JOURNAL OF MILK TECHNOLOGY

Volume 4 Number 4

JULY-AUGUST, 1941

Official Publication of

International Association of Milk Sanitarians

(Association Organized 1911)

Also designated publication of

California Association of Dairy and Milk Inspectors

Central States Milk Sanitarians

Chicago Dairy Technology Society

Connecticut Association of Dairy and Milk Inspectors

Indianapolis Dairy Technology Club

Massachusetts Milk Inspectors' Association

Metropolitan Dairy Technology Society

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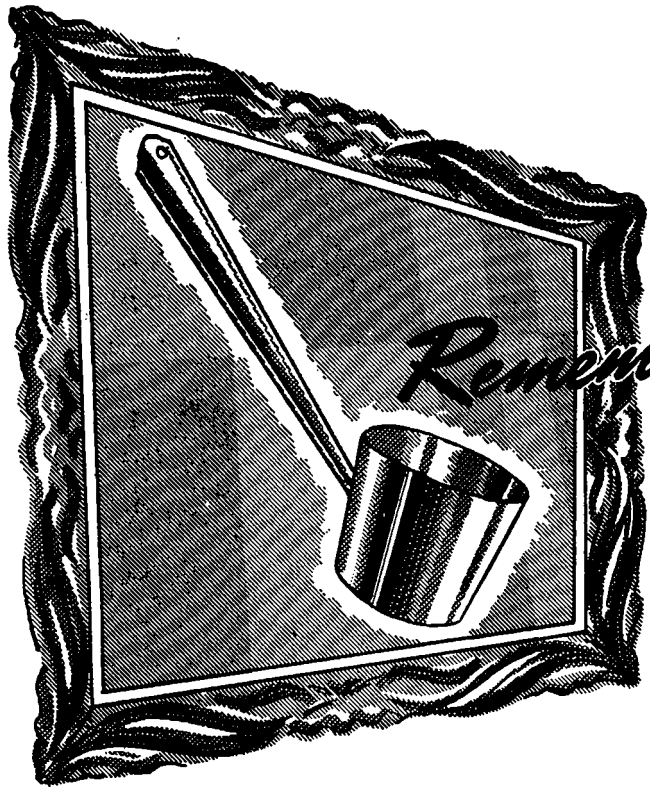

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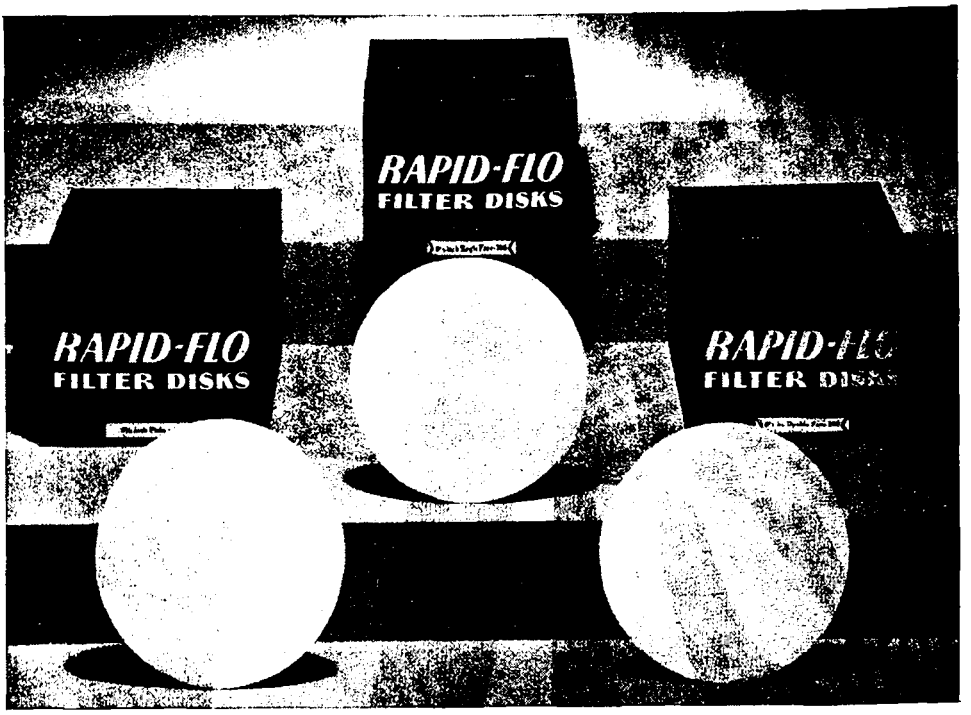

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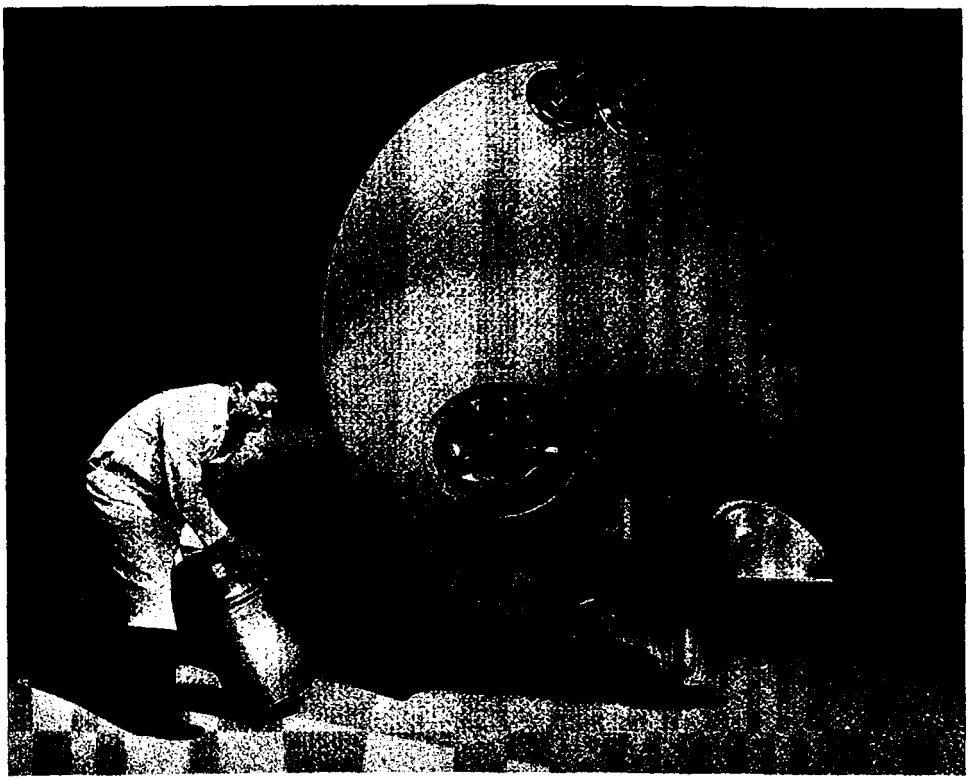

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JOURNAL OF MILK TECHNOLOGY

Official Publication of the

International Association of Milk Sanitarians
(Association Organized 1911)

and Other Dairy Products Organizations

Office of Publication 29 N. Day St., Orange, N. J.
Entered as second-class matter January 26, 1939, at the post office at Orange, N. J. under the Act of March 3, 1879.

(For complete Journal information, see page 234)

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of
MILK TECHNOLOGY

Volume 4 July-August, 1941 Number 4

Editorials

The opinions and ideas expressed in papers and editorials are those of the respective authors. The expressions of the Association are completely recorded in its transactions.

Facts, Then Progress

An outstanding feature of the Pittsburgh meeting of the Institute of Food Technology, held June 16-18, was the demonstration of the need for more facts about food. It was stated that the food industry runs in the financial bracket of fifteen to seventeen billion dollars, followed next by the automotive industry down at twelve billion. It is clear that such an industry is too large and important to hope to coast along on rule-of-thumb methods. It must base its practices on facts instead of the shifting sands of fancy.

Take the drying of foods for example. Most everyone thinks that there surely must be a commercial future in the drying of foodstuffs. And yet there is no real industry in this field, except for certain dried fruits. The question was strongly agitated during the days of World War I, and yet now, twenty-five years later, we remain just where we were then. No research!

Are the lower grades of foodstuffs as rich in nutrients as the better grades? In other words, does nutritional value parallel organoleptic quality? Are we compelled to pay for just appearance, or does the nutritional value warrant the cost? No data!

Milk. The power of the government is behind the effort to increase the consumption of cheese by one-third, and evaporated milk by one-fourth. An increase in cheese production probably does not materially affect the demand for bottled milk. But look at evaporated milk! An increase in its production at the projected rate is just too bad for the bottled milk trade.

It is poor consolation to recognize that the bottled milk industry is largely to blame. It has ploughed its resources into white-tiled plants, and has neglected research. It has developed a defensive complex instead of a vision of greater distribution. It has built up a price structure which now operates perilously near the area of diminishing returns. The whole trend of the public demand is in the direction of economy of space. This should mean cheaper transportation (delivery) and less storage space (in the household refrigerator). On top of this is loaded the burden of a restrictive price imposed by Control Boards, compelling the bottled milk trade to carry the heavy end of the production costs of the farmer.

Well, what are we going to do about all this? The answer to the research prob-

lem is the arousing of the commercial milk interests. To the price and market situation, the official milk control people hold the key. It is they who have succeeded so well in selling the dealers on the public health hazard in milk (unless handled sanitarily) that the industry as a whole is on the defensive. More is said about safe milk than about wholesome milk. Even our milk plants are made to look like hospitals, and the ice cream industry follows suit. All of this costs money. Does it bring in any big money? No. How do we know? Look at the per capita consumption of milk for the past ten years or more. It runs at a rather dead level, allowing for the sag in the early thirties. Putting hoods on pouring lips, using brightly lettered bottles, lowering the bacteria count a thousand or so, building glittering plants, and buying up milk routes is not the answer.

What is needed is boldness in devising new milk products that can be sold at lower prices than the present bottled prices. Some originality and ingenuity in devising new ways of distributing milk is in order. The industry should take the lead in this. In sympathetic collaboration, the control officials should not seek to freeze the industry in its present molds. They should liberalize the rules and regulations to give legitimate opportunity for growth and development. Increased regulation is not warranted when commensurate values are not afforded the public. We all want reasonably safe milk but we do not want a complicated regulatory structure that costs so much money to enforce and to comply with that the price of milk curtails consumption. We want more research facts from both laboratory and market. Then in collaboration with sympathetic control officials, reasonable rules and regulations should be drawn for the marketing of new dairy products in wider markets.

J. H. S.

Tulsa, Ho!

The forthcoming thirtieth annual meeting of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS will be held at Tulsa, Oklahoma, October 27-29, 1941. This meeting in the south central west affords a splendid opportunity for the Association to join hands with our fellow milk sanitarians in the west. When our membership was small and confined to the east, it was indeed difficult to "go west." Now, with our eleven hundred members, increasing in numbers regularly from all sections of the United States and from foreign countries, it is high time that we should broaden our horizons, and develop the spiritual and mental tempo commensurate with our opportunity.. We face more than an opportunity: it is an obligation to our membership on several counts.

In the first place, we should bring our support and inspiration to new sections where our members have been engaged in blazing new trails in milk sanitation. Moreover, our meetings always attract new blood, especially when we enter territory not previously visited. Then, too, we ourselves gain in perspective by meeting new people, visiting new scenes, and seeing different conditions from what we are meeting in the daily grind.

So, let's all pull out for Tulsa, the oil capital of the world!

Sources of Hemolytic Enterococci Found in Milk

George E. Turner and F. R. Smith
Division of Dairy Industry
University of California, Davis, California

The hemolytic enterococci are of considerable significance to persons in the dairy industry. These organisms have a rather interesting history. Among the workers who have isolated them from human feces are Sherman and Stark (8); Hare and Maxted (4); Sherman, Stark, and Mauer (9); and Smith and Sherman (13). The same streptococci have been found in milk or milk products by O. T. Avery and Cullen (1); R. C. Avery (2). Sherman and Wing (10 and 11); Sherman and Niven (7); Gunnison, Luxen, Marshall, and Engle (3).

The finding of those cocci in human feces and the isolation of the same species from milk might lead one to believe that the source of contamination of the milk was human feces. A few attempts have been made to find other sources. Orcutt (5) could not obtain these hemolytic enterococci from the feces of calves. Smith (12) isolated one culture of *Streptococcus zymogenes* from cow feces and one from horse feces. This latter study was quite limited, indicating only that these organisms might gain access to the milk through its contamination with animal feces.

The present study was undertaken in the hope of securing additional information on possible sources other than the intestinal tract of man and animals.

EXPERIMENTAL

Four methods of isolation were used to obtain these organisms from the various types of solid material investigated:

1. About 1 gram of the material was suspended in 10 ml. of sterile distilled water and heated at 60° C. for 30 minutes. Dilutions were plated in blood agar.
2. From the suspension described above, 1 ml. was added to 9 ml. of sterile skim milk containing methylene blue so that the final concentration of the dye was 0.1 percent. The mixture was incubated for 48 hours at 37° C., after which blood-agar plates were poured.
3. About 1 gram of the substance was added to 10 ml. of 1 percent sodium carbonate, and the method recommended by Stainsby and Nichols (14) was followed.
4. Dilutions of the sample were plated in blood agar without preliminary treatment.

Two methods were used to isolate the desired bacteria from milk:

1. Plating of appropriate dilutions in blood agar without special treatment.
2. Heating the milk to 60° C., holding it at this temperature for 30 minutes, and then plating it in blood agar.

Preliminary study on a herd of forty cows failed to show the desired organisms in the feces. A general survey of the dairy also failed to show any source on the premises. A series of tests on the milk coming from this dairy also failed to show these bacteria. Evidently, since this survey extended over several months, this herd as well as the milk supply coming from it was free of these organisms for a considerable period.

A survey of the milk from sixteen dairies showed that three were harboring hemolytic enterococci. Samples of the feed, the water supply (the drinking water for the cattle as well as the water supply used in the milk house), and the cows' feces were tested. In one dairy the organisms were recovered from the

drinking water supplied to the cattle. In the second case they were found in the drinking water as well as in the cows' feces. A thorough investigation on the third farm failed to show these bacteria in the feed, the water supply, or the feces. Since all other sources had failed, milk samples were taken from each cow. One animal was found to be shedding these organisms in small numbers (about 200 per ml.).

Conceivably, the organisms found in the investigation of herds 1 and 2 might have been merely chance inhabitants at the particular time of sampling, and the true source of contamination might have been one or more cows harboring these streptococci in their udders. To determine the validity of such an argument, samples were taken from the individual quarters of all the cows in herds 1 and 2. In no case were any of the hemolytic enterococci encountered. We must conclude, therefore, that these organisms may enter the milk supply from other sources than the cow's udder.

It was also possible that the animal harboring these organisms might be suffering from an udder derangement. To determine whether this was true or not, milk samples were secured from each quarter of the cow's udder. Three of the four were found to be shedding these hemolytic streptococci, whereas none were encountered in the fourth quarter. The following tests were made on the milk from the individual quarters: 1, microscopic examination, 2, pH determination, 3, chloride content, and 4, rennet coagulation. The results were as follows: 1, only an occasional leucocyte was encountered upon microscopic examination; 2, determinations varying from pH 6.69 to 6.72 were obtained by the electrometric method; 3, the chloride value was constant at 0.12 percent for each of the four quarters; 4, rennet coagulation was found to be well within the limits assigned to "normal" milk (about 5 minutes). It was impossible to obtain a complete history of the cow. The owner, however, gave the cow's age as 5 years, and stated the animal had never been suspected of having mastitis. It would, therefore, seem difficult to correlate the occurrence of these organisms with an infection of the udder.

Upon investigation it was found that the herds from which successful isolations had been made were allowed to graze freely, while the cattle from which the organisms were not isolated in the preliminary study were confined. It was possible that free-grazing cattle might be more liable to "pick up" these organisms than those which were confined. As a check on this hypothesis samples of cattle feces, soil, and alfalfa plants were secured from a field in which a beef herd was grazing. (This herd was owned and maintained on a portion of the same farm upon which was confined the dairy herd from which no cultures were isolated.) The hemolytic enterococci were quite readily isolated from the beef-cattle feces and the soil of this pasture, but were not found on the plants.

The results of the tests used in identifying these organisms, as well as the source from which a particular group was isolated, may be found in the accompanying table. The methods used have been recommended by previous investigators and were described by Sherman (6).

DISCUSSION

Though only a limited number of cultures were isolated from soil and water, we can see no reason why such sources might not be the natural habitat of the enterococci. It would be impossible to say whether the initial contamination may be from soil to water to intestinal tract or from the intestinal tract to the soil. To determine the initial source would require a thorough and careful investigation. Also, this detailed information would not seem valuable enough to warrant the necessary labor.

The occurrence of these hemolytic enterococci in the udders of "normal" cattle was of considerable interest. One might reason, from the sources listed for these organisms, that their entry into the udder could easily take place through the teat canal. Along with this fact we must

TABLE 1

Physiological Reactions and Sources of the Hemolytic Enterococci

Probable Species	Source	Number of cultures	Hemolysis	Growth in the presence of: 10° C.	45° C.	6.5% NaCl	0.1% Methylene Blue	pH 9.6	Final pH Glucose Broth	Survive 60° C. for 30 min.	Litmus reduced before curdling	Milk curdled	Sodium hippurate hydrolyzed	NH_3 from peptone	Esculin split	Fermentation of: Arabinose	Glucose	Maltose	Lactose	Sucrose	Trehalose	Raffinose	Inulin	Glycerol	Mannitol	Sorbitol	Salicin
Streptococcus zymogenes	Cow feces Beef cattle	4	+	+	+	+	+	+	4.5	+	—	+	—	+	+	—	+	+	+	+	+	—	—	+	+	+	+
Streptococcus zymogenes	Cow feces Dairy cattle	1	+	+	+	+	+	+	4.5	+	+	+	—	+	+	—	+	+	+	+	+	—	—	+	+	+	+
Streptococcus zymogenes	Water	3	+	+	+	+	+	+	4.5	+	2— 1+	+	—	+	+	—	+	+	+	+	+	—	—	+	+	+	+
Streptococcus zymogenes	Cow's udder	2	+	+	+	+	+	+	4.5	+	1— 1+	1— 1+	—	+	+	—	+	+	+	+	+	—	—	+	+	+	+
Streptococcus zymogenes	Milk	16	+	+	+	+	+	+	4.5	+	6— 10+	+	—	+	+	—	+	+	+	+	+	—	—	+	+	+	+
Streptococcus durans	Cow feces Beef cattle	5	+	+	+	+	+	+	4.5	+	+	+	—	+	+	—	+	+	+	—	—	—	—	—	—	—	+
Streptococcus durans	Soil	2	+	+	+	+	+	+	4.5	+	+	+	—	+	+	—	+	+	+	—	—	—	—	—	—	—	+

recognize the possibility that the less care given to the cattle and their surroundings, the greater the chance of this contamination. These enterococcus types may, however, occur in the udder without causing pathological changes; and therefore, in the particular case mentioned above we must consider the organisms as merely parasites.

Attempts to isolate hemolytic enterococci from cattle feces have led to conflicting claims. One reason that might explain this discrepancy is that investigators may have limited their study to one herd. This would mean that the finding of these microorganisms would be only a matter of chance. In this study we found one herd from which we could not isolate these streptococci even on repeated trial. A careful survey of the milk supply also failed to yield results. It would seem wise, therefore, if one wishes to isolate these cocci, to find a milk supply containing them and then to study intensively the herd involved. Such methods would seem likely to prove fruitful.

The accompanying table contains somewhat detailed information on the source and reaction of both *Streptococcus zymogenes* and *Streptococcus durans*. These species correspond well in practically all basic physiological characteristics, but are sharply differentiated by the inability of *Streptococcus durans* to ferment sucrose, glycerol, mannitol, and sorbitol. These cultures did not, however, appear to be so hardy or resistant as strains isolated from human feces. Although they were able to grow under the stringent environmental restrictions that may be imposed on the enterococci, they grew less rapidly or luxuriantly than one might expect. The reduction of litmus milk and of methylene blue was not so clear-cut and rapid as one would desire. Certain strains of *Streptococcus zymogenes* also were unable to reduce litmus, while the cultures of *Streptococcus durans* were able to reduce it. Judging from this anomalous behavior, the reduction of litmus may be less significant in the differentiation of these enterococcus types than we once believed.

SUMMARY

The occurrence of hemolytic enterococci in cow feces has been confirmed. These organisms have also been isolated from water, from soil, and from the udder of an apparently normal cow.

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A Small Electric Holder Type Pasteurizer[1]

C. W. England[2], Arthur P. Wiedemer[2], and George J. Burkhardt[3]

Maryland Agricultural Experiment Station, College Park, Maryland

INTRODUCTION

Proper pasteurization is recognized as the most important single factor involved in the safety of dairy products from the standpoint of public health. Within the past few years, various communities have enacted ordinances or put into effect regulations prohibiting the sale of raw milk to the consuming public. Increased demands for pasteurized milk in rural communities have brought about requests for small pasteurizers having a capacity of five to forty gallons.

In 1931 work was started by the National Rural Electric Project in cooperation with the University of Maryland on the development of a small electric holder-type pasteurizer designed to meet the requirements of the small producer-distributor, for small plant use or for large country estates. After much of the basic work (1, 2) had been completed, it was discontinued in 1933 due to lack of funds. Because of a growing need for a unit of this type, the project was re-opened by the Maryland Agricultural Experiment Station in 1937.

THE PASTEURIZING UNIT

The pasteurizer developed and used in the experiments reported herein has a capacity of 12 gallons. It consists of a synthetic rubber (Saniprene) lined, rectangular steel vat with the floor sloping toward a stainless steel outlet closed by a poppet-type valve, the head of which is covered with synthetic rubber. The electrodes are of graphitized carbon with spade electrical contacts, and attached to insulators which hook over the rim of the vat at its ends. The resistance of milk to the flow of an alternating current between these electrodes provides heat for pasteurization. The agitator consists of a block of lacquered* hard wood, screwed to the end of a bakelite rod and is belt-driven at 130 r.p.m. by a small electric motor. The shape of the agitator and speed at which it was operated gave adequate agitation with a minimum of churning.

