JOURNAL OF MILK TECHNOLOGY

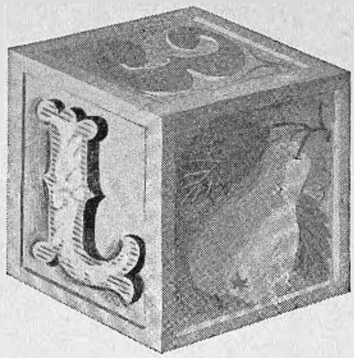
JULY-AUGUST
1943
VOLUME 6 NUMBER 4

THIRTY-SECOND ANNUAL MEETING

October 14 and 15
New York, N. Y.

Official Bimonthly Publication of:
INTERNATIONAL ASSOCIATION of MILK SANITARIANS
(Association Organized 1911)

Designated Official Organ of:
ASSOCIATIONS OF MILK INSPECTORS and SANITARIANS and DAIRY TECHNOLOGY SOCIETIES
Listed on Page 251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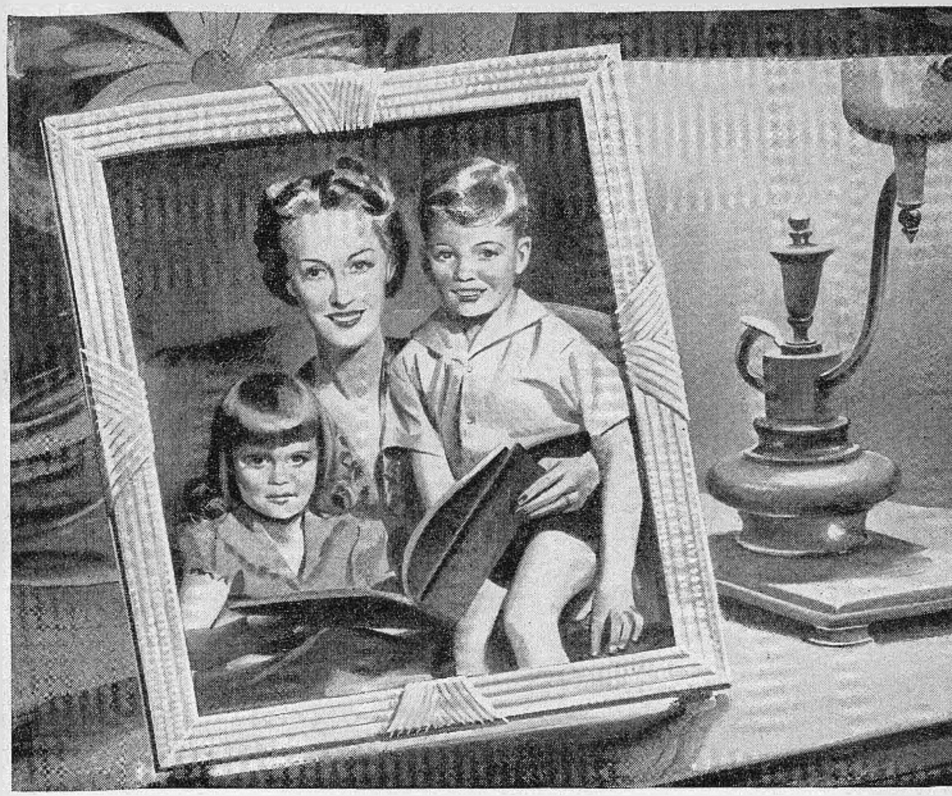

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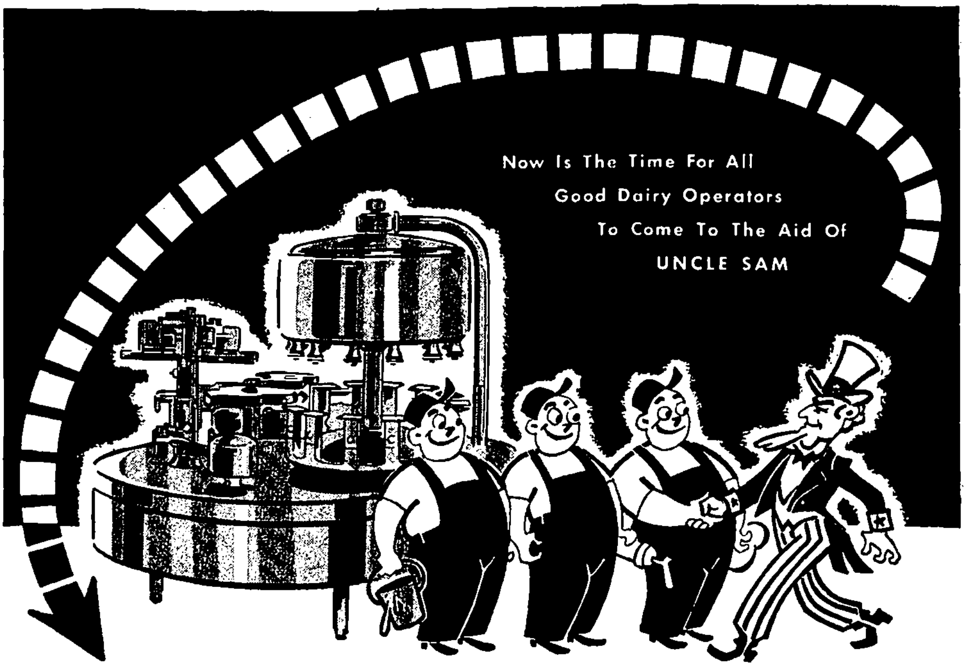

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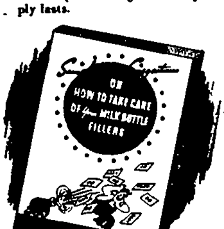

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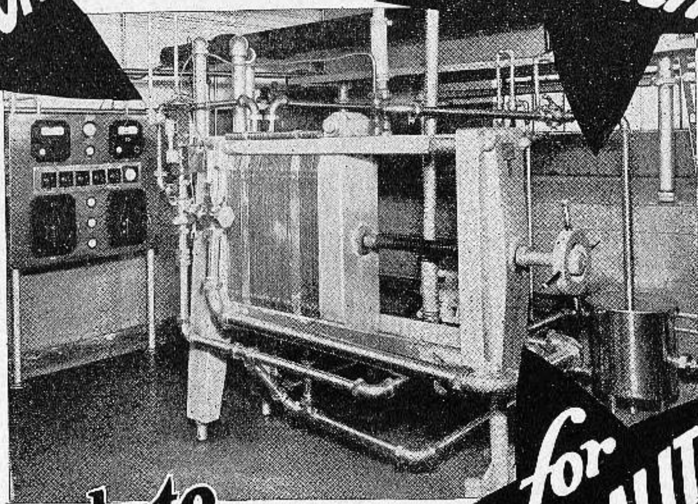

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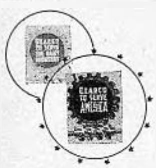

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JOURNAL OF MILK TECHNOLOGY

Official Publication of the

International Association of Milk Sanitarians
(Association Organized 1911)
and Other Dairy Products Organizations

Office of Publication 374 Broadway, Albany, N. Y.
Entered as second class matter at the Post Office at Albany, N. Y., March 4, 1942.

(For complete Journal information, see page 251)

Volume 6 — July–August, 1943 — Number 4

CONTENTS


NOW...
IS THE TIME
TO BUY CP
FULL-FLO PLATE
EQUIPMENT!

JOURNAL of MILK TECHNOLOGY

Volume 6 | July–August, 1943 | Number 4

Editorials

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

What Makes a Milk Sanitarian?

APROPOS of the teeming if somewhat one-sided discussion of what it takes to make a milk sanitarian, as former Governor "Al" Smith used to rasp on occasion: "Well, now, let's see what there is *to* this, anyway."

First of all: "time marches on." Forty years ago no one knew much about milk sanitation. The once popular slogan "Clean milk is safe milk" was very generally accepted as gospel truth. The farm was the principal consideration and the "inspector" looked, chiefly, for dirt and adulteration. It was vaguely recognized that the purpose of applying health regulations relating to milk was prevention of the spread of disease but, due to lack of understanding of fundamental principles, efforts were largely ineffective. If a milk supply was suspected of spreading scarlet fever, the health officer looked only for a milk-handler who was "peeling." The undiscovered typhoid carrier scattered his germs without let or hindrance. Cows were physically examined for bovine tuberculosis but, except for tuberculous udder infection, mastitis was not recognized as a factor in human disease. Undulant fever was unknown.

With the development of dairy bacteriology and, later, an understanding of the relation of pathogenic organisms to milk-borne infection, milk sanitation was on its way to becoming a science. Pasteurization was begun as a measure for making milk "keep" and, finally, was recognized and promoted as the outstanding safety measure. Engineers began studying the construction of pasteurizing apparatus and pointing out how its defects could be corrected. It became recognized that pathogenic bacteria and not barns and dirt caused disease. The milk sanitarian began to replace the milk "inspector." Then came the epoch-making phosphatase test. Today milk sanitation is a specialized field of scientific public health activity.

The milk sanitarian must be equipped with information drawn from many and varied fields. He must have a working knowledge of dairy bacteriology, of the human diseases which may be milk-borne, their etiology, of the pathogenic organisms inciting them. He must have some applicable knowledge of chemistry, physics, mathematics, agricultural procedure, architecture and construction, the relation of bovine disease to human infection, accounting and business methods, plumbing and steam-fitting. He must be an administrator, a diplomat, and an educator, and, above all, must be imbued with judgment and common sense.

The milk sanitarian needs a background of education but chiefly because it broadens his point of view. From courses which include the basic sciences and administrative and business methods, he will get smatterings of the fundamentals. But no course leading to a college degree, by itself, will qualify him as a milk sanitarian. The medical course offers a safe example. Since the major purpose of milk sanitation is prevention of human disease, it might be held that the doctor of medicine was best equipped. But few doctors of medicine ever become working milk sanitarians. The medical course is in preparation for medical practice, but it is now generally agreed that the doctor is not ready to go out in practice until he has had one or two years of practice under skilled supervision. This usually means a hospital interneship. The medical graduate, without similar specialized training and experience, would be next to useless as a milk sanitarian. When a house is built a foundation is necessary but it is the superstructure in which we live. In milk sanitation, education provides a foundation but it is the superstructure of practical training and experience which is most important. With any one of several educational courses as a background, the prospective milk sanitarian, from subsequent study, reading, and observation, can get all he needs of medicine, veterinary medicine, engineering, administration, agriculture, and the rest. In short, education prepares the individual for specialized training and experience but it is the training and experience which makes him a milk sanitarian.

P. B. B.

More Physics in Laboratory Techniques

THE arrangement of laboratory methods in *Standard Methods for the Examination of Dairy Products* is based on the conventional divisions into fields of applied science. For a long time this comprised only the microbiological and chemical methods. Then the field of bioassay was introduced. In the meantime the division of CHEMICAL METHODS is outgrowing its title.

Current chemical laboratory practice in general has been accepting such determinations as specific gravity, refractive index, moisture, polarization, sediment, sampling, etc. as part of the armamentarium of the chemist. When the need arose to determine pH values, the indicator method was considered to be only an extension of the regular acidity determination. The potentiometric technique made us begin to take cognizance of the fact that an increasing number of our "chemical" methods were purely physical ones. Now, the newer methods seem to be preponderantly in the realm of physics. Note the determination of extraneous material, the vitamin analytical techniques, increasing nephelometry and polarography and chromatography and spectrography.

And now comes along a method for the determination of moisture in "dried" products, based on the principle of radio frequency impedance. This impedance varies with the moisture content as shown on a dial. The reading of the needle is converted into moisture percentage by means of a calibration chart. The whole operation is completed in a few minutes. We know of efforts to work out a procedure for estimating bacterial populations by photoelectric application.

Physics has come into its own as a laboratory technique in "chemical" laboratory procedure. In all probability we shall be finding an increasing use of purely physical methods in our regular laboratory control procedures in the food industry, both in the industrial as well as the regulatory aspects.

This development should be encouraged for several reasons. In the first place, a good physical method usually enables us to make a determination very quickly. The results are often obtained in or capable of reproduction in photographic form—excellent for permanent records and court cases. Moreover, physical methods often utilize a small portion of a sample, and usually does not alter its condition. This is useful in official relationships.

We believe that the recognition of this development will have certain benefits. In the first place, it will constitute the basis for increasing the training of laboratorians in more physics. Probably our standard courses of "one year of physics" will have to be increased by an additional term or semester in electronics and possibly optics. This in itself will stimulate application of more physical techniques to laboratory control practice. Bacteriology has long needed this. Chemistry has been using it, as evidenced by the great development of the subject of physical chemistry, now a recognized member of the physical sciences in its own right.

We believe that the laboratorian of tomorrow will be more soundly trained in physics as such. Those who are not will be handicapped.

The trend toward consolidation of bacteriological and chemical laboratories into "Division of Laboratories" (or its equivalent) has broken down the old line of demarcation between the two kinds of laboratory work. We might as well recognize this in future editions of *Standard Methods.*

J. H. S.

MISSOURI REQUESTS MILITARY RECOGNITION OF MILK SANITARIANS

Resolution Adopted by the Missouri Association of Milk Sanitarians at the Eleventh Annual Meeting, May 6, 1943

At a meeting of the Missouri Association of Milk Sanitarians held in Columbia, Missouri, on May 6, 1943, it was voted by the members to go on record protesting against the army regulation which requires that the inspection, and/or laboratory control of all milk and milk products, and the inspection of farms and milk plants, to come under the direct supervision of the United States Veterinary Corps, to the exclusion of those health officials whose duty it is to supervise the production and sale of milk in all of our communities and who are well qualified to do such work.

The Secretary was instructed to notify our Senators and Representatives in Washington of this action, and respectfully request that they look into this matter and ascertain the reason why a qualified milk technologist and/or milk sanitarian is unable to obtain professional recognition in the United States Army, regardless of his qualifications, experience, and education, and why the field of milk technology is handled by the Veterinary Corps, and not by experienced and qualified milk sanitarians and milk technologists.

BOARD OF HEALTH RESTRICTS SALE OF RAW CERTIFIED MILK

The New York City Board of Health at its meeting on June 8 passed an amendment to Section 156 of the Sanitary Code restricting the sale of raw certified milk and of certified raw milk products to persons presenting a doctor's prescription. The new regulation will become effective January 1, 1944.

"The strict standards of cleanliness surrounding the production of certified milk cannot be questioned," said Health Commissioner Ernest L. Stebbine, commenting on the new amendment. "However," he continued, "in recent years public health officials and outstanding pediatricians have felt that pasteurization of even this milk is desirable. Pasteurization provides an additional safeguard against transmission of communicable diseases and results in milk of even superior sanitary quality. It also guards against contamination which may occur in the intervals between the periodic medical examinations of dairy farm employees."

It is estimated that 24,000 quarts of certified milk are sold daily in New York City. Of this number, 4,000 quarts are now pasteurized. These figures contrast unfavorably with those of cities like Boston, where 70 percent of all certified milk is pasteurized, and Detroit and Cincinnati where pasteurization of *all* certified milk is required.

The regulation as adopted by the Board of Health reads as follows:

"Regulation 15. Sale of certified milk, skimmed milk, or cream (raw) on physician's prescription only. No certified milk, skimmed milk, or cream, other than 'Certified Milk (Pasteurized),' 'Certified Skimmed Milk (Pasteurized),' or 'Certified Cream (Pasteurized)' shall be sold or distributed in the City of New York, except in those cases where a physician's statement, prescribing unpasteurized (raw) certified milk, skimmed milk, or cream, is filed by the purchaser with the milk dealer. The physician's statement shall bear the date of issuance, the name and address of the consumer, and shall be valid for one year from the date of issuance. Such statement shall be kept on file by the milk dealer, and shall be open at all times to inspection by a representative of the Department of Health."

THIRTY-SECOND ANNUAL MEETING, OCTOBER 14 and 15, 1943
NEW YORK, N. Y.

Pyrex Glass Tubing As a Substitute for Metal Milk Pipe in Dairy Plants*

G. J. Hucker and Robert E. Thomas

New York State Agricultural Experiment Station, Geneva, New York

The increasing shortage of metal, particularly stainless steel, and related materials, for use as milk pipe in dairy plants, has brought the problem of an acceptable substitute into bold relief. Many substitutes have been suggested, including plastics but the most promising at the moment appears to be Pyrex heat-resistant glass tubing. Basically one of the problems concerned with the use of glass in dairy plants has been its degree of resistance to breakage either mechanical or because of rapid changes in temperature of the solutions contained therein. Mechanical breakage has been largely overcome by devising proper supports and strengthening the wall of the Pyrex tube by increasing its thickness. The low coefficient of expansion of Pyrex glass tubing makes it particularly adaptable for dairy and food plants in the operation of which wide processing temperature fluctuations may prevail. Frequent dismantling as has been customary with metal milk pipe obviously increases the possibility of breakage of glass tubing.

The object of this investigation was to study the use of Pyrex glass tubing under actual plant operation and to determine the sanitary problems, if any, concerned with the use of this tubing and, more particularly, to develop acceptable methods of cleaning and sterilizing. In this connection special emphasis has been placed, during the investigation, on the types of joints employed with the Pyrex tubing and their sanitary condition under prolonged use. The principal sanitary problem has centered around the condition of the joints of glass tubing and the maintenance of such joints in an acceptable sanitary condition.

* The plan for this investigation was developed in conjunction with A. J. Powers, F. M. Scales, and J. L. Hileman, as representatives of the dairy industry. Approved by the Director of the New York State Agricultural Experiment Station for publication as Journal Paper No. 562, June, 1943.

Description of Plant

The study of the Pyrex tubing was carried on at the Dairymen's League Cooperative Association plant at Auburn, New York. This plant handles approximately 45,000 pounds of milk per day. The milk as received from the patrons is stored in two storage tanks, one of 3,000-gallon and one 5,000-gallon capacity; part of the milk is pasteurized immediately while the remainder, which arrives too late for pasteurization the current day, is held until the following morning. The milk is preheated in a Cherry-Burrell regenerative plate unit of 4,000-pound-per-hour capacity and held in Pfaudler holding tanks. The milk is then returned through the regenerative and cooling sections of the plate unit and then through a surge tank to the filler. Each day about 2,500 gallons of the raw milk supply is pumped through a 65-foot pipeline to a tank car for shipment to a pasteurizing plant in the metropolitan New York area.

Methods and Procedure

In order to study the sanitary performance of the glass tubing in this particular plant, sections of the metal pipe were removed and replaced with Pyrex tubing. Within the plant this glass tubing was used between the holder and the regenerative plate cooler (Figure 1). During a portion of this study another section of glass tubing was used between the surge tank and the filler. The number of joints involved, varied from 5 to 10 depending upon the amount of glass tubing used during the various periods of study. The total length of glass tubing in the plant varied from 20 to 45 feet.

The 65-foot section of metal pipe used to convey the raw milk from the storage tanks to the tank car was replaced by a single length of welded glass tubing. This welded glass tubing was permanently erected on the outside wall of the plant and adequately covered for protection from the elements. This tubing had a drop of 18 inches in 65 feet.

The laboratory procedures involved in the examination of the samples taken at various intervals in the plant were those prescribed in *Standard Methods for the Examination of Dairy Products* of the American Public Health Association (8th edition). Samples were collected at the plant and returned iced to the laboratory at Geneva for examination. In no instance was the examination made at a greater time interval than two hours after the sample was collected.

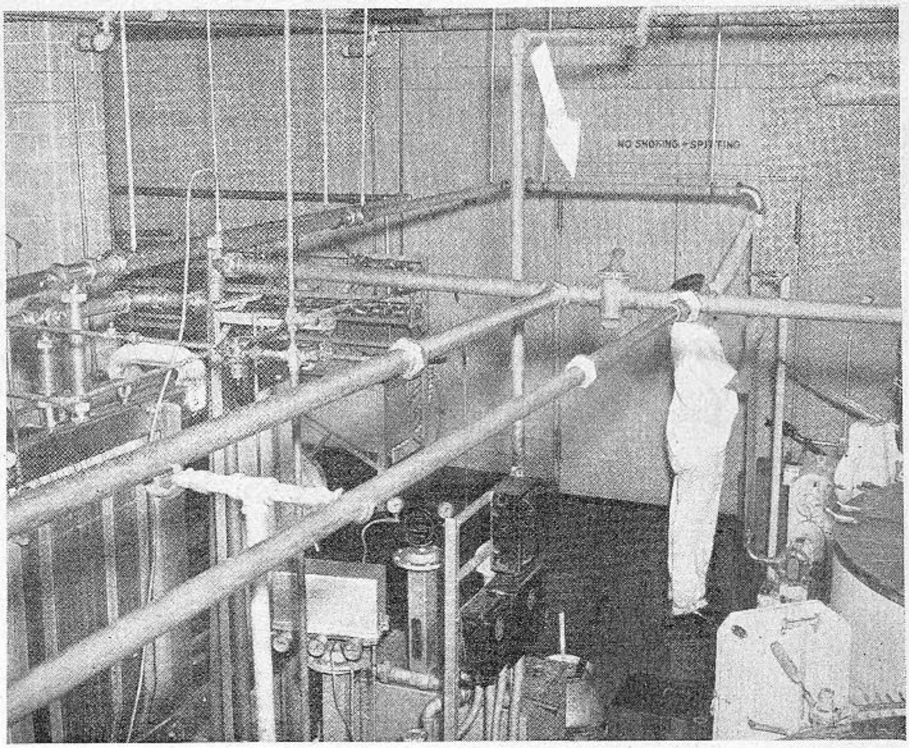


FIGURE 1
General view of section of plant with beaded glass tubing as part of hot milk line.

CLEANING PROCEDURES

The routine cleaning procedures followed in this plant to care for the sanitation of the metal milk pipe were common to the practices involved in most dairy plants. The metal milk pipe was taken down daily, rinsed, and brushed using a commercial alkaline cleaner containing approximately 4.0 percent of a wetting agent. That part of the system from the outlet of the holders through the hot-milk pump and the plate unit was rinsed with water

(128 ppm. hardness) and treated with a circulating solution of commercial milk-stone remover, which was followed by the circulation of a commercial alkaline cleanser solution. The system was then rinsed and the plate unit dismantled for hand cleaning. These procedures were somewhat modified for cleaning the glass tubing to simplify methods and to meet the necessities of the changing conditions as the experiment progressed.

EXPERIMENTAL

The study of Pyrex tubing conducted between July, 1942, and April, 1943, concerned itself with seven distinct periods of examination. In the first two periods, which covered approximately two weeks each, both the total number of organisms and the presence or absence of coliform types were noted on various process samples as collected at four different points in the plant. During the following five periods two different types of glass tubing were substituted for certain sections of the metal pipe and samples were taken at additional points.

SANITARY CONDITION OF METAL MILK PIPE PRIOR TO INSTALLATION OF GLASS TUBING

During these first two periods samples were secured of the raw storage milk, hot milk leaving the holder, and pasteurized milk from the surge tank and the filler. (Diagram 1, Sampling points 1, 5, 7, 8. See page 213.) Insofar as possible the raw milk was traced as individual batches through the plant.

During this period the regular cleaning procedures of the plant were carried out which, as stated above, involved daily disassembling of metal pipe.

It will be noted (Tables 1 and 2) that during these first two periods the sanitary condition of this plant was maintained at a rather constant level. The number of colonies as noted on the various process samples did not show excessive fluctuation. This would indicate that the cleaning procedures were comparable with those found in the average type of milk processing plant. On only a few occasions were colony counts found higher than 10,000 per cc. in the filler with the approximate mean in this instance at 6,000 organisms per cc. Several minor discrepancies can be noted in the counts as obtained over these two periods but the variations are in most instances within the error of manipulation of the laboratory procedures. During these two periods the laboratory procedure involved the use of 37° C. as an incubation temperature.

