk in farm bulk tanks for bacteriological testing

Variables such as tank size, speed and design of agitator, length of time that milk stands undisturbed, and location in the tank from which the sample is taken may affect the agitation time required for representative sampling of milk in bulk tanks. The information presented in table 4 was derived from a statistical analysis of the results obtained when agitation times required for representative samples were studied.

Sixty seconds of agitation of the milk in tank A and 90 seconds of agitation of the milk in tank B permitted representative samples to be taken regardless of sample location, quantity of milk in the tank, and previous time of undisturbed holding. Plate counts of samples taken from both tanks at the surface of the milk that had been undisturbed for 12 hours were two or three times higher than the plate counts of samples taken after agitation for 30 seconds or longer.

Effect of every-other-day pickup on bacteria count

The milk from four milkings was collected in each cooling tank and cooled to and held at 38°F until picked up by the tank trailer on the morning of the second day. While the milk from the second, third, and fourth milkings was entering tank A, the temperature of the milk varied from 35°F to 45°F, but it returned to the normal holding temperature shortly after the end of the milking period. About 50 gallons of milk entered the tank at each milking. The entrance of successive milkings raised the temperature of the milk in tank B to between 45°F and 52°F, but in all cases the temperature of the milk returned to 38°F within three hours. About 30 gallons of milk entered the tank during each milking.

Milk samples for plating were taken from the tanks after the second and after the fourth milkings had entered. The plate counts of samples taken after the fourth milking were sometimes higher and sometimes lower than the plate counts of samples taken after the second milking, but the differences were relatively small at all times, as is indicated by the mean plate counts shown in table 5. Under conditions of the bulk milk operation studied, every-other-day pickup rather than daily pickup at the farm did not adversely affect the bacteriological quality of the milk stored in the bulk tanks.

Effect of bulk transportation on bacteria counts

Milk samples were taken from the bulk tanks for plating before the contents were transferred to the tank trailer and from the tank trailer on its arrival at the receiving plant. The plate counts of the samples taken before and after the milk was transported in the tank trailer are summarized in table 6. The net increase in the mean of the standard plate counts of the milk during transport was an insignificant 300 colonies per ml. There was practically no difference between either the mean psychrophilic plate counts nor the thermoduric plate counts of the samples taken at the receiving plant and the samples taken at the farm. Under the conditions of this tanker transport operation, bulk transport did not contribute seriously to the plate counts of the milk being conveyed.

DISCUSSION

These studies were conducted on bulk milk cooling tanks that were cleansed and operated by civil service workers who, although conscientious, certainly would not be inclined to do a more thorough job of cleansing than a farmer whose entire income from milk production was at stake. The satisfactory sanitary condition of the tanks, as evidenced by the very low bacteria counts of milk stored in them for as long as two days and by the swab tests on the various milk contact surfaces, indicates that there is nothing inherent in the bulk tank assemblies that makes

TABLE 4 — TIMES OF AGITATION THAT PERMITTED REPRESENTATIVE SAMPLING OF THE MILK IN THE BULK TANKS

(Milk in tanks stored undisturbed for two and twelve hours before being sampled. All results are expressed as seconds of agitation).***

Tank	Hours undisturbed	Locations sampled**	Gallons of Milk in Tank: 35 SPC	50 SPC	70 SPC	100 SPC	140-150 SPC	100-210 SPC
A	2	A D E	....	30	....	30	30	60
A	12	A D E	....	....	30	....	45	30
A	12	A B C D E*	....	....	60	....	60	60
B	12	A E	30	....	45	60	....	....
B	12	A B C D E*	30	....	60	60	....	....

.... No samples taken

* Sampled after 60 and 90 seconds agitation. Other milk was undisturbed for 12 hours sampled after 0, 30, 45, and 60 seconds agitation. Milk undisturbed for two hours sampled after 30, 60, 90, and 300 seconds agitation

** E = Cover sampling port; A B C D = corners

SPC = Standard Plate Count

*** (Results are based on 57 milk samples.)

them unsuited for farm use in the production of high quality milk. The valve surfaces of both tanks were in an unsatisfactory sanitary state after routine cleansing more frequently than other surfaces. Apparently this resulted from neglect for when the recommended procedures of cleansing and drying were followed, swab tests indicated that the valve surfaces were in a satisfactory condition.

The time of agitation necessary to achieve homogeneity of the milk in the bulk tank was determined so that representative samples could be taken without needless agitation. The five minutes of agitation recommended for 3-A Standards by the Dairy Industry Committee is considerably in excess of the time of agitation found necessary for representative sampling for bacteriological testing. Similar results for taking samples for butterfat tests have been reported by Liska and Calbert.[3]

The milk produced and handled in the farm bulk handling system studied had a very low standard plate count; this was usually about 3,000 to 5,000 colonies per ml and rarely exceeded 10,000 colonies per ml. This milk could be held in the bulk tanks for two days without a significant increase in bacterial numbers. The operational procedures used prevented the introduction of significant numbers of microorganisms that could grow at 38°F. Milk that had been produced under conditions permitting large numbers of psychrophilic organisms to enter might be significantly affected by the extra 24 hours of storage resulting from every-other-day rather than daily pickup. A study of the effect of different holding temperatures and of milk from different sources on the success of two-day holding is being continued.

A significant increase in the bacteria count of milk did not occur, under the conditions of the bulk handling operation studied, during transportation of the milk in a tank trailer. The milk at about 38°F was transported to the receiving plant in a carefully cleansed and sanitized tank-trailer, the trip taking only 45 minutes from pickup to delivery. Loading was a closed operation with carefully cleansed and sanitized equipment. Other tanker transport systems might not be as satisfactory if conditions were not as good as those used for this system. The plate count of the milk could be increased in several ways: the agitation caused by loading and hauling could cause some of the clumps to break up; any milk residue in the tanker could be an excellent place for bacteria to multiply and seriously contaminate the milk hauled in the following load; the equipment used for loading, if not properly cleansed and sanitized, could permit bacterial growth and contamination; if the loading were not a closed operation, contamination from dust, clothing, and secretions of the worker could occur; and if the haul were long and the temperature of the milk unduly high, bacterial multiplication could occur.

Milk of good bacteriological quality was produced using the methods, procedures, and equipment described in these studies. The system used, although apparently satisfactory, is not necessarily the only or even the best for producing milk of low bacteria count by bulk handling.

SUMMARY

Bacteriological studies of a farm bulk milk handling system were made. The following conclusions were drawn from the results of this work:

1. The swab contact tests of the cooling tanks indicated that the flat, open surfaces of the tank as-

TABLE 5 — COMPARISON OF THE MEAN PLATE COUNTS OF MILK AFTER THE SECOND MILKING AND AFTER THE FOURTH HAD ENTERED THE TANK.*

Bulk cooling tank	Milking	Mean Plate Counts: Standard plate count	Thermoduric plate count	Psychrophilic plate count
A	Second	6,400	138	3,100
	Fourth	6,500	112	4,100
B	Second	3,000	83	1,800
	Fourth	4,000	110	2,600

*(Results expressed as numbers per ml. Each mean based on 14 to 20 samples.)

TABLE 6 — COMPARISON OF PLATE COUNTS OF MILK SAMPLES TAKEN BEFORE AND AFTER BULK TRANSPORT OF MILK FROM THE FARM TO THE RECEIVING PLANT.*

Arithmetic mean	Standard plate counts	Thermoduric plate counts	Psychrophilic plate counts
Before transport	3,500/ml	21/ml	2,900/ml
After transport	3,800/ml	24/ml	2,900/ml
Difference	300/ml	3/ml	0

*(Each mean based on 33 samples.)

semblies were maintained in a satisfactory condition, but that the valve surfaces required special care in cleansing and sanitizing.

2. The time of agitation required to permit representative sampling of the milk in bulk tanks for bacteriological tests was found to vary with the type of tank, the quantity of milk in the tank, the length of time that the milk had remained undisturbed, and the location from which the sample was taken. In these experiments, even when the milk in the cooling tank was least homogeneous, 60 seconds of agitation permitted representative sampling of the milk in tank A and 90 seconds in tank B.

3. The plate counts of milk collected at the end of two days of storage in bulk tanks were as satisfactorily low as the plate counts of milk at the end of the first day of storage, indicating that under the conditions of this system every-other-day pickup did not adversely affect the bacteriological quality of the milk stored in the bulk tanks. The milk in the tank that was cooled at a slower rate was just as satisfactory at the end of the second day of storage as was the milk in the other tank.

4. Under the conditions of this experiment, a significant increase did not occur in the plate counts of the milk during tanker transport.

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SANITARIANS AWARD

Continued from Page 75

to be based must have been completed during the five-year period immediately preceding January 1 of the year during which the Award is to be made. Under special circumstances, a consideration may be given to related work accomplished by a nominee during a period not to exceed seven years previous to the time the Award is to be made.

In judging the contribution of the nominee, special consideration shall be given to originality of thought, mode of planning, and techniques employed in carrying out the work, its comprehensive nature, and its relative value to the community. Consideration shall be given to the efforts of the nominee in establishing professional recognition in the community in which he served, to research and development, administration, and educational achievements.

Anyone is considered eligible who is a living citizen of the United States or Canada and who at the time of nomination is actively engaged in the line of work for which the Award is made. There are to be no restrictions as to race, sex, or age. The Award may be made to co-workers when deemed advisable. Membership in The International Association of Milk and Food Sanitarians is not a requisite of eligibility. No individual shall receive the Award more than once.