The cover of the vat carries the agitator drive, wiring, thermostat, and the electrical contacts. The pasteurizing unit, with lid raised, and with lid closed, is illustrated in Figures 1 and 2.

Figure 3 shows a diagram of the electrical circuit. Three wire, 230 volt service is used. The power to the electrodes is controlled by a power relay which is in turn controlled by the control circuit. The control circuit operates on 115 volts and consists of a glass-stem mercury-thermometer type thermostat and a special sensitive relay.** The thermostat will maintain the holding temperature within ½ degree. When the milk temperature reaches 144°F., the power is automatically cut off and remains off until the milk temperature drops to 143.5°F. As the pasteurizer is very quiet in operation it was very difficult to determine the cut-off point without watching the electrical instruments. A timing circuit was thus added consisting of a mechanical latch-in, hand-reset relay and a self-starting electric alarm clock.

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[1] Paper No. 537 in the Scientific Journal Series of the Maryland Agricultural Experiment Station.

[2] Department of Dairy Husbandry.

[3] Department of Agricultural Engineering.

* Polymerized normal propyl methacrylate resin dissolved in equal parts of toluene and xylene was used as a lacquer.

**The sensitive relay and thermostat were built especially for this work through the courtesy of the Vapor Car Heating Company, Chicago, Illinois.

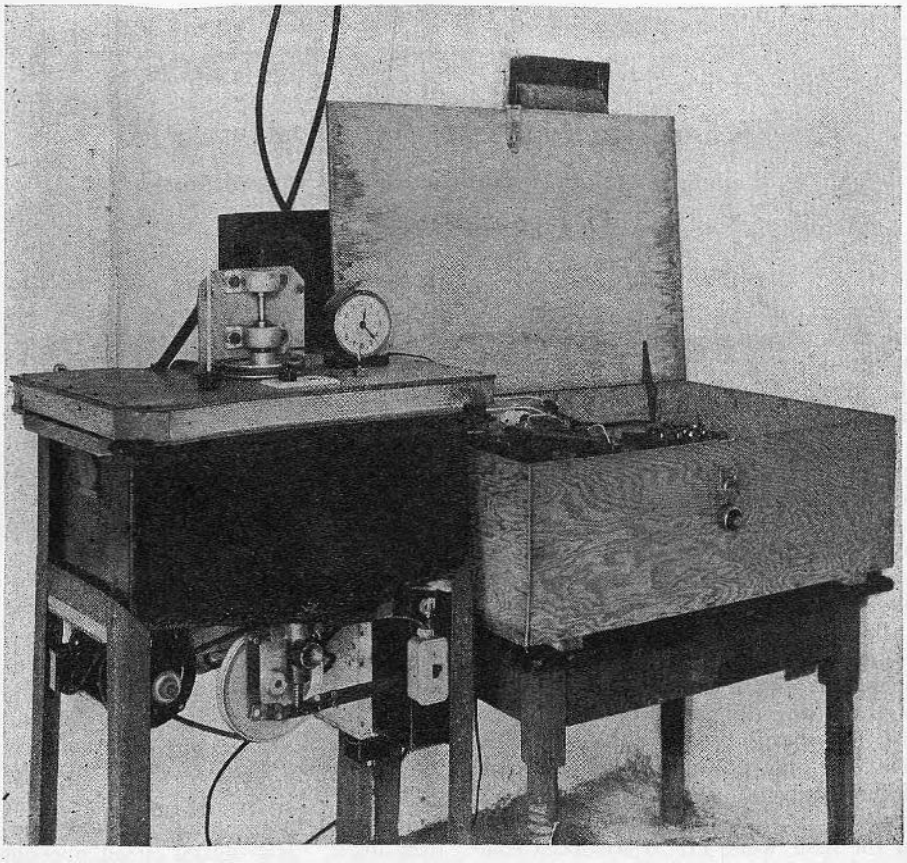

FIGURE 1
Electric Pasteurizer in Operation.

Actuated by the sensitive relay, the mechanical latch-in relay closes the clock circuit when the power circuit is broken the first time. The clock then continues to run and times the holding period. In practice, before the pasteurizer was started, the clock was set at 12:00 and the alarm at 12:30. The alarm would then signal the end of the holding period. In the general din of the dairy plant the alarm was not loud enough always to be heard.

Figure 4 shows a line drawing of section through the tank.

Certain features are embodied in the design to insure the safety of the operator from accidental electric shock. The contacts to the electrodes are located in the cover so the current is automatically broken when the cover is lifted, thus preventing shock due to contact with either the milk or electrodes should the switch be left on. The drain is placed at the neutral point of the 230-volt circuit so that contact with milk leaking from the drain or from an open drain while the current is on would not cause shock. A heavy ground is supplied as an additional safeguard. To avoid current failure in one side of the line and the consequent unbalance, the mechanically connected breaker is used and no fuses of any kind should be used. Where fuses may be required by law they should be so large that the breaker will trip first under all conditions.

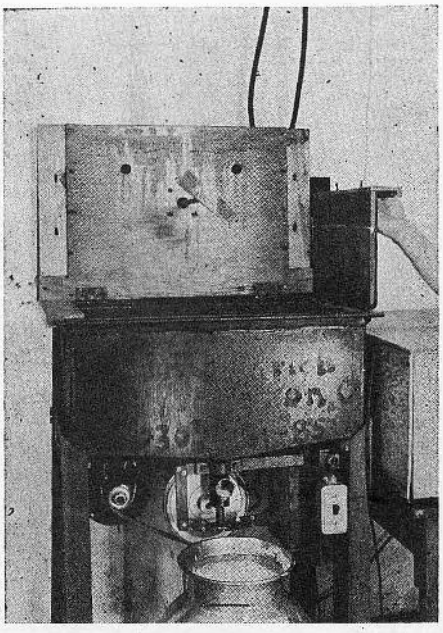

FIGURE 2
Electric Pasteurizer With Cover Open Showing Agitator and Electrodes.

Burkhardt and England (3) have given elsewhere a more detailed description of the electric pasteurizer described herein, together with recommendations for making the unit entirely automatic.

EXPERIMENTAL

To determine the comparable efficiency and adaptability of the electric pasteurizer, various lots of milk were pasteurized by both the "time-honored," water-heated, holder pasteurizer and the electric holder pasteurizer and results of tests on each compared. A 200-gallon, spray type, rectangular pasteurizer was filled with mixed evening's and morning's milk, previously cooled to approximately 40°F. This milk was thoroughly mixed in the pasteurizer, the desired samples were secured for analysis and 12 gallons were removed and transferred to the electric pasteurizer. Each lot of milk was pasteurized by heating to 143.5°-144°F. and holding at that temperature for 30 minutes. At the end of the holding period, samples were obtained from each lot of milk for examination and analysis. Tests made on each lot of raw and pasteurized milk included: flavor, creaming ability, pasteurization efficiency, phosphatase, percent butterfat, titratable acidity, pH and curd tension. The average results of one series of 30 tests are presented in Table 1. All averages reported are the arithmetic mean of 30 tests.

Flavor—All samples were scored for flavor by two experienced milk judges, the identity of the samples being unknown to the judges. Variations in scores on individual samples did not exceed one point. The two scores on each sample were averaged. The data in Table 1 show that pasteurization resulted in an improvement in the score, however identical average scores were obtained on the two lots of pasteurized milk.

TABLE 1
*Electric vs. Hot Water Pasteurization**

	Raw Milk	*Electric Pasteurizer*	*Hot Water Pasteurizer*
Flavor score	20.1	21.0	21.0
Percent cream volume after 8 hours	17.6	16.0	16.2
Percent cream volume after 24 hours	16.4	14.7	15.1
Total bacteria per ml.	192,860	4,170	4,990
Maximum bacteria per ml.	905,000	24,600	26,400
Minimum bacteria per ml.	24,000	260	340
Percentage bacterial destruction by pasteurization	.....	97.84	97.41
Gas production in broth tubes	+	—	—
Coliform bacteria per ml.	414	0	0
Percent butterfat	3.82	3.82	3.82
Percent titratable acidity	0.173	0.170	0.169
pH	6.56	6.53	6.54
Grams curd tension	38.45	33.45	34.91

* Arithmetic mean—30 samples.

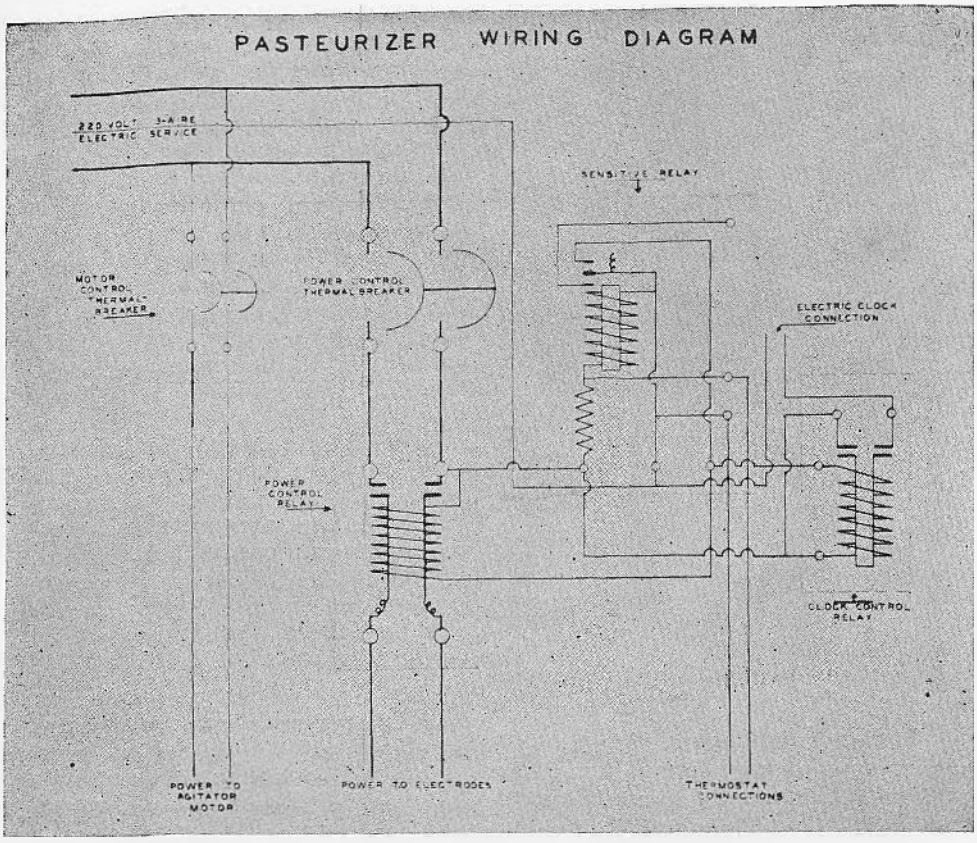

FIGURE 3
Pasteurizer Wiring Diagram.

Creaming ability. Triplicate 100 ml. samples of raw and of each lot of hot pasteurized milk were placed in graduated cylinders and the cylinders placed in ice water. Following cooling, the cylinders of milk were placed in a refrigerator maintained at approximately 38°F. The depth of cream layer on each sample was recorded at the end of 8 and of 24 hours. The three readings on each sample were averaged. Pasteurization resulted in a slight reduction in cream volume, the reduction being slightly greater on the milk pasteurized electrically. The milk from the electric pasteurizer produced 0.20 percent and 0.48 percent less cream volume than that from the hot water pasteurizer after 8 and 24 hours, respectively. These differences would probably be insignificant when observed in milk bottles. In all instances, greater shrinkage in cream volumes occurred in 24 hours as compared to 8 hours.

Pasteurization efficiency. Pasteurization efficiency was determined bacteriologically on all samples, in duplicate, by the standard plate count and by a determination of coliform organisms. The presence of coliform organisms was determined by inoculating tubes of Formate-Ricinoleate Broth and by plating on Violet Red Bile Agar. The raw milk samples were obtained immediately before the milk for electrical pasteurization was withdrawn from the 200-gallon spray pasteurizer. The pasteurized milk samples were obtained directly from the pasteurizers at the end of the 30-minute

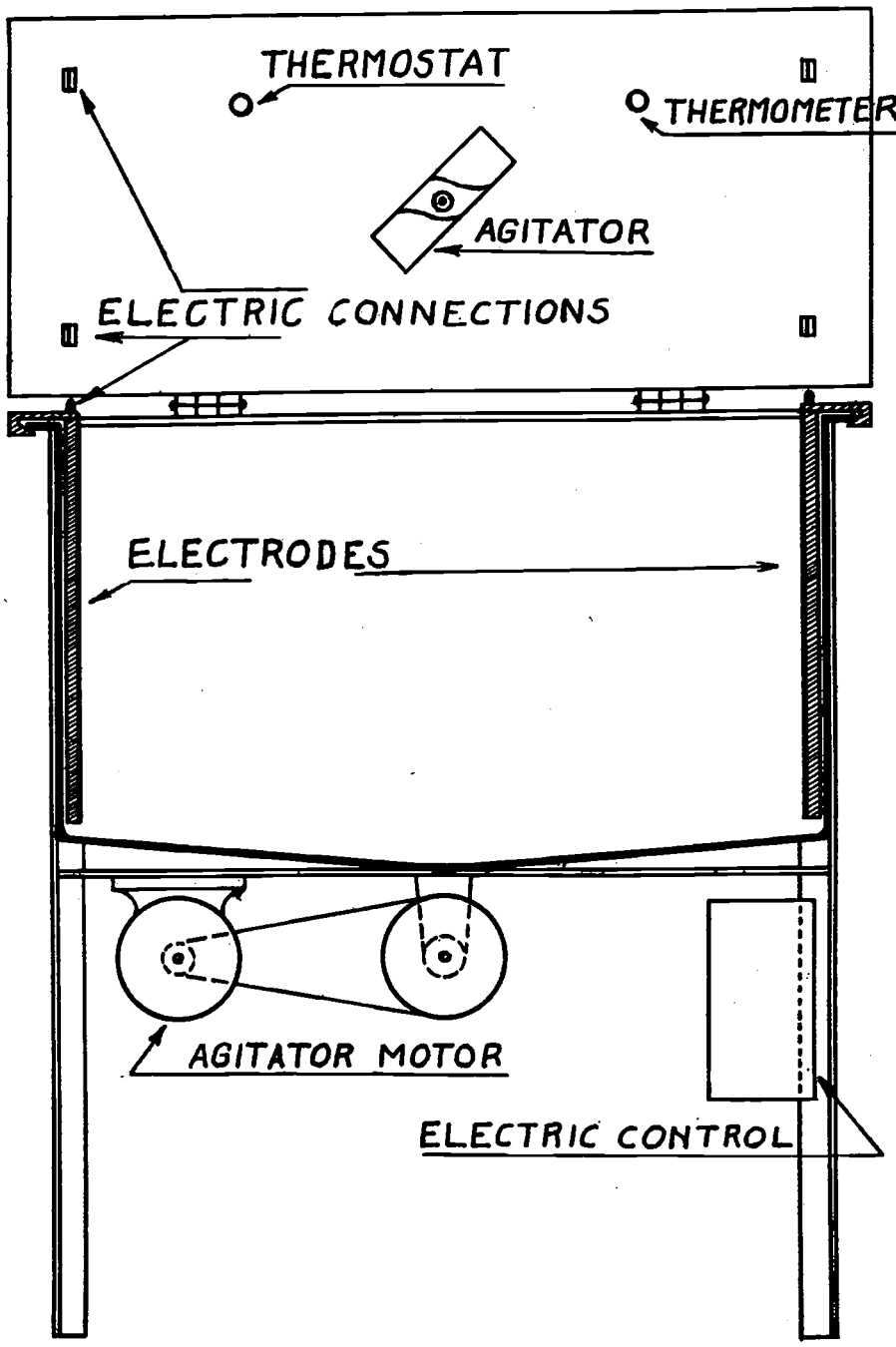

FIGURE 4
Electric Pasteurizer, Showing Section Through Tank With Lid Lifted.

holding period. The electric pasteurizer produced a small increase over the hot water pasteurizer in percentage destruction of total bacteria, the respective percentages being 97.84 and 97.41. This is probably due to the fact that it required approximately 25 minutes longer to raise the temperature from 38°F. to 143.5°F. in the electric pasteurizer than in the hot water pasteurizer. Negative coliform tests were obtained on all samples of pasteurized milk.

Phosphatase test. The Scharer laboratory test was used to determine the presence of phosphatase in the pasteurized milk. This test was made in duplicate on the residues of the samples secured for bacteriological analysis. All samples of pasteurized milk gave a phenol value of less than two units, indicating proper pasteurization.

Percent butterfat, titratable acidity, pH, and curd tension. Percent butterfat, titratable acidity, pH, and curd tension were all determined from one sample obtained from each lot of milk at the time samples were obtained for bacteriological analyses. The percentage of butterfat was determined in duplicate by the Babcock method, using test bottles of precision accuracy. Percentage titratable acidity was determined by titration in duplicate with tenth normal sodium hydroxide using phenolphthalein indicator. pH was determined in duplicate by use of the Beckman pH meter, and curd tension was determined in triplicate by the method recommended for adoption by the Curd Tension Committee of the American Dairy Science Association (May 1940). A Submarine Signal curd tension meter was used for all determinations.

As was to be expected there was no difference in the butterfat test of the pasteurized milk compared to that of the raw milk. The reduction in titratable acidity by pasteurization was also to be expected since it is a known fact that pasteurization reduces titratable acidity by expulsion of dissolved gases. The percentage acidity of the milk pasteurized electrically was 0.170 compared to 0.169 for that pasteurized by hot water. The pH results on the raw, electric-pasteurized and hot water-pasteurized milk were 6.56, 6.53, and 6.54, respectively.

Pasteurization definitely reduced the curd tension, that of the raw milk being 38.45 grams while the electric and hot water-pasteurized milks gave curd tensions of 33.45 grams and 34.10 grams, respectively. A statistical analysis of the data show that the difference in curd tensions of the two lots of pasteurized milk is not significant.

Pasteurization of Uncooled Milk. When milk is to be pasteurized, the usual practice is to cool prior to pasteurization, especially when the milk must be held for some time prior to pasteurization. Pasteurization immediately after milking, or within a reasonable lapse of time after milking, would save both time and expense in cooling and heating for the producer-distributor.

Seven lots of uncooled and cooled milk were pasteurized in the electric pasteurizer to determine the practicability of pasteurizing uncooled milk. Twenty gallons of mixed uncooled milk were obtained from the University dairy barns immediately after being milked. Ten gallons of the milk at 85°F. were immediately pasteurized electrically. The remaining 10 gallons of warm milk were immediately cooled over a surface cooler to 45°F. and held at that temperature until the electric pasteurizer was available for use (approximately one hour) at which time the cooled milk was pasteurized. Tests were made on each lot of milk for flavor, creaming ability, pasteurization efficiency, phosphatase reaction, titratable acidity, pH, curd tension, and power consumption. The average results of these tests are presented in Table 2.

These results show that pasteurization of uncooled milk immediately after milking compares very favorably with milk cooled prior to pasteurization. Heating time was reduced from 42.5 minutes to 24.5 minutes and current consumption was reduced from 3.14 kwhrs. to 1.95 kwhrs. A comparison of these figures with the graphs in Figure 5 indicates

TABLE 2
*Pasteurization of Uncooled vs. Cooled Milk**

	Raw	*Pasteurized*	
		Warm	*Cold*
Flavor score	21.8	21.3	21.2
Percent cream volume after 24 hours	12.6	13.4	13.8
Total bacteria per ml.	12,900	619	766
Percentage bacterial destruction by pasteurization	——	95.20	94.06
Coliform bacteria per ml.	4.28	0	0
Percent titratable acidity	0.173	0.171	0.169
pH	6.64	6.67	6.63
Grams curd tension	28.38	26.75	26.63
Heating time (minutes)	——	25.5	42.5
Total current consumption (kwhrs.)	——	1.95	3.14

* Arithmetic mean of 7 samples.

more efficient operation when 12 gallons are pasteurized as compared with 10 gallons. No good reason can be offered for the common procedure of cooling milk prior to pasteurization, except when the milk may be held warm a sufficient length of time to permit possible increases in the bacterial population.

SIZE OF BATCH AND NATURE OF PRODUCT

Batches of from 2 to 12 gallons of milk have been properly pasteurized in the unit described. The time required for heating small batches is somewhat greater and the efficiency is somewhat lower than for large batches.

Holstein milk was found to heat slightly faster than Jersey Milk, due to lower electrical resistance.

Cream containing 40 percent butterfat was found to heat approximately half as fast as milk. This lengthened the heating time to such an extent that the process would be impractical in the present unit except for occasional use. To adapt the unit for regular cream pasteurization, the vat should be shortened and its cross section area increased.

CURRENT CONSUMPTION AND COST OF OPERATION

Current demand increases with increase in milk temperature varying from 10.5 amperes at 38°F. to 31 amperes at 143° F. (Figure 5). Since there is less resistance to the flow of current with increase in temperature, the rate of heating increases as temperature increases. The higher the initial temperature of the milk at the starting point, the lower the number of watt-hours required to raise the temperature of the milk to 143.5°F. These relationships are shown graphically in Figure 5.

The operating cost of the pasteurizer depends upon the cost of electricity, the initial temperature of the milk and the size of the batch. Approximately 0.24 kwhr. is required during the holding period regardless of the size of the batch. This includes the power to the agitator. For a 12-gallon batch the total cost would range from 0.61 cent per gallon, with a starting temperature of 38°F., to 0.33 cent per gallon, with a starting temperature of 90°F., using current at 2 cents per kwhr.

