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Editorials

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Food-borne Outbreaks in War Plants

A GROWING recognition of the effect of good nutrition on morale and efficiency of war workers has led an increasing number of war industries to establish or encourage the establishment of cafeterias and other eating places in or near their plants. Unfortunately it has not been so generally recognized that, to be sure of accomplishing rather than defeating their commendable purpose, such eating places must be adequately equipped and efficiently managed. As a result there have been numerous outbreaks of food poisoning or food-borne infection.

As Perkins and Mayers * put it, in an interesting article published in February: in the effort to feed employees "all manner of amateur attempts are being made . . . by well-intentioned individuals with very little, if any, experience in the restaurant business." Many of them are "completely unaware of the potential dangers."

While such outbreaks in war plants do not differ in their clinical and epidemiological aspects from those occurring elsewhere in civil life, the loss of time and efficiency occasioned is likely to be much more serious. A striking example was an outbreak of eighty or more cases of *Staphylococcus aureus* toxin food poisoning which occurred among employees, mostly on the night shift, in an imporant war plant in New York State. Fifty or more patients were taken to hospitals, some of them being treated for shock. Naturally work at the plant was seriously disrupted.

This outbreak was traced to corned beef. It had been handled by an employee with pustular lesions on his hands and had stood for six hours without refrigeration. Staphylococci were recovered from the lesions and the corned beef.

Such outbreaks commonly result from bacterial contamination, by infected food handlers, of moist, bland foods, not highly spiced, salted, or acid, without

* Food Poisoning in State's War Industry Plant Cafeterias and Restaurants; James E. Perkins, M.D., and May R. Mayers, M.D. *The Industrial Bulletin* (New York State Department of Labor), February, 1944. Reviewed in *Health News*, May 22, 1944.

proper refrigeration. The most troublesome organisms are staphylococci of the aureus group and members of the *Salmonella* family, which are "closely related" to the paratyphoids. Staphylococci are commonly associated with boils, furuncles, and similar human lesions, and may be present in the discharges of a person suffering from a "cold." Milk from a cow with staphylococcus mastitis, if unpasteurized, is a possibility. Certain strains of salmonellae are harbored only by human carriers, while rodents and household vermin may be carriers of other strains.

The most explosive outbreaks ordinarily are those of poisoning by staphylococcus enterotoxin. If certain foods are contaminated with staphylococci and allowed to stand without refrigeration for three or more hours they are likely to contain the toxin. Symptoms of poisoning tend to appear in from two to six or seven hours. Symptoms of *infection* with large numbers of salmonella appear from 7 to 72 hours after ingestion.

Efforts to prevent food-borne outbreaks will be effective only if based upon clear understanding of their causes and control measures are concentrated upon these. It should be kept constantly in mind that it is pathogenic bacteria which constitute "the enemy." Reduced to its simplest terms the preventive program will aim at avoiding food handling by persons suffering from skin, gastrointestinal, or respiratory infections; at insuring that food handlers wash their hands before handling food and avoiding contaminating them with their discharges during the food handling process; at protecting foods at all times from contamination by persons, animals, or vermin; and at providing adequate and continuous refrigeration of those foods in which invading organisms will thrive whenever they are not actually being prepared or served.

P. B. B.

How Regulation Built an Industry

A Tribute to Walter G. Campbell

OFTEN we are so engrossed in our daily tasks that we do not realize the important and far-reaching developments that are taking place right before us. Among these is the growth of the food-packing industry. A glance around the average grocery or super-market indicates the distance we have come from the cracker-barrel days. All this did not just happen. Some force must have been operative. This would seem to be the confidence of the public in factory-packaged goods.

Although there are a few firms whose reputations for quality products are recognized by the whole country, the great bulk of packaged foods is produced by firms whose names originally meant almost nothing to the consumer. But the products were bought because the public knew that effective measures were being used by the government to insure the "purity" of foods. Most of this has stemmed from the former Bureau of Chemistry of the U. S. Department of Agriculture, now known (after several mutations) as the Food and Drug Administration of the Federal Security Agency.