A nomination for the Award may be sent to the Executive Secretary of the Association by any member of the International Association of Milk and Food Sanitarians, except members of the Committee on Recognition and Awards. Nominations must be accompanied by:

1. A brief biographical sketch of the nominee

2. A resume of the work and achievement for which recognition is proposed

3. Supporting evidence of the activities of the nominee

4. Where possible, reprints of any publication relating to these efforts.

No member may offer more than one nomination in any given year. Solicitation on the part of any individual or institution on behalf of any nominee will be looked upon with disfavor by the Committee. All nominations and supporting evidence must be in the hands of the Executive Secretary on or before May 15. The Executive Secretary will transmit all nominations as received to the Chairman of the Committee on Recognition and Awards.

HAROLD J. BARNUM, *Chairman*
Committee on Recognition
and Awards

MILK and FOOD SANITATION

PLANNING A STATE PROGRAM FOR RESTAURANT SANITATION*

GORDON W. MOLYNEUX
Senior Sanitarian (Restaurants) New York State Department of Health Albany, N. Y.

The author discusses the New York State (exclusive of New York City) restaurant sanitation program—past, present and future. The article based on continuing foodborne outbreaks and the results of 14 community restaurant surveys throughout the state emphasizes the need for improvement in restaurant programs to include clarification of authority on the state level, revised state code, qualifications for inspectional personnel, training of food service and health department personnel and coordination of activities.

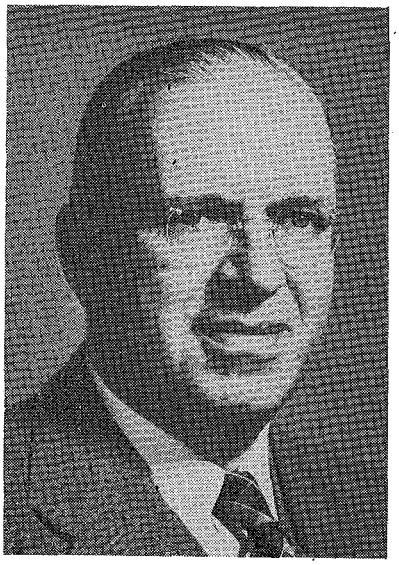
In discussing a state program for the sanitary control of eating and drinking establishments my experience has been restricted to New York State on both the local and state level. Consequently, my remarks will be limited to experiences and activities in the Empire State. Although we may be unique in some of our functions, in general our problems and approaches could be quite similar to those of other states. New York State is not unlike other states in having outbreaks of food-borne diseases.

LEGAL AUTHORIZATION

The New York State Department of Health consists of various divisions, bureaus, sections, and the restaurant program is a responsibility of the Milk and Restaurant Sanitation Section in the Bureau of Environmental Sanitation. The state is divided into regions and districts to bring the activities closer to the people and scenes of action. The central office is located in Albany, New York, and is charged with the formulation of administrative policies and procedures. Some direct services are given to local units by the central office, but this is a primary responsibility of the regions and districts.

The legislature some years ago included in the Public Health Law, a Public Health Council which is a part of the Health Department. Among other activities, the Council is charged with the promulgation of a state sanitary code to protect the health and welfare of the people. The code, numbering 18 chapters, covers all the state with the exception of New York City. It has the force and effect of law and provides penalties for violations thereof and is recognized and respected judicially by courts throughout the state. The enforcement of the code, in general, is charged to local health units, and the code further provides for the adoption of codes by local government provided they are not in conflict with state requirements. In other words, they can be more stringent within reason and designed to meet local conditions. Local requirements are subject to review by the State Commissioner of Health, and Article XVII of the Public Health Law empowers the State Commissioner of Health or his duly authorized agents to ascertain whether the provisions of the applicable state laws or local regulations are being observed. The state code further provides for the reporting of food-borne outbreaks.

Some years ago the State Department of Health embarked on a limited restaurant program as evidenced by the adoption in 1938 of a chapter in the Sanitary Code relating to restaurants, and the production and release of an educational sound film in 1940 entitled "Twixt the Cup and the Lip" with which many of you are familiar. Progress was slow, many complications arose, and with lack of personnel, and some administrative complications it became, and still is to some extent, a sideline of the milk sanitarian on the state level.



Gordon W. Molyneux has long been associated with regulatory milk and food sanitation in New York State having served in this capacity on the city, county, and state level.

In 1930 he became associated with the newly organized Westchester County Department of Health where for 18 years he contributed materially in organizing and supervising a milk control program in the county unit which received national recognition for its entire program.

On the city level he was in charge of a milk and food program. His experience also includes industry where he managed a combined milk and restaurant business for a few years.

Mr. Molyneux, who was president of New York State Association of Milk Sanitarians in 1941-1942, joined the State Department of Health in 1950 and is directly in charge of the restaurant program.

In a well rounded state program clarification of authority and standardization of regulations is necessary. Of the 48 states, food control in 25 states is exclusively in the Health Department, 11 in Agriculture, and 6 in other state agencies, and in 6 it is a dual responsibility shared by Health Departments and one or more other agencies. New York is one of the six states where the control of food is vested in the Health Department and some other state agencies. The Department of Agriculture and Markets is active in food control

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including some phases of restaurant sanitation and the State Liquor Authority, the Labor Department, the Conservation Department, and the Education Department, are also in the picture.

Divided authority does not lend itself to efficient supervision, standardization of regulations, and enforcement. Steps have been taken to clarify the jurisdictions of the various state agencies with respect to restaurant sanitation control, and we hope to alleviate some of the confusion that now exists.

Lack of personnel on the state and local level has also been a factor but is now improving. In New York State decentralization is the order of the day. An extensive campaign to establish full time local health units, stimulated to some extent by financial aid from the state, has resulted in the creation of a number of county health departments and full time city units. The New York State budget includes an appropriation of $11,475,000 for general health in the grants-in-aid program to be distributed to 10 cities having 50,000 population or over and to 57 counties, including 14 where county health departments have been established. This has organized considerably rural and suburban areas where heretofore only limited restaurant control measures could be exercised by the part time local health officers and the district offices of the State Department of Health neither of which were adequately staffed for this purpose.

Another factor that retarded a restaurant program was the lack of interest of some health officials predicated to some extent on morbidity and mortality rates only. In the light of the modern concept of sanitation this attitude is gradually decreasing and is following the pattern of the old raw milk advocates.

DEMONSTRATED NEED

In planning any program, of course, the first essential is to recognize a problem. The epidemiological picture in New York State as recorded in our department records appearing below (see table 1 and graph) follows the pattern of the reported disease outbreaks due to water, milk, and food issued by the United States Public Health Service for the various states.

TABLE 1 — REPORTED COMMON SOURCE* OUTBREAKS MODE OF TRANSMISSION

(Exclusive of New York City)

Bureau of Epidemiology and Communicable Disease Control
New York State Department of Health

	Water	Milk	Food**	Unknown	TOTAL
1943	6	4	50	40	100
1944	21	0	36	39	96
1945	11	4	42	15	72
1946	21	0	45	11	77
1947	12	1	45	21	79
1948	8	0	25	12	45
1949	5	1	26	8	40
1950	5	0	29	9	43
1951	4	0	19	10	33
1952	6	0	24	2	32

*Exclusive of single household outbreaks
**Probably no more than 10 to 15 percent of the true number of occurrences are reported

Probably only 10-15 percent of the actual number of food-borne occurrences are reported. Epidemiological data are often very incomplete because of difficulty, due to incubation periods, dispersal of population, etc., in associating sporadic cases with place of origin. Consequently, most recorded outbreaks concern institutions or special social occasions. Food-borne epidemics resulting from mass feeding such as picnics, clam bakes, church suppers, and banquets are easily recognized and accurately reported. However, similar transmission from a public eating or drinking establishment presents a much different epidemiological problem because of the transient exposure and the fact that those affected are not localized and have very little else in common.

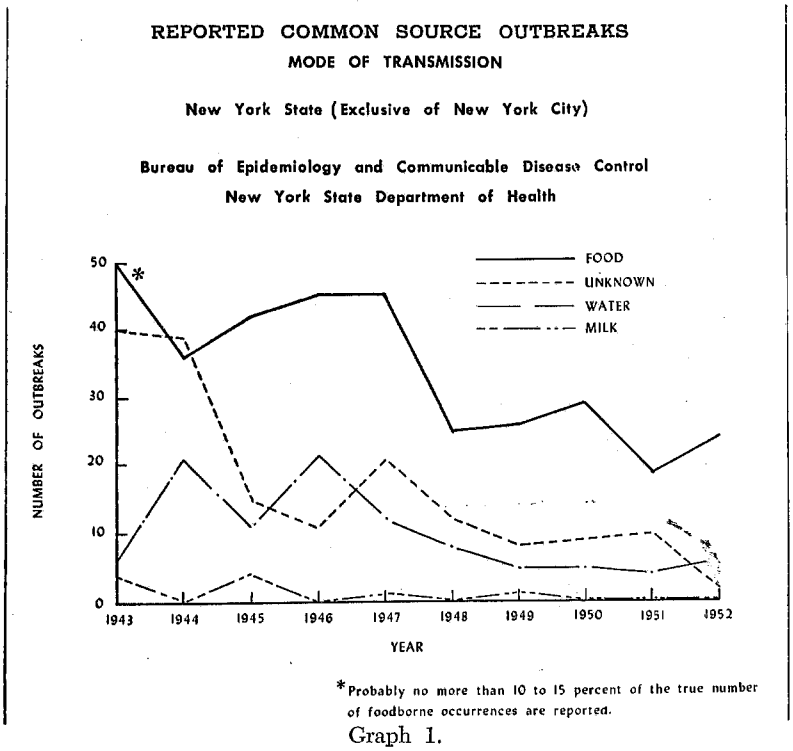
There is a growing demand for a well rounded restaurant program on the state level. With the increased growth of organized local units the request for guidance from the State Department also increased and the need for a revised and comprehensive restaurant code on the state level has become urgent.

