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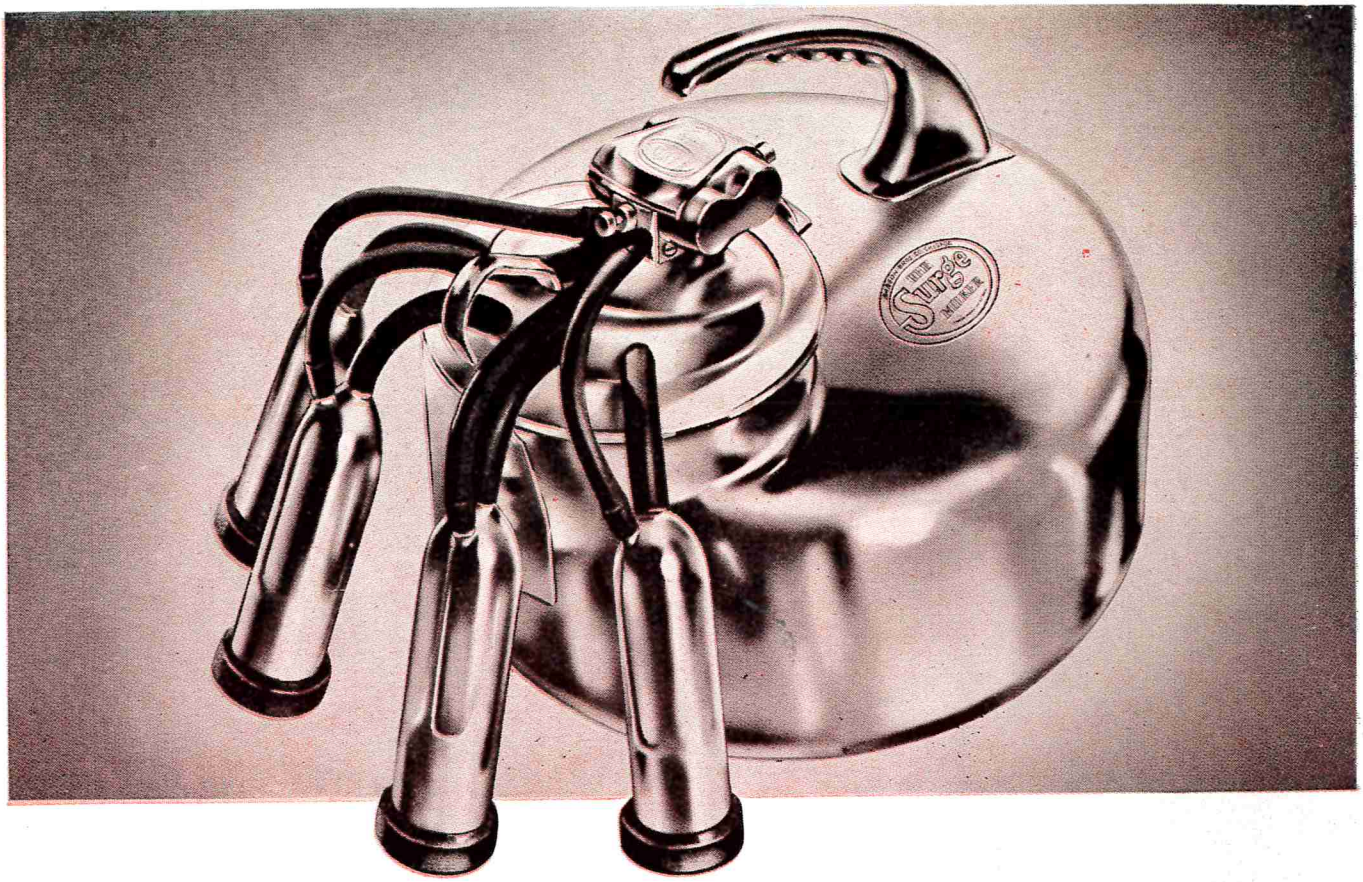
Journal of

MILK and FOOD TECHNOLOGY

Official Publication

International Association of Milk and Food Sanitarians, Inc.



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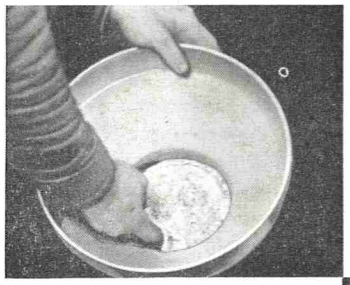
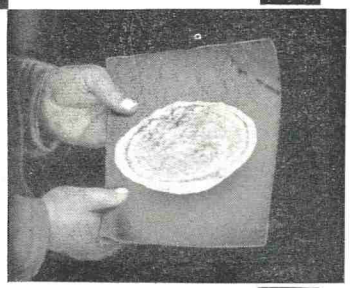
***The Rapid-Flo Farm Sediment Check-Up**



1. After filtering each can of milk (10 gallons or less), the producer should carefully remove the used **Rapid-Flo** Filter Disk from the strainer and place on a cardboard to dry.



2. When the **Rapid-Flo** disk is dry, it should be examined closely. The producer then has the facts. He can identify the sediment or extraneous matter to determine its origin, and take precautions to prevent its recurrence.

3. When conditions causing sediment are corrected and the **Rapid-Flo** Filter Disk, following filtration, is clean then you have the PROOF of clean milk production that you want.

In the interest of highway safety all of us are glad to comply with the regular automobile safety check-ups required by most cities and states.

In like manner all of us should encourage milk and cream producers to use the safety check-up for milk quality...the Rapid-Flo Farm Sediment Check-Up.* Here a clean used Rapid-Flo Filter Disk following filtration is the sign that the dairyman has kept his milk or cream clean and of high quality.

In the further interest of safety always recommend genuine Johnson & Johnson Rapid-Flo Filter Disks. They're *fibre-bonded for extra protection...* engineered for maximum retention and SAFE milk filtration...and at no extra cost you get the safety check-up for quality milk, the Rapid-Flo Farm Sediment Check-Up.*

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CLARITY OF DETERGENT SOLUTIONS IN HARD WATERS

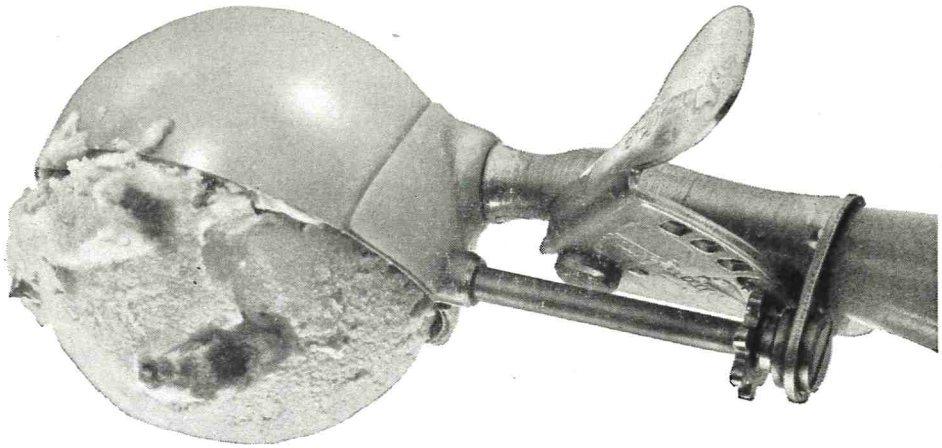
Very few sanitarians and fieldmen look either blank or skeptical today when the inability of detergent compounds to condition hard waters is charged as a principal contributing cause of "milkstone." Numerous efforts have been made to build up deposits by repeatedly soiling metal surfaces with milk, and then ineffectively washing them. But, unless the water is hard, the numbers of soilings and washings (the latter by investigators, of course) run rather high before readily observable deposits are formed.

Water hardness becomes a factor in the formation of milkstone (which is no more nor less than a milksolids-impregnated scale) because some detergent solutions prepared with it are invariable turbid. This turbidity consists of PRECIPITATED and SUSPENDED chemical salts. When these chemicals in the wash water which adhere to dairy utensils are not rinsed away with clear, cold water, they are deposited in a very thin layer on the surfaces when the film of the wash solution dries. Each layer of deposit is porous; the pores fill with milk serum and solids the next time the utensil is used. In time the deposit, consisting of layer upon layer, becomes visible.

Clear detergent solutions prepared with hard water have precisely as high a total content of chemical salts as turbid solution prepared with the same water. But the chemicals are IN SOLUTION; detergents compounded to keep water minerals in solution usually contain wetting agent to make solids free rinsing. Therefore, clear wash solutions are less likely to leave so heavy a residual film on washed utensils when removed. Rinsing in clear, cold water is, nevertheless, desirable; because even dissolved chemicals are precipitated and left on surfaces when the solution is entirely evaporated (dried).

The foregoing applies with equal force to food manufacturing equipment and service utensils.

The clarity of detergent solutions, prepared in accordance with the label directions, provides a rather reliable index of the rate at which milkstone or product deposits will form on surfaces washed with them. Have you ever employed this test?



most likely to appeal

When a patient presents a "feeding problem," ice cream may provide an ideal solution. Containing an excellent form of easily-digested protein, ice cream supplies an abundance of valuable minerals and vitamins, sugar, and moderate fat content for a readily-assimilated source of quick energy.

Because of its high calcium and phosphorus content, ice cream meets specific dietary requirements for the tubercular patient[1] and the pregnant[2] and lactating woman.[3]

An ideal food with which to tempt the older person, ice cream supplies many elements necessary in building resistance to infection[4]—in retaining nutritional status in osteoporosis,[5] in chronic colitis and other gastrointestinal diseases that interfere with digestive processes.[6]

For the pediatric patient, too, ice cream is not only traditional in the post-tonsillectomy period, but is also useful during recovery from poliomyelitis.[7]

Borden's Ice Cream offers the same food values as whole milk, but in different proportions—the same important proteins, minerals, and vitamins. Like other Borden dairy products, Borden's Ice Cream is made from only the finest of fresh milk, homogenized to break down curd size and render it easily digestible. Its high solids content, moreover, assures improved flavor and texture.

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[1]Brewer, W. D., et al: J. Am. Dietet. A. 30:21 [Jan.] 1954. [2]Murphy, G. H., and Wertz, A. W. : J. Am. Dietet. A. 30:34 [Jan.] 1954. [3]Spies, T. D. : J. A. M. A. 153:185 [Sept. 19] 1953. [4]Zeman, F. D., in Stieglitz, E. J. : Geriatric Medicine, ed. 2, Philadelphia, W. B. Saunders Company, 1949, p. 136. [5]Sebrell, W. H., Jr., and Hundley, J. M., in Stieglitz, E. J. : Geriatric Medicine, ed. 3, Philadelphia, J. B. Lippincott Company, 1954, pp. 186-187. [6]Barborka, C. J. : Treatment by Diet, ed. 5, Philadelphia, J. B. Lippincott Company, 1948, pp. 607-608. [7]Seifert, M. H. : J. Am. Dietet. A. 30:671 [July] 1954.

The *Borden* Company

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Sanitation in milking . . .

AND THE U. S. PUBLIC HEALTH SERVICE STANDARDS

STANDARDS set by the U.S. Public Health Service in 1939 were calculated to improve the quality of milk produced on America's dairy farms. If generally adopted, it was believed that dairymen and dairy equipment manufacturers who adhered to these standards would eliminate most of the common hazards to good sanitation.

In section 7 of this Milk Ordinance and Code, the standards for sanitary *construction* of milking equipment were defined. Here were *basic* standards. Without such standards, later efforts to improve sanitation would be for the most part ineffective.

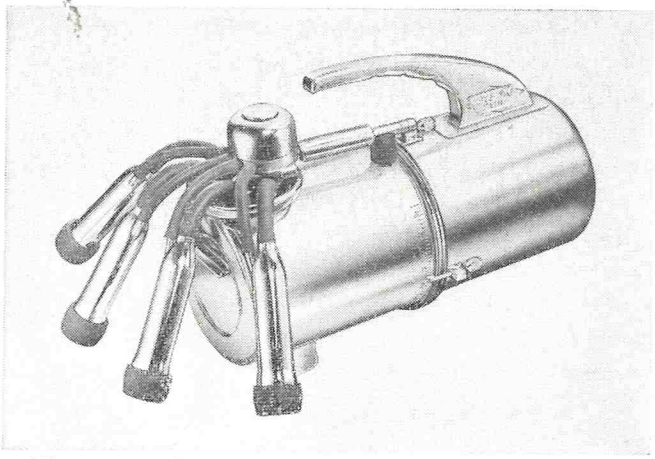
In creating a new suspended-type milker, our Rite-Way designers discussed the sanitation features of their new design with U.S. Public Health Service sanitation consultants. Our goal was to make sanitation *practical*. We reasoned that a genuinely sanitary milker would be well worth any possible extra costs incurred in its manufacture. Rite-Way carefully met every condition of section 7 of the Code.

Two design features were considered to be of primary importance.

(1) the vacuum line and pulsator should be separated as far as possible from the milk line. It was recognized that the cleanest vacuum lines would be those most difficult for milk to enter under average farm operating conditions.

(2) the milker itself must be *easy to clean*. Since prompt cleaning after each milking is absolutely necessary, the entire milker and pail must be designed for quick and thorough cleaning under normal procedures.

The result was a completely new idea—a pail that unfastened in the middle and came completely apart, exposing every square inch of its interior for quick, thorough cleaning. To keep the milk line clean, the pulsator was attached to the vacuum line in a way that made it impossible for the milk to enter either the pulsator or the vacuum line. These features were rigidly tested in the laboratory and on the farm. The result: the most practical and sanitary milker yet devised.



"Swing" is the only suspended or floor-type milker whose construction complies with the U.S.P.H.S.

Rite-Way called their new milker the "Swing". Today, it is widely advertised and a large part of our sales message stresses such important features as its proper teat cup positioning, lighter weight, narrower shape, and its ease of adjustment to any cow.

But the outstanding feature of "Swing" is its contribution to good sanitation. *Today, it is the only suspended or floor-type milker whose construction complies with U. S. Public Health Service standards.*

The standards established by this agency are available—indeed manufacturers who are interested are encouraged by the U.S. Public Health Service to design their equipment so as to comply with the provisions of the Milk Ordinance and Code. We feel we have measured up to our responsibility by adhering strictly to these standards.

We invite further inquiry and will be glad to send complete information on the Swing Milker or any other item in the Rite-Way line.

