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Listed on Page 183

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JOURNAL OF MILK TECHNOLOGY

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Editorial

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

More Education — Why?

OLD-TIMERS in food control in general and milk inspection in particular will recall the old days when their staffs were recruited from whomsoever the political leaders sent them. This writer had a retired bar-tender, a stone mason, and a penitentiary guard among his milk inspectors. One of his dairy farm men had never seen a farm. Such men did fairly well work when the need was brawn versus brain.

Probably the earliest factors which influenced a change in the type of personnel was the gradual introduction into the control field of full-time bacteriologists, chemists, engineers, physicians, and veterinarians. These men had all been professionally trained. They knew how to observe, to ponder, to correlate, to organize. They introduced new methods, modified old ones, and gradually built up staffs who knew what to do, how to do it effectively, and what it was all about.

Another early influence was the advent of the public health schools. Such a creation fostered the development of a profession of public health workers. This gave professional and pedagogical respectability to what otherwise had been a nondescript but more or less necessary public service. Its influence may be recognized objectively in the movement to change the name of "inspector" to that of "sanitarian."

Several other factors fostered the development of the new profession. One of the earliest was the increasing technological complexity of milk handling. The discovery of the health hazard from unwholesome milk in dead ends, leaky valves, irregular heating, and uncertain holding awoke the milk inspection forces to the recognition that a new field of mechanical engineering was being created—dairy engineering. The work of the milk program of the Public Health Service gave great impetus to this development.

Then, too, the commercial people helped shape the trend. They employed quality control men and plant operators who knew how to interpret the official regulations, and who also knew how to run a plant so as to keep out of trouble as well as how to correct conditions that were found to be faulty. Officials stimulated the commercial employees, and vice versa.

To these influences may be added those of increased stability of employment and higher levels of remuneration. Tenure in office operated to foster responsi-

bility, and to win public support for the need for the work and public confidence in the ability of the control officials. This led to increase in the salary schedules. All this attracted higher type men into food control work.

A great volume of research in government, experiment stations, and universities, supplemented by that done in commercial enterprises, opened up fields of new knowledge that only the qualified men could interpret and apply. This stimulus is still in full effect. The volume is actually increasing. The need for trained men is larger than ever before.

Several different types of agencies have arisen to meet the need. Some of the state departments of health have inaugurated seminars to enable in-service personnel to take refresher courses and become acquainted with the newer developments. Dairy departments of the colleges have introduced short courses for production men, plant operators, and owners of dairy enterprises. Professional societies have been organized for fostering improvement in official procedure and in technological development, notable among which is the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, publishing its JOURNAL OF MILK TECHNOLOGY. Numerous state organizations are springing up in affiliation therewith.

Several of the leading universities have now organized formal courses in this field. These curricula do not follow any regular pattern—praise be!—but they all are devised to train the student to work in this increasingly complex field. Much has been written about the duties of the milk sanitarian but there is not much greater recognition as to what his training should comprise than is the case with the food technologist. This very indefiniteness operates to leave the field open for individual initiative in both the educational institution as well as in the functioning milk inspection service.

As in all other lines of human activities, milk inspection and technology are undergoing change. The rate at which new techniques and practices are being adopted can be visualized when we recall that within the last few years, we have witnessed the introduction of the phosphatase test, the resazurin test, a markedly increased emphasis on mastitis control, a greater stress on "deck" examination of samples (with consequent shift of emphasis from dairy farm inspection to plant), more supervision of ice cream manufacture and production, new bacteriological laboratory methods, a differentiation between thermophilic and thermoduric organisms from the standpoint of their respective sources and control, the rapid adoption of high-temperature short-time pasteurization, and others. As we look into the future, we can see increasing emphasis on the color of milk, flavor, vitamin content, nutritive value, improved packaging, and more economical plant processing and delivery. In order to keep up with these rapid changes and advances, the milk sanitarian and technologist must set himself industriously to reading the literature, attending seminars, enrolling in courses of study at the universities, joining a professional association and attending the meetings, and occasionally buying an up-to-date book. This is the price that anyone has to pay to keep alert professionally.

One thing is clear. The day of the untrained inspector is gone. The man who does not avail himself of the numerous opportunities afforded for increasing his information and for improving his training risks loss of professional standing, if not jeopardy of position. The work of the milk sanitarian embraces the application of dairy husbandry, mechanical engineering, sanitary engineering, bacteriology, chemistry, an appreciation of legal limitations, a public-health

(Concluded on page 173)

The Progress, Results and Cost of Electric Refrigeration on Dairy Farms

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NATIONAL programs directed toward the conservation and development of our natural resources have been influencing factors in the growth of the dairy industry in the Memphis area. This is especially true with reference to the milk supply which is used for bottling purposes.

INCREASE IN DAIRYING

There has been a remarkable change during the past few years in methods of farming. In Tennessee, 135,000 farms, representing 88 percent of the farmland of the state, are participating in the soil conservation program. Land which was formerly used for the production of soil-depleting crops, has been diverted to the production of grass and hay, which are soil-conserving crops. This type of farming has afforded new opportunities in certain sections of the country in that attention has been directed toward the raising of livestock on farms which formerly had supported only a sufficient number to cultivate the crops. Large land owners in particular have turned to the production of graded milk as an additional source of income. These operators, realizing that this form of dairying is a highly competitive type of business, have been willing to make substantial initial investments in order to obtain a modern establishment. These dairies have, as a rule, been large in order that practical use could be made of the pasture and hay lands.

The average daily production of the Memphis dairies has tripled during the past ten years. In 1932, 541 dairies with an average daily output of 25 gallons were required to produce 13,600 gallons of milk used for pasteurization. Today, 347 dairies produce the 21,500 gallons used daily for this purpose. In addition, approximately 1,500,000 gallons of milk have been produced this year by these dairies for the manufacture of frozen desserts. This is a daily average of approximately 75 gallons per dairy. The production of this amount of milk at any single dairy justifies the installation of equipment which might not be economically practical at a smaller one.

The development of natural resources has made available a source of electricity at reasonable rates. By means of a coördinated rural electrification program, it has been possible to bring power to rural areas which heretofore had not been able to obtain it. Fluid milk for the Memphis market is drawn from six counties in two states—Fayette and Shelby in Tennessee, and Desoto, Marshall, Tate, and Panola in Mississippi. At the beginning of 1935 there were 343 miles of transmission lines in the Memphis milk shed. Three hundred thirty-three miles of these lines were in Shelby County while only ten miles were in the remaining five counties. This has now been increased to 878 miles with 678 miles in Shelby County and 200 miles in the remaining five counties. The availability of this power has made it possible to obtain improvements at dairies in the form of automatic water

systems, water heating facilities, and mechanical refrigeration which had previously been out of the question.

MECHANICAL COOLING INTRODUCED

In the Memphis area attention was first turned to the mechanical cooling of milk at the dairy farm in 1926 when the chief engineer of one of the local milk plants secured an appropriation from his company for experimental purposes. Equipment, including an ammonia compressor, was installed at one of the dairy farms. This piece of equipment proved successful, but the cost made its use prohibitive.

No further efforts were made along this line until the fall of 1933, when the Health Department notified the producers that, in the future, milk must be delivered to the plants at a temperature of 70° F. or less, with the exception of such morning's milk as could be delivered to the plant within two hours after milking.

The engineer who had conducted the former experiment constructed an insulated cabinet and installed it at one of the dairies. A compressor using methyl chloride as a refrigerant and powered by a gasoline engine was used. This equipment was installed during the fall of 1933 and was operated throughout that winter. It was demonstrated that this type of refrigeration was practical and could be operated at a reasonable cost.

The general installation of mechanical cooling was started in 1934. One distributing company required all of its producers to install this type of cooling. Another strongly recommended the installation of these units. The Health Department was further assisted in this program by the fact that these two companies purchased the cooling units in wholesale lots and lent such financial assistance of their shippers as was desired.

During the year 1934, there were 200 mechanical units installed on dairy farms shipping milk to pasteurization plants. This was considerably less than 50 percent compliance. Of this number, 57 were of the electric type and 143 were powered by means of a gasoline engine. Electric power was available at only a small number of the dairy farms at that time.

Considerable trouble was experienced with the gasoline-powered units due to the fact that the engines were forced to run at such high speeds that frequent overhauling was necessary. Often these engines failed to function with the result that the dairy was without the use of cooling equipment. The fact that these machines were operated only a few hours each day also caused trouble. As the cabinets began to warm up a condition known as "head pressure" was built up which resulted in the bursting of a number of expansion valves. A large number of these machines were not operated during the winter months of the first year. In the spring considerable trouble and expense was experienced due to the fact that the coils had corroded. Those who had operated their refrigerators for even a few minutes each day experienced little trouble except that due to mechanical reasons.

The fact that the Health Department had permitted the delivery of morning milk without being cooled, provided there was not more than two hours elapsed time after milking, delayed installation of the equipment to some extent. This ruling permitted some rather unsatisfactory conditions to develop in the way of off-flavored milk and high bacteria counts. An investigation developed the fact that in some instances there was as much as five hours between the beginning of the milking period and the time of delivery to the plant. In no instance was the milk delivered to the plant in less than two hours after the beginning of the milking period.

All milk is now required to be delivered to the plant at 70° F. or less. Since this ruling was put into effect many operators have found it advantageous to install tubular aerators.

The majority of these have been attached directly to the cabinet. The water in the cabinet is circulated through the coils as a cooling medium. By this means it is possible to cool the morning milk quickly and have it ready for early morning pick-up. Another advantage is that production of the dairy can be increased without the installation of larger storage equipment. As an example, a 4-can box will furnish cooling facilities for 8 cans of milk while storage is provided for only 4.

After 1934 fewer installations were made for a while due to the inaccessibility of electricity and the rather unsatisfactory results which were obtained by means of the gasoline powered units. As the power lines were extended, changeovers were made to electricity and the installation of refrigeration units increased. The Health Department urged that automatic switches be included as standard equipment. This makes it possible to maintain a constant temperature in the cabinet and results in a much more satisfactory and efficient operation. The electrical units were operated during the winter months thus eliminating many major repair bills which were occasioned in the past due to deterioration while the equipment was idle. Electrical refrigeration has proved satisfactory in the Memphis area from the standpoint of both the producer and the Health Department.

Memphis now has 93 percent pasteurization. Only 35 producer-distributor type of dairies remain and all but three have electrical refrigeration. Of the 347 producer dairies, all but 9 make use of this type of refrigeration. These 12 dairies are small and produce less than 1 percent of the total milk supply. As long as temperature standards are met no effort will be made to obtain changeovers to mechanical cooling.

A questionnaire was mailed to the health officers of several cities requesting information regarding the progress of electric refrigeration in their milk sheds. Reports from 28 of these cities have been tabulated as follows:

Percent of Compliance	*Number of Cities*	*Percent Cities*
100	2	7.2
90 to 100	7	25.0
80 to 90	4	14.3
50 to 80	5	17.9
Below 50	10	35.6
Total	28	100.

Of these 28 cities, 18 were in the south and 10 in the north. In each group there were five cities that had less than 50 percent of the dairies using mechanical refrigeration. Due to the fact that the ground water is much colder in the northern states and can be used as a satisfactory cooling medium, it would seem logical to find less mechanical cooling on dairy farms in that region. It would seem, however, that if production were on a large scale, powered pumping equipment would be a necessity since a vast quantity of water would be required for cooling purposes.

COST OF REFRIGERATION

Very few health departments had definite information on the cost of electrical refrigeration. Figures which were submitted varied from 6 cents to 12 cents per hundred pounds of milk. All agreed that this method of cooling was much cheaper than the use of ice.

The final cost of cooling milk by this method would depend upon several factors, such as, the original cost of the equipment, the number of years used before replacement, the cost of yearly maintenance, the cost of electricity, and the average daily amount of milk cooled by the unit.

The Memphis Health Department has estimated that the average life of a commercial cooling unit is 10 years. This being true, the yearly depreciation which should be charged is approximately $36, or, $3 a month. In addition to this, the average yearly repair bill is $12, or, $1 a month. This constitutes a monthly fixed charge of $4.

The cost of power for operation of the unit varies in different communities. Meters have been placed on cooling units throughout the territory in an effort to obtain some idea as to the cost of cooling milk by this means. The following are examples:

A. *Equipment powered by three-fourths horsepower motor.* (Tubular aerator is used in connection with the cabinet.)

Amount of milk cooled for the thirty day period, 14,700 pounds.

Unit operated 152 kilowatt hours for thirty day period.

Rate of power:

3¢ per kilowatt hour for first 250 hours.
2¢ per kilowatt hour for next 750 hours.
1¢ per kilowatt hour for next 1,000 hours.
8/10¢ per kilowatt hour for next 2,000 hours.

These rates are subject to a fifteen percent additional surcharge.

Power charge for thirty day period... $5.26
Fixed charge depreciation and repair.. $4.00
Total $9.26
Cost per hundred pounds of milk.. 6.3 cents

B. *Equipment powered by three-fourths horsepower motor.*

Amount of milk cooled for thirty day period, 15,200 pounds.

Unit operated 210 kilowatt hours for the thirty day period.

Rate of power:

10¢ per kilowatt hour for first fifteen hours.
3¾¢ per kilowatt hour for next 129 hours.
3¢ per kilowatt hour for next 80 hours.
1½¢ per kilowatt hour for all over this amount.

Power charge for thirty day period.. $8.44
Fixed charge depreciation and repair.. $4.00
Total $12.44
Cost per hundred pounds of milk.. 8.2 cents

C. *Gasoline powered.* Equipment consisted of three-fourths horsepower compressor operated by 1½ horsepower gasoline engine.

Amount of milk cooled for thirty day period, 15,500 pounds.

Average operating time, 4 hours per day.

Cost of operation (1 gallon gasoline daily, 20 cents):

For thirty day period..... $6.00
Fixed charge depreciation and repairs $4.25
Total $10.25
Cost per hundred pounds of milk.. 6.6 cents

These figures are for the first year of gasoline motor operation and compare very favorably with the cost of electrically operated units. However, by the end of the second year the efficiency of the engine had decreased to a point where 2 gallons of gasoline were required for a 24 hour period. This increased the cost of cooling a hundred pounds of milk from 6.6 cents to 10.3 cents. In addition to this, the gasoline-powered unit requires a great deal more attention on the part of the dairyman. These were all 8 can cabinets of the wet type. Cabinet "A" is a concrete insulated vat; cabinet "B" is a commercial vat, while cabinet "C" was the vat which was constructed in 1933 for experimental purposes. It is not our intention to imply that the concrete type of cabinet was more efficient than the commercial cabinet. There were at least two factors which operated to the advantage of this cabinet. First, the fact that a tubular cooler was used, and second a lower rate for the electric energy used.

The Agricultural Engineering Department of Kansas State College made a survey of the graded milk sheds of Kansas during the summer of 1939 and arrived at an average cooling cost per hundred pounds of milk of 9 cents for wet storage, and 12.72 cents for dry storage. The average cost of electrical energy was 3 cents per kilowatt hour. It has not been possible to review this report in order to ascertain what factors are accounted for. Our study was undoubtedly not nearly as complete and may account for the fact that the average cost of cooling arrived at was somewhat lower.

Ten years may be too long a period to allow in which to charge off the original cost of the unit. There have been replacements made in less time than that. However, it was thought

that necessity for these changes had been brought about by carelessness on the part of the dairymen. The cabinets have in many instances been set directly on the floor. This permits dampness to collect and in time destroys the outer lining of the cabinet with the result that the insulation becomes wet. Another practice which caused replacements earlier than otherwise might have been necessary is that of dropping the full cans of milk on the upper edge of the cabinet thus destroying the outer lining. In a few instances through carelessness the water in the cabinet has frozen during the winter months causing the sides of the cabinet to bulge. There are units in our shed that apparently will give satisfactory service for a ten year period.

The amount of milk handled through the unit will have some bearing on the cost of cooling. The dairies on which we have reported observations were using 8 can outfits and were producing approximately 60 gallons of milk daily. If smaller quantities of milk, for instance 30 gallons daily, had been handled by these units, the cooling costs would naturally have been higher per hundred pounds of milk. The electric units have been operated efficiently as is evidenced by the fact that the milk from both dairies have had average daily temperatures of less than 50° F. for the last grading period. The gasoline-powered unit was changed over to electric operation in 1938.

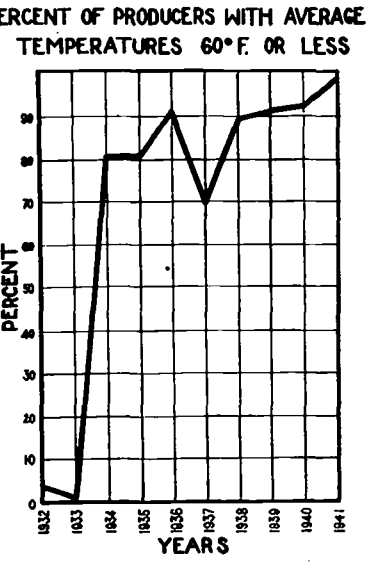
EFFECT ON QUALITY

All health officers replying to the questionnaire were in agreement that electrical refrigeration had resulted in a substantial improvement in the quality of the milk supplies. Our observations are that the installation of efficient cooling equipment at the farm reduces the necessity for rejecting milk because of high temperature. At the same time rejections due to off-flavors have been reduced to a minimum.

In an effort to show the effect of mechanical refrigeration on the Memphis milk supply, a study has been made of the delivery temperatures and bacteria counts of the producer dairies for the past ten years. These temperatures and bacteria counts are the only recorded evidence whereby the trend in the quality of the milk can be indicated with respect to the use of efficient cooling equipment.

Chart No. 1 shows the percentage

CHART 1

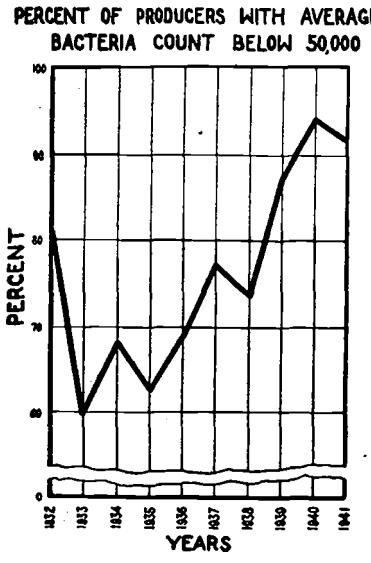


of the producers for each year with an average temperature of 60° F. or less for the first six months grading period of the year. It is interesting to note that during 1932 only 3.8 percent of the dairies had average cooling temperatures within this limit, and in the following year only 0.2 percent complied. The reason that attention was directed to mechanical cooling during the year 1933, however, was the fact that during these years a high percentage of the dairies had average delivery temperatures in excess of 70° F. For the first grading period of 1932, 30.1 percent of the dairies exceeded this limit and for the same period in 1933, 63.2 percent of the dairies were

in excess of it. Following the strict enforcement of the cooling requirement, the percentage of dairies exceeding the limit of 70° F. dropped to 2.3 percent in 1934 and 0.9 percent in 1935. Since that time no dairies have had average temperatures in excess of this limit. A rapid improvement was indicated for the year of 1934. The improvement has been gradual since then with exception of 1937 for which we have not been able to account. For the first grading period of 1941, 98.2 percent of the dairies had average delivery temperatures of 60° F. or less.

Chart No. 2 shows the percentage

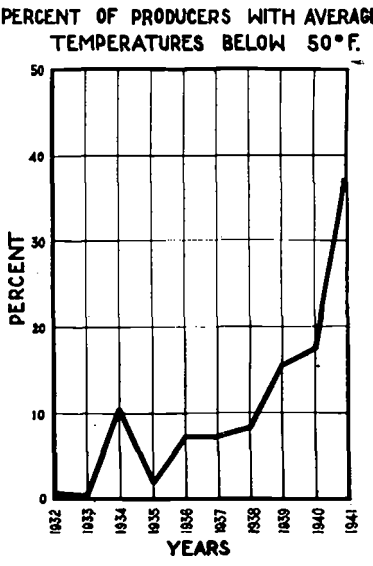
CHART 2



of producers by years with average bacteria counts of 50,000 per cubic milliliter or less for the first six months grading period of each year as computed by the logarithmic method. Of particular interest is the fact that even though a large percentage of the dairies exceeded the temperature standard of 70° F. during the first two years shown on the chart, approximately 80 percent of these dairies had bacteria counts of 50,000 per cubic milliliter or less for the first grading period of 1932, and 60 percent during the same period of 1933. The increase in the percentage of producers with average bacteria counts of 50,000 per cubic milliliter or less has been gradual. Ninety-two percent of the dairies had average bacteria counts falling within this limit for the first six months grading period of 1941.