Of vital importance in determining the need for an overall restaurant program is an appraisal of existing conditions. Three years ago evaluation studies of local programs were started and 14 have been completed to date. The evaluation surveys include inspection of a cross-section of eating and drinking establishments selected at random; a study of the local requirements and their application; record keeping; administration; personnel, and the program in general. Such surveys are of considerable value in evaluating conditions existing at a given time, and, among other benefits, afford a base from which to measure future improvement. Recommendations are offered which if accepted and applied, all or in part, will result in a corresponding improvement in the program. A percentage figure of compliance is computed from the results of the inspection of the selected establishments, but, of more importance, is the tabulation of the number and types of violations found.

The surveys are made on request of the local health authority. The findings are confidential. Originally surveys were conducted jointly with the United States Public Health Service but they are now a sole function of the State Department. In the absence of a comprehensive restaurant code on the state level the *Ordinance and Code Relating to Eating and Drinking Establishments* recommended by the Public Health Service is used as an appraisal yardstick.

The following charts show a summary of the results of the surveys

You can readily see by the results that there is need for improve-



Graph 1.

ment in our restaurant programs. In analyzing the poor results the following factors influenced the findings: (1) The surveys are a critical appraisal of conditions and the criteria utilized are somewhat more severe than those used by the local control agency. (2) The apathy concerning proper sanitary practices and the apparent satisfaction with the "status quo." (3) Food inspection is still rated second to milk inspection. (4) More stringent qualifications have been established by the Public Health Council for milk sanitarians than for food control personnel. (5) No final disposition of the chronic violator. (6) Lack of a complete rounded program and comprehensive ordinance on the state or local level.

The surveys, in general, have been well received by the local health departments, and although no resurveys have been made to date, routine contacts with local Health Departments indicate that many units have responded to the findings and are improving their restaurant sanitation programs.

ENFORCEMENT PROGRAM

We find that improvement in food sanitation has not kept pace with that in milk sanitation and in this connection there appears to be no justification in continuing more stringent qualifications for milk sanitarians over food control personnel. The two fields are equally important in the need for improved sanitation and the protection of the public health and are allied in nature in many respects.

A further need for a comprehensive restaurant program has been established by a report of the Engineering Section Project Studies in Sanitation Administration, American Public Health Association, entitled "Sanitation Practices in Local Health Departments" dated 1951. This study of 42 local health departments consisting of 29 county units, 7 cities, and 6 local districts located in 22 states with an average population of 130,000 ranging from 23,000 to 413,000 shows that food sanitation (excluding meat inspection) received 28.2 percent of the sanitation activities, milk being next with 25.5 percent. This reflects an investment of thousands of dollars of public funds in restaurant control throughout the country which should pay commensurate dividends in an improved sanitary environment.

The very liberal financial assistance given by the State to full-time local health departments and for certain other health services, and the cost of direct services rendered by the State Department to our communities, makes us cognizant of our financial and moral responsibility for determining a sound, efficient program on the local level.

Restaurant sanitation is not confined to the commercial eating and drinking place. Food service in camps and institutions demands the same protection; coordination of these functions in intra departmental activities is necessary. Most of these functions are administered directly by the state and in addition to actual inspections of institutions, the training of the temporary camp sanitary aides in sanitary food service is an important part of our program.

Realizing the desirability of a comprehensive restaurant code on the state level we are in the process of writing a proposed complete revision. Such a code would unify and make unnecessary the maze of ordinances and regulations on the local level and would, quite logically, impose the same regulations on the remaining rural areas not presently operating under a full-time health department. Certainly the program of the National Sanitation Foundation should be supported and the standards for food service equipment considered in any restaurant code. Recognition should be afforded to the provisions of the Public Health Service recommended restaurant ordinance and code in the interest of securing uniformity.

IMPORTANCE OF EDUCATION

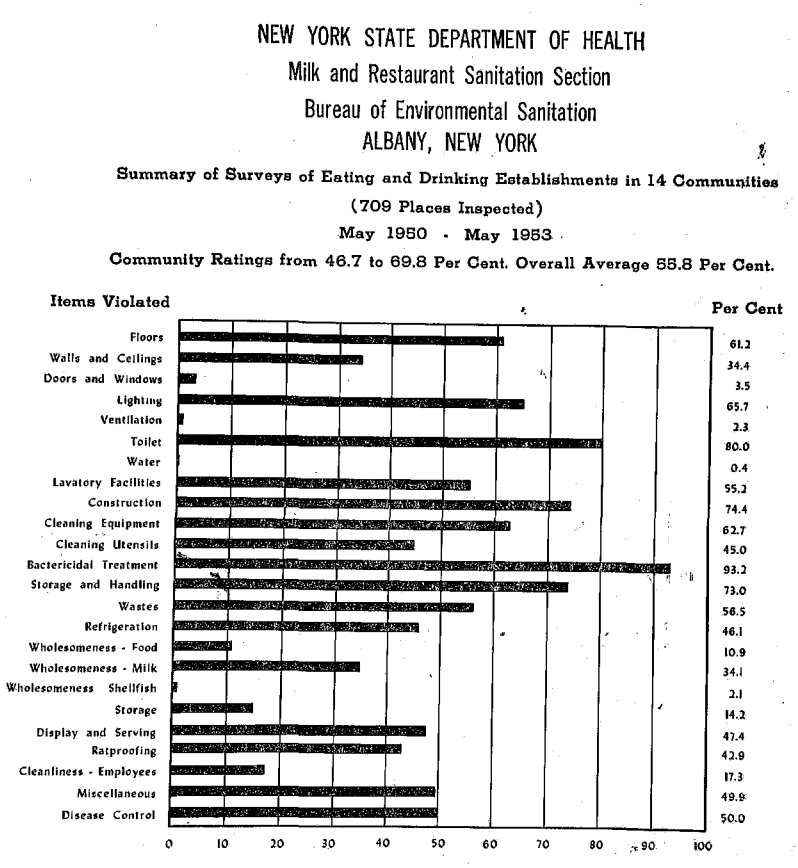
Education plays an important part in improving restaurant sanitation and in this project the State should assume leadership. There is still some doubt in the minds of a few public health officials whether food handler training produces tangible results and is a sound public health investment. Throughout the country, however, there is a growing conviction that such training is a good investment and is as necessary as training in other fields of sanitation and health activities. True, it is difficult to appraise this relatively new activity but the value of education in itself has long been established.

Several communities in New

York State have responded to the need for food handler training and have provided various types of training programs. About 4 years ago the State offered a complete training course, known as the "Safe Food Institute," sponsored by the New York Departments of Health and Education. This four session course is recommended to local health departments and other agencies, and is designed to give basic instruction in restaurant sanitation geared to the comprehension of the average employee. A set of flip charts is provided as a training aid together with a guide or manual giving a narrative for the complete course, suggestions for setting up a program, and a list of recommended films, demonstrations, and other visual aids. The charts are loaned without charge by the New York State Department of Health to local agencies within the State. Certificates of attendance are issued to those who complete the four sessions, and by its uniform application throughout the State one community can safely honor the certificate issued by another.

The four sessions are entitled: Good-bye to Germs, Plates to Please, Safe to Serve, and Tips to You. Several communities have adopted the program as an adult education project sponsored by the local Department of Health and Department of Education. To create further interest and competition some communities are issuing large certificates to establishments when a substantial percentage of their food service personnel have completed the course.

The training of regulatory personnel is conducted by the Training Section of the Bureau of Environmental Sanitation and includes a Field Training Center operated jointly with the United States Public Health Service. It also includes the training of teachers conducting food service personnel training courses. The services of the Office of Public Health Education are also used, as well as other sections and agencies of the State government. Short topical courses are offered at frequent intervals to improve the knowledge of sanitation personnel throughout the State.



Graph 2.

In addition to other releases the Department publishes the *Bulletin,* a weekly publication, and *Health News,* a monthly magazine which carries valuable public health material to all health departments and other interested agencies. Restaurant sanitation is included in the releases and you are all familiar with the wholesome weekly stories by the eminent "Doctor Jones." Pamphlets on various subjects are issued from time to time.

Last year restaurant sanitation was the feature of the June issue of the *Health News* and included an article by Theodore J. Curphey, M.D., Chairman, Council Committee on Public Health and Education of the Medical Society of the State of New York, entitled "Food Sanitation and the Physician." His concluding paragraph was:

"Finally, to ensure a more efficient organizational approach to the problem at the state level, attempts should be made to lessen the overlapping and conflicting efforts of the various agencies that have in the past led to confusion born of divided responsibilities. Because the problem is of vital concern to every physician, it would seem obligatory for the Medical Society of the State of New York, through its Council Committee on Public Health and Education, to offer its assistance in resolving the situation, by means of the formation of a committee composed of representatives from the State Department of Health, the Department of Agriculture and Markets, the Conservation Department, the Labor Department, and the Medical Society. The objective of the committee would be to develop simpler and more efficient coordination between the several agencies in their handling of the problem of food sanitation in New York State."