Walter G. Campbell, the retiring Commissioner of Food and Drugs, was appointed to this responsible position in a worthy line. First was Dr. Harvey W. Wiley, the vigorous, crusading pioneer in food control. He was the type that we needed to arouse the public to take action in combating the growing evil of proprietary remedies and adulterated foods. He was followed by Dr. Carl L.

Alsberg, the scientist. He guided and inspired further studies to gather facts and lay the foundation for the great structure of food analytical and technological knowledge, without which food control is weak. In 1916 he appointed Mr. Campbell to be Assistant Chief of the Bureau of Chemistry, in charge of the Food and Drug Law Enforcement operations. Campbell became Director of Regulatory Work in the Department of Agriculture in 1923. His organizing ability expressed itself particularly in 1927 when he organized the Food and Drug Administration which he has since continuously directed. When this unit was transferred from the Department of Agriculture to the Federal Security Agency in 1940, Mr. Campbell was designated as Commissioner of Food and Drugs.

His mind was the organizing, administering, legal type. His outlook from his law-training was the clear-cut sort that knew how to get at facts, and then how to organize them for effective use. Therefore, he was largely instrumental in showing that the original Food and Drug Act of 1906 had been left behind in the march of time, and that a new act, drawn to meet the new conditions, was needed. This led to the enactment of the new Federal Food, Drug, and Cosmetic Act of 1938.

His enforcement policy was a happy combination of prosecution when needed, and cooperation whenever possible. So, industry found that "the Bureau" was a friend to those who really wanted help but was the vigilant watchman to the relatively small number of violators of "the Act." Such a policy operated to build confidence in the industry as well as the public. Both knew that a fair-minded public official, untainted by any unwholesome associations, was giving unselfish, impartial, and conscientious service. In such a regulatory atmosphere, industry confidently expanded its operations, and the markets responded.

Mr. Campbell has done a fine job. His work, outstanding for over thirty years, bespeaks his vision and his character. Our felicitations are extended to a faithful public servant who has earned the gratitude and respect of industry and public, and who is entitled now to a relaxation from his erstwhile responsibilities.

He is succeeded by Dr. Paul B. Dunbar, a collaborator with Dr. Wiley, Dr. Alsberg, and Mr. Campbell. He entered the Bureau in 1906 as one of the original group selected for enforcement of the Food and Drug Act of 1906. His background is that of the chemist, but his long association with Mr. Campbell (staff assistant in 1914) led to his appointment as Associate Commissioner of Food and Drugs in 1942, and now Commissioner. We can expect that Dr. Dunbar will continue the fine work that his predecessors so well advanced and that he will make contributions to an industry which has already felt his helpful influence during all the years when he was so dependable an associate.

J. H. S.

New Problems for Sanitarians

Our living conditions just will not stay put. New economic, technological, and sociological forces play havoc with the *status quo*.

The editorial, initialed F. W. F., on page 125 of our May–June issue and the papers by Tracy and El-Rafey on pages 206 and 228 of this issue are indications of new developments with which food sanitarians will have to cope.

Let us consider the situation with regard to skim milk. Here is a product which contains the best protein that nature has been able to make. In addition, there is its lactose of unique nutritional value. What do we do with these 50 billion pounds of excellent food? Why, we dump some, but feed much of it to animals. Ten pounds of solids make one pound of pork. What a waste! Most of the remainder goes into the manufacture of plastics, paint, adhesive, and wool substitutes for clothing and hats. And yet one-quarter of the world is starving—starving. It would seem as if we say, "Let 'em starve! The regulations prohibiting the sale of skim milk must be maintained." Of course we do not say or even think this as baldly expressed—but our actions do.

Then, there is milk powder—skim and/or whole. Here the sanitarian faces a three-fold problem; sanitary supervision, quality control, and education.