Charts Nos. 3 and 4 show the per-

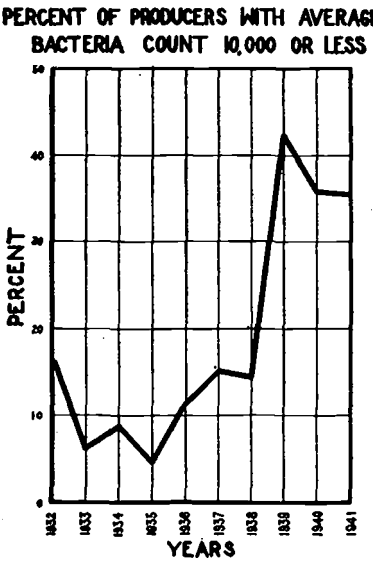
CHART 3



centage of producers by years with average temperatures of 50° F. or less and average bacteria counts of 10,000 per cubic milliliter or less for the first six months grading period of each year. We do not wish to convey the idea that the Memphis Health Department attaches an undue amount of significance to bacteria counts. These charts merely indicate that there is a correlation between effective and immediate cooling and low bacteria counts.

It cannot, however, be expected that a satisfactory milk supply can be obtained merely by the use of adequate cooling equipment, nor is a low bacteria count ample evidence that milk has been produced under approved conditions. Other physical equipment

CHART 4



and also the methods under which the milk is produced and handled must be in balance.

An effort has been made to keep all phases of the program up to reasonable standards. During the past three years 70 percent of the dairies selling milk to pasteurization plants have been housed in new buildings. These barns and milk houses have been built in accordance with plans prepared by the Health Department. Ninety-eight percent of this type of dairies have automatic water systems, and water is piped into the milk house and barn under pressure. All dairies are required to provide adequate water-heating facilities. Three compartment wash vats are a requirement and approximately 40 percent of the dairies have installed automatic chlorine dispensing devices.

Adequate cooling equipment is a necessity on the dairy farm which produces milk for bottling purposes. However, it is not possible to rely entirely upon this single factor of electrical refrigeration if a satisfactory quality of milk is to be produced. Other physical requirements must be on an equal, and at the same time the best known methods of sanitation must be practiced.

CONCLUSIONS

1. Some equipment for cooling of milk is necessary at dairies, especially in the south, if high quality milk for bottling is to be produced.
2. Mechanical refrigeration units powered by means of gasoline or electric motors have been used for this purpose.
3. Rural electrification programs have made current available at dairy farms, thus making it possible to obtain installation of electric operated equipment.
4. Electrical refrigeration has proven more effective and more economical than gasoline-motored equipment.
5. Of 28 cities replying to questionnaires, 18 reported that 50 percent or more of the dairies in their respective milk sheds use electrical refrigeration for cooling.
6. Estimates on the cost of electrical refrigeration vary in different localities but range between 6.6 cents to 12.72 cents per hundred pounds of milk.

Composition and Thiamin and Riboflavin Content of Defatted Milk Solids

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IN an effort to establish the uniformity of defatted milk solids with regard to some of the more important constituents, 32 samples of powder dried by the spray process during the spring of 1941 were analyzed for moisture, fat, protein, lactose, ash, calcium, and phosphorus. In order to observe possible relationship to the riboflavin and thiamin content, these important vitamins were also determined on the samples. The samples were chosen only with regard to the locality of their origin out of the many that enter this laboratory for grading purposes. All of the samples used were "extra grade." It was hoped that a representation of the major milk-producing territories could be found. However, at the time the samples were taken, certain territories were not submitting samples, and so there are some discrepancies in representation. We feel the data are nevertheless significant.

The available scientific literature is lacking in recent studies on the analysis of defatted milk solids with respect to these nutritionally important factors.

Hunziker (1) and Davies (2) list composition data of milk powders and more recently Lampitt, Bushell, and Filmer (3), Jephcott (4) and Supplee (5).

EXPERIMENTAL

Moisture was determined by the toluol distillation method of Bidwell and Sterling (6). The modified Roese-Gottlieb or Mojonnier method (7) was employed for fat determinations. Official A.O.A.C. methods (8) were used on protein (a), lactose (b), ash (c), and calcium (d). The calcium was run on the residue from the ash determination.

Phosphorus was determined by the phospho-molybdate colorimetric procedure on a sample prepared by the wet-ashing technique as follows: 0.1 gram of material is weighed into a 50 ml. beaker; 15 ml. of concentrated HNO_3 and a few boiling beads are added, the mixture is covered with a watch glass, and digested over a low flame in a hood until complete solution is effected and most of the first fumes are removed. Two and one-half ml. of perchloric acid (70 percent to 72 percent) are added, and gentle boiling continued until the solution is clear and colorless. After the addition of 5 ml. of sulfuric acid (1 and 1), the solution is boiled until fumes cease coming off. The solution is then cooled, the sides of the beaker washed down with as little water as possible, and the solution carefully neutralized with 25 per cent NaOH. One drop of H_2SO_4 (1 and 1) is added to make slightly acid, and the solution transferred quantitatively to a 100 ml. volumetric flask and diluted to volume. A 10 ml. aliquot of the diluted solution is pipetted into a 100 ml. volumetric flask, 4 ml. of molybdate-sulfuric acid solution are added (2½ percent ammonium molybdate in 10N H_2SO_4), the solution is made to volume, and thoroughly mixed into a 150 ml. beaker. Into this solution, 1 ml. of fresh 2½ percent stannous chloride is stirred.

A standard solution is prepared by determining the phosphorus in a sample of milk ash gravimetrically (8-c), dissolving the ash, and diluting to give a concentration of 10 micrograms/ml. A suitable aliquot of this solution is treated with molybdate and stannous chloride along with the unknown sample. The standard and unknown are compared immediately in a visual colorimeter and calculated in the usual manner. If a photo-electric colorimeter is available a standard graph is prepared and values for the unknown read from it.

Riboflavin was assayed by the fluorometric procedure of Hodson and Norris (9) while thiamin was determined by a modified Hennessy and Cerecedo (10) procedure using 2 percent acetic acid as the extraction medium and by adjusting the pH to 4.5 with 2M sodium acetate, before the taka-diastase hydrolysis. Hydrolysis was carried out over night at 32° C.

Table 1 shows the mean percentage values for the different constituents listed by state. The number of samples analyzed from each state is also shown. At the bottom of the table, the mean of the 32 samples along with the maximum and minimum found for each constituent is also given. In Table 2 the mean riboflavin and thiamin results are tabulated by states with the maximum and minimum found in each state. Here also is listed the mean of all samples and the maximum and minimum for all samples.

The authors feel that Table 2 is of particular interest to nutrition workers inasmuch as the riboflavin and thiamin content is shown to be comparatively uniform over the states represented. Many attempts have been made to minimize the value of the riboflavin in defatted milk solids on the grounds that the variation in vitamin B_2 content was too great to warrant use of the products where substantial riboflavin contribution was desired. The variation here shown, 17.05–25.00 micrograms/gram with a mean of 20.93 micrograms/gram indicate that defatted milk solids is of comparatively uniform vitamin B_2 content.

TABLE 1

PERCENTAGE OF CONSTITUENTS LISTED BY STATES

State	Number of Samples	Mean Moisture %	Mean Fat %	Mean Protein (Nx6.38) %	Mean Lactose %	Mean Ash %	Mean Calcium %	Mean Phosphorus %
New York	4	3.71	0.92	34.29	52.57	8.31	1.37	1.00
Pennsylvania	4	3.58	1.00	34.49	52.03	7.95	1.35	1.02
Maryland	2	3.50	1.07	36.77	50.40	7.81	1.33	1.02
Virginia	1	3.40	0.71	36.80	51.00	7.95	1.30	1.00
Ohio	1	3.70	0.81	37.30	49.50	7.67	1.30	1.07
Indiana	3	3.60	0.68	36.62	49.80	7.95	1.39	1.02
Illinois	1	3.90	0.78	37.00	50.35	7.91	1.30	1.00
Wisconsin	3	3.03	0.78	35.24	53.00	8.04	1.32	1.02
Minnesota	2	3.30	1.07	34.35	51.50	8.11	1.28	1.02
Missouri	1	2.90	0.59	35.19	49.40	7.84	1.31	0.97
California	5	3.42	0.71	35.79	50.06	8.09	1.29	1.02
Oregon	2	3.50	0.79	36.03	50.98	7.91	1.33	1.04
Washington	3	3.27	0.90	34.97	51.87	8.09	1.30	1.01
Mean of all samples	32	3.46	0.81	35.45	51.34	8.03	1.31	1.02
Maximum of all samples	32	3.90	1.24	37.90	53.80	8.34	1.40	1.07
Minimum of all samples	32	2.50	0.47	33.79	47.80	7.67	1.26	0.97

TABLE 2

CONTENT OF RIBOFLAVIN AND THIAMIN LISTED BY STATES

State	No. samples analyzed	Mean Riboflavin Content Micrograms	Maximum Found Micrograms	Minimum Found Micrograms	Mean Thiamin Content Micrograms	Maximum Found Micrograms	Minimum Found Micrograms
		Gram	Gram	Gram	Gram	Gram	Gram
New York	4	19.71	22.03	17.05	3.51	3.85	3.15
Pennsylvania	4	21.28	22.50	18.70	3.75	4.00	3.30
Maryland	2	20.75	22.00	19.50	3.44	3.65	3.22
Virginia	1	20.05	.....	.....	3.21	....	....
Ohio	1	19.60	.....	.....	3.67	.....	....
Indiana	3	22.63	24.00	21.75	3.24	3.57	3.00
Illinois	1	18.80	.....	.....	3.08	....	....
Wisconsin	3	22.53	25.00	19.50	3.33	3.85	3.07
Minnesota	2	21.00	21.50	20.50	3.49	3.63	3.34
Missouri	1	21.95	.....	.....	3.72	....	....
California	5	20.78	22.50	18.55	3.80	4.15	3.43
Oregon	2	19.18	19.43	18.93	3.85	3.92	3.78
Washington	3	21.23	21.30	21.15	3.80	3.90	3.74
Mean of all samples...	32	20.93	25.00	17.05	3.57	4.15	3.00

In neither the composition work nor in the vitamin study can any significant correlation be shown between the values and the geographic origin of the sample. However, the inadequacies of representation and the many other factors such as breed of herd, climatic conditions with their effect on pasturage, and some difference in drying operation may mask possible geographic variation.

Furthermore the vitamin content seems to have no correlation to the composition of the sample. Here again the factors above mentioned enter in, and relative variations may be masked by them.

SUMMARY

Thirty-two samples of defatted milk solids representing the major milk-producing states during the spring of 1941 have been analyzed for moisture, fat, protein, lactose, ash, calcium, and phosphorus, and assayed for thiamin and riboflavin. No relationship was found between the composition and the vitamin content or between the geographic origin of the sample and its composition of vitamin content. It is pointed out that the riboflavin content over the states represented is uniformly sufficiently high to constitute a good source of the vitamin for nutritional purposes.

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Report of the Committee on Communicable Diseases Affecting Man*

THE major part of the discussion in this report relates to the United States Public Health Service annual reports of milkborne outbreaks of communicable disease and their contents. These reports are very valuable, being the most dependable and, for most of us, practically the only source of the information they contain. In the course of our discussion, some suggestions will be offered as to possible ways of making them more valuable.

The latest report available is for 1939. This shows a total of 27 outbreaks attributed to fluid milk and cream. We are omitting from consideration, at this point, outbreaks attributed to milk products. These will be considered by themselves. Also omitted are one outbreak of undulant fever; two in which neither the name of the disease nor the means by which the milk was supposed to have been contaminated were stated; one bearing a notation: "milk or cream suspected"; and a so-called "outbreak" consisting of one case of gastroenteritis. With these reservations, the outbreaks listed for 1939 were typhoid fever, 4; paratyphoid, 1; scarlet fever and septic sore throat, together, 9; bacillary dysentery, 2; and gastroenteritis, either under this head or under the head of food poisoning, 11.

Of greatest interest, being more comprehensive, are the figures for the five-year period 1935–1939, inclusive. The total number of outbreaks traced to fluid milk and cream was 175. Omissions are made on the same basis as described for 1939. These include several "outbreaks" of one case each. Listing the diseases in the order of the number of outbreaks of each, scarlet fever and septic sore throat combined come first with a total of 68 outbreaks. Of these, 37 were listed as scarlet fever, 30 as septic sore throat, and one as scarlet fever and septic sore throat.

We have combined scarlet fever and septic sore throat because epidemiologically, bacteriologically, and clinically they are practically the same disease, the only difference between them being in the occurrence of the skin eruption. This is illustrated in the outbreak reported as "scarlet fever and septic sore throat," in which all of the cases presumably came from the same original infection. As is now well known, it is not unusual, in extensive outbreaks, to have cases which are clinically scarlet fever; others which, by themselves, would be called septic sore throat; and still others of erysipelas, all, in each outbreak, resulting from the infection of one bovine udder with hemolytic streptococci from the throat or infected wound of one milker. It would seem more logical, in the light of our present knowledge, to classify these outbreaks under the general head of hemolytic streptococcus infection.

Reverting to the five-year study, typhoid fever came next with 62 outbreaks. Then follow gastroenteritis, under various names, 36; bacillary dysentery, 5; paratyphoid, 3; and diphtheria, 1.

Quite evidently the two most important conditions, so far as milkborne

* Presented at the Annual Meeting of the International Association of Milk Sanitarians at Tulsa, Oklahoma, October 28, 1941.

infection is concerned, are typhoid fever and streptococcus infection. Typhoid fever involves a longer illness and greater danger to life. On the other hand a hemolytic streptococcus infection, although the acute illness ordinarily lasts but a few days and the fatality rate is only about a third that of typhoid fever (about 4 deaths per hundred cases as compared with 11 or 12 for typhoid) there is always the possibility of serious complications. The number of cases involved in outbreaks of streptococcus infection, speaking generally, are very much greater. Of the 62 typhoid outbreaks, in only one was the number of cases 50 or more (125 cases in one outbreak), whereas in 43 percent of the streptococcus outbreaks the number of cases ran from 50 to several hundred.

Viewing the distribution of outbreaks in this period by states, 8 states having, roughly, about 33 percent of the population of the United States, had about 65 percent of the outbreaks. The states reporting the largest number of outbreaks were New York, with 41, and California, with 20. However, when the number of outbreaks is computed on the basis of the number per 100,000 of population in the states, we get a somewhat different view of the picture. The states reporting the largest number in proportion to their population are:

Vermont	0.6	per	100,000
North Dakota	0.5	"	"
Oklahoma	0.4	"	"
California	0.3	"	"
Connecticut	0.3	"	"
New York	0.3	"	"
Virginia	0.3	"	"
Wisconsin	0.3	"	"

Comparing these figures with those for the preceding five-year period (1930–1934) it is interesting to note that each of these states, with the exception of Connecticut, reported more outbreaks in the later than in the earlier period. Connecticut reported the same number (5) in each period. The largest proportionate increases were for Oklahoma, North Dakota, Virginia, and California. There was a marked increase, also, for Illinois which, however, had less in proportion to its population than the others mentioned.

If time and available data permitted, an analysis of the factors entering into these increases and the relative variations in them would be of interest. In general it seems reasonable to assume that, at least in some measure, the increases indicated increasing proficiency in discovering and investigating outbreaks.

On the other side of the picture, still comparing the later with the earlier period, there were some sharp declines in number of outbreaks reported. The most striking was for Massachusetts, which reported 10 outbreaks for the first period and none for the later. Others were Indiana, which dropped from 12 to 5; Texas, 9 to 3; Kansas, 9 to 2; Iowa, 9 to 3; Maine, 5 to 1; and Missouri, 6 to 3.

A study was made of outbreaks reported for 1937, 1938, and 1939 with reference to the size of communities in which outbreaks occurred. The total number of outbreaks was 95. Of these about 35 percent occurred in places of 2000 or less; about 56 percent in places of 5000 or less; 82 percent in places of 25,000 or less. In general this probably follows the usual pattern: most of the epidemics occurring in the smaller places having smaller proportions of pasteurized milk.

Mr. C. S. Leete, in a paper presented before the New York State Association of Milk Sanitarians at Buffalo in September, reported interesting results from an analysis, along similar lines, of milkborne outbreaks in New York State. He found that half of the population of the State was in cities and incorporated villages with populations of 12,400 or more, the other half in townships and in cities and villages having populations

under this figure. He then made an arbitrary classification of the communities of the State into urban and rural: the urban being the cities and incorporated villages with populations of 12,400 or more, the rural being all not in the urban category. On this basis he classified the outbreaks occurring during two periods as occurring in urban or rural areas. The earlier period was one of 12 years: 1917–1928, inclusive; the later, 11 years: 1929–1939, inclusive. He found that in the earlier period twice as many outbreaks occurred in rural as in urban areas; in the later period sixteen times as many. This seems quite clearly to reflect the relatively greater increase in the proportions of pasteurized milk in the larger places.

MILK PRODUCTS

The Public Health Service report for 1935 was the first in which outbreaks attributable to milk products were included in the heading. Such outbreaks have been included since. Thus reports for five years, 1935–1939, inclusive, are available for study. Five outbreaks of gastroenteritis (under various names) were attributed to milk products in 1935; eight in 1937; three of gastroenteritis and one of septic sore throat in 1938; six of gastroenteritis (including food poisoning), one of paratyphoid fever, and one of typhoid in 1939: a total of 25 outbreaks in the five years. Omitted from consideration was an "outbreak" of one case and two in which ice cream was reported as suspected but without explanation.

In this connection, in comparatively few of the outbreaks concerning which information other than that contained in the tabulation was given, could the evidence as summarized in the reports be considered entirely adequate to serve as a basis of the determinations reported. In some instances there were no explanatory statements. Nevertheless wherever there was a direct statement of the responsibility of the milk product and even when it was stated to have *probably* been responsible, these outbreaks have been included, even though in some instances there were serious doubts as to the justification for including them. There would seem to be no justification, however, for charging to milk products outbreaks in which the products were merely suspected and proof was lacking.

A majority of the outbreaks, or 13, were charged to ice cream. It was homemade in 6 instances and there was no information as to the source in 4. Of the other three outbreaks, in one instance the ice cream was bought from a Mexican street vendor; in one the product was bought for fifteen cents a quart; in the third instance, samples of the ice cream consumed were not obtained for bacteriological examination but examination of a sample from the "factory" gave negative results.

Cheese was held responsible for 8 outbreaks, cottage or cream cheese for 2, and buttermilk for 2.

On the basis of this whole study, several constructive criticisms and suggestions for improving the Public Health Service reports and making them more valuable are offered. They are presented under several headings.

Completeness. That the reports probably are very incomplete is now quite generally recognized. In an earlier report of this Committee, the suggestion was made that the Public Health Service consider making studies in selected states reporting practically no outbreaks, with a view to determining whether outbreaks actually were occurring. This suggestion will bear repeating. Such studies would tend to stimulate investigation and reporting of outbreaks and to make the Public Health Service reports more dependable. More important. however, than the completeness of the reports is the fact that unless outbreaks are discovered and traced to their sources, they are not controlled and the public health suffers as a result.

Accuracy. On the other side of

the picture is the fact that it would appear that at least some outbreaks are charged to milk and milk products on insufficient evidence. If this is so, the reports are, in this respect, misleading.

Classification and Arrangement. So-called "outbreaks" consisting of one case each, we believe, should not be included in the reports, for reasons which seem obvious. The inclusion of several of these suggests the desirability of adopting a practical working definition of the term "outbreak." Until something better is devised, we suggest that these terms be used to apply to two or more cases of a disease, distributed in two or more families or households.

We have referred to outbreaks of gastroenteritis reported "under various names." The terms used were gastroenteritis, enteritis, food poisoning, and diarrhea. It would seem very desirable to reach an agreement on one general term under which these outbreaks would be grouped. Since in the reports, generally speaking, outbreaks are classified according to the disease or physical condition involved (typhoid fever, diphtheria, etc.) and since gastroenteritis is the condition from which the victims of these outbreaks suffer, it is suggested that this term be used. It goes without saying that where the causative agent is known—as for example *Staphylococcus aureus* toxin—it should be indicated, as at present, somewhere in the report.

It is suggested, also, that consideration be given to the desirability of listing scarlet fever and septic sore throat under the general head of hemolytic streptococcus infection, indicating elsewhere in the report when the cases are of the "scarlet fever" type or characterized by sore throat without eruption.