SUMMARY

Several months experience in operation of the electric holder-pasteurizer described indicates that the unit is safe, efficient, and practical. Its operation is simple and convenient. The operating cost is low where average electric rates are available. No auxiliary equipment such as boiler is needed.

Physical, chemical, and bacteriological tests have been made on milk pasteurized in the electric holder-pasteurizer and compared with similar tests on milk pasteurized in a 200-gallon hot-water spray-type holder-pasteurizer. The results of these tests indicate that the process used in the electric pasteurizer is essentially a heating process and that when like temperatures and holding periods are used, the results of the electric and hot water methods compare favorably.

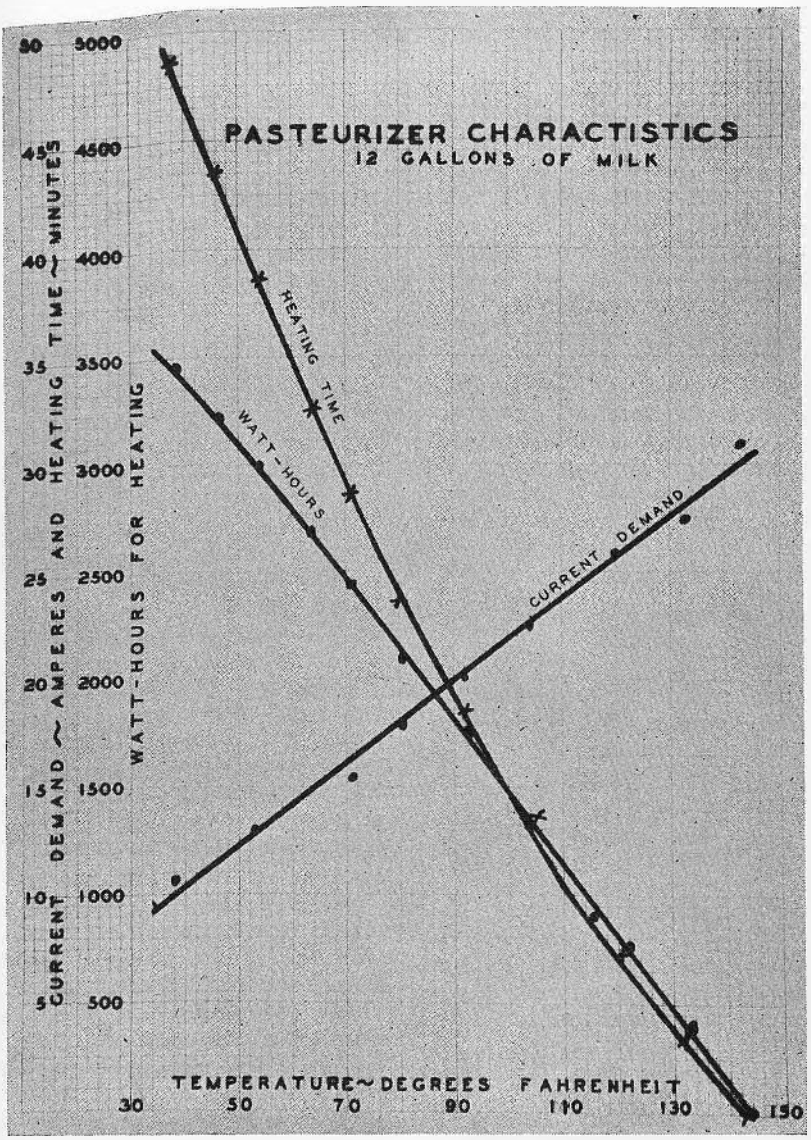

FIGURE 5

Curve Showing Pasteurizer Operating Characteristics.

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A New Microscopic Procedure for the Detecting and Locating of the Source of Thermoduric Organisms in Milk *

W. L. Mallmann and C. S. Bryan

Michigan Agricultural Experiment Station, East Lansing

and

William K. Fox

Department of Health, Lansing, Michigan

Since the adoption of the new standard agar for plate counts of milk, considerable difficulty has been experienced with high counts. This has been due largely to the fact that the new medium favors the development of organisms that on the old medium failed to grow or grew so poorly that the colonies were too small to count at the end of 48 hours incubation. High counts on the new medium have been particularly frequent in pasteurized milk.

That the high counts obtained from pasteurized milk are frequently due to thermoduric bacteria and not improper pasteurization is shown in Table 1. Raw milk samples from the producers were pasteurized in the laboratory to eliminate all sources of contamination that might enter under field conditions. Bacteria counts were made immediately before and immediately after pasteurization to determine the number of resistant bacteria that made up the total count as measured by the new standard agar. These data, picked at random from a large number of samples, show conclusively that high bacteria counts in pasteurized milk may be due to the presence of thermoduric bacteria.

There is no evidence that the presence of thermoduric bacteria in the milk is a public health hazard, but there is evidence to show that these organisms are indicators of unclean equipment and unclean practice on the dairy farm and in the dairy plant.

TABLE 1

The Demonstration of the Presence of Thermoduric Bacteria in Milk

Sample No.	Bacteria per ml. of milk	
	Before pasteurization	After pasteurization
1	1,100,000	83,000
2	85,000	31,000
3	57,000	15,000
4	2,900,000	550,000
5	3,900,000	1,120,000
6	121,00	65,000
7	345,000	195,000
8	175,000	90,000

Dotterrer (1) in 1923, and others, have demonstrated the presence of heat-resistant bacteria which survive pasteurization in raw milk. Practically all workers have observed that the heat-resistant bacteria in milk originate in the producer milk. Breed and his associates (2), (3), (4), (5) traced the source of thermophilic bacteria to farm utensils, and Proven and Rowlands (6) Weiness and Parfitt (7), and others have traced thermoduric bacteria to the producer.

All of the work on thermoduric and thermophilic bacteria shows definitely that these organisms are indicators of unclean equipment and careless handling of the milk. The presence of these organisms indicates to the sanitarian the need of instituting better practice in the handling of the milk supply.

* Presented at the Twenty-nioth Aonual Meeting of the International Association of Milk Sanitarians, New York City, October 17-20, 1940. Journal article No. 475 (N.S.) from the Michigan Agricultural Experiment Station, East Lansing.

The only reliable method of detecting thermoduric bacteria in milk has been the pasteurization test. Briefly, this test consists of determining the bacteria counts before and after laboratory pasteurization. This process has been used extensively in the laboratory of one of the writers (Mallmann) for a number of years and has been an excellent means of tracing the origin of these organisms. In the first part of Table 2 the data show the detection of producer milk containing thermoduric bacteria in a high-count pasteurized milk. The results of a thorough cleaning of farm equipment is shown in part 2 of this table. Similar results have been obtained in other small dairies.

TABLE 2

The Effect of Cleaning Farm Dairy Equipment as Measured by the Pasteurization Test for Thermoduric Bacteria

Producer Sample	Bacteria count of milk Before pasteurization	After pasteurization
Before cleaning farm equipment		
1	7,200,000	8,000
2	1,900,000	100,000
3	262,000	10,000
4	14,000	2,000
Composite	3,800,000	81,000
After cleaning farm equipment		
1	7,000	2,000
2	58,000	1,000
3	15,000	200
4	8,000	150
Composite	18,000	750

The pasteurization test for detecting thermoduric bacteria gives excellent results for dairies with a small number of producers but the test is too cumbersome to be applied to large dairies with a large number of producers.

Due to the success obtained by the application of the pasteurization test for small dairies, requests were made by large organizations for similar help. It was impossible to conduct tests for these large organizations, so research was started to develop a simple test that could be applied by any dairy with laboratory facilities.

Ward and Myers (8) demonstrated that the microscopic count made from pasteurized milk represented mostly viable bacteria and that the number of dead bacteria remaining visible after pasteurization did not impair the usefulness of a direct microscopic count after pasteurization. This work indicates that the bacteria surviving proper pasteurization must be thermoduric bacteria, hence a pasteurization test making microscopic counts before and after pasteurization should yield the same results as a standard plate count which has been used successfully. Thus the amount of work and materials would be lessened to a degree where tests could be applied successfully with economy of time and material.

To check and amplify the findings of Ward and Myers, a series of samples of milk was tested making standard plate and microscopic counts before and after pasteurization. In Table 3 are presented some random selections of bacteria counts in excess of 100,000 bacteria per ml. of milk to show the comparative value of the standard plate count and the microscopic method for detecting viable bacteria in milk after pasteurization. Samples 1 to 13 show an agreement of the two methods. Sample 14 to 17 show a fall in bacteria count according to the standard plate count, but little or no de-

TABLE 3

Random Selection of Bacteria Counts in Excess of 100,000 for Comparative Value of Standard Plate and Microscopic Methods for Detecting Viable Bacteria after Pasteurization.

Sample No.	Bacteria counts (recorded in thousands) Stand. Plate Count Raw	Pasteurized	Microscopic Count Raw	Pasteurized
Agreement of Methods				
1	176	69	200	140
2	540	540	3,000	3,000
3	500	3	240	20
4	400	86	500	40
5	120	6	120	5
6	100	20	120	5
7	120	1	80	5
8	400	86	500	40
9	100	20	120	5
10	300	120	240	240
11	200	1	480	5
12	180	1	480	5
13	170	161	220	120
No Agreement of Methods				
14	300	12	240	240
15	200	46	20,000	15,000
16	1,000	18	1,000	2,000
17	300	1	1,500	480

TABLE 4

Random Selection of Bacteria Counts of Standard Plate and Microscopic Methods after Pasteurization and Microscopic Count after 2 hour Incubation of Raw Milk at 58-60° C.

Sample No.	Bacteria Counts (recorded in thousands)				
	Standard Plate Count		Microscopic Count		
	Raw	Pasteurized	Raw	Pasteurized	Incub. 58-60° C. for 2 hours
1	60	6	80	40	80
2	720	54	30,000	10,000	2,000
3	1,800	120	25,000	20,000	2,000
4	3,000	80	2,000	2,000	480
5	1,200	1	2,000	10,000	5
6	3,000	1	5,000	2,000	5
7	2,400	1	1,000	240	5
8	600	1	240	120	5
9	1,500	70	2,000	3,000	480
10	13,000	100	20,000	15,000	480
11	10,000	120	30,000	10,000	720
12	2,000	1	5,000	4,000	5
13	90	3	9	80	5
14	300	1	480	480	5
15	54,000	1	480	120	5
16	2,000	30	5,000	2,000	5
17	2,000	5	480	1,000	5
18	10,000	40	10,000	8,000	5
19	2,000	3	3,000	4,000	5
20	200	1	240	240	5

crease according to the microscopic procedure. The microscopic count on samples 14 to 17 indicates that both living and dead bacteria are stained, assuming that the standard plate count gives a viable organism count. The samples presented in Table 3 are a fair sampling of all of the data collected. These data would indicate that the microscopic count of pasteurized milk is not always a measurement of the viable bacteria present in the sample. Accordingly the microscopic count of pasteurized milk could not be used as a measurement of the thermoduric bacteria content of milk.

In another series of tests, not only were standard plates and microscopic counts made of raw and laboratory pasteurized milk, but split samples of raw milk were incubated at temperatures of 58° to 60° C. for two hours. Microscopic counts were made to determine the effect of long incubation at high temperature on the dead bacteria that would result from incubation at these temperatures. In Table 4 are presented a random selection of samples taken from this series of tests. These data show that many dead bacteria do stain when microscopic counts are made directly after pasteurization. These data also demonstrate that if the milk is maintained at a temperature lethal to the non-thermoduric bacteria for two hours, the cells after death gradually disappear so that a microscopic count made at the end of two hours does represent viable cells. It will be observed from the table that in every instance cited, a reduction in bacteria count has occurred, the amount of reduction being dependent upon the number of thermoduric and thermophilic bacteria present in the sample.

In another series of tests, bacteria counts were made using the same methods of treating the sample except that the split raw milk samples were incubated at 58° to 60° C. for five hours when microscopic examinations were made at intervals of ½, 1, 2, 3, 4, and 5 hours. A random selection of bacteria counts of these data are presented in Table 5. It will be observed that in the samples containing thermoduric bacteria there is little difference in the count at the various intervals of incubation, but it will be observed that in samples 18 and 35 in the group not containing the thermoduric organisms, a fall in count occurs between

TABLE 5

The Effect of High Temperature Incubation on the Disappearance of Dead Bacteria

Sample No.	Bacteria Counts (recorded in thousands)									
	Standard Plate Count		Microscopic Count							
	Raw	Past.	Raw	Past	Time incubated at 58-60° C. in hrs.					
					½	1	2	3	4	5
	Samples containing thermoduric bacteria									
11	540	540	3000	3000	2500	3000	4000	3000	3000	3000
20	400	86	500	40	70	40	120	80	60	80
31	300	120	240	240	240	150	240	100	100	150
34	70	1	2000	2000	3000	400	5000	4500	5000	8000
42	700	120	2000	720	96	1500	1000	1000	800	800
44	300	100	720	240	720	720	1480	600	480	600
45	70	60	120	40	120	240	240	240	100	20
49	700	120	480	40	80	40	80	60	40	80
50	240	100	480	120	240	200	240	120	100	80
	Samples not containing thermoduric bacteria									
1	120	1	80	5	10	10	5	5	5	5
2	8	1	5	5	5	5	5	5	5	5
4	60	4	10	5	5	5	5	5	5	5
18	500	3	240	20	30	40	15	20	10	10
35	40	1	240	40	10	5	5	5	5	5
36	50	1	40	20	5	5	5	5	5	5

one and two hours of incubation. Incubation beyond two hours did not significantly change the bacteria count picture.

It may be concluded in summarizing the data presented that a microscopic count made at the end of two hours incubation of raw milk at 58° to 60° C. shows the presence of thermoduric bacteria in milk. Although increases in counts do occur during the two hour incubation period because of the presence of thermophilic bacteria, still the number of bacteria present is roughly a quantitative measure of contamination.

After a critical examination of all the data, an arbitrary standard of 40,000 bacteria per ml. in the milk incubated at 58° to 60° C. for two hours was set as a limit for the presence of objectionable numbers of thermoduric bacteria. Using this standard, out of 284 examples examined, there would have been missed 13 samples with microscopic counts under 40,000, containing thermoduric bacteria in numbers in excess of 100,000 according to the standard plate count of laboratory pasteurized samples. On the other hand, the standard plate count would have missed five samples by failure to develop colonies of sufficient size to be counted in 48 hours incubation.

If the standard were set at 20,000 bacteria per ml., eleven samples would be missed, but numerous samples not containing thermoduric organisms would be included, hence it would appear that 40,000 bacteria per ml. is the most acceptable standard based on the data available at this time.

The Proposed Test for the Determination of Thermoduric Bacteria in Milk.

1. Place 5 to 10 ml. samples of milk suspected of containing thermoduric bacteria in an incubator at a temperature of 58° to 60° C. Incubate for 2 hours.
2. Make a microscopic count following standard procedure.
3. Samples showing bacteria counts of 40,000 or more bacteria per ml. contain thermoduric bacteria in excessive numbers.

Application of Microscopic Procedure

1. Examination of raw market milk.
2. Examination of producer samples.
3. Plant surveys by examining samples taken from successive steps in the processing of milk or milk products.

SUMMARY

1. The microscopic technic for thermoduric bacteria is proposed.
2. The microscopic count of pasteurized milk taken directly after pasteurization represents living and dead bacteria.
3. The incubation of milk at a temperature of 58° to 60° C. destroys non-thermoduric bacteria and causes their dissolution.
4. A microscopic examination of milk after incubation of 58° to 60° C. for 2 hours presents the viable thermoduric bacteria.
5. A standard of 40,000 thermoduric bacteria determined by the microscopic technic presented is recommended as the maximum allowed in market milk.

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Sewage Treatment. Karl Imhoff and Gordon M. Fair. Book Review, John Wiley & Sons., Inc., 1940, 370 pp. *Pub. Health Engin. Abs.* xx, S, 94.

This is a joint effort of the authors to present briefly and simply the considerations and calculations which enter into the design and operation of modern sewage-treatment plants, the disposal of industrial wastes, and the disposal of effluents in streams. The table of contents gives:

(1) General considerations.
(2) Composition of sewage.
(3) Screening and skimming.
(4) Chemical precipitation and rapid filtration.
(5) Sedimentation.
(6) Principles of biological treatment.
(7) Treatment on natural soil.
(8) Treatment on coarse-grained beds.
(9) The activated-sludge process.
(10) Chlorination.
(11) Sewage sludge.
(12) Sludge digestion.
(13) Sludge gas and its utilization.
(14) Sludge treatment, disposal, and utilization.
(15) Water-carried wastes from unsewered habitations and industrial establishments.
(16) Origin and treatment of common industrial wastes.
(17) Self-purification of receiving waters.
(18) Disposal of sewage in receiving waters.
(19) Sample calculations.

The book is an interesting attempt to give a world-wide viewpoint on procedure and practice in concise form. It is of value to readers who are experienced enough to recognize the differences in German, British, and American practice, and for those who wish to supplement a general knowledge of sewage disposal and stream pollution by special studies of design or, for instance, oxygen relations in stream studies.

The experienced sanitary engineer, familiar with the care and discrimination of the authors in the selection of design and research data, will derive helpful stimulation and enjoyment from a careful study of this book, including the design problems and oxygen balance computations, which provide excellent mental discipline. In short, it is a "different" book.

Langdon Pearse.

Sanitary Regulations for Controlling the Production of Paper Containers for Milk *

C. N. Stark

Professor of Bacteriology, New York State College of Agriculture, Cornell University, Ithaca, New York

When we realize the many and varied interests in food production today, we can easily and readily recognize the inability of any one person to comprehend completely all phases of such a complicated subject. In many instances the reason why honest and competent persons fail to be in perfect agreement on a subject is found in their different experiences. One's opinions and points of view with regard to relative values are of necessity based on his knowledge and experience. The first concern of the producer of paper containers and milk and other dairy products, or any other product, must be to maintain a satisfactory margin of profit. In principle, we all agree that the efficient producer of an essential food product is rightly entitled to cost of production plus a small profit.

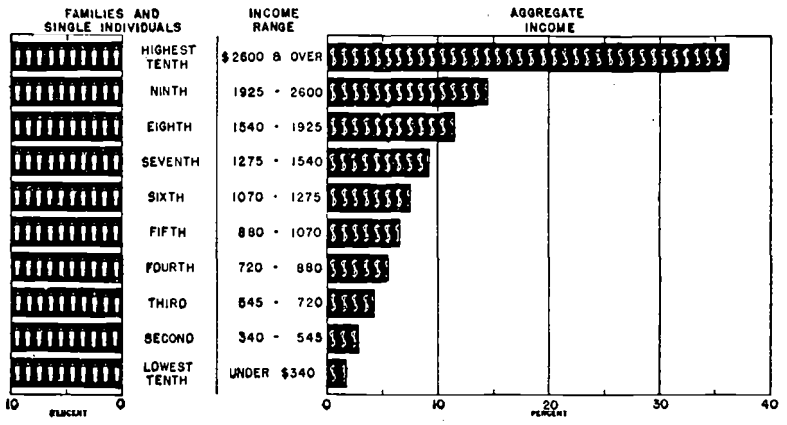
Producers of food products also have long realized the significance of a proper balance between the supply and the demand for their product. They well know the importance of both price and quality. The major concern of public health workers and sanitarians is to provide for consumers an abundant supply of food known to be pure, wholesome, clean, and safe. These protectors of the public welfare work in complete cooperation with the medical profession and research bacteriologists, many of their policies employed in the field being based on the findings of these workers. The large scale mass production methods used in the food industry today must have the services of many engineers. To prevent adulteration and to improve the quality of our foods, chemists are indispensable. For all of these services mentioned, as well as many others, the consumer must pay. The purchasing power of the consumer is controlled by the size of his income and the prices he must pay for the necessities of life. In attempting to maintain proper equilibrium between these powerful and important forces, our economists work untiringly. Often in attempting to protect the rights of an individual or a corporation or the public, the services of the legal profession are required. The daily papers tell us how the price of milk affects the entire agricultural situation. The milk distributor and the manufacturer of dairy products reminds us of his plight when prices he must pay to producers and prices he cannot exceed to consumers are largely fixed for him. Let us admit that under such circumstances, some dairymen, distributors, and consumers are apt to be treated unjustly. It is only by cooperation that such broad problems can be comprehended and solved.

A report of the National Resources Committee, published in 1939, showed that approximately only one-third of the annual income in the United States in 1936 went to two-thirds of our families. See Figures 1 and 2.

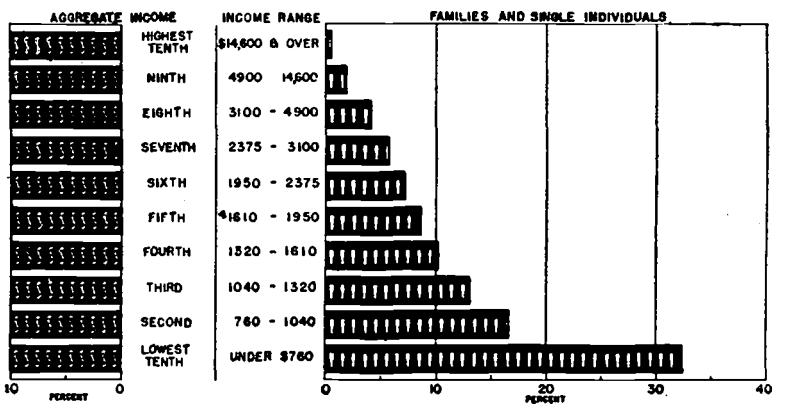
Dr. Eichelberger, Secretary, Food and Nutrition Section, American Public Health Association, (*American Journal of Public Health*, 1940) estimates "that the middle American family . . . . . in that year (1936) had an income of $1160 or just about $20 per week", and

* Presented at joint meeting of the International Association of Milk Sanitarians, and the New York State Association of Dairy and Milk Inspectors, New York, October 17-19, 1940.