Technological advance will, in all probability, solve the problem of making a powder that will keep satisfactorily during its commercial life and that will re-constitute easily. Merchandising initiative will find the right type of package and an effective marketing plan for distribution. Tracy points out that production conditions may cause the manufacturers to hesitate for fear of disrupting present outlets for bottled milk. Just imagine how the public would react to milk at ten cents a quart! In the competitive struggle that would be bound to ensue, we can hear the distributors of bottled milk proclaim that their milk comes from inspected farms under health department permit whereas the powdered milk may come from anywhere—farms that are good, bad, and indifferent. This price differential of about five cents a quart—"Why is that," asks the public. Fellow sanitarian, are the reasons we have been giving for enforcing the permit system and farm inspection convincing enough to the public to keep them "sold" on paying the higher price? In both finished products we have practically the same food value and equal safety. The differences between the two now lie in their characteristic flavor, degree of convenience of handling, and price.

Quality control of the sources of production of the milk that goes into powder is practically impossible (except for a relatively small amount of powder that is specially packed for a high-price trade). We must depend on platform (deck) examination of the incoming milk and on the final product. If this is good enough for dry milk, why is it not adequate for bottled milk? Both are fed to infants, ill persons, and convalescents.

The education of the public as to the food value, as well as other desirable features of milk powder, is almost a public duty. The reason is that the public should consume more milk but can not (or will not) pay the present high price for the quart-a-day nutritive requirement. Inasmuch as the promotion of health is one of the prime duties of the health official, and since the increased consumption of milk is an important factor in this objective, then it is clear that we should be actively encouraging the production and demand for more and cheaper milk—in the instant case, milk powder.

Successful utilization of butter oil by the armed forces will go a long way to showing the value of re-constituted cream. This should be superior in bacteriological quality to "natural" cream. If the flavor can be made and kept satisfactory, then we should be in a position to produce more and cheaper cream. Again, we cannot inspect the producing farms. We must depend on the examination of the finished product.

General food control has been excellently handled by the federal and state government agencies but the sanitary aspects are, and must continue to be, supervised by the local officials. Inasmuch as all food is generally under the

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Mastitis and the Plate Count of Milk

III.* A Quantitative Study of the Growth of *Streptococcus uberis* in Various Plating Media

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ONE of the chief drawbacks in the quantitative examination of milk for the presence of *Streptococcus uberis* has been the lack of a suitable differential medium to permit a gross differentiation of colonies in the plated sample. This difficulty may be largely attributed to the properties of various species of saprophytic streptococci commonly found in milk, which duplicate the appearance and biochemical reactions of *Str. uberis* well enough to make the counting of *Str. uberis* colonies in any of the common media unreliable.

Of the media available, Edwards' crystal violet aesculin blood agar as used by Morgan, Anderson, and Plastridge (2) for the detection of *Streptococcus agalactiae* in pooled milk seemed to offer the best qualities for the initial detection of *Str. uberis* in samples containing mixed flora. Although it is not a true selective medium for this organism, it has the advantage of suppressing the growth of many contaminating gram positive organisms through the action of the dye, as well as allowing preliminary selection of *Str. uberis* colonies, detected by a browning of the medium around the colony.

The present study was undertaken to determine the ability of *Str. uberis* to grow in various plating media and to determine if Edwards' medium might be used to ascertain the *Str. uberis* content of milk.

* The second paper of this series was published in this JOURNAL, 5, 67–76 (1942).

Methods Employed. Fifteen strains of *Str. uberis* were plated in parallel in each of standard agar, ox-blood agar, and Edwards' crystal violet aesculin ox-blood agar. The manner of procedure, with few exceptions, was similar to that outlined in reference (2). Colonies which developed in the standard medium were counted on a Quebec colony counter and those which developed in blood and Edwards' agar were counted on a device made in the laboratory to give a maximum of transmitted light. It was found that this type of light was more effective than that of the Quebec colony counter for counting colonies in semi-opaque media such as blood or Edwards' agar.