Finally, it is suggested that, as a matter of convenience of those using the reports, first, that the diseases appearing in outbreaks be listed in the same order in the reports from year to year; also (this, of course, is of minor importance) that when the sheets are stapled together, the stapling always be on the same side.

It remains now only to correct an error made inadvertently in the Committee's Report of last year. On the subject of poliomyelitis we said: "There seems to be but one epidemic of this disease described in print as being milkborne." This referred to an account, published by Godfrey and others in 1926, of an outbreak in Cortland County, New York. Our attention was called, later, to an earlier outbreak in New York State and two, subsequently, in Europe. Dr. John C. Dingham, Health Officer of Spring Valley, N. Y. in 1916 (New York State Journal of Medicine, December, 1916) published an account of an outbreak of 7 cases "possibly milkborne." Study of the evidence presented indicates that the outbreak was *probably* milkborne. Dr. Lloyd W. Aycock, of Harvard University, in published papers, referred to an outbreak of 10 cases "probably milkborne," in Sweden in 1905 and another of 62 cases described as "milkborne," in Broadstairs, England, in 1926.

Respectfully submitted

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APPENDIX *

Mr. Fuchs subscribed to this report with certain reservations which are expressed in the following quotation from his letter of October 18th to the Chairman of the Committee:

"Considerable thought and discussion has been devoted to the question of how few cases constitute an out-

break. . . . It is immaterial whether 1 case or 100 cases were involved, as the number is entirely a matter of chance. There is no more logic or principle in restricting the term 'outbreak' to 2 cases than to 3 cases, or 4, or any other arbitrary figure. Even if a single person contracts a disease from drinking raw milk, the situation may differ quantitatively but is identically the same qualitatively as an outbreak involving multiple cases."

FINAL REPORT ON MILKBORNE SEPTIC SORE THROAT OUTBREAK IN SUFFOLK COUNTY *

Health News † recently published a preliminary account of an outbreak of septic sore throat which occurred early in December, 1941, in a community in Suffolk County and which was attributed to the consumption of raw milk. All the persons affected were patrons of one milk producer and dealer who sold the greater part of his supply as raw milk and had the remainder pasteurized before selling it. Only those who drank the raw milk became ill, while those who consumed solely the pasteurized milk remained well.

On further investigation it was found that a milk handler was suffering from sore throat on November 15, the day on which he was first employed on the dairy farm. This was nine days before the beginning of the outbreak. The severity of his illness increased but in spite of this, he carried on his daily duties which included cleaning the cattle before milking, transporting milk utensils and cans of milk between the cow barn and bottling plant, helping to cool the raw milk at night, washing bottles and assisting in bottling the milk.

About November 17 one of the cows in the milking herd sustained an udder injury. On November 20, inflammation of one-quarter of the udder was observed and the milk handler, whose sore throat was now at its worst, was assigned the task of taking care of the injury.

Strains of hemolytic streptococci belonging to Lancefield serologic group A, which is the group usually associated with human infections, were isolated by the State Laboratory from the milk of the injured cow, from throat cultures from the milk handler, and from a number of the patients. The cow was slaughtered on December 13 and hemolytic streptococci of the Lancefield group A were also isolated from the udder tissue. All of these strains of hemolytic streptococci were typed and found to belong to a single serologic type.

* *Health News*, N. Y. State Dept. Health, Albany, Feb. 9, 1942.
† Septic Sore Throat Outbreak Traced to Raw Milk, *Health News*, December 22, 1941, p. 206.

The Use of Laboratory Pasteurization in Solving Milk Problems

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EVERYONE who is interested in regulating the quality of milk is continually finding samples which are bacteriologically unsatisfactory. These high bacteria counts indicate unsanitary practices which need to be corrected. When a milk control agency, supported by public funds, discovers milk showing a high bacteria count it is faced with two problems: First, how far should this agency go on the taxpayer's money in tracing the cause of the high count to its original source; and secondly, what procedure will correct the undesirable situation promptly and with minimum expense.

In Massachusetts public milk sanitation responsibility is divided by law between several agencies. The Department of Agriculture and the local boards of health in their own jurisdictions are responsible for inspection of dairy barns and licensing of dairies. The Department of Agriculture is obliged by law to accept the approval of local Boards of Health in this matter. The Massachusetts Department of Public Health and local milk inspectors enforce the milk grades and investigate the quality of milk sold to the consumer.

The starting point of the State Health Department investigation is usually a collection of samples taken unexpectedly from the retail dealer as he is about to deliver to the consumer. If our examination of these samples shows a high standard plate count for the designated grade and if the retail dealer is equipped to track down the cause of his trouble, the State may reasonably expect him to do so. We have all met the milk dealer who is only too glad to let the milk inspector assume the responsibility for the sanitary quality of his milk.

There are, however, many pasteurizing plant owners who make a strenuous effort to process clean milk and who from time to time find themselves in need of help from the State to locate the cause of their high counts. It is in such cases that laboratory pasteurization coupled with standard plate counts before and after pasteurizing has helped us successfully to find the cause of the trouble.

In investigating a poor milk supply, the inspector takes samples separately from the milk of each producer at the pasteurizing plant. More information can be gained if these samples are taken from separate cans, but where the number of producers is large it may be necessary to take from the dump tank composite samples of each producer. Composite samples are also taken from the pasteurizing vat before heating, after heating, and from each available place in the line during the drawing off process. Upon return to the laboratory a portion is removed from each sample tube for a standard plate count, and the tubes are then placed in a thermo-regulated water bath at 142° for 30 minutes. The tubes are cooled, and second portions removed for standard plate counts.

By a consideration of these before-and-after plate counts, it is often possible not only to tell which producer is responsible for the high count in the bottle of pasteurized milk but also to venture an intelligent guess as to whether the trouble on the farm is caused by poor cooling or by dirty utensils. In the event of poor cooling, a very high count before pasteurizing may be surprisingly low after heating. In the case of hay dust or dirty utensils, notably dirty milking machines, the count before pasteurization may not be high enough to indicate the source of the trouble especially in a composite sample, but a poor reduction in count is often found upon laboratory pasteurizing.

A good cleancut illustration is found in the results of an investigation listed

TABLE 1

Sample Taken from	*Standard Plate Count* Before Lab. Past.	After Lab. Past.
Producer No. 1.....	24,000	100
Producer No. 2.....	1,100,000	1,000,000
	3,000	200
	8,000	200
Producer No. 3.....	24,000	300
	82,000	100
Producer No. 4.....	7,000	200
	14,000	100
Producer No. 5.....	10,000	400
	7,000	300
	52,000	1,000
	7,000	300
	4,000	100
	7,000	200
Vat cold	320,000	294,000
Vat heated to 142°....	290,000	304,000
Vat after 30 min. holding period	236,000	
Below cooler	231,000	
Bottle of finished product	236,000	

in Table 1. The data clearly show that the trouble was caused by heat resistant organisms. Inasmuch as the sample from the cold vat pasteurized in the laboratory showed a count of 294,000 as compared with a count of 236,000 when pasteurized in the plant, the plant equipment can be assumed to be clean. The source of the heat resistant organisms is quite apparently producer No. 2. The findings were communicated to the city inspector who visited the farm and found the expected dirty milking machines.

In the above case producer No. 2 would have been suspected from the results of the counts before pasteurization alone, but Table 2 shows the

TABLE 2

Sample Taken from	*Standard Plate Count* Before Lab. Past.	After Lab. Past.
Producer A	27,000	6,900
	22,000	500
Producer B	490,000	900
Producer C	6,000	200
Producer X	290,000	163,000
	114,000	95,000
	150,000	85,000
Producer D	870,000	3,300
Producer E	400,000	27,000
	106,000	30,600
Producer F	25,000	3,900
Producer G	620,000	19,000
Mixed cold milk before clarifying	250,000	204,000
Mixed cold milk after clarifying	260,000	181,000
Cold vat	520,000	110,000
Vat heated to 142°....	166,000	
Vat held 15 min.....	102,000	
Vat held 30 min.....	91,000	
Below cooler	76,000	
From bottle	89,000	

data from an investigation where the true cause of the trouble was not apparent until the procedure of laboratory pasteurization was applied. The milk plant where this investigation took place in April, 1940, had a record of intermittant high counts since 1938. During that two years, plate counts were made on 38 bottles of milk from this plant and counts above 40,000 found on 22 samples. Five sets of producer samples were made during this period without laboratory pasteurization. Producer X showed average raw counts of 449,000, 350,000,

320,000, 3,840,000, and 242,000. The fourth and fifth sets of samples were close together in matter of time so that we believed the producer had cleaned up after the fourth sample. During this period the plant owner was called in for four hearings involving high bacteria counts and prosecuted once in connection with a positive phosphatase test.

In April, 1940, we made the investigation shown in Table 2. The counts after pasteurizing show that the heat resistant organisms got into the plant's supply through the milk from Producer X. Accompanied by the city inspector, we visited the farm in question. The milking machine was found coated with yellow deposit both in the valves and inside of the tubing. The tubing itself was rotten. The local inspector promptly excluded from sale the milk from this farm until the machines were thoroughly cleaned and equipped with new rubber parts. Since then we have collected 16 samples of bottled milk from this plant, 15 of which showed counts below 40,000, the geometric mean of which was 11,700.

In another case we were investigating a Grade A supply that persistently showed counts greater than 10,000 after pasteurization. At this farm the milking machines and utensils were free from visible dirt although the rubber tubes were not new. Thinking we might find an udder infection, the inspector went to the farm and took separate samples from each cow. During the milking, the inspector asked the milker to milk a couple of cows by hand. The results shown in Table 3 quite clearly indicate that the cause of the trouble was the milking machine. An interesting point to note is that the first milk through the machine washed out the accumulation of bacteria. When samples are taken from individual cans of milk brought into a plant, is it not uncommon to find two or three cans showing a considerably higher count than the balance of the supply. If these high counts are not properly reduced by laboratory pasteurization, it is probable that these cans represent the first milk from dirty utensils of some sort. If, on the other hand, approximately half of the cans from a producer show high counts and if these counts are drastically reduced on laboratory pasteurization, it is probable that the trouble may be poor cooling and that the lower counts represent the milk from the more recent milking.

Laboratory pasteurizing will sometimes give the producers a clean bill of health and place the blame squarely on the pasteurizing plant operator. Table 4 shows the results of an investigation in a small pasteurizing plant. You will note that the producer samples all show a reasonably low count both before and after pasteuriza-

TABLE 3

FARM INVESTIGATION OF GRADE A SUPPLY

	Sample Taken from	*Standard Plate Count After Pasteurizing in Laboratory*
Cows Nos. 17–18	First cows milked by milking machine.....	33,000
Cow No. 15	Second filling of milking machine.....	30,000
Cows Nos. 13–14	Machine milked	10,600
Cows Nos. 11–12	Machine milked	15,000
Cow No. 2	Hand milked	200
Cow No. 1	Hand milked	700
Cow No. 10	Machine milked	3,800
Cows Nos. 7–8	Machine milked	7,700
Cows Nos. 5–6	Machine milked	6,900
Cows Nos. 3–4	Machine milked	6,900

TABLE 4

Sample Taken from	Standard Plate Count	
	Before Lab. Past.	After Lab. Past.
Producers Nos. 2-3 in vat on arrival of inspector	4,000	100
Producer No. 1	44,000	100
Producer No. 4	7,000	100
	76,000	900
	131,000	200
	6,000	700
	25,000	2,500
	18,000	300
Producer No. 5	6,000	800
	11,000	400
	11,000	600
	6,000	200
	28,000	2,100
Producer No. 6 (not included in vat)	18,000	600
	27,000	300
	20,000	100
	4,000	400
	20,000	200
	20,000	300
No. 52 Composite in vat of Producers Nos. 1-5	43,000	100
Vat heated to 142° with agitation	34,000	800
Vat held 30 min.	7,500	
Below cooler	129,000	
From bottle	84,000	

tion in the laboratory. Sample No. 52, a composite sample from the vat serves as a check on the producers and eliminates them as a source of trouble. The milk was then agitated in the vat while it was being heated to 142°. In this instance there is practically no reduction, although ordinarily about 80 percent of the reduction in count takes place during the heating period. However, the laboratory pasteurization of the sample from the cold vat did not show the presence of heat resistant organisms in the milk from the farms. Therefore the source of contamination must have been in the vat. Note also that there is a considerable increase in count between the sample taken from the vat at the end of the holding period and the sample of the same milk after it had passed through the effluent piping and over the cooler. These samples were taken on February 3 of this year. The plates were counted on February 5. Late in the afternoon of February 5, after the plant had finished cleaning up, a sanitary inspection was made of the plant. The inspection report reads as follows: "Aluminum paddle in the vat badly pitted, very hard to sterilize." In connection with the cooler the report states: "Lines of yellow deposit in the crevices along the top part of the cooler. Most of the apparatus in first-class condition."

We would add that not all of our investigations are as clean cut and conclusive as those which have been chosen for the purpose of illustration, but that most of them have pointed to conditions that were verified by a subsequent physical inspection.

Chart 1 shows a summary of the reduction in standard plate count obtained by laboratory pasteurizing 1,465 samples of raw milk from individual producers. The series is arranged according to percentage reduction in count. Thus 3.96 percent of the total 1,465 samples showed greater than 99.8 percent reduction in count. In 50 percent of the series there occurred a reduction in standard plate count of 95 percent or more and that in 81 percent of the series the reduction in plate count was 80 percent or better.

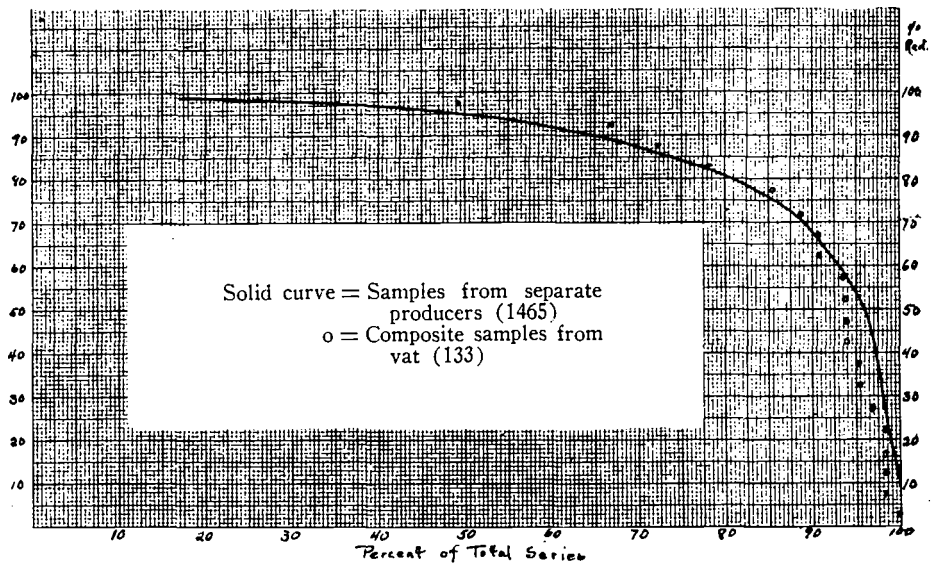
Chart 2 shows a comparison between the reduction in count of the milk in the vat at the end of the holding period and of the milk after it has been bottled. This decrease in efficiency between the vat and the bottle samples indicated contamination after pasteurization from unclean effluent pipe lines, coolers, bottles, etc. This contamination, although it is numerically not large, may be the most dangerous contamination from the viewpoint of public health.

A comparison of the plate counts of milk pasteurized in the laboratory under ideal conditions and the plate counts on the same milk pasteurized commercially shows that only a relatively small portion of the living bac-

Percent Reduction in Count

CHART NO. 1

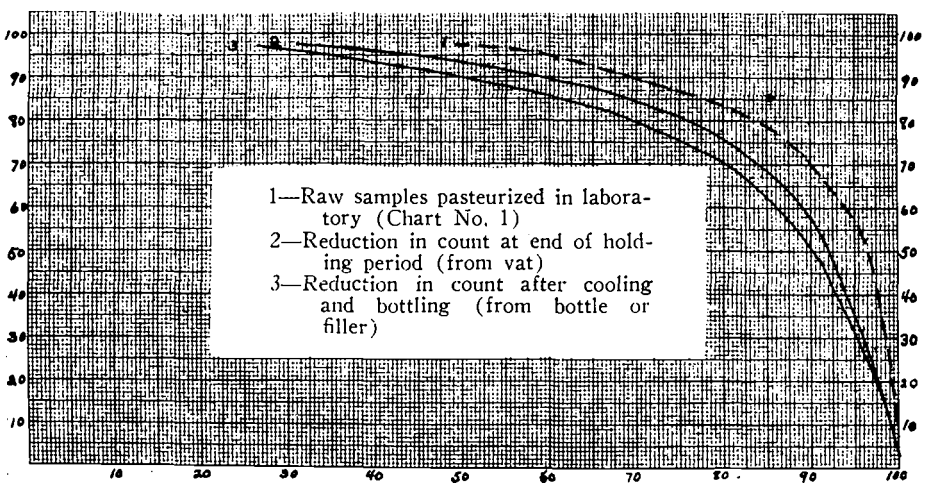
EFFICIENCY OF PASTEURIZATION



Percent Reduction in Count

CHART NO. 2

EFFICIENCY OF PASTEURIZATION



Percent of Total Series

teria found in bottled pasteurized milk can be attributed to poor conditions in pasteurizing plants. It would appear from a consideration of this data as a whole that the problem of improving the bacteriological quality of the milk sold in Massachusetts is largely one of improving the quality of the milk on the farm, but we must continue to maintain our present strict inspection of pasteurizing plants. In tracking down the source of bacteriological contamination, the procedure of laboratory pasteurization has been found to be very useful. It might be possible to reduce the labor involved in this procedure by substituting a smear for the plate count before laboratory pasteurization if one could accurately correlate a direct microscopic count with the subsequent plate count. We have, however, not tried this variation, preferring to have the two sets of plate counts for comparison.

COURSES FOR SANITARIANS

Courses of interest to milk and general food sanitarians will be inaugurated in the public health engineering section of the Department of Environmental Health in the newly organized School of Public Health, University of Michigan. These courses fall into two broad groups:

1. To familiarize all public health workers with the basic principles of sanitation, including such topics as water, milk, food, excreta disposal, rodent and insect control, industrial sanitation, rural sanitation, swimming pool sanitation, roadside and resort sanitation, milk sanitation, and others.

2. To train engineers with adequate background in sanitary science in local health department sanitary service, state health department service including consultation service to both city authorities and local health units.

These studies are intended to serve the needs of persons who are desirous of entering state, county, or municipal health organizations, as well as those already serving in such organizations who wish to broaden their basic training and knowledge in the field or to pursue intensive study toward specialization. For example, specialists in milk sanitation may become candidates for the degree of Master of Public Health.

Short courses of a practical nature are also being provided. The first of these has just been held, devoted to the needs of operators and owners of pasteurization plants. Others will be offered from time to time.

Information can be secured from the School of Public Health, University of Michigan, Ann Arbor, Mich.

The Department of Public Health at the Massachusetts Institute of Technology is offering an accelerated program of public health training beginning June 8 and allowing for the completion of a Master's Degree on February 6. These training programs are organized for public health engineers, health educators, and public health laboratorians, as well as for administrators. Special summer courses are also being offered. Information concerning these courses can be secured by writing to the Department of Public Health, M.I.T., Cambridge, Mass.

Report of The Committee on Dairy Farm Methods

THIS year's committee report recapitulates the fundamentals of dairy farm methods, or as they might be called dairy farm sanitation, rather than to discuss some particular practice or to offer something new. At the outset it should be recognized that dairy farming in different parts of Canada and the United States is practiced under a great variety of conditions and that consequently practices in various sections vary accordingly. In the colder provinces and states, cows may be stabled four months or more without being turned out, whereas in southern climates the barns may serve as places to milk the cows only, the animals being housed not at all. Thus sanitation is no doubt more difficult in northern than in southern climes.

Furthermore, in some milk sheds, as for instance, in Richmond, Virginia, and Jacksonville, Florida, milk is produced by farmers operating in barns and milk houses built according to approved standardized plans, and supplying milk in considerable volume. By contrast, in other milk sheds many small farmers have been encouraged to keep a few cows contributing a few cans of milk as a product incidental to general farming, from barns not designed primarily for dairying. Dairy farmers of the former class generally maintain good sanitation but those of the latter are apt to regard sanitation lightly, and to practice it intermittently only to get by the inspector and so to have heir milk accepted.