A study was also made of the sanitary condition of the metal milk pipe using the coliform test as an index on the same samples as were obtained for bacteria count. It will be noted (Tables 3 and 4) that coliform contaminations were encountered on several days in the filler which in only a few instances could be attributed to the pasteurized milk in the surge tank.

BEADED GLASS TUBING TO REPLACE METAL MILK PIPE

During the third and fourth periods certain sections (Figure 1) of the metal pipe were replaced with Pyrex beaded tubing. The beaded tubing is connected with standard metal fittings in an assembly (Figure 2) which includes a rubber gasket and a split plastic ring. The beaded ends of the two inch glass tubing fit snugly into the rubber gaskets.

During the third period the beaded Pyrex tubing was taken down daily for cleaning in the same manner as the metal pipe. During this period some difficulty was experienced with breakage. This breakage was not only due to the handling of the glass tubing but also because of the fact that the 2 inch O.D. beaded glass tubing had a wall thickness of approximately 0.125 inches.* In addition the unavoidable

* The usual thickness of 2 inch I.D. glass tubing would be 0.187 inch. In order to use it in combination with existing metal sanitary fittings the outside diameter of the tubing had to be confined to 2.0 inches and because of the desirability of providing as large a bore diameter as possible the wall thickness was held to 0.125 inch.

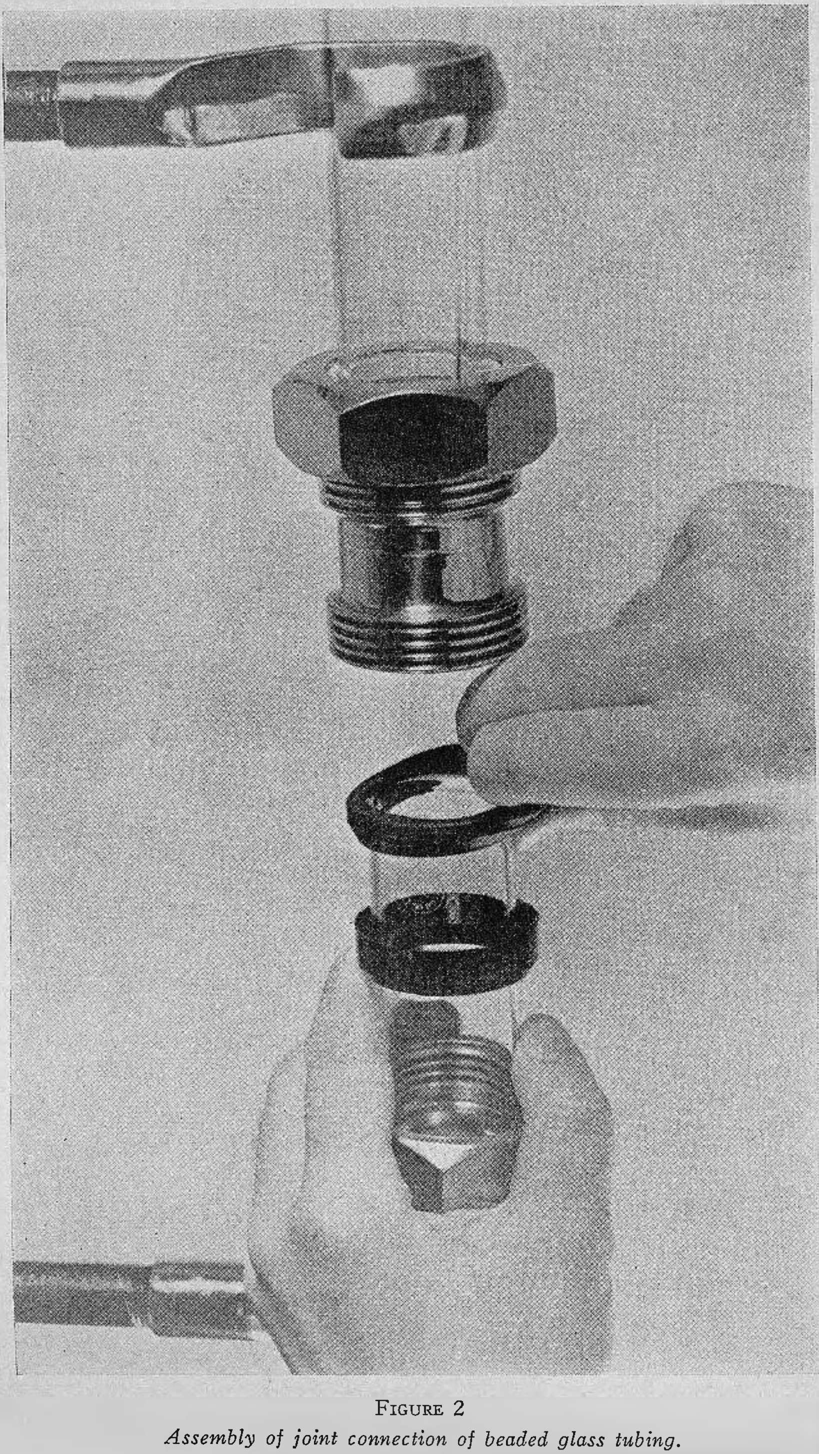


FIGURE 2

Assembly of joint connection of beaded glass tubing.

TABLE 1

SANITARY CONDITION * OF METAL PIPE, DISASSEMBLED DAILY FOR CLEANING PRIOR TO USE OF GLASS TUBING (FIRST PERIOD)

Date 1942	Total Number (37° C.) of Colonies Per Cubic Centimeter					
	Raw Milk Storage Tanks	*Batch Holder Number*	*Hot Milk Leaving Holder*	*Surge Tank*	*Filler*	*Tank Car*
July 21	217,000	1	.....	7,900	.....	
		2	8,300	7,700	5,700	
		3	6,100	5,900	2,500	
		4	2,800	.....	3,600	
	80,000	5	8,600	4,000	6,400	
		6	4,600	6,500	4,300	
		7	2,200	1,800	.....	
		8	.....	.....	.....	203,000
July 28	236,000	1	1,100	600	400	
		2	10,700	.....	21,000	
		3	5,800	.....	8,600	
		4	2,700	1,900	.....	
	116,000	5	2,900	6,700	2,900	
		6	1,300	.....	600	
		7	.....	.....	.....	
		8	.....	.....	.....	197,000

* As indicated by the total colony count.

contact of the glass tubing with the concrete floors, metal edges of the wash tanks, etc., caused some breakage and chipping. The plant personnel had to become accustomed to handling this type of glass tubing when disassembled each day, to avoid undue breakage. It proved impractical under general operating conditions to dismantle this type of glass tubing and wash it in vats as is customary with metal pipe. The third period of this experiment was carried on from August 18th to September 14th with daily dismantling of the glass tubing.

It will be noted on first observation (Table 5) that the number of organisms per cubic centimeter were much

TABLE 2

SANITARY CONDITION * OF METAL PIPE, DISASSEMBLED DAILY FOR CLEANING PRIOR TO USE OF GLASS TUBING (SECOND PERIOD)

Date 1942	Total Number (37° C.) of Colonies Per Cubic Centimeter					
	Raw Milk Storage Tanks	*Batch Holder Number*	*Hot Milk Leaving Holder*	*Surge Tank*	*Filler*	*Tank Car*
August 4	287,000	1	1,300	1,200	6,800	
		2	1,200	10,000	8,100	
		3	12,700	.....	3,900	
		4	13,300	12,900	3,800	
	189,000	5	9,800	16,900	5,900	
		6	.....	18,500	4,100	
		7	10,700	28,000	35,400	
		8	.....	.....	1,600	290,000
August 13	59,000	1	.....	.....	1,600	
		2	12,400	12,400	13,600	
		3	.....	4,900	10,400	
		4	.....	4,400	.....	
	187,000	5	7,300	5,200	13,800	
		6	2,100	.....	.....	
		7	29,400	2,800	8,300	
		8	1,600	1,300	.....	136,000

* As indicated by the total colony count.

TABLE 3

SANITARY CONDITION * OF METAL PIPE DISASSEMBLED DAILY FOR CLEANING PRIOR TO USE OF GLASS TUBING (FIRST PERIOD)

	Gas Production in Formate Ricinoleate Broth		
Date 1942	*Batch Holder Number*	*Surge Tank*	*Filler*
July 21	1	+	—
	2	+	+
	3	—	+
	4	—	+
	5	—	+
	6	—	+
	7	—	+
	8	—	+
July 28	1	+	—
	2	—	+
	3	—	—
	4	—	+
	5	—	—
	6	—	+
	7	—	—
	8	—	—

* As indicated by the coliform test.

TABLE 4

SANITARY CONDITION * OF METAL PIPE, DISASSEMBLED DAILY FOR CLEANING PRIOR TO USE OF GLASS TUBING (SECOND PERIOD)

	Gas Production in Formate Ricinoleate Broth		
Date 1942	*Batch Holder Number*	*Surge Tank*	*Filler*
August 4	1	+	—
	2	—	+
	3	—	—
	4	—	+
	5	—	—
	6	—	—
	7	—	—
	8	—	—
August 13	1	+	—
	2	—	—
	3	—	—
	4	—	—
	5	—	—
	6	—	+
	7	—	+
	8	—	—

* As indicated by the coliform test.

greater than the number found in the first and second periods in which metal pipe was used. However, the temperature of incubation of the plates for the first and second periods was 37° C. for 48 hours while during the remainder of the experiment the incubation temperature was adjusted to 32° C. for 48 hours. The differences in the over-all counts between this period and the preceding ones are, no doubt, due to the decrease in the temperature of incubation inasmuch as higher colony counts should be expected at the 32° C. incubation. It is apparent (Table 5) that the passage of the milk through the glass tubing did not increase the count excessively. Unfortunately the sampling of the milk just prior to entering the glass tube was omitted during this period.

During the fourth period of this investigation the sampling procedure was changed in order to collect a more comprehensive series of data to reveal the sanitary condition of the glass tubing.

TABLE 5

SANITARY CONDITION * OF BEADED GLASS TUBING DISASSEMBLED DAILY FOR CLEANING (THIRD PERIOD)

	Total Number (32° C.) of Colonies Per Cubic Centimeter						
Date 1942	*Raw Milk Storage Tank*	*Raw Milk Entering Plate Heater*	*Hot Milk Entering Holder*	*Entering Glass Tubing*	*Hot Milk Entering Cooler*	*Surge Tank*	*Filler*
Aug. 18	147,000	125,000	82,000		6,900	8,800	6,000
Aug. 24	32,000	89,000	50,000		3,500	3,700	4,000
Aug. 25		135,000	77,000		173,000	20,000	19,000
Aug. 26	160,000	160,000	140,000		34,000	23,000	32,000
Aug. 28	220,000	200,000	150,000		39,000	38,000	24,000
Aug. 29	200,000	160,000	110,000		48,000	41,000	44,000
Aug. 30	229,000	124,000	28,800		13,150	22,400	41,500
Aug. 31	570,000	683,000	283,000		45,000	42,000	5,100
Sept. 14	214,000	129,000	43,000		24,000	11,000	12,600

* As indicated by the total colony count.

Additional samples were collected during this fourth period (Table 6) which included (Figures 1–3, 5) not only a sample of milk leaving the holder (dipped from holder when half empty), but also a sample of hot milk taken at the pump just prior to entering the glass tubing. In addition, samples of raw milk were pasteurized in the laboratory to determine if thermoduric organisms were present in excessive numbers.

During this fourth period, which extended from September 15th to October 28th, the glass tubing was washed in assembled position. The cleaning procedure involved first rinsing with water for 10 minutes, followed by circulation of a 0.6 percent solution of a commercial alkaline cleanser * containing 4.0 percent of a wetting agent at approximately 110° F. to 120° F. for 20 to 30 minutes. This was followed by a sterilizing rinse of hot water, at approximately 190° F. for not less than 15 minutes. The hot milk pump was used as the means for the circulation of the cleaning agents. During this period the beaded glass tubing remained intact except on one or two occasions when certain connections were uncoupled, to observe the sanitary con-

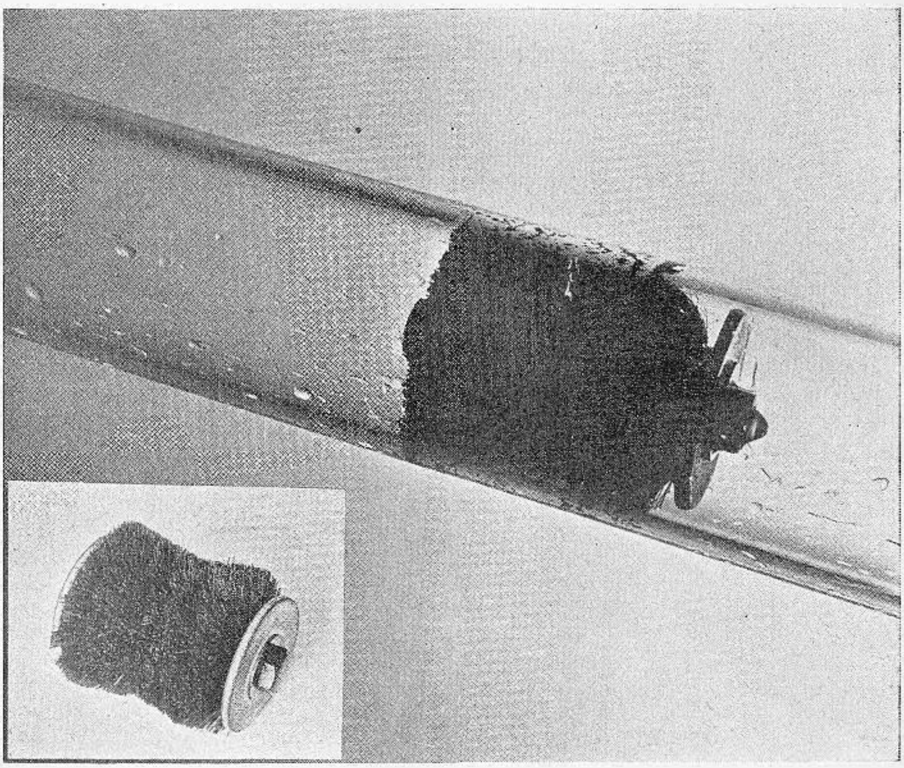


FIGURE 3

Torpedo brush passing through glass piping with cleaning solutions.

* An alkaline cleaner containing sodium metasilicate, 82 percent; sodium tetraphosphate (Quadrafos), 12 percent; and wetting agent, 6 percent; was used for a month with equally good results. The cost could be reduced slightly by reducing the wetting agent to 4 percent and correspondingly increasing the metasilicate. There are a number of wetting agents that may be employed in this composition.

TABLE 6

SANITARY CONDITION * OF BEADED GLASS TUBING CLEANED ASSEMBLED (FOURTH PERIOD)

Total Number (32° C.) of Colonies per Cubic Centimeter

Date 1942	*Raw Milk Storage Tank*	*Raw Milk Entering Plate Heater*	*Hot Milk Entering Holder*	*Hot Milk Leaving Holder*	*Hot Milk At Pump*		*Hot Milk Entering Cooler*	*Surge Tank*	*Filler*	*Raw Milk Lab. Past.*
				Glass Tubing Assembled Sept. 14, 1942						
Sept. 15		74,000	44,000	10,000		*Entering Glass Tubing*	12,000	6,000	4,300	
16	42,000		19,000				2,500	5,700		
17				24,000			13,000	13,000	40,000	
18	228,000	227,000	39,000	33,000				25,000	51,000	
21				11,000			38,000	30,000	16,000	
22				18,000			21,000	24,000	11,000	
29					165,000			7,700	4,100	
Oct. 1	103,000		50,000	8,600	6,000		4,800	4,100	12,000	140,000
2	220,000	182,000	102,000	11,000	13,000		10,000	12,000		17,000
3	178,000		12,000	6,200	4,900		6,100	4,800	8,800	37,000
6	83,000		129,000	4,200	6,600		9,000	8,100	6,900	13,800
7	103,000		39,000	9,100	7,200		8,800	7,100	16,000	
14				66,000	79,000		26,000	22,000	9,900	
15	180,000	120,000	56,000	11,000	11,000		9,800		16,000	15,000
17				18,000	19,000		15,000		29,000	
20	130,000				23,900		23,400		12,600	
21					14,100		15,900	13,600		
22	143,000				81,000		74,000	58,000	20,300	
23	151,000				14,000		15,000	27,000	12,500	59,000
28	138,000				12,800		15,600	18,800		
				Glass Tubing Examined Oct. 28, 1942						

* As indicated by the total colony count.

dition. On several occasions during this study a torpedo brush † was forced (Figure 3) through the glass tubing with the cleaning solution. The torpedo brush was particularly helpful in cleaning the 65 foot length of welded glass tubing.

It is apparent (Table 6) that no increase in the number of organisms could be noted over this period of approximately six weeks, as a result of the milk passing through the beaded glass tubing which was cleaned in assembled position. In no instance was any evidence found of a build-up of bacterial flora in the glass tubing or at the joints.

During the latter part of this period coliform tests were made upon the milk samples (Table 7). No positive coliform result was found on the milk after passing through the glass tubing, which was not evident in the equipment just prior to entering the glass tubing.

At the end of this six weeks' period the tubing was dismantled and exam-

† Torpedo brushes were supplied by the Braun Brush Company, Woodhaven, New York.

TABLE 7

SANITARY CONDITION * OF BEADED GLASS TUBING, CLEANED ASSEMBLED (FOURTH PERIOD)

Gas Production in Formate Ricinoleate Broth †

Date 1942	*Raw Milk Storage Tank* 1.0 cc.	0.1 cc.	0.01 cc.	*Hot Milk At Pump* 1.0 cc.	0.1 cc.	0.01 cc.		*Hot Milk Entering Cooler* 1.0 cc.	0.1 cc.	0.01 cc.	*Filler* 1.0 cc.	0.1 cc.	0.01 cc.	*Raw Milk Lab. Pasteurized* 1.0 cc.	0.1 cc.	0.01 cc.
				Beaded Glass Tubing Assembled September 14, 1942												
October 20	+	+	—	+	—	—	*Entering Glass Tubing*	+	—	—						
October 22	+	+	—	—	—	—		—	—	—						
October 23	+	+	—	—	—	—		—	—	—						
October 28	+	+	—	—	—	—		—	—	—				—	—	—
				Glass Tubing Examined October 28, 1942												

* As indicated by the coliform test.

† Duplicate tubes used for each dilution. Results from duplicate tubes were in agreement. Single plus tube reported as +.

TABLE 8

SWAB SAMPLES FROM JOINTS OF GLASS TUBING (SEPTEMBER 25, 1942)

Joint No.	*Identification*	*Total Colony Count*
1	Tubing rinsed only. Inside surface of gasket swabbed	40,400
1	Tubing rinsed only. Inside of head of gasket swabbed	840
2	Tubing washed by circulation. Inside surface of gasket swabbed	40
2	Tubing washed by circulation. Inside bead of gasket swabbed	40
3	Control swabs	40
3	Control swabs	160

ined and the joints found to be practically free of deposit. During the course of this period, after the tubing had been assembled approximately ten days, two individual joints were uncoupled for examination. Swab examinations (Table 8) taken at this time on these joints, first, after rinsing with water only, and next after flush washing but not sterilizing, indicated that in all instances with one exception, the number of organisms which accumulated was insignificant. The one exception, in which the tubing had been rinsed with water only, showed an excessive number of organisms on the inside groove of the gasket. A number of examinations made in like manner at later intervals, however, did not show this to be a common occurrence.

FLANGED GLASS TUBING TO REPLACE METAL MILK PIPE

In order to eliminate insofar as possible metal connections, including elbows and unions, another type of

TABLE 9

SANITARY CONDITION * OF FLANGED GLASS TUBING CLEANED ASSEMBLED (FIFTH PERIOD)

	Total Number (32° C.) of Colonies per Cubic Centimeter								
Date 1943	*Raw Milk Storage Tank*	*Raw Milk Entering Plate Heater*	*Hot Milk Entering Holder*	*Hot Milk Leaving Holder*	*Hot Milk At Pump*		*Hot Milk Entering Cooler*	*Surge Tank*	*Filler*
	Glass Tubing Assembled January 29, 1943								
Jan. 31					43,000	*Entering Glass Tubing*	47,000	11,600	8,000
Feb. 3	299,000	330,000	128,000	45,000	43,000		42,000	11,900	7,000
6	137,000			25,000	49,000		25,000	16,000	22,000
8	70,000	310,000	84,000	42,000	82,000		79,000	14,000	16,000
10	75,000	135,000	157,000	8,700	3,800		7,600	5,900	6,700
	Glass Tubing Examined February 10, 1943								

* As indicated by the total colony count.

TABLE 10

SANITARY CONDITION * OF FLANGED GLASS TUBING CLEANED ASSEMBLED (FIFTH PERIOD)

	Gas Production in Formate Ricinoleate Broth †												
	Raw Milk Storage Tank			*Hot Milk At Pump*				*Hot Milk Entering Cooler*			*Filler*		
Date 1943.	0.1 cc.	0.01 cc.	0.001 cc.	0.1 cc.	0.01 cc.	0.001 cc.		0.1 cc.	0.01 cc.	0.001 cc.	0.1 cc.	0.01 cc.	0.001 cc.
	Flanged Glass Tubing Assembled January 29, 1943												
January 30				+	+	+	*Entering Glass Tubing*	—	—	—	+	+	—
February 1	+	+	+	+	+	—		+	+	—			
February 3	+	+	—	—	—	—		—	—	—	—	—	—
February 6	+	+	+	—	—	—		—	—	—	+	—	—
February 8	+	+	+	—	—	—		—	—	—	—	—	—
February 10	+	+	+	+	—	—		—	—	—	—	—	—
	Glass Tubing Examined February 10, 1943												

* As indicated by the coliform test.

† Duplicate tubes used for each dilution. Results from duplicate tubes were in agreement. Single plus tube reported as +. 1.0 cc. and 0.1 cc. dilutions gave comparable results.