With the aid of a calibrated micrometer, ten subsurface colonies from each set of plates were measured for length and width. The major and minor axes of the elliptical shaped colonies were obtained in terms of millimeters. These were later converted to a measure of surface area for purposes of an analysis.

The identities of the cultures employed were checked both biochemically and serologically. The fermentation reactions, presented in Table 1, are typical of the fermentation pattern of *Str. uberis.* The slide agglutination test as employed by Plastridge, Banfield, and Williams (3) was used in the serological identification of cultures. The antigens were tested against three separate pooled sera containing agglutinins for *Str. agalactiae,*

TABLE 1

BIOCHEMICAL REACTIONS OF CULTURES OF *Str. uberis*

Strain of Str. uberis	*L*	*M*	*I*	*R*	*S*	*T*	*Aes.*	*S.H.*	*L.M.*
1	A	A	A	O	A	A	+	+	AC
2	A	A	A	O	A	A	+	+	AC
3	A	A	O	O	A	A	+	+	ApC
4	A	A	A	O	A	A	+	+	AC
5	A	A	a	O	A	A	+	+	AC
6	A	A	A	O	A	A	+	+	ApC
7	A	A	A	O	A	A	+	+	ACR
8	A	A	A	O	A	A	+	+	ApCR
9	A	A	A	O	A	A	+	+	ACR
10	A	A	a	O	A	A	+	+	AC
11	A	A	a	O	A	A	+	+	AC
12	A	A	a	O	A	A	+	+	AC
13	A	A	a	O	A	A	+	+	ACR
14	A	A	A	O	a	A	+	+	AC
15	A	A	A	O	a	A	+	+	ACR

Abbreviations: L=lactose; M=mannite; I=inulin; R=raffinose; S=sorbitol; T=trehalose; Aes.=aesculin; S.H.=sodium hippurate; L.M.=litmus milk.
A=acid production; a=weak acid production; C=coagulation; pC=partial coagulation; R=reduction.

Str. dysgalactiae, and *Str. uberis,* respectively. All the cultures showed a positive reaction with the last serum only. The preparation of pooled antisera for use in the slide agglutination test is described in *Storrs Agricultural Experiment Station Bulletin 240.*

RESULTS

Numbers of Colonies. The numbers of colonies which developed in each of the three media when inoculated in parallel are given in Table 2. Using the average number of colonies in standard medium as a basis for comparison, it appears that blood agar supported more colonies and Edwards' agar fewer colonies than standard medium, and that blood agar supported more colonies than Edwards' agar.

The validity of experimental results depends largely upon the reliability of the technique which produced them. Before examining these results for significant differences, chi-square tests were applied to individual sets of triplicate plates to determine whether they represented a homogeneous sampling within the limits of the 5 per cent level. This point is an arbitrary standard adopted by statisticians to discriminate between chance occurrences and occurrences influenced by other factors. Chi-square tests revealed that all sets of triplicate plates fell below 5.99, the limit at the 5 per cent point for 2 degrees of freedom. This means that the counts made on corresponding plates within each set of triplicates showed good conformity.

It is desirable to test the resulting chi-square values for variability of distribution to discover any tendencies in

TABLE 2

COUNTS RESULTING FROM PLATING PURE CULTURES OF *Str. uberis* IN DIFFERENT MEDIA

Strain of Str. uberis	*Plate count per ml. in millions (average of triplicate plates)*		
	Standard	*Blood*	*Edwards'*
1	232.3	217.6	200.0
2	251.6	221.0	264.0
3	261.0	243.6	251.6
4	77.7	756.6	no growth
5	293.6	315.6	10.4
6	140.3	139.3	137.3
7	415.3	426.6	448.3
8	579.3	565.3	576.0
9	71.6	58.6	66.6
10	651.7	610.0	627.0
11	137.7	121.7	118.0
12	82.0	261.3	301.6
13	338.5	453.3	512.0
14	351.7	321.0	332.7
15	197.0	189.0	194.7
Average	272.09	326.70	269.35
Mean ratio	1 : 1	1 : 1.201	1 : 0.990

experimental technique which persist throughout the procedure and which deviate from the distribution expected by chance. To extend this analysis, a test suggested by Fisher (1) was applied. It is assumed that if the quantity $\sqrt{2\chi^2} - \sqrt{2n-1}$ exceeds 1.645 for the 5 per cent level, the total chi-square value of all the individual tests is an unreasonable value to expect. By applying this formula to the experimental values, a result of 0.576 is obtained. This is interpreted to mean that the variability of the chi-square values between sets of plates is close to the theoretical expectation, an indica-ion that the plating technique was satisfactory.