The financial status of the dairyman has a direct bearing on sanitation. Those who own their farms are usually willing to make reasonable sanitary improvements and are anxious to have high sanitary rating, but the renter is in a predicament which commonly makes the maintenance of good sanitation impossible. Since he does not own the farm, he naturally will not spend his money on another's property his tenancy of which is insecure, and his landlord, who may be a retired farmer or a city dweller, shortsightedly enough, takes the attitude that the property is rented "as is" and will do nothing to improve sanitation. There are milk-producing areas that are wholly of this complexion; they have been inspected time and again, each time at considerable expense without visible improvement resulting. Such areas often are limited to the production of cream but there seems to be no valid reason for accepting them as suitable for this purpose. Doubtless, if such farms were to be declared unfit for dairying, many owners would make the investment required to put them in good condition for commercial dairying.

Decidedly useful factors in improving dairy farm sanitation are those firms that spend money in bettering the dairy farm methods of their patrons. These efforts are highly commendable for they build morale, give dairymen better understanding of the firms' problems and of their own, and thus lead to the production of good milk.

Availability of electric power affects improved dairy farm methods for it makes possible the use of electrical refrigeration and power driven equipment of various sorts which reduces production costs, lightens the labor burden, and frees the dairyman to give time and thought to quality production. From these general observations we may proceed to discuss dairy farm methods germane to good sanitary dairying.

Two necessities on the dairy farm are: (1) an abundant supply of pure water, and (2) the safe disposal of human excreta. Wells usually are the source of water for the farm; they must be free from surface and underground pollution. Dug, drilled, bored, or driven wells, properly located, constructed and maintained, are the most reliable source of safe water for the average dairy farm. Pitcher pumps, pumps in disrepair, and pumps that require priming should be condemned, because the water from them is almost always contaminated. To secure adequate water pressure on some farms elevated wooden or iron tanks are used. They should always be tightly covered, and since in even the best built sand and microorganisms get in they should be cleaned out and chlorinated periodically. On others automatic water pressure systems have been installed; they should be chlorinated before being put in service.

Human fecal matter on dairy farms is generally disposed of in sanitary privies or in septic tanks, for both of which official designs are usually available. Both require vigilant inspection to keep them from becoming nuisances and menaces to the milk supply. No dairy farm inspection should be regarded as complete unless these conveniences have been inspected and approved.

When one thinks of dairying the herd, the pastures, and the dairy barn come to mind. The herd is of course the money maker of the business; it is under the care of the farmer and his veterinarian, and should be composed of healthy animals and high producing cows. The pasture should be well drained and should be well kept up. It should be a cow pasture for it is unwise to let hogs and other animals run with the herd.

The barn is the most prominent farm building; it is good advertising to place it where it will catch the eye of the passerby, provided it is not set in a huddle of delapidated sheds and shops, and is not in the midst of discarded implements and other unsightly trash. Barns should be large enough to house the herd without overcrowding; the type of barn adopted will depend on climatic conditions and on what seems sensible to the dairyman. In cold climates two-story barns are common, and feed is usually kept above the first story where cows are milked, in which case the ceiling above the cows should be tight. In barns of this kind where cows are housed for long periods good lighting and ventilation become important. Shed barns are usually easily lighted and ventilated, especially in warm climates where they are used merely for milking, all barns should have floors of concrete, or other impervious material, which should be sloped to drain promptly. Modern barns usually have concrete feed troughs and iron stanchions. The layout of the barn is important; it should be such as to be convenient and to minimize labor. It is true that clean milk may be produced in rather primitive barns, and some milk ordinances do not emphasize good barn construction, but experience has shown that clean milk, as a rule, will not be consistently produced in barns ill suited to dairying.

Important as is the dairy barn of itself, the operations carried on therein and in the milk house, are even more so. One of the things that every dairy farmer has to contend with is fly infestation which makes proper disposal of the manure important. The best practice is to haul it out daily and spread it on the fields; where farm conditions do not permit this it should be stored far from the barn in a place that is roofed and screened so that the manure will be protected from the elements, the cows cannot get to it, and the fly pest shall be minimized. The manure should be removed frequently enough to prevent development of fly maggots in it, or else it should be sprayed with borax to kill the maggots. H. G. Bailey, of Savanah,

Georgia, has reported to a member of the Committee that in South Africa dairymen pile manure on a cement platform four inches thick with a curb six inches high, which is completely surrounded by a concrete moat six inches deep which is filled with water kept from drying up by a constant trickle from the waterfaucet. As the maggots migrate from the manure pile to find earth in which to mature they perish in the moat. The only effective way of controlling the fly nuisance is by hunting the breeding places and destroying them. However thoroughly this may be done, some flies will hatch out and seek the milking barn; a helpful way of keeping down their number is to use a solution composed as follows: Cooper's cattle dip, one pint; good syrup, five quarts; water four gallons. This solution should be made up precisely. It is best used by sprinkling it lightly on the dry barn floors with a whisk broom after cleaning them, or by dipping dry gunny sacks into the solution and hanging them up in the barn where the flies can light and feed on them. The solution is poisonous, inasmuch as the Cooper's cattle dip contains arsenic, therefore, it should be kept out of the reach of children and small farm animals. The solution should not be sprayed on the cows. One member of the Committee (Layson) objects to the use of a poisonous product in connection with milk production.

The production of clean milk requires primarily, clean healthy cows, milked in a clean manner, into sanitized pails, poured into sanitized cans, cooled rapidly to 50° F. or less, and kept at this temperature until delivered. Thus, washing of the cow's udders, followed by a chlorine rinse is indicated. Milk stools should be kept clean and should be stored off the floor; metal stools are usually required except in cold climates. In certain dairy districts cows are required to be clipped to facilitate cleaning, and so to keep sediment out of the milk. Thus, R. L. Griffith, of Oakland, California, reports that on the West Coast professional clippers have been developed who may operate several crews during the clipping season and cover several hundred herds in a few weeks.

Milking is commonly done by hand. Milkers should be healthy; those who develop sore throats, diarrheas, or sores on the hands should be relieved of duty till rid of their ailment. Wet milking should be prohibited. It is advisable to have a vessel in the barn containing chlorinated water into which milkers should dip their hands at the beginning of milking and as the process proceeds. Milk should not be poured in the barn but should be carried to the milk house and poured there.

For various reasons, among which is shortage of farm labor, the use of milking machines has rapidly increased. It has brought problems in sanitation with it, both in its handling and in its care. The teat cups may be contaminated in use by careless handling in placing them on the udder, by dragging them over the barn floor and by similar insanitary practices. If the milk buckets are filled too full milk may be drawn into the pulsator with consequent pollution of the milk. The pipe connections of milking machines should be cleaned out every thirty days or oftener if necessary because milk may get into them and contaminate the milk in the milking unit, or it may interfere with the operation of the machine. The rubber parts of the machines should be renewed as often as they become cracked or porous, otherwise serious bacterial contamination of the milk will occur. Many operators are prone to delay the purchase of new rubber parts till ordered to do so by an inspector.

The cleaning of milking machines is most important and several Experiment Stations have issued bulletins telling how best to do it. Recently the unsatisfactory quality of machine drawn milk in the New York milk

shed has led the Public Health Committee of the Milk Research Council to give out instructions for the care of milking machines which are in part:

1. Rinsing and brushing of milk machines immediately after the last cow has been milked; rinsing and brushing the milking machine parts and pails with clean, cold water, using one 12-quart pailful for each unit.

2. Dismantling of milking machines: They should be disassambled sufficiently to thoroughly wash and brush with hot water all parts coming in contact with the milk, immediately after the rinsing and brushing with clean cold water process.

3. Reassemble and rinse with clean hot water, using six to eight quarts to each unit.

4. Sterilization: All milking machine pails and metal and rubber parts coming in contact with the milk must be sterilized by one of the following methods:

A. Hot water of a minimum temperature of 180° F., using six to eight quarts per unit.

B. Chlorine—200 parts per million. Discard solution in teat cups and milking machine tubes after each use.

C. Lye—0.04 or slightly less than one-half of one percent.

Lye—stock solution, 13 oz. to 1 gallon of water; use six ounces of the stock solution to one gallon of water. Discard solution in teat cups and milking machine tubes after each use.

5. Storage: The use of crocks or earthenware jars for storage of teat cups and milking machine tubes shall be discontinued. Dry storage—which means that all parts shall be drained and stored dry in a sanitary manner in the milk house—is recommended at all times. However, in spring, summer and fall the use of solution racks with proper strength lye or chlorine solution is permissible.

6. The milking machine shall be rinsed or flushed out immediately prior to use.

7. All rubber parts should be examined regularly to determine if they are porous, cracked or deteriorated, and if found in poor condition they shall be replaced immediately.

One member of the Committee (Johns) dissents from the requirement that the milker unit shall be disassembled each time it is used and says that his experience of fifteen years at the Central Experiment Farm, supported by that of numerous other investigations and producing farmers has proven that it is unnecessary. He holds that cleaning can be accomplished satisfactorily by the suction rinse method in much less time, and he holds it unjust to ask the dairy farmer to do the job in the hard way.

It is most important that milking machines be kept clean and sterile because thermoduric bacteria are prone to develop in milk that has passed through unclean milking machines; they are likely to survive pasteurization with consequent high bacterial content in the pasteurized milk. In fact, pasteurizing plants have had much trouble from these organisms derived from the milk of careless users of milking machines.

The foregoing discussion should not be held to impugn either the practicability or the usefullness of milking machines. It seems probable that they will be much more generally used than they now are. The discussion merely points out that like other machines they must be properly used and maintained if they are to function properly and give satisfaction.

It is of the utmost importance to have all milk utensils thoroughly cleaned and sterilized before use, otherwise prolific bacterial growths develop on their surfaces which heavily contaminate milk that comes in contact with them. Since bacteria grow only on moist surfaces, utensils should be dried promptly after washing.

The care of milk cans is important. In some places the cans are washed, sanitized, and dried at the milk plant and are delivered to the farmer who uses them without further treatment. In other places the milk plants are permitted only to rinse the cans and return them to the dairymen who are held responsible for cleaning and sanitizing them. Mr. M. E. Parker has done research on the use of steam rinse, acidified with gluconic acid. This rinse destroys very undesirable types of bacteria not destroyed by the use of alkaline cleansers, and it tends to eliminate milkstone deposits on the inside of milk cans. The principle seems about to be applied in a large

way. It is amazing how commonly the care of milk cans is neglected, for all the precautions that may be taken to produce clean milk may be nullified by putting it into unclean cans that support heavy bacterial growths.

Every dairy should have a milk house for handling and storing milk, which should be well lighted, completely screened, and as nearly as possible dust proof. It should be equipped with hot and cold water and means of sanitizing cans and bottles. The floors should be of concrete and should be sloped to give prompt drainage. A two compartment, galvanized sink is necessary. In the colder climates the milk house should be heated and it should always be large enough to handle the milk cans, etc., conveniently.

The mode of transportation of milk from the dairy barn to the milk plants, or in the case of retailers directly to the consumers is highly important. If the milk is exposed to the sun, warm air, dust or other harmful conditions, the quality of the milk is impaired, consequently in some milk sheds milk is required to be hauled in covered insulated trucks from the farm to the milk plant. The use of covered trucks with paneled sides by retailers is postulated in some ordinances, and wisely so, because milk exposed to the elements in uncovered trucks is very likely to develop off flavors or other defects.

A word should be said about a matter that has been discussed many times before many different audiences, viz.: the unwisdom of different health departments prohibiting practices that are not objected to by others, such for instance as stipulating that covered pails should, or should not be used, that milk houses should be located at certain distances from the dairy barn, that surface coolers may, or may not be used, etc., etc. There is no doubt that this disagreement among health officials is confusing to the farmer and brings dairy sanitation into disrepute. The remedy is to unify inspection methods to prevent confusion both in inspection and in members of the dairy industry. If the cardinal principles of dairy sanitation are practiced on the farm the milk is bound to be good, and it should be acceptable everywhere.

It may be pointed out that there are two different attitudes toward dairy inspection; one of these would put a minimum amount of emphasis on dairy farm methods and equipment and would judge the quality of milk by certain applied tests, such as reduction tests, bacterial counts, sediment and acidity tests. Some officials maintain that too much emphasis is placed on the aesthetics of milk production which they hold to be unimportant. In some quarters this policy has received the hearty support of producers who would do away with farm inspection altogether. Other officials point out that close farm inspection is necessary to detect open privies, impure water supplies, and to insure clean handling of the milk. They maintain that only by close inspection will milk be produced in such a manner that the consumer would not object to using it could he see the actual farm operations. As illustrative of the necessity of farm inspection, a member of the Committee (Palmer) points out that farms having electric refrigeration may produce milk which will pass routine bacterial analysis but which contains thermoduric bacteria that cause relatively high counts in the pasteurized milk. He cites a case that he had recently, viz.: One particular load of milk carried that of thirteen shippers. Recent quality tests showed the milk to be of passable quality but farm inspection revealed thirteen milking machines, eleven of which had not been properly cleaned.

Furthermore, those who would curtail dairy farm inspection seem to have overlooked the rôle of the inspector as a builder of the dairy industry. His duties are in a large part educative; he has persuaded dairymen to adopt better methods of dairy farming, and im-

proved sanitation, and he has helped build production with the result that the public has confidence in milk supplies, and milk markets have been broadened. The meticulous inspection of farms is possibly burdensome and costly, but few inspectors who have had practical experience in farm inspection would willingly admit that many of the regulations which they postulate should be abandoned. It should be pointed out that the pioneer dairy inspectors have seen progress in dairy farm sanitation that has been remarkable, and they believe that in the future the regulations of pure milk production will be widely accepted by everyone.

Lastly, the Committee would call attention to a statement by one of its members (Kelly), viz.: "It seems well to stress somewhat the adaptation of inspection methods to present economic conditions. Being rather close to the situation here in Washington, I realize the serious shortage of certain vital materials, especially metals, which are used in dairy equipment. Almost every day I am called into consultation to try to secure certain materials such as steel, tin, rubber, and nickel for important and necessary dairy equipment. Of course aluminum is practically out. This emergency is growing increasingly acute, and will continue to do so. For this reason it seems to me that it would be wise for farm inspectors not to demand new equipment, especially that requiring the scarce metals, unless it is absolutely imperative from a sanitary standpoint. In other words, we shall probably have to patch up, repair, and retin many of our pieces of apparatus and utensils, whereas we formerly would have discarded them for new items. Of course milk contact surfaces should be kept in immaculate condition, but there should be little insistence on outside surfaces which may not be of good appearance but do not come in contact with milk."

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Short-Time High-Temperature Pasteurization of Milk

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INTRODUCTION

SHORT-TIME high-temperature pasteurization of milk is a relatively new principle to the majority of milk sanitarians, yet strange as it may seem, it was the first successful principle adopted for the safeguarding of our most nearly perfect food.

Principles sometimes established become obsolete in our minds only to be recreated later with improvements sought previously but never achieved.

So apparently it has been with the short-time high-temperature pasteurization of milk. The original methods had faults that today have been corrected. This in no way should reflect against the originators of the method but instead should be an acknowledgment of the improvements in the various factors necessary to achieve the present status of this method.

Today we look back at the original efforts at milk pasteurization and find that developments in the interim make possible the fabrication of finer metals. The control of heat by means of improvements all along the scale of valves, injectors, thermometers, et cetera.

Our plants of the present are devoid of the main shaft with pulleys and belts that were inescapable in the plants at the turn of the century. Removal of these old standbys in favor of the highly accurate, thoroughly dependable power plants ready to begin functioning by the mere flip of a switch indicates to some extent the progress in our ability to get the job done.

HISTORY

I am sure that Albert Fesca had many problems to confront him in the years preceding December 24, 1881, when on Christmas Eve in Berlin, he applied for a patent on a "continually working apparatus for the heating of milk for the purpose of preserving same."

This apparatus consisted of a copper kettle-like body which was heated by steam. The milk flowed in from the top and was carried through a rotating, agitating, and distributing device to the bottom of the machine. The milk was kept in a constantly rotating motion by a shaft and the agitator. When the milk was heated to 158°–176° F. it flowed out the top of the machine.

There was admixing of the milk not previously heated with the heated without any idea of the holding time.

The machine had a capacity of from 2,500 to 5,500 pounds of milk per hour. This was the first successful application of the principle of Pasteur in the conservation of milk in a machine which was to bear the name pasteurizer.

Presumably some of the problems today have been ever present since heat was first applied to milk in open kettles to conserve it, because special efforts were taken by Fesca to prevent the "burning" of milk during the heating process.

In 1886 Carl Thiel introduced a new principle of pasteurization. His apparatus consisted of a metal cylinder in-

side of which was another cylinder with corrugated walls. Between the two cylinders was a space for steam heating. The milk flowed over an umbrella shaped hood to the corrugated cylinder thence downward. The steam-heated water was kept at 170° F. with the milk being heated to 140° F.

Franz Hochmuth also used a gravity flow principle in his equipment invented prior to 1893. This equipment was not unlike the Supplee and Jensen equipment reported in their article presented to this association in 1940, except they heated by electric current.

Today the manufacturers of high temperature equipment proclaim the economy of regeneration. To Hochmuth goes credit for the first regenerator. His equipment looked very much like three tubular coolers mounted vertically. The milk flowed over a preheater section where it was preheated by the cooling medium from the third or cooler section. The center section which was heated by steam, was the pasteurizer section.

One disadvantage to this method, in the absence of milk pumps, was the height of the equipment. To overcome this obstacle the sections were laid horizontally and the milk flowed over the top side.

Mention is made of these earliest types of pasteurizers to point out that although we look at high-temperature short-time pasteurizers today as new developments they are in reality the forerunners of the batch type pasteurizer with spiral heating coils in universal use at present.

First Batch Type Holder

Incidentally the first pasteurizer of the batch type holder, with spiral heating coils, was one constructed and recommended by Bitter. His pasteurizer was similar to our present round vertical vat but with descending and ascending fixed steam coils spiralled inside. Agitation was by means of fine like plates rotated between the two coils.

Types of Short-time High-temperature Pasteurizer

On the American market today there are three general kinds of short-time high-temperature pasteurizers. Each of these types provide for the milk to be heated to a temperature of at least 160° F. and thereafter held at that temperature for at least 16 seconds.

These methods are known as tubular, plate, and electric. The electric method is distinguished from the former because heat is applied in the heater section by means of electricity whereas steam or steam-heated water is used in the tubular and plate units.

Tubular Type

Two types of tubular units are in limited use at present. The older of the two employed two sections, one for preheating, the other for final heating, with a holder tube outside the influence of the heating medium. These units are being replaced and few are currently in use. Difficulty of operation, faults in expansion compensation, and lack of regeneration generally are given as reasons for discontinuance. Flavor difficulties and inability to vary capacities were also factors.

Recently a tubular heater using steam to heat the milk to pasteurization temperature was placed in use. This unit neither preheats nor regenerates. All the heating takes place in a cylinder through which tubes carry the milk. If preheating or regeneration is desired this may be accomplished as supplementary processes.

The milk is standardized, filtered cold, heated to pasteurizing temperature as mentioned, held in either a tubular or meandering type holder, and cooled in a cabinet-type tubular cooler.

The manufacturer claims, "the use of regeneration remains a mooted question. The cons just about balance the pros in the great majority of installations. The saving in heat units which regeneration saves is in the majority of cases offset by the depreciation upon

the larger investment and the extra expense for labor and repairs to keep the regenerative equipment in operating condition.

"The cons point out that the value of aeration at high temperature on the flavor of milk is so great that regeneration is not used."

PLATE TYPE

The plate type short-time high-temperature pasteurizer consists of a series of heat transfer plates hanging in a suitable frame or press and spaced close together so that thin, flat, wide sheets of milk and heating or cooling medium can flow between the plates. Openings are arranged in each plate and matched in adjoining plates so as to guide milk into each alternate space between the row of plates, with other openings to guide either cold milk for regeneration, hot water for heating, or a refrigerant for cooling through the intervening plates.

Reducing these operations to those actually performed by the plates themselves it must be admitted that only two basic functions are performed, namely heating and cooling. Regeneration can be performed and since regeneration is simultaneous heating of one portion by cooling of the opposing portion actually three jobs are performed during the one operation.

The various steps during the processing or pasteurizing of milk can be accomplished by simply arranging connections through which the milk can be taken from the preheater section, filtered, separated, or homogenized and returned without interrupting the continuity of flow.

At present the plate type of short-time, high-temperature pasteurizer appears to be the type selected by most manufacturers, and several modifications are on the market. Plate equipment in general is considered to be the most satisfactory heat transfer method in the dairy industry today.