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PACKAGE MACHINERY COMPANY
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Chicago, Illinois • *Oklahoma City, Oklahoma*

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INCLUDING MILK AND FOOD SANITATION

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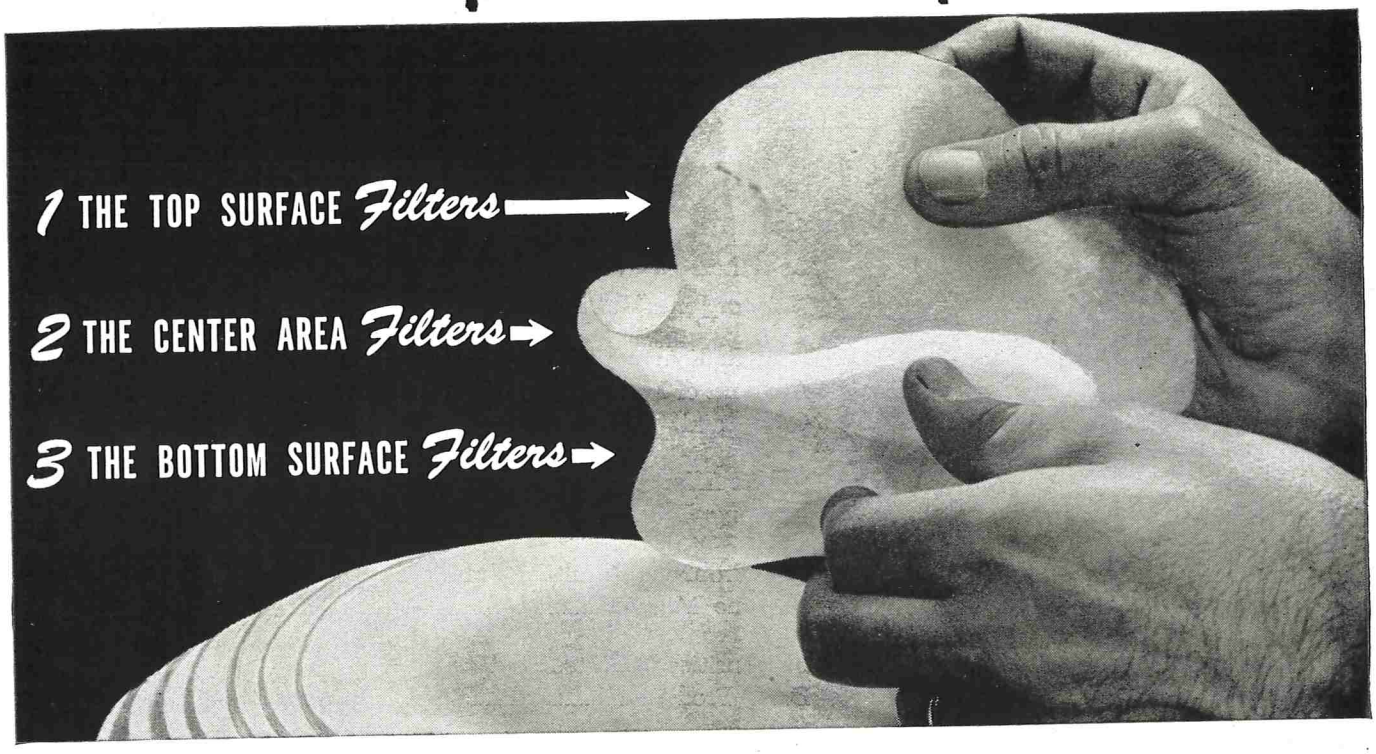

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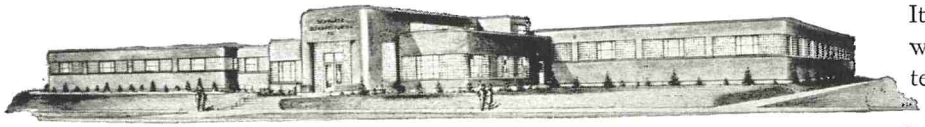

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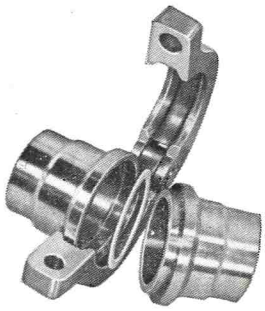

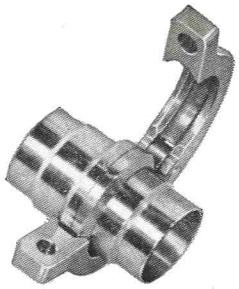

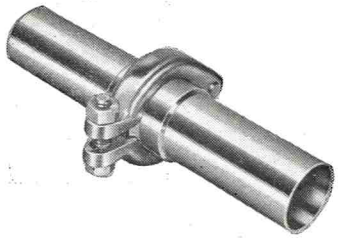

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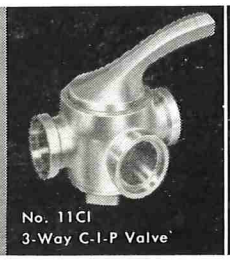
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Editorial Notes

AS OTHERS SEE US

In 1952, a team of fourteen dairymen from the British Isles, representing management and labor, visited this country to study its milk utilization practices. Its findings were published in a report of 114 pages, obtainable from Brit. Product. Council, 21 Tothill Street, London, S.W.1, 5/sterling, post free. The *Australian Journal of Dairy Technology*, April-June issue, 1954, quotes it as follows:

"The U.S.A. is, in fact, the largest milk producing, processing, and consuming country in the world, handling over 50,000,000 tons of milk annually, compared with about 8,500,000 tons in U.K. Although British output is 16 percent of that of the U.S., it is achieved in only 3 percent of the land area." . . .

" . . . it did seem that the lower levels of management had a clearer understanding of the policy and general problems of their company than is frequently found in this country."

"It was very noticeable that the majority of managers and foremen were well able to discuss the problems affecting other aspects of their industry or organization and were interested in them."

". . . interesting to note the great uniformity in the type of churn throughout the U.S. as against the variety of patterns in this country. (U.K.)"

". . . more than 100 different items (of milk and allied products, in numerous types and sizes of packs) are carried on the distribution vehicle."

"Another striking feature was the exceptional growth in sales of vitaminised non-fat or low-fat milk, said to have increased 500 percent in the last 5 years coinciding with a decrease in sales of cream."

"Industry in the U.S. is constantly seeking a better way of doing a job. It is spurred to the effort by competition and increasingly high freight costs—(and) a definite belief that nothing that has been done is quite good enough."

". . . we were impressed by the high standards of production at the few farms seen and would say that these high standards, coupled with mechanical refrigeration at the farm and speedy delivery to the depot, often by insulated transport, must tend to give a milk of high quality."

"For example, homogenizers and pumps—both well-known sources of contamination—are so constructed that they can be *completely* stripped by the unskilled labor associated with the cleaning operation."

"There appeared to be much more consultation between rival managements than is apparent in the U.K. and a freer exchange of costing information both as between individual competitors and through numerous trade associations and conventions. This springs from the recognition by American management that there are many problems in the industry which can be better solved by combined discussion and research and that anything benefiting their particular industry should benefit them all."

From these excerpts, we reflect:—

Cooperation—The cooperation which exists between our producers, our plant men, our research groups, and the health forces is certainly paying off. In the milk industry, the rule of the jungle does not prevail; cooperation is more effective than fighting.

Quality—Quality does indeed pay off in consumer preference and appeal but the dairy industry is quality-conscious at greater depths than merely the desire to make money. Yes, we'll say it: it has ideals of public service (fully up to that, at least, of communications linemen and transportation personnel) that stems from a deep-seated consciousness that it is uniquely close to household needs, and therefore has the human touch *par excellence*. It strives to produce quality, not because it *has* to but because it *wants* to as a duty and as personal gratification of doing a useful and necessary job.

Creativity—Our national, geographical frontier has now reached the Pacific Ocean but we have not lost our frontier as long as we have imagination, initiative, industry, and the spirit of inventiveness (stemming from the spirit of adventure).

Need — But we have yet something to learn from the "old country." British milk production is reported to be more "efficient" by a production factor of 5 to 1 as compared with milk production in this country (judging by the figures in the above-mentioned report). If these are verified, then it seems to us that American dairy husbandry apparently has not kept pace with our dairy technology.

One of the blessings of having good friends is that we learn both the good and the bad about ourselves. Our accomplishments encourage us, and our shortcomings stimulate us to do better. So, everybody is better off.

J. H. SHRADER

"DOCTOR JONES" RETIRES

The following is quoted* from Dr. H. F. Hilleboe, New York State Health Commissioner:

> "Doctor Jones" has retired.
>
> For seventeen years, Dr. Paul B. Brooks, under the pseudonym "Doctor Jones" has provided this publication with a column of down-to-earth facts in his own incomparable style — instructive, interesting, humorous — all in one package.
>
> "Doctor Jones Says" has been cited by the *American Journal of Public Health* as an outstanding contribution in the field of public health education. It has been quoted frequently by health organizations and public health workers throughout the State. Editors of seventy-five weekly newspapers have used it as a regular feature.
>
> Doctor Brooks, formerly Deputy State Health Commissioner, retired from State Service in 1946, hoping as he said, to do a few things he'd been wanting to do for years. His continuing to write the column for the weekly *Bulletin* more or less interferred with his doing the things he had in mind.
>
> During his years as a member of the Health Department staff, Doctor Brooks played a prominent part in the development of department activities. Among these was his characterization of "Doctor Jones" as a local health officer in the department's weekly radio program. This part was a "natural"

for him and in this as in his greater responsibilities, he attained considerable prominence.

Doctor Brooks has written a large number of articles on a variety of health subjects which have appeared in department publications and in medical and scientific journals. The best known probably are those written, several years ago on Milkborne Communicable Diseases. Quotations from these have appeared in well known text books.

One of Doctor Brooks' chief characteristics has been his broad understanding of public health practice and his almost intuitive grasp of the problems and viewpoint of the medical practitioner. This and his ready insight into the everyday problems of those about him, have endeared him to his friends and associates everywhere.

The retirement of "Doctor Jones" may give Doctor Brooks more time to do the things he has wanted to do,—we hope that he will include a bit of writing for the *Weekly Bulletin*.

Ever since the *Journal of Milk and Food Technology* was born, Dr. Brooks has been one of our dependable and valued contributors and a long-time Associate Editor. But to the Association, he has been a veritable god-father.

He was our President at our Silver Anniversary meeting at Atlantic City. Again, when we had no one to hold the Association together during the confused days after the death of Ivan C. Weld (our first secretary and inspiring genius) Dr. Brooks took over and helped us get straightened away. His influence on the direct health aspects of our work has been greater than that of any one member, and nearly that of all combined. Particularly outstanding was his work on the epidemiology of milk-borne disease.

Old-timers will recall their startled dismay at many of our annual meetings when "Paul" Brooks and "Bill" Palmer would let fly at each other—no holds barred. Gradually we would recognize that these hot forensics were really harmless—but certainly stimulating, and no one slept during them!

He has been one of the stalwarts of the Association. He was one of the few M.D.'s who have taken an active interest in this field of ours. He has always been practical and down-to-earth in his work, penetrating in his insights, and forceful in his utterance. We'll miss what "Dr. Jones Says" but shall likewise be glad to realize that he is enjoying a well-earned rest. With Dr. Hilleboe, we hope to hear from him whenever he feels the spirit moving him.

J. H. SHRADER

*New York State Department of Health, News Release of September 6.

THE USE OF RADIOACTIVE PHOSPHORUS TO MEASURE THE AMOUNTS OF MILKSTONE DEPOSITED ON RUBBER, PYREX GLASS, AND TYGON TUBINGS

MYRON W. CUCCI*

(Submitted for publication, August 21, 1954)

The problem of milkstone formation together with its contribution to high bacterial counts is being attacked by a study of physical as well as chemical factors. The condition of the surface of milk equipment would be expected to influence the rate at which milkstone is deposited. The results obtained show that the relatively rough and porous surface of rubber takes on twice as much milkstone as glass, and that little or none is deposited on tygon during the given time exposure.

INTRODUCTION

The purpose of this study was to obtain information regarding the amounts of milkstone deposited on rubber, pyrex glass, and tygon tubing.

Milkstone is generally regarded as scale resulting from the precipitation of calcium and magnesium salts on a surface. These salts may be of an inorganic nature such as phosphates and carbonates, and of an organic nature such as lactates and proteinates.

*MILK PLANT SPECIALTIES CORPORATION, 770 Exchange Street, Rochester 8, New York.

since calcium phosphate would be expected to be present in significant quantities in milkstone, it was decided to use radioactive phosphorus in the form of phosphate as a tracer.

In an attempt to simulate the formation of milkstone from the rinsings of a milk pipeline, a solution of 1 percent aqueous whole milk containing radioactive phosphorus was used. This milk solution did not lend itself to the formation of a detectable precipitate after an exposure period of one day. The experiment was then repeated using whole milk to which radioactive phosphorus was added. Again, no detectable precipitate formed after an exposure of one day.

At this point it was decided to simulate the condition of rapid formation of milkstone resulting from a combination of high calcium concentration from milk and a high phosphate concentration as present in some common detergent solutions. This combination gave not only a precipitate but also a significantly measureable amount of radioactivity.

Myron W. Cucci obtained his A. B., 1937, at the University of Rochester; M. S., 1939, Cornell University; 1939-1941, Research Chemist, Lehmkuhl Laboratory, Rochester, New York; 1941-1943, Civilian Inspector of U. S. Army Ordnance Material, New York State Area; 1943-1946, Seventh Medical Laboratory, 3rd U. S. Army European Theater; 1946-1950, Atomic Energy Commission, University of Rochester, Research Associate; 1950-1954, Milk Plant Specialties Corporation, Rochester, New York, Research and Development.

RESULTS

	Counts per 5 min per ml	Counts per min per ml	Counts per min above background per ml
Tygon	97	19.4	−0.6
Glass	143	28.6	8.6
Rubber	171	34.2	14.2
Background	100	20.0	..... *

*Distilled Water — Blank

PROCEDURE

0.1 ml of radioactive phosphorus (P32) in the form of phosphate was added to a solution of 255 ml of homogenized milk and 45 ml 10 percent trisodium phosphate dodecahydrate.

A 1-ml aliquot was counted on a "Berkeley" Geiger-Mueller thin end window counter and found to have an activity of 2,500 counts per minute per ml.

100 ml of this "tagged" milk was placed into tubing of rubber (½ inch I.D. x 24 inches long x 1 inch O.D.), pyrex glass (½ inch I.D. x 24 inches long x ⅞ inch O.D.), and tygon (½ inch I.D. x 24 inches long x ⅝ inch O.D.). Each tubing was clamped in a vertical position and plugged with No. 1 size rubber stoppers. At the end of 24 hours, the "tagged" milk was poured off and the tubings allowed to drain in a vertical position for 15 minutes.

The material retained on the inner wall was rinsed three times with 10 ml quantities of distilled water, then eluted once with 15 ml of concentrated HCl, and twice with 20 ml (1:1) HCl. The rinsings and elutions were transferred to 100-ml volumetric flasks, diluted to 100 ml with distilled water, and shaken thoroughly.

1-ml aliquots were taken from each flask and counted on the above described instrument for five minutes.

CALCULATIONS

1. The original tagged milk + trisodium phosphate contained 2,500 counts per minute per ml or a total count of 2,500 x 100 = 250,000 counts per minute.

2. Counts obtained by elution of inner wall of tubing:

Tygon = none

Pyrex Glass = 8.6 counts per minutes per ml x 100 = 860 counts per min.

Rubber = 14.2 counts per minutes per ml x 100 = 1420 counts per min.

3. Percentage retained on inner surface of tubing:

$$\text{Tygon: } \frac{0}{250{,}000}\ (100) = \text{Zero}$$

$$\text{Pyrex Glass: } \frac{860}{250{,}000}(100) = 0.34\%$$

$$\text{Rubber: } \frac{1420}{250{,}000}\ (100) = 0.57\%$$

DISCUSSION

The use of homogenized milk and trisodium phosphate was made because two previous runs with 1 percent aqueous whole milk and with regular whole milk gave no evidence of retention. The failure of calcium phosphate to precipitate in the first two instances indicated that the pH was not high enough, even though it has been shown by other workers that calcium phosphate can begin to precipitate at pH 3 to 4. Also, since some detergents contain trisodium phosphate, its presence in milk lines is not foreign, and its use in the experiment to form a precipitate is not out of order.