Before proceeding with an analysis of the variance between the average numbers of colonies which developed on the three media, the counts were expressed in units which would compare their proportionate numbers. For this purpose and to stabilize the variability between cultures, all counts were changed to logarithms. The missing value for strain number 4 which failed to grow on Edwards' medium, was supplied by the technique outlined in Snedecor (4). With the block of figures completed, the analysis of variance was computed as given in Table 3.

The analysis first examined the variation between strains, which was found to be highly significant. This discloses the value of using a number of strains rather than one or two strains which might differ considerably from the average type. The variation between media was divided into standard medium vs. blood, standard vs. Edwards.' and blood vs. Edwards', and the resulting variations were tested for significance. No significant variations appeared between the numbers of colonies supported by the standard and blood media or between the numbers supported by the standard and Edwards' media. The variation between blood and Edwards' media, however, showed a marked significance since the F value, 11.49, exceeds 7.68, the limit at the 1 per cent level for 1 and 27 degrees of freedom.

These results showed no significant differences in the numbers of colonies which developed in standard and Edwards' media. Blood medium, however, supported 17.54 per cent more colonies than Edwards' medium.

TABLE 3

ANALYSIS OF VARIANCE BASED UPON THE LOGARITHMS OF THE MEAN NUMBER OF COLONIES WHICH DEVELOPED IN THE VARIOUS MEDIA

Source of variation	*Degrees of freedom*	*Mean square*	*Variance ratio (F)*
Between strains	14	0.4855	17.62*
Stand. vs. blood	1	0.0567	2.06
Stand. vs. Edw.	1	0.1053	3.82
Blood vs. Edw.	1	0.3168	11.49**
Error	27	0.0275	1.00
Total	43		

* Highly significant ($P < .001$).
** Expected value at the 1 percent level for 1 and 27 D.F. is 7.68.

Sizes of Colonies. Ten subsurface colonies were selected from each plate and measured for length and width. The procedure for selecting the colonies for measurement may have introduced an "observer's bias". Since all observations were made by the same individual, however, their relative values are believed to be reliable. After converting the dimensions into millimeters, the surfaces of the colonies were calculated by multiplying the product of the semi-major and semi-minor axes of the ellipse by 3.14. The average exposed areas of the measured colonies are presented in Table 4. The mean ratios in the last row of the table indicate that the standard medium supported colonies of considerably greater surface than those supported by either blood or Edwards' medium; also, colonies which grew in Edwards' medium were somewhat larger than those in the blood medium.

To test the significance of these differences, the data were examined by the analysis of variance. The exposed areas were multiplied by 100 and

TABLE 4

AVERAGE OF EXPOSED AREAS OF *Str. uberis* COLONIES WHICH DEVELOPED IN THE DIFFERENT MEDIA

Strain of *Str. uberis*	Area of colonies in square mm.		
	Standard	*Blood*	*Edwards'*
1	0.089	0.046	0.083
2	0.089	0.081	0.068
3	0.131	0.061	0.067
4	0.114	0.035	0.060*
5	0.048	0.057	0.012
6	0.110	0.081	0.097
7	0.061	0.071	0.083
8	0.076	0.039	0.060
9	0.174	0.116	0.138
10	0.033	0.035	0.054
11	0.105	0.068	0.138
12	0.108	0.048	0.046
13	0.189	0.083	0.084
14	0.035	0.081	0.106
15	0.151	0.054	0.099
Total	1.513	0.956	1.195
Mean ratio	1 : 1	0.632	0.790

* Missing value supplied.

changed to logarithms. A missing value was supplied for culture 4 in the manner of reference (4). The analysis of variance based upon the logarithms of the average surface areas is given in Table 5 with the same subdivisions as in Table 3.