FUTURE PLANS

We realize that there is considerable room for improvement in the food services in New York State. Much has been accomplished in the past and we accept the challenge to stimulate and further promote advances in restaurant sanitation as an integral part of the

Continued on Page 100

THE INFLUENCE OF TIME AND TEMPERATURE OF PLATE INCUBATION UPON BACTERIAL COUNTS OF MARKET MILK AND RELATED PRODUCTS, PARTICULARLY AFTER HOLDING UNDER REFRIGERATION[1/]

F. E. Nelson and M. P. Baker
Dairy Industry Section, Iowa Agricultural Experiment Station, Ames, Iowa

Use of incubation periods shorter than 3 days at 25° C, 4 days at 21° C, 7 days at 15 or 10° C and 10 days at 5° C resulted in some decrease in counts on certain samples. Incubation at 25° C for 3 days detected many samples containing large numbers of bacteria which would not develop colonies at 35° C. Negative coliform counts were obtained on many samples giving high psychrophilic counts.

Recent changes in processing technology, plant schedules, marketing procedures, and shopping habits are tending to increase the time milk and related products are held between processing and consumption. The holding temperatures usually are 10° C or below. Thus the microorganisms which develop must be those capable of growing at refrigeration temperature. The term "psychrophilic" frequently is used to describe these organisms, even though this term may not be completely accurate. Truly psychrophilic bacteria have their optimum growth temperature at 15° C or below; many of the bacteria growing under refrigeration will grow better at temperatures of 21° C or above than at the lower temperatures.

The ninth edition of Standard Methods[1] suggests incubating plates at 18-25° C for 3-5 days to detect low-temperature organisms. To detect "true psychrophiles," incubation of plates at 5-10° C for 10-14 days is suggested. Among the changes proposed for the tenth edition of Standard Methods is incubation of plates at 5° C for 10 days for detection of psychrophilic bacteria.[8] After this study was almost completed, a personal communication from Robertson[7] indicated that the tenth edition would specify incubation for 7 days at 5° C for detection of those bacteria which grow at refrigeration temperatures.

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[1]Journal paper No. J-2353 of the Iowa Agricultural Experiment Station, Ames, Project No. 1050.

Although quite a few investigators have incubated plates at 35-37° C for 2 days to follow changes in bacterial populations in fluid dairy products held under refrigeration, more recent investigators commonly have employed much lower incubation temperatures. Rogick and Burgwald[9] used 12 days at 4–7° C for their psychrophilic counts. Watrous *et al.* [14] used 5° C for 10 days, comparing counts obtained under these conditions with those obtained using 25° C for 3 days and 35° C for 2 days. Most of the organisms growing in refrigerated products were able to grow at 25° C also, and counts at 25° C commonly were higher than those at either 5 or 35° C. Erdman and Thornton[5] used incubation at 10.5° C for 13 days for psychrophilic counts on pasteurized milk and either 10.5° or 4.5° C for 7 days on raw milk and cream. Dahlberg *et al.* [4] determined psychrophilic bacteria by incubating plates for 10 days at 44° F (6.7° C).

The literature failed to reveal a report on results of a comprehensive comparative study of a series of different incubation temperatures and times for making plate counts on milk held at refrigeration temperatures. Such a study was undertaken, using principally milk samples, but also a few samples of other fluid dairy products.

Experimental Methods

The samples used were processed in eleven plants located in five cities in central Iowa. Most of the samples were purchased at retail stores, usually soon after the milk had been brought to the store. Some samples were taken from the milk storage room of the market milk laboratory at the College. Several lots of milk used were brought to the College by milk inspectors for routine bacteriological examination. Although most of the samples were milk, two samples of 3:1 concentrate, one sample of coffee cream, three samples of skim milk, and four samples of half-and-half were included. Most of the samples held after purchase were kept in original containers in a household-type refrigerator at approximately 5° C. In the latter stages of the study, four different samples were held at approximately 2°, 5°, 10°, 12° (only two samples), and 15° C; each original sample was mixed thoroughly, and approximately 120 ml quantities were placed in each of five sterile 6-oz. medicinal ovals, one of which was placed at each storage temperature and sampled periodically.

In plating, TGEM agar[1] was used. Replicate plates were made and duplicates of each dilution incubated for each temperature and time combination employed. Plates were incubated at 35° C for 2 days, 32° C for 2 days, 25° C for 2 and 3 days, 21° C for 2, 3, and 4 days, 15° C for 3, 4, and 7 days, 10° C for 4, 5, and 7 days, and 5° C for 5, 7, and 10 days. Variations exceeding 1° C from the desired incubation temperature did occur at

Dr. Nelson is Professor of Dairy Bacteriology at Iowa State College, a position he has held for 10 years. His B. S. and M. A. degrees are from the University of Minnesota and his doctorate from Iowa State. He has been on the staffs at the University of Minnesota and at Kansas State College. From 1947 through 1952 he edited the *Journal of Dairy Science*. He received the Borden Award for research in Dairy Manufacturing from the American Dairy Science Association in 1953.

times; these variations did not seem to influence the results, although this is a matter of opinion. In many of the later studies, incubation for the intermediate time at temperates of 21° C and below was not used. An attempt was made to count each colony discernible as such with the aid of a Quebec colony counter; in some instances this led to counting of colonies which might be overlooked in routine laboratory practice. Population changes in the held samples were followed using plates incubated at 32° C for 2 days to help determine when a complete series of plates should be poured.

Coliform bacteria were determined, using violet red bile agar.[1] Replicate plates were incubated at 35 and 32° C for 1 day and frequently at 25° C. At the latter temperature counts were made after incubation for 1 day and again from the same plates at 2 days.

RESULTS

Data on influence of time of incubation at the several temperatures on the count are summarized in table 1. The samples have been divided into groups based upon the temperatures at which counts too low and erratic for satisfactory comparison were obtained. With the 11 samples, which gave no satisfactory counts at 5° or 10° C, not held after acquisition, incubating the plates less than the maximum time resulted in lower counts in all cases, except that incubation for 3 days at 21° C gave counts which approached those after 4 days at this temperature.

Somewhat similar results were obtained on the three samples which gave very low counts when incubated at 5° C. Of the three samples giving good counts at all incubation temperatures, the second one was half-and-half which gave a count of approximately 170,000 per milliliter under all incubation conditions except at 35° C, where the count was 360 per milliliter. This sample quite possibly had been held in the plant long enough or otherwise handled in such a manner that the microbial population resembled that of samples held for long periods at low temperatures. This sample, as well as the other two samples in this group, reached a count of over 30 million per milliliter at all of the incubation temperatures except 35° C after being held for 5 days at 5° C. These three samples were negative for coliform bacteria in 1-ml quantities when received, and two still were negative after 5 days at 5° C; the third sample had a coliform count of 79 per milliliter after holding for 5 days at 5° C.

Of the two samples of milk held at 5° C for some time which failed to give counts on plates incubated at 5° C, the first one apparently contained essentially no bacteria capable of growing at 5° C, for the counts at all temperatures of plate incubation did not rise during holding. The second sample, which was sample 66 in table 3, increased slowly in bacterial count while held at 5° C, but never gave a satisfactory count on plates incubated at 5° C. This was the only sample which behaved in this manner.

Most of the 31 samples of held product which gave counts at 5° C plate incubation gave essentially the same count at the shorter plate incubation times as they gave with maximum incubation time at each temperature. These results may be somewhat misleading for two reasons. As the data on range show, at nearly every temperature

TABLE 1—EFFECT OF TIME OF INCUBATION OF PLATES UPON COUNTS AT THE SEVERAL TEMPERATURES.

No. of Samples		Percentages of count at maximum plate incubation time								
		25° C	21° C		15° C		10° C		5° C	
		2d. of 3d.[a]	2d. of 4d.	3d. of4 d.	3d. of 7d.	5d. of 7d.	4d. of 7d.	5d. of 7d.	5d. of 10d.	7d. of 10d.
Original samples (not held after acquisition)										
11	Mean	26	4.1	90	2.7	11	X[b]	X	X	X
	Median	24	2.6	81	1.7	5.5				
	Range	3.2-66	0.9-12	58-193	0.3-9.6	0.5-49				
3		63,15,29	32,0.3,11	56,85,68	26,0.7,....	46,2.5,6	30,64,17	58,50,36	X	X
3		54,112,14	50,94,7	75,106,28	79,....,100	69,110,117	115,94,91	122,100,89	98,88,90	93,100,80
Samples held at 5° C for 4d. or more										
2		68,112	28,105	.....	19,125	.....	117,5	.....	X	X
31	Mean[c]	89	85	.....	85(29)	.....	103(30)	.....	85	.....
	Median	98	95	.....	95	.....	100	.....	100	.....
	Range	25,158	4.5-148	.....	15-150	.....	67-141	.....	<1-121	.....
13[d]	Mean	77(11)	71	92	71	80	99(12)	98	71	81
	Median	65	88	93	84	88	100	93	90	83
	Range	25-158	5-120	69-110	15-115	19-130	69-138	81-144	<1-107	39-118

[a] 2d. of 3d. and similar expressions indicate the percentage of the count after plate incubation at the longer interval which was obtained when using the shorter incubation time.
[b] X = no suitable data because of very low counts.
[c] Figures in parentheses indicate no. of samples for which data were available.
[d] These 13 samples were included in the 31 above.