Since this study was exploratory and made under limited conditions, the interpretation of results is not intended to be decisive. However, the evidence is sufficient to indicate that twice as much milkstone in the form of calcium phosphate is deposited on rubber than on Pyrex glass during a one day exposure, and that no detectable amount is deposited on Tygon during the same interval.

It is recognized that the conclusion is based on data from a relatively short time exposure with very small pieces of representative equipment and under static conditions.

For those interested persons who may wish to experiment under dynamic conditions, it is suggested that the same materials be tested in closed pipeline circuits with continuously circulating milk. It is believed that such an experiment may also afford an opportunity to determine whether surface electrical charges developed by the passage of fluid through a pipeline have any influence on milkstone deposition.

ACKNOWLEDGEMENT

This work was conducted in collaboration with Dr. Philip S. Chen, Jr.[1] and Dr. John Weikel[2] of the Atomic Energy Project of the University of Rochester, and with the kind permission of Professor William F Neuman of the Department of Biochemistry of the Medical School at Strong Memorial Hospital.

1. Present Address: National Science Foundation Post Doctorate Fellow, University of Copenhagen, Copenhagen, Denmark.

2. U. S. Department of Health, Education, and Welfare, Food and Drug Administration, Washington 25, D. C.

OREGON MILK SANITARIANS SHORT COURSE

The annual Oregon fluid milk sanitarians short course will be held November 29 and 30 and December 1 this year with sessions in both Salem and Corvallis. The tentative program has just been announced by Kenneth E. Carl of the division of foods and dairies of the state department of agriculture.

Features the first and second days, when the meeting will be held in the state capitol at Salem, will include a talk on Role of Oregon Dairy Industry in milk legislation, views on milk sanitation by a consumer and dairyman and a number of field trips.

On December 1 the sessions will move to Withycombe Hall on the Oregon State College campus in Corvallis, where sanitation and milk quality will be the main topics under consideration. This annual short course is sponsored by the department of agriculture and the state college and is for all state milk inspectors working in Oregon. Attendance of inspectors is required under the Oregon Fluid Milk Act. The course is held annually to improve techniques and to make uniform both the state and city milk inspection service. During the three-day meeting the Association of Milk Sanitarians will hold their annual dinner meeting.

SOME FACTORS AFFECTING GELATION OF FROZEN EGG YOLK[a, b]

ANTHONY LOPEZ[c], CARL R. FELLERS, AND WILLIAM D. POWIE
Department of Food Technology, University of Massachusetts, Amherst, Massachusetts

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Freezing at temperature below -6° C (21°F) produces irreversible physico- chemical changes (gelation) in egg yolk. Colloid milling of yolk inhibited gelation to a large extent. None of the many chemical substances examined inhibited gelation and produced a yolk of normal flavor. Very quick freezing combined with rapid thawing had a pronounced gelation inhibiting effect. Frozen shell eggs that were defrosted by dielectric heating did not thaw uniformly.

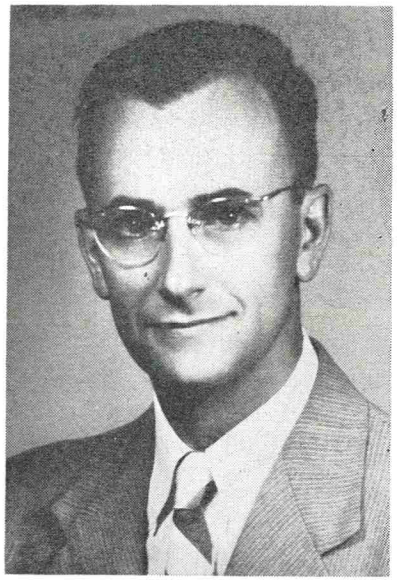
INTRODUCTION

Freezing shell eggs in such a way that they would retain their fresh egg characteristics after thawing and cooking would offer many advantages for civilian and military uses. The quality of the eggs would remain substantially constant during long storage periods. It would also be advantageous to be able to freeze egg yolk without changes in quality caused by the freezing process, and without changes in flavor due to substances added to avoid the loss of its normal appearance when thawed. The fundamental mechanisms of the physico-chemical changes (gelation) which take place in egg yolk upon freezing at a temperature below –6° C (21° F) have received only scant attention. This report describes the effect of several different treatments of egg yolk upon gelation.

REVIEW OF LITERATURE ON FREEZING OF SHELL EGGS, EGG YOLK, AND EGG WHITE

Egg yolk has an average freezing point of –0.65° C (30.8° F), while the albumen has a freezing point of –0.45° C (31.2° F). According to Moran[7], whole eggs may be cooled somewhat below these temperatures without actual freezing of the contents. The changes that take place in egg white as a result of freezing are much less pronounced than the changes that occur in the yolk. At all temperatures of freezing, there is an increase in the proportion of the liquid portion with a corresponding decrease in the viscous portion. This increase is controlled by the minimum temperature reached during the freezing process, the lower the temperature, the larger the increase. When yolk is frozen between the limits –0.65° C (30.8° F) and –6° C (21.2° F) normal fluidity is regained on thawing. If, however, the temperature is carried below –6° C and the yolk kept at the lower temperature for a short time, the yolk on thawing becomes a paste, like putty. Yolks have been supercooled as low as –11° C (12.2° F) for 7 days without the yolks changing to the pasty state. When egg yolks are frozen in liquid air, upon thawing they pass into the pasty state; but if thawed rapidly in mercury at 30° C (86° F) they completely regain normal fluidity. Therefore, the irreversible yolk changes may be produced either in the freezing or in the thawing process. Even at the temperature of liquid air (–190° C) (–310° F) egg yolk requires an appreciable time to change over into the irreversible condition. At – 11° C (12.2° F) it was shown that a period of not less than 20 hours is required.

Thomas and Bailey[12] showed that in pure egg magma (mixed whites and yolks) the degree of gelation (pastyness) is a function of the mechanical treatment of the magma prior to freezing. Colloid-milled specimens showed practically no gelation. Sodium chloride, sucrose, and dextrose lowered the degree of gelation of the whole egg magma. The maximum degree of gelation is reached in 60 to 120 days of storage at – 21 to –18° C (–5.8 to 0° F).



Dr. Anthony Lopez received his B.S. (1942) in chemistry at the Catholic University, Chile. From 1942 until 1945 he was a chemist with S.A. Organa, manufacturing chemists, in Chile. In 1947 he received a Ph.D. degree in food technology from the University of Massachusetts. From 1948 until 1952 he was technical director of Industria de Productos Alimenticios of Chile. During 1952-53 he was Associate Research Professor of food technology at the University of Georgia. At present he is Professor of Fruit and Vegetable Processing in the Department of Horticulture of Virginia Polytechnic Institute. He has done research on bacteriostatic activity of dyes, on utilization and nutritive value of fish, on composition and nutritive value of fruits and vegetables, on sauerkraut fermentation, on processing of vegetables, and on egg freezing.

Quick freezing yields a better egg product than delayed slow freezing according to Swenson and Thomas[11]. Carbonation of the egg batter before freezing improves the quality of the egg on thawing. The combined use of 10 percent salt and quick freezing is effective.

Pasty yolks which have been frozen quickly in liquid air are firmer in texture, after thawing, than yolks that have been frozen slowly. (Quoted by Romanoff and Romanoff[9]), Tongur and Ragosin[13] showed that alteration of the colloid state can be avoided by homogenizing the egg mixture with a milk homogenizer. A patent on the use of pancreatin and other enzymes for inhibiting gelation of yolk upon

[a]Contribution No. 964, Massachusetts Agricultural Experiment Station.

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[c]Present address: Department of Horticulture, Virginia Polytechnic Institute, Blacksburg, Virginia.

TABLE 1—EFFECT OF CHANGE OF pH UPON GELATION OF YOLK[1]

Yolk sample	pH after addition of acid or alkali	Relative Viscosity[2] Before freezing	Relative Viscosity[2] After Thawing	Degree of Gelation[3]
Fresh (control) pH 6.2	Not added	0.1	Over 100	High
Test 1 (NaOH added)	6.6	0.2	Over 100	High
Test 2 (NaOH added)	7.0	1.2	Over 100	High
Test 3 (H_2SO_4 added)	5.1	3.7	Over 100	High
Test 4 (H_2SO_4 added)	4.6	5.0	Over 100	High
Test 5 (H_2SO_4 added)	3.2	Over 100	Over 100	High

[1]All the values are the mean of three replications
[2]Measured with a Brookfield Viscometer
[3]Observed organoleptically

freezing was granted to Tressler[14] in 1932. Schaible and Card[10] described a procedure for producing frozen eggs for home use. The procedure consists essentially in placing individual mixed yolks and whites in rectangular shaped containers, freezing, and packaging the resulting blocks in water vaporproof film. In this publication, no reference is made to gelation of yolks, or to any change produced by freezing.

Kaloyereas[5] patented a method by which eggs can be frozen in the shell without cracking or breaking of the shell during the freezing operation. This is accomplished by removing 5 - 10 percent water from the shell eggs either by placing them *in vacuo* or over some strong dehydrating agent. The egg yolk, however, has a waxy consistency.

Urbain and Miller[15] state that the physical character of the yolk portion is altered on freezing due to the separation and coagulation of lecithin. Gelation is prevented by adding 10 percent by weight of dextrose or levulose. Sucrose is not nearly so effective. None of the sugars form permanent combinations with the yolk while freezing.

It has been found by Colmer[2] that *Bacillus cereus* and related species produce a hardening of the yolk when the yolk of fresh shell eggs is inoculated with one of these species, and incubated at 37° C (98.6° F). The explanation given is that the lecithoprotein of yolk is broken down by the action of the lecithinase produced by these bacteria on the lecithin. With the loss of the binder action of the lecithin, the fat and protein change from their dispersed state to that found after the bacteria have grown in the egg.

Jordan *et al.*[4] found that when egg yolks and whole egg magma, treated with salt, sugar, or white corn syrup were frozen and stored at −18° C (0° F) they retained to a high degree the functional properties necessary for satisfactory performance in plain cakes and custards. On the other hand, frozen untreated yolks were unsatisfactory.

TABLE 2—EFFECT OF COLLOID MILLING OF YOLK UPON ITS GELATION[1]

Yolk sample No.	Mill clearance (inches)	Viscosity[2] Before milling	Viscosity[2] After milling before freezing	Viscosity[2] After freezing	Degree of gelation
1	.003[3]	4.5	6.0	8.0	Very low
2	.003	3.2	3.7	9.1	Low
3	.003	4.5	3.5	9.3	Low
4	.020	3.2	3.8	17.3	Medium
5	.020	3.1	3.7	16.1	Medium
6	.040	3.2	5.2	14.6	Medium
7	.040	7.0	3.8	15.4	Medium
8	.060	5.5	3.1	14.5	Medium
9	.060	3.0	1.5	14.9	Medium
10	.083	3.7	2.5	18.7	Medium
11	.083	3.0	2.0	19.8	Medium
Control[4]	.....	3.3	....	Over 100	High

[1]All the values are the mean of three replications
[2]A Brookfield viscometer was used
[3]Run three times through the .003″ clearance
[4]The control was not colloid milled

EXPERIMENTAL PROCEDURES AND RESULTS

The eggs used in these experiments were strictly fresh eggs from mixed breeds from the University flocks. Since many of the experiments here reported led to negative results, only limited data are included.

1. *Effect of Freezing upon the pH of Egg Yolk*

The pH of 12 individual fresh yolks was determined, then the yolks were sealed in polyethylene bags, and maintained at −18° C (0° F) for 72 hours. After defrosting by immersing the bags in water at 50° C (122° F), the pH values were again determined. The mean pH value of the fresh yolks was found to be 6.16, and that of the frozen thawed yolks, 6.19. Therefore, freezing did not significantly affect the pH of fresh egg yolk.

2. *Effect of Change of pH upon the Gelation of Yolk*

Sulfuric acid (4 N) was added to fresh mixed yolk that had a pH of 6.20, and the pH of different samples modified to different values. Using a Brookfield viscometer the relative viscosity of each sample was determined before and after the addition of sulfuric acid. The samples were placed in polyethylene bags, frozen at −18° C (0° F) and kept frozen for 72 hours. They were thawed by immersion in water at 50° C (122° F), and their relative viscosity was again determined. A similar experiment was run using 0.214 N sodium hydroxide. The results are presented in Table 1. The degree of gelation was high in all cases. The reversibility of the change produced in yolk by the addition of

sulfuric acid was also studied. To fresh yolk (pH 6.2) 4-normal sulfuric acid was added until its pH was 3.2 and mixed well. The resultant mass was sticky and of high viscosity, having a relative viscosity value of over 100 on the Brookfield viscometer. Then, 0.214 N NaOH was added to the yolk until its pH was brought to the original value of 6.2. It was observed that the yolk became even more viscous and stringy. Thus, the reaction was found to be non-reversible.

3. *Effect of Cooking before Freezing upon the Onset of Gelation in Mixed Yolk and in Shell Eggs.*

Fifteen-gram samples of mixed yolk packaged in polyethylene bags, and shell eggs were immersed in water at 55° C (131° F) and at 100° C (212° F) for different lengths of time (5 seconds to 120 seconds). They were then frozen at –18° C (0° F) and kept frozen for four days at the same temperature. The samples were thawed by immersion in water at 50° C (122° F). A high degree of gelation was observed in all samples.

4. *Effect of Different Degrees of Dilution and of Dehydration of Yolk upon Its Gelation.*

Samples of fresh yolk material were dehydrated in vacuum oven at 50° C until different samples had lost 5, 10, and 15 percent of their weight. Other samples were diluted with different amounts of water (10, 25, 40, 70, and 100 percent). Viscosity readings were taken before freezing them and storing them in a freezer at –18° C for 4 days, and after thawing by exposure to air at 23° C (73°F). Gelation of yolks was not prevented by dilution or concentration. All samples showed a high degree of gelation except the 70 and 100 percent dilution samples, which were liquid probably due to the degree of dispersion of the yolk particles.

5. *Effect of Colloid Milling of Fresh Yolk upon Its Gelation.*

In the literature there are references to the colloid milling of whole egg material previous to freezing it, but the effect of colloid milling upon the onset of gelation in yolk material has not been reported.

TABLE 3—EFFECT OF COLLOID MILLING OF FRESH YOLK MATERIAL CONTAINING SODIUM CHLORIDE UPON ITS GELATION

Sample Number	NaCl percent	Viscosity[1]			Degree of gelation
		Before milling	After milling	After freezing	
A-1	0.2	3.0	3.5	Over 100	High
A-2	0.2	3.0	Not milled	Over 100	High
B-1	0.5	3.5	8.0	Over 100	High
B-2	0.5	3.5	Not milled	Over 100	High
C-1	0.8	5.6	7.4	100	High
C-2	0.8	5.6	Not milled	85	High
D-1	1.0	8.0	10.0	73	High
D-2	1.0	8.0	Not milled	58.5	High
E-1	1.5	10.0	10.0	65.0	High
E-2	1.5	10.0	Not milled	38.0	Medium
F-1	2.0	13.0	16.0	Over 100	High
F-2	2.0	13.0	Not milled	73	Medium
G-1	5.0	17.0	29.0	84	High
G-2	5.0	17.0	Not milled	35	Medium
H-1	10.0	56.0	84.0	Over 100	High
H-2	10.0	56.0	Not milled	16.5	Low
Untreated	0	5.2	----------	--------	High

[1]Clearance of mill in all cases was 0.003 inch. All the values are the mean of three replications.