SHARE OF AGGREGATE INCOME RECEIVED
BY EACH TENTH OF NATION'S CONSUMER UNITS
1935 - 36



PROPORTION OF NATION'S CONSUMER UNITS RECEIVING
EACH TENTH OF AGGREGATE INCOME
1935-36



says: "Imagine, if you can, what a job it would be to pay house rent, clothe the family, try to give the children some education, and above all, feed the family for good nutrition on that income." She states further that, "In every region families spending a small amount of money for food used only a small quantity of milk. In fact, it was obvious that the average diets include only from one-half to two-thirds as much milk as they should, and when food expenditures went down for city clerical workers, the consumption of milk and dairy products went down at the same time."

"The fact that milk consumption generally is far below the standards set for good nutrition leads us to estimate that a

TABLE 1

Approximate Percentage of Milk of Each Grade Sold in The Different Types and Sizes of Containers in New York City, 1938.

Grade of milk	Type of container	Size of container: Half pint Percent	Pint Percent	Quart Percent	Total Percent
Certified	Glass bottle	....	....	0.7	0.7
Grade A	Glass bottle	0.3	0.3	13.0	13.6
	Bulk	....	....	0.1	0.1
Grade B	Glass bottle	0.4	0.7	57.0	58.1
	Paper container	0.8	0.3	14.4	15.5
	Bulk	....	....	12.0	12.0
Total	All types	1.5	1.3	97.2	100.0

part of inadequate feeding and lowered general well-being encountered is the result of a too low milk intake."

In a personal communication Dr. Leland Spencer, Professor of Marketing, Cornell University, says: "You will note that the consumption of fresh milk and cream in New York was reduced considerably during the depression in 1932-1934, while the consumption of evaporated milk continued to rise."

In Cornell University Agricultural Experiment Station Bulletin 735, "An Analysis of Dealers' Sales of Milk and Cream in the New York Market, 1933-38", just published, Dr. Charles J. Blanford says: "Retail sales of quarts of Grade A milk vary only slightly except for a decrease during the summer months. This product is purchased by families with moderate to high incomes, and is consumed largely by children." . . . . . "During the period of this study there were no changes of more than one cent in the price of milk on retail routes. There were, however, two occasions, in 1934 and in 1937, when the price of milk at stores declined rather sharply. In each of these instances there was a marked increase in the sales of milk at stores, without much change in the sales on retail routes." . . . . . "Since 1935 the sales of Grade B milk through retail food stores have increased, while sales on retail routes have declined. This change is due to the decreased purchasing power of a large share of the consuming public and to the fact that milk has been sold by stores at lower prices. Since 1935 an increasing proportion of the milk sold through stores has been put up in paper containers, and, although this milk has generally been priced one cent a quart higher, the greater convenience of the paper container as compared with glass bottles has tended to promote the store method of distribution."

With this important and far-reaching picture in mind, regulations controlling production and distribution of food products should be made. With a desire to make available to the largest number of people the largest amount of clean, safe, and wholesome milk, I hope it is in order to discuss with you Sanitary Regulations for Controlling the Production of Paper Containers for Milk.

The data in table 1, taken from Doctor Blanford's bulletin, shows the importance of the marketing of milk in paper containers in New York City.

It will be observed that in 1938 more Grade B milk was marketed in paper containers than was sold in glass bottles and in bulk of Certified and Grade A milk. I make such a comparison only to call attention to the volume of milk now being marketed in paper containers.

These containers for milk must meet rigid standards of economy, convenience, sanitation, and freedom from health hazards. An excellent discussion of the economy side of paper containers for milk is given by Bartlett (1938) who says: "The introduction of paper bottles in the store distribution of milk is eco-

TABLE 2

Milk Distribution Costs on Wholesale Routes in Glass Bottles and Paper Bottles, New York City

Milk dealer costs	Wholesale routes	
	Glass bottles July, 1935 (cents per quart)	Paper bottles Jan.-Mar., 1936 (cents per quart)
City plant	1.20	.614
Containers	.10	1.347
Selling, delivery, collections	2.40	1.025
General and administrative	.15	.254
Total cost	3.85	3.240

nomically sound to the extent that it lowers distribution costs and is accepted by consumers." . . . . . "The limiting factor in the use of paper bottles is the cost of the container." Bartlett presents the figures in table 2 to substantiate his conclusions.

He further states: "Breaking down these figures, one observes that city plant costs for processing and bottling milk in paper bottles were about one-half those for performing the same operations with glass bottles. Use of the single-service container eliminates all costs of labor, space, equipment, and power, necessary for handling, washing, and storing glass bottles."

"Selling, delivery, and collection costs for paper bottles averaged about 1 cent per quart, as compared with 2.4 cents per quart for the same service with glass bottles."

A broad and thorough discussion of the advantages and disadvantages of paper milk bottles in use under ordinary milk plant conditions is given by Tracy (1938), who says:

"Consumer tests based upon 221 completed questionnaires returned by the milk customers on the University milk route have shown a preference in most respects for the paper. From a sanitary point of view the majority of users preferred the paper. Few thought there was any difference in the flavor of the milk, its keeping quality, and its tendency to freeze or the rate of temperature rise. It was almost a unanimous opinion that the paper containers took up less space in the refrigerator and were more convenient for picnics, etc. The glass bottle was picked for greater ease of pouring and for ease of separating the cream from the skim milk. A slight majority preferred the paper containers to the glass when the milk sold for the same price, but at 1 cent less, 75 per cent indicated a preference for the paper container."

The sanitary aspects of paper containers for milk have been studied and reported by Breed, Prucha, Rice, Sanborn, Tanner, Wheaton, and others. To these workers we are indebted, in part, for the very creditable sanitary conditions now existing in the manufacture of paper containers for milk. The paper industry is to be congratulated on its eagerness to accept and adopt suggested improved methods. The ideal of the paper industry appears to have been acceptable sanitary procedures economically applied to practical plant operations.

Sanborn (1938) in discussing, "Reasonable Sanitary Standards for Paper Products" says:

"Through the efforts of co-operating mills, the hygienic status of food container board has been raised to a point which renders it entirely suitable for direct contact with the most perishable and carefully processed foods."

Every one recognizes the public health advantages of a single service container which eliminates contact between the home and the dairy. The increasing popularity and use of paper containers for milk attest, in some degree, as to how well these rigid standards of economy, convenience, and freedom from health hazards are being met. That paper containers have never been incriminated in any outbreak of disease is convincing evidence of their public health safety. In fact, this record of many years of safe and satisfactory use strongly implies the absence of any public health problem connected with paper containers for foods.

There are positive reasons why paper containers for milk are sanitary and safe. They are made from virgin pulp produced from sound and healthy trees. From

these barked and washed logs, ground wood pulp is produced by grinding. Chemical pulp is produced by using strong chemicals and high temperatures, as a means of dissolving the binding materials to free the cellulose fibers. These necessary chemicals also act as a preservative. At the paper mill this virgin pulp is made into paper board. The paper mill water supply now usually meets the sanitary requirements for water for human consumption. The various ingredients added to the pulp, in the paper making process, also meet rigid bacteriological standards. As a further safety measure, the water supply and the disintegrated pulp mixture are, as a rule, chlorinated at the paper mill. After the paper board is formed it must be dried. To accomplish this drying the moist paper passes over roll driers heated to 240° F. or higher. This moist high temperature practically sterilizes the paper board.

Sanborn and Breed (1938) in reporting on, "The Sanitation of Paper Milk Containers" say: "After the board passes over the hot drier rolls in the paper-making process the surviving organisms are all of very heat-resistant types as the temperatures reached are much higher than those used in the pasteurization of milk. No pathogenic organisms could survive the temperatures used." They also say, "A determination of the number of living bacteria per gram of disintegrated board becomes a measure of the bacteriological condition of the pulp. This record secured from the finished product even more accurately interprets conditions previous to the paper-making processes than similar counts from pasteurized milk interpret the bacteriological condition of the raw milk."

At the fabrication plant all exposed surfaces and edges of paper are removed. In the making process the containers are mechanically handled, so far as is possible. The inks and glues used are practically sterile. For the waxing process, a high grade, high melting point wax is applied at a temperature between 160° F. and 200° F. The waxing may be done either at the fabricating factory or the milk plant.

The nature of the waxing process at such high temperatures and the protection from exposure to the air given the waxed containers readily explain why workers find negligible numbers of bacteria by the rinse test. Wheaton, Lueck, and Tanner report that over 80 percent of the 7,000 containers examined by the rinse test were found free from bacteria, and that the majority of the paper milk bottles showing the presence of any bacteria had fewer than five colonies per bottle.

Sanborn, in a discussion of "Suitable Paper Wrappers and Containers for Foods," Oct. 6, 1937, said:

"The goal of the present investigation of the sanitary condition of food containers is to produce, if possible, consistently sterile paper and to make sterile containers from this sterile stock. Perhaps this goal is unattainable."

It is my belief the production of *sterile* paper containers for milk bottles is commercially impractical and also unnecessary. I am more inclined to agree with Doctor Sanborn's statement, made before the Massachusetts Milk Inspectors' Association, January 5, 1938, when he said: "In view of the fact, however, that bacteria normally found in milk tend to outgrow nearly all of the paper container types, casual contamination from the container does not appear to be significant." The agar plate count, of bacteria in paper board, made by the disintegration method is subject to considerable experimental error. Air contamination of the sample board is possible; the size of the pulp sample examined is relatively small; and the number of plates needed for testing one sample is large.

The findings of many workers in this field, including my own unpublished results, have indicated the presence of only very small numbers of harmless bacteria in paper containers for milk. But I do not wish to imply that perfection has been attained. Further improvements in cleanliness and general sanitation could be made by the paper industry. They call these needed changes "better housekeep-

ing" and say that it will improve their method of production. The present waxing process is not perfect, but the paper industry is aware of this and is attempting to improve it. Complete, or more complete, mechanical handling should be employed. This is being done by the industry as a means of increasing production and decreasing costs. Of most importance in making these further advances is the alertness of men in the paper industry to improvements along all lines of sanitation. This state of mind is a credit to sanitarians working in this field.

In accepting the invitation to give this talk it was my hope to visualize the consumption of more milk by the lower income families which constitute at least two-thirds of our population. It is generally accepted that the consumption of more milk will assist in improving the general health. Greater consumption of milk will benefit producer, distributor, and consumer. Under present conditions the paper milk bottle appears to hold the possibility of wholesome and safe milk at a lower price. Any unwise or unnecessary regulations in the production of paper containers for milk will eventually contribute toward an increased cost of milk to the consumer and a decreased consumption of milk and a generally lowered health condition of the people.

In conclusion, the findings of workers in this field seem to indicate:

1. That a determination of the number of living bacteria per gram of disintegrated board measures satisfactorily the conditions under which the paper board was produced.
2. That the rinse test is a satisfactory measure of storage and handling after the containers are formed.
3. That the methods employed in the manufacture of paper containers for milk are such that the possibility of a public health problem connected with their use is remote.

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The Effect of Commercial Practices on Ascorbic Acid and Dehydroascorbic Acid (Vitamin C) in Milk. Warren W. Woessner, K. G. Weckel, and Henry A. Schuette. Jour. of Dairy Sci., 23, 1131-1141 (Nov. 1940). *Pub Health Eng. Abs.* xxi, Mi, 13.

Exhaustive work on the stability of the 2 forms of vitamin C in milk—namely ascorbic and dehydroascorbic acid—has shown that the holder methods of pasteurization cause a 20 percent loss of this vitamin. All dehydroascorbic acid was destroyed by pasteurization. The length of time held has a more destructive effect on ascorbic acid than the temperature to which the milk is taken. Consequently, high-temperature short-time pasteurization is less destructive than the holder method.

The most serious losses of vitamin C during the processing of the milk were due to contamination by copper and exposure to light. Fortification of milk with vitamin C has been found to be practical on a commercial scale but extra-special care must be exercised to eliminate the possibility of contamination by copper and excessive exposure to light rays.

Tubular preheating, clarification, homogenization, cooling, and protected delivery were found to cause no loss of vitamin C. The use of sodium metaphosphate or pancreatic enzyme for the purpose of reducing curd tension was found to have no beneficial or detrimental effect on ascorbic acid. Even though the enzyme concentrate had no effect on disappearance of vitamin C, it did prevent the copper-induced oxidized flavor.

CURTIS B. WILLIAMS.

The Need of Sanitary Control in the Manufacture of Frozen Dairy Products *

F. W. Fabian
Research Professor of Bacteriology
Michigan State College, East Lansing, Michigan

INTRODUCTION

Sanitation is its own excuse for being. One of the tenants of good pedagogy is repetition. If we are to educate, then we must continually present old truths in a new light. Truth, like an uncut diamond whose true value is ever present, requires the skill of a diamond cutter to bring its beauty to light. Likewise, what we may say of the need for sanitation was just as true before the time of Louis Pasteur as it is today, but it required this brilliant and skillful savant to grind the first facet. Since his time, research workers have ground many facets until today we have a brilliant and many sided stone in the form of sanitation.

NEED OF SANITARY CONTROL

An intelligent question to ask any health official is, What is the need for sanitary control of frozen desserts? Why are all the rules and regulations necessary? I shall not attempt to give all the answers, but shall discuss briefly only the more important ones. In the first place, practically every regulation found in an ordinance or law has a very good and sufficient reason based on experience, anticipated dangers, or scientific research or else it would not be there. If any regulation does not have such a pedigree, then it has no place in an ordinance.

ANTICIPATED DANGERS

Even though practically all provisions in the laws and ordinances regulating frozen desserts are based on experience or research, this is by no means necessary in order to have a provision or regulation enacted into a law. It is a recognized principle in public health practice that it is not necessary to wait until some insanitary condition or procedure has caused an epidemic or illness before a regulation or law prohibiting it can be enacted. On the contrary, it is the duty of those who protect the public's health to anticipate danger and to correct the situation before harm occurs. In other words, it is prevention rather than cure that interests the public health official.

Health officials and inspectors are often asked the question, Why bother with this or that condition or practice; it never made anyone sick or it never caused an epidemic. Sometimes it is true that the thing which the inspector asks to have corrected never has and possibly never will cause trouble but they cannot afford to take that chance. It is potentially dangerous.

The tires on your car may be wearing thin. You might drive the car several hundred or even thousands of miles without a blow-out. Again you might not. If you have a blow-out while traveling fast, it might kill or injure you. Again it might not. It is a potentially dangerous condition. You are in the same position as the health official. You cannot afford to take that chance.

The attitude of control officials regarding conditions or practices that are potentially dangerous but not actually proven insanitary is set forth in a scholarly opinion of far-reaching importance written by Justice Gardner of the Alabama Supreme Court in the case of Gil-

* Presented at Ice Cream Short Course, University of Illinois, Urbana, Ill., March 17-21, 1941.

christ Drug Company vs. City of Birmingham *et al.* He said:

"The Mannix Case was decided twenty years ago, and the requirement that the milk sold to the public in centers of large population should be protected from exposure was vigorously contested; and yet there would be few today bold enough to question the wisdom of such a precautionary measure.

"Rapid advance has been made in the science of medicine and in the field of bacteriology. That the health and welfare of the people have been greatly advanced by the conscientious and intelligent labor of the scientists and members of the medical profession cannot now be open to question. Their labors are not to be restricted to curing disease and alleviating suffering, however important these may be, but the greater benefits are to be realized by the use of preventive means in anticipation of the danger of an epidemic. And it is fully as important that the health authorities should anticipate danger to public health, and provide against them, as it is to take steps to eradicate conditions after the disease has appeared."

EPIDEMICS DUE TO FROZEN DESSERTS

The fact that frozen desserts are the second most important cause of disease epidemics is the paramount reason for sanitary regulations to control their manufacture. The number of epidemics caused by them is exceeded only by milk. For example, up to 1927 incomplete data for only one disease, typhoid fever, traced to dairy products, showed that there were 479 epidemics involving 14,968 cases and 219 deaths. Milk was considered the medium of infection in 444, ice cream in 32, butter in 2, and cheese in one of the above total. One of the typhoid fever epidemics traced to ice cream involved 1,851 investigated cases located in 21 counties and 102 dealers in 82 localities.

Now add to the epidemics of typhoid fever traced to frozen desserts, those of scarlet fever, diphtheria, septic sore throat, paratyphoid and enteric fever, dysentery, and many minor digestive disturbances, you have an imposing array of evidence that will convince even the most skeptical. They will no longer thoughtlessly or through ignorance ask, Why all the fuss about sanitation?

Some may say that the danger is past since these epidemics occurred two decades or more ago. However, in the five year period from 1934 to 1938, there were reported 10 epidemics involving 252 cases or an average of two epidemics and 50 cases per year. The danger is real and ever present.

I am not trying to impress you or scare you. I am only trying to give you the reasons why we have certain rules and regulations for the protection of the public as well as for your own protection.

REASON FOR PASTEURIZATION

Pasteurization is the only operation in the manufacture of ice cream that kills bacteria. Therefore, it is the only safeguard and the only protection the public has against the possibility of contracting an infectious disease when they eat your product. Every other operation such as homogenizing, cooling, and freezing may actually add bacteria to the product.

This is the reason why health officials are so particular about the construction and operation of pasteurizing equipment. They demand that it be dependable, simple, easily cleanable, and operated by a trained man. It, likewise, explains why the phosphatase test is considered the outstanding contribution to dairy sanitation of the past decade. For with this test, one can detect the careless operator and defective equipment.

When you consider the possibility of contamination of dairy products from both animal and human sources, one can understand why the great emphasis on pasteurization.

REASON FOR COOLING

All dairy products are required to be held at temperatures below 50° F. This applies more particularly to milk and cream since ice cream mix, ice cream, and frozen desserts in general must be held at much lower temperatures, usually a few degrees either side of 0° F. Nevertheless, the principle is the same, it being only a matter of the degree of the magnitude of the bacterial count. Now let us see why all regulations require milk to be cooled to 50° F. or below. Table 1 will illustrate the reason very well.

TABLE 1

Changes in the Numbers of Bacteria in Milk at Various Temperatures (Ayers, Cook and Clemmer, U.S.D.A. Bul. 642, 1918)

Temp. of Holding	Bacteria per Milliliter (Avg. 20 samples)				
	Fresh	24 hours	48 hours	72 hours	96 hours
40° F.	4,295	4,138	4,566	8,247	19,693
50° F.	4,295	13,961	127,727	5,725,277	39,490,625
60° F.	4,295	158,733	33,011,111	326,500,000	962,785,714

This table not only illustrates the reason why we have the 50° F. temperature specification in all regulations but also the proper balance between economics and sanitation. From a sanitary standpoint, it would be more desirable to require that milk be held at 40° instead of 50° F. However, at the end of twenty-four hours (which is as long as raw milk should be held), although the count has increased three fold at 50° as compared to 40° F., yet, the bacterial count of the milk is still reasonably low. Now the additional cost of cooling milk 10 degrees lower is out of all proportion to the benefits derived. Therefore, there has been a sensible compromise between economics and sanitation in which case both will benefit. It should be noted, however, that there can be no compromise between 50° and 60° F. since the numbers have become too great.

STERILIZING EQUIPMENT

Experience and experiment have taught health officials that dirty equipment contributes to the undesirability and bacterial count of dairy products. It is not only insanitary but also poor economy to neglect to thoroughly clean and sterilize dairy equipment. Unwashed equipment rusts and corrodes more quickly than clean equipment. Vats and pasteurizers that are covered with milkstone not only are a source of undesirable bacteria such as thermophiles but it requires more B. T. U.'s to do the same work since there is a loss of heat due to the coating of milkstone which is a poor heat conductor. It acts in a manner analogous to boiler scale on steam boilers.

NECESSITY OF CLEAN MATERIALS

It has become axiomatic in the food industry that you cannot make a fine wholesome finished product out of a poor raw product. Nowhere is this more true than in the dairy industry. The quality of inferior milk, cream, fruit, nuts, color, gelatin, eggs, and flavors is not enhanced by any process of manufacture. Even the pasteurizing process is only 98 to 99 percent efficient in the killing of bacteria. So that, if you start with a high bacterial content in the raw products, you will have only a certain percentage reduction still leaving a high bacterial content in the finished product. Therefore, we have set up bacterial standards for both the raw and finished products. Likewise it is for this reason that we have dairy farm and milk and ice cream plant inspection. We cannot place too heavy a responsibility on bacterial counts. Inspection and laboratory tests should supplement not supplant each other. Inspection should find the visible and bacteriology the invisible dirt.

INHERENTLY CLEAN EMPLOYEES

A dirty man is a careless man. He has no place in the dairy industry handling such sanitarily fragile merchandise as dairy products. An employee who is not inherently clean has no more business in the dairy business than the proverbial bull in the china shop. It is practically impossible to check his work all day every day. You must teach him the correct way and then trust him to carry out your instructions as to cleaning, pasteurizing, and sterilizing. If he is dirty, careless, and indifferent, he is truly a dangerous individual in a dairy plant—just as such a type of an individual would be in a powder plant. The only difference is that the latter would be self-eliminating, whereas the former might eliminate others.

Again in the matter of health, you should instruct your employees to report a cold, sore throat, fever, venereal diseases, and intestinal disturbance such as

diarrhea or dysentary, etc. Then send them to a doctor for treatment. Don't penalize them by laying them off without pay.

REGULATION FROM AN EPIDEMIC

Jefferson County, Alabama, in which Birmingham is located, has a very excellent regulation (which should be in every ordinance and law) to the effect that the ice cream mix shall flow in a closed pipe from the pasteurizer directly into the freezer, and from there directly into a sterile can or carton. This provision was inspired by the typhoid fever epidemic of 1916 and has successfully stood the test of the Alabama State Supreme Court.

This provision has the same scientific foundation as the one requiring milk to be conveyed directly from pasteurizer to bottler in a closed pipe.

CONCLUSION

If time permitted, it would be possible to give the reason for every regulation in our ordinances and laws. They all are born of scientific investigation and experience. Many of the provisions have been incorporated into the sanitary regulations as a result of an epidemic with its attendant sickness and death.