TABLE 2—RELATIONSHIP OF COUNTS AT DIFFERENT TEMPERATURES (USING THE COUNT AT 25° C WITH 3-DAY INCUBATION AS 100 AND CALCULATING THE PERCENTAGE OF THIS COUNT ATTAINED AT OTHER INCUBATION TEMPERATURES).

No. of Samples	Percent of 25° C count at:						
	35° C-2d.	32° C-2d.	25° C-3d.	21° C-4d.	15° C-7d.	10° C-7d.	5° C-10d.
			Original sample				
19 Mean	26	86	100	105	75	16	11
Median	21	87	100	105	79	3	1
Range	0.2-85	51-132	100	74-152	13-100	0.1-95[a]/	0.1-95[a]/
			Samples held at 5° C				
33 Mean	12	84(32)[b]/	100	105	95(31)	79	77
Median	0.2	90	100	100	96	88	92
Range	0.1-87	20-114	100	83-211	61-163	1-133	0.1-178
			Samples held at all temperatures (2-15° C)				
54 Mean	15.5	82(53)	100	101(53)	97(52)	82	75
Median	2.4	89	100	99	97	90	86
Range	0.1-88	20-128	100	63-211	60-163	1-165	1-178

[a]/ One sample with a count of 180,000/ml at 25° C-3d. responsible for the high values in each case. May have been in refrigerator for some time.

[b]/ Figures in parentheses indicate no. of samples, where all samples of the group were not included because of incomplete data.

an occasional sample gave a considerably lower count when incubation time was shortened. Also, the colonies sometimes were much more difficult to count satisfactorily at the shorter incubation times. The 13 samples treated separately from the 31 of which they are a part show much the same trend as does the entire group. They also show that intermediate incubation times give intermediate results. Incubation for 7 days at 5° C would give a higher count and an easier plate to count than would incubation for 5 days at 5° C, but the results still would not be equal to those on plates incubated 10 days at 5° C.

EFFECT OF INCUBATION ON COUNTS

In table 2 are summarized the data on the influence of incubation temperature on level of count, using the counts obtained after the maximum incubation time at each temperature. The count at 25° C for 3 days has been chosen arbitrarily as 100 and all other counts on the same sample figured as percentage of the control at 25° C. The means then were calculated arithmetically for all samples in the group. The data on the 19 samples as received probably are best considered in terms of the medians, for, especially at 5° and 10° C, the means are not representative because of the high values for one sample; this is the same sample of half-and-half which introduced problems in the interpretation of the first portion of table 1. The great majority of these 19 samples contained only a very small percentage of bacteria which produced countable colonies in appreciable numbers at 10 or 5° C. The counts at 35° C commonly were considerably below those at 25 or 21° C, while the counts at 32° C usually were quite close to those at 25° or 21° C.

Of the samples held at 5° C until appreciable increase in bacterial population occurred, the majority gave very low percentages of maximum count when incubated at 35° C. At the other temperatures of plate incubation, only an occasional sample yielded counts which were greatly different from the counts at 25° or 21° C. Three of the samples gave counts at 5° C which were less than 2 percent of the counts at 25° C, with only one sample doing this at 10° C. The samples giving low counts at these lower temperatures without exception were in a group which had shown comparatively small increases in count at other plate incubation temperatures after holding at refrigeration temperatures.

The high range figures at 21° and 15° C are due to one sample which apparently contained organisms which really preferred the lower incubation temperatures. No isolations were made to characterize the responsible bacteria.

When results on samples held at 2° to 15° C were included with results on those held at 5° C, to give a total of 54 stored samples, only the results of counts at 35° C were changed. As will be shown in table 3, holding samples at 15° C permitted types of bacteria to develop which gave counts at 35° C incubation which were similar to the counts using plate incubation at lower temperatures.

EFFECT OF HOLDING MILK AT DIFFERENT TEMPERATURE

Four samples of pasteurized milk, each from a different plant, were divided and portions held at different temperatures to study the effect of holding milk on counts obtained following incubation of plates at different temperatures. The results are presented in table 3. Samples 48 and 61 had relatively poor keeping quality at all temperatures, while samples 49 and 66 kept considerably better, particularly at the lower temperatures. The temperature at which pasteur-

ized milk is held, if long enough for a considerable growth of bacteria to occur, does influence relationships between the counts which will be obtained from plates incubated at the different temperatures. Considerable differences in these relationships are found in even the limited group of samples employed in this phase of the study, presumably because of differences in types of organisms present.

Sample 49 gave a count at 35° C that was not greatly different from the count at 32° C or lower, regardless of the holding temperature. After holding at 15° C, the count at 5° C on this sample was considerably below the counts obtained at the higher temperatures; no similar effect was observed with samples 48 and 61, and sample 66 always gave low counts at 5° C, no matter what holding temperature was used.

No great difference between the counts at 35° C and at lower temperatures was observed on any of the four samples held at 15° C, but when the holding temperature was dropped only to 12° C on sample 61, the count on plates incubated at 35° C was much below those obtained on plates incubated at lower temperatures. Bacteria which grow on plates incubated at 5° C developed to a considerable degree in 2 days or less in some samples held at 15° C and grew quite rapidly in some samples held at 10° C.

COLIFORM COUNTS

The data of table 3 show that coliform bacteria vary from sample to sample in their abilities to grow at the different holding temperatures. In sample 48 considerable coliform development occurred in 6 days at 2° C, despite a negative coliform test on the original sample. If coliform bacteria are going to develop, the data indicate they will do so very rapidly at 15° C, and also to some degree in many samples when held at somewhat lower temperatures. The low coliform count on sample 49 held at 10° C is due possibly to overcrowding of the plates and subsequent failure to form characteristic colonies.

In some of the samples covered by the data in tables 1 and 2 the coliform bacteria developed to a considerable degree during holding at 5° C. In general, no relationship between rate of development of bacteria in refrigerated fluid dairy products and the initial coliform count could be established in this entire series of samples. Fre-

TABLE 3—COUNTS AT DIFFERENT INCUBATION TEMPERATURES AND TIMES ON FOUR SAMPLES OF MILK HELD AT TEMPERATURES FROM 2 TO 15° C UNTIL CONSIDERABLE INCREASES IN COUNT OCCURED

Holding Temp. (°C)	Holding Time (days)	Plate counts/ml at: 35° C - 2 days VRB[a/]	35° C - 2 days TGEM[b/]	32° C- 2d.	25° C- 3d.	21° C- 4d.	15° C- 7d.	10° C- 7d.	5° C- 10d.
				Sample 48					
2	2	<1	450	1.8T	.....	.....	.....	.....	170
2	6	3.2T[c/]	5.9T	360T	360T	430T	430T	320T	420T
5	6	1.8T	5.7T	1.2M	1.2M	1.5M	1.3M	1.3M	1.2M
10	3	52T	150T	1.3M	1.4M	1.2M	1.2M	1.3M	1.3M
15	2	>3T	380M[d/]	500M[d/]	400M[d/]	270M[d/]	480M[d/]	180M[d/]	230M[d/]
				Sample 49					
2	2	1	400	1.7T	.....	.....	.....	.....	<100
2	18	<1	8.9T	10.4T	.....	.....	.....	.....	23T
2	32	<1	7.4M	5.5M	8.5M	8.3M	8.6M	8.7M	11M
5	16	<1	1.7M	1.7M	.....	1.5M	1.9M	1.7M	1.6M
10	9	<1?	18M	85M	72M[d/]	85M[d/]	114M[d/]	95M[d/]	16M
15	3	17M	40M	47M	76M	36M	46M	34M	630T
				Sample 61					
2	2	<1	980	1.6T	.....	.....	.....	.....	300
2	10	<1	2.3T	1.2M	4.0M	4.0M	3.5M	4.9M	3.7M
5	7[e/]	<1	2.0T	6.8M	28M	24M	22M	22M	23M
10	3[e/]	<1	100T	5.1M	11M	9.7M	10M	11M	15M
12	3[e/]	4.3T	140T	3.9M	9.4M	7.8M	9.0M	9.7M	10M
15	2[e/]	1.8M	6.8M	7.6M	15M	14M	13M	14M	9.1M
				Sample 66[f/]					
2	4	<1	7.1T	13T	.....	.....	.....	.....	<300
5	16[e/]	<1	6.5T	290T	250T	560T	390T	280T	<10T
10	7[e/]	<1	980T	1.8M	1.7M	2.0M	1.6M	1.2M	<10T
12	7[e/]	<1	3.1M	5.6M	7.2M	6.7M	5.2M	4.4H	<10T
15	4[e/]	<1	13M	18M	17M	18M	18M	9.4M	<1M

[a/] Coliform count on violet red bile agar
[b/] Standard plate count on TGEM agar
[c/] T = thousand; M = million
[d/] >300 colonies on plate; estimated count
[e/] plus holding 2d. at 2° C
[f/] no count increase after 13d. at 2° C

quently, in samples held at 5° C, the "total" counts were well into the millions without coliform organisms being detectable in 1-ml quantities of the product. Occasionally a sample initially had coliform organisms present in 1-ml quantities and still did not show more than a slight increase in either coliform or psychrophilic count after holding 5 days at 5° C. On the other hand, a sample giving a coliform count of 38 per milliliter after holding at 2° C for 2 days increased in plate count from 40,000 to 5 million per milliliter, using plate incubation for 10 days at 5° C, when the sample was held an additional 3 days at 2° C.