ELECTRIC METHOD

The electric unit consists of a plate regenerator section from which milk at approximately 136° F. is delivered to an electrode chamber which is a vertical, rectangular compartment through which the milk ascends at a constant and uniform flow. Two opposite walls of the chamber are flat carbon electrodes; the intervening walls are of heavy plate glass and serve as insulators. As milk flows between the electrodes, electricity passes through it, from electrode to electrode. The passage of electricity directly through the milk causes heat to be liberated actually within the milk. In this way, the manufacturer claims, electrical pasteurization avoids the difficulties which surround the practice of driving heat, as such, into milk. More specifically, it avoids bringing the milk into contact with hot surfaces thereby producing a "burned on" flavor and also the depositing of milkstone.

Upon reaching the desired temperature of 160°–162° F. the milk is held for 15 or 16 seconds before entering the hot milk entrance of the regenerator section from which it emerges to be cooled and bottled.

ADVANTAGES OF SHORT-TIME HIGH-TEMPERATURE PASTEURIZERS

For all of the described short-time high-temperature processes the following claims are made:

1. Less floor space required, often resulting in savings up to 50 percent, or if a plant using the holder method is faced with expansion, a method of expanding by changing pasteurization methods rather than enlarging the building.

2. Less equipment to invest in, especially when the regenerator, heater, and cooler are combined in one unit. Not only is the investment factor important, but also the actual availability of metals for dairy purposes during the present emergency.

3. Less labor is necessary to clean the equipment.

4. Less water is used in the clean up, and use of the regenerator section eliminates a water cooling section. This also reduces cooling and heating costs.

5. With only one pump used to move the milk, the cost of extra pumps and their maintenance and operation is saved.

6. Loss of milk by evaporation is reduced to zero in completely enclosed systems and appreciably reduced in partially open systems.

7. Milk is pasteurized within five minutes after entering the unit as compared with 35 to 45 minutes required when using the 30-minute holding method.

DISADVANTAGES

In spite of the glowing accounts of successful use of the short-time high-temperature method of pasteurization there are certain difficulties encountered, or to be avoided, by the successful operators.

1. There must be adequate storage capacity for raw milk, some plant operators desiring as much as 75 percent of volume in storage space.

2. Fillers must be correlated to the operating capacity of the pasteurizer; or,

3. A balance or surge tank to compensate for inadequacy or fillers or shut downs up to 20 minutes must be installed;

4. Raw milk must be of highest quality so far as off-flavor production is concerned.

Before deciding on this method of pasteurization the plant must have sufficient volume. As one manufacturer states, "short-time pasteurizers are built in capacities that range from 2,500 pounds per hour up to 20,000 (40,000) pounds per hour. This makes them available to quite small plants. However, we want to emphasize to you that, in our opinion, outfits below 5,000 pounds per hour for a very small plant are more of a fad than an economic necessity. We make this statement on the basis that it usually increases the investment in a small plant, for a short-time pasteurizer is not too flexible in handling things like chocolate milk, buttermilk, and cream, making it necessary for such a plant to have additional vats. We do not mean by this statement that we cannot satisfactorily pasteurize cream through the short-time pasteurizer, but usually if you are running cream it is necessary to have a vat to store it in, and this might just as well be the pasteurizing vat. Therefore, in our opinion, for the very small plants, the batch system is going to show a better cost of product due to the fact that depreciation costs are much lower."

TEMPERATURE CONTROL

Pumps may be referred to as the heart of the short-time high-temperature pasteurizer, the flow diversion valve as the brain, and the thermometers and tubing as the nerves.

With the problem of applying heat to milk satisfactorily solved by either the plate or tube method the problem of temperature control arose. Manual operation of valves was so imperfect as to preclude the possibility of this method since human error was far beyond the permissible error in temperature control which could be tolerated. First effort at a solution of this problem was a milk pump stop. A milk pump stop was developed which would automatically stop the milk pump motor following a prescribed drop in temperature below that for pasteurization. Development also provided for the pump to start automatically when the milk again reached pasteurization temperature. By this arrangement only milk at the proper pasteurization temperature was moved forward.

Guarantee of pasteurization by use of the milk pump stop was assured only: (1) when the milk pump stop control was located between the heater

and holder unit, for if the holder were located outside the influence of the heating medium and at the end of the holder, supplementary means of applying heat would be required or underheated milk would have to be drawn off manually; (2) when the pump was of the positive type that would not permit milk to flow through when under pressure; and, (3) when there was no possibility of syphonage when the pump stopped.

The U. S. Public Health Service Code requires that it be impossible to start the forward flow of milk unless the bulb of the milk pump stop is at or above its temperature setting. In order to start the pasteurizer using a milk pump stop it was necessary to run water through the heater at a temperature above the pasteurization temperature until the temperature of the bulb reached the controller set point, The milk pump would then start. Once the pump started, milk was admitted to follow the water through the heater. Live steam could be blown into the tubes of the heater for the same purpose.

The flow diversion valve was designed to correct these difficulties. It is a three-way valve designed to control the flow of milk depending upon its temperature at the time it reaches the valve. There are three ports to the valve, the center one being the input port, the upper the forward flow port, and the bottom the diversion port. For the purpose of disassembling and cleaning, the bottom port is fastened to the body of the valve by means of a coupling nut. Disassembling is easy although the valve itself consists of about 25 parts, this being exclusive of the actuating mechanism.

Actuating mechanism consists of a solenoid air valve to which an air supply of twenty pounds pressure is connected. When the milk is at pasteurization temperature air is admitted to the valve driving the mechanism down. When the temperature drops an outlet valve opens thereby exhausting the air and the mechanism moves upward.

When the flow diversion valve is connected to the actuating mechanism the following results: At pasteurizing temperature the solenoid valve is actuated and moves downward pushing the valve into the forward flow position. When not actuated, and the air is exhausted, a coil spring pushes the valve upward or to the diverting position. Failure of the air supply therefore makes the valve divert automatically.

Failure to connect the valve to its actuating mechanism is prevented by a micro switch which is actuated by the key making the connection. This micro switch is interlocked with the milk pump motor starter. If the connecting key is in place, the milk pump motor starter will operate the pump when the milk temperature is either below or above the pasteurizing temperature. If the key is not in place, the micro switch prevents the milk pump motor from operating the pump if the milk temperature is sub-legal.

This key is designed so that it can be inserted into the stem coupling in only one way, and then only when the valve stem is in proper engagement.

As stated, failure of the air supply causes the valve to take the diverted position, which is also true of failure of the electricity. This automatically stops the forward flow of milk.

Flow diversion valves permit the starting of the milk pumps although the milk is below pasteurizing temperature, since this milk is returned to the heater until a temperature of pasteurization causes the valve to move to the forward position where it remains as long as the temperature does not drop. Settings are usually made so as to cause diverting of the milk if the temperature drops one ¼° F. below the setting.

EFFECT ON QUALITY FACTORS

There are three quality factors to be considered so far as any system of pasteurization is concerned. This is

particularly true of a new system. These factors are: (1) Elimination of pathogens and a satisfactory reduction of bacterial counts; (2) retention of maximum creaming qualities; and (3) absence of "cooked" or other "off" flavors. What is the answer to these questions so far as short-time high-temperature systems?

Since about 1920, when the "flash" method of pasteurization was revived by the short-time high-temperature pasteurization method, various health authorities have continually tested results of pasteurization by this latter method.

Principal determinations were to find out the extent of destruction of pathogens. Exhaustive tests have led investigators to conclude that heavily contaminated milks could be safely pasteurized by this method.

Consensus is that the degree of bacterial reduction in average market milk is substantially the same as when pasteurization is by the holder method. There seems to be some difference of opinion, however, regarding reduction of thermoduric or thermophylic organisms at 160° F. for 16 seconds. Practical application of 162° F. for 16 seconds, however, seems to leave but little doubt of the killing effect of this temperature and time combination since few such organisms seem to survive.

However, a clean up of milk producing farms seems to have more effect than temperature and time applications.

Investigations tend to show that a temperature of 160° F. for 16 seconds has no more effect on the creaming quailities of milk than does the holder method. Pressure, agitation, and application of higher temperatures tend to decrease creaming qualities when increased. Sucking of raw milk through regenerator sections to produce lower pressures than maintained on the heated milk has materially helped solve this problem as has methods to reduce pressure on the heated milk to as much as one-fourth that necessary in equipment introduced two decades ago.

Predominating flavors found in pasteurized samples are those from feed. More than the usual care in grading raw milk for short time high temperature is necessary, especially to eliminate high acid milk. Aeration, in general, seems to improve the flavor of milk. Less oxidized odors are encountered. Less heated flavors are encountered.

SUMMARY

1. Short-time high-temperature pasteurization of milk was the first successful method used.
2. Improvements in materials, methods of fabrication, and new appliances have made possible rapid strides.
3. Early inventions included present methods, even regeneration.
4. Holder method was suggested to overcome difficulties encountered in the early high temperature heaters.
5. Present types include plate, tubular and electric methods.
6. High-temperature short-time pasteurizers have many advantages as well as new problems to be coped with.
7. Accurate temperature control regulating devices meant success where earlier types were failure.
8. Quality factors seem to be as good or better than milk pasteurized by the holder method.

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ANNUAL MEETING OF AMERICAN DAIRY SCIENCE ASSOCIATION

What is the latest information concerning sterilizers in this era of priorities, and will public health restrictions be curtailed due to war conditions?

These are typical questions that will get some answers in the 15th annual summer meeting scheduled June 22–25 at Michigan State College by the American Dairy Science Association.

The Michigan Dairy and Milk Inspectors Association have this year cancelled their own summer meeting and plan to attend the American Dairy Science Association meeting as a group.

Program committee members indicate they will inject pertinent subjects for what is considered the most important annual meeting of the association since inauguration of the summer series 15 years ago on Michigan State College campus at East Lansing.

Another of the convention features includes a pre-convention tour of the plant of the Kalamazoo Vegetable Parchment Company. This tour is scheduled for Monday, June 22.

The association this year, for the first time in its history, is headed by an officer engaged in commercial work, H. F. Judkins, vice-president of Sealtest, Inc., of the National Dairy Products Company. Mr. Judkins has long been associated with the American Dairy Science Association and has the unique advantage of having training which enables him to see the problems of the dairy industry through the eyes of a former college professor as well as those of a high ranking commercial manufacturer.

The meeting this year is expected to attract more commercial men than usual because of the pressing problems which the industry must solve and because of the central location of the meeting place.

The association will hold its meetings in Abbot-Mason Hall on the college campus. This building is sufficiently extensive to house and feed all guests as well as to provide adequate lecture, exhibit and committee rooms for the three groups holding meetings simultaneously. These are the Dairy Extension Section, the Dairy Production Section, and the Dairy Manufacturers Section. The last-named group devotes its entire time to cheese problems, ice cream, market milk, and butter problems. Some of the meetings are being scheduled as general sessions on questions and problems common to all the groups mentioned.

A feature on this year's program will be a presentation of the national dairy situation by O. E. Reed, Chief of the Bureau of Dairy Industry, United States Department of Agriculture, Washington, D. C. He will outline the broad war program of his department. The full program will be announced in the May issue of the *Journal of Dairy Science.*

Specific questions concerning housing costs, meals, and similar inquiries should be addressed to G. M. Trout, Dairy Department, Michigan State College, East Lansing, Michigan.

Chemical Taste In Milk

CHARLES PALEY

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A TASTE in milk resembling iodine has sometimes been reported and recently one case came to my attention. An investigation was conducted, tracing the cause for this taste in milk. The history of the case is as follows:

A milk plant operator reported that an institution receiving his milk in half-pint bottles complained about a chemical taste, described as an iodine taste in some bottles while other bottles of milk did not show the same taste, although bottled in the same plant during the same night and constituting part of the same shipment of milk.

An investigation at the pasteurizing plant did not disclose the presence of any iodine compounds nor any other chemical that might liberate iodine. A thorough job of chlorinating the equipment was being performed and this was the last part of the cleansing and sterilizing operation. Since it is generally recommended that sterilization be performed immediately before pasteurization and bottling, some chlorine material remained on the cooler, in the pipelines, and in the filler bowl. The chlorine used had a relatively high pH value and was therefore stable. Although some parts of the equipment were already dry, the chlorinating material was still present on these parts of the equipment.

In the operation of the plant, the half-pint bottles were filled first. The first milk coming over the chlorine-treated cooler and through the chlorinated pipe lines and into the chlorinated filler was examined. It was found to have the same taste as was observed in the milk examined at the institution. The taste was so pronounced that there was no need to make a chemical examination for chlorine. It was therefore evident that this first milk coming in contact with the chlorinated equipment concentrated all the chlorine into the first filler bowl of milk. The filler bowl was then emptied of this first milk and thereafter the rest of the milk showed a normal taste and there was no more indication of the so-called chemical taste.

It therefore appears that since chlorine treatment of milk processing equipment is generally performed before the operation of a plant and since most chemical solutions used are relatively stable because of the pH of the chlorine material used, the first milk passing through or over chlorinated milk equipment will sometimes result in a chemical taste which may be described as an iodine taste, but is in reality due to these sodium hypochlorite or other chlorine compound washings.

It is advisable, when a chemical taste is reported in milk or any pasteurized dairy product where chlorine or its compounds are used, that the milk from the first filler bowl be drawn off or if the milk is to be placed in cans, that the milk in the catch basin of the cooler be drawn off. These drawn-off milks should not be used for fluid milk purposes if it is found that a chemical or abnormal taste is present.

It might be added, that no ill effects were observed in the children who drank the milk containing these chlorine washings, but it was objectionable to taste.

Report of Committee on Ice Cream Sanitation

THIS Association should ever be a leader—especially in all things sanitary. Several years ago this Committee suggested that the name of the Committee be changed from the present title to the Committee on Frozen Desserts Sanitation. This suggestion was in keeping with the newer developments and the ever widening field of frozen desserts. It is hoped the Association will act favorably upon this suggestion this year.

The American Public Health Association has just issued a new (8th) edition of *Standard Methods for the Examination of Dairy Products*. A whole new part, Part II, has been added which deals with the Microbiological Methods for the Examination of Frozen Desserts and Ingredients of Frozen Desserts. Here will be found official methods for analyzing all types of frozen desserts and such ingredients as dry, evaporated, and condensed milks; all types of sugars and sweetening agents, fruits, nuts, flavoring extracts, and coloring materials; and tentative methods for eggs and egg products. A sediment test applicable to frozen desserts is also included. This will enable control officials for the first time to check not only frozen desserts but also their ingredients as carefully as they do milk and cream. This is, indeed, a step forward in dairy sanitation.

The U. S. Public Health Service has been working on a frozen dessert ordinance for several years. They have had the advice of a well qualified group of men. After several preliminary drafts the 1939 edition was published in the JOURNAL OF MILK TECHNOLOGY 3, 49–52 (1940), under the title "Frozen Desserts Ordinance" recommended by the U. S. Public Health Service. While the ordinance in its present form represents the best which has appeared to date, there is a great deal of room for improvement. To illustrate—under Section 1. Definition—A. Frozen Desserts.—"A frozen dessert is any clean frozen or partially frozen combination of two or more of the following: milk or milk products, eggs or egg products, sugar, water, etc., etc.—"

The wording of this definition is faulty. Can you imagine a frozen dessert made from two of any of the products listed such as sugar and water or vanilla extract and coloring matter? Furthermore, it would be impossible to make a frozen dessert conforming to the requirements which are later set forth from any two ingredients. The wording used in this ordinance is similar to that used in most ordinances. A more correct wording would be "a suitable combination of milk or milk products, eggs or egg products, sugar, water, etc." There are other places where the ordinance could be improved.

The Chairman, following his usual custom of soliciting reports from all Committee members, is pleased to transmit herewith these contributions. These reports are always very illuminating since they indicate the problems encountered in different parts of the country.

REPORT OF ANDREW J. KROG, OF PLAINFIELD, N. J.

1. New Ingredients of the Mix

The past year has seen the development of some new items and the modification of some old ones, to make them suitable sources of solids for ice cream use.

a. Butter from Plastic Cream.—Through the development of a patented process, plastic cream is converted into butter without resorting to churning. The question has come up as to whether such butter is to be made subject to the same regulations covering its use in ice cream as butter obtained by churning. Since butter made from plastic cream is more suitable as an ingredient of ice cream mix than churned butter, and since it is frequently sold at a premium above churned butter, there seems to be no reason why this product should be made subject to more stringent regulations than other butters.

Although fluid dairy products incorporated into the ice cream mix are subject to rigid supervision, butters and other concentrates are not. There is no reason why this immunity should be continued. It is suggested that the Committee review the regulations covering butterfat concentrates used for ice cream manufacture, and create new specifications more in keeping with those for fluid products. Since the use of such concentrates is on the increase it would be well to give this matter more attention.

b. Low Lactose Milk Solids.—Serum solids concentrates low in lactose content are now commercially available. The advantages of such products are obvious, when one recognizes that the percentage of milk solids other than fat (when using normal ingredients) is limited in ice cream mixes by the lactose concentration (high lactose contents result in "sandy" ice creams). It has been noted that the standards for serum solids concentrates vary tremendously for ice cream manufacture throughout the country. A request is made to the Committee that definite standards be drawn up, and that in the case of "delactosed" products, the same sanitary specifications be maintained and (although this is no business of this Committee) it would be a good idea to standardize on the concentration of protein and lactose in these special products.

c. High Conversion Corn Syrups and Corn Syrup Solids.—These ingredients have come into acceptance in the ice cream industry because of their advantageous effects on ice cream texture, and because of their utilizability in greater percentages than cane or corn sugar. (See Ice Cream by Weight, below.) High conversion corn syrup is frequently handled as a liquid syrup. Although cane and corn sugars have been available as syrups to the ice cream industry for some time, there are very few areas in which definite legislation regarding the sanitary control of these supplies has been established. Since the use of syrups is on the increase, it is respectfully suggested that the Committee formulate model specifications for sanitary control of these products.

d. Stabilizers.—Conditions abroad have done much to promote the use of stabilizers other than gelatin. Various pectin products, gums, and seaweeds have been processed to make them suitable as stabilizers for the ice cream industry. Although the Committee advocated standards for the sanitary control of gelatin in the past, similar specifications for these new products are not yet available. It would be well if the Committee reviewed its gelatin standards and revised them so that they would apply to all products which might be classified as stabilizers.

e. Egg Products.—The value of egg yolk (fresh, frozen, and dried) as an

ingredient of ice cream mixes, especially where butterfat concentrates such as butter of frozen cream are employed, has been well established in the literature. It has been our experience that where plants employ frozen eggs and dried eggs, conditions of storage of these products are frequently far from satisfactory. We particularly resent the manner of permitting frozen eggs to thaw at room temperature for periods as long as a week in some instances. It would seem that desiccated egg yolk is a fairly fool-proof article. The material generally comes packed in cartons, kegs, or drums. When egg powder is packed in large containers, opportunities for contamination are frequently found. One way of eliminating this possibility is to package the contents of drums in small units sufficient for standard batches of mix. Although we do not wish to complicate the work of the Committee too much, it is high time that some recommendations for the sanitary control of egg products were drawn up and incorporated into ice cream legislation.

f. Fruits and Nuts.—Previous annual reports have referred to the products added to the frozen ice cream (fruits, nuts, flavors, and colors) in their relationship to coliform contamination. There is no need to review the principles involved.

Fruit packers have not yet become uniform in their methods of handling fruits, so that frequently barreled, cold packed, and frozen fruits contain large numbers of coliform organisms. The method of dipping fruits in sterilizing solutions prior to cold packing or freezing (developed in California) permits the ready sterilization of sound fruit. Even where such sterilization has been practiced, however, the lack of uniformity of handling barreled fruits has resulted in contamination of barrel units. Something has to be done about this.

Nut packers, too, have been lax about supplying the industry with coliform-free products. The ethylene oxide method of sterilizing spices is readily adapted to handling nut meats. The attention of nut packers should be directed to the need for their coöperation.

The method of preparing daily batches of sterile color solution has been adopted by a number of large plants, but smaller plants, in a number of instances, have not done so. Line checking for the origin of coliform organisms aids in demonstrating the need for such processing.

2. Processing of the Mix

a. Homogenization.—The question of where a homogenizer should be placed in relationship with other plant equipment has come up in connection with our control of fluid milk supplies. In most ice cream plants the homogenizer is placed so that the mix goes through it after it has been pasteurized. (We insist, however, in the case of milk operations, that the homogenizer be placed before the holder.) Although this practice is well established in the ice cream industry, we might discuss the advantages and disadvantages of making the ice cream process identical to the one which has been advocated for milk.