In conclusion it can be truthfully said that good sanitation is good economics. There is a much closer relationship between the two than most people appreciate.

What To Do About Floors. L. C. Thomsen. The Milk Dealer, 34, 48-49 (Dec. 1940). *Pub. Health Eng. Abs.* xxi, Mi. 18.

Dairy-plant floors should meet at least 5 requirements:

(1) Continuous smooth surfaces with no hollow spots.

(2) Impervious to water, washing or soaker solutions, milk wastes, fats, etc.

(3) Easy to clean.

(4) Easy to work on.

(5) Ability to withstand loads and traffic.

In smaller plants concrete is used more widely because: (1) The first cost is low, 20-30 cents per square foot; (2) construction is of simple nature. Concrete floor construction may be of 2 types: (a) Monolithic type where a wearing course, usually 1 inch thick of 1-1-2 mix, is placed within 45 minutes on the freshly poured base floor; (b) the type which consists of adding the wearing course after the base slab has hardened for 7 days. To increase the wearing quality the concrete should be as dense as possible. Amount of water should be limited to 3½ to 4¾ gallons per sack of cement, thus requiring tamping. For newly layed floors special treatment for protection against lactic acid is suggested.

(1) Magnesium fluosilicate or zinc fluosilicate is applied as 2 treatments. The first is used at the rate of 1 pound per gallon of water, and the second at the rate of 2 pounds per gallon of water. The surfaces should dry between applications.

(2) Sodium silicate mixed at the rate of 1 to 4 with water and applied in 2 or 3 coats.

(3) Linseed oil (boiled) applied in 2 or 3 coats. Best penetration is obtained if the oil is hot. It may be applied after the magnesium fluosilicate treatment.

(4) Cumar (a synthetic resin soluble in xylol) consisting of 6 pounds of cumar per gallon of xylol with one-half pint boiled linseed oil. Two or more coats should be used.

(5) Varnishes and paints.

(6) Bituminous or coal-tar paints, tar and pitches.

(7) Bituminous enamel.

The author advises against laying water, steam, or refrigeration pipes or electric conduits in or under concrete floors unless there is a sub-basement. Usually trapped drains are provided every 300-400 square feet of floor area. Floors are sloped ⅛ to ¼ inch per foot. Special procedure is outlined for patching concrete floors. Brick floors are coming more and more into use. The initial cost is higher than concrete, but they are probably the cheapest flooring material in the long run.

A. J. KRANASKAS.

The National Nutrition Conference *

In the last twenty-five years, a really amazing mass of information has been accumulating concerning the relation of the use of food to health. The results of a number of surveys have indicated that undernourishment is common among the people of the United States. One-third of the population is subsisting on a diet reckoned as "poor" by conservative standards. Not more than one-fourth consumed a diet rated as "good." We know that the average American diet does not provide what the children of today need to become vigorous citizens of tomorrow, as they can be. These conditions were not restricted to persons at levels of income which precluded the financial means to eat well. Moreover, the findings of the Selective Service revealed much undernourishment. Clinical, social, and laboratory data all showed that a level of what is generally called good health, showing no evidences of nutritional deficiency, or clinical signs of debility, could be raised to an appreciably higher level of vitality if the nutritive quality of the diet were improved by utilizing what is known concerning the relations of food to buoyant health. It has been made clear over and over again that the food an individual eats fundamentally affects his health, strength, efficiency, stamina, nervous conditions, morale, and mental functioning. Therefore, these considerations emphasize proper nourishment as an important part of our defense program. As President Roosevelt expressed it, "If people are undernourished, they cannot be efficient in producing what we need in our unified drive for dynamic strength."

Public interest in these matters needed to be awakened. Scientific guidance was necessary to correlate the findings and to express them in an effective and coordinated program on a nation-wide scale. To do this, the Committee on Foods and Nutrition of the National Research Council was organized. The Chairman of this Committee is Dr. Russell M. Wilder, of the Mayo Foundation. This body has studied not only the nutritional requirements, but also the supply of essential nutrients in all foods. Every effort will be made to supply this demand through natural foods, emphasizing education and research to develop methods for the better utilization of natural foods. However, on account of the imperative demands of the emergency conditions which now exist, specific enrichment procedures may have to be recommended. One has already gone into effect, namely, the enrichment of flour and bread with thiamin, riboflavin, calcium, and iron. Other foods may be included, but each will be considered individually.

The Conference was organized into nine sections. Each met separately under its respective chairman and secretary. They reported the results of their deliberations on the final day. These sections, together with a summary of their findings, are listed as follows:

SECTION I

RESEARCH AND NUTRITIONAL PROBLEMS

This group outlined eight definite fields needing further research. They recommended the appointment of a committee to survey existing facilities in all the universities, agricultural and land-grant colleges, or other laboratories of the country, fitted to carry out substantial portions of the general program of research outlined in the report.

They showed that we already possess sufficient information to formulate adequate dietaries at different cost levels, to

* Summarized from *Public Health Reports*, 56, June 13, p. 1233 (1941). The complete proceedings will be available later upon request through the Office of the Administrator, Federal Security Agency, Washington, D. C.

recognize a number of specific types of malnutrition, how to conserve nutrients in foods, and practical means to utilize several synthetic vitamins as supplements to deficient dietaries.

SECTION II

ECONOMIC POLICY AND SOCIAL RESPONSIBILITY AS RELATED TO NUTRITION

The discussion here stemmed from the recognition that insufficient income is the root of inadequate dietaries among millions of Americans. The Committee recommended that there be no reduction in Federal non-defense expenditures for employment and relief, that long-range planning offset fluctuations in economic and defense activity, that the Federal Fair Labor Standards Act be extended to those now excluded, that the Social Security Act include domestic and agricultural workers, the elimination of employment barriers against Negroes and other minority groups whose nutritional problems are acute by reason of very low incomes, the elimination of taxes on very low incomes, and provision for benefits to disabled or ill workers.

It urged the Government to secure an increased supply of protective foods, and to encourage industry to market such low-cost, highly nutritious foods as soy beans, peanuts, and milk products, in forms acceptable to consumers. Essential foods should be provided wholly or in part at public expense, including free school lunches and extension of the Food Stamp Plan both to relief families as well as to other low-income families.

Their recommendations included the services that education can perform, the need for reducing costs of processing and distribution, and the need for further research.

SECTION III

PUBLIC HEALTH AND MEDICAL ASPECTS OF NUTRITION

This section recommended that State and local public health authorities should be led to recognize that they have a large responsibility in the efforts of their communities toward better nutrition. As acceptable diagnostic methods are developed in the field of nutrition, the service be made available by departments of health to the practicing physician. They recommended the wider distribution and utilization of inexpensive foods of high nutritive value, and endorsed the enrichment of flour and bread. It further recommended that the Committee consider the desirability of adding vitamin K for women in late pregnancy and for new-born infants within the first 24 hours of life. Lists of the kinds and quantities of food needed for adequate nourishment of pregnant and lactating women and of children at different age groups be prepared and widely distributed.

They presented a dietary "pattern" as follows:

Milk, adults 1 pint, children 1½ pints to 1 quart

Egg, 1 daily

Meat, 1 serving (20 gm. at 1 year to 100 gm. for adult). (Calculated as beef.)

Vegetables, 2 servings. One green or yellow.

Fruit, 2 servings. One citrus or tomato, and one other, as apple or prunes.

Potato, one or more servings.

Butter or fortified oleo (100-500 calories). (1 to 5 large pats.)

Cereals and bread, 2 oz., infants to 10 oz., adults, half of these quantities to be in whole or enriched cereal and bread. Calculated as minimum enriched.

Sugar, fat, etc., to complete calories.

SECTION IV

NUTRITION FOR WORKERS IN DEFENSE INDUSTRIES

Supplemental feeding of workers in factories should be instituted wherever diets were found inadequate, even to the setting up of community feeding, with its "advantages of economy and expert supervision," if necessary. Approval of contracts for construction or expansion of defense plants should include consideration of facilities for feeding the workers. Studies should be inaugurated in select-

ed defense plants to determine the influence of diet on health, working capacity, incidence of accidents, absenteeism, and the psychological bases of industrial unrest.

The section recommended finally that the Governor of each State call a conference on nutrition in defense.

SECTION V

METHODS OF EDUCATION IN NUTRITION

This section recommended that professional and lay readers be given preservice and in-service education in nutrition.

It recommended further that all State, local, and national groups provide educational material and otherwise help to make the most effective use of every medium of presenting information. These include news reels, documentary films, the radio, the press, town meetings, posters, exhibits, food demonstration, and every activity or presentation by which knowledge of nutrition may be carried from mind to mind.

SECTION VI

PROFESSIONAL EDUCATION IN NUTRITION

This group recommended that plans be made with the heads of various professional schools for (1) short refresher courses for workers now in the field, (2) special training courses for persons selected to act under supervision in emergencies as lay leaders, and (3) a stronger basic training to stimulate present and future students to specialize. More nutritionists thoroughly trained in the scientific background of nutrition and in its practical application are needed.

It was further recommended that in-service education and consultation with specialists in nutrition be made available to professional workers in that field and allied fields.

It advocated better training in this field for students of medicine, dentistry, and public health and extensive postgraduate courses for physicians, dentists, and public health officers. It emphasized the need for physicians and dentists trained in nutrition and experienced in recognizing the nutritional diseases to serve as consultants to teachers, social workers, public health nurses, nutritionists, and any others concerned with solving the problem. This section favored the establishment of nutrition clinics in association with professional schools where facilities for research and advanced training might be available.

SECTION VII

NUTRITION PROBLEMS IN DISTRIBUTION AND PROCESSING OF FOODS

This section advocated that agricultural production be adjusted to provide adequate supplies of those foods in which the American diet is deficient and away from those crops for which the export market has for the time being fallen off. It was specified that farmers must receive fair prices and fair incomes while these adjustments are being made.

Important to the budget of the low-income family is efficiency in the transportation, processing, and distribution of food products, and greater efforts along these lines were urged upon the food industry.

The section recommended that the Government continue its policy of vigorous enforcement of antitrust laws against those illegal practices which tend to raise food prices, whether they be in agriculture, industry, or labor.

In some instances, municipal, State, or Federal legislation include restrictions, not designed solely for the protection of the public welfare, which interfere with the ability to produce, process, and distribute foods. The section urged a judicious examination of all such laws.

The need for rapid methods for vitamin assay was stressed, and the recommendation made that the Federal Government designate tests now acceptable and develop further tests and methods from the viewpoint of the Association of Official Agricultural Chemists.

The section favored the addition of vitamins or minerals or both to those processed foods which, in the opinion of recognized nutritional authorities, are in need of enrichment.

The Processing Section recommended: (1) that the National Selective Service System be requested to recommend for deferment those technically trained men who are essential in the production of processed foods; (2) that the Office of Production Management give effective priorities to the food-processing industry for material and supplies essential to the production of processed foods and food accessories; and (3) that the United States Maritime Commission and the Transportation Division of the Office of Production Management give effective priorities for the transportation of materials and processed foods and the supplies and personnel necessary for their production.

It was further recommended that agricultural and trade groups be asked to set up a body to work with the government and with appropriate local organizations in attaining a successful program of nutrition.

SECTION VIII

COMMUNITY PLANNING FOR NUTRITION

The members defined the nutrition program as a long-range one. The unit of organization should be the neighborhood or other natural community subdivision, whose local program would be assisted by the State agency. The Federal agency should make available one or more consultants as desired. The State group should designate the person or agency responsible for getting the community programs under way.

SECTION IX

NUTRITION PROBLEMS IN GROUP FOOD SERVICE

The section had in mind those who "eat out," students at boarding school, travellers, and all others for whom group food service is run. Its recommendations were directed toward assisting food operators in institutions and public eating places to know how to judge the nutritional adequacy of dietaries and how to increase food values without increasing costs.

The section recommended that established food allowances be translated into quantitative practical terms for convenient use. Further recommendations included such measures as the use of surplus commodities, especially milk, in low-cost group feeding, and experimentation with such products as dried and evaporated milk, frozen and dried eggs, soybean and peanut products as a means of increasing food value without increasing cost.

It also recommended that Federal, State, and local programs include training of cooks and other members of food-production staffs as part of the contribution to the national defense.

RECOMMENDATIONS TO PRESIDENT

The National Nutrition Conference then made to the President of the United States a series of recommendations based upon the reports of its sections. A significant statement concluded the series, namely: "But the Conference also wishes to put on record its belief that such a policy and program have implications that go beyond the present emergency."

A Comparative Evaluation of an Ice Cream Supply as it Reaches the Consumer. I. K. Crowe and P. A. Downs, Journal of Dairy Science, Vol. 23, No. 7, July 1940, pp. 615-620; *Pub. Health Engin. Abs.* XX, Mi, 47.

"This preliminary study of a limited number of pint samples of vanilla ice cream at all price levels available to the consumer in the trade territory studied does not indicate the reason for the difference in price level when a comparison is made on the basis of the following: net weight of ice cream obtained; calculated overrun in per cent; composition including butterfat, total solids, protein and calculated carbohydrate; bacteria count of either total or colon type organisms; calorific value purchased for a certain expenditure, or quality as determined by organoleptic examination.

"It is recognized that this is not an all-inclusive study of a problem of this character, but it is believed that studies such as this carried out in a market at intervals of six months or one year would tend to bring to the consumer a more uniform product and tend to aid in establishing a sound basis for differences in price per unit quantity of ice cream purchased."

R. A. C.

Report of Committee on Sanitary Procedure

Your committee on Sanitary Procedure has continued the cooperative program for the standardization and acceptance of specific items of milk plant equipment.

In addition to committees representing the International Association of Milk Dealers and the Dairy Industries Supply Association, the Committee on Sanitary Control of the International Association of Ice Cream Manufacturers has joined in this cooperative work.

Nine items have been accepted by the committee after due investigation since the last report. These include a 14-R ferrule for ground joints,* a 15-R ferrule for ground joints,* a 15-RG ferrule for gasketed joints,* a 13-H hex nut,* a 16-a ground seat cap,* and a 3-A interchangeable thermometer fitting for application to vats (Figs. 1 and 2) and to pipe lines (Figs. 3 and 4).

Consideration has been given to satisfactory finishes on stainless steel. The committee determined that "No finish on stainless steel below a number four is acceptable for surfaces in contact with fluid milk products." Experience has shown that the No. 2 pickle finish, although presenting a smooth appearance generally, may contain pits and may corrode rapidly in use on some applications in the dairy industry.

At the suggestion of Mr. Layson of Illinois, consideration has been given to the standardization of the size of holes in strainers for weigh vats. It is apparent that these holes should be large enough to be easily cleaned by brushing, which is affected by both the diameter and the depth of the holes, and small enough to prevent the passage of large particles of extraneous matter, such as straws and insects that might accidentally have fallen into the milk. It is recognized that it is not the function of such a strainer to serve as a substitute for filter cloths. The committee's decision is that strainers are to have holes of 0.0625 inch diameter in 16 or 18 U. S. gauge metal with selvedge edges of one-half inch or more.

Dr. Grim of Ardmore proposed the standardization of the position of the handle in 3-way valves. It appears that at least two different types of 3-way valves are being manufactured. Operators as well as inspectors cannot determine the direction of milk flow in any plant without knowing the inner construction of the valve. Sometimes two types are used in the same plant leading to confusion and possible improper operation. The committee determined that in the standard 11-c 3-way valve, the handle shall point in the direction of flow with the flow entering at the side opening.

Much time has been devoted this year to studying the problem of vermin-proofing electric motors for milk plant use and in otherwise improving the construction to facilitate cleaning. Specifications for a sanitary motor have been drawn up in cooperation with the committee on sanitary motors of the National Electric Manufacturers Association headed by Mr. J. L. Hamilton, and a similar committee of the Institute of Food Technologists under Mr. Earle R. Pickett. The specifications are being left for further consideration at some future time. In the meantime it appears that experimentation by manufacturers in the field may lead to greater improvements than are contemplated in the present specifications.

* For details see Journal of Milk Technology, 3, 65 (1940).

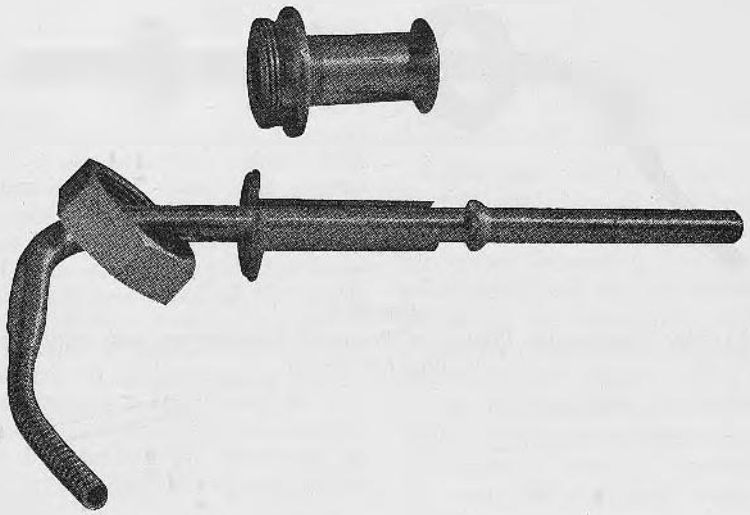

FIGURE 1

3A Type Three-in-One Fitting for Recording Thermometers and Controllers (for Jacketed Tanks and Vats)

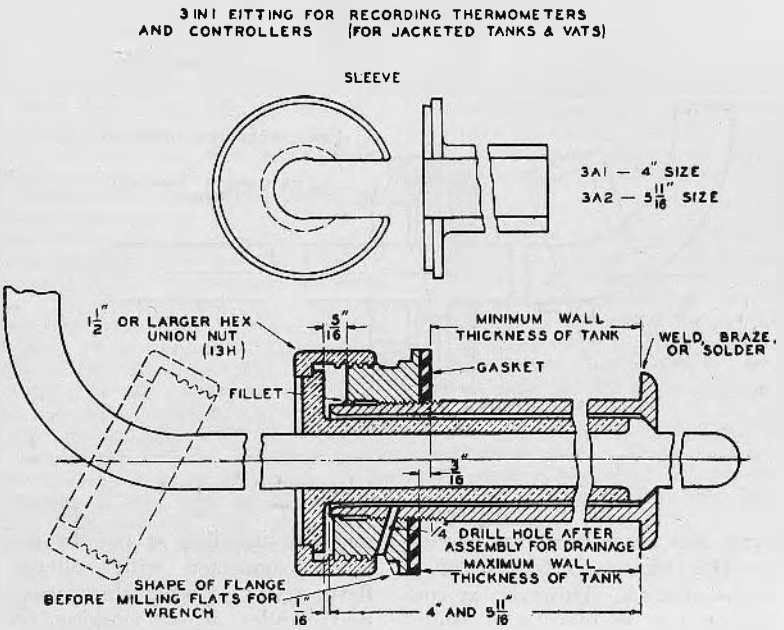

FIGURE 2

FIGURE 3
3A Type Three-in-One Fitting for Recording Thermometers and Controllers (Pipe Line Form)

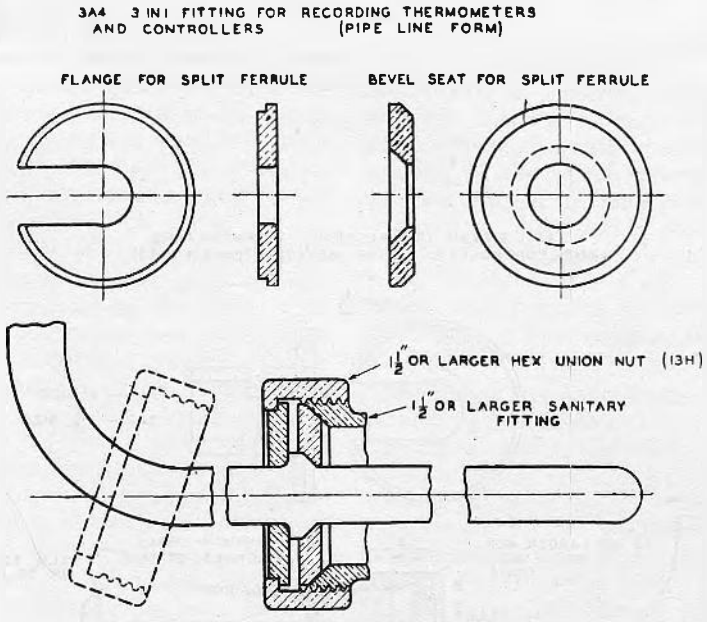

FIGURE 4

Last year the committee reported on plastics. The subject is too broad to study in the abstract. However, as concrete applications of plastics to equipment develop it is suggested that test units be installed at one or more milk plants connected with colleges where flavor tests and other observations by experts under actual working conditions can be made over a long period.

The committee is now studying the problem of the disposal of milk plant wastes. It appears that greater conservation of milk in dumping is a primary consideration. Feeding of machine contaminated waste to animals may be a possibility if it is pasteurized, colored with a harmless dye, and transported in cans that are not used for fluid milk deliveries. The committee favors the development of some acceptable plan for keeping milk plant wastes out of the sewers where they create a problem but as opposing the use of machine-contaminated waste for human consumption.

The committtee is considering the possible standardization of certain features of flow diversion valves. However, no material progress can be reported as yet in this field.

Committee meetings were held in Chicago on March 11 and 12 and on June 20 and in New York City on June 5, 1940. It has been very difficult to get a satisfactory attendance at meetings because members have not only had to donate their time, but pay their own traveling expenses as well.

Plans are being developed for reprinting previous, current, and future reports of this committee on items accepted in order to make this material more readily available to manufacturers, dealers, and milk control officials.

Again your committee urges officials to wait until new designs accepted by the committee can be placed in production before demanding their use on new installations, and also recommends that officials do not demand the replacement of sanitary equipment in existing installations with new designs. It is also requested that members do everything possible to encourage the general acceptance of designs accepted and standardized by the committee after such designs are in production.