Coliform counts made at 32° C incubation usually agreed closely with those made at 35° C. A somewhat greater tendency for bacteria other than coliform types to grow on the medium and cause some increase in difficulty of counting was apparent when 32° C incubation was used in place of 35° C. Plates incubated for coliform counts at 25° C frequently were overgrown by non-coliform organisms. When colonies were countable after incubation for even 1 day at 25° C, the counts usually were much the same as when incubation was at 35° C.

DISCUSSION

These data, as well as those of Watrous *et al.* [11] and others, indicate that nearly all the bacteria which grow in pasteurized milk and closely related products held at refrigeration temperatures apparently can produce countabe colonies over a rather wide range of incubation temperatures. The term "psychrophilic" frequently is applied to these bacteria because they have grown at temperatures of 10° C and below. A more nearly correct term might be "facultative psychrophilic," because colony size and relative counts indicate that optimum temperature for growth is in the range of 21° to 25° C, although growth at lower temperatures will occur. On plates incubated at 5°and 32° C, some of these bacteria apparently grow quite slowly and fail to produce countable colonies in a reasonable time.

At 35° C incubation, many of the bacteria (sometimes more than 99.99 percent) found in milk held at 5° C until considerable bacterial growth occurred failed to produce countable colonies. Many of the samples with high counts of facultative psychrophilic bacteria would be missed by incubating plates at 35° C for 2 days, and a few would be missed by incubation at 5° C for 10 days.

Incubation at 32° C for 2 days would have detected all samples with high counts encountered in this study, but on quite a few samples held under refrigeration for some time, the counts at 32° C would be somewhat less than maximum. Incubation at 15° C seems to offer no advantage, neither rate of colony development nor magnitude of count being improved.

Incubation of plates at 21° C for 4 days or 25° C for 3 days can be recommended on several scores for detection of bacteria which grow at refrigeration temperatures. Plates incubated in this temperature range usually give maximum counts, whether the milk is fresh or has been held. Although the counts at 21°–25° C may be greater than those at 5° C on some samples, this is not considered a drawback. If the count is excessively high for any reason, the control laboratory should know this and take appropriate steps; growth at refrigeration temperatures obviously is only one cause of high counts. Possibly an occasional sample with a high thermophilic count might be detected at 35° C and not at 21°–25° C. However, searches for thermophilic bacteria are better made using either incubation at 55° C or a microscopic procedure.

Incubation at 21°–25° C would make the counts available much sooner than would incubation at 5° or 10° C. In plant control work, the week or 10 days required to obtain a count at 5° or 10° C means that much damage can be done before the laboratory data are available. The long incubation period at low temperatures also means that considerable incubation space and plating equipment are necessary. Incubation at 21°–25° C would permit leaving plates at room temperature much of the year. Only if room temperature rose above 32° C would there be danger of missing samples with high counts. When temperature control did become necessary, a section of the culture incubator at 21°–22° C might be used to advantage.

Incubation at 25° C is not good for routine counts of coliform bacteria because the plates are so easily overgrown by other bacterial types. Other plating media or tube dilutions were not tried, but these might prove more desirable than violet red bile agar if incubation at 21°–25° C were to be used.

Although incubation of plates at either 32° or 35° C is recognized by Standard Methods[1], incubation at 32° C will give an index of bacterial growth at refrigeration temperatures, whereas incubation at 35° C usually will not. Plates for coliform counts seem to be relatively satisfactory when incubated at 32° C in place of 35° C. The tentative recommendation of incubation at 5° C for 7 days for counts of bacteria which grow at refrigeration temperatures[7] apparently will not give quite as high counts on an occasional sample as incubation at 5° C for 10 days, and some of the colonies will be harder to count because of small size.

Rogick and Burgwald[9] showed that bacteria which grow at refrigeration temperatures do not survive pasteurization and are present as post-pasteurization contaminants. Presence of coliform bacteria commonly is used as an index of post-pasteurization contamination, but presence of these organisms obviously is not a good criterion of whether rapid development of bacteria at refrigeration temperatures will occur or has occurred. Coliform organisms are but one of the types which may gain entrance to a product after pasteurization; their relatively easy detection in the presence of numerous bacteria of other types accounts for their value as an indicator of post-pasteurization contamination.

Under some circumstances bacteria which grow at refrigeration temperatures might gain entrance without being accompanied by coliform bacteria. This could happen easily with some water supplies which are satisfactory from the standpoint of freedom from

coliform bacteria but still contain bacteria capable of growth at low temperatures in dairy products. Because of the considerable differences in ability of different strains of coliform bacteria to grow at low temperatures, prolonged holding at 5° C may result in no increase in coliform count in one sample, but a definite increase in another.

The results of this study differ from those of Dahlberg[3], who reported that the coliform count increased more rapidly than the total count in refrigerated samples; however, he held many of his samples at 45–50° F and at 55–60° F where the growth of coliform bacteria would be greater than at lower temperatures, and he apparently incubated his plates for total counts at 35° C or above, and thus would not have enumerated many of the non-coliform bacteria which grow at refrigeration temperatures.

Retention of the coliform test as a quick index of contamination seems justified, but interpretation of negative results, should be conservative, because of the considerable possibility the test will not detect some important types of contamination.

Dahlberg *et al.* [4] found that many of the samples they studied increased very greatly in psychrophilic count during holding at 44° F (6.7° C) for either 4 or 7 days, but few of the samples showed much growth when held at 33° F (0.6° C). Whether growth was considerable at 44° F was related to some degree to source of sample. Trout *et al.* [10] showed that even at 33±1° F (0.6° C) considerable increases in standard plate count occurred after holding for several weeks; psychrophilic counts apparently were not made.

The limited results on holding samples at different temperatures prior to plating (table 3) suggest the possibility that the quickest practical test for bacteria which develop at refrigeration temperatures, and thus for keeping quality under refrigeration, might consist of holding the sample at 10° C for 2 days, followed by plating and incubation of the plates at 25° C for 3 days. In many instances an indication of high count could be obtained by examination of the plates after 2 days, and sometimes after only 1 day. If the counts rose as high as 200,000 per milliliter after the sample was held 2 days at 10° C, considerable question might be raised about the sanitary conditions under which the product had been processed and the probable keeping quality under usual marketing and home storage conditions. If conditions were distinctly bad, the product probably would be off in flavor at the end of the holding period and no plating would be necessary. Lower holding temperatures would be less rigorous and higher temperatures undoubtedly would lead to development of bacteria which would not grow at usual refrigeration temperatures. A careful study of this suggestion under actual production conditions would be necessary before it were adopted for more than trial purposes.

SUMMARY AND CONCLUSIONS

1. Incubation periods shorter than 3 days at 25° C, 4 days at 21° C, 7 days at 15 or 10° C, and 10 days at 5° C resulted in lower counts on certain samples. The smaller colonies formed in the shorter times also frequently were more difficult to count.

2. Incubation at 25° C for 3 days commonly gave the maximum count for a sample and detected samples giving high counts on plates incubated 10 days at 5° C in all cases.

3. Incubation of plates at 35° C frequently failed to detect samples which gave very high counts upon incubation of plates at 32° C or below.

4. The temperature at which a sanple is held influences markedly the effect which different incubation temperatures will have upon the count obtained.

5. Negative coliform counts were obtained on some samples, although these samples contained large numbers of psychrophilic bacteria. A low coliform count is not necessarily an index of freedom from contamination with psychrophilic bacteria.

6. Incubation of plates 21° C for 4 days or 25° C for 3 days is recommended for detection of milk which has a high bacterial count due to growth during refrigeraton.

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PLANNING STATE RESTAURANT PROGRAM

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2. The preparation and dissemination of educational material for the public, the food service personnel, and the health department worker.

3. The resolution of inter and intra departmental conflicts at state level to present a uniform, coordinated program on food sanita-

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STATE RESTAURANT PROGRAM

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4. The provision of a comprehensive advisory service to local departments including a recommended ordinance and periodic program appraisal.

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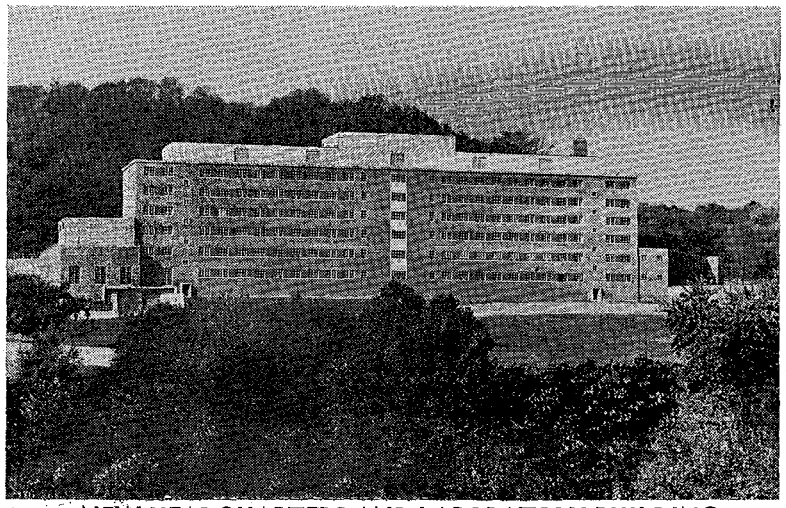

NEW HEADQUARTERS AND LABORATORY BUILDING

Gross floor area of 159,000 square feet, arranged on a modular plan of repeated standard units. Each unit, 12x18 feet, is provided with high and low voltage electricity, hot and cold water, steam, compressed air, vacuum, gas, and acid resistant waste lines. Interior partition walls are non-load bearing, built of 4-inch concrete block to facilitate remodeling.