The following procedure was followed. Well mixed 500-gram portions of yolk were prepared and their relative viscosities determined. They were run through different clearances of a colloid mill. The clearances (distance between the rotor and the stator of the mill) ranged between 0.083 and 0.003 inch. The samples were then placed in glass jars and frozen at–18° C in a freezer provided with air circulation. The samples were held for three days. They were thawed by letting them stand overnight at 4° C (40° F). Their relative viscosity was again determined and the degree of gelation of the samples was visually observed. It was found that colloid milling decreases the degree of gelation of frozen yolk; the smaller the clearance of the mill, the less the gelation. The best sample was the one which was passed consecutively three times through the smallest clearance (0.003 inch). This sample was found to be a thick liquid, somewhat more viscous than free untreated yolk material. That is, it had experienced a low degree of gelation. Its consistency was about

TABLE 4—GELATION INHIBITING PROPERTIES OF SOME SUGARS

Sugar	Percent added to yolk	Degree of gelation[1]	Flavor	Color and odor
Arabinose	5	Medium	Too sweet	Normal
Arabinose	10	None	Too sweet	Normal
Galactose	5	Medium	Too sweet	Normal
Galactose	10	None	Too sweet	Normal
Cellobiose	10	High	(2)	(2)
Lactose	10	High	(2)	(2)
Maltose	10	High	(2)	(2)
Raffinose	3	High	(2)	(2)
Raffinose	10	High	(2)	(2)
Sucrose	3	High	Too sweet	Normal
Sucrose	10	Low	Too sweet	Normal
Dextrose	3	Medium	Too sweet	Normal
Dextrose	10	Low	Too sweet	Normal

[1]Determined organoleptically
[2]Flavor, odor and color not recorded because of high degree of gelation produced

the same as that of yolk treated with 10 percent sucrose or 5 percent salt prior to freezing. The frozen, untreated control was a plastic solid; that is, its degree of gelation was high. The experimental data are presented in Table 2.

The least gelled colloid milled egg yolk sample was fried in Crisco, and compared in panel acceptance tests with fried fresh, untreated yolk. The flavor, color, and texture of the colloid milled sample were very similar to those of fresh yolk. No off flavor was detected in the colloid milled sample. The untreated gelled yolk was also fried. Its texture was rubbery and its color bleached as compared with the fried fresh, untreated yolk. The flavor was flat, i.e., it lacked egg flavor, although no off-flavor was detected. This colloid milled product possesses the advantage of having neither a sweet nor a salty flavor. Such a product has market possibilities.

6. *Effect of Colloid Milling of Fresh Yolk Material Containing Sodium Chloride upon Its Gelation*

The method followed was the same as that described in Section 5 with the difference that the clearance of the colloid mill was kept at 0.003 inch for all samples, and that all the samples, except the control, contained sodium chloride in concentrations varying from 0.2 to 10.0 percent in different samples.

The results are presented in Table 3. They show that the degree of gelation of frozen colloid milled yolk containing sodium chloride was higher than that of frozen non-milled yolk containing the same concentration of salt. It was also observed that the addition of sodium chloride to fresh, untreated yolk up to 0.5 percent had the effect of decreasing its viscosity, and that a concentration of salt of 0.8 percent or higher, increased the viscosity of the fresh yolk material.

7. *Effect of Dilution of Fresh Yolk Material Previous to Colloid Milling*

Mixed yolks were diluted with 5 and with 15 percent of water, then colloid milled and frozen. The milling and freezing methods were the same as followed in Section 6. After thawing overnight at 4° C (40° F), all test samples showed a high degree of gelation, as high as an untreated control.

8. *Colloid Milling and Freezing of Yolk Material That Had Already Suffered Gelation.*

Fresh, untreated mixed yolks were frozen at −18° C (0° F), thawed overnight at 4° C (40° F) and were found highly gelled, as normally occurs under these conditions. This gelled yolk material was mixed in a Waring blendor with 10 percent added water. It then became fluid. Different samples of this fluid were colloid milled through 0.003, 0.040, and 0.083 inch clearances respectively, placed in glass jars which were taken to a freezing room, and held at −18° C (0° F). They were kept for five days, and thawed by leaving overnight at 4° C (40° F). All samples again showed a high degree of gelation.

9. *Effect of Stability of Emulsion upon the Properties of Frozen Yolk*

The purpose of this phase of the work was to study the effect of added emulsion stabilizers and destabilizers upon the onset of gelation in frozen-thawed yolk. Several different substances were used in an attempt to increase the stability of the yolk emulsion. The substances used, and their concentration in yolk, were the following: Glyceryl monolaurate, 0.5 and 3.0 percent; glyceryl monoleate, 0.5 and 3.0 percent; soluble starch, 1.0 percent; Irish moss extract, 0.25 percent; the compounds known commercially[d] as Aldo 28, 0.5 and 3.0 percent; Aldo 25, 0.5 and 3.0 percent; and Peg 42, 0.2 and 1.0 percent. Calcium chloride, 0.5 and 3.0 percent, and a water-in-oil emulsifier, Aldo 33, 0.5 percent, were used to attempt to break the emulsion or make it less stable.

The following experimental procedure was followed: The compound to be used was dispersed or dissolved in a small amount of water when necessary, and mixed with yolk in a definite proportion by means of a Waring blendor. The amount of yolk treated was divided in two portions, one of which was run through a colloid mill with a clearance between rotor and stator of 0.003 inch, then frozen at 0° F in a freezer with air circulation. The other portion, which was not run through the mill was used as a control. Another control sample was made up of untreated fresh yolk and was frozen together with the other samples. After six days of frozen storage all samples were thawed by leaving them at 4° C (40° F) overnight.

The criteria for ascertaining the results were based on determinations of relative viscosity of the frozen-thawed samples and in organoleptic observations of the onset of gelation.

Under the conditions of these experiments, the samples and controls showed approximately the same high degree of gelation. None of the substances tested had any influence in decreasing the degree of yolk gelation.

10. *Testing of Gelation Inhibiting Properties of Several Substances*

The following substances, in the concentrations indicated, are used commercially for inhibiting the gelation of yolk material or of egg magma (mixed yolk and albumen): sucrose, up to 10 percent; sodium chloride, up to 10 percent; glycerol, up to 5 percent; dextrose, up to 10 percent and levulose, up to 10 percent. Yolks and egg magma so treated possess good qualities for use in the baking, candy, and mayonnaise industries, but their sweet or salty flavor makes them unsuitable for other purposes. The inhibiting properties of other substances were investigated as follows:

A) *Trisodium citrate.* Trisodium citrate prevents coagulation of blood. In three experiments, 3 percent sodium citrate in yolk prevented its gelation, but imparted to the yolks a strong citrate flavor. Yolks with one percent sodium citrate gelled and also had some citrate flavor.

B) *Sequestrene Na_3*[e]. In order to ascertain whether metallic ions have direct influence upon the gelation of yolk, a chelating agent was tested. Sequestrene Na_3 (trisodium ethylenediaminetetracetate) was used in concentrations of 0.05, 0.2 and 1.0 percent. The results show that Sequestrene Na_3 under the conditions of the experiment did not prevent the gelation of yolk.

C) *Sugars.* Since there are some sugars that prevent the onset of gelation in frozen yolk, it was decided to determine whether other

sugars would also inhibit gelation. Some pentoses, monosaccharides, disaccharides and trisaccharides were tested. Sugars with most neutral flavor were selected. Sucrose was used as a control. The frozen storage period was 7 days. The experimental data are presented in Table 4. The results show that only arabinose, a pentose, and galactose, a monosaccharide, inhibited gelation. These two sugars, in the concentrations in which they were found effective, also give an objectionable sweet flavor to yolk.

Mixed yolks treated with either 10 percent arabinose or 10 percent galactose after a frozen storage period of 7 days had a lower viscosity than yolk material treated with either dextrose or sucrose. Because of the higher cost of arabinose and galactose, as compared with sucrose and dextrose, these results have little commercial significance at present. However, the fact that other sugars did not inhibit gelation appears to disprove the theory that sucrose, glucose, and levulose are effective in inhibiting gelation because they lower the freezing point of water present in yolk. If this were the case, cellobiose, lactose, and maltose should also have inhibited the gelation of yolk. No common physical or chemical property among the sugars that inhibit gelation, or among those that do not inhibit gelation, has been found which could be offered as an explanation of their behavior. The best we can do at present is to suggest that some sugars "protect" egg yolk constituents against gelation caused by freezing.

D) *Miscellaneous substances.*

The following substances, in the concentrations indicated were tested: mannitol 3.0 and 10.0 percent; dextrin, 2.0 percent; ethylene glycol, 2.0, 4.0, 6.0, 8.0, and 10.0 percent; propylene glycol, 5.0, and 10.0 percent; ethyl ether, 2.0 percent; ethyl alcohol, 5.0 percent; sodium gluconate, 10.0 percent; galacturonic acid, 10.0 percent; inositol, 10.0 percent; choline chloride, 0.5 percent; sorbitol, 10.0 percent; potassium chloride, 1.0 percent; potassium dihydrogen phosphate, 1.5 percent; monosodium glutamate, 1.0 percent; pectin, 0.25, 0.50, and 1.0 percent; gum tragacanth, 2.0 percent; gum arabic, 2.0 percent; gum Karaya, 2.0 percent; ascorbic acid, 0.2 percent; potassium permanganate, 0.1 percent; potassium metabisulfite, 0.1 percent. sodium chloride, 1.0, 1.5, 2.5, 3.0, and 4.0 percent. and glycerol, 10.0 percent, were used as controls.

Of the substances named above, ethylene glycol and propylene glycol, both at the 10.0 percent level, inhibited gelation, but the yolk had a marked sweet flavor. Sorbitol (10.0 percent), partially inhibited gelation, but the yolk had an off-flavor. Sodium chloride at 4.0 percent inhibited gelation completely, and at 3.0, 2.5 and 1.5 percent, the inhibition was partial, and directly proportional to salt concentration. Glycerol, at 10.0 percent concentration inhibited gelation completely. None of the other substances was effective in inhibiting gelation totally or partially.

11. *Freezing of Yolks and of Mixed Yolk Material in Solid Carbon Dioxide-Acetone Mixture and in Liquid Nitrogen*

A) Ten yolks from fresh shell eggs were carefully separated, unbroken, from the whites. They were dipped in the freezing acetone-CO_2 mixture, (temperature approximately –70° C, –94° F). In all cases the vitelline membrane of these yolks broke during the freezing operation. For thawing, they were allowed to stand at room temperature (24° C, 75° F). All these yolks were gelled to a high degree.

B) Each of ten polyethylene bags was filled with 15 grams of fresh mixed yolk. The thickness of the yolk in the bags was of approximately one-fourth inch. Then, they were frozen in acetone-dry ice mixture and thawed by immersion in water at 54° C (130° F). The degree of gelation of the yolk varied from low to very low; that is, the yolk had a somewhat higher viscosity than fresh yolk. but it was a flowing liquid. The degree of gelation of yolk was high when similar bags were frozen in acetone-dry ice as before, but thawed slowly by leaving them at room temperature, or when frozen at a slower rate in air at –18° C (0° F) and quickly thawed in water at 54° C.

C) Experiments were performed using liquid nitrogen as a freezing medium. Twenty polyethylene bags were filled with 15 grams of fresh mixed yolk and heat sealed. Ten of them were dipped in liquid nitrogen for two minutes. Together with the ten untreated bags, they were immediately transferred to a freezer maintained at –18° C. After 7 days, five of the nitrogen frozen bags and five untreated bags were thawed by immersion in water at 54° C (130° F). Five nitrogen frozen bags and five untreated bags were thawed by leaving them at room temperature. Results showed a very low degree of gelation in all samples frozen in nitrogen and thawed in water at 54° C. The degree of gelation was medium in samples frozen in nitrogen and thawed by leaving them at room temperature. All samples that were frozen in freezer at –18° C showed a high degree of gelation.

The experiments using an acetone-dry ice freezing medium, and those using liquid nitrogen, confirm Moran's results[7] on the beneficial effects of very rapid freezing and thawing, upon gelation. In the work reported herein it was also observed that both quicker freezing and quicker thawing, independently, decrease the degree of gelation of frozen yolk, and that faster freezing and faster thawing, when combined, are more effective than either of these two variables independently.

12. *Preliminary Experiments on the Effect of Sonic and of Supersonic Vibrations upon Gelation in Shell Eggs*

Fresh shell eggs were exposed to sonic and to supersonic vibrations under the following conditions: 10,000 cycles per second for 1 minute; 10,000 cycles per second for 3 minutes; 10,000 cycles per second for 5 minutes; 27,000 cycles per second for 1 minute; 27,000 cycles per second for 3 minutes; 27,000 cycles per second for 10 minutes; 1,000,000 cycles per second for 1 minute; 1,000,000 cycles per second for 5 minutes; 1,000,000 cycles per second for 10 minutes. Five fresh shell eggs were exposed to each set of conditions. The eggs, one at a time, were suspended in water, through which medium the vibrations were transmitted to the eggs. Immediately

after they were frozen by surrounding them with dry ice. They were held in this condition for three hours, afterwards being placed in a freezer maintained at −18° C. After 3 days they were thawed by letting them stand at room temperature. A high degree of gelation was observed in all samples.

13. *Preliminary Experiments on Thawing of Frozen Eggs by Dielectric Heating*

Ten fresh shell eggs were frozen by dipping in liquid nitrogen and stored at −18° C for 7 days. While still in the frozen condition, they were dielectrically heated, one egg at a time. It was observed in all samples that, under the conditions of the experiment, the heat concentrated at a few points or spots in the egg yolk and albumen, with the effect of thawing and heating only those points to the temperature of coagulation of the proteins before the rest of the yolk and albumen had thawed. It was not possible to defrost uniformly the frozen shell eggs. After thawing completely by letting them stand at room temperature, the portions that had not coagulated by heat showed a high degree of gelation. This phenomenon of unequal heat distribution is characteristic of the dielectric heating of many substances. Should the proper dielectric heating conditions be found, it is thought that shell eggs quickly frozen by immersion in a very low temperature liquid freezing medium, and rapidly and uniformly thawed by dielectric heating, would gel to a very low degree. This very low degree of gelation might not significantly affect the consumer acceptability, or it might open to frozen shell eggs or to frozen yolks certain markets now closed to sugar, salt, or glycerine yolks.

SUMMARY

Freezing and frozen storage did not significantly affect the pH of fresh egg yolk. Changing the pH of yolks, cooking yolks for different lengths of time at different temperatures, and diluting and dehydrating yolks previous to freezing did not inhibit gelation.

Under certain conditions the colloid milling of yolks before freezing inhibited gelation to a large extent. The flavor, color, and texture of the cooked, colloid milled yolk were very similar to those of cooked, fresh yolk. The addition of sodium chloride to yolk previous to colloid milling, freezing, and frozen storage, produced yolk with a higher degree of gelation as compared with colloid milled samples with no added sodium chloride.

The use of emulsion stabilizers and destabilizers had no effect on inhibiting gelation totally or partially, either with or without the use of colloid milling treatments. The gelation inhibiting properties of a number of chemical substances was tested. Not one of the many chemical substances examined, inhibited gelation and produced a yolk of normal flavor. While sugar, salt, and glycerol were effective in partially preventing gelation, the flavor was markedly affected.

Very quick freezing of shell eggs and of egg yolk by immersion in dry ice-acetone mixture and in liquid nitrogen partially inhibited gelation. The more rapid the rate of freezing, the lower the degree of gelation of yolk. Very quick freezing combined with rapid thawing had a more pronounced effect of inhibition. Further research is needed on quick freezing combined with rapid defrosting of shell eggs and yolks.