The various strains of *Str. uberis* varied significantly in mean size of colony. Also, standard medium produced significantly larger colonies than blood medium. No significant variation appeared between the standard and Edwards' or between blood and Edwards' media.

Summary. Fifteen strains of *Str. uberis* were plated in parallel in standard agar, ox-blood agar and Edwards' crystal violet aesculin ox-blood agar. Under the conditions of the experiment, standard medium and Edwards' medium supported the growth of *Str. uberis* equally well in respect to both number and size of colonies. Blood medium, however, supported about 18 per cent more colonies than did Edwards' medium. The colonies grown in standard medium averaged about 37 per cent more surface area than those grown in blood medium.

TABLE 5

ANALYSIS OF VARIANCE BASED UPON THE LOGARITHMS OF THE AVERAGE EXPOSED AREAS OF COLONIES WHICH DEVELOPED IN THE DIFFERENT MEDIA

Source of variation	*Degrees of freedom*	*Mean square*	*Variance ratio (F)*
Between strains	14	0.0821	2.60*
Stand. vs. blood	1	0.2206	7.00**
Stand. vs. Edw.	1	0.0775	2.46
Blood vs. Edw.	1	0.0366	1.16
Error	27	0.0315	1.00
Total	43		

* Expected value at the 5 percent level for 14 and 27 D.F. is 2.08.

** Expected value at the 5 percent level for 1 and 27 D.F. is 4.21.

Although blood agar yielded greater numbers of colonies than either of the other two media, it does not have properties which permit the differentiation of *Str. uberis* colonies from those of other bacteria found in the mixed flora of milk. Edwards' agar, besides having the advantage of being equal to standard agar in growth-supporting ability for *Str. uberis*, permits some degree of preliminary identification of these colonies, and for these reasons offers relatively good possibilities as a plating medium for this organism.

ACKNOWLEDGEMENT

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Mastitis and the Plate Count of Milk

Part IV. The Contribution of *Streptococcus uberis* Mastitis to the Plate Count of Herd Milk

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Over a period of years the activities of dairy and public health officials have brought about increasing improvements in the sanitary conditions under which milk is produced. By adopting higher standards and by educating the producers in the use of modern milking and cooling equipment, the bacterial content of market milk has been effectively reduced. Improvements along these lines accentuate, in a relative sense, the importance of milk flora occurring as a result of infections within the udder, and the question of the contribution of mastitic udders to the plate count of milk has become more important to the producer. One or more mastitic animals contributing large numbers of bacteria to herd milk could prove a serious obstacle for the farmer attempting to maintain acceptable standards of quality.

Morgan (2) found that while *Streptococcus agalactiae* usually contributes a very small share to the total number of organisms present in high count milk, it may be responsible for a large proportion of the standard plate count of low count milk. Ranking next to *Streptococcus agalactiae* among the streptococci identified with mastitis is *Streptococcus uberis*. A survey of data obtained over a five-year period from *Str. agalactiae*-free experimental herds revealed that about 17 per cent of the 361 animals showed evidence of *Str. uberis* infection at least once during the test period.

Ferguson (1) plated samples of producers' milk upon blood agar and found that in 60 samples streptococci which might have been *Str. uberis* were never found as predominating organisms.

The difficulty of differentiating between the colonies of *Str. uberis* and those of saprophytic streptococci in the examination of composite herd milk is the chief factor in accounting for the lack of work done on this problem. The writers (5) have shown that Edwards' medium may be used to advantage in the detection of *Streptococcus uberis*, a fact made use of in the following study. Milk from quarters of animals known to be infected with *Str. uberis* were plated to determine the proportion of the total milk flora attributable to this organism.