Lighting is designed to provide 50-foot-candle intensity at laboratory bench level from fluorescent fixtures. Filtered air recirculates through most of the structure.

ACTIVITIES OF THE CENTER

The Public Health Service's Sanitary Engineering Center (until recently the Environmental Health Center) is dedicated to research, field investigators, and training in the sanitary sciences as related to man's contact with air, water, food, wastes, and ionizing radiations. It is the only laboratory in the nation to attempt a coordinated study of the health significance of physical, chemical, and biological forces in the environment. Dramatic population changes, growing industrialization, increasing use of atomic energy, and other factors in modern civilization are making it daily more important that the effects of the environment on the nation's health be understood and that the nation develop and apply the necessary control techniques to assure a healthful environment for its population.

In recognition of these needs, the 80th Congress authorized the construction of new Headquarters and Laboratory Building. To meet present needs the Center is turning attention to problems of such water-borne virus diseases as infectious hepatitis, water-borne toxins generated by algal growths, hazardous chemicals in the water supply and in the atmosphere, control of environmental radiation hazards which have been accentuated by the growth of the atomic energy industry, and the development of rapid, automatic, and economical means for detecting and measuring contaminants in air and water by use of modern electronic techniques such as the use of infra-red waves to "fingerprint" bacteria.

Another study which should repay the cost of investigation many times over is the application of a molecular filter which strains out all bacteria from drinking water. This filter offers major economies to public water works in providing a more rapid and economical method of examining water for bacteria. It can be used to insure the safety of drinking water taken from wells, lakes and springs.

Better methods for detecting, controlling, and remedying water pollution have long been pursued by the Center. Some lines of this endeavor have been the development of new and improved analytical techniques, studies of sewage and industrial waste treatment processes and studies of the ability of streams to purify themselves naturally. A systematic study of industrial wastes, in collaboration with industry associations, individual industrial plants, the National Technical Task Committee on Industrial Wastes, and others, has been a major responsibility of the Center. A series of industrial waste guides has been published for technical use.

Of particular professional interest is the Center's training program for state and local health workers in advanced sanitation and radiological health subjects. During the past five years 160 training courses have been conducted, attended by more than 6300 public health specialists from the forty-eight states and many foreign countries. The new laboratories are equipped with unique "classroom labs" for the accommodation of such visitors. These courses have proved invaluable in providing the Center with another way of making research results available to sanitary engineers and allied professional workers for practical and wide-spread use in controlling health hazards.

Intensive research into environmental factors is new in the health field. There are many unknowns to challenge the investigator and many methods of approach to them. Important by-products of research in the Cincinnati laboratories may, in the future, reveal clues to the mysteries of the present day "killers" and "cripplers", poliomyelitis, heart disease and cancer. What is the role of the water we drink, the air we breathe, and the food we eat in relation to these diseases?

* * *

The Sanitary Engineering Center is under the direction of Vernon G. MacKenzie, Officer in Charge.

PHS SANITARY ENGINEERING CENTER

The new four million dollar building in Cincinnati, Ohio, which will house the Sanitary Engineering Center of the Public Health Service, will be dedicated by Mrs. Oveta Culp Hobby, Secretary of the Department of Health, Education and Welfare, on Thursday, April 8.

The Sanitary Engineering Center, until recently the Environmental Health Center, is the focal point of the Federal government's research and study into how the health of human beings may be affected by contacts with elements found in air, water, and food, and by radiation and other factors in the environment.

The structure is located at Columbia Parkway and Grandin Road, about six miles east of downtown Cincinnati and overlooking the Little Miami River. It was authorized by the 80th Congress, in 1948, under bipartisan legislation.

Mrs. Hobby's dedication address will be part of a two-day program opening the new research and training center. The program on the second day will include talks by four leading scientists dealing with various aspects of man's efforts to control the environmental factors affecting his health.

In addition to Mrs. Hobby's dedication address, Dr. Leonard A. Scheele, Surgeon General of the Public Health Service and Mr. Mark Hollis, Chief Engineering Officer of the Public Health Service will speak. Mr. Vernon G. MacKenzie is Officer in Charge of the Sanitary Engineering Center and will be host for the occasion.

The scientific symposium on the second day of the program will deal with the general subject "The Control of the Environment for the Health of Man". Three of the speakers will discuss the role of their own special scientific fields in attacking this broad problem.

Dr. Oram Woolpert, director of the Ohio State Research Foundation, will speak on the role of the biological sciences; Dr. Detlev W. Bronk, president of the Rockefeller Institute for Medical Research, will talk on the role of the physical sciences; and Dr. Gordon M. Fair, professor of sanitary engineering at Harvard University, will speak on the role of engineering.

In addition, Dr. Herman E. Hilleboe, State Health Commissioner of New York and President of the American Public Health Association, will speak on "The Relationship of Environmental Health Problems to Social and Economic Development".

On Thursday evening, following the dedication ceremony, a banquet is to be held at the Netherland Plaza Hotel in downtown Cincinnati, and the speaker is to be Dr. Abel Wolman, one of the nation's leading sanitary engineers, who has served as special consultant to several foreign countries during the past several years. Dr. Wolman will discuss the significance of the new building and its research program, not only to the United States but to international efforts to raise health standards throughout the world.

ANNUAL MEETING KENTUCKY ASSOCIATION OF MILK AND FOOD SANITARIANS

The Kentucy Association of Milk and Food Sanitarians held its 1954 annual meeting at the University of Kentucky, February 17, in connection with the Fieldmen's and Herdsmen's Short Course. The program of the short course for this day was arranged principally for the benefit of the sanitarians group. It included talks by Mrs. Sarah Vance Dugan of the Kentucky State Board of Health, "Kentucky Milk Supply as a Health Problem"; Prof. George Hyatt, North Carolina State College, Dairy Extension; "How Fieldmen Can Aid Dairymen With Milk Production Problems"; Dr. K. G. Weckel, University of Wisconsin, Dept. of Dairy and Food Technology, "Fieldman and Sanitarian — Opportunities and Responsibilities"; Dr. C. A. Abele, Diversey Corporation, "Recent Advances in the Sanitation of Milk Production"; and Dr. A. S. Barnes, Ass't. Kentucky State Veterinarian, "Keeping UP-to-Date on Control of Bang's Disease".

At the business meeting, attended by 34 members, discussion centered on plans for making the association more useful to members, expanding the membership and plans for the next annual meeting.

The present officers were re-elected to serve another year.

PENNSALT INTRODUCES NEOFLOOR — SKID-PROOF, CORROSION RESISTANT FLOOR COATING

NeoFloor is a new, economical and easily applied skid-proof surface coating for concrete, wood and metal floors. Developed by the Pennsylvania Salt Manufacturing Company for use in plants, shops and other places where oils, greases and chemicals create safety hazards and maintenance problems, NeoFloor provides safe, comfortable footing and long lasting surfaces which stand up under heavy traffic, heat-aging and other rugged conditions.

As described by Robert R. Pierce, sales manager of Pennsalt's Corrosion Engineering Products Department, NeoFloor is a grit-like material anchored in a matrix of resilent neoprene and bonded firmly to the floor with an adhesive primer. Both primer and coating are supplied in liquid form for easy, quick-drying application with brush or roller.

Unlike ordinary surface coatings, NeoFloor is a tough, tightly bonded material which is highly resistant to fumes, spillage from acids, alkalies, salt solutions and solvents at temperatures up to 220° F. Also waterproof, NeoFloor is impervious to oils and greases and is easily cleaned with commercial detergents and cleaners.

NeoFloor is Pennasnlt's latest addition to an extensive line of chemical resistant cement mortars, coatings, membrane and molding products. Like Penchlor and Pennsalt Furan acid-proof cements and Pennpaints, NeoFloor will be distributed through sales engineers in the United States and Canada. Export sales will be directed by Pennsalt International Corporation. Additional information may be obtained by writing the Corrosion Engineering Products Department, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pennsylvania.

AMERICAN CAN BREAKS GROUND FOR NEW RESEARCH LABORATORY

American Can Company has announced the breaking of ground on a 40-acre tract of land in Barrington, Ill., for the construction of its new Research and Development Center.

The new scientific laboratory, through its improved and larger facilities, will make possible greater service to the container-using industries, and plans have been made for future expansion as the company's growth requires it, stated Dr. Roger H. Lueck, Canco's general manager in charge of research and development.

The present quarters at Maywood, Ill.—known throughout the industry as the "Maywood Laboratories"—jointly occupied with the technical service and quality control groups, leave no room for addition of new research facilities and staff, Dr. Lueck said. Head of the new Barrington laboratory will be Dr. Robert Warren Pilcher, the can company's director of research.

According to present plans the new laboratory will contain approximately 102,000 square feet of floor space and will provide for expansion, now envisaged, to a floor area of about 140,000 square feet. Of latest architectural design, the building will be of buff brick construction featuring half-glass walls and cheerful tile interiors. It will be a one-story structure except for a small section of the central part of the building which will be two stories.