W. D. TIEDEMAN, *Chairman*

C. A. ABELE	RALPH E. IRWIN
LOOMIS BURRELL	JOHN A. KEENAN
W. D. DOTTERRER	PAUL F. KRUEGER
H. C. ERIKSEN	M. E. PARKER
LESLIE C. FRANK	SOL PINCUS
GEO. W. GRIM	GEO. W. PUTNAM

Control of Heat-Resistant Bacteria. A. C. Maack. The Milk Dealer, 30, 84-87 (Jan. 1941). *Pub. Health Eng. Abs.* xxi, Mi, 17.

Heat-resistant bacteria are of two types:

(1) Thermoduric, those that merely survive pasteurization temperatures.

(2) Thermophilic, those that grow at pasteurization temperatures.

Thermoduric organisms differ from thermophiles in that they grow well at 98.6° F. but do not reproduce at pasteurization temperatures. Thermophiles find their way into milk at the dairy farm from feed, bedding, and soil through faulty methods. Thermodurms may come directly from the udder, but in the majority of cases the milking machine is responsible in that the rubber parts are not thoroughly cleaned and sterilized. Heat-resistant bacteria can best be controlled at the farm by thorough cleaning of utensils to remove deposits of milk stone or other foreign substance; then sterilizing with steam or hot water (180° F. for 15 minutes or longer) or chlorine 100 p.p.m. for 5 minutes and drying quickly; elimination of dust in the barn during milking; storing of milking-machine rubber parts completely submerged in 0.4-percent lye solution after thoroughly cleaning; and efficient cooling of milk during all seasons of the year.

At the plant special attention should be directed to the can washer. Returned products should not be repasteurized. In the event milk is being pasteurized in continuous pasteurizers or if single vats are used many times during a day's run, it may be necessary to discontinue operation from time to time and wash and sterilize the pasteurizer and sanitary pipe. Foam on milk that remains in the vat between batches may be responsible for seeding the milk with thermophiles. Dead ends, pockets, and milk stone encourage growth of thermophiles. Rapid cooling immediately after pasteurization is essential.

A. J. KRANASKAS.

The Milk Sanitarian's Approach *

S. V. Layson

Illinois Department of Public Health, Springfield, Illinois

DEVELOPMENT OF MILK INSPECTION

The legal control of milk supplies in America is not one hundred years old. The first milk legislation was enacted in Massachusetts in 1856. The enforcing official was known as a milk inspector. This term was applicable as only the milk was observed or tested. More recent legislation considers farm and plant sanitation and sanitary methods of handling the milk. Milk analysis and milk inspection is now only the final phase of milk control. That title clung to the position in most localities until a few years ago when The International Association of Milk and Dairy Inspectors in annual convention voted to change the name of The Association to International Association of Milk Sanitarians.

The present day trend of milk sanitation control is towards education of the milk-producing and milk-consuming public and away from the old strong-arm police methods in vogue not so many years back. Therefore the milk sanitarian should be well versed in the subject of clean, safe milk. It is reasonable to assume that he cannot teach others unless he is so qualified. This does not necessarily mean that he must have a formal education in this particular field but he should have the desire to learn all he can; he should have a thirst for knowledge.

QUALIFICATION OF INSPECTORS

Some authorities have expressed the belief that there should be special college courses for milk sanitarians and I heartily concur in this opinion. Possibly the best training qualifications that could be required at the present time would be that applicants for the position of milk sanitarian be graduated from a college or university of recognized standing with a degree in dairy husbandry, dairy technology, sanitary engineering, bacteriology or veterinary medicine. This does not mean that the high school graduate with the ability and desire to learn should not be permitted to engage in the work of milk sanitation. His lack of formal training should be compensated for by some practical experience in a field closely associated with the subject of milk sanitation.

In order to promote and carry on a milk sanitation control program the milk sanitarian must have the ability to lead others. The old strong-arm police method of milk control revolved around the principle of driving all before it. The result was ill-will and defeat of purpose. Milk handlers obeyed the precepts of the law just as long as they were afraid they would be discovered in a violation and punished as a result. Qualified leadership in milk sanitation control will show the reasons for and the advantages of complying with milk sanitation regulations.

SELLING THE MILK PROGRAM

The promotion and carrying out of a milk sanitation control program is a matter of salesmanship. It is the selling of an idea—the idea of clean, safe milk, so that it will stay sold and the customers, the milk consumers, will come back for more.

In order to sell any commodity today you must advertise. An advertising expert has given the five requirements of effective advertising as follows:

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* Paper presented at meeting of dairy inspectors held at Iowa State College, Ames, February 21, 1941.

(1) It must attract attention.
(2) It must create interest.
(3) It must arouse desire.
(4) It must engender confidence.
(5) It must result in action.

These five principles might well be adopted by the milk sanitarian for promoting a milk sanitation program in any community.

First, he must attract the attention of the people who are interested in or who should be interested in clean, safe milk. This would include municipal authorities, the medical profession, milk consumers, milk distributors and milk producers.

Interest may be aroused by educational programs in schools and before civic groups, by newspaper stories, by radio broadcasts, and by other appropriate means.

Sickness and loss of life cannot be measured in dollars and cents. The trivial cost of prevention by means of a safe milk supply is a sound investment. It is health insurance. It is also business insurance to the dairy industry. Any milk distributor who has experienced the loss of trade which resulted when his milk supply became involved in a milk-borne epidemic is usually a willing supporter of a milk sanitation program.

Experience indicates that in the smaller communities an interest in milk sanitation control must usually be motivated from external sources. For instance, a state health department representative approaches city officials first. When no encouraging response is forthcoming, the next move is to contact the industry. The first question asked by the city men or the industry is, "What is it going to cost?" And it is a legitimate query. Milk is something that every one has taken for granted for so long that when some young whipper snapper of a health man comes around suggesting the city do something about getting a safe supply, well they just naturally think he is trying to sell them something. And as a matter of fact he is attempting to sell them health insurance of a kind, of which they have never heard in all probability.

With regard to the cost of clean, safe milk, Leslie C. Frank has said: "A study of retail milk prices in 38 American cities listed on page 60 of *The Milk Dealer* for June 1940, discloses the fact that the average retail price of milk in 14 cities which enforce the Standard Milk Ordinance is 12.3 cents, whereas the equivalent price in 24 cities which enforce other types of milk ordinances is 12.4 cents. . . . . It would seem, therefore, that the cost of compliance with The Standard Milk Ordinance is not great enough to raise the price of milk above the general level."

Illogically the consumer is the last person to whom the milk sanitarian appeals when seeking support for a milk improvement program. Women's organizations are usually eager for a "cause", and when the proper contacts are established a successful conclusion may be anticipated.

The milk-consuming public is not well informed about the facts of milk sanitation, its production and processing. No one should be in a better position to supply this information than those engaged in milk sanitation work. It is their job.

If a good job is done at attracting attention and creating interest, the desire for clean, safe milk is certain to follow. The milk sanitarian cannot work alone. He must have the full support of the health officer and the other city officials. They must be kept informed as to the work done and the improvements achieved. The health officer must often act as an arbitrator or support the sanitarian in his work. Unless the health officer has a complete knowledge of the work and its problems, all the efforts of the sanitarian may be for naught. Frequent clear reports, conferences, and occasional field trips will maintain the interest of the officials. Proper conduct of the initial campaign will have promoted confidence.

Action will be the setting up of the machinery in the form of an ordinance, the provision of laboratory facilities and other appurtenances necessary for carrying on milk sanitation work. Then the job has just begun.

ENFORCEMENT POLICY

A man prominent in the production phase of the dairy industry of the middlewest has said that milk sanitation control should be: Friendly, Fair, Firm. These three words express the underlying principles as concisely as it is possible for the written word to do.

Be friendly. If you have not read Dale Carnegie's book, *How to Win Friends and Influence People*, do so before the next new moon. Read it again and keep it handy for a ready reference at all times. It will give a fair idea of what being friendly can accomplish. To be friendly you do not need to make a pest of yourself by eloping with the farmer's daughter.

In his book, Carnegie says the only way to influence the other fellow is to talk about what he wants and show him how to get it. Nine times out of ten the producer or distributor wants more profit from his operation. Avoid talking price but show them how to attain more profit by producing or distributing a better product. Make them feel that you are there to help them accomplish that end.

Carnegie suggests that you ask yourself this question: "How can I make him want to do it?" Show the dairy farmer that, by using clean methods, by cooling the milk promptly, and by employing any of the other fundamentals in which he may be deficient, he may produce a better flavored and more nutritious product and as a result people will drink more of it.

A concrete barn floor may not be absolutely necessary for the production of clean milk but it will decrease the labor of producing clean milk many fold. You may have the privilege of attaching after your name the most honorable degree which may be conferred by our institutions of higher learning but that does not mean a hoot to farmer John Doe when you happen upon him as he is cleaning out the cow barn. If you can smile and roll up your sleeves and relieve his aching muscles a few minutes by throwing a few scoopsful into the spreader, you have a better chance of convincing him that it will save him work to clean the barn every day. It does not mean a thing to him that the code says it must be cleaned every day.

Every requirement in the sanitary code has a valid reason for being there. It is the duty of each individual milk sanitarian to make himself thoroughly familiar with those reasons. He must be prepared to give those reasons in a friendly manner and in terms of the other fellow's wants.

The sanitary code makes certain equipment mandatory. It is the minimum found by long experience to be necessary for the results desired. Provision of the required minimum equipment does not complete the task by any means. It is useless to require the milk producer to provide a two-compartment wash tank in his milk house and then fail to teach him the proper method of using it.

To demand that a distributor equip his pasteurizer with air space heating apparatus because the code says he must have it and then not successfully sell him on the proper and conscientious use of it is a waste of your time and his money. He will not love you for that.

Try to avoid criticism and condemnation. Be quick to recognize and give credit for a job well done. It will accomplish more to give words of praise for the correction of even a few minor defects than to condemn severely for failure in some major item. According to Carnegie, "The way to develop the best that is in a man is by appreciation and encouragement." He also suggests that we try to understand why people do what they do. It breeds sympathy, tolerance, and kindness. But be cautious against flattery. It is like counterfeit money. It will get you into trouble.

Be fair. Interpret the sanitary requirements the same to all but in their language, in terms they understand.

When making an inspection of a farm or milk plant, explain to the owner or someone in charge what the defects are and how they may be corrected. It is usually a waste of time to make a lot of hen scratches on a report form, then tack it up some place about the premises and

scoot away as though you were afraid of being caught in the act. Remember you have a bill of goods to sell, the idea of clean, safe milk, and that you cannot do it without contacting the purchaser of your goods, be he the farmer or distributor.

Be fair to the other fellow in that you respect his confidences. One sure way to defeat your purpose is to peddle gossip about neighbors or competitors. That is not being friendly. It is not being fair.

Do not put too much emphasis on trivial details. They may and often do have a bearing on the final results but treat them in their proper relation to the whole.

It is only fair to the dairy industry and all members of it that the sanitary requirements be enforced uniformly without fear or favor. The promotion of uniform enforcement should be one of the principal subjects for consideration and study when milk sanitarians get together in meetings or conventions.

Be firm. Be sure you are right, and then stick to it. It may engender hard feelings for a time but in the end you will be respected for doing so.

No law or regulation has ever been written which gave in detail the methods of enforcement. The Public Health Service Milk Ordinance and Code is as complete in this respect as a law or ordinance can be, but in it, much is left to the judgment of the enforcing official. Adopt a policy regarding borderline cases and enforce the regulations with firmness. In extreme cases it may be necessary to use police methods but remember the best law-suits are settled out of court. For instance, if a farmer ordered you off his place or a processor verbally kicked you out of his plant, the best solution would be to go. But you should shut the farmer's milk off the market or keep the processor's milk off the streets until such time as compliance with the requirements has been attained. (This is assuming that you have not pulled a bonehead play that justified the act of the dairyman).

Above all, the milk sanitarian must be thorough in his work. Have you ever heard the statement, "Yes, an inspector has been here before. He breezed in the front door and out the back. Don't know what he saw or did."

If defects exist worthy of mention, they should be marked on the inspection report and discussed with the owner or manager. To check some new item each time an inspection is made leads to confusion, and the dairyman soon gets the impression that there is no end to the requirements and changes. Generally all corrections will be made at once or a plan of gradual improvement will be worked out. For instance, on the first inspection of a dairy farm every defect should be checked and discussed. The major items that are desired corrected first should be indicated and a plan of doing it outlined. There is no point in discussing cleaning and storage of utensils unless there is a milk house in which to do it.

The foregoing comments are based on the premise that milk is one of our most vital and widely used foods. It therefore plays an important part in the health of our people. The milk sanitarian should ever keep before him the objective. "The effective control of preventable disease and the security of health of all the people." This should be supplemented with the aim of "An adequate supply of safe milk for every community."

NEW DEVELOPMENTS AND COMPENSATIONS

Progress in the science of public health as it is related to milk has been so rapid that it is no small task to keep even moderately informed on new developments. It means constant and arduous study. New problems are continuously coming into the field and many of the old ones are bobbing up from time to time to plague our dreams. If this were not true, if milk sanitation were just a wheel in a rut proposition, it would soon get monotonous and there would be no fun in it. And again to quote Dale Carnegie, "A man rarely succeeds at anything unless he has fun doing it."

Milk sanitation has its compensations. There is real satisfaction in observing the reactions of dairymen who have improved their working conditions and who are taking pride in producing a better product. When the milk consumption of a community goes up and up, when the incidence of milk-borne disease steadily declines, it is gratifying to know that milk sanitarians had a part in these results.

SUMMARY

In conclusion, we can sum up the milk sanitarian's approach as follows:

(1) Know the milk laws and ordinances thoroughly, the reasons for the requirements, and keep a general speaking knowledge of the milk industry, its problems and advancements. Educate and inform the dairymen in proper methods of sanitation.

(2) Advertise and sell your work and the reasons for safe, clean milk to the consumer, the city officials, and the industry.

(3) Be friendly in your approach and helpful.

(4) Be fair in your interpretations and demands.

(5) Be firm and consistent in the enforcement of the regulations.

(6) Be thorough in your work.

And finally—make your work interesting to yourself and enjoy doing it.

Comparative Study of the Bacterial Flora of Grade A and Grade B Milk in New York City. M. L. Isaacs and M. Nussbaum, DeLamar Inst. of Pub. Health, Columbia Univ. New York, N. Y., Am. J. Pub. Health, (Supp.) 30:9, 2-22, 1940, Jour. of Dairy Sci., 23, A228 (Dec. 1940). M. W. Y. *Pub. Health Engin. Abs.* xxi Mi, 7.

"A total of 1,130 samples of Grade A and Grade B raw and pasteurized milk were studied. Laboratory tests used were total counts on old and new standard methods agar; count on blood agar; microscopic count; identification of genera and species, quantitative counts of coliform organisms, clostridia spores, yeasts and molds; and toxicity test on guinea pigs.

"Agar plate counts of Grade A milk by Standard Methods gave monthly median values ranging from 22,000 to 300,000 for the raw, and from 450 to 2,400 for the pasteurized product. The range of Grade B milk, by the same methods, was from 160,000 to 890,000 for the raw, and 8,400 to 21,000 for pasteurized. Use of the newly adopted official agar raised the counts of most samples of milk and increased considerably the number of samples of Grade B milk with counts in excess of the limit allowed by the present Sanitary Code of New York City. From this and other tests, the conclusion is made that Grade A milk is a more uniform and cleaner product than Grade B milk."

R.A.C.

Effect of Cannery Wastes on Operation of Sewage-Treatment Plants. William A. Ryan. Sewage Works Journal, Vol. 12, No. 1, January 1940, pp. 99-107. *Pub. Health Engin. Abs.* xx, S, 98.

The author relates his observations of experience in the treatment of cannery wastes in the State of New York and lists the following general conclusions:

(1) Canning waste (if not excessive in volume) should be treated in existing sewage-treatment plants.

(2) It is not economical to employ a screen at a sewage-treatment plant with less than 16-mesh—or better, 8-mesh.

(3) Preliminary treatment by the industry is essential in most cases.

(4) There is greater danger to public health from untreated sewage than untreated cannery waste.

(5) Activated-sludge-type plants do not appear to be suitable for handling cannery waste as bulking is increased due to the increase in Sphaerotilus growth from increase in carbohydrate content in the waste-sewage mixture.

(6) Removal of all possible solids within the canning plant as garbage rather than as liquid waste reduces the load on the treatment plant.

Interesting data relative to the screening of cannery wastes are contained in a discussion of the author's paper by C. J. Bernhardt.

L. W. Klockner, Jr.

Report of the Committee on Communicable Diseases Affecting Man

The United States Public Health Service reports that in 1938 there were forty-two outbreaks in as many different communities in seventeen states, viz: New York 10, California 5, Minnesota 5, Wisconsin 3, Colorado 2, Idaho 2, Illinois 2, Indiana 2, North Dakota 2, Oklahoma 2, Georgia, Iowa, Kansas, Kentucky, Michigan, Washington, and West Virginia, 1 each. The communities involved were small, twenty-three under 1,000 population, eleven of 1,000 to 5,000, three of 5,000 to 10,000, and one of 100,000. Thus 80 percent of the outbreaks involved populations of less than 5,000. So, the familiar condition is portrayed of the great number of outbreaks occurring in small communities, and of but seventeen of the forty-eight states reporting outbreaks. Also familiar is it that but a single outbreak was attributed to pasteurized milk; in this case it is said that the pasteurizer broke down. The forty-one other outbreaks are attributed to the use of unpasteurized milk and milk products, viz.: one outbreak of seventeen cases of tyrotoxicon poisoning traced to fecally contaminated cheese from a single factory; one outbreak of a dozen cases of gastroenteritis attributed to buttermilk; one outbreak of seventy-six cases of gastroenteritis contracted from ice cream infected by manual contact and from improperly sterilized cans at an insanitary roadside stand; and thirty-eight outbreaks due to the consumption of infected raw sweet milk. Of these thirty-eight, 1 was diphtheria, 2 dysentery, 6 gastroenteritis, 5 scarlet fever, 6 septic sore throat, and 18 typhoid fever. The diphtheria outbreak occurred in the State Hospital at Pueblo, Colorado, and was possibly caused by a carrier. The two dysentery cases originated on dairy farms, four of the gastroenteritis outbreaks were staphylococcus infections, three of them being attributed to cows with mastitis. These outbreaks of dysentery and gastroenteritis constitute an additional argument for pasteurization of milk and milk products, if one were needed. All five outbreaks of scarlet fever started on dairy farms, three from cases, one from a carrier, and one from the exudate of an abscess on a milker's leg. Of the six septic sore throat outbreaks, one was traced to streptococci from ulcers on a milker's hand; two to milkers with sore throats; one to a case on a farm; and one to a cow with mastitis. In the eighteen typhoid fever outbreaks, the determinative factors in two were not discovered; in one it was a case in the dairyman's home; in one it was an ambulatory case; and in fourteen the outbreaks were attributed to carriers.

The gastroenteritis outbreak at Luther College, Decorah, Iowa, is interesting, for on October 20 at breakfast 111 students seated on the right side of the dining room were served with milk obtained from the college dairy on the previous evening. One hundred and seven of these students developed gastroenteritis, whereas the 219 students seated in the center and left side of the room and served pasteurized milk did not devolop the illness. These findings, with typical symptoms beginning within three hours indicated that this epidemic was due to the toxin of hemolytic staphylococci which develops when milk containing these organisms is allowed to stand at room temperature.

The eight epidemics which are listed in this report as occurring in state institutions, colleges, schools, camps, etc., evoke the query as to whether such organizations in general appreciate the importance of safe milk supplies and are

diligent to serve it. Perhaps an opportunity for useful educational work is here open to milk control officers.

This material has been worked up in somewhat different form by Leslie C. Frank in his interesting paper on "Disease Outbreaks Caused by Faulty Environmental Sanitation" in the August 2, 1940 issue of the *Public Health Reports*.

The report of the Public Health Service on milkborne outbreaks of communicable disease in 1938 does not list brucellosis cases. This disease is of course important, both because it is more prevalent than was once thought, and because of its serious character. It occurs in the acute and also the chronic form; with neither of which was the general practitioner familiar until recently. Though brucellosis is a disease of protean manifestations, the clinical symptoms of the acute type are fairly definite whereas they are not so in latent and chronic cases. In these, long continued ill health with attendant low grade fever is suggestive. In children the acute type of brucellosis is rare and the chronic type commoner. In the *Journal of the American Medical Association*, Vol. 113, N. 3, p. 201, F. H. Robinson and Alice C. Evans reported on "Chronic Brucellosis in Charlotte, N. C." This city of 100,000 was chosen as a survey area because 81 percent of the milk was sold raw, and the herds supplying the city were known to be infected with contagious abortion. In the course of the six months' survey, twenty-two cases of chronic brucellosis were discovered. The report should be carefully studied by inspectors.

The importance of brucellosis is being recognized by diagnostic laboratories. Thus in a letter to Doctor Brooks, Dr. J. L. Pomeroy, Health Officer of Los Angeles, California, says that in 1929 his department subjected all negative widals to further tests with Brucella antigen. Cases turned up regularly which were checked back clinically with gratifying results. Dr. J. N. Patterson, Director of Laboratories, of the Florida State Board of Health, says that in the first eight months of 1940, his records show 149 specimens of blood that gave an agglutination titer against *Br. abortus* of 1/80 or higher. A titer of 1/80 or 1/160 is usually diagnostic of undulant fever, though it is not positive evidence of the disease. There have been five deaths in the first seven months of 1940 from brucellosis in Florida.

It seems in order to say a few words as to the likelihood of poliomyelitis being milkborne. There seems to be but one epidemic* of this disease described in print as being milkborne. It is reported by Doctors Knapp, Godfrey and Aycock, and it occurred in New York State in 1926. In "Virus and Rickettsial Disease," p. 558, Doctor Aycock says that "transmission of poliomyelitis through milk is exceptional and plays only a small part in the epidemiology of the disease." However, it is to be noted that Dr. John A. Tooney, of Cleveland City Hospital, finds that to produce the disease, the virus must contact gray-fibered nerves which have axis-cylinders into which the virus can be absorbed and thus find transportation to its goal—the central nervous system. Gray-fibers which the virus can reach for entry would include nerves in the nasal passages and about taste buds of the tongue, and networks of nerves in the stomach tract. So, more may possibly be heard of the role played by milk in the transmission of poliomyelitis.