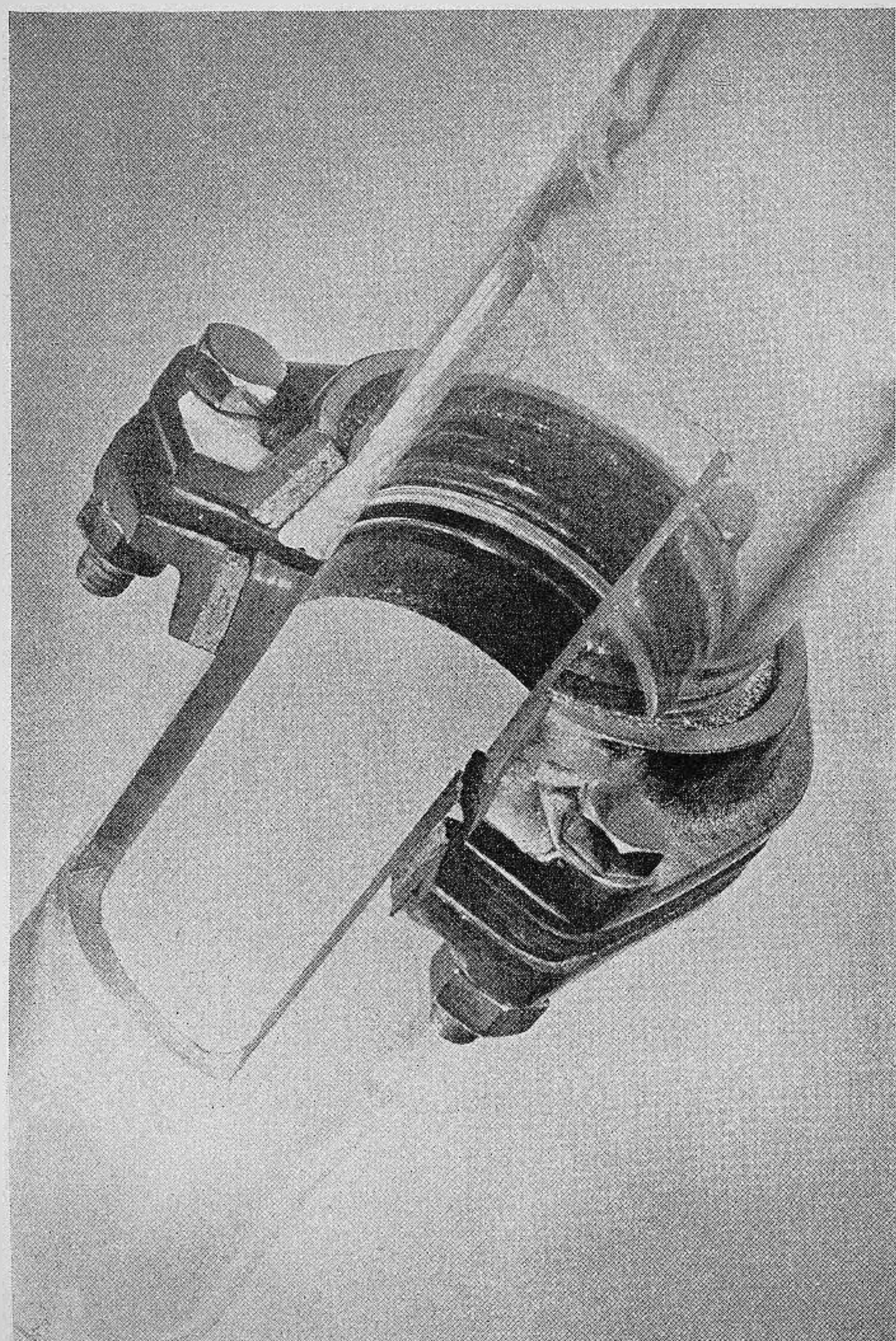


FIGURE 4

Detail of connection of flanged glass tubing.

glass tubing was installed at the beginning of the fifth period. This tubing (Figures 4 and 5) is coupled by a rubber gasket and bolted metal flange assembly. The flanged glass tube-ends seat squarely on the flat resilient gasket, reducing to a minimum the possibility of accumulation of deposit in crevices or seams. During the course of the fifth period which extended from January 30th to February 10th, 1943, the flanged glass tubing remained assembled during the entire twelve days.

It was found, both by the coliform test and colony count taken before and after passage through the flanged glass tubing, that these joints were maintained in a satisfactory sanitary condition by the cleaning procedure as outlined. Again, in only two instances was a positive coliform test found in milk after passage through the glass tubing, and in both cases the positive test was due to contamination in the filler. It will be recalled that such contaminations were found in filler samples during the experimental period in which metal pipe was dismantled daily for cleaning. The number of organisms found in the process samples (Tables 9 and 10) indicated no build-up in bacterial flora in the flanged tubing and joints. At the end of twelve days the flanged glass tubing was dismantled and carefully examined. It was found that the joints had collected no deposit and the glass tubing appeared to be in the most acceptable sanitary condition.

TABLE 11

SANITARY CONDITION * OF FLANGED GLASS TUBING, CLEANED ASSEMBLED (SIXTH PERIOD)

Total Number (32° C.) of Colonies per Cubic Centimeter

Date 1943	Raw Milk Storage Tank	Raw Milk Entering Plate Heater	Hot Milk Entering Holder	Hot Milk Leaving Holder	Hot Milk At Pump		Hot Milk Entering Cooler	Surge Tank	Filler	Raw Milk Lab. Past.
			Glass Tubing Assembled Feb. 16, 1943							
Feb. 17	48,000	121,000	46,000	5,100	2,000	*Entering Glass Tubing*	12,400	6,200	6,500	
18	64,000	291,000	48,000	202,000	139,000		35,000	36,000	43,000	11,500
20	115,000	168,000	14,000		14,000		19,000	3,500	4,200	
23	269,000	T.C.	158,000	35,000	324,000		45,000	137,000	79,000	81,000
25	245,000	590,000	129,000	72,000	69,000		71,000	65,000	64,000	55,000
26	429,000	T.C.	140,000	54,000	123,000		62,000	48,000	68,000	118,000
27	245,000	290,000	230,000	76,000	716,000		60,000	49,000	65,000	148,000
Mar. 1	230,000	620,000	113,000	50,000	50,000		33,000	32,000	42,000	62,000
2	340,000	430,000	8,600	53,000	74,000		37,000	39,000	44,000	49,000
			Glass Tubing Examined March 2, 1943							

* As indicated by the total colony count.

TABLE 12

SANITARY CONDITION * OF FLANGED GLASS TUBING, CLEANED ASSEMBLED (SIXTH PERIOD)

Gas Production in Formate Ricinoleate Broth †

Date 1943	Raw Milk Storage Tank 0.1 cc.	0.01 cc.	0.001 cc.	Hot Milk At Pump 0.1 cc.	0.01 cc.	0.001 cc.		Hot Milk Entering Cooler 0.1 cc.	0.01 cc.	0.001 cc.	Filler 0.1 cc.	0.01 cc.	0.001 cc.	Raw Milk Lab. Pasteurized 0.1 cc.	0.01 cc.	0.001 cc.
				Flanged Glass Tubing Assembled February 16, 1943												
Feb. 17	+	—	—	—	—	—	*Entering Glass Tubing*	—	—	—	—	—	—			
Feb. 18				—	—	—		—	—	—	—	—	—	—	—	—
Feb. 20	+	+	—	—	—	—		—	—	—	—	—	—			
Feb. 23	+	+	+	—	—	—		—	—	—	+	—	—			
Feb. 25	+	+	—	—	—	—		—	—	—	+	—	—	—	—	—
Feb. 26	+	+	+	—	—	—		—	—	—	+	+	—	—	—	—
Feb. 27	+	+	+	—	—	—		—	—	—	+	+	—	—	—	—
Mar. 1	+	+	+	—	—	—		—	—	—	+	+	+	—	—	—
Mar. 2	+	+	+	—	—	—		—	—	—	+	+	+	—	—	—
				Flanged Glass Tubing Examined March 2, 1943												

* As indicated by the coliform test.

† Duplicate tubes used for each dilution. Results from duplicate tubes were in agreement. Single plus tube reported as +. 1.0 cc. and 0.1 cc. dilutions gave comparable results.

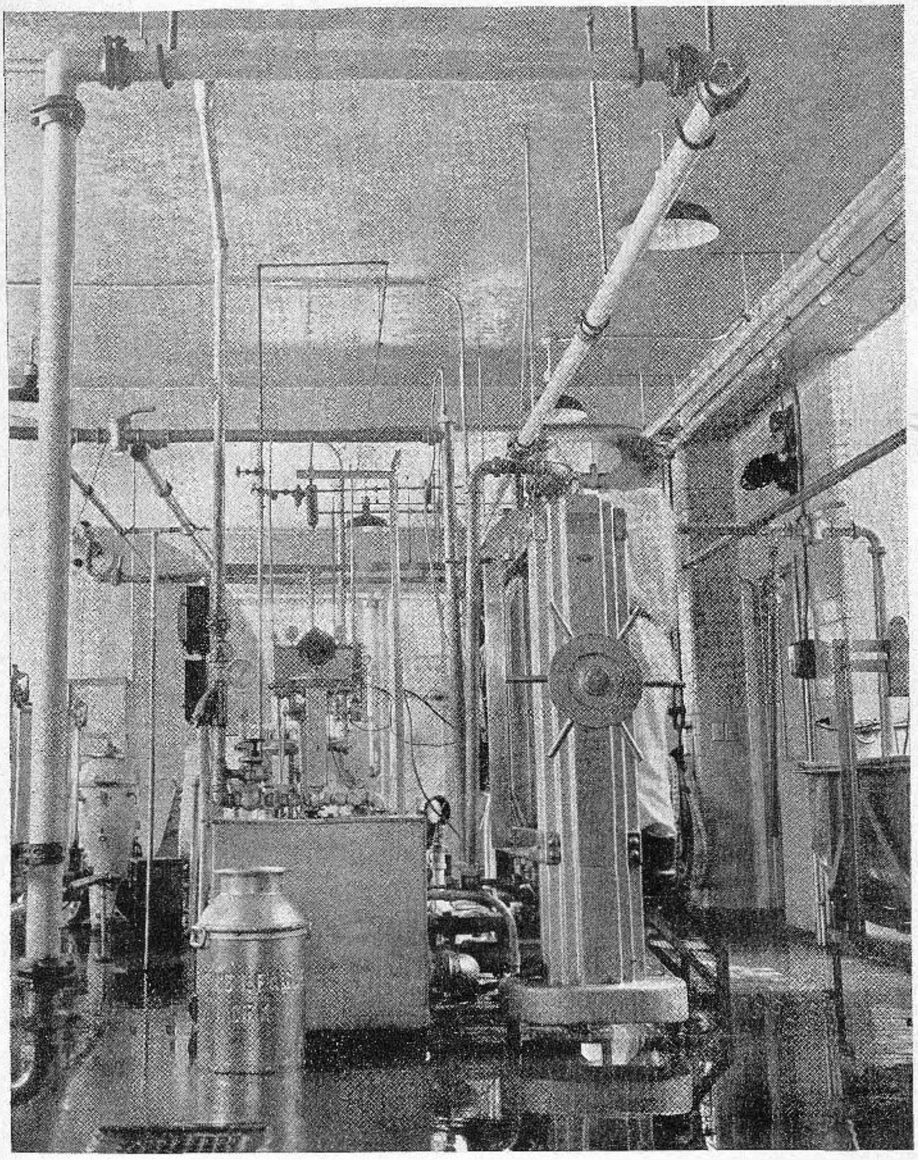


FIGURE 5
General view of section of plant with flanged glass tubing as part of hot milk line.

A sixth period of tests on the flanged glass tubing was started on February 17th and carried through for approximately two weeks. It will be noted (Tables 11 and 12) that the results during this period were comparable to those secured in the previous tests. The examination of the glass tubing and joints at the end of this period indicated that no deposit had accumulated.

A final series, seventh period, to determine the sanitary performance of the flanged Pyrex tubing was carried on over a period of approximately two weeks. In this instance the date of sampling of the initial raw storage milk (Tables 13, 14, and 15) was adjusted to include on some days milk as received from producers, and on other days stock milk which had been held in storage from the day before.

During this seventh period the cleaning procedure was carried out as in the previous periods with the flanged glass tubing remaining assembled. It will be noted, both from the standpoint of the number of organisms in the samples and the results of the coliform test that the glass tubing and joints were maintained in an acceptable sanitary condition. In no instance was an appreciable increase in count found as a result of the milk passing through the glass tubing even after the tubing had remained assembled for a period of two weeks.

Welded Glass Tubing for Conveying Raw Cold Milk

A 65-foot section of welded glass tubing (Figures 6 and 7) was used to conduct the raw storage milk from plant storage tanks to the tank car for shipment. This line was made of 2-inch I.D. glass tubing with walls approximately 3/16 of an inch thick, and the individual sections were fused or welded together into one continuous length. The line was permanently installed on the outside wall of the building with an 18-inch drop for the 65-foot length. This tubing was placed in operation on September 15th and remains in operation (May 1st) after over seven months daily use.

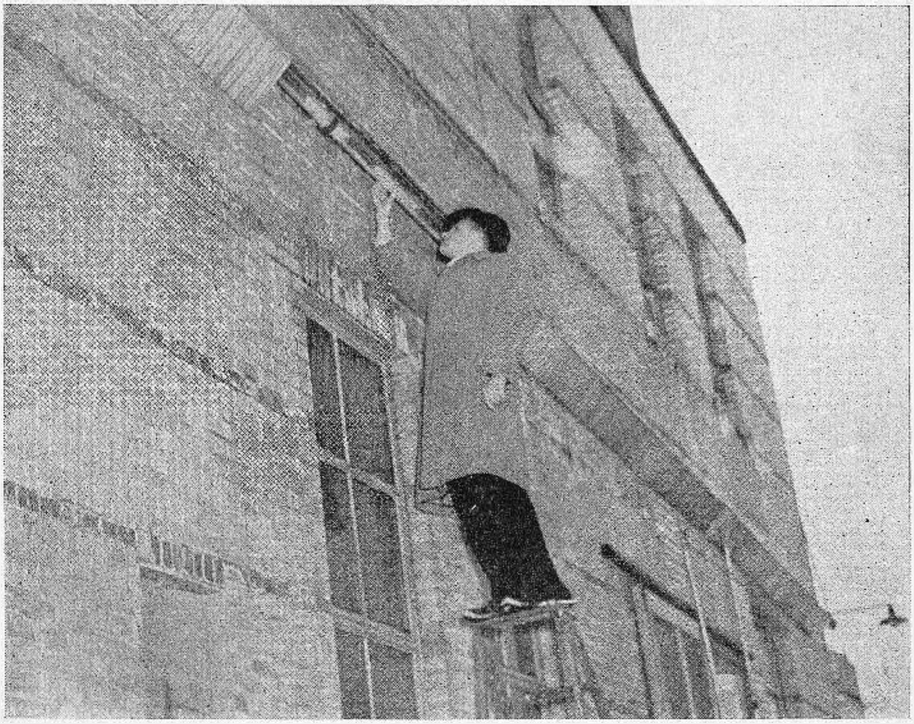


Figure 6

Section of outside 65-foot welded glass tubing for conveying cold milk. Note ice in tube.

The welded glass tubing was rinsed after each use by flushing with cold water, after which a solution of commercial alkaline cleanser was allowed to remain in the tubing for one-half hour. This was facilitated by the use of a 20-inch standpipe at the lower end of the line. The tubing was then flushed with warm water and sterilized with live steam. The tubing was then capped at both ends until the following morning. Before use the tubing was sterilized a second time with live steam. At periodic intervals the tubing was brushed internally by forcing a torpedo brush through the line with the detergent solution.

At intervals, the welded tubing was rinsed with tap water, the colony count of which was determined before and after it passed through the 65-foot length (Table 16). It was found that after several weeks this welded glass tubing did not accumulate a bacterial flora and with the specified cleaning procedure the count was held at an insignificant level.

DISCUSSION

Pyrex glass tubing appears to show considerable promise as a substitute for metal milk pipe in dairy plants. In addition to the bacteriological evidence, which indicates that glass tubing can be cleaned in assembled position and maintained in a sanitary condition, other factors are involved which may enhance its use. In this connection it should be pointed out that visible examination of the interior of glass tubing is possible which is not the case with metal pipe. Glass tubing also appears to be free from microscopic surface irregularities, and therefore less liable to accumulate milk film than metal milk pipe. That glass tubing will not accumulate film is evident from a general observation of the tubing during this experiment. There was no apparent accumulation of milk film or stone in those cases in which the glass tubes were left assembled for periods of five to six weeks.

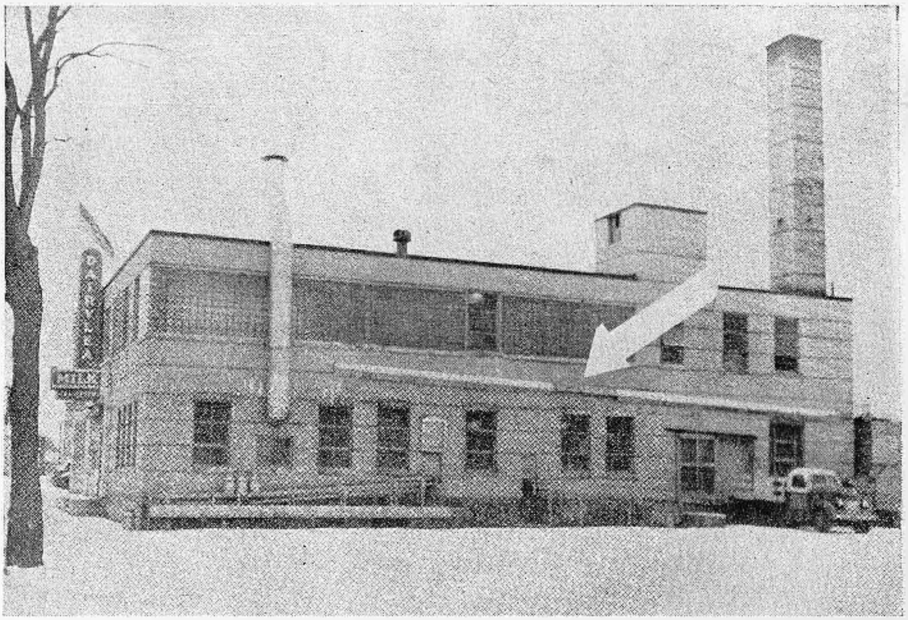


FIGURE 7

General view of plant with 65-foot welded glass tubing for confused cold milk.

TABLE 13

SANITARY CONDITION * OF FLANGED GLASS TUBING, CLEANED ASSEMBLED (SEVENTH PERIOD)

		Total Number (32° C.) of Colonies per Cubic Centimeter									
Date 1943	*Condition of Milk*	*Raw Milk Storage Tank*	*Raw Milk Entering Plate Heater*	*Hot Milk Entering Holder*	*Hot Milk Leaving Holder*	*Hot Milk At Pump*	*Entering Glass Tubing*	*Hot Milk Entering Cooler*	*Surge Tank*	*Filler*	*Raw Milk Lab. Past.*
		Flanged Glass Tubing Assembled March 3, 1943									
Mar. 4	F	45,000	63,000	8,100	11,000	11,000		12,000	14,000	11,000	32,000
8	S	89,000	125,000	57,000	18,000	17,000		31,000	16,000	18,000	13,000
9	F	41,000	292,000	41,000	13,000	39,000		13,000	36,000	6,100	850
10	S	174,000	316,000	100,000	17,000	18,000		14,000	16,000	14,000	57,000
11	S	189,000	306,000	39,000	15,000	15,000		15,000	10,000	7,200	4,700
12	S	144,000	213,000	83,000	3,700	3,800		3,800	2,400	3,200	12,000
13	S	115,000	179,000	50,000	5,800	4,700		10,000	9,600	6,900	spr.
15	S	360,000	380,000	67,000	9,400	11,000		10,000	10,000	10,000	59,000
16	F	140,000	98,000	16,000	13,000	9,600		broken	1,400	9,300	69,000
17	S	310,000	190,000	86,000	29,000	28,000		18,000	37,000	46,000	39,000
18	F	27,000	31,000	9,400	8,000	9,000		7,800	39,000	38,000	9,000
		Flanged Glass Tubing Examined March 18, 1943									

F=Fresh milk. S=Stock milk held over from day before.
* As indicated by the total colony count.

There are no data available to indicate the maximum number of days glass tubing can be left assembled in the plant and still be satisfactorily cleaned by circulating solutions without dismantling and brushing. There may be little need for frequent dismantling for cleaning, since the transparency of the glass permits constant observation of the physical cleanliness of the interior surfaces of the tubing.

Objectionable conditions, such as incorporation of air or foreign material, partially filled milk lines, etc., can be readily observed when glass tubing is substituted for metal pipe. For example, during one part of the experimental work, a broken milk pump packing allowed oil to enter the milk line. This condition was immediately noticed in the glass tubing, beyond the pump, and the operation was stopped while the pump was repaired. Under ordinary operating conditions with metal pipe, it is possible that this situation would not have been noticed until the milk had been bottled.

There also appears to be a definite psychological reaction upon plant employees when glass tubing is used. The transparent glass tubes bring unsanitary conditions into bold relief, and plant employees develop pride in maintaining a clean and sanitary appearance

TABLE 14

SANITARY CONDITION * OF FLANGED GLASS TUBING, CLEANED ASSEMBLED (SEVENTH PERIOD)

		Total Number (37° C.) of Colonies per Cubic Centimeter									
Date 1943	*Condition of Milk*	*Raw Milk Storage Tank*	*Raw Milk Entering Plate Heater*	*Hot Milk Entering Holder*	*Hot Milk Leaving Holder*	*Hot Milk At Pump*	*Entering Glass Tubing*	*Hot Milk Entering Cooler*	*Surge Tank*	*Filler*	*Raw Milk Lab. Past.*
		Flanged Glass Tubing Assembled March 2, 1943									
Mar. 4	F	32,000	41,000	10,000	7,000	11,000		7,000	11,000	7,000	19,000
8	S	165,000	97,000	36,000	8,800	9,000		7,900	6,900	8,700	4,400
9	F	7,000	79,000	11,000	9,200	15,000		8,000	spr.	4,400	.....
10	S	91,000	24,000	48,000	8,900	7,800		6,500	6,100	6,400	9,300
11	S	120,000	165,000	187,000	3,800	7,300		6,300	4,200	3,200	11,200
12	S	52,000	71,000	31,000	1,100	1,400		1,000	1,800	1,700	12,800
13	S	59,000	83,000	16,000	1,500	1,600		2,300	4,100	2,300	spr.
15	S	12,000	12,000	19,000	4,800	5,600		2,800	5,100	6,300	14,200
16	F	100,000	80,000	7,700	1,600	1,900		.....	4,000	3,000	spr.
17	S	190,000	100,000	6,200	19,000	13,000		17,000	15,000	22,000	22,000
18	F	13,000	91,000	6,000	3,900	6,800		4,800	7,500	spr.	spr.
		Flanged Glass Tubing Examined March 18, 1943									

F=Fresh milk. S=Stock milk held over from day before.
* As indicated by the total colony count.

TABLE 15

SANITARY CONDITION * OF FLANGED GLASS TUBING, CLEANED ASSEMBLED (SEVENTH PERIOD)

		Gas Production in Formate Ricinoleate Broth †														
		Raw Milk Storage Tank			*Hot Milk At Pump*			*Hot Milk Entering Cooler*			*Filler*			*Raw Milk Lab. Pasteurized*		
Date 1943	*Condition of Milk*	0.1 cc.	0.01 cc.	0.001 cc.	0.1 cc.	0.01 cc.	0.001 cc.	0.1 cc.	0.01 cc.	0.001 cc.	0.1 cc.	0.01 cc.	0.001 cc.	0.1 cc.	0.01 cc.	0.001 cc.
Flanged Glass Tuging Assembled March 2, 1943																
Entering Glass Tubing																
Mar. 4	F	+	+	—	—	—	—	—	—	—	—	—	—	—	—	—
8	S	+	+	+	+	+	—	—	—	—	+	—	—	—	—	—
9	F	+	+	+	+	—	—	+	—	—	+	—	—	—	—	—
10	S				—	—	—	—	—	—	+	—	—	+	—	—
11	S	+	+	+	—	—	—	—	—	—	+	+	—	—	—	—
12	S	+	+	+	—	—	—	—	—	—	—	—	—	—	—	—
13	S	+	+	+	—	—	—	—	—	—	—	—	—	—	—	—
15	S	+	+	+	—	—	—	—	—	—	+	—	—	—	—	—
16	F	+	+	+	—	—	—				+	—	—	—	—	—
17	S	+	+	+	—	—	—	—	—	—	—	—	—	—	—	—
18	F	+	+	+	—	—	—	—	—	—						
Glass Tubing Examined March 18, 1943																

* As indicated by the coliform test.

† Duplicate tubes used for each dilution. Results from duplicate tubes were in agreement. Single plus tubes reported as +. 1.0 cc. and 0.1 cc. dilutions gave comparable results.

TABLE 16

SANITARY CONDITION * OF OUTSIDE SIXTY-FIVE FOOT GLASS TUBING AFTER STERILIZED WITH STEAM

	Total Number (32° C.) of Colonies per Cubic Centimeter		
Date 1942	*Tap Water Control*	*First (Tap) Water to Run from Tubing as it Drained*	*Last (Tap) Water to Run from Tubing as it Drained*
Sept. 15	18	450	3,200
16	11	64	3
18	15	95	140
21	10	8	9
28	22	5	8
Oct. 1	3	4	14
2	191	103	18
3	1	4	44
7	19	5,400	

* As indicated by total colony counts.

of the glass tubing. This effect became apparent as the experiment progressed, and was particularly evident at the end of the investigation, when it was suggested that the metal pipe be re-installed in place of the glass tubing. This suggestion met with spontaneous opposition on the part of the plant employees.