In plan, the building will be shaped like a large capital "I" with a long cross-bar through the middle. The cross-bar and the top and bottom bars are wings extending at right angles to a central passage running the length of the building. It is designed to furnish every office and laboratory with outside light.

The structure will occupy about five percent of the spacious landscaped and wooded grounds, and will be situated approximately 500 feet back from the Northwest Highway in Barrington.

"Such a location," Dr. Lueck said, "will make it possible for our scientific people to work in a suburban atmosphere free from noise, vibration, smoke and other conditions which are not conducive to the best in research work."

The center will initally house a staff of more than 150 scientific, technical, clerical and maintenance people.

In addition to admintrative offices, the building will contain special laboratories devoted to food chemistry and nutrition, tinplate, coatings and other specialized types of research.

Special "hot" and "cold" rooms, capable of simulating climate conditions from the tropics to the Artic, will permit storage of test packs of every type of food an dnon-food products, Dr. Lueck said. Much of the research and development work, he added, will concern containers of metal, fibre and combination of the two, and the new laboratory will be equipped to package small quantities of food and non-food items in these containers for experimental and test purposes.

One of Canco's most important long range research project—known as "Operation Survival"—will be continued in the new center. The goal of this project is the elimination of tin as a can-making material.

Work on the new structure will be started immediately following the ground breaking and clearing of the site and will continue throughout the winter to permit steel and brickwork to be erected in the spring. Building and equipping of the new research center will require an estimated 12 months to complete, Dr. Lueck said.

In addition to the new Research and Development Center at Barrington, the can company will continue its technical service and quality control groups at Maywood, Dr. Lueck stated. The container-making firm has 58 manufacturing plants and four technical service laboratories located throughout the United States, Canada and Hawaii, as well as machine shops, warehouses and other facilities.

1ST. EXHIBITION OF DAIRY PRODUCTS AT GHENT

In the framework of the 9th International Fair of Ghent, from 11 to 26 September 1954, an Exhibition of dairy Products and connected Industries, will be organized in Belgium for the first time.

This important Exhibition, placed under the Patronage of the Minister of Agriculture, will have a scientific, technical and, at the same time, an industrial character.

The participation of the Ministry of Agriculture and Education, of "Office National du lait", of Red Cross of Belgium, and the Federation of the Belgian Milk Industries has already been granted.

For all information required apply to the Administration of the International Fair of Ghent, Palais des Floralies — Park — GHENT (Belgium).

ADDITIONAL COMMITTEE MEMBERSHIP APPOINTMENTS

Committee on Applied Laboratory Methods:

J. C. McCaffrey
Division of Laboratories
Illinois Dept. of Public Health
1800 W. Fillmore St.,

Committee on Dairy Farm Methods:

A. G. McLeod
Bureau of Food Control
Manitoba Dept. of Health and Public Welfare.
Winnipeg, Manitoba, Canada.

Committee on Food Equipment:

Charles E. Cotton
Idaho State Dept. of Public Health
Boise, Idaho.

W. R. McLean
Region 4
Public Health Service
Atlanta 5, Ga.

PRESIDENT OF OAKITE PREDICTS SUBSTANTIAL SALES IN 1954

A steady increase in the sales of industrial cleaning and metal treating compounds during the coming years was forecast by John A. Carter, president of Oakite Products, Inc., in a talk before the company's division managers at their annual conference in New York's Hotel Roosevelt on January 25.

"The rapid advances made in mechanized cleaning over the past few years have cut production costs and stepped up both the quality and rate of production," Carter stated. He cited the savings made possible in the metal industries by combining cleaning and phosphating in one spray-washing operation; in the food industries by the use of hot-spray cleaning; in the dairy industry by new in-place cleaning techniques; and in the petroleum industry by circulating cleaning solutions through equipment.

Reviewing the history of the company, a leader in the field of industrial cleaning and metal treating for the past 45 years, Carter pointed out that Oakite is continuing its program of expanding its present field service staff of more than 215 men, and that the company's research and service laboratories will move to larger, more modern quarters at 350 Hudson Street, New York City, about April 1.

PLASTIC TRAILER PASSES FIELD TESTS, GOES INTO MASS PRODUCTION AT STRICK

A trailer with the body built completely of plastic has successfully passed tests in the field and is now in quantity production at Strick Company, Philadelphia, manufacturers of over-the-road trailers for more than 25 years.

Sol Katz, vice president of Strick, said, "We expect the new plastic freighter to account for about six percent of our total sales in 1954. Acceptance of the models in the field, particularly among haulers of certain types of cargo, has been enthusiastic."

An outstanding advantage of the new material is that it is corrosion resistant and nonelectrolytic. Hides, lye, storage batteries—either acid or alkali cargo—can be transported in the plastic freighter with no special precautions. A carrier in New England has been hauling hides for nearly a year in a test model with no corrosion yet apparent. Formerly three months was outside limit before the metal was eaten away.

The plastic is also impervious to smells and has proved strikingly successful in food hauling operations. After dirty or smelly cargo is unloaded, the trailer can be cleaned readily, for the plastic washes as easily as a pane of glass.

Particularly desirable for truck operators with problem cargo, the plastic freighter is also considered good for general cargo hauling because of its light weight and serviceability.

The reinforced fiber glass and polyester resin plastic is a little lighter than aluminum, has approximately the same strength, and is impact resistant. If the trailer should be damaged in collision, the plastic can be repaired quickly and inexpensively without special tools or equipment.

The plastic panels are moulded for maximum useful strength per pound by providing extra thickness in the lower half and tapering toward the roof—1/8 inch to 3/32 inch. Roof panels are 1/16 inch in thickness.

Although the plastic used is translucent, Strick has controlled the amount of light permitted to enter by impregnating their panels with satin aluminum pigment. The resulting surface never needs painting and at the same time has high heat deflection and insulating properties. One or more of the roof panels are made of non-pigmented plastic and act as skylights for the freighter.

Riveted construction is used throughout with side panels riveted to exterior aluminum posts. The body is built on either standard chassis or as drop frame model.

VEGETABLE GUMS IN DAIRY PRODUCTS

Continued from Page 81

ard sediment disc or by using a 1 pint sample with the sediment concentrated on ⅛ the area of a standard disc. Off-the-bottom sediment standards can be used for evaluating the grades of these modified discs. Results of these modified tests are comparable to those obtained by the present standard off-the-bottom method on ten gallon cans.

*O.B. signifiies off-the-bottom

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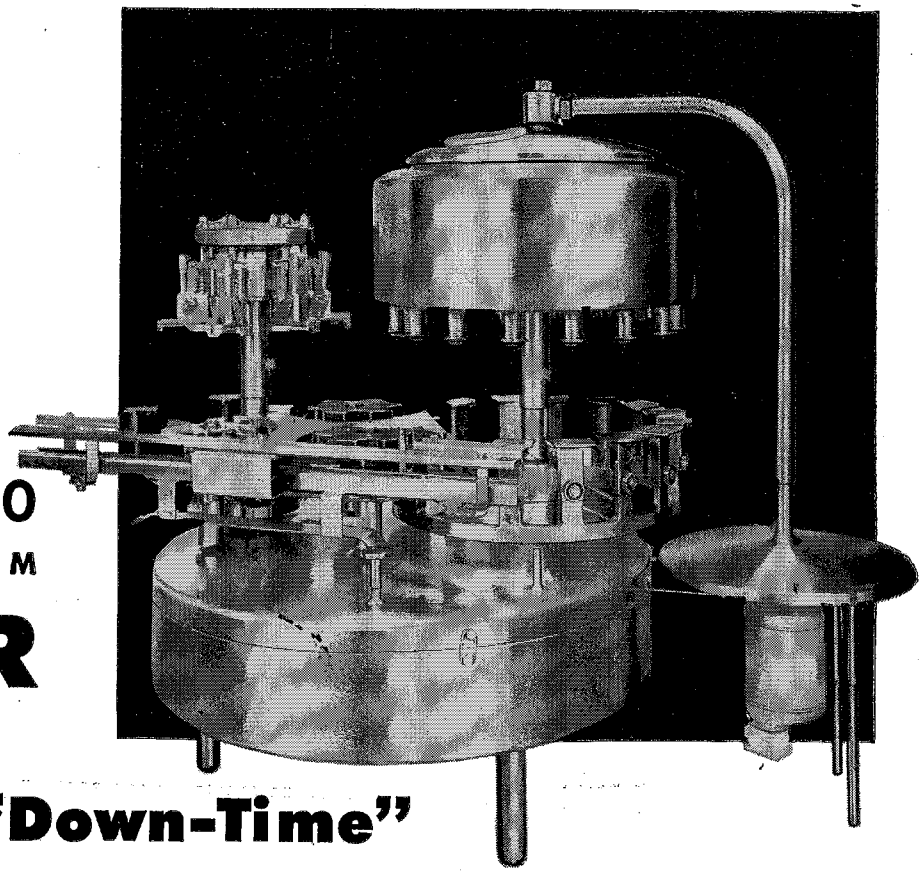

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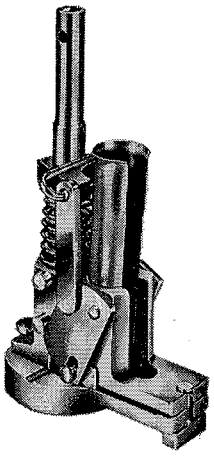

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