In preliminary experiments, shell eggs subjected to sonic and to supersonic vibrations, previous to freezing and frozen storage, showed a high degree of gelation upon thawing.

When frozen shell eggs were defrosted by dielectric heating, the eggs did not thaw uniformly; a part of the contents was coagulated by the heat, and the rest was found highly gelled.

Chemical and enzymic studies on yolk gelation are in progress.

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[d]Manufactured by Glyco Products Co., Inc., Brooklyn 1, N.Y.

[e]Manufactured by Alrose Chemical Co., Providence 1, R.I.

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BALTIMORE HEALTH DEPARTMENT REQUIRES BRUCELLOSIS-FREE MILKING HERDS

The City of Baltimore, Md., on July 7, 1954, adopted a new dairy farm regulation requiring that all cows supplying milk for the city be tested for, and certified to be free from, brucellosis. This same requirement is now in force for all of Maryland, as required by the Maryland State Board of Agriculture, the Maryland State Board of Health, and the Maryland Cooperative Producers', Inc. All brucellosis testing of the herds must be completed by January 1, 1956, the date on which this regulation will take effect.

REGULATORY PROBLEMS RESULTING FROM PIPELINE MILKING*

H. E. Eagan, Educational Specialist
Communicable Disease Center, Public Health Service, U. S. Department of Health, Education, and Welfare, Atlanta, Georgia

The wider utilization of pipeline milking on the farm has resulted in the adaptation of cleaning-in-place procedures for these types of installations. The problems involved in such procedures have led many health departments to issue special regulations. The new developments in equipment design and cleaning procedures should not be hindered by stagnate regulations. The 1953 edition of the Milk Ordinance and Code Recommended by The Public Health Service **accepts the principle of pipeline milking and the cleaning-in-place procedures, but acknowledges that design and construction standards should be flexible. The cleaning and bactericidal treatment of this equipment must be determined by the usual standards of inspection.**

The development of a Cleaning-In-Place procedure applicable to the operation of milking equipment on the farm is evolving gradually but as yet has not crystallized into a standard for general adoption. The 1953 edition of the *Milk Ordinance and Code* recommended by the Public Health Service recognizes the potentials for Cleaning-In-Place standards by the statement in Section 6, Item 8r, subitem 3 "None of the milk house operations are conducted elsewhere. An exception may be made in the case of pipeline milkers which are cleaned and given bactericidal treatment in place in such a manner as to comply with the provisions of items 13r and 14r and are approved by the health officer."

Further the milk ordinance states under Section 7, Item 15r, in part, "However, if approved by the health officer, (See Item 8r) those parts of pipe-line milkers which are cleaned in place may be stored in place."

The advancement in the manufacture of detergents and the methods of their application is rapid. Several cleaning procedures have been developed which give satisfactory results. The milk sanitarian must take into consideration the final results of these processes as evidenced by his observation and by official laboratory examinations.

Engineering Features

Permanent pipe lines should be constructed of smooth, easily cleaned, noncorrodible material. Stainless steel and glass have proven the most satisfactory materials although ordinances generally do not stipulate the fabrication material. Gaskets made of Neoprene, Buna rubber, hycar or teflan have been suggested as nontoxic materials with low absorption qualities. They are relatively self-positioning in the lines. All interior surfaces including joints must be flush and all lines must drain readily. Welded joints on metal piping must be polished and must present a surface free of recesses or high points.

Inspection openings on all milk lines must be provided at all points where the direction of milk flow is changed. A thermometer should be installed on the return line near the outlet.

The return line or solution line should be of the same diameter and material as the milk line and should be so installed as to minimize foaming at the solution tank. The solution line and the milk line should not be permanently connected, but should be so constructed as to be easily disconnected from the milk line during the milking operation.

The solution tank should be located in the milk house. This tank should be large enough to fill the lines completely when using a recirculating system. When air brush friction is used the solution must be sufficient to provide full-time friction for at least 15 minutes.

Generally speaking the solution pump used for recirculation of the cleaning solution should deliver an average of 30 gallons of solution per minute at the discharge end of the return line.

The advisability of cleaning the teat cups in place has not been fully resolved. It is the general opinion of milk sanitation personnel that brushing should follow the flushing process. However, a special teat cup cleaning attachment located on the wash tank is desirable so that the units can be hooked into the circulating system.

All dead ends must be eliminated on the milk and the solution lines. All ells and vertical risers should be reduced to a minimum, with all lines having a minimum of one-sixteenth inch drop per foot toward the milk house. A trap of sufficient capacity provided with an automatic shutoff should be installed ahead of the milk pump or releaser in the vacuum line.

H. E. Eagan, was educated at Washington and Lee University and Cornell University; he has been associated with regulatory public health sanitation since 1931. He was in charge of milk and food sanitation in Huntington, West Virginia, for 12 years. From 1943 to 1945, he was assigned by the Public Health Service to the State Board of Health, Jackson, Mississippi, on the state-wide milk sanitation program. Since 1945 he has been assigned to the Training Branch, Communicable Disease Center, with assignments at Savannah, Georgia; Topeka, Kansas; and Atlanta, Georgia. He is now on a nation-wide milk sanitation training program in cooperation with the Division of Environmental Sanitation; Milk, Food, and Shellfish Program of the Public Health Service.

He entered his official work from the Phenix Cheese Company where he held the position of an Assistant to the Vice President in Charge of Production.

*Presented at the 23rd Annual State College of Washington Institute of Dairying, Pullman, Washington, 1954.

CLEANING

Although modifications of the cleaning process will of necessity be made to meet the water conditions at the farm, generally speaking, the following process is adequate to produce clean and properly bactericidal treated equipment.

1. Immediately after milking with vacuum pump still operating, open the end milk valves intermittently to push out any milk left in the line.

2. Shut off the vacuum pump and rinse the entire system with clean, cool water until the return water is clear.

3. The washing solution should be made up of a good alkaline cleaner and the temperature maintained at the detergent manufacturer's recommendation. Extremely high temperatures have resulted in the formation of deposits on the interior of the pipe lines. The terms of "mushroom" and marshmallow" have been used to describe this white, featherylike deposit. The choice of a detergent that is compatible with the individual water condition seems to be the deciding factor in the successful results of this type of cleaning. The solution is circulated from 15 to 30 minutes. All caps, plugs and special fittings should be removed and brushed clean. Valve seats, cross ends and tie ends should also be brushed.

4. After the solution has been run off onto the floor, the pipes should be rinsed with lukewarm or cool water until all trace of the solution has been removed.

5. The bactericidal treatment should consist of a chlorine solution containing an initial concentration of 200 ppm of available chlorine which is circulated for at least 10 minutes. It is recommended that the circulation of the bactericidal solution take place just prior to the beginning of the milking operation.

6. Such parts as the releaser, milk pump, receiving vessel, inflations, and rubber hoses should be dismantled once a day and hand brushed.

7. The use of organic acids at regular intervals is recommended.

Experimentation is now being conducted which utilizes organic acids daily. A 1½ percent organic acid solution is circulated throughout the system for about 10 minutes following a clear rinse. An alkaline detergent is then added directly to the acid solution until the Ph has been raised to 11 or 12. The sequestration prevents the precipitation of the water hardness components by a chelating process.

CONCLUSION

The 1953 edition of the *Milk Ordinance and Code* recommended by the Public Health Service recognizes the use of pipe-line milkers and the cleaning in place of such equipment.

The *Milk Ordinance and Code* recommended by the Public Health Service contains design and construction standards that are applicable to all dairy equipment. These standards are equally applicable to pipe-line milking as to construction, cleaning, and bactericidal treatment. The final result of the process of cleaning in place must be determined by sight or touch and by laboratory examination by swabs or rinses of the cleaned and treated equipment.

FOOD FOR LIFE

Eating the right foods will add years to your life and life to your years.

This is the theme of a dramatic new educational exhibit "Food for Life" in the Museum of Science and Industry, Jackson Park, Chicago.

The exhibit, a public service contribution by Swift & Company, portrays the extent of man's knowledge of foods. It emphasizes that right eating helps people of all ages.

John Holmes, President of Swift & Companys, says that the purpose of the exhibit is to "dramatize the important story of nutrition in an understandable manner so that all persons who see it will realize that they can benefit themselves by proper eating." Holmes says the exhibit provides basic information to guide visitors in selecting their daily diets.

Major Lenox R. Lohr, Museum President, says that the "Food for Life" exhibit marks the first time the nutrition story has ever been told in a Museum on such a large scale. "Therefore, it is a really unique exhibit," Major Lohr says.

Almost two million people will see the exhibit annually. It has educational features of special interest to school, home economics, women's and agricultural groups.

The exhibit describes how each visitor to the Museum can benefit from proper eating practices, including the selection of the right foods in the right amounts. The role of the soil, plants and livestock in providing proper food for human beings is explained. The story of food processing and distribution also is told.

The soil section illustrates how proper nutrients are necessary in the soil to produce plants which properly nourish human beings and livestock. The plant section describes how plants convert nutrients derived from soil, water and air into food. The livestock section describes how meat animals consume plants which human beings cannot eat; how animals concentrate and store this food for human use and make it possible for human beings to have foods which are rich in the necessary nutrients.

Another section shows how human beings assimilate food and why proper balance of all nutrients is necessary for health. There also is a section on the selection, storage, preparation and serving of food.

A feature of the exhibit is a display of live baby pigs, lambs and other young farm animals in an air-conditioned "nursery."

The live animal display illustrates the nutrition of livestock in actual practice. The young farm animals are fed scientifically balanced rations such as are available in regular commercial feeds, which provide all the essential food nutrients for healthy vigor, vitality and growth. In this display visitors also see hatching of chicks in a glass enclosed incubator.

COLIFORM DENSITIES IN PASTEURIZED DAIRY PRODUCTS

JACQUES ARCHAMBAULT, D.Sc., F.A.P.H.A.
Director and Chief Chemist, Division of Laboratories
Quebec Ministry of Health, Montreal, Que.
(Submitted for publication, April 21, 1954)

The sanitary significance of low coliform densities of pasteurized dairy products and the importance of using laboratory methods sufficiently sensitive to detect such densities are stressed. A comparative study of common solid media and brilliant green bile broth reveals frequent failure of solid media, as usually employed, to yield typical colonies in cases of gross coliform contamination and the superiority of the tube method for examining pasteurized samples with low coliform densities.

To be thoroughly safe for the consumer, milk and milk products should not only be efficiently pasteurized but they must also be free from recontamination. Although this is theoretically well understood, it is surprising that laboratory procedures, which have played a most important role in reducing bacterial counts of pasteurized products, have not been more intensely used to detect post-pasteurization recontaminations and to prevent them. The coliform test, first officially suggested, in 1920, by an A.P.H.A. Committee on Milk Supply, has been the one most generally recommended since then for this purpose. McCrady and Langevin[1], however, noted in 1932 that this suggestion was not followed by the study which reasonably might have been anticipated. Despite the numerous reports published later, recent papers show that the place of the coliform test in pasteurized milk control is still misunderstood in some quarters.

No Coliforms in Safe Milk

We know of no instance where coliforms survived pasteurization in significant numbers, when the raw milk was of acceptable quality. The best report on the subject is probably the one published by Buchbinder and Alff[2] who concluded, after a rather complete study of previous reports and considerable investigation, that heat-resistant coliforms have absolutely no practical significance in the coliform test of pasteurized milk. They incubated overnight 468 flasks, of approximately 1 litre each, of pasteurized milk, all taken before bottling and usually from a sanitary line just after the pasteurizer. All the samples, except one, yielded negative results, although the coliform counts of the raw milk used in these trials ranged from 1,000 to 56,000,000 per 100 ml. Their conclusions are in perfect agreement with our own experience. Our results on pasteurized milk taken from pasteurizers are nearly always negative in the 45.5-ml total volume we use in our routine test; when coliforms have been found, investigation has nearly always revealed something wrong. Various coliform strains obtained from positive samples taken from pasteurizers have been submitted to pasteurization tests, in the laboratory, over a long period, and none of them has been found to be of a heat-resistant type. Presence of coliforms in milk taken from pasteurizers, according to our experience, is usually due to inadequate heating of the milk, or to contamination with raw or incompletely pasteurized milk, or with drippings from defective covers, etc. In fact, coliform densities of properly pasteurized and uncontaminated milk taken from pasteurizers are normally so low (probably much less than 1 per litre) that, for all practical purposes, the organisms may be considered as absent from such milk. If they occur in significant numbers at subsequent stages, we must conclude that they have gained access to, or have multiplied in the milk, as a result of faulty operation or of poorly sanitized or defective equipment.

Neither the swab test nor the Standard Plate Count can serve as a substitute for the coliform test. It is extremely common in plants employing careless methods of sanitation to find no coliforms in the milk taken from the pasteurizer, but a high coliform content in the bottled milk with no apparent change in the plate counts. There is no over-all test available at the present time that can detect existence of opportunities for addition or multiplication of bacterial contaminants, that might be associated with pathogens, so readily, so rapidly, and so surely as does the coliform test.

Dr. Jacques Archambault received his B. S. degree (Chemical Engineering) in 1924 and his D. Sc. degree in 1941, from the "Ecole Polytechnique" of Montreal University. He has been with the Quebec Ministry of Health since 1924. After serving in the Division of Sanitary Engineering from 1924 to 1927, he joined the Division of Laboratories as Chemist, became Chief Chemist of the Laboratory of Chemistry and Sanitation in 1933, Associate Director of the Division in 1944 and Director of Laboratories in 1953. He is Referee for Detection of Coliforms in Dairy Products, A.P.H.A. Standard Methods Sub-Committee.

We must usually rely upon the phosphatase test positively to detect inadequate heating or contamination with raw milk, but the coliform test may often prove much more sensitive for detecting leakage of raw milk into the pasteurized milk. Tiedeman[3] and Weber[4] have emphasized that the coliform test can reveal slight recontamination with raw milk or cream that cannot be detected by the phosphatase test. More recently, Olsen[5] reports the interesting case of a plant in which leakage of raw milk through a fissured regenerator plate was responsible for persistent abnormally high coliform densities in stassanized milk for a period of nearly 6 months, before the fissure had become large enough to permit such

TABLE 1—SUMMARY OF COLIFORM RESULTS OBTAINED ON SAMPLES OF PASTEURIZED MILK, AS DELIVERED TO CONSUMER, FROM MONTREAL SUBURBS* (PLANTS IN MONTREAL AND SUBURBS), DURING A 4 MONTH PERIOD FROM MAY TO AUGUST.

Total samples examined : 927	
Proportion of samples with coliform densities (M.P.N.)	
not exceeding 10 per 100 ml. :	73.1 %
not exceeding 50 per 100 ml. :	87.4 %
not exceeding 100 per 100 ml. :	89.3 %
Number of dairies represented · 20 (*including all plants from which at least 8 samples have been examined*)	
Proportion of plants having, in at least 75% of samples examined, coliform densities	
not exceeding 10 per 100 ml. :	10 / 20 (50%)
not exceeding 50 per 100 ml. :	17 / 20 (85%)
not exceeding 100 per 100 ml. :	17 / 20 (85%)

* *City of Montreal excluded (samples from Montreal are examined by the City)*

leakage that positive phosphatase tests of the contaminated product were obtainable.