Experimental

Source of Samples. Rather than examine bulk milk for *Str. uberis*, it was believed that samples taken directly from infected animals would give a more reliable count, since the danger of contamination with saprophytes from outside sources would be reduced. Quarter samples were taken aseptically in herds known to harbor animals with *Str. uberis* infection. Isolations of the streptococci were made and the cultures were identified biochemically. Quarters from which *Str. uberis* was isolated were used in the experimental work.

Method of Sampling. Samples for examination were obtained by milking out the quarters with a sterile milking machine.* It was found convenient

* Two units, a DeLaval "Magnetic Speedway" and a DeLaval "Sterling" were employed.

to disassemble the machine before sterilizing. All hose connections were plugged with cotton, and since only one quarter was milked at a time, three of the four outlets of the milk-claw assembly were plugged with rubber stoppers and the fourth with cotton. Cotton plugs were placed in both ends of the teat cup and the terminal end was covered with a double layer of parchment paper held in place by a heavy elastic band. All sections of the machine were placed in a laboratory autoclave in a manner to allow free circulation of steam and were held at about 220° F. for one hour.

At the farm the cotton plugs were removed and the machine reassembled, care being taken to avoid contamination. The flanks and the udder of the animal were thoroughly washed with a solution of Phenolor (Squibb), which contained one ounce to about five quarts of warm water. About five milliliters of foremilk were directed into a strip cup to detect clots or flakes and also to rid the quarter of the most highly contaminated portion of milk. Following this, the teat of the quarter to be milked was given a second washing with a clean solution of Phenolor, particular attention being given to cleansing the opening of the streak canal. The parchment paper and cotton plug were then removed from the teat-cup and the machine was applied to the teat. The machine was left on the animal for the usual milking time. In some cases, however, it was necessary to leave the machine on for a longer time to get a complete milking.

Following the removal of the machine from the animal, the milk can was vigorously swirled to insure good mixing of the milk, and two 25 ml. portions were removed into sterile test tubes by means of a sterile milk thief. The samples were iced immediately and were held in ice until they were analyzed, usually a period of from 14 to 16 hours. Considerable travel was necessary to reach some of the farms, making it impossible to provide a separate sterile milking machine for each animal. On the occasions in which the same machine was used more than once, the animals were milked in the order of the progressive severity of the infections. The pails were thoroughly drained after each milking and separate sterile teat cups were used with each animal. It was believed that there would be a greater risk of contamination (especially with saprophytic streptococci) if the milking unit were washed on the premises after each milking than there would be with careful draining and handling of the unit between milkings.

One of the duplicate portions from each milking, in addition to being used for the bromthymol blue test and leucocyte count as described by Plastridge, Anderson, and Seremet (4), was examined for abnormalities in appearance and for the presence of sediment and clots. Dilutions of 1:100, 1:1000 and 1:10,000 were prepared from the second portion and triplicate plates of each dilution were poured with standard tryptone glucose extract skimmilk agar and a medium described by Plastridge, Anderson, and Weirether (3) which is essentially the same as Edwards' medium except that mannite, inulin, and sorbitol are substituted for aesculin*. *Str. uberis* ferments these substances and its growth is characterized by a greening of the medium adjacent to the colony.

Counting and Identification of Colonies. Plate counts were made by the methods discussed in a previous report (5). Ten well-isolated subsurface colonies were picked from the medium, inoculated into blood broth, and incubated for 24 hours at 37° C. Each culture was identified biochemically or serologically (5). Where fewer than ten colonies appeared on the plate of the lowest dilution, all of the colonies were cultured and identified.

* War conditions made the purchase of aesculin impossible.

RESULTS

The results of the examination of samples are summarized in Table 1. Plate count values were obtained by averaging the counts from triplicate plates. A scatter diagram, prepared from the data in Table 1, revealed no consistent relationship between the leucocyte count and the plate count. In a similar comparison, no significant correlation was found between the bromthymol blue number and the plate count. (These diagrams are not included in this paper.)