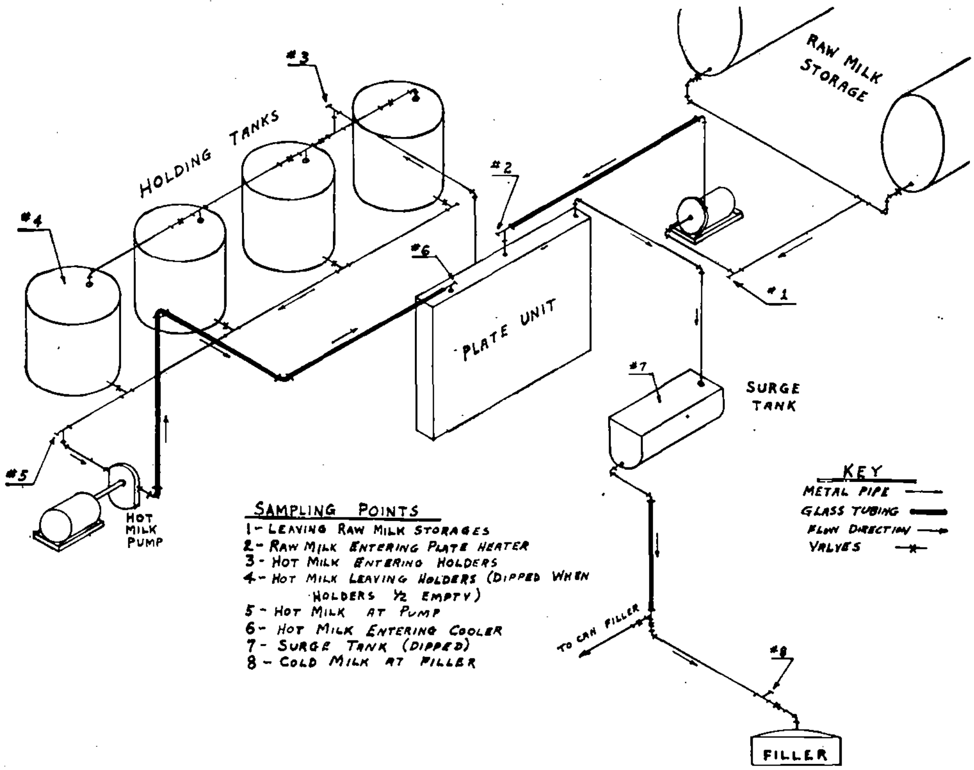
Either of the two types of glass tubing which were available can be recommended for replacing metal milk pipe in the plant. The beaded glass tubing can be installed in the plant in combination with the standard metal sanitary fittings. It was found during the fourth period of this investigation that there appeared to be no sanitary reason for the daily disassembly for cleaning of beaded glass tubing when used with metal sanitary fittings. It was established that the beaded glass tubing in combination with standard metal sanitary fittings could be kept intact for many weeks and washed daily according to the procedure as outlined. However, at such intervals as the metal fittings need to be removed for cleaning they may be uncoupled, leaving the glass tubing in the hangers. After the metal fittings are cleaned by hand, the line should be assembled so the glass tubing may be cleaned by circulating a detergent solution.

The flanged glass tubing is available in standard stock lengths. Other lengths must be made to order. Duplicates of all special lengths and a few of the standard stock lengths should be held in reserve for substitution in the event of breakage so that plant operation will not be unduly delayed.

CONCLUSIONS

1. Pyrex tubing, beaded or flanged, can serve as a replacement for metal milk pipe in dairy plants.

2. Pyrex tubing may be satisfactorily cleaned and sterilized in an assembled position. It is not to be construed that



DIARGAM 1

Schematic flow sheet of experimental plant indicating sampling stations.

this conclusion applies in any way to metal milk pipe assemblies.

3. Glass tubing and tube joints opened and examined at intervals of two to six weeks were found to be in an excellent sanitary condition when cleaned daily in assembled position as follows: Circulating through milk lines, (a) cold water rinse; (b) a 0.6 percent solution of an alkaline cleanser containing 4.0 percent of a wetting agent, at a temperature not less than 110° F. for at least 20 minutes; (c) clean water rinse at about 110° F.; and (d) sterilizing rinse of hot water at approximately 190° F. for not less than 15 minutes. Immediately prior to milk operation a chlorine flush solution of at least 100 ppm. strength may be circulated through the milk processing system.

4. The optimum time interval for disassembling and examining Pyrex glass tubing joints was not determined. However, until further data are secured, disassembly at intervals of not greater than two weeks is suggested.

5. A bacteriological study of glass tubing cleaned and sterilized in assembled position yielded results which, from a sanitary standpoint, were satisfactory and comparable to those obtained under present dairy industry practice of daily dismantling of metal milk pipe for cleaning.

Homogenized Milk and Public Health*

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In the midst of uncertainty regarding the future of the homogenizer in the dairy industry, Baldwin (1916) prophesied:

> "Just what attitude public health officials should take toward homogenized products might depend on circumstances; but it would seem as though there should be no general objection unless an unhealthful product is made or one which would tend to deceive the consumer.
>
> "With the exception of the occasional fraudulent use of the process, homogenization apparently marks a distinct advance and the product thus made seems to be of better flavor and texture than unhomogenized cream containing the same amount of fat. Another feature of distinct advantage to the public in homogenized products is that they are practically all pasteurized."

The attitude of the public at that time, toward the use of the homogenizer was undoubtedly well expressed in another statement by Baldwin (1916) who believed that

> "For the most part homogenizing is done to secure some commercial advantage either through cheapening or improving the quality of the product, or the elimination of difficulties incident to customary methods, but there are some cases in which the process is distinctly fraudulent."

That the use of the homogenizer in the market milk industry was not only debatable but questionable is not surprising. First of all, the homogenizer was a comparatively new machine, the most obvious effects of its use being the reduction in the size of the fat globule making fat-bearing liquids homogenous. That "dispersed cream lines told no tales" connoted its use toward fraudulent purposes. Second, the sanitary features of a high pressure machine which could not be disassembled readily for washing and sterilizing naturally led officials to question the advisability of its adoption, nor were these fears without foundation.

Bishop and Murphy (1917) had demonstrated that this newly introduced machine was apparently a great source of contamination. Homogenizing raw milk at a temperature sufficiently high to liquefy the fat globules yet low enough not to kill off the bacteria, they secured counts of 1,500,000 before homogenizing and 11,500,000 after homogenizing, an increase of approximately 8 fold. Their experiments on cream showed that a low fat cream properly homogenized appeared much richer in fat; that after homogenizing milk the cream did not rise by gravity and could not be separated by centrifugal separation; that homogenized cream could not be churned and when added to coffee did not mix so readily as normal cream. All of which seemed to indicate that its chief merit was deception and this attended with difficulties. However, since ice cream made from homogenized products was superior in texture to that made from non-homogenized products, thus contributing to its palatability, the use of the homogenizer seemed destined to remain in that branch of the dairy industry.

Furthermore, early studies on the feeding value of homogenized milk lent little encouragement to its use. In their extensive studies, Washburn and Jones (1916) concluded in part that

* Jour. Article No. 620, n.s., Michigan Agricultural Experiment Station.

"The homogenization of the fat does not seem to be helpful in the feeding of the young, if we may judge by the clinical evidences. The pigs fed the milks thus treated ate their food less greedily and, whenever the fat content of their ration was increased, went 'off feed' more quickly than did those receiving milk containing normal fat. However, the curds formed from milk, the casein of which had been homogenized, were made so much more flocculent and friable as a result of this process that the writers are led to feel that perhaps benefit may be expected from such treatment."

In the light of present knowledge on homogenized milk it is interesting to speculate as to the reason why the pigs did not relish the homogenized milk as they did the non-homogenized. In most of the feeding trials, the milk was homogenized raw at 85° F., a condition approaching optimum for inducing rancidity. Likely, therefore, the homogenized milk was extremely rancid and bitter at time of feeding.

Several years later James (1923) using sterilized water demonstrated what contamination might be expected from a homogenizer supposedly "sterile". Making five runs with pasteurized skim milk using a machine previously treated with boiling water rendering it practically sterile, he found that the comparative numbers of organisms before and after homogenization ranged from a ratio of 1 to 1.5 to 1 to 4.5. These increases were undoubtedly the result of breaking up of clumps rather than from contamination.

USE IN MARKET MILK

The discovery of vitamins focusing the attention of dieticians to the necessity of a proper diet, especially for the young, contributed in part to the adoption of milk in the schools. However, not until Kelly (1932) pointed out that school children were leaving behind a considerable portion of the milk fat did homogenization of milk for school children seem desirable. He reported that a survey in cities throughout the United States, in which half-pint bottles of milk were being served school children that the average quantity of the milk left behind was 5.63 percent whereas the quantity of fat left averaged 15.83 percent.

These data indicated that school children were deprived of a portion of the butterfat served them. Kelly suggested that the remedy to the situation was better mixing by shaking and homogenization. In the experience of the intervening years homogenization of milk for school children seems to have gained the preference over better mixing by shaking.

By this time the second and successful introduction of homogenized milk on a commercial scale in Canada was at best an experiment of not more than half a decade standing. Apparently a successful enterprise there, its growth, problems, acceptance and possibilities were being scrutinized closely by the market milk industry in the United States. In fact, a few courageous United States dairymen already had dared to introduce the product despite the fact that many of its problems were yet unknown and hence unsolved. The success of these early commercial ventures, coupled with the enthusiasm of the housewives themselves for homogenized milk as noted in a survey by Tracy (1936), forced others to place homogenized milk on the market.

At first reluctant to permit the sale of homogenized milk, boards of health in the larger cities now recognize it as a standard milk product. The United States Public Health Service (1939) recognizes and defines homogenized milk specifically as follows:

"Homogenized milk is milk which has been treated in such manner as to insure break-up of the fat globules to such an extent that after 48 hours storage no visible cream separation occurs on the milk and the fat percentage of the top 100 cc. of milk in a quart bottle, or of proportionate volumes in containers of other sizes, does not differ by more than 5 per cent of itself from the fat percentage of the remaining milk as determined after thorough mixing."

The machine once of questionable character in the milk industry, after a quarter of a century of development and research, has been accepted as standard equipment. It is interesting to note what developments have been made during the past 25 years which have been responsible largely for the change in attitude of the public and its officials toward homogenized milk. Many may be cited but five are worthy of further consideration. These are:

1. Introduction of new, completely-demountable, stainless steel homogenizers which may be disassembled readily for washing and sanitizing.

2. Development and introduction of more efficient washing powders and chemical sterilization.

3. Marked improvement in the general raw milk supply to milk plants.

4. Introduction of home refrigeration making low-temperature storage and quantity fresh food buying possible.

5. Extensive research on homogenization of milk and problems related thereto.

The major objection to the early homogenizer, namely, that even with conscientious cleaning it with its inaccessible stuffing boxes was a potential source of contamination, has been overcome in today's machine. Each part with which milk comes in contact is now demountable, washable, and sanitizable. Made chiefly of stainless steel its valves and pistons resist wear and are no longer seats of marked grooves which defy adequate cleaning. Disassembled after each run, the parts must be kept in first-class condition at all times that the machine will perform efficiently under the pressure required.

In the field of cleaning and sanitizing dairy equipment, the methods employed and materials used today are a marked contrast to those of a quarter century ago. Then, generally one alkali served all dairy purposes; today, a specific chemical compound is available for each specific purpose. The milk-stoned equipment of yesterday is the polished surface of today. Hot water was available for sterilizing then as now, but in addition today chemical sterilizers are at the service of the plant manager.

The bacteriological quality of the milk supply today as contrasted to that of the turn of the century represents an improvement which is little less than a marvel in the field of food engineering. Routine inspection with specific tests, improved methods of production, facilities for prompt and adequate cooling and storing milk on the farm, covered trucks, refrigerated transportation and in some territories twice-a-day delivery have resulted in a milk supply of comparatively low bacteria count. Consequently, bottled pasteurized milk today often has such a low biological oxygen demand that at certain seasons development of flavors resulting from chemical activity are a serious problem to the distributor. The home refrigerator making possible lower temperatures and longer storage of milk has been a factor in this problem. Research has shown that homogenization stabilizes the milk against these oxidative changes.

HOMOGENIZATION TECHNOLOGY

During the past decade many data have been presented by research workers on various aspects of homogenized milk. In the light of these data, both the processor and public health officials have come to recognize certain facts associated with homogenized milk which are of distinct value to public health. A few having especial public health significance are herewith presented and discussed briefly:

1. *Homogenized milk must be a pasteurized product.* This should be of special interest to the public health official. Bundesen (1937) stated "We maintain that proper pasteurization is the front line of defense against milk-borne disease, and it is a defense which can never be allowed to waver or break down."

When the raw milk is homogenized, it soon becomes bitter, rancid, and undrinkable, due to the activity of the enzyme lipase which is present in all milk. Lack of palatability will defeat milk sales so quickly that no plant manager would risk inadequate pasteurization of homogenized milk.

2. *Homogenized milk is capable of being pasteurized at a higher temperature and maintained for a longer holding period than regular pasteurized milk.* Since properly homogenized milk is homogeneous throughout showing no cream line, the destruction of creaming ability of milk by heat treatment is of no concern in homogenized milk. Thus, the fear of high temperatures affecting the creaming of milk is out. Furthermore, the cooked flavor does not occur in milk until momentary temperatures around 175° F. have been reached. Gould and Sommer (1939) showed that the appearance of the cooked flavor in milk was a function of time as well as temperature, the flavors appearing at temperatures of momentary heating at around 80° C. (176° F.) and at 30 minutes holding at 70° C. (158° F.). Consequently, the upper temperature limit of pasteurization of milk for homogenization purposes may be materially raised, thereby resulting in greater pasteurization efficiency without affecting the palatability of the product.

In a recent survey of 23 Michigan milk plants homogenizing milk, Trout and Scheid (1941) found that 14 or 60.8 percent of them were pasteurizing at 145° F. and above; that 11 or 47.8 percent at 147° F. and above, and that 8 or 34.8 percent at 150° F. and above. With the exception of one plant pasteurizing at 160° F. for 20 minutes, the time of holding in each case was 30 minutes.

3. *Homogenized milk cannot be mixed with raw milk without developing rancidity.* Experiments with mixtures of raw and pasteurized homogenized milk by Gould and Trout (1939) and by Larsen, Trout, and Gould (1941) demonstrate fully the necessity of inactivating the enzyme lipase in homogenized milk if development of rancidity is to be avoided. Rancidity in milk is so easily detectable by taste and is so repulsive that such milk will not be consumed; and it follows that that which will not be consumed will not merit repeat sales.

4. *Clarification is a companion process with homogenization.* Jones (1929) early pointed out the possibility and occurrence of sedimentation in bottled homogenized milk and advised the necessity of clean milk for homogenization purposes. This defect was more fully described by Trout and Halloran (1932) (1933) who reasoned that with a lack of creaming as the result of homogenization any silt present might readily settle out together with some casein or milk cells. These investigators found the sediment compared very favorably in appearance and chemical composition to separator slime, which from earlier investigations by Hammer (1916) and by Marshall and Hood (1918) was known to have cell counts, in some cases, approaching or even exceeding one billion per gram. Clarification was resorted to therefore, as the practical remedy for sediment in homogenized milk.

Babcock (cited by Kelly, 1932) showed that homogenized milk sediment was high in leucocytes and demonstrated (1934) that settling of leucocytes did occur in homogenized milk, the lower portion of bottled homogenized milk being extremely high in them as compared to the upper portion. The above observations and remedies have been later substantiated with supporting data and limitations by many other investigators.

Despite the settling of body cells and the importance of low cell milk for homogenization purposes the importance of clean milk cannot be minimized as shown by Charles and Sommer (1935). Furthermore, the plant operator well appreciates the value of general plant sanitation and cleanliness where homogenized milk is being processed. Observations made by the writer of a plant changing from an old "stuffing box" type of homogenizer through the use of which sediment in homogenized milk could be demonstrated at will to a modern demountable type of homogenizer with which, using the same source of milk supply, slight sedimentation could be demonstrated only with difficulty convinces him that the use of low cell milk alone is not the solution, but that sanitation of the machine itself is of very vital importance also in eliminating sediment in homogenized milk.

5. *The process of homogenization has been an educational influence to the milk processor making him more "milk-conscious".*

In processing and merchandising homogenized milk, the processor soon learns that

a. Prompt adequate heat treatment must accompany the process to inhibit the development of rancidity.
b. Homogenized milk exposed to light is prone to develop the so-called "sunshine flavor". The manager, therefore, has a vital, personal reason for instructing the milkman to set the milk out of the sun and may even provide his customers with milk boxes.
c. Because of sedimentation, homogenized milk must be of high quality and preferably clarified.
d. Homogenized milk must be protected in transit from heat to prevent leaky caps and from freezing to prevent watery appearance as shown by Hood and White (1934) and Trout (1940) (1941).
e. Inasmuch as the homogenizer not only is another piece of equipment with which the milk comes in contact, but breaks up bacterial clumps yielding higher apparent counts as well, the plant operator becomes more conscious of the necessity of efficient plant sanitation throughout.

6. *The bacterial count of commercial homogenized milk is comparable to that of regular pasteurized milk.*

Despite contamination from the homogenizer and breaking up of clumps of bacteria, factors which cannot be denied, thus yielding a higher plate count as shown by James (1923), Tracy (1938) and others, the fact remains that homogenized milk is meeting boards of health bacterial standards throughout the country every day. Data presented by Hollingsworth (1931), Hood and White (1934), and Tracy (1938) show that homogenized milk of comparatively low bacteria count is being marketed regularly. Often fully unappreciated is the fact that, since cream line is not a factor in homogenized milk, heat treatment is not limited to a few degrees, but may be raised markedly to secure greater pasteurization efficiencies. Furthermore, the flash of temperature of a few degrees resulting from the processing pressure undoubtedly contributes further toward a lower bacteria count. Furthermore, contamination from the modern completely demountable homogenizer would seem to be nil in comparison to that of the old-type machine.

7. *The fat content of homogenized milk may be easily and reliably determined by the modified Babcock method.*

It is generally recognized today that Babcock fat tests of properly homogenized milk are well within 0.1 percent of that of the same milk non-homogenized. Doan and Swope (1927) found that homogenization even at high pressure exerted but little influence on the Babcock test. Halloran and Trout (1932) made similar observations. Trout (1933) and Trout, Halloran and Gould (1935) using sulphuric acid standardized at 1.82 sp. gr. demonstrated that accurate fat tests could be made on homogenized milk. Babcock (1934), however, found in every case that the homogenized milk showed a lower fat test, ranging from 0.05 to 0.15 percent with an average of 0.10 percent, than the same milk before being homogenized. Hood and White (1934) found the lowering of the fat test due to homogenization to average

0.08 percent. Tracy (1935) using the modified procedure for homogenized milk stated, "In general, no great difficulty was encountered in securing tests comparable to the results secured on the unhomogenized samples." Apparently, therefore, health authorities may confidently and at will, using available Babcock equipment, check the milk supply to ascertain if the fat content meets local board of health requirements. The fact that milk is homogenized does not put it into a class which defies chemical analyses — a class wherein allurements to deception might be a public health problem.

8. *Homogenized milk is an important factor in increased milk consumption.*

Smallfield (1929), having made a customer preference study involving homogenized milk, stated:

> "The questionnaires which were returned showed that all those reported on it liked the homogenized milk. Sixty-two per cent preferred it to the unhomogenized milk. Nearly all the families in this group had small children. Some replied that they preferred it on account of its greater apparent richness."

This consumer reaction to homogenized milk, to a greater or lesser extent, has been made also by Irwin (1931), Hudon (1931), Doan (1932), Babcock (1934), and Tracy (1936). Tracy's 36 reasons furnished by the customer's themselves as to why they prefer homogenized milk are almost classic.

Two factors, contributing to the greater palatability of homogenized milk, seem to stand out. These are: first, the homogeneity of the milk. Homogenized milk exhibits no flakes, specks, or granules of cream or butter in the glass, such as are frequently encountered in non-homogenized milk; and second, the continuous wholesomeness of good flavor upon prolonged storage. The latter is very important, as regular pasteurized milk upon storage at certain seasons of the year is prone to develop various stages of oxidized flavor, rendering it less palatable. Homogenization has been shown by Tracy, Ramsey, and Ruehe (1933) to inhibit or delay oxidative changes. This observation has been substantiated since by several other investigators.

With the wealth of scientific information available pointing to the necessity of including milk in the diet, health authorities are vitally interested in a safe, sanitary product which would tend to increase the present consumption of milk, particularly a milk which will assure children that they are getting the full amount of fat in each glass.

A foregone conclusion is that public health officials through establishment of standards and through rigid and routine inspection have played no minor role in the development of the present market milk industry. Ever cautious in accepting and adopting new products and processes, they have kept the good of the public in mind. Presented with facts supported by adequate research, they are accepting today and even welcoming homogenized milk, which was a product of suspicion less than a quarter of a century ago.

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Septic Sore Throat Epidemic at School

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An investigation was made on June 10, 1942, of two outbreaks of sore throat which had occurred among the students, teachers, and other employees of the school, one in February and the other during the first week in June. The school physician, as well as other school authorities, had suspected that the disease came from the milk supply. The investigation revealed that on February 6 one of the older boys, a student at the school, had reported to the infirmary with a sore throat. He was found to have what appeared to be an extremely septic throat, and was immediately put to bed. On the following day it was necessary to open a paratonsillar abscess which had developed in this patient. This boy was one of the school boys who aided in taking care of the dairy herd of the school, in milking, and in caring for the milk. On the morning of the day that he reported to the infirmary with a septic throat, he had assisted in the milking. On February 6, the date of the onset in the first case, a total of 124 students, teachers, and other employees lived either in the school dormitories or on the school grounds, all of whom obtained their milk supplies from the school dairy.

The attack rate rose abruptly from less than 1 per 100 on February 12 to 15.8 per 100 on February 13, the highest attack rate obtaining on February 15, when it reached 20.2 per 100. On February 16, this rate dropped to 15.2, after which it fell abruptly to a rate of 1.5 per 100 on February 18. After this date, it fluctuated between zero and 10.6 per 100 until March 2. From then on, no further cases occurred until the week of May 30 through June 5, during which time 18 cases occurred among 46 visitors who came to the school and took up residence for a conference that was to be held.

The outbreak was quite explosive, the greatest number of onsets and the highest rates obtaining on February 13, 15, and 16. The explosive nature of this outbreak is further emphasized by the daily sore throat sick census for the school.

On June 10, the State Epidemiologist and Milk Sanitarian went to the school to investigate the outbreak. On this date only 59 students, teachers, and other school employees remained at the institution. All of those among the visitors who had developed sore throat had recovered, except one, and while this patient was up and around, he still complained of a sore throat. Throat cultures were taken from each of the 59 resident persons and planted on blood agar plates. After incubation of these plates for a period of 24 hours, it was found that 22 of the 59 individuals had hemolytic streptococci in their throats. One of these 22 was the vistor whose throat remained sore. This high percentage of individuals with hemolytic streptococci in their throats certainly suggested that an infection, caused by this organism, had, within the recent past, been fairly widespread in the school population.