PRACTICABLE COLIFORM STANDARD

Since it is difficult to attain absolute perfection in a pasteurizing plant, a few coliforms may sometimes be expected to occur in the finished product, but they should be very few: certainly usually less than 100, and preferably less than 20, per 100 ml. However, in a recent study of the milk from representative plants in 8 American cities, Dahlberg, Adams, and Held[6] reported that only one of these cities had 100 percent of freshly pasteurized samples with coliform densities lower than 0.1/ml, whereas the others had from 72 to 27 percent of samples with such densities. Claims, often expressed, that it is not possible to get the coliform densities of pasteurized milk down to low figures derive largely from the disinclination of the control officer to conduct the stage by stage bacteriological investigation which is usually necessary to discover the sources of the contamination or cultures that are being fed into the pasteurized product.

Probably one of the factors most responsible for this condition has been the lack of coliform standards in most areas. We may hope that the recent limiting standard of 10 coliforms per ml, proposed for an initial control program by the U. S. P. H. S., although, in our opinion, too lenient, will stimulate the interest of milk workers in the test and bring conviction that, with reasonable effort, coliform densities in pasteurized milk can be maintained at low levels. As reduction of bacterial counts in pasteurized milk has been secured by adequate supervision of milk production on the farm, coliforms may be reduced to extremely low densities by proper control in the pasteurizing plants. Since coliform densities, however, are more directly related to the safety of the product, a supply with an average plate count of around 75,000/ml and extremely low coliform density is evidently safer than one with a count of around 30,000/ml and a coliform density of 1,000/100 ml, provided both give satisfactory phosphatase results. We learned dearly, from the Montreal milk-borne typhoid epidemic of 1927, the importance of keeping pasteurized products as free as possible from contamination and the possibilities of the coliform test for this purpose.

A summary of coliform results obtained by our laboratories on pasteurized milk from the Montreal suburbs is given in Table 1, showing the usual achievement of our plants during summer months when the coliform densities are usually highest.

According to this summary, 89.3 percent of the samples, all representing milk *as delivered to consumers,* did not exceed 50/100 ml and 73.1 percent, 10/100 ml. Of the 20 dairies represented, 17 (85%) had not more than 25 percent of samples with coliform densities exceeding 50/100 ml: the best of these plants had not a single sample above this limit and only 18 percent of samples with over 10/100 ml, while the worst had 21 percent with over 50 and 37 percent with over 10 coliforms/100 ml.

INTERPRETATION OF COLIFORM COUNTS

If the pasteurized milk is kept properly refrigerated, as generally required, outside temperatures should have little practical influence on increase of its coliform density from the moment of bottling to the time of delivery, especially when the initial coliform content is practically nil as it should be. According to our data, when coliform densities are abnormally high in street samples during the warmer months, they usually are likewise high in the freshly bottled samples. Warmer temperatures, which tend to multiply causes of contamination (dust, flies, condensation water) and favor the rapid growth of contaminants on equipment, in cracks, etc., evidently contribute to increase the coliform densities of the bottled milk; but since such increases are due to a multiplica-

TABLE 2—COMPARATIVE STUDY OF BBL DESOXYCHOLATE AGAR, DIFCO VIOLET RED BILE AGAR AND DIFCO BRILLIANT GREEN BILE BROTH.

	BBL[1] and VRB[2]			BBL[1] and BGB[3]		
	SAMPLES	Results higher with		SAMPLES	Results higher with	
		BBL	VRB		BBL	BGB
Raw milk	63	45 (71.4%)	16 (25.4%)	63	—	—
Past. milk	95	17 (17.9%)	17 (17.9%)	95	18 (19.0%)	17 (17.9%)
Past. homogenized milk	17	6 (35.3%)	2 (11.8%)	46	9 (19.6%)	4 (8.7%)
Past. chocolate milk	24	2 (8.3%)	8 (33.3%)	41	6 (14.6%)	17 (41.5%)
Past. cream	32	8 (25.0%)	9 (28.1%)	52	10 (19.2%)	18 (34.6%)
TOTAL Pasteurized	168	33 (19.6%)	36 (21.4%)	234	43 (18.4%)	56 (23.9%)

(1) = *BBL desoxycholate agar* (2) = *Difco violet red bile agar* (3) = *Difco brilliant green bile broth.*

tion of potential hazards, they really indicate the necessity of improving sanitizing procedures or of taking more care to detect and eliminate sources of contamination, rather than the need of relaxing standards.

Since bacteriological standards are essentially arbitrary limits, often set at different levels in different areas, they should not be interpreted as a sharp dividing line between safe and unsafe products. This is especially true of coliform standards, since coliforms in pasteurized milk seem always to derive from insufficient processing or recontamination and, consequently, when they are present even in small numbers the possibility of the presence of some pathogens also cannot be entirely excluded. Similarly, no complete guarantee may be had that pathogens are not present on the equipment surfaces with which milk comes in contact, if sanitizing procedures employed do not usually leave such surfaces free or almost free from coliforms. Fortunately, coliforms are not necessarily accompanied by pathogens; otherwise, the only logical standard would be one requiring total absence of such organisms in the final product. Densities tolerated, however, should be as low as practicable since even slight contaminations involve some potential health hazard, which is the more threatening in pasteurized milk in which, according to Olsen, because of the loss of a bactericidal factor, Salmonella and Shigella grow far better than in raw milk.

When determining where the limit is to be fixed, therefore, official authorities should be guided by the usual achievement of the best plants rather than by the desire of assuring an almost general compliance without improving present faulty procedures. A standard of not more than 100 coliforms per 100 ml may usually be met by Certified-Pasteurized milk; why should a 10 times higher limit be tolerated for ordinary pasteurized milk, when the significance of the presence of coliforms is exactly the same in both cases? At least three cities in Quebec Province have been enforcing with no great difficulty, for several years, a standard (recently adopted as a Provincial legal standard) of not more than 50/100 ml in 3 of the last 4 samples collected. Accumulated data indicate that a limit of 20/100 ml could be met nearly as easily, provided the same tolerance, allowing for the odd "accident" which may always occur, is applied.

Compliance with standards, however, should not be considered as a perfect achievement. Even lower densities may be significant, especially if they are found persistently, and procedures to detect them should be employed. The normal dilution of cultures of organisms, which may be expressed from the pocket formed by a broken joint or otherwise fed into the pasteurized product, often results in coliform densities of the order of 50, 20, or even fewer per 100 ml and, unless such densities can be properly determined, efforts to detect the sources of recontamination by sampling at various stages of processing may fail. In many areas

where competence of plant operators and control officials cannot be denied, failure to succeed in reducing coliforms to reasonably low levels is probably due, to a large extent, to the lack of sensitivity of the laboratory tests used and to the consequent lack of significance of negative results.

TECHNIQUE FOR MAKING COLIFORM COUNTS

Both the plate and the tube methods are recommended by the Standard Methods for the coliform test. Tiedeman and Smith[7], comparing the formate ricinoleate broth tube method (with 3 x 1 ml) and the desoxycholate agar plate method (with 1 ml), observed a good correlation between results obtained on 1630 pasteurized samples. Similarly, plating 836 samples in both violet red bile agar and desoxycholate agar, they found that these two media were equally satisfactory. Buchbinder and Fertig[8], studying 2,250 samples with desoxycholate agar and brilliant green bile broth, concluded that the productivities of the media were essentially the same. In another study for determining the influence of the milk volume plated on the productivity of the desoxycholate agar, they found that volumes of 1 to 4 ml gave comparable findings but that plating decimal dilutions often resulted in a reduction of the productivity, due to greater inhibition of sodium desoxycholate in the absence of considerable proportions of milk.

In an attempt to determine if this partial neutralization of the inhibiting agent by the milk proteins might indicate the use of a higher concentration of desoxycholate, we compared the B.B.L. (No. 114) agar and the Difco (No. 273) agar which contains double the amount of desoxycholate, plating 0.1-, 0.01-, and 0.001-ml portions of raw milk samples, and 1- and 4-ml portions of pasteurized samples. The greater inhibitory action of the higher desoxycholate content of the Difco agar seems to be very striking, since markedly higher counts were obtained with B.B.L. agar from 9 of 10 raw milk samples examined. With the relatively large volumes of 30 pasteurized samples plated, however, comparable findings were obtained: 7 (23.3%) yielded higher results with B.B.L. agar and 5 (16.6%) with Difco. The differences observed, moreover, were not excessive; but two pasteurized cream samples which, according to our routine test with brilliant green bile broth, contained 900 and more than 2400 coliforms per 100 ml respectively, gave no typical colonies at all on either agar medium. The plates with 4 ml were so opaque that no colonies could be seen and plates with 1 ml showed only atypical colonies. These particularly serious discrepencies incited us to proceed with our comparative study, using Difco violet red bile agar, B.B.L. desoxycholate agar and brilliant green bile broth with further samples of raw and pasteurized milk and other pasteurized products. The volumes plated were as indicated above except that an additional plate with 0.1 ml was also used with each medium in the case of pasteurized cream. For the fermentation test in the bile broth, five 1 ml and five 0.1 ml portions have been used, with higher dilutions of raw samples, and with four 10 ml portions of pasteurized milk and cream when the volume of the sample permitted.

A comparison of the results obtained is summarized in Table 2. In this summary, the B.B.L. agar appears to be markedly more productive than violet red bile agar with lower than 1 ml volumes of raw milk, but both media usually gave quite comparable findings with larger volumes of pasteurized milk or cream. Violet red bile agar, however, proved to be even more satisfactory than B.B.L. agar for plating chocolate milk.

In order to make as fair as possible the comparison between brilliant green bile broth and B.B.L. desoxycholate agar by taking into account the mathematical limitations of both techniques, in the case of pasteurized samples absence of coliform colonies in the 5 ml total volume plated and densities lower than 20/100 ml by the tube method were considered as concordant results, as were production of gas in all the fermentation tubes and coliform counts exceeding 2400/100 ml on B.B.L. agar. Results generally show a satisfactory concordance, but with a marked advantage in favor of the tube method with chocolate milk and cream samples. In the case of raw milk, a satisfactory correlation has also been obtained, although no significant comparative figures can be given because of an excessive frequency of gas production in all tubes used. The tendency of the B.B.L. agar to give higher results with homogenized milk more often than the violet red bile agar and the bile broth is rather puzzling. A reverse tendency is evident with chocolate milk.

The serious failure of both solid media to reveal typical coliform colonies when numerous bacteria grew on the plate has been frequently observed, although the violet red bile agar, recently reported by Morris[9] to inhibit development of typical colonies frequently when coliform contamination is heavy, proved to be superior in this respect. Counts secured from the plate, especially with desoxycholate agar frequently giving colonies of all shades from dark red to pink or white, were often most unsatisfactory on account of the very great difficulty in identifying typical colonies; the number of such colonies sometimes decreased in proportion, and often were entirely absent, in larger volumes of sample. In fact, many samples containing from 1000 to more than 2400 coliforms/100 ml, according to the tube method, gave no typical colonies at all with the various volumes plated. Such gross discrepancies were observed more frequently in tests of homogenized milk and, especially, chocolate milk and cream. With cream samples, typical coliform colonies often appeared on the 0.1-ml plates only. The frequency of this serious failure, aggravated by an objectionable opacity of the medium when 4 ml of homogenized milk, chocolate milk, or cream are plated, greatly reduces the significance of negative results, restricts the supposedly superior accuracy of coliform counts on plates, and limits the effectiveness of the plate method for determining densities lower than 100/100 ml.

On the contrary, only three samples, two of chocolate milk and one of cream, gave negative results with the fermentation tubes and counts higher than 1000/100 ml with the plates. Upon investigation, in the case of the cream

sample, the organisms isolated from the fermentation tubes formed no gas in lactose broth but produced typical red colonies on both B.B.L. agar and violet red bile medium, provided the plate did not contain many more than about 100 colonies.

The tube method, consequently, appears to be the method of choice for examining pasteurized samples, the coliform content of which usually should be very low. Since there is nearly no practical limit to the volumes that can be used, the potential sensitivity of the test is practically unlimited. It offers much less risk of missing gross recontamination, or of yielding grossly discordant results in the hands of different workers and with various pasteurized products, including chocolate milk and cream. If the plating method be used, two or more portions of different volumes should preferably be plated, including sufficiently small volumes to reduce the risk of failing to detect typical colonies on overcrowded plates.

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DAIRY INDUSTRY INITIATES REMEMBRANCE FUND

The establishment of Dairy Remembrance Fund, Inc. — an organization devoted to further the progress of the dairy industry— has been announced by Madison H. Lewis, president.

The Fund will serve as the central agency through which contributions may be made in honor of important milestones and other significant events in the lives of dairy personnel. Through delegates from eight national and international dairy groups it also will administer memorial trust funds which perpetpate great names within the dairy industry.

Headquarters of the new organization will be located at 111 North Canal street, Chicago.

Charter sponsors include American Dairy Science Association, Dairy Industry Committee of the United States, Dairy Industries Society International, Dairy Industries Supply Association, International Association of Ice Cream Manufacturers, Milk Industry Foundation, National Association of Retail Ice Cream Manufacturers and National Dairy Council.

Mr. Lewis, former president of the International Association of Ice Cream Manufacturers and grandson of the founder of the Horton Ice Cream Company, was elected as the first president of Dairy Remembrance Fund. Mr. Lewis said: "The establishment of this Fund is further evidence of the determination of the dairy industry to solve the problems of the present temporary surplus and to find ways and means for the efficient disposal of what should rightfully be an even greater production. We plan to allocate our income for research projects which may develop an improved knowledge of the production, processing or distribution of all forms of dairy products; projects which may promote a better understanding of the nutritive value and the better utilization of all forms of dairy products; projects which may promote the general welfare of any phase of the dairy and allied fields and any other projects which may advance the good name of the dairy and allied fields."

Robert Rosenbaum, former president of D.I.S.A. and chairman of Dairy Industries Society, which sponsored the recently held First World Congress for Milk Utilization, was elected secretary and executive director of the Fund. Mr. Rosenbaum stated that the projects undertaken would be coordinated with the existing research programs of the diverse branches of the dairy field. In addition, he explained that the projects, as outlined by Mr. Lewis, could include the stimulation of students' judging contests both here and on an international basis and the exchange of dairy personnel with other nations.

E. J. Mather, director of International Association of Ice Cream Manufacturers, became the Vice President of the Fund and chairman of its executive committee. E. B. Lehrach of Chicago serves as Treasurer both of the Fund and of National Dairy Council whose offices in Chicago will serve as headquarters for the period just ahead.

Other members of the executive committee are: B. F. Castle, Executive Vice President of the Milk Industry Foundation. V. K. Shuttleworth, board of directors, National Dairy Council.

A CAREER FOR YOU

Dairy science students at Cornell have published "A Career for You," a 16-page booklet outlining facilities for dairy science majors in the College of Agriculture and describing opportunities in the field.

Changes in the past two decades have brought about a need for more qualified personnel to meet existing competitive conditions, C. G. Kazolas, Jamaica senior and member of the Dairy Products Judging Team, points out in an article. He traces innovations from 1851, when Jesse Williams, a Rome, N. Y. farmer started the first cheese factory in the country.

Dairy graduates with a thorough background in accounting, quality control, production, labor relations, and marketing have the best chance for a successful career, Kazolas says.

"In Percentages and Possibilities," Paul R. Seymour of West Seneca reports more than 90 percent of former dairy science students have remained in the milk industry.

Association News

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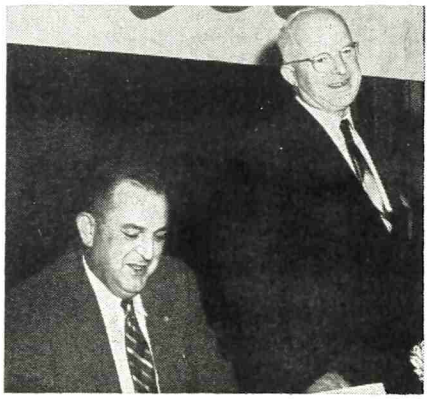
THE ANNUAL MEETING AT ATLANTIC CITY

The Forty-first Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, held at Atlantic City, N.J., October 20 - 23, 1954, was eminently successful. The program was broad in scope, covering a wide variety of subjects in the field of milk and general food sanitation.