A number of areas report the passage of legislation requiring the use of sanitary head homogenizers. The importance of this type of device is well recognized by all active ice cream control officials. Perhaps the Committee would promote uniformity in ice cream practice if the interest of ice cream control officials in some areas (which have not yet adopted legislation regarding this feature) were stimulated.

b. Mix Cooling.—The legislation in force does not require the cooling of dairy products to temperatures below 50° F. Ice cream mix storage periods are generally longer than fluid milk storage periods. The industry itself recognizes the advantages of chilling

mix to as close to its freezing point as possible. (The more refrigeration put into the mix, the more rapid its freezing.) Since three-and-four-day storage periods are not uncommon for ice cream mix, it is respectfully suggested that the Committee consider advocating legislation demanding temperatures of 40° F. (or possibly even lower) as being the maximal permissible for ice cream mix storage.

Plant equipment frequently will not cool the mix directly to 40° F. by passage over or through cooling devices. Where this condition is found, additional mix cooling may be provided by fitting unit coolers into insulated storage tanks.

c. Mix Storage.—During the hot weather, some plants have developed the practice of pumping newly processed mix into storage tanks containing mix processed one or more days previously. It is obvious that this manner of handling is not in accord with sound sanitary principles. The Committee is asked to consider what might be done to prevent this circumstance.

3. Freezing the Mix and Packaging the Ice Cream

a. Continuous Freezer Operation.—The adoption of continuous freezers generally coupled into the processing line by means of univats is almost universal. The attention of plant operators should be drawn to the need for sterilizing the pipe lengths connecting storage tanks to univats and from the univats through the freezers. It has been noted that although many plants sterilize their processing equipment rigorously, they tend to neglect portions of the freezing and packaging equipment.

Packaging equipment which is hooked up to continuous freezers is readily sterilized in one direct operation. Where batch freezers are employed, legislation is not uniform in requiring pumps to empty batch freezers into packaging devices. Uniformity of such legislation could be promoted by a campaign on the part of the Committee.

4. Manufacture of Novelties

a. Sterilization of Novelty Equipment.—During the hot weather, novelty manufacturing devices are frequently in continuous use in many ice cream plants. Such usage does not permit adequate time for thorough cleaning and sterilization. It is suggested that a routine be adopted for the regular check up of novelty molds and packaging devices, to determine their sanitary condition.

The ice cream industry is much more active, of course, in the hot weather than it is in other seasons of the year. The hot weather season, then, should also be the time of greatest activity on the part of ice cream control officials.

b. Packaging of Novelties.—Many ice cream novelties (coated bars, etc.) are packaged in envelopes. There is no uniformity in the legislation requiring the machine opening of envelopes and in their sealing. It is suggested that the attempt be made to promote the use of blowers to avoid hand contact with envelopes, in opening them. Devices are available on the market which perforate the paper in such a manner that an inexpensive but positive seal is maintained. The use of such closing devices should also be stimulated.

c. Wiping Cloths. — Manufacturers have been definitely opposed to chemical sanitization and sterilization of wiping cloths due to the odors and flavors usually associated with accepted disinfectants. This objection can readily be overcome by the use of a commercial product known as Roccol (alkyl - dimethyl - benzyl - ammonium - chloride). Cloths saturated in an aqueous solution of this product 1 : 5000 will be found to be sterile and therefore cannot be a contributory factor in the transmission of bacterial organisms to the ice cream product.

5. Ice Cream by Weight

a. Many areas have recently adopted legislation requiring that ice cream be dispensed by weight. (These regulations do not suggest that ice cream be weighed by the retailer, but they demand a guaranteed minimal weight per unit volume.) Some localities have also adopted regulations requiring minimal percentages of food solids in the finished product.

It is well recognized that regulations of this character will eliminate some of the malpractices committed by marginal manufacturers. Ice creams subscribing to the minimal fat content and blown up to 120 or 130 percent overrun cannot meet these specifications. A word of caution should be given to officials who plan to adopt this type of legislation, however. During the summer time, ice creams of low fat and solids contents are more acceptable to the consumer than the richer products. A high fat, high solids, low overrun ice cream is not "refreshing" on a hot day. It is respectfully suggested that where ice cream by weight and available nutrient percentages are written into ice cream regulations, the weights and percentages developed as minima be selected, so that refreshing ice creams are not excluded from the market.

One of the reasons for the stimulation of interest in high conversion corn syrups is that these products possess only a fraction of the sweetening power of cane sugar, and do not depress the freezing point as much. It is therefore possible to increase the total nutrients in a mix without making it too sweet, and without hurting its freezing point by replacing part of the cane sugar (and corn sugar) with these substances. If the specifications for fat and dairy serum solids contents of ice creams are worded carefully enough, the practice of using these high conversion corn syrups and corn syrup solids will improve, rather than adversely affect, ice cream manufacturing.

6. Retail Outlets

a. The lack of uniformity noted to exist in the ice cream control regulations in different localities is particularly true in the consideration of the specifications for the sanitation of retail dispensing agencies. To avoid spending too much time on this topic—prior annual Committee reports have gone into details—satisfactory ice creams may leave manufacturing plants, but will not get to the consumers in their original condition unless more adequate control of retail outlets is practiced. If the Ice Cream Committee itself cannot do anything to stimulate attention to this feature, possibly a joint committee formed with other control organizations might help. It is respectfully suggested that this topic be considered.

7. Laboratory Examination of Frozen Desserts

a. Prior annual reports have detailed the importance of the coliform determination in the examination of frozen desserts. Prior reports have related, too, that ices—frozen desserts in which milk products are absent—should be considered in the same light as water supplies. It is respectfully suggested that in order to provide for uniform control technique in all parts of the country, the Committee review the analytical procedures employed in the bacteriological control of ice creams, ices, and sherbets.

Mr. Cameron, who is in the Marketing Service of the Dairy Products Division of the Federal Department of Agriculture in Ottawa, always brings us up to date on the conditions in Canada. His report follows:

REPORT OF W. C. CAMERON, OTTAWA, CANADA

Comments on the Ice Cream Situation in Canada—1941

CONSUMPTION

Sales of ice cream in Canada this year have shown a substantial increase over those of 1940. Business conditions are very much better, many more people have money for such foods as ice cream, children have more nickels for cones, and factory and office managements are realizing the increased efficiency that comes with a mid-morning or mid-afternoon dish of ice cream or glass of milk.

The increase in the sale of ice cream has occurred in both bulk and packages, but particularly in that of packaged goods. Picnics, canteens, army huts, and any place where ice cream can conveniently be dispensed in packages, have pretty well discontinued the purchase of bulk, which requires the dipping of ice cream for cones and dishes. Packaged ice cream affords a more accurate check on the number of individual sales. It may be that when the final statistics of production have been published for 1941, they will show that the present year has been the largest on record from the standpoint of gallonage manufactured and sold.

SANITATION

There are various opinions as to whether or not the retailing of packaged ice cream such as twinkles, mel-o-rol, sherbicles, chocolate-coated bars, etc., is a more sanitary method of dispensing ice cream than the retailing of this product from bulk containers. Many believe that it is, while others maintain that the extra handling required in the manufacture of some types of packaged goods offers more opportunity for contamination than bulk ice cream dispensed in the usual way.

There is still a lot of room for improvement in the methods used in retailing ice cream. Some municipalities require that dippers be kept in running water. Roadside stands and others in these areas, not equipped to meet these sanitary standards, have turned to the handling of packaged goods.

There are many manufacturers who feel that legislation should be enacted prohibiting ice cream cabinets from being used for anything other than ice cream, and they emphasize particularly the need for prohibiting ice cream cabinets being used for the storage of meat, fish, or any other foods or materials which may taint ice cream.

FIELD INSPECTION

In their preliminary tests for the fat content of ice cream, inspectors have been weighing 9 grams of melted ice cream into a 20 percent ice cream test bottle, and using 13 ml. of glacial acetic acid and 9 ml. of commercial sulphuric acid. They have found that if sodium alginate has been used as a stabilizer in the manufacture of ice cream, a clearer reading is obtained by increasing the quantity of glacial acetic acid to 17 ml.

The Division of Dairy Research is experimenting with a trier which it is believed will pull a definite quantity of ice cream from bulk containers filled or partly filled with ice cream. If such a trier can be made available to Inspectors of Dairy Products, then all ice cream can be readily examined for weight. At present ice cream in partly filled cans found at places where no suitable scales are available is difficult to check for weight.

ANALYSES

Some of the analysts in the industry believe that in the freezing of an ice cream mix some change occurs with the result that 0.15 percent to 0.20 percent of the fat cannot be detected by the ordinary methods of analysis. In other words, ice cream shows a fat content of 0.15 percent to 0.20 percent less than the mix from which it was frozen. Any information on this subject will be appreciated.

OVERRUN CONTROL

Would the ice cream industry in the United States and Canada benefit if a uniform system were adopted for controlling the amount of air that could be legally incorporated in ice cream? If so, is not the most adequate method that of prescribing the minimum weight of food solids (of which a minimum weight shall be milk fat) per unit volume of ice cream?

COUNTER FREEZERS

Counter freezers do not appear to be gaining in popularity. Many machines are not in use this year. With better business conditions prevailing, retailers do not want to be bothered freezing their own product. The prices of raw materials have increased, and since the retail price of ice cream has not advanced in like manner profits are less. Machines and parts are more difficult to obtain under present conditions.

STANDARDIZATION OF PACKAGES

Legislation requiring that packages of ice cream and sherbet be of the full net volume of one-quarter pint, one-half pint, one pint, one quart, or multiples of a quart (packages under five fluid ounces being exempt) has now been in force for two years. Firms previously opposing such legislation, having had ample opportunity of becoming accustomed to it, now indicate their approval. In some localities the half-pint package (10 fluid ounces) has proven to be a popular size.

TEXTURE IN RELATION TO DIPPING

Some retailers maintain that they can dip more scoops per gallon from ice cream manufactured in a continuous freezer than from ice cream of the same composition frozen in a batch freezer and on which the same overrun has been taken. They believe this is due to the smoother, finer texture of ice cream manufactured in continuous freezers.

Mr. Ralph E. Irwin, Harrisburg, Pa., reports interesting developments in Pennsylvania to improve further frozen desserts sanitation. The method of handling frozen desserts at fairs and exhibits should prove of great help and real interest to all sanitarians since this is a very prolific source of potential epidemics and has given the control official trouble since the danger was recognized.

REPORT OF RALPH E. IRWIN, HARRISBURG, PA.

In 1935 a law was passed placing ice cream sanitation in this Bureau. The farms and plants contributing to the preparation of ice cream are to meet the same sanitary standards as farms and plants for the preparation of milk. We do issue permits for the sale of raw milk but the law requires the ice cream mix to be pasteurized before freezing or the dairy products used in the making of mix should be pasteurized. Therefore we cannot issue permits for the sale of ice cream made from raw milk.

Rooms and buildings for the preparation of ice cream are to meet the same requirements as those for the preparation of milk. In fact, we make ice cream and process milk in the same room and use the same equipment so far as is practical. Such a setup has brought the so-called counter freezer

into rather prominent position. We cannot approve a freezer being located in the sales room, restaurant, etc.

The manufacture and sale of ice cream at county fairs and large exhibits has resulted in the preparation of what may be called a small ice cream plant that may be built in sections. This small plant consists of a wash room, freezing room, and sales counter. The freezing room is air conditioned. Into this room the mix is taken and poured into the freezer. The ice cream is collected in cans and placed in a cabinet which is a part of the partition between the ice cream room and the sales room. This cabinet opens into the sales room. Thus we prevent the entrance of flies and dust from the sales room and wash room into the ice cream room. For ventilating the ice cream room, we use a suction fan and air filter bringing the air from the outside into the ice cream room so that in entering the ice cream room the air movement is toward the outside of the room and largely prevents the entrance of unfiltered air.

We now have trucks for county fairs built in three parts, namely, wash room, ice cream room, and sales room. These trucks are equipped with heating facilities for hot water to be used in cleansing and sterilizing equipment. Similar heating facilities are provided for the small plants just referred to.

A few of our municipalities have ordinances providing standards for the preparation and sale of ice cream. These include the requirements of our State law and also such local requirements as appear necessary. Through municipal supervision we hope to obtain better control of small plants than is possible through districts into which the State is divided. We are sending out letters now calling together a general Committee to begin study of our entire sanitation law preparatory for the general session of our assembly in January, 1943.

F. W. FABIAN, *Chairman*

L. C. BULMER	A. J. KROG
W. C. CAMERON	H. N. PARKER
H. E. ERICKSON	R. V. STONE
R. E. IRWIN	G. J. TURNEY

(Continued from page 130)

sense, and a public-relations-mindedness. This is a large order. Yes, and it requires a highly qualified man to fill it. The wide-awake, efficient milk sanitarian is eager to do more effective work. He blazes new trails, he builds industry, he improves the public health when he is motivated by a conscientious devotion to duty, and when he has the knowledge as to what the situation needs and the why and the how to remedy it.

Authority without knowledge is a sham. Ambition without industry and knowledge is like the house built upon the sands—it risks disaster. Activity and industry without information is as bad as a ship without a rudder. To neglect to grow is to stagnate, probably to slip. The public demands intelligent service by well trained men. It is making the positions more stable, remunerative, and generally attractive. It provides the means for improved work and encourages special training. Unutilized knowledge makes intensive training an economic necessity.

Numerous courses are being offered in many institutions all over the country. The uncertainties of the times warrants large enrollments this summer. Learn now while opportunity permits. Knowledge is power, and perseverance in its pursuit is rewarding. J.H.S.

Milk Sanitation in the Federal District of Mexico

DR. SAMUEL DE LA PENA AND TOMAS CHAVEZ

Sanitary Engineer, Federal District Health Department, Mexico City, Mexico

(Translated from the Spanish and arranged by Max A. Heinzman, Chief Inspector, Division of Sanitation, Ventura County Health Department, Ventura, California)

MILK sanitation in Mexico is one of the most complex problems of health departments, the solution of which is still being studied. In Mexico City, the growth of the milk industry began in the latter part of the last century. Dairies producing and selling milk "Al Pie de la Vaca," meaning literally at the foot of the cow, were found everywhere, some being located in the very heart of the city. This milk was considered of a very high quality as the purchasers could see what they were buying, and the dairy owner did not have an opportunity to adulterate the milk by adding water. Sanitary conditions in these dairies were very poor, the standards depending on the individual owner. At the beginning of the present century, the health commission drafted regulations governing the production of milk offered for sale within the city limits. The city council also intervened in this matter by passing laws concerning the cleanliness of the dairies and their relationship to the sanitation of the city. In 1920, a section of the city was zoned, and dairies were prohibited from operating therein. This zone embraced the center of the city.

A distribution problem then arose in the zone where dairies were prohibited. Permits were issued for milk depots and within a short time these places sprang up throughout the city. They lacked proper sanitary facilities because of little or no inspection on the part of the health department. Milk was transported to the milk depots in cans holding approximately 10 gallons, and sold to the public by either of the following methods: (1) milk was poured into a large open holding tank from which it was dipped by the person in charge, using a measure holding slightly more than a quart; (2) by dipping directly out of the cans. Customers furnished their own containers consisting of pails, jugs, bottles, etc. The milk contained a great deal of sediment, had a very poor flavor, and was sold warm. Frequently the milk was adulterated with water, and preservatives were added in order to prevent souring.

In 1920, the health commission was reorganized and became known as the Federal Health Department. This department was responsible directly to the President of the Republic, and its powers were greatly increased. Leaders in this reorganization were the ex-chief and the ex-general secretary of the health commission, Dr. Bernardo Gastelun and General Medellin. These two gentlemen possessed the courage and energy necessary to institute health measures needed in order to improve sanitary conditions in food establishments and dairies.

In 1925, the federal health department issued regulations governing the sanitation of dairies. These regulations were revised in 1929, and although lacking in respect to the construction of milking barns and methods of handling milk, these regulations were

enforced in spite of the tremendous opposition on the part of the industry. These regulations made the cooling of certified milk mandatory, abolished hand bottling and capping, required that all utensils be sterilized by steam, and that milk be stored in refrigerated boxes. Dairying in Mexico City became a business.

CERTIFIED RAW MILK

Certified raw milk dairies operate under the direct supervision of the health department. The majority of certified raw milk dairies delivering milk in the federal district are located within a radius of 25 miles from the center of Mexico City. In order to secure a permit from the federal district health department to operate a certified raw milk dairy, the buildings must be constructed in accordance with the plans and specifications prepared by the technical committee. The authors of this article have been members of this committee for several years, and over strenuous opposition have succeeded in elevating standards for building construction. Regulations at the present time permit existing dairies to continue operating, provided however, that they are maintained in a sanitary condition.

The sanitary engineer of the technical committee inspects the buildings during construction and examines all materials used. He inspects the source of the water supply and collects samples for bacteriological examination. Since 1937, several model certified raw milk dairies have been constructed, among which the "Rancho El Olvido" is considered the model certified raw milk dairy of Mexico. This dairy was constructed in 1937 by General Rafeal Sanchez Tapia who had long been an advocate of clean and wholesome milk. General Tapia deserves the greatest credit for constructing such a fine plant and for the high standards being maintained there. The buildings are constructed of masonry, the entire plant being enclosed by a high brick wall. The rancho "El Olvido" has the following departments:

1. Milking barn.
2. Milk house, wash room, storage and machinery rooms.
3. Dressing rooms for milkers.
4. Calf Pens.
5. Calving Barns.
6. Hospital Barn.
7. Feed Storage.
8. Service yards and holding corrals.

Space does not permit a detailed explanation of each department, therefore only a short description of the milk handling facilities will be made. The milking barns are constructed of concrete and steel. The mangers, standing platforms, gutters, lighting and ventilating features are designed especially to meet conditions in Mexico. The barns are well lighted, ventilated, and properly drained. The milk house is located at a distance of 25 feet from the nearest string of cows being milked. This building consists of a pouring or receiving room, processing room, wash room, storage room, cold storage box, machinery room, and the milkers' dressing rooms. These rooms have modern sanitary facilities.

An interesting feature of the receiving room is that regulations call for a room without windows, having the walls painted black. The only light permitted in this room is one which barely provides sufficient light for the milker to see the receiving tank. Doors opening into this room are of steel, swing outward, and are self-closing. The stainless steel receiving tank has a hinged lid operated by a foot pedal. The only opening between the receiving room and the bottling room is a small hole for the stainless steel pipe, which connects the receiving tank and the clarifier, the latter being located in the bottling room. Between the clarifier and the surface cooler, a large covered holding tank, equipped with an agitator, is used to hold the milk until bottling time. The cooler is enclosed with a stainless steel cover. A Milwaukee filler and a Standard

Hood and Seal capper complete the equipment in the bottling room. This room has tiled floors and walls. The ceiling is cement plastered and oil painted. The light and ventilation of this room are very interesting, regulations requiring that the windows be of a size not less than 20 percent of the square footage of the walls. Ventilation is provided through a large ceiling ventilator and wall ventilators located 6 inches below the ceiling line. These ventilators are covered with copper fly screen and are screened on the inside and outside of the building. The wash room is adjacent to the bottling room. The height of the wash room is regulated by the location of the windows in the bottling room. Equipment in the wash room consists of 3 washing trays, a cabinet sterilizer, bottle washer, storage racks, and a roller conveyor which extends to the bottle filler. Containers which have been returned from the routes are stored in a nearby room, but an effort is made to wash and sterilize these containers as soon as possible. The boiler is housed in the boiler room. The cold storage box opens into a vestibule which has a door opening into the bottling room. A loading door is located in the vestibule so that trucks can receive bottled milk through a small door. The plant is well designed, of excellent construction, and can be easily kept in a sanitary condition.

Certified raw milk must be produced from cattle which have been tested for tuberculosis and Bang's disease. Reactors must be removed immediately and branded. A certified raw milk dairy must employ a registered veterinarian who is responsible for the health of the cattle. The resident veterinarian must notify the health department of all cases of disease among animals on the dairy. In addition, inspectors from the health department visit the dairies at unannounced intervals to examine the cattle and methods of handling the milk. Cows must be well fed and washed an hour before milking time. Teats must be washed and dried immediately before milking. All milkers must wear white milking suits and caps. They must hold a certificate from the health department stating that they were free from contagious disease at time of employment. This examination must be repeated every 6 months. Due to the distance from the milking barns to the receiving room, it is necessary to use a can to carry the milk to the receiving room. The dark receiving room as previously described is lighted by an electric light having a very low wattage. The milk flows by gravity from the receiving tank to the clarifier where all sediment and foreign substances are removed. After clarification, the milk is stored in the large covered holding tank and agitated until bottled. Milk must be cooled to a temperature below 40° F., and dairies are required to have a recording thermometer with the spud extending into the bottle filler. Certified milk must be mechanically bottled and capped, having a cap that will completely protect the pouring lip of the bottle. Certified milk at time of delivery must not carry more than 50,000 bacteria per ml., contain at least 3.2 percent of milkfat, and not less than 8.5 percent solids-not-fat. At the present time, 314 dairies hold permits to bottle certified raw milk.