While the epidemiological information was being obtained from the nurse and school physician and while the throat cultures were being taken, the Milk Sanitarian was investigating the dairy herd of the school. On the day of the investigation, 10 out of a total herd of 14 cows were being milked. All of these cows had been tuberculin- and Bang-tested within the past year and no reactors found. This herd produced, on an average, about 40 gallons of milk per day, all of which was consumed at the school. Strip-cup tests were taken from each quarter of each of the 10 cows. Cultures from these specimens of milk revealed hemolytic streptococci in one or more quarters of the udders of 3 of the 10 cows. Cultures from specimens of these 3 cows also revealed *Staphylococcus aureus* or *albus*, one or both. The other 7 cows all showed *Staphylococcus aureus* or *albus*, the aureus being hemolytic in every case.

On inspection of the dairy barn, it was found that concrete floors were broken and irregular, the barn and milk house walls needed white washing or painting, the milk cooler was dented and in a poor state of repair, and the milk pails had broken seams which were roughly soldered. All utensils with which the milk came in contact had a slightly greasy feel, and on the cooler was a considerable deposit of old dried milk near the bottom tubes. There was no chemical disinfection or steam sterilization of milking utensils. The cotton disks through which the milk was strained were exposed to dust and flies. No chlorine was used in the water with which udders and milkers' hands were washed. Milk stools were dirty. It was found that the milk was cooled at the milk house, placed in 5 gallon cans, which were, in turn, taken to the kitchen refrigerator. At 6:00 P.M. the temperature of the afternoon milk in the cans in the refrigerator was 70 degrees, while the inside temperature of the refrigerator was 56 degrees. Two students milk the cows in the dairy barn. Each pail of milk was strained in the straining room of the milk house. Milk then flowed by gravity through a short sanitary pipe connecting, through the milk house wall, onto a tubular cooler. The milk flowed over the tubular cooler, which was located in the same room as that used for washing and storing utensils. The cooling medium was the water from the reservoir that provided the school water supply. Milk was coming off the cooler at approximately 70 degrees. At meal time the milk was placed in large aluminum pitchers and these pitchers were set in the center of each table, so that each individual, student, teacher, employee, or visitor could drink all the milk he wanted.

Conclusions

1. Septic sore throat was epidemic among students, teachers, and employees of the school in February and March of 1942.

2. This disease recurred in epidemic form among some visitors to the school during the first week of June, 1942.

3. Hemolytic streptococci were cultured from specimens of milk obtained directly from the udders of 3 to 10 cows that were producing milk for the school at the time of the investigation.

4. Specimens of milk obtained from the udders of the 10 cows in the dairy herd contained *Staphylococcus aureus* or *albus*.

5. Improper cleansing and disinfection of milk utensils, milkers' hands, and cows' udders increased the possibility of pathogenic organisms finding their way into milk, and inadequate cooling and refrigeration permitted multiplication.

6. The period of 7 days that elapsed between the date when the first case was recognized in a milker and the date when the first large number of onsets occurred was long enough for this milker to have infected cows' udders, mastitis thus arising and serv-

ing as foci from which organisms entered the milk in which they multiplied and were carried to the victims.

7. The fact that two outbreaks of septic sore throat, both explosive, one over a period of 20 days, the other 3½ months later in a visiting population and covering a period of one week further strengthens the suggestion that the epidemic was milk-borne.

PRINCIPLES INVOLVED IN SHORT-TIME PASTEURIZATION OF MILK *

Certain problems connected with short-time pasteurization of milk have occasioned much discussion but apparently have not been brought to a solution. The author interprets the principles that have been employed successfully in the scientific advancement of heat sterilization of canned foods in such a manner as to facilitate the application to milk pasteurization of a method of treatment analogous to that applied to canned foods. The manner of using this scientific method to solve the problems associated with milk pasteurization is described specifically, with especial emphasis upon an explanation of why a high-short pasteurizing process appears sometimes to be equivalent to the ordinary low-temperature long-hold process whereas at other times the former process appears to have less bacteria destroying power than the usual long-hold process. Mathematics is used to explain this puzzle by showing, first, that the relationship between different pasteurizing processes depends upon the particular kind of bacteria one is interested in destroying, and second, that the time taken to heat the milk to pasteurizing temperature and to cool the milk from pasteurizing temperature may make a material contribution to the bacteria-destroying power of the process.

* Abstract of paper by C. Olin Ball presented at meeting of Agriculture and Food Division, American Chemical Society, Buffalo, N. Y., September, 1942. To be published in *Industrial and Engineering Chemistry*.

The efficacy of the pasteurization process of 30 minutes at 61.7° C. (143° F.) has been established by years of experience. Calculations based on the bacteria-destroying value of this process as a reference standard show the comparative value of processes at other times and temperatures in destroying different types of bacteria. On the basis of available data, it was found that 19.2 seconds at 71.7° C. (161° F.) has destructive power equivalent to 30 minutes at 61.7° C. (143° F.) for one important kind of bacteria *(Br. suis)* but that for *S. aertrycke,* another type of bacteria which is important but less likely to be present in milk, a process of 3 minutes 20.4 seconds at 71.7° C. (161° F.) is required to have destructive power equal to that of 30 minutes at 61.7° C. (143° F.).

This principle is important in a consideration of any test for proving the sufficiency of a pasteurization process, such as the phosphatase test. Assuming that the enzyme phosphatase in milk is inactivated by heat at the same rate at which a simple chemical reaction takes place, one finds that for this test a process of 3 minutes at 71.7° C (161° F.) will produce the same results as those that are produced by a process of 30 minutes at 61.7° C. (143° F.).

These equivalents are based on actual heating time at the given temperatures with instantaneous rise to temperature and instantaneous cooling assumed. It is impossible, of course, to bring milk to a pasteurization temperature or to cool it in no time at all. Therefore, the relationship indicated by these figures do not apply strictly to practical conditions. Periods of time consumed in heating the milk to holding temperature and in cooling the milk, along with the holding period at the pasteurization temperature, contribute to the destruction of bacteria and enzymes. When a rise of temperature to 71.7° C. (161° F.) proceeds over a period of 7 minutes and the cooling of the milk requires a similar length of time, the periods of rise and decline of temperature may contribute much more lethal heat to the destruction of bacteria or to the inactivation of phosphatase than is contributed by the holding period of the process. The fact that only 16 seconds at 71.7° C. (161° F.) has been found to give adequate pasteurization indicates that the effects of coming up and cooling periods have been overlooked in the interpretation of the results of tests.

The author tabulates the bacteria-destroying values of processes having various combinations of rates of rise and decline of temperature, which show that these periods must be taken into account in the scientific evaluation and comparison of pasteurization processes. These results show, for example, that, for *Br. suis*, a microorganism which data indicate to be destroyed in 19.2 seconds at 71.7° C. (161° F.), a period of 7 minutes used to bring the temperature of the milk to 71.7° C. could supply almost 10 times as much lethal heat as is required to destroy the organism.

THIRTY-SECOND ANNUAL MEETING, OCTOBER 14 and 15, 1943
NEW YORK, N. Y.

Is It Desirable to Simplify and Unify Our Milk Quality Program?

FROM THE VIEWPOINT OF THE HEALTH OFFICER

N. O. GUNDERSON
Commissioner of Health, Rockford, Illinois

IN the light of our present knowledge in dairy science, it is well to ask why our known and accepted control measures have not been more universally applied.

To answer this question satisfactorily, it is necessary to consider some of the limiting factors for a proper control of milk supplies. Among these may be mentioned the economic, the esthetic, and quality aspects of the problem; certain long established ordinance features; and a shortage in manpower due to the war effort.

LIMITING FACTORS FOR CONTROL

The economics involved is always a limiting factor in connection with control work as evidenced by the fact that present effective control programs presuppose that from ten to twenty cents per capita per year will be available for carrying out the work.

When we remember that the majority of smaller municipalities and counties now provide practically nothing for milk supervision and that the average provision among cities is about five cents per capita, the seriousness of this economic angle is better appreciated.

ESTHETIC ASPECT

As to the esthetic aspect, all students of milk problems are in accord with the excellent conditions under which certified milk is produced and handled. We should be pleased to have the same attractive conditions surround the production of ordinary milk as exist in connection with certified milk production.

However, when we remember that these very attractive conditions entail an increase of approximately three to five cents per quart in the retail price of milk, we understand why our esthetic desires cannot have full sway in milk production. In other words, our esthetic desires are in fairly constant conflict with the economics of the situation.

MILK QUALITY

The third aspect of control work is that concerning the quality of milk as produced. It is agreed that too many health officials are striving to improve the quality of milk by measures which are directed mainly toward the esthetics of the situation, in the hope that this will solve the problem of quality.

Under such conditions, it is not surprising that our milk control efforts are not producing the results desired.

ORDINANCE CONSIDERATIONS

Fourth, practically all municipal ordinances, including the Public Health Service Standard Ordinance, favor the use of the bacterial plate count as one of the criteria for judging milk, which perhaps does not offer the dependable quality picture originally anticipated.

For instance, it is now apparently believed by many laboratory workers that standard plate counts contribute little or nothing to controlling a milk supply, and indeed at times actually detract from milk control because of the illogical absurdities encountered in the attempt to enforce bacterial standards. As a matter of fact, the agar plate method entails too much work for the results attained.

FEDERAL ORDINANCE COMMENT

As to milk control under the provisions of the Standard Milk Ordinance, which now has been with us for practically twenty years, this ordinance apparently comes no nearer to unifying milk control than at the start, because of the many cities and states which do not deem it advisable to adopt this code. Perhaps it is significant that three of the largest milk producing states — New York, Michigan, and Wisconsin—have not urged its adoption.

Further, in our own state of Illinois, outside of the Chicago and St. Louis milk markets, only four cities—Elgin, Decatur, Champaign and Waukegan—were able this last year to attain a ninety percent or better rating by the U. S. Public Health Service. This scoring unfortunately is interpreted by the public as being a standard for judging the safety of milk.

DECREASED MANPOWER

Lastly, experience shows that we are still continuing to control milk production by our old systems, which must be changed or modified to conserve manpower. Vigorous farm inspection service will have to be curtailed. Quicker methods of attaining the same results must be substituted.

MILK QUALITY YARD STICK

Health authorities seem agreed that the quality of milk is made up of five essentials: richness or food value; safety or freedom from pathogenic organisms; cleanliness or freedom from physical dirt; sweetness or keeping quality; and flavor or palatability.

The value of this classification is much increased by the fact that indices are available for each of these conditions, and these indices may be used in the control of milk supplies.

CERTAIN SIMPLE TESTS CAN BE APPLIED

For instance, richness is indicated by the Babcock test; safety is indicated by the phosphatase test; cleanliness is indicated by the sediment test; and keeping quality and flavor are indicated by physical observations and the methylene blue reductase test of the raw milk. When laboratory facilities are available, the direct microscopic examination can be used in place of, or in conjunction with, the reductase test. Experience in many places over a long period indicates that it gives a great deal of information regarding the causes of poor quality milk, not only raw, but also pasteurized milk.

DOCK TESTING

With these apparently reliable tests at hand, an increasing number of health departments are experimenting to see whether these rather simple tests can be applied at the points where milk is received into the city, for the purpose of rejecting such milk as does not meet these tests.

In other words, following an initial inspection of the farm, the point of observation and determination of milk is shifted from the farm to the receiving dock or city plants.

The attempt to control the milk largely by stipulating the environment under which it is produced has given place to an attempt to measure in the milk itself the qualities which make it attractive and safe to the consumer.

4-POINT TEST SYSTEM

In the light of this situation, it appears reasonable to give serious consideration to the possibility of streamlining milk control by utilizing certain accepted platform and plant tests which can be used to assure safe milk and milk products for the armed forces and civilians.

Such an attempt is schematically outlined in Chart 1, which shows a 4-point test system for judging the quality of milk by utilizing (1) the Sediment, (2) the Direct Microscopic (or Reductase Test), (3) the phosphatase, and (4) the Swab Test, together with certain other simple observations applied at the receiving plant and in the processing plant.

In this plan, farm inspections by field men are restricted to the small number of non-compliance milk producers, and if desired the milk can be rejected *on the spot.* This affords the city inspector more time for cooperating with plant men in the proper processing of milk, and so permits quicker and more effective control of the quality of the raw milk to be processed.

CHART 1

DOCK AND PLANT INSPECTION PROGRAM

A. Incoming RAW MILK Can Be Judged by Noting

Daily by Weighman

1. Its Appearance: (1) Off Color, (2) Flaky, (3) Stringy, (4) Bloody.
2. Odor: (1) Sour, (2) Barn, (3) Feed, (4) Chemical, (5) Silage.
3. Temperature: Milk over 65° F. is not desirable.

Weekly

4. **Sediment Test:** (1) Clean, (2) Acceptably Clean, (3) Slightly Dirty, (4) Dirty.
5. Methylene Blue Reductase Test: (When no laboratory is available). Milk not decolorizing in 6 or more hours is good milk.

Every Four Weeks (A very helpful test to the field men).

6. **Direct Microscopic Examination:** Shows (1) Excessive Count, (2) Udder Trouble, (3) Dirty Utensils, (4) Poor Cooling.

Twice or Once a Year (With decreased manpower rely on direct microscopic examination).

7. Routine Farm Inspections: Essential to use written recommendations with field cards.

As Indicated

8. Disposition of Producers in Trouble:
   a. Give Notice: (1) Through hauler, (2) by phone, (3) by can tag, (4) by mail.
   b. Submit Samples to City Laboratory: (1) For 3 successive days, (2) conferences.
   c. Farm Visit: To check (1) cooling, (2) milking machine, (3) utensils, (4) herd disease.
   d. Rejection on the Spot: As a last resort only.

B. PASTEURIZED MILK Can Be Judged by Noting

Daily

1. Charts and Staffs: If below or not checked, suggest repasteurization.
2. Plant Technic: Check (1) Washing, (2) Sterilization, (3) Storage.
3. **Phosphatase Test:** Preferably of each vat; if positive, repasteurize.

Daily (This test can replace bacterial plate counts).

4. Direct microscopic examination of finished pasteurized milk:
   a. Count should not be over 60,000.
   b. There should be no evidence of mastitis.
   c. Free from heat-resistant bacteria from raw milk or plant equipment.

Monthly or Oftener

5. **Swab Test of Equipment Parts:**
   a. To note improper cleaning and sterilization.

Monthly or Oftener

6. Butter Fat Test: Perhaps should be at least 3.25 percent.

   Explanatory Note: It is to be noted that laboratory testing is limited essentially to the **4-Point Test System,** that is, to (1) the sediment, (2) the direct microscopic, (3) the phosphatase, and (4) the swab test. With no laboratory the (1) sediment and (2) the methylene blue reductase tests are very useful adjuncts.

APPLICATION OF PLAN AT ROCKFORD

Reference is made to the March 24, 1943, issue of the *Bulletin of The Dairy Research Bureau,* Detroit, giving results obtained with one type of dock and plant control used in the Rockford milkshed for twelve years.

Since January first an attempt has been made to replace the methylene blue reductase test for keeping quality and the coliform test when used to check sterility of plant equipment, with the direct microscopic and swab tests.

(For results of the present program, see Chart 2.)

The cost of supervising this plan is 0.155 cent per gallon, which is approximately one-third the cost estimated by Fuchs in operating the Standard Milk Ordinance for cities the size of Rockford.

ARE PRESENT QUALITY STANDARDS SATISFACTORY?

With this picture in mind, let us now ask whether our present milk quality standards are satisfactory. In the case of milk consumed in the raw state, the answer of course is "no" because of the continued number of epidemics still reported in the use of raw milk.

However, in communities where milk is still sold in the raw state, the direct microscopic examination perhaps comes nearer to showing the quality of milk than any other means available thus far. Indeed, instant rejection of inferior milk *on the spot* is far superior to costly, time-consuming routine farm inspections, supported by bacterial plate counts, which are more or less quantitative and do not distinguish types of bacteria present. Scarlet fever and septic sore throat are spread more generally than is realized through udder infection with human strains of streptococci. The direct microscopic test will detect a high percentage of such infected udders. Special tests will determine whether human or animal strains cause the infection.

The second question as to whether it is desirable to employ dock inspection more and farm inspection less can perhaps at this writing be answered in the affirmative, based on experience, especially in the East and to some extent in Illinois.

Results obtained with the 4-point test system discussed apparently speak for themselves, compared to expensive, time-consuming routine farm inspections, coupled with bacterial plate counts of the finished product.

As to uniform standards for all markets, it perhaps can be said that in terms of dock and plant control—with the direct microscopic examination (or methylene blue test), sediment test, the phosphatase test, and the swab test, the answer is "yes" because, after all, these criteria meet the economic, esthetic, and quality aspects of the problem. In other words, no matter the market, these criteria can, in the face of a man-power shortage, be utilized at small cost.

Finally, the question of whether we want a single standard for all milk regardless of its utilization: It appears that rejections of fluid milk, cheese, cream, butter, ice cream, evaporated and powdered milk by governmental agencies passing on the use of these dairy products for the armed forces and for lend-lease shipment seem to present satisfactory evidence that the answer to this question is "yes."

OVER-ALL PICTURE SPEAKS FOR SIMPLIFICATION

The over-all picture then is one in which it appears desirable to simplify and unify our milk quality program in terms of data presented, not perhaps in the next year, but in a shorter time than has been our experience with the standards used during the last quarter of a century. Under the Standard Milk Ordinance, it was presumed that a greater degree of satisfactory compliance could have been expected.

Simplification under a 4-point test system, with abolition of the bacterial plate count, plus selective farm inspections and rejection *on the spot,* apparently offers possibilities.

From data presented it perhaps may be in keeping to suggest that a National Allied Dairy Products Council be formed for the purpose of formulating specific recommendations that will simplify and unify the many varied milk control procedures applied to fluid milk, cheese, cream, butter, ice cream, evaporated and powdered milk, similar to what was done with the State of Michigan Fluid Milk Code.

CHART 2

PRELIMINARY RESULTS OF DOCK AND PLANT INSPECTION AT ROCKFORD, ILLINOIS

A. Incoming RAW MILK

Daily by Weighman

1. Appearance: 2,150 lbs. of milk held out for retesting.
2. Odor: 2,200 lbs. rejected.
3. Excessive Temperature: 650 lbs. returned to producers.

Weekly by Weighman

4. **The Sediment Test:**
   (Class 1, 0 mgm.; 2, 25 mgm.; 3, 100 mgm.; 4, 125 mgm.)

Month	*Tests*	*Class 1 & 2*	*Class 3*	*Class 4*
Jan.	1,085	86.3%	13.1	0.6%
Feb.	1,236	89.7	9.9	0.3
Mar.	1,649	88.9	10.5	0.4
Apr.	1,329	82.8	16.8	0.4
May	1,304	87.9	11.9	0.2

5. Methylene Blue Reductase Test:
   (Class 1, 6 hrs. and over; 2, 6 hrs.; 3, 3 hrs.; 4, 2 hrs.)

Month	*Tests*	*Class 1*	*Class 2*	*Class 3*	*Class 4*
Jan.	1,210	90.0	7.1	1.1	0.8
Feb.	1,179	86.6	12.1	1.1	0.0
Mar.	1,657	93.7	5.4	0.7	0.1
Apr.	1,161	94.7	4.9	0.3	0.1
May	1,100	92.8	5.5	0.7	1.0

Every Four Weeks (This test replaces bacterial plate counts.)

6. The Direct Microscopic Test:

Month	*Tests*	*Below 200,000*	*200,000 to 480,000*	*500,000 to 1,000,000*	*Over 1,000,000*
Jan.	383	76.7%	8.5%	5.2%	9.4%
Feb.	339	83.9	9.1	4.1	2.6
Mar.	385	85.1	8.3	3.9	2.8
Apr.	386	88.8	5.9	2.3	2.8
May	383	83.0	10.5	3.1	3.1

Apparent cause of high direct microscopic counts (More than one cause may apply to each farm in trouble.)

Month	*Tests*	*Dirty Utensils*	*Poor Cooling*	*Insanitary All Respects*	*Udder Trouble*
Jan.	76	15.0%	4.4%	0.6%	13.3%
Feb.	64	15.4	2.2	0.2	11.0
Mar.	44	8.5	1.6	0.0	5.5
Apr.	40	5.3	0.7	0.5	6.1
May	101	10.0	4.2	0.3	8.9

Twice a year (Less than once a year soon—loss of personnel.)

7. Routine Farm Inspections:
   (Write Rockford Health Department for Details.)

As Indicated

8. Disposition of Producers in Trouble:
   a. Given Notices: 1,709 in first 5 months of 1943.
   b. Submitted 3 Successive Samples to City Laboratory: 9 producers.
   c. Farm Follow-up: 167 required to be visited.
   d. Milk Rejected at the Dock: 12,030 lbs. in 1943.

B. PASTEURIZED MILK

Daily

1. Pasteurized Charts and Staff Temperatures: 5 corrected.
2. Plant Technic: 5 showed poor washing, sterilization, or storage.
3. **The Phosphatase Test:** (As indicated so far in 1943).

Month	*Samples*	*Negative*
Jan.	44	100.0%
Feb.	47	98.8
Mar.	45	100.0
Apr.	54	100.0
May	48	98.8

Daily (Mickle of Connecticut advocates greater use of this test.)

4. Direct microscopic examination of the finished pasteurized milk:
   a. Over 60,000: Jan., 64%; Feb., 60%; Mar., 28%; Apr., 28%; May 2%.
   b. Evidence of Mastitis: Four percent.
   c. Heat-resistant Bacteria: 19 percent.

Monthly or Oftener

5. **Swab Test** of Equipment and Parts:

Month	*Plants Checked*	*Number Tests*	*Improperly Cleaned and Sterilized*
Jan.	3	80	3
Feb.	6	199	5
Mar.	11	188	2
Apr.	0	0	0
May	6	62	1

Monthly

6. Butter Fat Test: 4 percent of samples were below 3.25 percent.

Some Advantages of Dock and Plant Testing

1. It is one method of unifying milk control procedures.
2. Plan quickly locates apparent source of poor milk.
3. It is a means of culling out low production mastitis cows.
4. Minimizes time-consuming routine farm inspection.
5. Plan emphasizes safety, quality, and flavor of milk—not esthetic scoring of milk control.
6. Is apparently applicable to not only fluid milk, but to cream, butter, cheese, evaporated and dried milk quality control procedures.
7. Plan conserves manpower so essential in the war effort.

Each of the following organizations could be invited to select one representative to serve on this national council:

International Association of Milk Sanitarians
Association of Bacteriologists
Milk Producers Association
International Association of Milk Dealers
American Dairy Science Association
Association of Agricultural Colleges
Dairy Industries Supply Association
Association of State Health Officers
Institute of Food Technologists
Municipal Health Officers Association
American Veterinary Medical Association

Working collectively, this council no doubt could be instrumental in devising a quality program of merit in terms of advanced knowledge in the field of dairy science.

CONCLUSION

From data presented, it appears that our present milk control procedures should be critically re-examined, with the object of eliminating what have become, with the passage of time, irrelevancies.

LISTING SALVAGABLE EQUIPMENT

War Production Board

To determine whether a piece of material or equipment should be used in its present form or put into war production in the form of scrap, the Special Projects Salvage Branch of the Salvage Division, WPB, is publishing, bi-monthly, "Available Used Material and Equipment Bulletin."

This publication, providing a ready guide for scrap determination, is distributed to approximately 3,000 government procurement officers and contractors, including the services and other war agencies such as Lend-Lease, Board of Economic Warfare, etc., covering most of the market for war uses. If any material or equipment listed in this bulletin can be put to use by these agencies, they contact the owner for purchase, and the listing is terminated. If the material or equipment has not been sold within a stipulated period (usually 60 days) after listing, the Regional Office of the War Production Board takes every possible step to move the material as scrap.

One of the most puzzling problems in the national salvage program has been the determination of whether a piece of equipment can be put to immediate war use or whether it should be melted down as scrap. A great deal of equipment is "borderline"; that is, no one can, for certainty, decide if it can be put to use "as is." The owner is usually anxious to have some guide as to the value of his property, and failure on the part of 3,000 war agency purchasers to ask for the equipment is a good indication that it cannot be used in the war effort.