The registrants came from thirty-four states, the District of Columbia, Canada, Mexico, and Porto Rico—over two hundred with many ladies. The Pennsylvania delegation of 37 nosed out New York's 36.

President, John D. Faulkner

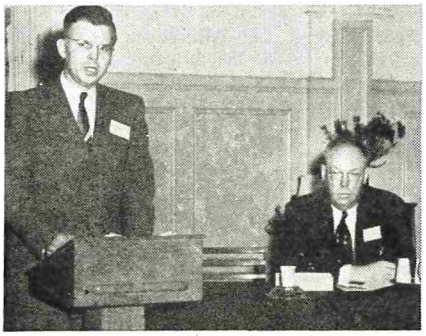
The many excellent addresses, papers and reports will be published in succeeding issues of the Journal. One of the important items of business was the discussion of the recommendation of the Committee on Education and Professional Development that a fund be raised to finance scholarships for the training of food sanitarians. This is projected as a collaborative undertaking between the parent Association and the Affiliates. The details have yet to be worked out.



Toastmaster, "Cliff" Goslee.

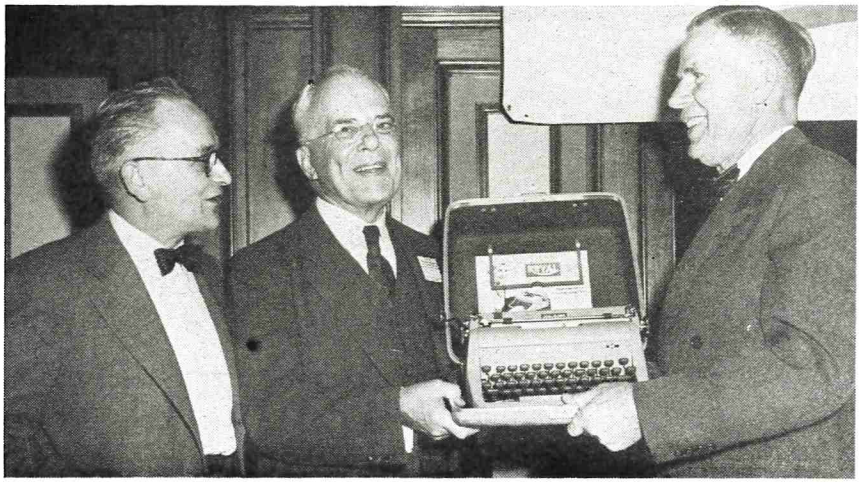
J. H. Shrader Receives $1000 U.S. Government Bond.

Harold J. Barnum Receives Past President Certificate

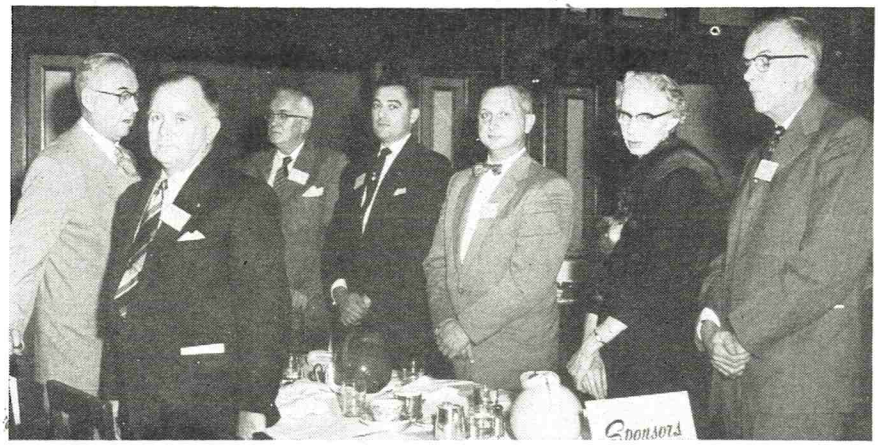


Walter Purdom, Speaker Food Section Meeting, Jas. Stallbird, Chairman.

Banquet.



Dr. J. H. Shrader receives typewrite from Fred Baselt (left) and F. W. Fabian (right).



Sponsor of Sanitarians Award: Left to right. Jas. Sharp, Diversey; W. H. Haskell, W. J. Dixon, Klenzade; Lawrence Dormuth, Penn Salt; John Griese, Oakite; Mr. and Mrs. Wm. Hadfield, Penn Salt; Mathicson, representative unable to attend.

The Association acted favorably on the recommendation of the Committee on Sanitary Practice that steps be taken to administer the use of the 3A symbol for dairy equipment that meets the accepted sanitary standards. This was referred to the Executive Board.

At the joint meeting of the Executive Board and the Board of Associate Editors, the Journal was reported to be operating with a profit to the Association. It goes to almost four thousand eight hundred persons and libraries, of whom about four hundred live in other countries. The Journal has published seventeen volumes, containing about four million words of reading material. The current volume is carrying about one-third more pages of reading material than heretofore.

The editor of the Journal, Dr. J. H. Shrader, felt that the time has arrived when he should step aside to allow a younger man to take over.

The banquet was uniquely interesting. Under its genial toastmaster, "Cliff" Goslee, three members of the Association were cited for meritorious service, as follows:

Dr. Fred W. Fabian read an appreciation of the work of Dr. Shrader as the co-founder and editor of the Journal for the past seventeen years. On behalf of the Board of Associate Editors he presented Dr. Shrader with a typewriter, a silver plaque with name and citation, and a check. The Executive Board presented a U. S. Savings Bond in the amount of one thousand dollars.

Presented to

DR. JAMES HOUSTON SHRADER
in grateful recognition of
meritorious service as editor
and of his inspiring leadership
INTERNATIONAL ASSOCIATION OF
MILK AND FOOD SANITARIANS
October 22, 1954

Then the Chairman of the Committee on Recognition and Awards presented the Citation Award for distinguished service to the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS to Dr. C. K. Johns, Officer in Charge, Dairy Technology Research Unit, Canadian Department of Agriculture, Ottawa, Canada. The Chairman, Harold J. Barnum, said:

"Dr. Johns, who has been engaged as a teacher and research worker in milk sanitation and dairy technology with the Canadian Government all his life, has been continuously active in the INTERNATIONAL ASSOCIATION for twenty-four years. His membership and activities in other scientitic organizations is extensive. Dr. Johns became an officer of this Association in 1931. He served as President in 1935. Since the inauguration of the official publication of the Association, *Journal of Milk and Food Technology*, he has served as Associate Editor. Dr. Johns has served on four major standing committees of the Association. He is presently Chairman of the Committee on Laboratory Methods. He has been the author of seventeen articles in the *Journal of Milk and Food Technology*."

The Certificate of Citation as presented to Dr. Johns is as follows:

"Because his diligent work in behalf of our Association has contributed greatly to its growth and outstanding reputation; because he has gladly devoted so much time and effort as an officer, as chairman and member of many important committees of this Association; because he has been a wise counselor to a long line of officers of this Organization, an Associate Editor of our publication, a contributor to many scientific publications and to the program of our annual meetings; and because he is a true scientist and friend, this citation is awarded for Distinguished Service to the International Association of Milk and Food Sanitarians."

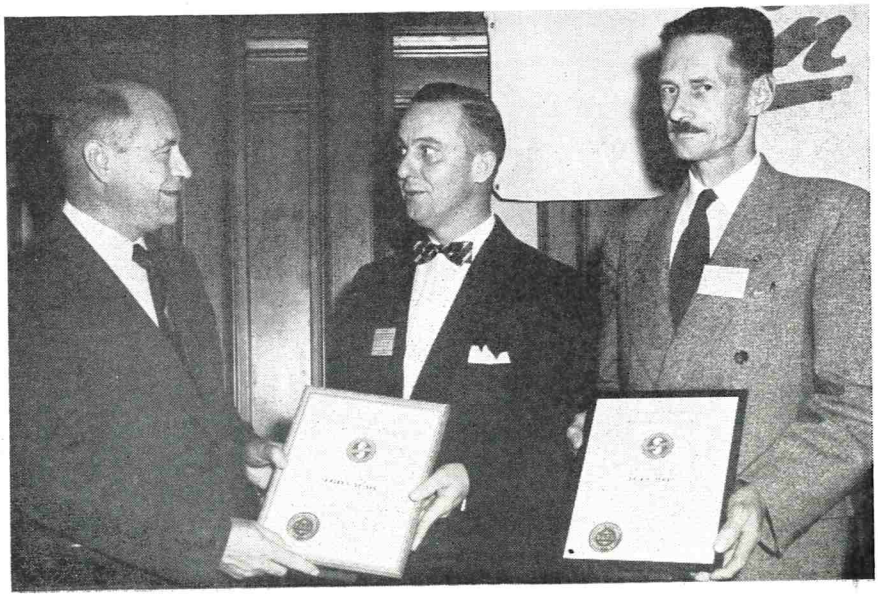
The Sanitarians Award went to Mr. Kelly G. Vester, Senior Sanitarian, Rocky Mount Health Department, Rocky Mount, North Carolina. This award consisted of a certificate of Citation and a check for one thousand dollars.

The Award is sponsored jointly by a group of manufacturers and distributors of sanitation chemicals. These companies are: The Diversey Corporation, Pennsylvania Salt Manufacturing Company, Klenzade Products, Inc., Oakite Products, Inc. and Olin Mathieson Chemical Corporation.

Mr. Vester has served as a food sanitarian for the City of Rocky Mount since 1945. The recipent of

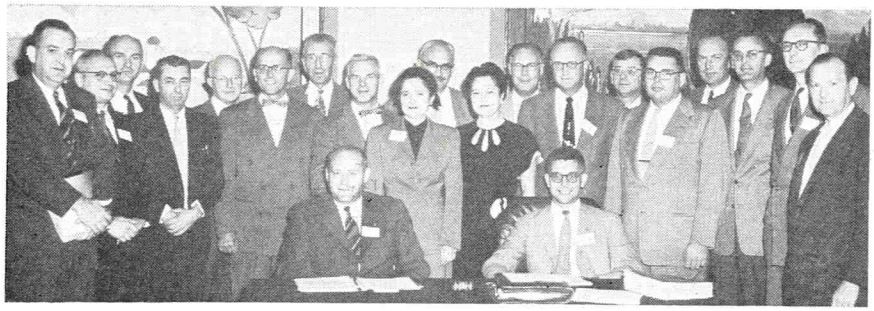
Kelly G. Vester presented with $1000.00 check and plaque, by Harold J. Barnum

Dr. C. K. Johns Receives Citation Award.

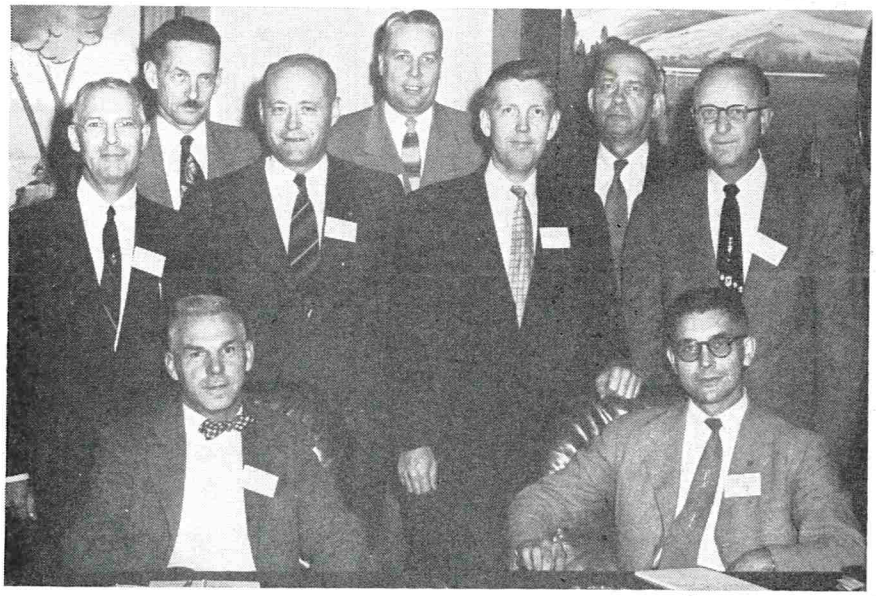


Harold J. Barnum, Kelly G. Vester, Dr. C. K. Johns.

Past Presidents Table—Left to right—Russell Palmer, Detroit, Mich.; Milton Fisher, St. Louis, Mo.; R. G. Ross, Tulsa, Oklahoma; Mr. and Mrs. F. W. Fabian, E. Lansing, Michigan; C. A. Abele, Chicago, Illinois; K. G. Weckel, Madison, Wisconsin; Walter Tiedeman, Ann Arbor, Michigan; C. K. Johns, Ottawa, Ontario, Canada; Geo. W. Grim, Ardmore, Pa.



Advisory Council Meeting.



Committee Chairman and Executive Board Meeting.

the 1954 Award was selected because of his success in carrying out his self-inspection plan for public food service, public schools, hospitals, hotels, and tourist homes. The program started by Mr. Vester in 1950 in Rocky Mount has been widely used in other areas and states. It makes use of health education on a very practical basis because it is built around the philosophy of teaching people to help themselves and to assume sanitation leadership at the individual level. Mr. Vester has inspired the entire community of Rocky Mount with a better understanding of the whys and wherefores of sanitation by making all food handlers a member of his team. He has carried his program to the public schools, and has been unusually successful in winning over the entire community to the importance of sanitation as a way of life.

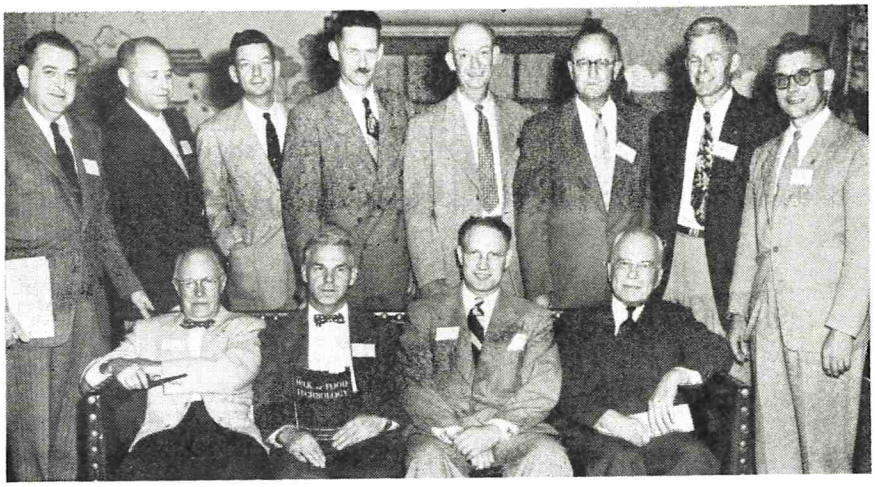
The program is organized as follows:

A. Schools

The Sanitation Hour, a program instituted in all schools in our city as a companion to the Self-Inspection program in the schools, has afforded education in Environmental Sanitation, better health practices, modern equipment installation in rest rooms, drinking fountains, lunch rooms and regular school refuse disposal. The children have entered into the spirit of the program with enthusiasm and note deviations from good sanitation practice. Assembly programs are devoted to portray sanitation and health practice with student casts and participation. School classes vie with one another to accumulate honors and knowledge in sanitation. The work has been integrated into the whole school program and curriculum.