PASTEURIZED MILK

When certified raw milk standards were established, the health department realized that only a small number of people could afford to purchase certified raw milk. Due to the rapid growth of Mexico City, milk consumption increased tremendously, and milk was being sold that had been produced in areas not subject to inspection. This milk was of a poor quality, and did not comply with desired standards. In order to protect the residents of the federal district, all milk produced in dairies not meeting

the standards of certified milk was required to be pasteurized. Naturally, the majority of dairymen were forced to ship their milk to pasteurizing plants. It was felt that a safe milk, even though produced in sub-standard dairies, would be of better quality than that being sold. Pasteurized milk dairies are places which have been in operation for years. Some have cement floors, some brick, and others cobblestone. Very few of these dairies are equipped with coolers, sterilizing equipment, and sanitary milk houses. Immediately after milking, the milk is hauled by truck or shipped to Mexico City by special milk trains. At the present time, 1,381 dairies are producing approximately 80,000 gallons of milk for pasteurization. Nine pasteurizing plants are located in Mexico City. These plants are with one exception in poor condition. The buildings are badly lighted, ventilation is inadequate, and there is little or no protection from flies. The machinery is old, and methods used for washing and sterilizing of bottles, equipment, and cans is very poor. None of these plants are equipped with cold storage facilities, and milk is delivered to milk depots, stores, and trade immediately after bottling. Plant owners operate their equipment at very high speed in order to handle the tremendous volume of milk. Owners are not required to have each vat equipped with a recording thermometer with the result that the efficiency of pasteurizing depends entirely upon the care given in keeping track of the time each vat has been held at pasteurizing temperature. Pasteurized milk shall be held at a temperature of 143° F. for at least 30 minutes, and then rapidly cooled. As hereinbefore stated, the holding time depends on the man in charge, and milk is probably over-pasteurized. As the public has been drinking boiled milk for generations, the problem of flavor in pasteurized milk does not give plant owners any trouble. Milk must not contain more than 1,000,000 bacteria before and not exceed 50,000 bacteria after pasteurization.

In addition to the commercial pasteurizing plants, the Department of Public Welfare owns and operates the finest plant in the Republic of Mexico. This plant is equipped with modern machinery, consisting of a homogenizer, pasteurizers, retorts, bottle washing machine, refrigerating machinery, storage tanks, and complete laboratory facilities. Approximately 8,000 bottles of feeding formulas are prepared daily under the direction of Dr. Samuel de la Pena. These formulas are put up in bottles of 7 ounce size, and finally sterilized in retorts at a temperature of 240° F. under 15 pounds of pressure for 12 minutes. Trucks from the Department of Public Welfare deliver the finished product to maternity centers located in various parts of the city. Distribution is made to families who are unable to care properly for children under 3 years of age. Visiting nurses certify to the Director of the Maternity Center where malnutrition exists, and a careful check is made to see that the children in need are cared for. This program has resulted in a marked decrease in infant mortality caused by stomach disorders. Dr. Gustavo Baz, Secretary of the Department of Public Welfare, has authorized the construction of an addition to the plant for the purpose of supplying all public institutions with milk from the "Provision of Leche."

Comparing the production and consumption of milk in the Federal District of Mexico and the city of Cleveland, Ohio, it is interesting to note that the population of these cities is approximately the same. Cleveland, Ohio, has 11,202 producers with a cow population of 120,000, while the Federal District of Mexico is supplied by 2,495 producers having a cow population of approximately 45,000. The daily per capita consumption in Cleveland, Ohio, averages 0.5 pint. The population of the Federal District of Mexico is estimated to be 1,423,149

inhabitants and the per capita consumption is 0.25 pint per day.

FAMILY DAIRIES

The Federal District of Mexico has approximately 950 dairies which are known as "Establos de Consumo Familiar." These are places where the owner is permitted to maintain not more than 3 cows on the premises, and the milk is intended only for family use. It is impossible to prevent these places from selling milk to neighbors. The health department has a tremendous problem to stop these dairies from selling milk. Inspectors keep as close a check on these places as possible, often maintaining guards day and night.

Owing to the laxity of the people engaged in maintaining these dairies and the indifference of the consuming public, the health department must carry on a campaign against tremendous difficulties. It is due only to the untiring efforts of health authorities that people are discontinuing buying milk from unlicensed dairies.

CONCLUSION

The Federal Health Department, under the direction of Dr. Victor Fernandez Manero, is making great strides toward improving the quality of milk. Due to present world conditions, producers of milk in Mexico will be unable to secure milk machinery. When conditions in the world again become normal and such machinery can be sold in that country at a reasonable price, health authorities will be in a position to demand that their dairies be equipped with modern machinery. The engineering staff of the Federal Health Department has prepared plans for the construction of pasteurizing plants which will be located in the principal cities of Mexico. Mexican health authorities are to be congratulated for carrying out a program of milk sanitation which is providing the residents of their country with a clean and wholesome product. Such a program will contribute to the health, safety, and welfare of the inhabitants of that nation.

SANITARIAN POSITION VACANT

The Flint Department of Public Health announces an opening for a sanitarian on its staff. Minimum entrance qualifications are education equivalent to graduation from an accredited 4-year high school and completion of at least 2 years in a college or university with courses in public health, dairy science, or bacteriology and hygiene. Previous experience in public health is also desirable.

The salary range for the position is $1,620 to $2,160. The appointment will be made under the Civil Service after candidates have taken written examinations. Although but one vacancy now exists, it is anticipated that other vacancies will occur, and the Department desires to establish an eligibility list.

Persons interested should write to the Flint Civil Service Commission, City Hall, Flint, Michigan, and the requisite application blanks will be forwarded to them.

NEW METHODS OF PAYING FOR MILK DEVELOPED

A new method of paying producers for both fat and the solids-not-fat in milk has been developed by R. K. Froker and C. M. Hardin of the College of Agriculture, University of Wisconsin, Madison. The new plan is applicable for use in all types of dairy plants and operations, including cheese factories, creameries, condenseries, and fluid milk markets. The plan, with numerous examples, is described in a new bulletin, "Paying Producers for Fat and Solids-Not-Fat in Milk," which has just been released. While the edition lasts, copies may be secured at 10 cents a copy.

This bulletin represents the most complete method of purchasing milk that has so far been proposed. It takes into account virtually all of the constituents of milk that have economic value, and also recognizes differences in processing costs as well as variations in prices received for the different products made from the milk.

It is shown in the bulletin that milk testing 3 percent fat normally has nearly an extra pound of solds-not-fat for each pound of fat above that of 5 percent milk. The new pricing plan takes this factor into account.

How to pay for fat and solids-not-fat in milk has long been a problem in the dairy industry. The problem has grown in importance in recent months. Large purchases of cheese, evaporated milk, and skimmilk powder have been made by the federal government, without a corresponding increase in demand for butter. The fact, however, that the domestic market for skimmilk powder, buttermilk powder, and casein has increased rapidly in recent years, together with a growing realization by the public that solids-not-fat in milk have a high nutritive value, emphasizes the importance of this pricing problem.

All payment plans developed in the new bulletin follow the general pattern of pricing milk on a hundredweight basis with adjustments in this price for variation in the fat and solids-not-fat content of the milk among individual patrons. This means that in Wisconsin the price will be quoted in terms of a hundredweight of milk testing 3.5 percent fat with adjustments as the fat and solids-not-fat vary from this standard.

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 Eng. 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 percent; 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.

Legal Aspects

Sewage Disposal *

(Wisconsin Supreme Court; *State ex rel. Martin, Attorney General* v. *City of Juneau,* 300 N. W. 187; decided October 7, 1941.) The State Board of Health and the State Committee on Water Pollution of Wisconsin found that the discharge of inadequately treated sewage from the city of Juneau into a drainage ditch caused, among other things, a menace to public health and a nuisance. Based on these findings the board and committee ordered that the city take immediate steps to secure detailed plans and specifications for a complete sewage treatment system or plant adequate to meet local needs, which plans and specifications were to be submitted to the board for approval in accordance with statutory requirements. It was also ordered that the treatment system or plant be installed and placed in operation in a little less than a year and that it be so operated and maintained as to prevent objectionable pollution conditions in the ditch. The city failed to comply with the order and the State sought a mandatory injunction commanding the city to comply and asking that it be enjoined from discharging inadequately treated sewage into the drainage ditch after a reasonable time to be determined by the court. The city did not pursue the statutory remedies provided for the review of the order or the arbitration of the question, and the Supreme Court of Wisconsin said that, because of the city's failure to avail itself of the remedies provided, it was considered that in the instant action the city was foreclosed from raising any questions except (1) the validity of chapter 144 of the Wisconsin Statutes, and (2) whether the State board of health and the State committee on water pollution acted within the powers conferred upon them by statute. The city, upon appeal by it from the lower court's order, contended that chapter 144 was invalid and unconstitutional because (1) it was vague and indefinite and incapable of enforcement, (2) it unlawfully delegated both legislative and judicial power, and (3) it was unreasonable, arbitrary, and oppressive.

The purpose of the statute respecting the State committee on water pollution was to prevent pollution of the waters of the State and under it the committee had the duty and power to issue special orders directing particular owners to secure such operating results toward pollution control as the committee might prescribe. One objection of the city was that because the words "operating results" were not specifically defined the statute was invalid because indefinite. The supreme court said that it would seem to be reasonably plain that an operating result was one which prevented pollution and rejected this objection and stated that other specific objections of the same general character did not need to be separately considered. Relative to the question of delegation of legislative and judicial power, it was the view of the court that the limitations upon the power to delegate had not been exceeded by the provisions of chapter 144. The appellate court also pointed out that what the statute conferred upon the State board of health and the State committee on water pollution was authority to promote public health. "The discretion vested in" the board and committee "is not arbitrary, it is subject to court review and the rights of all parties are fully protected." Neither did the court find any basis for the city's contention that the board and committee had acted beyond and without the powers conferred upon them by chapter 144.

The statute being valid and the board and committee having acted within their statutory powers, the supreme court affirmed the lower court's order.

Liability for Sale of Contaminated Beverage *

(Georgia Court of Appeals, Division No. 1; *Crosby et al.* v. *Calaway,* 16 S.E.2d 155; decided July 8, 1941.) In an action brought for injury alleged to have resulted from drinking a bottled beverage which was contaminated, the Georgia Court of Appeals, in the course of its opinion, referred to the following section of the State code: "Any person who knowingly or carelessly sells to

* *Pub. Health Repts.,* March 27, p. 482 (1942).

* *Pub. Health Repts.,* 57, 551 (1942).

another unwholesome provisions of any kind, the defect being unknown to the purchaser, by the use of which damage results to the purchaser or his family, shall be liable in damages for such injury." The court said that this did not apply to clerks or agents who were not shown to have undertaken to perform the duty of inspection required of distributors or retailers. "We think this section is applicable to principals and not agents."

In closing the opinion the court stated that an agent or clerk in a retail store, who merely passed out the articles and received the price for the principal, was not liable for defects in the article sold unless he had actual knowledge of the defects, or unless he assumed the responsibility which the law placed upon retailers and distributors of food, or unless he owed some particular duty to the purchaser. "Before an agent becomes liable for an act or omission alleged to have constituted negligence with resultant injury it must appear that such agent agreed to perform such act for his principal, or had assumed to perform it."

Death from disease caused by bacillus enteriditis held compensable under workmen's compensation act.—(Utah Supreme Court; *Andreason et al.* v. *Industrial Commission et al.,* 100 P.2d 202, decided March 13, 1940; rehearing denied May 31, 1940, 102 P.2d 894.) An employee of an animal by-products company, whose duties consisted of skinning and butchering animals, died as a result of contracting a disease attributed to bacillus enteriditis. His widow sought compensation under the Utah workmen's compensation law for herself and her minor children. The illness from which the employee died was uncommon and rare, and there were no other known cases in the State. The disease was one that was acquired from contact with diseased animals or diseased meat. There was no evidence that the deceased came in contact with any diseased animals except at his work. The statute provided for compensation for the injury or death of an employee "by accident arising out of or in the course of his employment." The law also stated that "personal injury by accident arising out of or in the course of employment" should "not include a disease, except as it shall result from the injury." The Utah Supreme Court said that two questions confronted it, namely, was the disease an accidental injury, and, if so, was it contracted in the course of the deceased's employment. These questions were answered in the affirmative.

The court was of the opinion that under the compensation law an injury arising out of an accident was not limited in meaning to the result of the application of physical force to the body of the injured. An accidental injury might well be expressed as a disability happening by chance or unexpectedly but must, however, be connected with the employment. We do not wish to imply, said the court, that, because one becomes ill while at work, the statute applies to him, even though it may be that he became ill unexpectedly. "That alone is not sufficient to make this case one of an accidental injury. There must be a causal connection between his employment, or his place of employment, and his illness—something which happened to him in the performance of his duties, or some contact he made at his place of employment while on duty there—which forms the connecting link between his employment and the contraction of the illness. And, we might add, which is not an occupational disease." Respecting the legislative provision, above-mentioned, relative to personal injury by accident not including disease, the supreme court referred to one of its prior decisions in which it had been stated that the purpose of the legislature in so enacting was to eliminate occupational diseases.

Relative to the evidence, the court stated that it believed that there was only one reasonable inference to be drawn and that was that the deceased contracted the disease in the course of his employment.

The court held that, so far as the questions submitted to it were concerned, the dependents of the deceased were entitled to compensation.

Supreme Court Decides Two Food Firm Cases

Two United States Supreme Court decisions affecting the food industries were issued on February 2. In one ruling the Court affirmed Federal authority to regulate intrastate commerce when that business is in competition with interstate traffic. And in a unanimous decision the court denied the claim of Wrightwood Dairy Company for exemption from a milk marketing agreement for the Chicago area on the ground that the concern operates only in Illinois.

A second decision held that Alabama and other states may not, under authority of pure food laws, stop interstate movement of raw country butter en route to a plant to be processed into renovated butter. This decision settled an appeal brought by Cloverleaf Butter Co., Birmingham, which sought to prevent state officials from seizing butter being shipped to its manufacturing plant. The firm contended that it was licensed under the Federal Renovated Butter Act and that that statute prevented Alabama from acting.

—*Food Industries,* March, 1942

JOURNAL OF MILK TECHNOLOGY

Official Publication of the

International Association of Milk Sanitarians

(Association Organized 1911)

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JOURNAL OF MILK TECHNOLOGY

AS THEIR OFFICIAL ORGAN

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Secretary-Treasurer, J. B. Baker, Department of Health, Charleston, W. Va.

Association News

Chicago Dairy Technology Society

The April meeting was a joint session with the Chicago Section of the Institute of Food Technologists. Mr. F. M. Scales spoke on "The Wetting Agents—Their Properties and Application to Food Industries."

G. B. ULVIN

Kansas Association of Milk Sanitarians

Preliminary plans are being formulated at this time for the thirteenth annual meeting of the Kansas Association of Milk Sanitarians, which will probably be held in November, at Manhattan, Kansas. The officers and directors of the association will meet at Kansas State College, Manhattan, Kansas, on Tuesday, April 21st, for the purpose of making the necessary arrangements for the meeting. A definite announcement of the date set for the meeting will be made at a later date.

W. J. CAULFIELD,
Secretary-Treasurer

Massachusetts Milk Inspectors' Association

There is expression of considerable concern among public health officials and milk inspectors in this area regarding the alternate-day delivery of milk to consumers. It is not working out satisfactorily, particularly with regard to infant feeding. The problem is associated with the lack of proper refrigeration in hot weather with attendant lack of proper storage facilities. This will undoubtedly be true in the poorer sections of the cities. The final result will probably be more milk bought from stores as has already been noticed. This condition will call for more rigid inspection of milk all the way from the farm to the consumer.

The spring meeting was held in Boston and was addressed by Mr. A. W. Fuchs on "Milk Control in the Defense Program." Motion pictures were shown under the auspices of the DeLaval Company.

ROBERT E. BEMIS,
Secretary-Treasurer

Michigan Association of Dairy and Milk Inspectors

The Michigan Association begins its fifteenth year with a good record of activity and accomplishments. The past year has been particularly active because of the several projects undertaken.

Three meetings were scheduled during the year all of which were well attended. The annual 3-day short course for daily inspectors was held during July at Michigan State College. In December the Association sponsored a demonstration on recommended methods for the sanitary care of milking machines at Michigan State College. This affair was unique in that the manufacturers of 13 leading milking machines sent representatives to demonstrate the proper care of each of their machines. The demonstration lasted the entire day. In February a 2-day meeting was held in Lansing in conjunction with the Michigan Allied Dairy Association Convention.

Members of the Association took a very active part in the writing of the new Michigan Milk Ordinance which was officially adopted in March. With the completion of this work the Dairy Farm and Milk Plant Standards Committees were dissolved and the Ice Cream and Creamery Standards Committees were continued. The Committee on Sanitary Care of Milking Machines will also be continued.

The Association voted to carry all members serving in the armed forces of the country on the active list of membership without dues.

It is with a great deal of pleasure that we announce that the summer meeting will be held with the American Dairy Science Association at their annual meeting at Michigan State College in June.

HAROLD J. BARNUM,
Secretary-Treasurer

New York State Association of Milk Sanitarians

The Executive Committee of the Association met recently in Albany to formulate a preliminary program for the annual meeting of the Association which is scheduled to be held in Albany in September. Members are invited to submit suggestions as to topics they would like to hear discussed at this meeting including, if possible, suggested speakers to handle such subjects.

Mr. Lamont C. Snyder has been appointed as milk inspector in the sanitation division of the Buffalo City Health Department filling the vacancy created by the death of Eugene E. Ruth. Mr. Snyder has been assigned to cover pasteurizing plants in certain of the city districts.

Nicholas A. Milone, district milk sanitarian with the New York State Department of Health at Middletown, N. Y., was called for military service as a reserve officer on April 6. He is serving as First Lieutenant in the Chemical Warfare Service.

The Bureau of Milk Sanitation of the New York State Department of Health announce the recent appointment under civil service of 5 new junior milk sanitarians.

Three of these men, namely, Philip A. Beckler, Henry W. Scoralick, and S. Emerson Smith, who have been on duty for some months past as provisional appointees pending the establishment of a civil service list, have received permanent appointments. Beckler and Scoralick are serving as district milk sanitarians in the Oneonta and Batavia districts respectively. Smith is in charge of the milk laboratory at Utica.

Effective April 15, 1942, Paul L. Brooks and Mead P. Creath were appointed. Brooks has been assigned to the Middletown district in the temporary absence of Nicholas Milone in military service. Creath has been assigned to the Gouverneur district.

W. D. TIEDEMAN,
Secretary-Treasurer

Refrigeration of Precooked Ham. Health News, N. Y. State Dept. of Health, *18*, 10–11 (Jan. 20, 1941). *Pub. Health Eng. Abs.* xxi, Mi, 23.

A number of small outbreaks of food poisoning have been reported in New York State in recent years in which the epidemiological evidence clearly pointed to ham as the source of infection. One of these was apparently due to eating precooked ham. Laboratory examination of a specimen of the ham revealed large numbers of *Staphylococcus aureus*, and a Gram-negative bacillus with characteristics of *B. coli*. Precooked hams which are not refrigerated are apt to become contaminated. "It would appear, therefore, that so-called tenderized or precooked hams are a good medium for the growth of staphylococci and other microörganisms and that they approach custard-filled pastries as perishable foods requiring careful handling and proper refrigeration up to the time of consumption."

ELMER W. CAMPBELL

New Members

INTERNATIONAL ASSOCIATION OF MILK SANITARIANS

ACTIVE

Bruhn, Aksel T., Sr., Dairy Inspector, Wisconsin State Dept. of Agriculture, 1502 Drake St., Madison, Wis.

Fish, Dr. James G., Veterinarian-Dairy Inspector, 4644 Main St., Jacksonville, Fla.

Gunderson, Dr. N. O., Commissioner of Health, Department of Public Health, Rockford, Ill.

Pizzoferrato, Julius A., City Health Commissioner, Department of Health, Stubenville, Ohio.

Tyler, Max E., Instructor in Bacteriology, Colorado Experiment Station, Fort Collins, Colorado.

ASSOCIATE

Armil, Ed., City Hall, Davenport, Iowa.

Barber, Franklin W., Teaching Assistant, University of Wisconsin, 213 N. Randall Ave., Madison, Wis.