Listing of materials in the "Available Used Materials and Equipment Bulletin" is possible only after investigation by the Regional Office of the WPB and routine reporting of the project has been made. As a direct result of the publication, thousands of tons of metal have been moved as scrap, and thousands of pieces of idle equipment have been bought by agencies for war work.

The Connecticut Three-Point Laboratory Program as an Aid to Control of Pasteurized Milk*

FRIEND LEE MICKLE AND EARLE K. BORMAN

Director and Assistant Director, Bureau of Laboratories, Connecticut State Department of Health, Hartford, Conn.

HISTORICALLY, the standard plate count has been responsible for advances in milk sanitation that have resulted in milk supplies of better grade than were once thought possible. However, many now realize that advance in milk control cannot progress further until a better laboratory yardstick is used to measure the quality of milk. The recent changes in the standard plate count have been designed to make it a more usable method under modern conditions but even these have fallen far short of the desired end. In other words, the maximum effect of an outmoded tool appears to have been realized and we must substitute for it a new program not subject to the limitations of the old standby which has served so faithfully. Methods for accomplishing this have been available for some time. It is the practice of some laboratories to supplement the standard plate count with the test for coliform organisms and the phosphatase test on pasteurized milk. While this is a step forward, it must be realized that no plate incubated at a given temperature will develop colonies of all bacteria present in milk, whether raw or pasteurized. In fact, the direct microscopic method of counting is considered by many to be superior to the plate count for accurate work.

A controversy exists over the merits of the direct microscopic count on pasteurized milk. The focal point of this controversy is the contention of some that dead bacteria are counted by the direct method. To support this contention it is argued that many organisms observed in smears from some pasteurized milks do not grow on plates. That this is a poor argument is emphasized when the Committee on Standard Methods for the Examination of Dairy Products [1] recognizes the inability of the standard method to grow all bacteria present and urges the use of temperatures other than the standard ones for incubation of supplementary plates. As a matter of fact, there is good evidence [2, 3, 4, 5] that the bacteria which are killed by pasteurization are usually rendered unstainable.

It is pointless to continue this controversy here for the reason that as proponents of the direct count we are not seeking to duplicate plate count figures. We are, rather, seeking to set new standards; entirely apart and distinct from those used for plate counts, so that a method offering many adventages over any plate count may be used by the control official to judge milk quality. These standards must be just, and they must also be sufficiently strict to bring about control at least comparable to, and preferably better than, that achieved by use of current plate count standards. If these objectives are fulfilled, it matters little if some dead bacteria may be counted, especially since direct counts will include psychrophilic, mesophilic, and thermophilic bacteria, and even types too fastidious to grow on standard agar, and will do this without resort to additional platings at a series of incubation temperatures.

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* Presented at the Thirty-first Annual Meeting of the International Association of Milk Sanitarians, St. Louis, Mo., October 30, 942.

Prior to 1935, interest in the direct microscopic bacterial clump count in Connecticut had been confined to its use as a means of investigating outbreaks of milk-borne disease, particularly streptococcal infections. However, in October, 1935, a survey [6] of pasteurizing plants in cooperation with the Dairy and Food Commissioner was initiated which demonstrated the usefulness of the method in detecting in the finished product heat-resistant bacteria not found by standard plate counts.

During 1936, a study [7] was made of the reproducibility of results on replicate samples examined by the standard plate count in several laboratories. The study demonstrated that even when portions of the same sample kept under identical conditions were examined by several workers in conformance with Standard Methods, there were factors uncontrollable by any practicable means that caused wide discrepancies between any two laboratories. Direct microscopic counts on these samples were considerably higher than plate counts, and were supported by high plate counts only in those laboratories in which observed conditions of incubation were most favorable.

Throughout these studies we were impressed by the rapidity with which the direct microscopic count could be made, as compared with the standard plate count and by the added information concerning a milk sample, gained by observing the types of bacteria present. Accordingly, during September, 1937, arrangements were made with the Dairy and Food Commissioner to carry out a survey [8] of milk and cream processed by pasteurizing plants in Connecticut. During that study, 773 samples of pasteurized milk and cream from 249 plants were examined by the direct microscopic clump count, the test for coliform organisms, and the phosphatase test. That was the beginning of the present three-point program for laboratory work on pasteurized milk.

As a result of that survey the following tentative standards were set in 1937:

1. *Direct microscopic clump count limits:*
   Grade A pasteurized milk—200,000 per ml.
   Grade B pasteurized milk—500,000 per ml.
2. *Coliform organisms:* Absent in 0.1 ml. (later, 1.0 ml.).
3. *Phosphatase test:* Less than 0.05 mg. phenol.

That the use of these standards has worked no hardship on dealers in good quality milk is shown by the fact that the standards have been in operation for four years and the only change has been to make them more rigid by modifying the requirement for coliform organisms to a provision that these be absent in 1.0 ml. (January, 1941).

Perhaps a word of explanation is necessary concerning the application of results obtained. None of the three laboratory tests as yet enjoys official recognition in existing laws and regulations in Connecticut. Nevertheless, all are being used by the State Dairy and Food Commissioner and by local health officers to improve milk supplies. Perhaps this would not be possible under a program which is entirely punitive in nature, but the Connecticut 3-point plan has proved to be a workable and effective means whereby milk control officials can readily check the condition of a given supply, and either make definite recommendations for improvement or concentrate upon specific items for investigation. These are indispensable means of furthering a control program which is largely based upon the educational approach. For the persistent violator hearings have so far been an efficient corrective force without resort to court action.

With respect to direct microscopic clump counts on pasteurized milk, it has been our experience that the great majority of samples are easily classed either as good or as very bad. Only a comparatively small percentage (less than 10 percent) presents a borderline picture. Table 1 shows the distribution

TABLE 1

PERCENTAGE DISTRIBUTION OF DIRECT MICROSCOPIC CLUMP COUNTS ON PASTEURIZED MILK

Range of Counts	*Percent Grade A Samples (Total 836)*	*Percent Grade B Samples (Total 2,255)*	*Percent Both Grades (Total 3,091)*
Below 100,000	70.0	50.6	55.9
100,000–180,000	11.0	13.8	13.0
200,000–300,000	4.1	7.0	6.2
330,000–480,000	3.6	5.5	5.0
500,000–1,000,000	11.3	6.5	7.8
Over 1,000,000	0.0	16.6	12.1

of counts on samples for one year (1939) to illustrate this point.

It will be seen that only 4.1 percent of samples of Grade A pasteurized milk fell into the group, with counts in the borderline range just exceeding the standard of 200,000 clumps per ml. Furthermore, only 6.5 percent of Grade B samples fell into what might be termed a broad borderline range extending from the 500,000 limit to 1,000,000 per ml. It will also be seen that to have lowered the limit for Grade B milk from 500,000 to 200,000 per ml. would have affected only 12.5 percent more of the samples. To have done so would have resulted in a compliance of 68.9 percent for all 3,091 samples. This figure is comparable to the result [9] obtained in New York State.

The results of our experience with this program over a five-year period are shown in Table 2, which gives the percentage of samples complying with the tentative standards for the three tests by years, together with a five-year summary including over 15,000 samples. It will be noted that there is good correlation between the coliform determination and the direct count. When samples were classed as satisfactory on the basis of absence of coliforms in 0.1 ml., the direct count was slightly the more stringent standard of the two. When absence of coliforms in 1.0 ml. was required (1941), the coliform test compliance fell below the direct clump count. It is apparent that a more strict direct count standard (200,000 per ml.) for Grade B milk would result in even closer correlation between these tests on a compliance basis.

There is possibly little need to point out the true significance of a test for coliform organisms, but there are still some who persist in the idea that it is meant to provide an index of barn contamination. The coliform group is so broad and so widely distributed that this is readily seen to be fallacious. Assuming a milk to have been properly processed, the test is of value only to indicate improper handling somewhere

TABLE 2

PERCENT COMPLIANCE OF SAMPLES OF PASTEURIZED MILK WITH TENTATIVE STANDARDS

Year	*1937*	*1938*	*1939*	*1940*	*1941*	*5 Years, 1937–1941*
Direct microscopic count [1]	63.1	78.8	77.0	79.4	74.6	77.4 (15,300 samples)
Coliform organisms [2]	70.0	74.7	84.7	82.7	65.3*	75.6 (15,452 samples)
Phosphatase test [3]	86.7	92.1	91.3	93.7	94.7	92.7 (15,438 samples)

[1] Grade A, fewer than 200,000 clumps per ml.; Grade B, fewer than 500,000 clumps per ml.
[2] For years 1937–1940 inclusive, coliforms not present in 0.1 ml.; for 1941, coliforms not present in 0.1 ml.
[3] Phosphatase values below 0.05 mg. phenol.
* Standards for coliforms changed in 1941; see Note 2 above.

between the end of the heat treatment and delivery to the consumer. Coliform organisms are not particularly heat resistant, and so those present in the raw milk are reduced by pasteurization at least to a minimum not detectable by the method used. Their reappearance is evidence either of contamination during cooling, bottling, or capping, or of inadequate refrigeration permitting multiplication of the minimal number which may have survived pasteurization.

There seems little need to discuss the phosphatase test except to point out that it rounds out and completes the three-point program. It is the test most directly related to the safety rather than to the quality of the milk, and so is indispensable.

The advantages of the three-point program for pasteurized milk may be listed as follows:

1. The direct microscopic clump count presents a more nearly true picture of the bacteriological quality of a milk supply than does the plate count, and provides a much more rapid, more complete, and hence more effective laboratory service to the control official.
2. Tests for coliform organisms, furnishing evidence of improper handling after pasteurization, yield supplementary information correlating well with the direct count.
3. The phosphatase test yields the only positive information obtainable on the effectiveness of pasteurization, and hence is an indispensable index of probable safety of a supply.

The combination of these three laboratory tests is superior to any combination which includes the standard plate count as a means of estimating bacterial numbers; in pasteurized milk, no one of the three should be omitted from a well balanced control program. Standards for the direct clump count which are entirely separate and distinct from those for the standard plate count have been applied for four years in Connecticut without hardship to milk dealers. Application of the three-point program on a state-wide basis in Connecticut has resulted in a laboratory service giving essential information not otherwise obtainable to milk control officials with a minimum of delay.

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Comparative Educational Background of Dairy Graduates, Sanitary Engineers and Veterinarians in Milk Control

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"A little learning is a dangerous thing;
Drink deep or taste not the Pierian Spring:"
—Alexander Pope

WITH the founding of our agricultural colleges, courses were inaugurated for the study of dairying, both as it pertains to the production of milk and the manufacture of its various products. To a great degree quality in milk and milk products as known today is due, in no small part, to dairy college graduates who have dedicated their careers to the study of dairying and all that it implies. The very nature of the complex problems arising in the dairy industry in regard to manufacture, sanitation, production, and distribution of dairy products entails an intimate and thorough knowledge of the chemistry, bacteriology, and economics of the products involved. The agricultural colleges with their courses of study related to the subject—dairy manufacture, bacteriology, chemistry, animal husbandry, economics, et cetera — are institutions preeminently suited to train men in the study of milk in all its phases — including sanitation.

Since World War I, the field of dairy science as it relates to public health has slowly but surely drifted from the dairy college graduate into the hands of sanitary engineers (a division of civil engineering) and veterinarians. Today, only sanitary engineers may hold commissions as milk sanitarians with the United States Public Health Service, and only veterinarians are deemed qualified to exercise sanitary supervision over the production and manufacture of all products of "bovine origin" being used by our armed forces. Strangely enough the dairy graduate is given no appropriate official recognition in either of these important Federal services while, of late years, even still stranger it would seem is the fact that many state and municipal health departments have seen fit to place milk sanitation and its complex problems as a subsidiary to all other sanitary work—fly, rodent, mosquito control, sewage disposal, et cetera, under the direction of a sanitary engineer.

To what extent, if any, can this form of administration be justified?

In order to supply an honest unbiased answer to this question, it seems necessary to return to the fundamentally important matter of education. To what extent are our dairy colleges affording complete courses of study to fit graduates for executive and other important roles associated with public health milk control? To what extent, if any, is the college educational background of the sanitary engineer or graduate in veterinary medicine superior to that of the dairy graduate for such work? Well, it would seem that the only way to arrive at any fair-minded conclusion on this question is to examine the curricula of the three courses of education under discussion.

To this end the results in summary form are submitted here of a careful study made by the writer of the curricula of five dairy colleges, five veterinary colleges and five schools of sanitary engineering. In each instance the colleges studied were those generally accepted as outstanding in their particular fields.

In order to interpret further and appreciate the data presented, it might add to the clarity of the subject to define the functions of the three courses of study. The following definitions are taken verbatim from a few of the many catalogues reviewed relative to courses of instruction open to the respective students discussed herein:

DEFINITIONS

Dairy Graduates

The dairy manufactures option is suggested for students who wish to specialize in and prepare for positions requiring training in the manufacture of butter, ice cream, cheese, market milk, and condensed milk. This option prepares the students for positions in teaching and extension, and for numerous government and commercial positions which require dairy manufactures training.

The dairy production option is suggested for students who wish to specialize in dairy farming and prepare for positions as managers of dairy farms, and for students who wish to prepare themselves for teaching or extension work in the feeding, breeding, and management of dairy cattle.

(*Note:* In all catalogues of Dairy Colleges studied, emphasis is laid on specific training made available in the science and practice of dairying and in agricultural economics.)

Veterinarians

The State Veterinary College, established by Chapter 153 of the laws of 1894, shall be known as the New York State Veterinary College. The object of said Veterinary College shall be: To conduct investigations as to the nature, prevention, and cure of all diseases of animals, including such as are communicable to man and such as cause epizootics among live stock; to investigate the economic questions which will contribute to the more profitable breeding, rearing and utilization of animals; to produce reliable standard preparations of toxins, antitoxins, and other productions to be used in diagnosis, prevention, and cure of diseases, and in the conducting of sanitary work by approved modern methods; and to give instruction in the normal structure and function of the animal body, in the pathology, prevention, and treatment of animal diseases, and in all matters pertaining to sanitary science as applied to live stock and correlatively to the human family.

(*Note:* In none of the catalogues of Veterinary Colleges studied was reference made to any specific training being made available in the science and practice of dairying or in agricultural economics.)

Sanitary Engineers

Sanitary Engineering has to do with the planning, construction and operation of waterworks, sewerage and drainage systems, water-purification plants, and works for the treatment and disposal of city sewage and waste disposal, with the improvement and regulation of natural waters for purposes of sanitation; with air sanitation; and with the principles and standards for the ventilation of buildings and for working under compressed air.

Public Health Engineering has to do more particularly with governmental supervision and control of all those activities of an engineering nature which are definitely related to public health.

(*Note:* In none of the catalogues of Schools of Sanitary Engineering was reference made to any specific training being made available either in the science and practice of dairying or in agricultural economics.)

TABLE 1

DAIRY COLLEGES

	Dairy Mfg.	*Animal Husb.*	*Bacteriology*	*Dairy Bact.*	*Chemistry*	*Dairy Chemistry*	*Agricultural Economics*
College A	7*	1	2	1	7	1	4
College B	7	1	2	1	2	1	2
College C	6	2	2	1	2	1	2
College D	11	3	2	1	5	1	3
College E	9	3	2	1	2	1	4

By the very definitions of its function, the dairy college readily establishes the justification of its ability to train men for work in all fields of endeavor as it relates to milk and its products. The schools of sanitary engineering and veterinary medicine do not pretend to train men for this particular work, as evidenced from the above.

Referring to Table 1, the good job our dairy colleges are doing in educating men for a career in milk sanitation is apparent. Essential to success in any chosen career is a knowledge of the fundamental tools with which the individual is to work. In every instance a minimum of 5 and a maximum of 11 courses are being offered for study in dairy manufactures. The courses include such studies as market milk, butter, ice cream, condensed products, cheese, dairy mechanics and equipment, laboratory control of dairy products, and dairy products-judging. From Table 1, it can be further deducted that our dairy colleges appreciated the fact that the study of milk and its products transcends the pure mechanics of its production and manufacture but includes the study of animal husbandry, bacteriology, chemistry, and economics. Who will deny that courses in animal nutrition, general organic and physiological chemistry, and instruction in agricultural economics, marketing and distribution are not essential in the education of the milk sanitarian?

In Table 2, of the 5 Veterinary Colleges studied, only two offered any instruction in the fundamentals of milk and its products. Where such courses were offered, said instruction was very scanty and elementary. While more courses were offered in animal husbandry, this was due to the fact that more of the farm animals other than cows were studied. The courses in bacteriology and chemistry were similar to those for dairy students, with the exception of the chemistry and bacteriology of dairy products, which are not taught to veterinary students. The only economics offered for study is one course in veterinary jurisprudence. No courses in agricultural economics are offered in this curriculum.

From Table 3, the lack of any courses of study in dairy manufacture and animal husbandry in the 5 schools of

TABLE 2

VETERINARY COLLEGES

	Dairy Mfg.	*Animal Husb.*	*Bacteriology*	*Dairy Bact.*	*Chemistry*	*Dairy Chemistry*	*Agricultural Economics*
College A	1	2	2	..	1	..	..
College B	..	4	3	..	4	..	..
College C	..	3	3	..	3	..	..
College D	..	4	2	..	3	..	..
College E	2	2	3	..	2	..	..

TABLE 3

SCHOOLS OF SANITARY ENGINEERING

	Dairy Mfg.	*Animal Husb.*	*Bacteriology*	*Dairy Bact.*	*Chemistry*	*Dairy Chemistry*	*Agricultural Economics*
College A	..	..	4	..	4	..	..
College B	..	..	2	..	2	..	..
College C	..	..	2	..	4	..	..
College D	..	..	3	..	2	..	..
College E	..	..	3	..	2	..	..

* In every instance the number of courses corresponds to the actual number of different courses studied and not semester hours.

sanitary engineering is apparent. The bacteriology and chemistry are in the main part connected with water and sewage and affiliated subjects. In the field of economics, subjects such as vital statistics and public health administration are offered; no courses are offered in agricultural economics of any kind.

Obviously, from the above our dairy colleges have not fallen down on their jobs of instructing their students in courses of study relevant to a career in the field of dairy science, whether it relates to production, sanitation, or distribution. Despite this fact, health officers and directors of field work in milk sanitation as it applies to public health find it necessary to instruct aspirants in this profession for a minimum period of six months to a year. Nevertheless, the dairy college graduate by virtue of his superior education in dairy science is, it would seem, the logical choice for instruction in milk sanitation.

The plight of the dairy college graduate in regard to holding positions of influence and prestige in public health work is glaringly brought to light in the following study, conducted in 1942 by means of a questionnaire sent to 78 cities having a population over 100,000, and to 28 states in the Union. In this effort an attempt was made to obtain information in regard to not only the number of men employed but also the educational background of said personnel. In addition, the technical training of directors of milk control in said cities and states was also obtained. The results are presented below:

	Personnel				*Director of Milk Control*			
	San. Eng.	*Vet.*	*Dairy Graduates*	*Laymen*	*San. Eng.*	*Vet.*	*Dairy Graduates*	*Laymen*
28 states	20	26	175	94	12	2	13	1
79 cities	30	102	160	377	12	25	21	21

In this study a few startling facts presented themselves. In 32 cities of the 79 answering the questionnaire, *no dairy graduates at all* are employed in milk sanitation. Further, it was disclosed that much discrepancy existed between large centers of population in regard to the number of dairy graduates relegated to dairy inspection. In City A, population 3,396,808, of 77 men employed, only 1 is a dairy graduate; while in City B, population 7,454,995, of 69 men employed, 25 are dairy graduates.

It was further disclosed that of the 28 states questioned, 8 employed no dairy college graduates on their milk control staff—approximately ⅓ of the states queried saw fit to refrain from employing dairy specialists on their milk control staffs.

CONCLUSIONS

The fundamental issue as to why the dairy college graduate does not hold positions of prestige and influence in the public health field can probably be laid on the "doorstep" of the dairy colleges and those health officers and directors of milk sanitation whose duty it is to employ and maintain personnel. It is lamentable but true that our dairy colleges have been too prone to overlook the public health field and concentrate their primary interests on buttermakers, ice cream makers, cheese makers, et cetera. As a result, in the last two decades milk sanitation as it relates to the public health has steadily drifted from the dairy college graduate to the sanitary engineer and to the veterinarian. This trend can be further substantiated by several statements written by the late Leslie C. Frank in a pamphlet entitled "Engineering Problems in Milk Sanitation"—reprint No. 2051 from the *Public Health Reports,* March 31, 1939. To quote a few statements from this publication we find the following:

"Milk Sanitation is a problem which now requires and will in the future increasingly require the serious attention of sanitary engineers."

"Information collected by the Public Health Service shows that in at least 25 States milk sanitation work is now being done by the divisions or bureaus of sanitary engineering, whereas two decades ago only one or two State sanitary engineering bureaus interested themselves in the problem."

While many milk sanitarians are sanitary engineers who by practice and experience have become expert in this particular line of endeavor, the pre-eminence of the educational background of the dairy graduate cannot be denied—by this virtue above all, is he (the dairy college graduate) the logical candidate for milk sanitation and all it implies.

On the other hand, health officers in general whose duty it is to maintain well-rounded staffs in all phases of public health have become oblivious to the virtues of the technical dairy college graduate in the fundamentals of dairy science as it relates to the public health.

The fact that dairy college graduates are being discriminated against in milk sanitation transcends the matter of education and training. It is purely a matter of a few "in the driver's seat" refusing either to share or relinquish the reins. If, through this paper, the writer has to some extent given some insight into the present picture of the plight of the dairy college graduate in its true perspective to both our agricultural colleges and health officers, the effort expended will have been justified. The time is ripe for the dawn of that day which will find the dairy college graduate in his rightful field of endeavor—dairy science as it relates to the public health.

ABSTRACTS OF RECENT INTERPRETATIONS OF THE 1939 MILK ORDINANCE AND CODE RECOMMENDED BY THE PUBLIC HEALTH SERVICE

(Second Edition, June, 1943)

Introduction

Since the first edition of abstracts of interpretations was issued in September, 1940, a number of others have been made in response to individual inquiries. The interpretations listed below are those which it is felt are most generally applicable. Not included are interpretations arising from unusual conditions. When enforcement officials encounter such circumstances, their decisions and actions should be based upon the fundamental principles of milk sanitation. They are also urged to communicate with the Public Health Service for advice if desired, and in order to assist the Public Health Service and its Sanitation Advisory Board in keeping the recommended milk ordinance and code up-to-date.

At the last meeting of the Advisory Board, several amendments to the 1939 milk ordinance were adopted. It was decided not to issue a revised edition of the ordinance and code until after the war, but a list of the amendments has been issued separately.

Although it is beyond the scope of this compilation of interpretations to discuss the impact of war-time conditions on milk sanitation, reference is made to the need for less stringent interpretations of rigid peacetime equipment specifications and of accepting substitute materials because of the severe shortages of critical materials. Accordingly, immediate replacement of milk utensils and equipment which, though imperfect, are still safely usable should not be insisted upon. This can be done without jeopardizing the essential safety of the milk supply.

It should also be pointed out that while the Public Health Service has advised milk sanitation authorities to accept the above and other modifications of peacetime "business as usual" milk sanitation practice, such advice should not be construed by anyone as indicative of any intent to de-emphasize the importance of milk sanitation. Such an intent has been refuted emphatically by the Surgeon General, who further stated: "The truth is that the Public Health Service considers it more important to maintain the essential safety of the milk supply now, during the war, than ever before. It should be obvious that the highest possible national level of health is essential to the vigorous prosecution of the war. The maintenance of a high level of cleanliness and safety in our national milk supply is a public-health responsibility of considerable importance. In view of the difficulties imposed by the war, all milk-sanitation authorities should redouble their efforts to insure such safety."