B. Self-inspection program for the grading of food handling facilities.

It is built around the idea of encouraging the individual worker to be ever conscious of the principles of sanitation which meet with the most rigid type of inspection by himself or anyone else. Every employee in food handling institutions are assigned the task of making routine inspections of his establishment and records of the total personnel of the institution are used as a basis for its rating



Executive Board, Editors, and Associate Editors.

C. A. Abele presents 3A symbol problems to Executive Board.

Registration

General Session

Alfred Fletcher, N.J. State Health Dept. Extends Greetings.

in health and sanitation. This method encourages a personal interest in every employee and their efforts are reflected in the pride of the owners as well as the satisfaction of customers.

Mr. Vester has published many articles in leading magazines and publications on food sanitation and service. He is the author of two text books, namely, *Hospitality—A Twentieth Century Frontier*, and *Food Service—A Master Plan*. He has won many local and state honors, and has received national recognition for his creative sanitation programs.

Honors Won:

1. Reynold's Award—Outstanding Achievement in Public Health 1951, North Carolina.

2. Distinguished Service Award by the North Carolina Junior Chamber of Commerce.—1952—Fol-

Franklin Barber, Oakdale L.I., N.Y. Speaks At Milk Section Meeting.

lowed by statewide Jaycee sponsorship of Mr. Vester's creative sanitation Programs.

3.Honorary Membership in the International Mark Twain Society in 1952.

The Certificate accompanying the Award presented to Mr. Vester reads as follows:

"This award is conferred for distinguished service to his community in the field of Public Health; for his contribution to the advancement of the profession of the sanitarian; for his ability to personalize the ideals of the sanitarian; and for his original and unique approach to the many problems of food sanitation."

The main address of the evening was delivered by Mr. J. Roger Deas, Public Relations Manager, American Can Company, New York. This was a masterly and inspiring oration on technological and humanistic ideals in public service: we are eminently successful when all levels

Roger Deas

of people—as just folks—have experienced from us sympathy, understanding, and a helping hand.

Among the distinguished guests were Dr. Otto F. Hunziker, Dr. Rene O. Cravioto, Head of the Department of Food Control, and Dr. Mino Appendini, federal district, both of the Department of Public Health, Mexico.

At the final business meeting on Friday, October 23, Paul Corash, Director of the Milk Division, City Health Dept., New York City, was elected Second-Vice-President, and H. H. Wilkowske, University of Florida, was re-elected Secretary-Treasurer. In accordance with the Constitution and By-laws of the association, the other officers and Executive Board members for 1953-54 were moved up to the next office; thus, Harold J. Barnum, Denver, Colorado, became Senior Past President; John D. Faulkner, Washington, D. C., Immediate Past President; I. E. Parkin, Penn. State University, State College Penn. President; Ivan Van Nortwick, Lawrence Kansas, President-Elect; Harold S. Adams, Indianapolis, First Vice-President.

FOOD LABELING REGULATION AMENDED

Several million persons throughout the United States should have an easier time following their "low salt" or "low sodium" diets, as the result of an amendment of the dietary foods labeling regulations under the Federal Food, Drug, and Cosmetic Act, the Food and Drug Administration, U. S. Department of Health, Education, and Welfare, said today.

The new regulation will require the labeling of "salt free' or "low sodium" food products for dietary use to declare their sodium content in milligrams of sodium per 100 grams of the food, and in an average serving of the food. The "average serving" is required to be expressed in such common terms as the number of slices, cookies, wafers, etc., or in terms of cupfuls, tablesspoonfuls, teaspoonfuls, etc.

The salt free or low sodium diets are widely prescribed for persons suffering from high blood pressure and certain types of heart, liver, and kidney diseases, FDA said. As a result, the packing of special foods for this market has grown extensively in recent years, the agency said. This development, however, has been accomplished by such variations and confusion in the labeling terminology used to indicate absence of salt or the amount of sodium present in these foods. Many products were found on the market labeled "salt free" or "no added salt" but which nevertheless contained substantial amounts of sodium naturally present as in some vegetables, or added in the form of baking powders or other ingredients. The new regulation should insure uniformity in the label information regarding the salt or sodium content of the foods and make it possible for patients better to compute their intake of sodium, FDA said.

The significance of salt free or low sodium diets in certain diseases lies in the property of sodium to regulate the water content of body tissue, FDA said. Edema, or excessive water in the tissues, is a complication of these diseases which may require dietary management under the direction of a physician.

The regulations are in line with recommendations made by the American Heart Association and the Council on Foods and Nutrition of the American Medical Association. Packers of the foods did not object to the regulations at hearings held in Washington last December, FDA said. The new regulations became effective on September 29, 1954.

FINANCIAL REPORT

During the past year ending July 15, 1954, the International Association of Milk and Food Sanitarians, Inc. continued the practice of having all financial matters centralized in the office of the Executive Secretary, H. L. Thomasson, in Shelbyville, Indiana. In accordance with sound financial operations, all transfers from the general fund are made by check co-signed by the Executive-Secretary and the Secretary-Treasurer. The firm of Robert E. Eck, Certified Public Accountant, Shelbyville, Indiana, was retained throughout the year to close the books monthly, and to make quarterly reports and an annual report of the financial position of the Association. Following is an abbreviated Balance Sheet of a much more lengthy and thorough annual financial report, which presents fairly the financial position of IAMFS:

BALANCE SHEET
As of July 15, 1954

Assets

Current Assets	
Cash and Reserve Fund in Bank (operating funds and general funds)	$11,392.77
Accounts receivable	397.05
Inventory of supplies	1,545.98
Unexpired insurance premiums	21.20
Total Current Assets	$13,357.00
Fixed Assets	
Office, addressing and mailing equipment, at cost less reserve for depreciation	2,293.62
TOTAL ASSETS	$15,650.62

Liabilities and Reserves

Current Liabilities	
Accounts payable	$ 175.75
Accrued salaries and bonus	2,607.98
Accrued payroll taxes	229.50
Reserve for special award	1,192.74
Total Current Liabilities	$ 4,205.97
Reserve for Contingencies	11,444.65
TOTAL LIABILITIES AND RESERVES	$15,650.62

The Executive Board of the Association has carefully reviewed the entire financial status of the Association as well as examine critically all matters of income and expense of the Association. It should be pointed out that the Reserve for Contingencies one year ago was $9,043.51 for a Net Gain for the year of $2,401.14. The present working capital ratio of 3.2 at July 15, 1954, is considered very satisfactory.

A cost analysis of the first six monthly issues of the Journal of Milk and Food Technology for 1954, as compared with the previous bimonthly publication shows that such a progressive step appears possible without any additional cost in subscription rates to the membership, a very remarkable achievement during the past year.

Respectfully submitted,
H. H. Wilkowske,
Secretary-Treasurer

NATIONAL CONFERENCE ON INTERSTATE MILK SHIPMENTS

The next meeting of the National Conference of Interstate Milk Shipments will be held at the Hotel Peabody, Memphis, Tennessee, on Tuesday and Wednesday, March 29 and 30, 1955.

The Conference program will be built around the major theme "The Best Possible Milk for All the People". Problems of operation of the Conference will be reviewed by authorities of member states, and by committees of the Conference appointed by the Executive Committee. It is desirable that state regulatory officials extend invitations to the industry and local health authorities in their respective states. The Executive Committee has appointed Harold Barnum, Denver, Colorado; Clarence Luchterhand, Madison, Wisconsin; and D. B. Whitehead, Jackson, Mississippi, to the Program Committee.

FRANK KOVAL APPOINTED TO OHIO STATE UNIVERSITY POST

Frank Koval, a graduate in Dairy Industry from The Ohio State University in 1949, has been appointed as Dairy Technology Extension Specialist in the Department of Dairy Technology at The Ohio State University. Mr. Koval, whose home is in Shadyside, Ohio, was born and reared on a dairy farm in eastern Ohio.

Following his graduation from The Ohio State University, he has been associated with the Evaporated Milk Association as a member of the Sanitary Standards Staff. He has been engaged in sanitary audits of evaporated milk plants and dairy farms and in assisting with the organization of fieldmen conferences.

He will fill the position made vacant by the resignation of Perry R. Ellsworth.

"DOCTOR JONES" SAYS:*

PAUL B. BROOKS, M. D.

Can you remember when there were no ice cream sodas? No—that was 30 years before your time. But we had "soda fountains." Flavoring syrup they blew fizz-water in — sometimes a little sweet cream—cost a nickel. A few years later they began putting ice cream in. Yes — I remember taking a girl friend in to treat her. I discovered they'd gone up to 10 cents — all I had. But, with two straws and spoons, we managed all right.

Three or four years later we had a big scarlet fever epidemic one of the "explosive" kind. It proved to be milk. Their first clue: a bunch of teen-agers that patronized a popular soda fountain they got it. (I was in school but I knew about it.) The druggist made his own ice cream. His raw milk and cream came from one dealer. His milk was already under suspicion.

Then, years later (1916), we had our big polio epidemic. It didn't take long to see that the soda fountains, with their common glasses, could be one way of spreading the infection. That started a nation-wide drive for single-service paper containers at soda fountains. It's been a long time, now, since I've seen the old-fashioned, common glasses in one of 'em.

Well, sir—what got me going on this theme: a friend sent me this little trade magazine: The Niagara Pioneer. (Buckley — that's right!) Anyway, it's put out by the Niagara Alkali Company. They make the stuff that makes the fizz. It's got a clever little article here: The Fountain of Youth. Here's one paragraph from it.

"Soda fountains like the teen-ager trade. It isn't fussy. It doesn't diet. It has money. It's willing to try anything, at least once. It never knows when it has had enough. And it shows no disposition to dash out huffily if not promptly served. It gets keen enjoyment, as well as ideas, from what is being served to others." So, if Ponce de Leon could go back to Florida today, he'd find *a* fountain of youth, if not the one he was looking for.

*From New York State Health Department July 19, 1954.

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HYAMINE makes odorless, non-irritating, chemically stable sanitizers

In meat packing plants the preferred way to clean meat cutting tables is to remove greasy residues first with an alkaline cleaner containing TRITON X-100, a Rohm & Haas non-ionic detergent. Then apply a HYAMINE sanitizer which reaches germ breeding places; maintains activity against organism growth.

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HYAMINE and HYAMINE-TRITON cleaning compounds are preferred *for janitorial work* in hospitals, schools, and buildings of all types. Cleaning personnel like the quick-acting, dirt-removing action of TRITON detergent. They appreciate the odorless, non-irritating qualities of HYAMINE solutions. Institution and building managers profit from the versatility and fast, germ-killing cleaning activity of HYAMINE-TRITON sanitizers.

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.

Soda fountains, restaurants, bars and cafes find HYAMINE-formulated compounds effective and low-cost sanitation aids. Glassware, dishes and silver are protected against bacteria when sanitizers containing HYAMINE are added to the rinse water. Workers like sanitizing solutions based on HYAMINE because they are odorless and do not irritate the skin. HYAMINE germicides are effective bacteria killers over a wide range of water temperatures. They withstand long exposure to high temperatures without decomposing or volatilizing.

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COW CLIPPING TIME IS HERE

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CLIPMASTER

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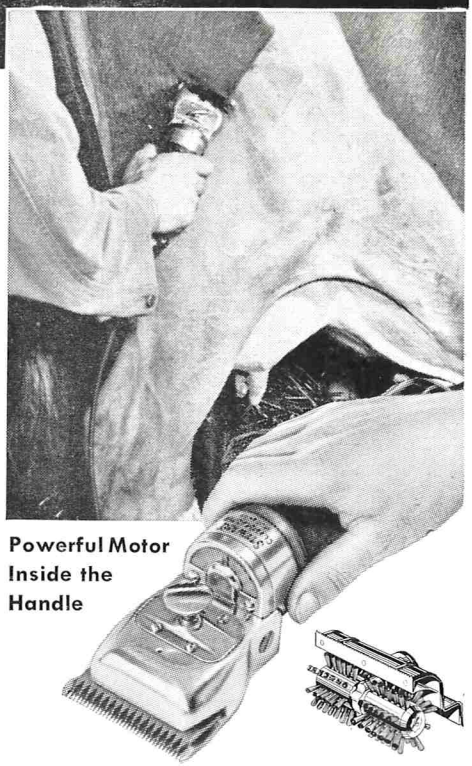

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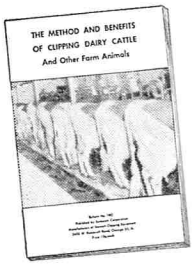

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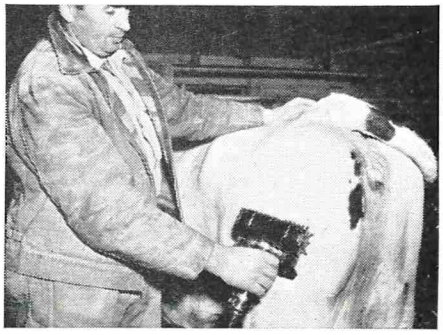
Bulletin 100—"The Method and Benefits of Clipping Dairy Cattle and Other Farm Animals." This handy manual illustrates the 5 simple steps in clipping dairy cattle that can be easily learned by everyone. Contains no advertising. Send for your free copy.



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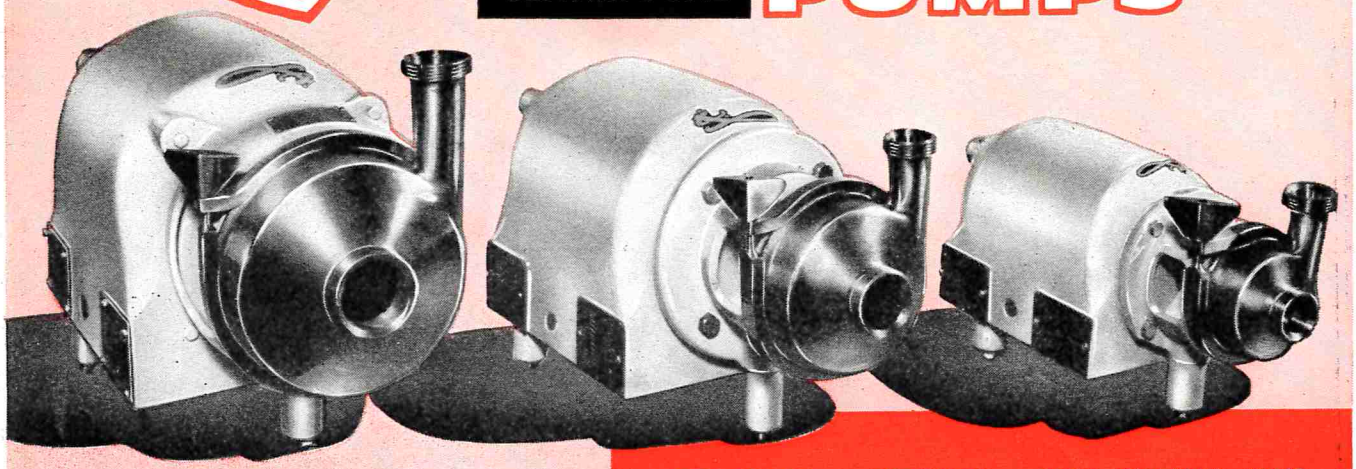
Announces New Stainless Steel (Patent Pending) SANITARY CENTRIFUGAL PUMPS



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