It seems fitting to close this report by calling attention to the findings of D. A. Sanders, of the Florida Agricultural Experiment Station, that the common house fly and fruit flies are important transmitters of mastitis. This work is reported in *Science*, V. 92, No. 2387, p. 286, and seems to be an enlightening contribution to the mastitis problem.

HORATIO N. PARKER, *Chairman*
PAUL B. BROOKS I. A. MERCHANT
LESLIE C. FRANK F. L. MICKLE
J. G. HARDENBERGH A. R. B. RICHMOND

* Editor—See reports on several such outbreaks, in *Food Control: Its Public Health Aspects*, by J. H. Shrader, p. 86-7.

Summary of the Report of the Chief of the U. S. Bureau of Dairy Industry, 1940*

HERD-IMPROVEMENT WORK

It has long been evident to leaders in the dairy industry that the greatest need for efficiency, and the place where the most improvement can be made, is on the average milk-producing farm. Less than 5 percent of the 26,000,000 milk cows in the United States produce as much as 8,000 pounds of milk a year. At present farm prices for milk, and for feed, cows that produce 8,000 pounds of milk pay for their feed and a fair return for labor and overhead. But the great mass of cows milked throughout the country produce little more than half that amount. Such cows cannot possibly pay a profit, and in thousands of instances they can pay nothing for the labor they require.

In 1939 the association cows produced 7,979 pounds of milk and 323 pounds of butterfat per cow on the average, whereas estimates show that the average of all cows milked in the United States produced only 4,538 pounds of milk and 179 pounds of butterfat per cow. Each of the former cows consumed only 79 cents worth of feed for every 100 pounds of milk they produced, whereas the average cow consumed $1.06 worth of feed per 100 pounds of milk.

It costs less to develop a herd of high-producing cows by following a breeding program that will insure high-production inheritance in the heifer calves than constantly to cull out low producers and purchase replacements. It costs less to maintain a healthy herd than to face the losses caused by disease and failure to reproduce normally. Farming practices that insure a plentiful supply of good pasturage and other high-quality roughage are essential, both for adequate nutrition of the herd and to reduce the cost of the feed required for milk production.

The number of farm herds now enrolled in dairy herd-improvement associations is more than double the number 6 years ago. Information is available on the breeding value of more than 3,000 bulls. Artificial insemination is rapidly becoming an important means of making the most extensive use of good proved sires. Within the last year, approximately 138 selected sires have been artificially "mated" to about 34,000 cows, or nearly 8 times as many as they would have served otherwise. Research is seeking satisfactory methods of semen preservation.

The most noticeable improvement in dairy feeding practices in recent years is the greater reliance on pastures throughout the whole growing season and the increased effort to produce and feed roughage of better quality, particularly grass and legume silage. Farmers are giving more attention to the seeding, liming, and fertilizing of pastures; to the practice of rotation grazing; to the use of temporary pastures; to better methods of making hay or silage from the hay crops; and to the use of temporary silos for emergency feed storage.

The practice of preserving grass and legume hay crops in the silo increased markedly throughout the country, from Maine to California. In Pennsylvania, for example, more than 1,200 dairymen put up grass or legume silage last year, as compared to 25 or 30 in 1936.

A serious objection to the use of hydrochloric and sulfuric acids in making grass and legume silage has been that the

* Editor: The original report covers fifty-three pages, from which are selected herewith subjects of particular interest to dairy technologists.

acids impair the palatability of the silage. When about half the quantities usually advised were added, the palatability of the silage was only slightly impaired. The use of liquid phosphoric acid by experiment of 20 pounds to the ton of green alfalfa in one instance, and 32 pounds in another, brought about satisfactory fermentation without impairing the palatability.

Continued effort is made to improve the quality of dairy products so as to increase the monetary returns to the producer. For example, in one section of Kentucky, where quality-improvement work has been conducted for the last 10 years, only 47 percent of the butterfat purchased by the trade in 1929 was "premium" grade; today 68 percent is of that grade and "onion" cream has almost disappeared.

Research work at one of the state experiment stations has shown that the flow of blood through the udder of a lactating cow is nearly 400 times the quantity of milk produced. The quantity of blood passing through the udder would be about 20,000 pounds for a cow producing 60 pounds of milk daily. In an attempt to provide a more understandable picture of the circulatory system, the arteries of a freshly excised udder were filled with red latex (liquid rubber) and the veins were filled with blue latex. The glandular connective and ductual systems were dissected away leaving the arterial and venous systems suspended in relief in essentially a normal position. This intricate mass of blood vessels was photographed in black and white and in natural colors. The quantities of latex held by the two systems indicated that the volume of the venous system was about 4 times as great as that of the arterial. These studies add additional information to show that a heavy producing cow does not necessarily require or possess an excessive development of "milk veins" on the abdominal wall.

The best and cheapest coating to protect concrete from the action of silage juice was to dissolve 2 pounds of No. 1 asphalt in enough gasoline to make one gallon, yielding enough to apply two coats to an area of 250 square feet of smooth concrete wall.

NUTRITION AND PHYSIOLOGY

The use of periodic acid in the sythesis of hydroxy-amino acids was continued. The results indicate that the reaction may be used in quantitative methods for the determination of serine, threonine, hydroxyglutamic acid, and methionine in proteins. It has been used thus for the assay of synthetic or otherwise pure serine and threonine. Preliminary results indicate minimum serine contents of 2.8 percent for casein as compared with previous figures of 0.5 percent. Also, only very small quantities, if any, of hydroxy-glutamic acid are present in casein, whereas 10.5 percent was reported by Dakin some years ago. A knowledge of the occurrence of these amino acids in feeds and in such products as milk, meat, etc., is therefore essential in judging the adequacy of a protein and in selecting proteins that will supplement each other in the diet.

Cows are very wasteful in their utilization of carotene. Much of the carotene in the feed is excreted in the feces. Nothing is known about the conditions that may affect this waste. The rations should contain 80 to 100 milligrams of carotene daily, possibly several months before calving, to furnish the vitamin A for the production of a normal calf.

Previous reports have shown that rations of grain and of poor quality hay are deficient in vitamin A potency; that this deficiency leads to the production of abnormal calves and reduces the vitamin A value of the milk, but does not reduce the milk yield; and that cows on these rations are prone to develop various ills which terminate prematurely their productive life. It seems that the number of normal calves born to dams on rations containing poor quality hays supplemented with vitamin A may not be so good as may be expected on the very best rations, but is close to that of a good ration.

The carotene content of corn silage has been found to be greater than that of the corn from which it was made, when the other pigments in the plant were separ-

ated from the carotene by a modification of the partition method of Willstätter and Stoll. The carotene, as usually determined, appeared to increase about 20 percent during storage in the silo, but this apparent increase is found to be due to an increase in the amount of pigmented impurities that were usually measured as carotene. There was apparently no evidence of the destruction of carotene during storage. The biological inactivity of the pigmented impurity has been demonstrated. These facts must be taken into consideration when estimating the vitamin A content of a feed.

DAIRY RESEARCH LABORATORIES

In the growth of the bacteria that produced propionic acid (important in producing flavor and eyes in Swiss cheese), the limits of growth are directly influenced by the size of the inoculation in relation of the volume to the medium. If this factor is not taken into consideration, statements about the pH value limits of growth are unreliable.

A surprising phenomenon was observed whereby certain combinations of ingredients in standard broths produced toxic effects resulting in the death of 90 percent of the spores, whereas other combinations of the same ingredients nullify this toxic effect.

Some bacterial species, notably one species of the genus *Lactobacillus,* require riboflavin (Vitamin B_2) to support growth, whereas others produce not only sufficient amounts of this vitamin for their own needs, but excrete into the medium enough to promote the growth of bacteria which cannot synthesize their own riboflavin.

Lactobacillus casei fails to grow when heavily inoculated into an agar medium free of riboflavin, but if a colony of one of the bacterial cultures known to synthesize riboflavin is established on the surface of this medium, it soon becomes surrounded by a zone of colonies of *Lactobacillus casei*. The same phenomenon can be produced by placing a drop of solution of riboflavin on the medium. By the use of this method, the synthesis of riboflavin by a number of species of bacteria was demonstrated.

The catalytic activity of the bands of the visible spectrum on the rate of oxidation of fatty acids decreases with increases in the wave length of the visible spectrum; that is, decreases from the blue to the red end. The activity of the different bands follows closely the absorption spectrum of the fat, with the exception that there is a very slightly increased activity in the band between 5,600 and 6,500.

Experiments upon the operation of the continuous freezer indicate that considerably more air is taken up by the freezing than can be accounted for by air solubility and the volume relationships of the freezer. It is evident that this air is actually squeezed into the mix through compression of the individual bubbles by the surface tension effects of the surrounding medium.

In place of the usual postulation of a somewhat rigid structure of the continuous phase in the whipped mass, it may be assumed that the slightly compressed air of the air cells is doing its share in supporting the whip. The continuous medium can be considered here as a viscous fluid without rigidity.

Two methods for using dairy byproducts in ice cream, developed incidentally in these investigations some years ago, have recently been applied commercially and continue to give satisfactory results. In one method it was shown that if butter or butterfat is homogenized with milk to produce a cream of normal composition, the mixture may be used in an ice cream mix which will yield the usual overrun and texture. This method has been adopted by a large ice cream company with entirely satisfactory results.

In another method it was shown that the addition of sucrose to milk decreased the viscosity of the solution and thus permitted the separation of crystalline lactose when the milk was concentrated beyond its saturation point. Applying this principle to the manufacture of concentrated skim milk for ice cream making, a product was obtained containing all of

the solids of the skim milk except a large part of the lactose removed by crystallization and centrifugation. This concentrated skim milk may be used to increase the solids-not-fat in ice cream without danger of inducing the sandiness caused by an excess of lactose. It distinctly improves both the texture and the flavor of mixes that have a low fat content and one company which made some trial batches about 2 years ago has continued its use with very gratifying results.

Incidentally, the lactose removed from the skim milk can be purified readily by a single crystallization. The crude lactose, however, is of sufficient purity to use in certain types of candy, and since the cost of separation is carried by the concentrated milk, it may be sold in competition with sucrose.

Work has continued on the conversion of lactic acid (made by fermentation of the lactose of whey) to acrylic acid, making a polymethylacrylate having the optical activities of the commercial methylacrylate plastics, but with a high degree of elasticity and a solubility which permits its use in impregnating fabrics, in insulation, and in numerous other industrial applications. A new plastic material has been produced with promise of extensive commercial application in waterproofing and gasproofing fabrics.

Work was continued on the development of resins and lacquers. A new resin was made from lactic acid which is insoluble in most solvents, including water and ethyl alcohol, but can be dissolved in chlorinated solvents and in carbitol. It is somewhat brittle, but can be softened by the addition of plasticizers. It makes a clear, colorless lacquer which dries rapidly and adheres well to glass and metal.

Research on the development of a textile fiber from casein has been completed, except as assistance may be required in commercial applications of the process. Seven patents have been granted on various details and modifications of the process and two applications are still pending. One of the patents has been thrown into interference proceedings with an application still pending and some laboratory work will be required to defend this action.

Work was continued on the process of extracting lactose and soluble proteins from whey by alcohol, and several modifications were made to make the process simpler and more efficient. As already reported, the residue that remains after the alcohol is recovered is a concentrated solution of riboflavin, and thus a suitable ingredient of poultry feeds. This residue contains a small amount of lactose, and observations and experiments made during the year indicate that under certain conditions the riboflavin is adsorbed on the surface of the lactose as it crystallizes and that eventually practically all of the vitamin is obtained in a highly concentrated form with the sugar. The adsorption is selective to the extent that only the riboflavin is adsorbed, leaving in solution other coloring matter which may be present. This crystalline material is suitable in every way for use in human foods and medicines. Additional work will be required to determine all of the conditions essential to a satisfactory crystallization and adsorption.

Work was completed on the acid hydrolysis of lactose and the preparation of hydrolyzed lactose sirup. As a result, a clear, sweet sirup of pleasing taste, containing glucose and galactose with small quantities of lactose and hexose decomposition products, can be made easily by hydrolyzing lactose with acid. Such a sirup can be prepared to contain 60 to 63 percent sugar, will keep well, and is suitable for table use or for the manufacture of various sweet goods. Some additional work will be done to determine its suitability for use in ice cream and confectionery.

The work on a skim milk and potato wafer was completed and a paper was published giving details of the method of manufacture.

A successful attempt was made to utilize the high-foaming properties of skim milk. While skim milk whips readily, the foam is so unstable that it has been of no value in the preparation of whip-

ped food products. A way was found for so improving the stability of the whip that it may be used in combination with fruit juices or crushed fruits to make various desserts.

Improvement in the average quality of domestic Cheddar cheese was demonstrated. The methylene blue reduction time was determined on each vat of milk, the propagation of the starters was carefully checked, and the finished cheese analyzed for fat and water. All the milk was pasteurized, regardless of quality.

The adjustment of the relation of casein to the other constituents of milk was successfully demonstrated by dilution with whey instead of skim milk. Demonstrations showed important improvement in the making of Swiss cheese by grading all milk on the basis of the methylene blue test, the use of pure culture starters, various alterations in the manufacturing process, and also adjustment of the temperature and humidity of the curing rooms. In one plant, the increased income by these improvements amounted to $500 for the first month, and over $1,000 a month for the second and third months, in addition to reduction of shrinking from 14 percent to about 7½ percent.

Work on goats' milk yielded the following results: (1) the soluble calcium and phosphorus salts in the Chamberland-Pasteur serum are slightly reduced; (2) the soluble albumin and globulin protein fraction is denatured to a slight degree; (3) curd tension is reduced considerably by the holder method and only slightly by the short-time, high-temperature method of pasteurization; (4) the flavor of the fresh goats' milk is improved slightly and the keeping quality improved considerably by pasteurization; and (5) the phosphatase test as now conducted cannot be applied in detecting slight deficiencies of pasteurization of goats' milk. The phosphatase enzyme in goats' milk is deactivated sufficiently to pass the phosphatase test only 5 minutes at 143° F.

Further work showed that there is no advantage in the reduction of curd tension by using a two-stage homogenization over a single-stage treatment.

The effect of pasteurization and homogenization (at 1,000 pounds and 2,500 pounds pressure) on the digestibility of milk was discussed in last year's report. In that experiment, digestion took place at a pH value of 3.5 and the results indicated that soft-curd milk is more readily, but not more completely, digested than raw milk. Further digestive experiments in vitro were conducted this year. The technique, however, was modified so that the milk was first coagulated with an N/10 hydrochloric-pepsin solution and was added in sufficient quantity to lower the pH value of the mixture to 2.0. Digestion therefore took place at a pH near the optimum for proteolysis, on curds simulating those formed in the stomach. The results obtained under these conditions showed the same general trend as those previously reported. The rate of proteolysis, however, was more rapid, and greater differences were obtained than when digestion took place at a pH value of 3.5.

A comparison of the digestibility of pasteurized milk having an average curd tension of 46 grams with pasteurized homogenized milk having an average curd tension of 7 grams, showed that during the first 15 minutes 171 percent more proteolysis took place with the pasteurized homogenized milk than with the pasteurized milk. At the end of the first half hour, this difference had decreased to 93 percent, after which there was a rapid decrease in the amount of proteolysis in the two milks. At the end of 5 hours, the amount of proteolysis was practically the same for the two milks. These results indicate to a greater extent than the results reported last year that soft-curd milk is more readily, but not more completely, digested than hard-curd milk.

The relation of curd size to curd tension and digestibility showed that the curd area cannot always be correlated with curd tension. However, when a

number of determinations are averaged, there does appear to be a rather definite correlation between curd tension and curd area. As the curd tension of milk is lowered by homogenization, the surface area of the curds increases.

Safeguards in Test for Bang's Disease Described

A high degree of success in standardizing the diagnostic agent, Brucella antigen, used in testing cattle for Bang's disease, is described by Howard I. Thaller in a report recently issued by the U. S. Live Stock Sanitary Association. Doctor Thaller is a Department of Agriculture veterinarian at the Bureau of Animal Industry Animal Disease Station at Beltsville, Md. The report likewise shows advancement in the technique of making the test, thereby adding to the accuracy of detecting animals affected with the disease, against which an extensive Federal-State campaign is being conducted.

The production of Brucella antigen by the Bureau of Animal Industry was undertaken at the request of the U. S. Live Stock Sanitary Association and other organizations interested in the suppression of Bang's disease, long a menace to the cattle industry. From July 1939 to November 1940, a period of 17 months, approximately 6,000,000 cubic centimeters of antigen were produced and distributed to cooperating laboratories by the Bureau of Animal Industry. This was used to conduct about 10,000,000 official tests.

The primary purpose in the production of this antigen by the Bureau was that every laboratory might have a uniform agent upon which to base its diagnosis of the disease. Every step in the preparation of the antigen is rigidly controlled. More than 3,000 guinea pigs have been used in tests, and more than 23,000 agglutination tests were made in an effort to maintain standard sensitivity of the product. On numerous occasions laboratories have been requested to return samples of antigen to determine whether or not a change in sensitivity has resulted due to shipping and storage. In no instance has such change been noted.

It is very essential in the interest of uniform and exact results, Doctor Thaller points out, that the technique of the Bureau be followed in every detail, and for this reason a copy of the Bureau's technique is submitted to each cooperating laboratory.

Officials of the Bureau consider that the test being used in combating Bang's disease compares favorably in accuracy and general dependability with the tuberculin test, which was so successful in the campaign against bovine tuberculosis.

Correction Concerning Plate Cleaning

In the May-June issue of this Journal, page 136, the statement is made that the plates in high-short equipment can be effectively cleaned by pumping dilute solutions of phosphoric acid through them. The author, J. L. Hileman, submits the following statement concerning the use of this patented procedure:

> "With reference to the use of phosphoric acid for cleaning plate heaters, as described on page 136 of the May-June issue of this Journal, it should be noted that such use of phosphoric acid is covered by U. S. Patent 1,759,762 owned by Oakite Products, Inc. However, this patent does not cover the use of weak organic acids such as citric, lactic, or tartaric, which are widely used for the same purpose."

Court Decision on Public Health *

City ordinance prescribing hours for sale of uncured or uncooked meats upheld.—(California District Court of Appeal, Fourth District; *Justesen's Food Stores, Inc.*, v. *City of Tulare et al.*, 111 P.2d 424; decided March 22, 1941.) An ordinance of the city of Tulare made it unlawful to sell or offer for sale any uncured or uncooked meats except between the hours of 7:30 a. m. and 6 p. m. on days other than Saturday, Sunday, and certain specified holidays and except between the hours of 7:30 a. m. and 9 p. m. on Saturday. It was also made unlawful to keep, or permit to be kept, open for business any establishment selling uncured or uncooked meats or to remove therefrom any such meats for sale or delivery, except between the hours above stated. If any other business was carried on in the same room and it was desired to operate such business on the days or during the hours prohibited to the meat business, it was required that a permanent partition not less than 7 feet in height should enclose and separate the place where such other business was carried on from the remaining part of the room where the meat business was conducted.

The plaintiff, which was engaged in the ordinary general grocery store business, brought an action to obtain an injunction against the enforcement of the above-mentioned provisions of the city ordinance. From a judgment of the lower court dismissing the action the plaintiff appealed to the district court of appeal, contending that the ordinance contravened the Federal and State constitutions in that it deprived the plaintiff of its liberty and property without due process of law. The appellate court was of the view that the challenged ordinance was valid. Relative to the provisions concerning hours, it was said that, in order to make inspection efficacious in the protection of the public health, it was necessary and reasonable to make regulations to insure that meat markets and butcher shops should not be open except at specified reasonable hours. With respect to the section relating to the separation by a partition of different businesses, the court said that it was a legitimate exercise of the police power and not unreasonable. In closing its opinion the court stated the rule regarding the due process of law clause, enunciated in a prior State case, to the effect that, when the necessity or propriety of an enactment is a question upon which reasonable minds might differ, the propriety and necessity of such an enactment was a matter of legislative determination.

* From *Pub. Health Repts.* 56, 1222 (1914).

Court Decision on Public Health. Public Health Reports 55, 1282-1283 (July 12, 1940) *Pub. Health Enng. Abs.* xxi, Mi, 14.

An action was brought in Ohio to recover damages resulting from illness alleged to have been caused by the plaintiff eating pork infected with Trichinella spiralis. The Ohio statutes penalized the sale of diseased, corrupted, adulterated, or unwholesome provissions when the condition is not made known to the buyer. In this case the plaintiff, a boarder, at the request of his landlady, purchased some fresh pork and beef at a retail grocer's. The meat was ground and made into balls, fried in oil for 6 to 8 minutes, and then served. Persons, including the plaintiff, later became ill and the illness was diagnosed as trichinosis.

The trial court directed a verdict in favor of the defendants on the grounds that the sale of the pork under the circumstances was neither negligent nor violative of the state statutes and the court inferred negligence on the part of the landlady, as an agent of the plaintiff, for failing to cook the food properly.

Upon appeal the appellate court reversed the judgment of the trial court, stating: "There was substantial evidence from which the jury could have found that appellant's illness was caused by his eating pork that was infected with trichinella when sold by appellees; and, under Ohio law, the court should have instructed the jury that if they found these facts appellees were negligent in law * * * * that their negligence was the proximate cause of appellant's injury, even though another's negligence may have contributed thereto."

M. S. CAMPBELL.

New Books and Other Publications

Seven Decades of Milk—A History of New York's Dairy Industry, by John J. Dillon. Published by Orange Judd Publishing Company, Inc., New York, 1941. 340 pages. $3.00.