Because it was feared that the impact of the war might result in serious shortages of agar for milk laboratory use, it has been recommended by some that methods not involving the use of agar be substituted for the agar plate count wherever possible. However, direct inquiry of the War Production Board has revealed that the supply of agar is considered adequate for bacteriological laboratory use, although little, if any, is available for other purposes. General Preference Order No. M-96, issued February 9, 1942, restricting the use of agar to bacteriological laboratory use, is still in effect, and no further restrictions are contemplated at this time. In fact the agar situation seems to be improving now, and further improvement is expected in 3 or 4 months. Consequently, it would appear unnecessary for milk laboratories to abandon the use of the agar plate count method for fear of being unable to obtain agar.

Additional copies of these interpretations are available upon request.

Section 4. Labeling and Placarding

When a milk plant is shipping ungraded milk to other communities, the plant and the health authorities of the shipping community have fully discharged their obligations under the ordinance if the milk is properly labeled as ungraded milk. If receiving communities incorrectly permit such milk to be labeled grade A after pasteurization, the fault is not with the shipping plant or community, and it is not fair to attempt to require the shipping plant to add coloring matter to the ungraded milk.

A product of grade A pasteurized quality and having a butterfat content of, say 12%, may be labeled as follows:

Grade A Pasteurized Milk (cream added)
At least 12% butterfat
Blank Dairy Products Co.

Such a product cannot be labeled "cream," since it does not conform to the ordinance definition. The use on the label of an additional name which resembles "cream" in spelling or pronunciation and hence would be misleading should not be approved, unless such designation is generally accepted and recognized locally and legal standards for such a product exist.

The following label is satisfactory for "chocolate milk" having a butterfat content of less than 3¼%:

Grade A Pasteurized
Skimmed Milk Beverage
Blank Dairy Products Co.

The inclusion of a trade name or similar term to indicate the chocolate content may be approved with propriety if it is not misleading, and is not so used as to obscure the labeling required by the ordinance.

SECTION 6. THE EXAMINATION OF MILK AND MILK PRODUCTS

In the first edition of these Abstracts, it was suggested that parallel bacterial plate counts be made, using both the old and the new "Standard Methods" agar if it was felt that the use of the new agar might result in a significantly stricter standard. Subsequent experience indicates that the new agar may be used exclusively.

The current (1941) edition of Standard Methods for the Examination of Dairy Products indicates that low-count plates are unreliable, and suggests that if plates developing less than 30 colonies must be used, the count should be reported as "less than 3,000" if the 1:100 dilution has been used, etc. This is in conflict with the ordinance and code, which requires that the actual count be recorded in order to permit the computation of average counts. In order to conform as closely as possible with the intent of Standard Methods and at the same time to comply with the code requirement that a definite count must be recorded, it is suggested that plates developing less than 30 colonies from a 1:100 dilution be reported as having a count of 3,000, and from a 1:1,000 dilution, 30,000, etc. However, a special record of such cases should be kept, and if this procedure would result in throwing a dairy out of grade, the count based on the actual number of colonies should be substituted.

When bacteria counts are made of several samples of milk collected from the output of one dairy or plant on one day, these counts should be averaged logarithmically, and the result recorded as the count obtained on that day. The use of the logarithmic average is desirable in order to "snub" the effect of occasional high counts which may occur through accident. If the counts on multiple samples are uniform, the logarithmic average will approach the arithmetic average. However, the arithmetic average is used for averaging the results of several plates of the same or different dilutions.

SECTION 7. THE GRADING OF MILK AND MILK PRODUCTS

Item 1r. Bovine tuberculosis.—It is not required that test certificates be on file if the area is in fact included in the list of modified accredited tuberculosis-free areas published by the U. S. Department of Agriculture, because the modified accredited area plan approved by the U. S. Bureau of Animal Industry is accepted in lieu of annual testing. An exception is made, however, in any area in which the proportion of dairy cattle is so small that the application of the area plan to the total number of cattle in the area might permit an undetected and relatively high level of infection in the dairy cattle. In such a case annual testing is required by the ordinance.

Item 4r. Dairy barns, floors.—If the portion of the barn in which calves and horses are kept is separated from the milking portion of the barn only by railings, it is required that such other portions also be kept clean. However, if separation is by a tight partition, it is not specifically required that such other portions of the barn be kept clean, except that proper disposal of manure is necessary under item 7r to minimize fly breeding.

Item 8r(e).—The use of wash pots or other containers located in the yard does not constitute compliance with the requirements for water-heating facilities.

Item 19r. Milkers' hands.—If the dairy barn and milk house are widely separated, and if proper hand-washing facilities are provided in or convenient to the dairy barn, additional hand-washing facilities are not required in the milk house.

Item 5p. Miscellaneous protection from contamination.—Neither this item nor the first paragraph of Section 10 are interpreted as prohibiting the filling and capping of large containers of milk and cream in the cold storage room. If all the necessary precautions are observed to prevent contamination, this procedure may be approved.

Item 9p. Sanitary piping.—Standardization should be done before pasteurization, in order to minimize the hazards of possible contamination. It is believed that this procedure is feasible in every instance. The pouring of milk or cream directly into the pasteurizer for standardization at small plants is not prohibited by the ordinance when standardization precedes pasteurization. If it should be desired to standardize after pasteurization, item 9p requires that milk or cream be introduced into the pasteurizer or storage tank only through sanitary milk piping, and this procedure would probably not be feasible for small plants which standardize in the pasteurizer.

Item 10p. Construction and repair of containers and equipment.—This item is violated if defective cans are found which are owned by the plant. It is not violated if they are the property of the producer, in which case item 12r is violated. However, both the producer and the plant are responsible for cleaning and sterilizing the cans. If dirty cans are found after washing at the plant, item 12p is violated; if found dirty at the farm after washing, item 13r is violated.

Item 15p. Storage of caps, etc.—Is not at present interpreted as requiring that hoods for milk bottles be wrapped or packaged in a manner similar to that required for caps of the disc and other types. The installation of special machinery, which would be very difficult if not impossible for the manufacturers to obtain, would be required, and this is not believed to be justified during the war, because with hoods the hazards of contamination are less serious than with caps which come in direct contact with the milk in the bottle.

Item 16p. Pasteurization.—The operation of high-temperature short-time pasteurizers at holding times of less than 15 seconds is not accepted as proper pasteurization, even though temperatures higher than 160° F. are used. For example, "pasteurization" at 170° F. to 180° F. with a momentary holding period is not accepted because the effect of such treatment on milk-borne pathogens is not definitely known, although the process seems promising from a commercial standpoint.

Item 16p(b)(B). Pasteurization (High-temperature short-time).—In order to permit bactericidal treatment of the forward-flow lines by chlorine solutions at temperatures lower than 160° F., it has been proposed that a special switch be installed to permit the flow-diversion valve to assume the forward-flow position when the hot water controller set pointer is adjusted to maintain a water temperature of 110° F. or less. Such an installation should not be approved, as it is in violation of the following provision on page 105 of the Code: "The *control mechanism* of all flow-stops shall be so designed that the forward flow of milk cannot start unless the temperature of the stop-bulb is at or above the cut-in setting." Without the special switch, bactericidal treatment by means of chlorine solutions may be accomplished either (a) by removing the bulb from the machine and placing it in hot water, or (b) with the bulb in place, by using a hot solution at about the pasteurizing temperature.

Item 16p(c). Inlet and outlet valves and connections.—Refer to (4) under *Design* on page 116 and to the first sentence under *Operation* on page 118. In the case of an existing single-vat installation having either no inlet valve or an inlet valve which is not of the leak-protector type, the inlet piping may be disconnected during the holding and emptying periods in lieu of providing a satisfactory valve. In a new single-vat installation, the provision of an inlet valve is not required, but if one is installed it must be of the leak-protector type.

Item 16p(d). Air heating.—Refer to last paragraph on page 126, which states that the bottom of the bulb chamber of the air temperature indicating thermometer shall not extend more than 3½ inches below the underside of the vat cover. The purpose of this limitation is to reduce the likelihood that the bulb will be submerged in the milk. While this limitation is important in the case of vats with practically flat covers, a greater projection may be accepted on vats with steeply sloped covers. Although the intent of the Code is not actually violated unless the bulb extends more than 3½ inches below the "overflow level" in vats of the latter type, it is recommended that the bulb not extend below the "overflow level."

Item 17p. Cooling.—Refer also to second paragraph under Grade A Pasteurized Milk on page 82. Since receiving stations are required to comply with item 17p, it is considered that surface coolers used for raw milk at receiving stations must be provided with covers.

Items 18p. Bottling, and 20p. Capping.—As sour cream is one of the milk products defined in Section I of the ordinance, it is required that sour cream containers be bottled and capped by approved mechanical equipment. Plants handling very small quantities may prefer to buy it already bottled from another plant, rather than to install the necessary equipment.

SECTION 10. TRANSFERRING OR DIPPING MILK; DELIVERY CONTAINERS; HANDLING OF MORE THAN ONE GRADE; DELIVERY OF MILK AT QUARANTINED RESIDENCES.

Prevention of the diversion of low-grade or ungraded milk into high-grade channels has been a much-discussed subject. Drastic preventive measures which have been proposed include requirements that different grades must be handled in separate equipment, or in separate rooms, or even in separate plants. It is not believed that such drastic requirements can regulate the fraudulent practice out of existence, however. Even if they could, it is doubtful that it would be wise to penalize the whole industry so severely in order to prevent fraud by the dishonest few. The general enforcement of such drastic requirements would entail enormous remodeling and equipment expense, as is obvious when it is remembered that the majority of the smaller pasteurized milk dealers also manufacture ice cream, cottage cheese, or butter. The most practical remedy is close inspection of suspected plants, with careful checking of receipts against sales. Accordingly, the fourth paragraph of Section 10 should be interpreted as written, and not as requiring separate equipment, rooms, or buildings for different grades of milk and milk products.

MISCELLANEOUS

"Super-Grades." The addition to the ordinance when adopted locally of "super-grade" definitions, such as "grade AA pasteurized," "selected grade A pasteurized," "special grade A pasteurized," etc., is objectionable, and is in opposition to the basic philosophy of the Public Health Service Milk Ordinance. Such grade designations give the consumer the impression that that "grade" is significantly safer than grade A pasteurized. Such an implication is false, because the ordinance and code requirements for grade A pasteurized milk, if properly enforced, will insure that this grade of milk will be as safe as milk can practicably be made. Consequently that is no public-health need for "super-grades." Where there is a local demand for a milk of higher fat content to be sold at a higher price, the P.H.S. Milk Ordinance does not prevent such sale, and the increased fat content may be shown on the label. However, the increased fat content does not justify the use of a "super-grade" designation on the label, because milk grades should be based upon relative safety, and not upon fat content. If milk with a fat content of 5% were permitted to be labeled "grade AA," it would be logical to label 18% cream as "grade AAAAA," which would obviously remove all the public-health significance of the grade A label.

Repasteurization.—While early editions of the P.H.S. Milk Ordinance prohibited repasteurization, this prohibition has not appeared in recent editions. Communities revising their ordinances are advised to delete the prohibition. The following 2 cases illustrate the need for permitting repasteurization: (a) In some areas smaller plants buy pasteurized cream in bulk from larger plants and, after receipt, standardize it to produce creams of the different fat contents desired locally. After such handling, with the consequent hazards of contamination, repasteurization is essential. (b) "Return" bottled pasteurized milk is often dumped and used for making cultured buttermilk (during "normal" times). This milk must be pasteurized at a high temperature in order to insure proper conditions for culturing. This practice is widely accepted by health authorities, but could not be permitted if the local ordinance prohibited repasteurization.

SHRADER ORGANIZES FOOD PRODUCTION COURSES

The U. S. Office of Education, under the Engineering, Science, and Management War Training program, has approved a series of courses in "Sanitation Problems in Food Handling & Processing", sponsored by Manhattan (Engineering) College and the New York City Health Department. Dr. J. H. Shrader has been retained as Educational Supervisor to organize these courses and direct the work of the instructors. The classes are arranged into sections which deal with subjects of related content. Each class enrolls about twenty-five students, and there are now eleven such classes with enrollment still continuing. The emphasis is chiefly on the technology of production on a background of proper sanitary practice and understanding of the health problems involved. The courses are open to high school students, without charge, and are conducted at college level. Each course runs for six weeks of two weekly three-hour sessions, totalling thirty-six hours. A certificate is issued by the New York City Health Department for those who successfully pass the course, as determined by class work and final examination.

EMERGENCY MEASURES TO BE USED IN MISSOURI IN THE ENFORCEMENT OF THE MILK ORDINANCE IN COMMUNITIES WHERE THERE IS A SHORTAGE OF GRADE A MILK

(See Resolution of Adoption on Page 253)

If there is an actual shortage, or an impending shortage, of Grade A milk in your milk shed, the health officer is authorized by Section 8 and Section 11 of the Standard Milk Ordinance to declare an emergency and take certain suitable steps in view of this emergency. However, to declare an emergency with regard to the milk supply is a serious step, and for many reasons the health officer should be well assured in his own mind that an emergency actually exists. The following suggestions are concerned with the question of determining if an emergency exists, and if so, the procedures which the health officer might logically take in view of this emergency.

Probably the health officer should consider carefully in his own mind what really is an emergency from the health standpoint relative to a milk supply. It appears that in general we have become too prone to "cry emergency" relative to any minor shortage in the milk supply, whereas it is doubtful that the effects of such a minor shortage should be considered as constituting a health emergency. The health officer will probably have to depend upon his own judgment as to what really does constitute an emergency. Certainly the younger children and the older folks should have an adequate quantity of milk. It would seem that with the many supplementary foods available, as well as evaporated and powdered milk, probably the fluid milk supply for a city could be substantially reduced without actually creating a health emergency. It then resolves itself into a question of the health officer's deciding whether or not from the standpoint of his obligations it would not be better to have the supply of milk reduced to a certain minimum rather than lower the sanitary standards of the entire milk supply.

1. In any case, before the sale of a lower grade of milk is allowed, adequate data and figures must be presented in writing by the milk distributor to the health officer, showing that an actual shortage of Grade A milk and milk products exists.

The data and figures presented by the distributor must be carefully checked by the health officer. This may be done by checking the "loading out" of trucks at the plant, and by checking the returns and "hold-over" in the plants. Plants should be required to keep the "returns" to a bare minimum before being allowed to process a lower grade of milk. A check should be made of all plants and distributors on the milk shed to determine whether or not the shortage applies to the entire milk shed. A shortage in individual plants only should not justify issuing permits to that plant to handle lower grades, provided there was an adequate supply of Grade A milk on the shed.

2. In the event an actual shortage of Grade A milk is demonstrated, and the shortage is applicable to the entire milk shed, the health officer may issue the plants a temporary permit for handling a lower grade of milk and milk products. Permits issued shall be temporary and shall be for a period not to exceed 30 days. At the end of the 30-day period, the health officer shall determine if the permits are to be continued for another period.

3. The temporary permits will allow plants to use the lower grades of milk for making buttermilk, cream, chocolate milk, and other milk products defined in the ordinance only, and for Type III milk for the Army, when Type III milk is accepted by the Army. The following conditions shall apply in handling these lower grades of milk.

(a) All milk and milk products must be pasteurized in accordance with the specifications of the Standard Milk Ordinance and the State Board of Health Milk Regulations.

(b) The lower grades of milk and milk products may be handled in the same plant and through the same equipment as the Grade A milk but must be handled after the Grade A run is completed.

(c) All milk and milk products for civilian use must be labeled with the proper grade designation as provided for in the Milk Ordinance. Where the lower grades are used for Army requirements they may be labeled Type III milk, in accordance with Army specifications. (Note: Buttermilk, chocolate milk, cream, and other milk products must be properly labeled in accordance with the ordinance requirements.)

(d) The lower grades of milk when used for buttermilk, chocolate milk, cream, and other milk products, should be pasteurized at a temperature of not less than 160° F. for 30 minutes. (Note: It is a common practice to pasteurize these milk products at a high temperature; the industry should be requested to do this.)

4. If the use of lower grade milk for the above mentioned milk products is not sufficient to relieve the shortage of Grade A milk, it may be necessary to allow the lower grades of milk to be used for pasteurized milk, in which case the milk must be labeled in accordance with ordinance requirements.

The above "Emergency Measures" have been prepared for use in enforcing the milk ordinance in communities where a shortage of Grade A milk exists, and as a result of a conference of milk control officials held at the State Board of Health on Tuesday, November 17, 1942.

It was suggested at this conference that local health departments should notify the State Board of Health of any action taken concerning the sale of lower grades of milk, and that the State Board of Health will in turn notify the United States Public Health Service.

NEW METHOD FOR DEHYDRATING CHEESE

A new method for dehydrating natural American Cheddar cheeese for lend-lease or other uses, which is more direct than the commercial procedures now in use, and which will also release spray-drying equipment for drying other foods, has been announced by the Agricultural Research Administration of the U. S. Department of Agriculture.

Dr. George P. Sanders of the Bureau of Dairy Industry, who devised the new method, found that if natural full-fat cheese is grated and then partly dried at room temperatures, the fat will be sealed up in the numerous case-hardened particles of curd. The particles can then be dehydrated in a tunnel drier or by any other heated-air method without loss of fat.

Heretofore, commercial companies have been unable to use direct methods in dehydrating cheese of normal fat content, because the heat of dehydration caused the fat to melt and run out. Some processors have overcome this difficulty by first processing the full-fat cheese with heat and water, and usually with a chemical emulsifier, into a milky paste that can be spray-dried. In another commercial process, the fat is removed from the milk used in making the cheese and then added to the dried cheese.

The Bureau's new method is more direct, and the resulting product is a natural cheese, minus only the water.

Natural Cheddar cheese in its original state usually contains about 36 percent water, but the dehydrated flakes, as prepared in the Bureau's laboratories contain about 3 percent water. The dehydrated flakes thus contain all the fat and other solids, but weigh only two-thirds as much as the original cheese.

The flakes can be packaged loose, or they can be compressed to the same density as the original cheese, or to two-thirds its volume. The compressed cheese can be easily broken up, and it can be consumed directly, or used in almost any other way that cheese is ordinarily used.

If the flakes are compressed into rectangular or block form instead of the round shapes typical of natural Cheddar cheese, considerable additional storage or shipping space can be saved. Compared to the original cheese packed in round boxes, the dehydrated compressed blocks would occupy between 53 and 58 percent as much storage or shipping space.

Judged on the basis of all essential factors, including dryness, physical properties, flavor, and keeping quality, the Bureau's product apparently meets all requirements. Studies are now under way to develop the most efficient drying, compressing, and packaging procedures, and information for quantity production is being assembled. The Bureau has applied for a public service patent.

Legal Aspects

Local Regulations May Not Make State Ones More Stringent

An opinion recently rendered the New York State Department of Health by the State Attorney General, confirming one previously written by his immediate predecessor, establishes what appears to be a new precedent, so far as New York State is concerned, in the matter of relative powers of the State and local authorities in the enactment of health regulations.

Under its Public Health law, the State has a Public Health Council empowered to enact a sanitary code, effective throughout the State excepting in the city of New York, and dealing with "any matters affecting the security of life or health or the preservation and improvement of public health." The law also authorizes every local board of health to "make and publish . . . such . . . regulations, ***not inconsistent with the provisions of the sanitary code,*** as it may deem necessary and proper for the preservation of life and health . . . in the municipality." Chapter III of the State Sanitary Code relates to milk, and its Regulation 31 has for some time read:

> "Local authorities may enact supplementary regulations. The health authorities of any municipality may in their discretion enact supplementary regulations not inconsistent with the provisions of this code. Such authorities may require the pasteurization of any milk or cream not required to be pasteurized by this code."

While this regulation, in its phraseology, implies a limitation upon authority of local boards of health, the view commonly held for many years has been that a local regulation was "inconsistent" only if it attempted to set aside, void, or reduce the stringency of provisions of State regulations, and that local boards probably had authority to prescribe additional or more stringent requirements. However, it has been thus assumed local authority which has been largely responsible for such lack of uniformity as has existed between State and local requirements. Finally the Department of Health decided to ask the Attorney General for an interpretation. An opinion was rendered by the former Attorney General shortly before relinquishing the office. Because of the importance of the matter, the present incumbent was asked to review the opinion of his predecessor and, after very careful consideration, has confirmed it.

The Attorney General holds, in effect, that a provision of a local health regulation or ordinance relating to a subject covered in the State Sanitary Code which, without authorization in the Code, goes beyond or is more stringent than the State regulations is "inconsistent with the provisions of the sanitary code" within the meaning of Section 21 of the Public Health law.

". . . it seems to me," he says, "that the powers of the Public Health Council . . . are broad enough so that it need not permit local health boards to increase the stringency of its requirements, if it considers that the effectiveness of the Sanitary Code may be impaired thereby." The Public Health Council, he holds, "may properly define what may be considered inconsistent." It may authorize additional requirements covering certain matters or if it "believes that Chapter III . . . has completely covered all that is necessary to providing security of life or health or the preservation and improvement of public health in the state . . . it may say . . . that any other requirements are inconsistent with the Code."

While the question addressed to the Attorney General referred specifically to the chapter on milk, the opinion appears equally applicable to other chapters.

Paul B. Brooks

Shellfish *

Possession of shellfish received from unregistered shipper.—(New York Court of Appeals; *People* v. *Thompson & Potter, Inc.,* 45 N. E.(2d) 432; decided December 3, 1942.) The New York City Sanitary Code provided that no dealer in shellfish or other foods should "purchase or have in his possession" shellfish received from a shipper of shellfish not registered for shipping shellfish into the city. The defendant, a wholesale commission house dealing as a broker in shellfish, was convicted by the trial court of having in its possession three bags of oysters received from a shipper who was not registered with the health department as an approved shipper of shellfish into the city. It appeared that on a particular day 40 shipments of shellfish were delivered before 6 A.M. when the defendant opened its place of business and that the market watchman admitted the shipments into the premises. An officer and an employee of the defendant arrived about 6 A.M., but claimed that they had not completed their checking of these

* *Pub. Health Repts.,* May 14, 1943.

shipments by 11 o'clock because of the rush of business. A health department inspector found two of the bags of oysters involved at 9:45 A.M. and the third at 11 A.M. Preceding each inspection the inspector inquired in effect whether the defendant had any shipments from unregistered sources, and was told "No." The defendant had a list of approved shippers in its office with which it was its duty to compare the tags on the bags and return goods not on the approved list.

The Court of Appeals of New York said that the purpose of the New York City ordinance was to protect the consumer against the danger of disease involved in eating shellfish taken from sources which were not approved by the health authorities. According to the court a decisive point in the case was the proper construction of the term "possession" as used in the ordinance, and respecting this the court found nothing unreasonable in construing the provision as it was written, namely, that the mere receipt of shellfish into a dealer's premises constituted "possession" within the meaning of the sanitary code. A contrary holding, said the court, would render the enforcement of the code almost impossible and expose the consuming public to the very danger against which protection was sought. "To allow contaminated shellfish to be mingled with a dealer's goods for any period of time involves the peril that the shellfish may be resold to the consuming public without detection by the health authorities, since it is shown that the turnover in this business is both large and immediate." The ordinance was said to be a fair and appropriate exercise of the police power as applied to the subject matter and designed to protect the public health. As applying with force in the instant case, the following was quoted from the opinion in a prior case: "Food laws are designed primarily, not for the punishment of the dealer, but for the protection of the consumer. In this field of law, the obligation to beware is on the seller rather than the buyer. Lack of proof of guilty intent does not satisfy that obligation."

The judgment of the trial court was affirmed.