Bartlett, Carl J., City Laboratory, Ottumwa, Iowa.

Bennett, A. L., Dist. Health Office, Manchester, Iowa.

Bergy, Malcolm, Chemist, S. M. A. Corporation, Mason, Michigan.

Cucher, Jack L., Dairy Inspector, 544 W. 63rd St., Chicago, Ill.

Dashen, Stephen, Milk Laboratory, City Hall, Des Moines, Iowa.

Fassnacht, R. S., Milk Inspector, City Hall, Salina, Kansas.

Kimmer, W. H., Chemist, Johnson & Johnson, New Brunswick, N. J.

Kinney, Frank G., City Health Department, Sioux City, Iowa.

Knight, Harold L., Anderson-Ericksen Dairy, Des Moines, Iowa.

Krause, K. S., District Health Office, Washington, Iowa.

Kreamer, F. W., Health Department, City Hall, Sioux City, Iowa.

Lavine, Joe, Milk Laboratory, City Hall, Des Moines, Iowa.

Mitchell, Adrian E., Cutter, Slipco Mfg. Co., Shelton, Conn.

Mutten, Glenwood, Roberts Dairy, Sioux City, Iowa.

Olson, E. A., City Hall, Fort Dodge, Iowa.

O'Malley, Charles M., Chief Chemist, American Dry Milk Institute, Inc., 221 N. La Salle St., Chicago, Ill.

Pesek, Jerry M., Undergraduate Assistant, University of Wisconsin, Park Falls, Wis.

Potter, C. C., County Health Department, Burlington, Iowa.

Powell, Marcus, 266 Medical Laboratory, University of Iowa, Iowa City, Iowa.

Ruppert, Clarence J., 727 Rundell St., Iowa City, Iowa.

Sampson, J. A., Court House, Ft. Dodge, Iowa.

Schliekelman, R. J., District Health Office, Centerville, Iowa.

Schwimmer, Robert L., Public Health Engineer, U. S. P. H. Service, Bay County Health Dept., Panama City, Fla.

Spaun, Rolland E., Bacteriologist, Michigan State Dept. Agri., Lansing, Mich.

Strait, Maurice, Milk Laboratory, City Hall, Des Moines, Iowa.

Swanson, L. H., 1553 Eighth Ave., Moline, Ill.

Waffle, R. W., Plant Mgr., Borden's, 501 South Park St., Owosso, Mich.

Walker, Joe L., County Sanitarian, Butler County Board of Health, 521 N. Taylor St., El Dorado, Kansas.

CHANGES IN ADDRESS

Hyatt, George, Jr., from 227 Jones Ave. to *R. F. D. 4, Stewartstown Road, Morgantown, W. Va.*

Colvin, Claude H., from Binghamton to *65 Court St., Buffalo, N. Y.*

Colvin, Robert H., Monroe to *Cortland, N. Y.*

Costello, Floyd, from Holland Patent to *Adams, N. Y.*

Eldred, Burdett, not Benedict.

Ellmers, Dr. Gordon R., from Bogota, N. J., to *Schenectady, N. Y.*

Hart, E. E., Jr., from Sherrill to *Oriskany Falls.*

Hettinger, S. M., from Newark, N. J., to *307 E. Grant Ave., Rochelle Park, N. J.*

Kloser, George G., from 516 Jackson Ave., Utica, to *285 Tower St., Waterville, N. Y.*

Lewis, John, from Candor to *Camden, N. Y.*

Nichols, Rudolph, from Albany to *Chatham, N. Y.*

Safford, C. E., from Albany to *26 Nathaniel Blvd., Delmar, N. Y.*

Spencer, Harold S., from New Milford, Pa., to *Homer, N. Y.*

Swanner, Roy O., from Albany to *Saratoga Springs, N. Y.*

Van Winkle, Fred, from Middletown to *Milk Plant Specialties Corp., Rochester, N. Y.*

The Massachusetts Milk Inspectors' Association

In appreciation of many years of service in the field of milk inspection and extraordinary contributions to the perpetuation of the ideals for which this association was founded hereby

***Presents to* JULIUS HERMAN FRANDSEN**

Teacher—Investigator—Councilor—Friend

this

CERTIFICATE OF MERIT

on the seventh day of January 1942

(signed) JOHN H. BUCKLEY
President

ROBERT E. BEMIS
Secretary

INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, INC.

Committees for the Year 1942

Communicable Diseases Affecting Man Their Relation to Public Milk Supplies

Paul B. Brooks, *Chairman*...Albany, N. Y.
Lloyd Arnold.....Chicago, Ill.
R. G. Flood.....San Francisco, Cal.
A. W. Fuchs.....Washington, D. C.
J. G. Hardenbergh.....Chicago, Ill.
R. A. Garcia.....Begota, Colombia, S. A.
H. N. Parker.....Jacksonville, Fla.
A. R. B. Richmond.....Toronto, Ontario

Sanitary Procedure

C. A. Abele, *Chairman*.....Chicago, Ill.
C. D. Dalzell.....Little Falls, N. Y.
W. D. Dotterrer.....Chicago, Ill.
H. C. Eriksen.....Santa Barbara, Cal.
A. W. Fuchs.....Washington, D. C.
George W. Grim.....Ardmore, Pa.
Ralph E. Irwin.....Harrisburg, Pa.
A. C. Fay.....Boston, Mass.
C. W. Weber.....Albany, N. Y.
M. E. Parker.....Chicago, Ill.
Sol Pincus.....New York, N. Y.
George W. Putnam.....Chicago, Ill.

Dairy Farm Methods

H. N. Parker, *Chairman*..Jacksonville, Fla.
Chester F. Bletch.....Washington, D. C.
W. P. S. Hall.....Toledo, Ohio
R. L. Griffith.....Oakland, Cal.
H. E. Bremer.....Montpelier, Vt.
C. K. Johns.....Ottawa, Canada
Ernest Kelly.....Washington, D. C.
W. D. Dotterrer.....Chicago, Ill.
Russell Palmer.....Detroit, Mich.
E. H. Parfitt.....Chicago, Ill.
L. C. Bulmer.....Birmingham, Ala.
R. G. Ross.....Tulsa, Okla.
M. R. Fisher.....St. Louis, Mo.
D. A. Davidson.....Nashville, Tenn.
S. V. Layson.....Springfield, Ill.
James D. Brew.....Knoxville, Tenn.

Frozen Desserts Sanitation

F. W. Fabian, *Chairman*
East Lansing, Mich.
Ralph E. Irwin.....Harrisburg, Pa.
Andrew J. Krog.....Plainfield, N. J.
John M. Scott.....Gainesville, Fla.
R. V. Stone.....Los Angeles, Cal.
M. R. Fisher.....St. Louis, Mo.
L. C. Bulmer.....Birmingham, Ala.
H. E. Miller.....Ann Arbor, Mich.
H. L. DeLozier.....Louisville, Ky.

Standardization of Technological Procedure

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C. A. Abele.....Chicago, Ill.
Paul B. Brooks.....Albany, N. Y.
K. G. Weckel.....Madison, Wis.
F. W. Fabian.....East Lansing, Mich.
Ernest Kelly.....Washington, D. C.
H. N. Parker.....Jacksonville, Fla.

Applied Laboratory Methods

K. G. Weckel, *Chairman*....Madison, Wis.
T. H. Butterworth.....Houston, Texas
J. L. Barron.....Hempstead, L. I.
Sarah Vance Dugan.....Louisville, Ky.
H. A. Harding.....Detroit, Mich.
H. R. Thornton.....Edmonton, Alberta
C. K. Johns.....Ottawa, Canada
Ernest Kelly.....Washington, D. C.
F. P. Wilcox.....Los Angeles, Cal.

Resolutions

Ernest Kelly, *Chairman*..Washington, D. C.
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V. M. Ehlers.....Austin, Texas
J. G. Hardenbergh.....Chicago, Ill.
Ralph E. Irwin.....Harrisburg, Pa.
C. K. Johns.....Ottawa, Canada
Horatio N. Parker.....Jacksonville, Fla.
William B. Palmer.....Orange, N. J.
A. R. B. Richmond.....Toronto, Ontario
A. R. Tolland.....Boston, Mass.

A Bacteriological Study of Home-Made Ice Cream. V. D. Foltz (Kans. State Col.) (Jour. Bact., 39 (1940), No. 3, p. 345). Expt. Sta. Rec. *83,* 394 (Sept. 1940). *Pub. Health Eng. Abs.* xxi, Mi, 21.

"Standard plate counts and presumptive tests for coliform bacteria on 100 samples of home-made ice cream showed logarithmic average plate counts of 171,000 per cubic centimeter and logarithmic average coliform counts of 70 per cubic centimeter. Samples frozen in tub freezers averaged higher than those frozen in mehanical refrigerators, and those made from unpasteurized dairy products averaged much higher than those from pasteurized products. The bacteriological quality of the home-made ice cream averaged lower than that of commercial ice cream (E. S. R., 82, p. 677)."

International Association of Milk Sanitarians, Inc.

CONSTITUTION

Adopted October 16, 1911
(Amended October 20, 1932; October 15, 1936, and October 25, 1939)

ARTICLE I

This Association shall be known as the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, INC.

ARTICLE II

OBJECT

The object of this Association shall be to develop uniform and proper supervision and inspection of dairy farms, milk and milk products establishments, and milk and milk products; to encourage the improvement in quality of dairy products and the technological development of dairy equipment and supplies; and to disseminate useful information regarding dairy sanitation, technology, inspection, and administration.

ARTICLE III

MEMBERSHIP

PARAGRAPH 1. There shall be two classes of membership in this Association: ACTIVE and ASSOCIATE.

PARAGRAPH 2. The professional and experiential qualifications of the ACTIVE members, in addition to the distinctions specified in the following two paragraphs, shall be:

(A) An undergraduate degree or its equivalent;

(B) Actual experience of at least three (3) years in dairy inspection, supervision, teaching, or technology; provided, however, that all persons who at the time of the adoption of this amendment are members of the Association shall retain their present status.

PARAGRAPH 3. The ACTIVE membership shall be composed of persons who are officially engaged in dairy or milk inspection, or the laboratory control of, or the administration of such function for any country or any subdivision thereof, and of persons who are officially engaged in research or educational work related to dairy or milk inspection for any country or subdivision thereof, and who possess the qualifications described in Paragraph 3 of this Article.

PARAGRAPH 4. The ASSOCIATE membership shall be composed of any persons, not eligible for Active membership, who are interested in the promotion of dairy sanitation and technology. Associate members shall not be elegible to vote, serve as officers, hold the chairmanship of any committee, serve on the Resolutions Committee, or serve as majority members of any committee of this Association.

PARAGRAPH 5. Any person may make application for ACTIVE or ASSOCIATE membership to the Secretary-Treasurer, and if application is accepted by the Membership Committee, said applicant may become an Active or Associate member, as the case may be, upon payment of the annual membership dues of three dollars ($3) for ACTIVE membership, or two dollars ($2) for ASSOCIATE membership.

OFFICERS

The officers of this Association shall be a President, three Vice-Presidents, a Secretary-Treasurer, and two Auditors, who shall be elected by a majority ballot at the Annual Meeting of the Association, and shall hold office for one year or until their successors are elected. An Executive Board, which shall direct the affairs of the Association when not in Annual Session, shall consist of the President, the three Vice-Presidents, and the Secretary-Treasurer.

AMENDMENTS

This Constitution may be amended by a two-thirds affirmative vote of those Active members of the Association who register their votes with the Secretary. Any member proposing amendments must submit the same in writing to the Secretary-Treasurer at least sixty days before the date of the Annual Meeting, and the Secretary-Treasurer shall at once notify all members that the proposed amendments will be open for discussion at the Annual Meeting immediately succeeding such notification. After discussion at the Annual Meeting such amendments, upon a majority affirmative vote of the members in attendance, shall be, within 90 days, submitted to the entire membership of the Association by the Secretary-Treasurer. All members voting on such amendments shall, within 60 days after receipt of such notification, register their vote in writing with the Secretary-Treasurer on blanks furnished by the Association. These ballots shall be opened and recorded by the Executive Committee and the results shall be reported by the Secretary-Treasurer at the next Annual Meeting: and if the amendments are passed they shall become a part of the Constitution from the date of such report by the Secretary-Treasurer at the Annual Meeting.

BY-LAWS

ADOPTED OCTOBER 25, 1913

ORGANIZATION

The Constitution shall be the basis of government of this Association.

ARTICLE 1

MEMBERSHIP

SECTION 1. Any person eligible for membership under the Constitution who shall file an official application, accompanied by the first annual membership dues of three dollars, and whose application for membership shall have the approval of the Membership Committee, may become a member of the Association for one year.

SECTION 2. Any person having once become a member may continue membership in the Association so long as the annual membership dues are paid. Any member who shall fail to pay annual dues within thirty days after having been notified by the Secretary that said dues are due and payable, shall be dropped from membership. Any member so dropped may, within ninety days, be reinstated by the Membership Committee, upon application filed in due form and accompanied by the annual membership dues for that year.

SECTION 3. A member of the Association may be expelled for due cause upon recommendation of the Membership Committee, and a majority vote of the members at any annual meeting. Any member so expelled shall have refunded such *pro rata* part of his membership dues as may not be covered by his term of membership.

HONORARY MEMBERS

SECTION 4. Members of the Association may elect as honorary members, at any stated meeting, on the recommendation of the Membership Committee, those whose labors have substantially added to the scientific knowledge of milk supply betterment, or those who have been of pronounced practical influence in the improvement of the milk industry. From such members no dues shall be required. They shall have the privilege of attending the meetings of the Association, but they shall not be entitled to vote.

ARTICLE 2

OFFICERS

SECTION 1. The officers of this Association shall be a President, a First, Second, and Third Vice-President, a Secretary-Treasurer, and two Auditors, who shall be chosen by ballot at the annual meeting of the Association, and shall hold office for one year, or until their successors are duly elected.

SECTION 2. The Executive Board shall consist of the President, the three Vice-Presidents, and the Secretary-Treasurer.

SECTION 3. The Membership Committee shall consist of the President, the three Vice-Presidents, and the Secretary-Treasurer.

ARTICLE 3

DUTIES OF OFFICERS

SECTION 1. It shall be the duty of the President to preside at all meetings of the Association. He shall examine and approve all bills previous to their payment, appoint all committees unless otherwise directed by vote of the Association, and perform such other duties as usually devolve upon a presiding officer, or are required of him by the Association.

SECTION 2. The Vice-Presidents, in the order of their selection, shall perform the duties of the President in his absence.

SECTION 3. The Secretary-Treasurer shall record the proceedings of the Association. He shall keep a list of members, and collect all moneys due the Association, giving his receipt therefor. He shall record the amount of each payment, with the name and address of the person so paying. He shall faithfully care for all moneys entrusted to his keeping, paying out the same only with the approval of the President, and taking a receipt therefor. He shall, immediately after his election to office, file with the President of the Association a bond in the sum of five hundred dollars, the expense of which shall be borne by the Association. He shall, at the annual meeting, make a detailed statement of the financial condition of the Association.

It shall also be the duty of the Secretary-Treasurer to assist in making arrangements and preparing a program for the annual meeting, and to compile and prepare for publication all papers, addresses, discussions and other matter worthy of publication, as soon as possible after the annual meeting.

SECTION 4. The full management of the affairs of the Association when the Association is not in session shall be in the hands of the Executive Board, as provided in the Constitution.

SECTION 5. It shall be the duty of the Auditors to examine and audit the accounts of the Secretary-Treasurer and all other financial accounts of the Association, and to make a full report of the condition of the same at the annual meeting.

ARTICLE 4

MEETINGS

SECTION 1. The annual meeting of the Association shall be held at such time and place during the month of October of each year or at such other time as shall be designated by the Executive Board.

SECTION 2. Special meetings of the Association may be called by the Executive Board, of which due notice shall be given to the members by the Secretary.

SECTION 3. Quorum.—Twenty-five per cent of the membership shall constitute a quorum for transaction of business at any annual meeting. Voting by proxy shall not be permitted.

ARTICLE 5

These By-Laws may be altered or amended at any annual meeting of the Association. Any member proposing amendments must seasonably submit the same in writing to the Secretary-Treasurer, who shall then give notice of the proposed amendments by mail to each member of the Association at least thirty days previous to the date of the annual meeting.

"Dr. Jones" Says—*

HERE awhile ago, when I was listening to a sermon, I got to thinking about a friend of mine that took an automobile trip out west. There was one long stretch through the desert where, for hours, they didn't see any houses and what bothered 'em more: they didn't come to any service stations. The car was running O.K. and he didn't need anything but he said he'd have been a lot more comfortable if he could've passed one once in a while, just to know they were there. And, you know, the thought struck me that the church, as you might say, is sort of a service station along the road of life. It's a place where you can get your tank filled up with power and get oil to keep down friction and get the bugs and things cleaned off'm your windshield so you can see more clearly. You may think you're all fixed up so you don't need it. Just the same you feel a lot more comfortable just to know it's there.

Yes, sir. We argue and disagree about a lot of things but there's at least two things most of us have in common. One's our religion and the other's our interest in our health. And the two sort of hitch up together. Folks can be awful independent when they're feeling hale and hearty but if there's something wrong with their health they're liable to start thinking about whether their passport to the hereafter's been properly visaed and whether they've got reservations and so on. And you can't have perfect health without peace of mind and I'm beginning to wonder whether anybody that hasn't got a religion—or thinks he hasn't—can ever have complete peace of mind.

But I was thinking about what James—I mean the one in the Bible—what he said. He says if you say to somebody "Depart in peace, be ye warmed and filled; notwithstanding ye give them not those things which are needful to the body; what doth it profit?" Faith without "works," he says, is dead. A youngster dying from diphtheria, for instance: it ain't "the will of God," the way they used to think; it's usually somebody's mistake: not having 'em immunized against diphtheria or not giving 'em antitoxin in time. Having faith don't relieve us from any of our responsibilities. "Works," the way I see it, is knowing what our responsibilities are and meeting 'em.

The "shepherd of the flock"—nowadays he's supposed to see that his sheep are dipped to kill ticks and all that (in some sections, anyways). So the ministers—I figure, while they're stimulating and supporting the faith of their constituents, they sort of owe it to 'em to keep 'emselves posted on such things as vaccination, and safe water supplies and pasteurization of milk and what not: things that are "needful to the body."

PAUL B. BROOKS, M.D.

* Health News, New York State Department of Health, Albany, Dec. 1, 1941.

Index to Advertisers

Application for Membership

.....194.....

TO THE INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, INC.:

Application for ☐ Active ☐ Associate Membership (See reverse side of Sheet)

(Membership includes subscription to Journal of Milk Technology)

Name .....

Address (mailing) .....

PRESENT POSITION

Title ..... Length of Service .....

Organization .....

PREVIOUS POSITION

Title ..... Length of Service .....

Organization .....

Title ..... Length of Service .....

Organization .....

GIVE FOLLOWING INFORMATON

Education: Name Schools attended	Years of Attendance	Graduate	Degree
College	.....	.....	.....
University	.....	.....	.....
Technical School	.....	.....	.....
Other	.....	.....	.....

Give additional information you desire to have considered

.....

.....

.....

Application endorsed by

Active or Associate member } .....

.....

Mail this application and annual dues, $3.00 Active, $2.00 Associate, which includes $1.00 for subscription to Journal of Milk Technology:

C. SIDNEY LEETE, *Secretary-Treasurer,*
International Association of Milk Sanitarians, Inc.
State Department of Health, Albany, N. Y.

Active Membership open to Government Officials and Employees.

Associate Membership open to Members of Industry and others.

CULTURE MEDIA
for Examination of Milk

Bacto-Tryptone Glucose Extract Agar

is recommended for use in determining the total bacterial plate count of milk in accordance with the procedures of "Standard Methods for the Examination of Dairy Products" of the American Public Health Association.

Upon plates of medium prepared from Bacto-Tryptone Glucose Extract Agar colonies of the bacteria occurring in milk are larger and more representative than those on media previously used for milk counts.

Bacto-Proteose Tryptone Agar

is recommended for use in determining the bacterial plate count of Certified Milk. The formula for this medium corresponds with that suggested in "Methods and Standards of Certified Milk" of the American Association of Medical Milk Commissions.

Bacto-Violet Red Bile Agar

is widely used for direct plate counts of coliform bacteria. Upon plates of this medium accurate counts of these organisms are readily obtained.

Bacto-Brilliant Green Bile 2% and Bacto-Formate Ricinoleate Broth

are very useful liquid media for detection of coliform bacteria in milk. Use of these media is approved in "Standard Methods."