Here is a fascinating account of the stirring events connected with the efforts of the milk producers on the New York City milk shed, mostly in New York state, to secure a better price structure for their milk. After recounting the conditions, both sanitary and industrial that prevailed in the early days, the book records the struggles to organize the producers, and how the dealers have continued to circumvent them. A large part deals with the author's personal relation to the long fight, especially his part in the early days of the Department of Foods and Markets, when as its first Commissioner, he served as agent to negotiate the sale of all milk which the Dairymen's League was authorized to sell for its members. How the great fight of the milk producers in 1916 was planned, executed, and won is revealed in detail.

An interesting side-light of the narrative is the difficulty experienced by an altruistic, personally disinterested, public-spirited citizen in leading (or attempting to lead) a large group of people in a constructive enterprise. The adage, 'Good Lord, deliver us from our friends," is illustrated in one incident after another.

Manual for Dairy Manufacturing Short Courses, by Dairy Manufacturing Division, Pennsylvania State College. Lithoprinted by Edwards Brothers, Inc., Ann Arbor, Michigan. v + 266 pages. 1940.

This book is written as a manual for instruction in examining and in manufacturing dairy products. After a general introduction of 38 pages dealing with composition, legal standards by states, and milk-testing procedure, the text comprises Course I—Testing Dairy Products and the Manufacture of Butter and Cheese (including the concentrated milks), 65 pages; Course II—Ice Cream Making, 52 pages; and Course III—Market Milk and Milk Control, 96 pages.

A large amount of specific and practical information in all phases of the production of milk and its products is presented in text, in outline form, or in useful tables. Good laboratory exercises, review questions, reading references, and clear instructions make it a useful aid to instructors.

Some parts might be improved in accuracy. For example, on page 222, septic sore throat, scarlet fever, and diphtheria are listed as caused by "direct bovine infection," whereas under "Direct or semi-direct human infection" both scarlet fever and diphtheria are mentioned, but not septic sore throat. Neither staphylococci infection nor paratyphoid fever are mentioned, although cases reported from the latter greatly outnumber those from diphtheria and dysentery. Also, the costs of "enriching" milk with vitamin D are rather high—metabolization 0.5-0.6c per quart, irradiation 0.3c, and fortification with concentrate 0.2-0.4c. Moreover, the discussion of soft curd milk and homogenized milk is couched in such conservative terms that the reader or student may wonder why the production of these milks is increasing the way it is. Possibly the instruction staff figures that erring on the conservative side may help to steady the thinking of the student (who will be the future milk dealer) against the exaggerated claims of some salesmen.

The Avitaminoses—The Chemical, Clinical, and Pathological Aspects of the Vitamin Deficiency Diseases, by W. H. Eddy and Gilbert Dalldorf. Second Edition. The Williams and Wilkins Company, Baltimore, Maryland. 1941. 519 pages. $4.50.

The many advances made in our understanding of the vitamins has necessitated a complete re-writing of most of the text. The aim of the authors has been to make the book useful, not only to the tyro, but also to specialists whose experience is limited to the biochemical or clinical aspects of the deficiencies or to a single one.

A chapter on cellular oxidation has been inserted for those readers who want to be informed on the chemistry of oxidation. The vitamin tables have been revised with full recognition of their absolute inaccuracy in view of the variety of conditions which obtained in their production, technology, and assay. Many new illustrations are added, together with numerous references for the year 1938 and 1939, and some for 1940.

Chemistry of Food and Nutrition, by H. C. Sherman. Sixth Edition. The Macmillan Company, New York. 1941. 611 pages. $3.25.

This is the sixth edition of this well-known text, the earlier ones being those of 1911, 1918, 1926, 1932, and 1937. The book follows the general plan of the previous issues in meeting primarily the needs of college classes. So much advance in nutritional knowledge has been made during recent years that the latter half of the book has been completely rewritten, every chapter has been revised, and three new chapters, dealing with the most recently discovered among the vitamins, together with the relations of food supply to the disease pellagra, have been inserted. Vitamin tables have been revised and expressed in International Units. We note with interest that the nomenclature of the vitamins has been emancipated from their alphabetical order.

The references for general supplementary reading are as extensive as in earlier editions, and have been brought up to date. A large proportion bears such late publication dates as 1939 and 1940.

The typographical work is up to the usual high standard of Macmillan production.

Standard Established for Oleomargarine

The Federal Security Agency announces that regulations have been promulgated under the Federal Food, Drug, and Cosmetic Act establishing a definition and standard for oleomargarine.

This standard was formulated on the basis of evidence received at public hearings held during November 1940. It becomes effective September 5, 1941.

The definition and standard is published in the Federal Register of June 7, 1941, copies of which can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

JOURNAL OF MILK TECHNOLOGY

Official Publication of the

International Association of Milk Sanitarians

(Association Organized 1911)

THE JOURNAL OF MILK TECHNOLOGY is issued bimonthly beginning with the January number. Each volume comprises six numbers. It is published by the International Association of Milk Sanitarians, and is printed by The Chronicle Press, Inc., Orange, N. J., U. S. A.

Subscriptions: The subscription rate is $2.00 per volume. Single copy, 50 cents.

Advertising: All correspondence concerning advertising, reprints, subscriptions, and all other business matters should be addressed to the Managing Editor, **W. B. Palmer, 29 North Day Street, Orange, N. J.**

Manuscripts: All correspondence regarding manuscripts, editorials, news items, announcements, and other reading material should be addressed to the Editor, **J. H. Shrader, 28 East Elm Ave., Wollaston, Mass.**

Membership and Dues: Active membership in the Association is $3.00 per year, and Associate membership is $2.00 per year, including respectively all issues of the JOURNAL OF MILK TECHNOLOGY. All correspondence concerning membership in the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, including applications for membership, remittances for dues, failure to receive copies of the JOURNAL OF MILK TECHNOLOGY, and other such matters should be addressed to the Secretary of the Association, **C. Sidney Leete, State Department of Health, Albany, N. Y.**

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Association News

Chicago Dairy Technology Society

The final meeting of the Chicago Dairy Technology Society was held May 13. Roud McCann of the Dry Milk Institute spoke on the subject "Developing Markets for Dairy Products." The dry milk industry, according to Mr. McCann, offers an effective means of helping to solve two of the dairy industries' greatest problems: (1) assisting in marketing all that the dairy cow produces, and (2) providing the consuming public with its full quota of milk and dairy products. He further pointed out that increasing the value of the milk-solids-not-fat in milk 1 cent was equivalent to raising the value of the butterfat 2 cents. In 1925 there were approximately 70,000,000 pounds of dried skim milk produced in this country, while last year 500,000,000 pounds were produced. In spite of this increased production, we are still using only about 20 percent of the raw supply that might be made available. Some 17 percent of the population receive no milk at all, and at least 1/3 are classed as badly undernourished. We have come more or less to a standstill in the fluid milk industry, so that we should consider ways of getting milk constituents to the consumer in every possible form; in this way, the consumer would, through his natural choice of foods, consume more nearly the equivalent of the recommended quart of milk per day. Dried milk, when added to bread, increases the protein value of the bread, and increases the calcium content several hundred percent. The milk sugar makes the calcium content more available, and the riboflavin and B_1 vitamin contents are enhanced. Some of the finest bread is now made with a milk solids content of 12 percent.

Other outlets of skim-milk solids are cakes, cereals, ice cream, candy, sausage, and meats. Lower grade powders and surpluses have found profitable outlets in animal feed markets such as poultry, calves, fur-bearing animals, dogs, game birds, and fish. Mr. McCann pointed out in his closing remarks that any industry cannot stand still, but must go ahead with the changing markets and time, and it is such a policy that the dry milk industry has been following.

The next regular meeting of the Society will be held September 9 at the Hotel Sherman. The program will be announced later.

P. H. TRACY,
Secretary.

Massachusetts Milk Inspectors' Association

The Association has been following legislative matters quite closely through the Committee on Agriculture, where all milk bills have been heard. The bill that is most interesting at present is the newly-drafted bill House No. 2325, referring to the State Milk Control Board, which was primarily set up for price fixing—purely economic. Now the Board seeks widespread authority to investigate and regulate, as conditions permit and the purposes of this Chapter require, all matters pertaining to markets, to the production, manufacture, processing, storage, transportation, disposal, distribution, and sale of milk and milk products within the Commonwealth, and to the establishment of reasonable trade practices.

The Association is in favor of the Milk Control Board, minus the clause pertaining to power to act in matters referring to public health. Several other groups and organizations were opposed to the Milk Control Board in like manner.

The summer meeting was held at the Hood Farm in Beverly, Massachusetts on July 16, in the form of an outing for all members and their families. A large attendance participated in the games and sports.

ROBERT E. BEMIS,
Secretary-Treasurer.

Michigan Association of Dairy and Milk Inspectors

John E. Vogt, Assistant Engineer of the Michigan State Health Department and President of the Association, resigned his position June 1st. Being a Reserve Officer, he was called for a year's service in the Army. He will be attached to the 77th Engineers of the 5th Division. He is a Lieutenant in the Engineering Corps and is now located at Camp Forrest, Tennessee.

Frank E. Holiday, 1st Vice-President, will succeed him as President.

The Third Annual Summer Conference of the Association will be held at Michigan State College on July 17, 18 and 19.

The program is as follows:

Thursday, July 17

La Rue Miller, Chairman

9:30-10:30 A. M. Registration.

10:30 A. M. "Milking Machines and Their Care."
Doctor George H. Hopson, DeLaval Milking Machine Company.

1:00 P. M. "Scoring and Identification of Flavors and Odors of Milk."
Doctor G. M. Trout.

2:00 P. M. Laboratory Sessions.
"Flavors and Odors of Milk"
Group to be divided into 3 sections, J. M. Jensen.

4:00 P. M. Golf Tournament.
Swimming at Jenison Field House.

7:00 P. M. Bull Session, Wells Hall.

Friday, July 18

F. E. Holiday, Chairman

9:00 A. M. Discussion and Report of the Allied Dairy Association Committee on the Proposed Michigan Milk Ordinance.
Doctor E. F. Meyer and L. N. Francke.
Business Meeting.

1:00 P. M. "The Sanitary Aspects of Heat Resisting Bacteria."
Doctor C. S. Bryan.

2:00 P. M. Laboratory Sections:
1. The Use of the Microscope in determining thermophylic and thermodermic bacteria.
Doctor C. S. Bryan.
2. Determination of Alkali Caustic and Residual Chlorine at the Plant.
Doctor Ira A. Gould.

4:00 P. M. Baseball Game.
Detroit vs. Outstate.

6:30 P. M. Banquet.

Saturday, July 19

Albert C. Miller, Chairman

9:00 A. M. The effect of water hardness in relation to the action of various dairy detergents.
Demonstration and discussion, Doctor W. L. Mallmann and J. M. Jensen.

HAROLD J. BARNUM,
Secretary-Treasurer.

Missouri Association of Milk Sanitarians

The ninth annual meeting of the Missouri Association of Milk Sanitarians and Milk Control Short-Course was held in Columbia, Missouri, on April 29, 30 and May 1, 1941. This was one of the best meetings from the standpoint of attendance and quality of the program thus far held. The increase in attendance from sixteen members in 1932 to approximately one hundred in 1941 is evidence of growing interest in milk control work throughout the state.

A Seminar in the Public Health Control of Milk Supplies was held in Kansas City, Missouri, on June 9-14, 1941. The Seminar was conducted by the United States Public Health Service in collaboration with the Missouri State Board of Health and the Kansas City, Missouri, Health Department.

Twelve states were represented at the meeting with a total attendance of 110.

GLENN M. YOUNG,
Secretary-Treasurer.

New Members of INTERNATIONAL ASSOCIATION OF MILK SANITARIANS

*Clarkson, Arthur W., Sanitary Engineer, State Board of Health, Hannibal, Mo.
*Cohen, Morris, Health Inspector, New York City Dept. of Health, 1296 Sheridan Ave., Bronx, New York.
*Foster, J. E., Production Manager, Phenix Dairy, Houston, Texas.
*Hunt, Dr. F. J., Medora, Ill.
*Kieda, Adam, Dairy Chemist and Bacteriologist, Queensboro Farm Prod. Inc., 148 Center St., Canastota, N. Y.
*McPheters, Hunter, Agricultural Engineer, Portland Cement Assn., 521 Lincoln St., Stillwater, Okla.
Moutrey, Curtis E., Sanitarian, State Health Dept., 15 W. 10th St., Shawnee, Okla.
Peck, C. P., Milk Inspector, City-County Health Unit, 805 College Ave., Stillwater, Okla.
*Riddle, W. G., Sanitarian, City-County Health Unit, Box 471, Stillwater, Okla.
*Roberts, F. C., Jr., State Sanitary Engineer, State Board of Health, Phoenix, Arizona.
*Sharp, Paul F., Professor Dairy Chemistry, Department of Dairy Industry, Cornell University, Ithaca, N. Y.
Sullivan, Elbrege, Chemist, City Health Department, R 2, Lawton, Oklahoma.
*Wilson, Robin C., Plant Superintendent, Kristoferson's Dairy, Inc., 1300, Ranier Ave., Seattle, Wash.
*Wisnieski, Karol S., Member of Veterinary Detachment in the U.S. Army, Box B, Veterinary Detachment, Fort Benning, Ga.

* Active Member.

Corrections

Membership list of February 1, 1941.

John, L. E., 704 Coconut Drive, not Box 554.
Roberts, Dr. C. R., Sheffield Farms, not Dairymen's League.
Safford, C. E., N. Y. State Dept. of Agriculture and Markets, not Health.
Shrader, J. H., 23 East Elm Avenue, not 59 Winthrop Avenue.

New members listed in this Journal, May-June issue, p. 175.

Gross, H. F., M & R Dietetic Laboratory, not M & M Dietetic Laboratory.

Copies of the membership list of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, corrected to February 1, 1941, may be secured by writing to Mr. C. Sidney Leete, Secretary-Treasurer, State Office Building, Albany, N. Y. The names of new members are listed in each succeeding issue of this Journal.

The "Mold Mycelia Count" for Butter. H. Macy. The Circle, 3-6 (Jan.-Feb. 1941). *Pub. Health Eng. Abs.* xxi, Mi, 18.

A description of the method used in making the determination and its meaning. The "mold count" reveals unsatisfactory plant processing methods and sanitation while the "mold mycelia count" serves as "an index of the general quality of the cream which reflects the care in producing and handling, the age of the cream and conditions of storage . . . A high mold mycelia count in butter shows conclusively that decomposed or unfit cream was used."

HOWARD D. SCHMIDT.

Vacreation of Dairy Products. F. S. Board. The Circle, 11-13 (Jan.-Feb. 1941). *Pub. Health Eng. Abs.* xxi, Mi, 17.

The process was developed in New Zealand and consists of passing cream or ice-cream mix in a spray downward through a vacuum tank filled with live steam with which it makes direct contact. It is also subjected to centrifugal force in the vat. This is utilized to separate vapors and gases from the treated cream. The process is said to be efficient in destroying bacteria, a clean flavor is obtained, the keeping quality of ice cream is improved, and oxidized flavor development has been reduced.

HOWARD D. SCHMIDT.

Conference of Oklahoma Sanitarians

A conference of milk sanitarians and others interested in milk control work in Oklahoma was held at Stillwater April 29 and 30 under the sponsorship of the Department of Dairying of the Oklahoma A. and M. College.

Dr. W. J. Bishop, Milk Sanitarian from Bartlesville, presided at the conference which included discussions of problems pertinent to milk control work. Burley Walker sanitarian from Ada, Curtis Moutrey, sanitarian from Shawnee, and W. R. Webb, Beatrice Creamery Company, Tulsa, presented interesting discussions on current problems. Members of the staff of the Oklahoma A. and M. College appearing on the program were Dr. L. H. Moe and Dr. H. W. Orr of the Department of Veterinary Science, and Professor H. W. Cave, Dr. J. L. Barnhart, Professor Walter Krienke, and Dr. H. C. Olson of the Department of Dairying.

A banquet sponsored by the Students National Dairy Club whose membership is composed of students majoring in Dairying, was held on the evening of the first day. After a bountiful meal, featuring an abundance of dairy products, the group was favored with a talk by Dr. C. P. "Hog" Thompson of the Animal Husbandry staff, whose mixture of sober thought and spicy humor is always pleasing.

JOHN L. BARNHART,
Assistant Professor of Dairy Manufacturing Oklahoma A. and M. College, Stillwater, Okla.

Composition of Goat Milk of Known Purity. Herman C. Lythgoe. Jour. of Dairy Sci., 23, 1097-1108 (Nov. 1940). *Pub. Health Eng. Abs.* xxi, Mi, 13.

In an effort to determine the variability of the composition of goat's milk of known constant purity, with special reference to stage of lactation and season of year, 335 individual samples and aggregate samples from 21 herds were collected and exhaustively analyzed. It was noted that stage of lactation has no marked effect upon the composition of goat's milk, but the season of the year has a very marked effect regardless of stage of lactation. There is marked reduction in total solids, fat, and solids not fat in goat's milk in the summer months, as compared with the winter months of December, January, and February. This reduction starts in the month of March, reaching its lowest level in the month of August, and starts back up again in the month of September. This variation from high to low is much greater than is the case with cow's milk. Because of this wide variation in the serum constants, adulteration in goat's milk is much harder to detect than in cow's milk. Also because of the low solids content of goat's milk in the late summer months, it should be recommended that consumers use 10 percent more at this time of year to obtain the same food value that cow's milk offers. The percentage of calcium in the ash is virtually the same in goat's and cow's milk but because of the higher ash content in goat's milk, it should be recommended where there is a high calcium demand in the diet.

The phosphatase test should not be used on goat's milk to determine compliance with the law on pasteurization. The enzyme phosphatase in goat's milk is inactivated at pasteurization temperature long before the expiration of the legal holding time. If the enzyme is not inactivated it can be definitely concluded that the milk is raw.

CURTIS B. WILLIAMS.

"Doctor Jones" Says—*

A while ago I was talking to a fellow't has quite a lot to do with making health regulations along certain lines (recommending 'em, that is) and said on one matter he'd come to the conclusion they'd gone further'n necessary. "Well," I said, "if you think that why don't you recommend changing 'em?" "I don't know," he says, "I'm afraid that'd look like a step backward."

That made me think of the farmer down here, years ago, that bought a team of horses that'd been used on streetcars down in New York—you know: the old horsecars? He said the only trouble with 'em: they'd never learned to back up. Of course the thing of it was: on the streetcars when they wanted to go back they took the horses around and hitched 'em on the other end and then they were going ahead. They went in the direction they needed to go and the horses never had to take backward steps. Maybe we need to work out a system like that.

Yes, sir, making laws or regulations—I figure it's more or less like driving a horse or an automobile. No matter how good a driver you are or how well you know the country you're bound to get on the wrong road once in a while or, maybe, go a little too far in the right direction. When that happens the only sensible thing to do is to back up.

Like our board of health here a few years back: we had a regulation we'd been enforcing—or trying to—for three or four years (I believe I recommended it myself, originally) and we finally agreed it wasn't a good one. "Yeah—but if we repeal it," somebody says, "a lot of 'em'll think we didn't know our business when we adopted it." Well, I told 'em, I'd bet there weren't a dozen people in town but what'd like to repeal something they'd done in the last four years. It'd be a whole lot worse if they found out we'd gone on trying to enforce a regulation after we all knew it was wrong. Naturally we don't want to make any more missteps'n we have to but, personally, I'd have more confidence in a board that admitted a mistake once in a while and corrected it than I would in one that never admitted making one. A board that's a hundred percent right all the time—that's just too good to be true.

That old maxim there, "Be sure you're right and then go ahead"—that's one of 'em I was brought up on and it's just as good as it ever was. But I've learned from experience: you can be awful sure you're right, sometimes, and still find out later you were wrong. Whatever way you do it there's times, like the old horsecar, when a "step backward" actually is a step ahead.

PAUL B. BROOKS, M.D.

* From *Health News*, New York State Department of Health, Feb. 3, 1941.

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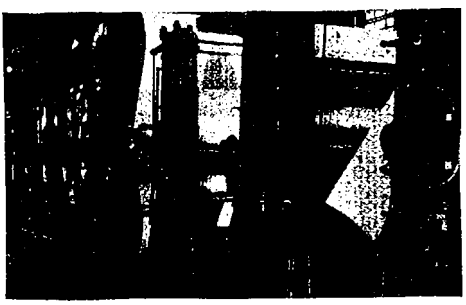

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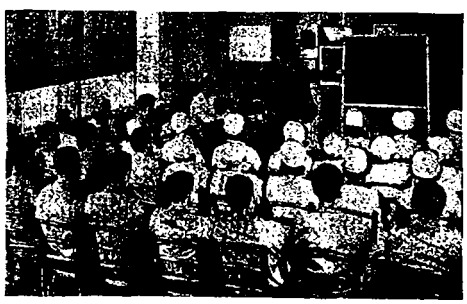

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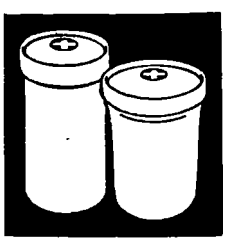

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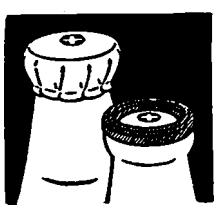

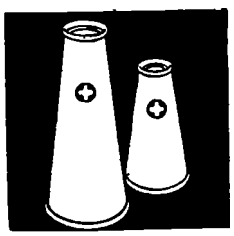

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BACTO-VIOLET RED BILE AGAR

is recommended in "Standard Methods for the Examination of Dairy Products" of the American Public Health Association for direct plate counts of coliform bacteria in milk and other dairy products. Upon plates of medium prepared from Bacto-Violet Red Bile Agar coliform organisms form reddish colonies, 1 to 2 mm. in diameter, which are usually surrounded by a reddish zone of precipitated bile. After incubation for 18 hours at 37°C. counts of these colonies may be made without interference by extraneous forms.

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