Filled Milk Prohibited Again *

Filled milk law upheld.—(Kentucky Court of Appeals; *Carolene Products Co.* v. *Hanrahan, Commonwealth's Atty., et al.*, 164 S.W.(2d) 597; decided November 28, 1941, rehearing denied October 23, 1942.) A Kentucky statute made it unlawful to manufacture for sale or sell or exchange any filled milk. Filled milk was defined as "any milk, cream, or skimmed mik, whether or not condensed, evaporated, concentrated, powdered, dried, or desiccated, to which has been added, or which has been blended or compounded with, any fat or oil other than milk fat, so that the resulting product is an imitation or semblance of milk, cream, or skimmed milk, whether or not condensed, evaporated," etc. The plaintiff company brought an action seeking a declaration of rights and injunctive relief against threatened multiplicity of prosecutions under the act. It was alleged by the plaintiff that its products were manufactured by adding refined bland coconut oil and vitamin A and vitamin B concentrates to pure sweet skimmed milk and that thereafter this mixture was evaporated in the same manner as sweet whole or skimmed milk is evaporated in the manufacture of evaporated milks and the product canned by modern and approved processes. The defendants demurred to the petition, thus admitting as true all facts well pleaded but denying that such facts constituted a cause of action. The demurrer was sustained by the trial court and the plaintiff appealed. The contentions made by the plaintiff before the Kentucky Court of Appeals were (1) that the filled milk act did not apply to the plaintiff's products, and (2) that the act, if construed to so apply, was unconstitutional because violative of the fourteenth amendment to the Federal Constitution and of certain specified sections of the State constitution.

The appellate court considered first the matter of constitutionality and, with reference to the act offending the Federal Constitution, said that it thought that this question had been definitely set at rest by the case of *United States* v. *Carolene Products Co.*, 304 U. S. 144 (1938), in which the Supreme Court of the United States held constitutional a Federal act which was almost identical with the Kentucky act. Under that decision, the fact that articles within the prohibited class were wholesome and nutritive did not render the Federal act unconstitutional for the reason that Congress was justified in determining that prohibition of the entire class was necessary. By taking judicial notice of the report of the Congressional committee to the effect that prohibition of all the products involved was necessary because of the impracticability of separating the good from the bad, the supreme court satisfied itself of the existence of a rational basis for the legislation. According to the court of appeals, the fact that, since the supreme court decision, the plaintiff had added vitamins to its product and that there had been no Congressional or legislative investigation or report on the subject in no way detracted from the decision's binding effect. The addition of the vitamins only had the effect of making the plaintiff's product more wholesome and nu-

* Public Health Repts., March 19, 1943.

tritive, and the wholesome and nutritive character of the product was assumed by the supreme court when the decision was reached.

With respect to whether the Kentucky act violated the State constitution, the court of appeals said that it was in thorough accord with the reasoning of the supreme court decision, even though such decision was not binding as concerned this question, and was of the opinion that the act was not violative of the State constitution, since the aggregate effect of the restraints imposed on State legislative action by the State constitutional provisions relied on was in substance the equivalent of the 14th amendment in so far as the instant controversy was concerned.

Nor was the act's constitutionality rendered any less certain by the plaintiff's allegations (1) that the legislation was unnecessary because the plaintiff alone was engaged in marketing the products involved, and (2) that the statute was passed in disregard of the findings of the State board of health. "There was a rational basis supporting the legislative action, as heretofore indicated * * *." It was the court's conclusion that the act was a reasonable exercise of the police power.

Coming to a consideration of the plaintiff's other contention that the act did not apply to plaintiff's products, the appellate court took the view that such products were filled milk within the meaning of the act. "When considered in their entirety, appellant's allegations are insufficient to show that its product is not in semblance of milk but, on the contrary, establish this to be a fact." Also decided adversely to the plaintiff were its arguments (1) that its products were so different from others of the prohibited class as to be without the reason for the prohibition, and (2) that the public had been fully informed as to the products and that there was no possibility of fraud in connection with their sale. The court stated that, as already indicated, the wholesome and nutritive qualities of the products did not remove them from the prohibited class and that, as far as fair labelling was concerned, it had to be assumed that the legislature had determined that prohibition of false labelling would fail to furnish adequate protection and that, therefore, complete prohibition, not regulation, was required to accomplish the legislative purpose.

The judgment of the trial court dismissing the petition was affirmed.

New Books and Other Publications

Brucellosis in Man and Animals, by I. F. Huddleson and Contributing Authors A. V. Hardy, J. E. Debono, and Ward Giltner. Revised Edition. Published by the Commonwealth Fund, New York. 1943. 379 pages.

This second edition of *Brucellosis in Man and Animals*, published in 1939, presents important changes that have been made in the laboratory diagnosis of the disease, new facts pertaining to the nature of this ailment, and a detailed discussion of its clinical manifestations and epidemiology. Dr. Hardy writes particularly on Brucellosis in the United States, Dr. Debono on Brucellosis in Malta, and Dr. Giltner on eradication or control of sources of brucellosis infection. The appendix carries 26 case reports, and the bibliography, 485 references.

Dr. Giltner: "Brucellosis is perhaps three times as prevalent as was tuberculosis at the time its eradication was begun." Brucellosis control is feasible.

Although authoritatively technical, the book makes interesting and facile reading. Milk control officials would do well to read it from cover to cover.

Essentials of Nutrition, by Henry C. Sherman and Caroline Sherman Lanford. Second Edition. Published by the Macmillan Company, New York. 1943. 442 pages. $3.50.

This second edition, appearing only three years after the first edition, attests the wide and merited acceptance of the author's efforts. New advances in the rapidly growing field of human nutrition necessitated some rewriting and additions, particularly in Appendix F on "The Planning of Diets in Terms of Twelve Food Groups," expanded from four to thirteen pages; "Yardsticks" of recommendations and interpretations for calcium and phosphorus); additions to the ascorbic acid chapter; rewriting of the riboflavin chapter to include "related ills" with pellagra; much new material in "Other Water-Soluble Vitamins"; Deletion of vitamins F and H; and additions of recent articles in "Suggested Readings."

This book retains its same format, and makes easy reading for the busy food official who wants a non-technical review of the current knowledge of nutrition.

The Price of Milk, by R. W. Bartlett. Published by Interstate Printers and Publishers, Danville, Illinois. 1941. 171 pages.

The author discusses the price of milk under the following chapter headings: The Milk Problem; Monopoly, Coercion, and Unfair Practices; Price Systems That Have Failed; Proposed Government Remedies; A Price System That Works; Increasing Milk Consumption by Lowering Costs; Quality Control and the Price of Milk; and Antitrust Enforcement.

He states that in 90 percent of the larger markets, the price of milk is higher than it would be if free competition prevailed. Pertinent to present general interest in the construction of a streamlined but effective milk control ordinance is his statement that quality control is often needlessly contributory to high milk prices. He maintains that consumption is related to price.

The book is quite readable, and should be interesting to milk control officials in these days of rising prices, curtailed consumption, and nutritional needs.

JOURNAL OF MILK TECHNOLOGY

Official Publication of the

International Association of Milk Sanitarians

(Association Organized 1911)

The Journal of Milk Technology is issued bimonthly beginning with the January number. Each volume comprises six numbers. It is published by the International Association of Milk Sanitarians, and is printed by The William Boyd Printing Co., Inc., Albany, N. Y., U. S. A.

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

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

Manuscripts: All correspondence regarding manuscripts, editorials, news items, announcements, and other reading material should be addressed to the Editor, J. H. Shrader, 23 East Elm Ave., Wollaston, Mass.

Membership and Dues: Active membership in the Association is $3.00 per year, and Associate membership is $2.00 per year, including respectively all issues of the Journal of Milk Technology. All correspondence concerning membership in the International Association of Milk Sanitarians, including applications for membership, remittances for dues, failure to receive copies of the Journal of Milk Technology, and other such matters should be addressed to the Secretary of the Association, C. Sidney Leete, State Department of Health, Albany, N. Y.

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Association News

Associated Illinois Milk Sanitarians

The Second Conference of the Associated Illinois Milk Sanitarians was held in conjunction with the Illinois Public Health Association at the Hotel La Salle, Chicago, Illinois, on May 13, 1943. Approximately 150 members and guests attended the Conference.

Chairman Maynard and his committee arranged a very interesting and educational program.

At the conclusion of the program a business meeting of the Association was called to order by President Weeks. Acting Secretary-Trèasurer Riley was elected permanent Secretary-Treasury. An additional article to the By-laws was unanimously adopted by the membership to provide for any future vacancy in the offices of president, vice-president, and secretary-treasurer.

The Association now boasts one hundred ten paid members, and tentative plans were made for the annual conference of the Association, to be held in December or January.

P. Edward Riley,
Secretary-Treasurer.

Chicago Dairy Technology Society

The Chicago Dairy Technology Society held its last meeting before the summer vacation period on May 11 in the Hotel Sherman. Dr. W. E. Petersen of the Division of Dairy Husbandry of the University of Minnesota, spoke on "Some Studies in the Physiology and Biochemistry of Lactation." His topic was exceedingly interesting and enthusiastically received by the large number of members and guests present. It was gratifying to the Society to close the first half of the year with such a fine meeting.

The next meeting will be held in September, the date of which will be announced later.

Bert Aldrich

Connecticut Association of Dairy and Milk Inspectors

Professor Ira V. Hiscock, a charter member of our Association and a past president of the International Association of Milk Sanitarians, now carrying on special work for the Federal Government, was made an honorary member. Like recognition was given to Dean E. G. Woodward of the College of Agriculture, University of Connecticut.

The Ways and Means Committee presented tentative plans for a two day school for Dairy and Food Inspectors to be held in January, 1944, in which the Department of Health, Yale University, the College of Agriculture of the University of Connecticut, and the State Departments of Health, Agriculture, Domestic Animals, and Dairy and Food will cooperate. This Committee report received favorable comment, and in view of this project the usual October meeting will be omitted.

A recent dairy farm survey by the Dairy and Food Commission showed the following results (covering May, 1942 to May, 1943):

Number of dairy farms....1.7 percent loss
Number of dairy animals..2.5 percent gain
Number of quarts of milk produced
3.7 percent gain
Number of employees.......7.3 percent loss

There was an acute labor shortage on farms previous to May, 1942. While the results show that the milk producers have done their utmost to increase the volume of milk as a patriotic measure, it cannot be hoped that the dairymen can continue to carry on in the face of such obstacles as shortage of labor and inequality of prices.

H. Clifford Goslee,
Secretary-Treasurer.

Michigan Association of Dairy and Milk Inspectors

The annual Summer Meeting of the Michigan Association of Dairy and Milk Inspectors will be held at the Hurley Hospital in Flint on Friday, July 16, 1943.

President Al Miller entered the armed forces late in June. Doctor C. S. Bryan will assume the duties of President upon the departure of President Miller.

Charles Ruegnitz, a member of the Board of Directors, is now Post Sanitarian with the Army in San Francisco.

HAROLD J. BARNUM,
Secretary-Treasurer.

Missouri Association of Milk Sanitarians

The Eleventh Annual Meeting of the Missouri Association of Milk Sanitarians and Milk Control Short Course was held at the Dairy Department, University of Missouri, Columbia, Missouri on May 6 and 7, 1943. The Department of Dairy Husbandry, University of Missouri, the Missouri State Board of Health, and the Missouri Association of Milk Sanitarians cooperated in conducting this meeting.

The meeting this year was devoted mainly to wartime milk sanitation and milk control problems. This subject was discussed by persons representing the producer, the distributor, the consumer, and the milk control official. The subject material used by each of the speakers elicited much lively discussion by those present, which in itself is evidence of the fine material presented by the speakers.

One of the resolutions adopted is herewith given in full:

WHEREAS, the existing "Emergency Measures" prepared for use in the enforcement of the milk ordinances in communities where there is a shortage of Grade A milk are adequate for any probable emergency concerning the milk supply without changing the purpose and intent of the milk ordinances; therefore,

BE IT RESOLVED, That the Missouri Association of Milk Sanitarians unanimously approved the "Emergency Measures to Be Used in the Enforcement of the Milk Ordinance in Communities Where There Is a Shortage of Grade A Milk," which were prepared at a conference of state and city milk control officials held at the State Board of Health in Jefferson City, Missouri on November 17, 1942.

(A copy of the "Emergency Measures" is printed on page 244 of this issue.—Editor.)

The attendance this year of well above 80 compares favorably with recent years, and represents a considerable increase from the 16 persons who were present at the first meeting eleven years ago.

The Missouri Association is affiliated with the INTERNATIONAL Association and has designated the JOURNAL OF MILK TECHNOLOGY as its official organ.

GLENN M. YOUNG,
Secretary-Treasurer.

New York State Association of Milk Sanitarians

Since the announcement of the two day Annual Conference to be held in Syracuse, New York, on September 23 and 24, 1943, the Hotel Syracuse has been selected as headquarters for such conference.

The Executive Committee has in preparation an interesting program of subjects having direct bearing on war problems in maintaining the production processing, and marketing of milk and milk products in war time.

The New York State Department of Health recently has discontinued the use of two streetcar type motor buses as milk laboratories, and has transferred these laboratories to permanent quarters, one to Room 522, Mayro Building in Utica, New York, in charge of Mr. S. Emerson Smith, and the other to rooms at 291 Delaware Avenue, Buffalo, New York, in charge of Mr. A. Millenky.

W. D. TIEDEMAN,
Secretary-Treasurer.

Philadelphia Dairy Technology Society

The Philadelphia Dairy Technology Society held its last meeting of the season at the Whittier Hotel on Thursday, May 13, 1943. This was a joint meeting with the Pennsylvania Association of Approved Dairy Laboratory Directors of the Southeastern Region.

An afternoon forum attended by 75 members was under the direction of Mr. Frank Martin, acting president of the Pennsylvania Association of Approved Dairy Laboratory Directors of the Southeastern Region. Dr. F. Bruce Baldwin served as discussion leader.

Dr. Ralph E. Irwin, Director of the Bureau of Milk Sanitation, Pennsylvania Department of Health, gave us Five Rules to Be Observed for Producing Safely Pasteurized Milk. Other subjects outlined for discussion were:

Various Methods of Laboratory Pasteurization of Individual Farm Samples......... M. C. Matt
The Phosphatase Test......John C. Beatty
Scale Remover from Bottle Washing Machines.....................Jay D. Girard
Testing Homogenized Milk................ Dr. Bernhard Spur

These outlines brought forth some interesting discussions that could have gone on "into the night."

The forum adjourned at 5:30 P.M. Dinner, attended by 85 members, was served at 6:30 P.M.

The evening program was under the chairmanship of Mr. J. J. Sampey, president of the Philadelphia Dairy Technology Society.

A silver cake dish was presented to our former assistant-secretary, Miss Marie C. Whalen, whose marriage will take place before our meetings resume in the fall.

Dr. Ralph E. Irwin gave a very interesting historical resume on milk improvement work in Pennsylvania, as well as the background of the Laboratory Directors Association.

Dr. A. C. Fay, Director of Laboratories, H. P. Hood and Son, Boston, gave us a most worthwhile and interesting talk on "Psychrophilic Organisms as a Factor in High Counts on Cream."

The Philadelphia Dairy Technology Society elected officers for the ensuing year.

W. S. HOLMES,
Secretary-Treasurer.

Heinzman Assists War Effort in Mexico

Mr. Max A. Heinzman has resigned as President of the California Association of Dairy and Milk Inspectors on account of his absence from the country. For the past several months he has been away from his home at Ventura, working for the Farm Security Administration, U. S. Department of Agriculture, in the Mexican Labor Recruitment and Transportation Program. Inasmuch as he has had many years' experience in that country, he felt it his duty to cooperate in the war effort by engaging in work for the above Bureau. His address is Gomez Pedraza 62-bis, Tacubaya, D. F., Mexico.

New Members

INTERNATIONAL ASSOCIATION OF MILK SANITARIANS

ACTIVE

Brown, W. Howard, Assistant Director, Food & Drug Laboratory Division, City Board of Health, Engineer Bldg., Jacksonville, Fla.

Fitzgerald, Donald V., Chicago Milk Division, Borden Dairy Co., Box 263, Crown Point, Ind.

Hayes, H. M., Milk Sanitarian, Knoxville Bureau of Health, 634 Orlando Avenue, Knoxville, Tenn.

Hopson, Robert S., Sanitarian, Village of Winnetka, Village Hall, Winnetka, Ill.

Leonard, J. Roy, Chief Milk Sanitarian, Knoxville Bureau of Health, 220 Lenland Ave., Knoxville, Tenn.

Prucha, Arnold A., Senior Sanitarian, Health Department, Village Hall, Winnetka, Ill.

Ross, Charles Elden, Health Officer, City Health Department, Berlin, N. H.

Thomasson, H. L., Dairy Sanitarian, Indiana State Board of Health, R. F. D. 6, Shelbyville, Ind.

ASSOCIATE

Ashbaugh, V. J., Secretary-Treasurer, Durham Dairy Products, Durham, N. C.

Bartlett, Carl, Milk Sanitarian, City Water Works, Ottumwa, Iowa.

Battle, Gordon, Milk Sanitarian, City Health Department, Greensboro, N. C.

Bezdenejnykh, V. A., Engineer, Government Purchasing Commission, U. S. S. R., 1610 Park Road, N. W., Washington, D. C.

Damman, George H., Production Superintendent, J. D. Roszell Co., 736 South Washington St., Peoria, Ill.

Duck, Edgar L., Sanitarian, Hardin County Health Department, Savannah, Tenn.

Graf, Robert, District Sales Manager, Calgon, Inc., 2512 Book Bldg., Detroit, Mich.

Hanawalt, Eugene M., 2355 Lombard St., San Francisco, Cal.

Hansen, E. L., Agricultural Engineer, Portland Cement Assoc., 33 W. Grand Ave., Chicago, Ill.

Lefton, 1st Lieut. I. M., Sn.C., Assist. Sanitation Branch, Hospital 31, Fort Bragg, N. C.

Luscomb, A. I., Manager, Breakstone Brothers, Inc., Walton, N. Y.

Madison, Russell M., Major, Station Veterinarian, Chanute Field, Rantoul, Ill.

Roach, Gavin, Deputy Dairy Commissioner, Kansas State Board of Agriculture, 1512 Leavenworth St., Manhattan, Kan.

Scicchilano, Samuel J. P., Dairy Chemist, Sheffield Farms Co., Canton, N. Y.

Stine, James Bryan, Kraft Cheese Co., Chicago, Ill.

Struif, Gus, Sanitary Inspector, Alton Health Department, City Hall, Alton, Ill.

Weisgerber, A. F., Fly Control Consultant, Detjen Corp., 340 N. 7th St., Newark, N. J.

Whiteford, Malcolm, Dairy Chemist, Sheffield Farms Co., Canton, N. Y.

Wood, Lois Bluhm, Bacteriologist, Oswego-Falls-Sealright Co., Fulton, N. Y.

Woodman, L. S., Schleuter Dairy Supply Co., Janesville, Wis.

ERRATA

Page 130. Seventeenth line from the top. The head of the Veterinary Corps is General Kelser.

Page 145, Example 2. Formula should read as follows:

$$50.42 = \frac{\text{"x" times 15 (seconds holding time) times 1.1 (safety factor)}}{\text{3600 (seconds per hour)}}$$

"Dr. Jones" Says—*

SAY, that was too bad about Edsel Ford, wasn't it? Men like that, that're capable of doing big things, we need 'em, especially right now. Of course, with their organization, I don't suppose the loss of one man is going to stop 'em turning out war machines, but after this war is over men with unusual vision and ability—we can't have too many of 'em. And, of course, that's just the public angle; the loss to his family and friends and so on, that's something else.

Of course I'm a health officer and—well, I don't know what he died from—the paper said he'd had an operation a few weeks before, but it said he'd just been laid up with undulant fever. And the natural conclusion is that that contributed to his death. The paper didn't say where he got the undulant fever, but raw milk or cream—that's where most of it comes from.

This is nothing new—but the way the public—that's us—the way we react to these things is interesting. We'll hear about a couple hundred cases of undulant fever being reported in the State in a year and it won't make any more impression than two flies on a window pane. It's like these bombs being dropped over in Europe: it's terrible, but it's so far away—well, we read about it and a few minutes later we're griping about ration books or not enough gasoline or what not. But let someone we know about get it—somebody that's important to us one way or another and that's a horse of another color. "Why don't they *do* something about it?"—that's what a lot of 'em will say. They are doing something about it, but the big handicap is this idea that nothing matters that don't hit us, individually. I suppose most everybody's important to someone.

You know, it'd be kind of interesting if some statistician could figure out what proportion of our undulant fever cases are "important people." Of course farmers, a lot of them get it and they're mighty important—but I mean these high-up executives and so on. I'd expect the proportion'd be low—on the theory that they'd value their health enough to take reasonable precautions. You hear about 'em insuring their lives for a hundred thousand dollars and all that. They could insure 'em against undulant fever (and some other things at the same time) just by paying an extra cent or so a quart for pasteurized milk. But I've noticed before now that some pretty "big shots" miss the mark now and then when it comes to health matters.

PAUL B. BROOKS, M.D.

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* *Health News*, New York State Department of Health, Albany, N. Y., June 7, 1943.

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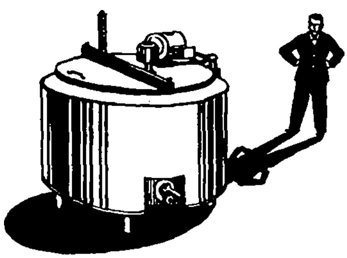

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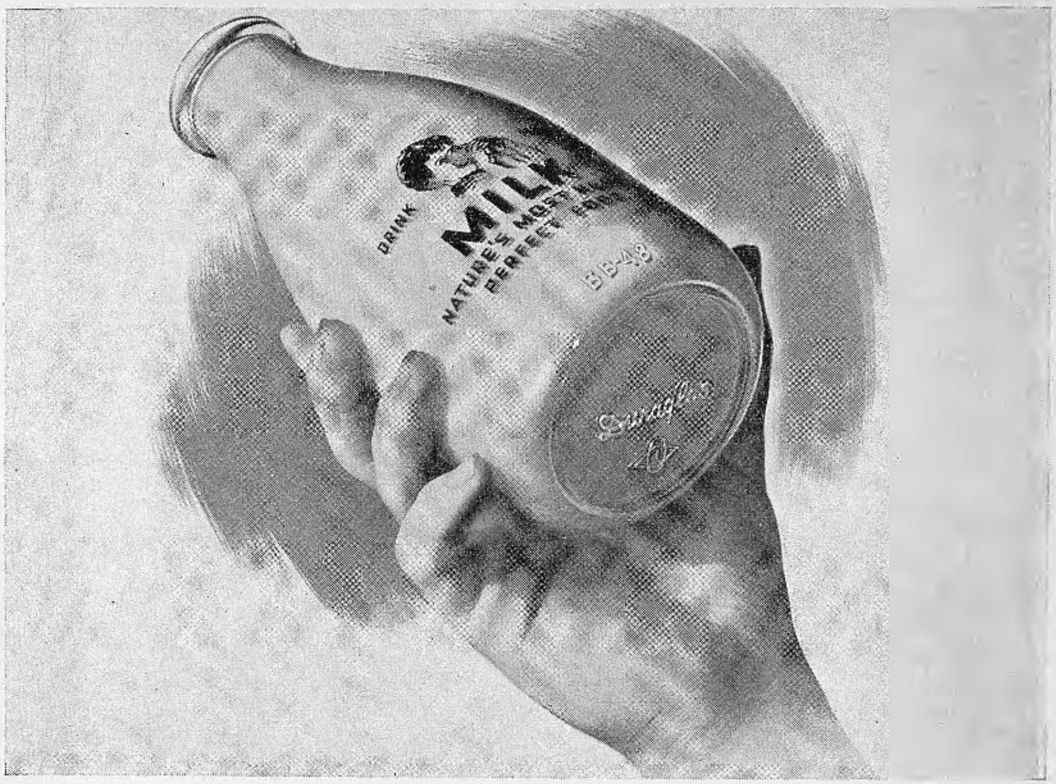

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