Plate counts of *Str. uberis* ranged from 30 to 44,000 organisms per ml. To compute the mean and standard deviation, these counts were converted to logarithms, as this has the advantage of reducing the influence of extremely high values which disproportionately influence the measure of central tendency when an arithmetic mean is used. The standard deviation of the logarithms of the counts in Table 1 was found to be 0.84. This was added to and subtracted from the mean, 3.476, and the antilogarithms of the resulting numbers were obtained. By this method the geometric mean was found to be about 3000, and the range expected to include 67 per cent of such counts fell between 430 and 19,800 organisms per ml.

Table 2, which shows the frequency distribution of the plate counts, was prepared with equal logarithm intervals on a two-fold dilution scale. It has the advantage of covering a large range with a small number of classes. An examination of the entries reveals that 16 of the 23 counts are included in the classes embraced by the values 1281 and 20,480. Of the remaining counts, five fell below and two above this range.

Comment. In the present experiment the majority of samples yielded relatively low counts of *Str. uberis.* None of the counts obtained was high enough to affect materially the plate count of high-count milk. When the dilution effect of the low-count milk from normal quarters is considered, even the highest count obtained, 44,000 per ml. would be reduced to a level acceptable as grade 1 milk by present standards. There is evidence that under certain conditions quarters infected with *Str. uberis* may release much larger numbers of this organism into the milk. In one herd, counts of brown-producing colonies on Edwards' agar ranging from 700,000 to 1,420,000 per ml. were obtained from six quarters. Before experimental work could be started, a particularly infectious strain of *Str. agalactiae* spread through the herd, making it valueless for further work with *Str. uberis.* Obviously, such animals, particularly in a small herd, would greatly increase the total plate count of the herd milk.

Summary. Twenty-three quarters containing *Str. uberis* were milked with a sterile milking machine. Partially differential plate counts, made upon a special medium, showed a geometric mean of 3000 organisms per ml. There is evidence that the *Str. uberis* count of some quarters, under certain conditions, may rise to much greater numbers.

Under the conditions of this experiment *Str. uberis* counts obtained from infected quarters were not great

TABLE 2

DISTRIBUTION OF COUNTS OF *Str. uberis* OBTAINED FROM PLATING SAMPLES FROM TWENTY-THREE QUARTERS

Count	*No. of Samples*
21–40	2
41–80	0
81–160	1
161–320	0
321–640	1
641–1,280	1
1,281–2,560	4
2,561–5,120	4
5,121–10,240	4
10,241–20,480	4
20,481–40,960	1
40,961–81,920	1
Total	23

TABLE 1

RESULTS OF THE ANALYSIS OF SAMPLES OF MILK ASEPTICALLY DRAWN FROM TWENTY-THREE QUARTERS CONTAINING *Str. uberis*

Animal	*Quarter*	*Brom thymol blue* [a]	*Leucocyte count* [b]	*Appearance*		*Str. uberis count* [c]	*Standard plate count*
				Quarter	*Sample*		
48B	RH	1	1.75	Normal	Normal	3,300	not plated
Sonata	LH	6	13.50	Normal	Flakes	90	240
Sonata	LF	3	2.00	Normal	Flakes	3,500	3,800
Sonata	RH	3	1.50	Normal	Flakes	4,400	1,600
Twining	RH	1	.89	Normal	Normal	7,900	10,400
Marietta	LH	5	4.00	Underdeveloped	Normal	16,700	74,000
Profitess	RF	4	1.50	Normal	Normal	15,500	14,800
Cotton	RH	4	.06	Normal	Normal	6,800	24,600
Felice	LF	1	3.50	Normal	Normal	4,400	7,600
Promptability	RH	1	.03	Normal	Normal	5,400	5,200
Promptability	LF	3	.88	Normal	Normal	29,000	45,000
21	LH	1	.81	Normal	Normal	630	4,000
185	LF	1	.50	Normal	Normal	2,480	2,130
92	RF	2	.28	Normal	Normal	2,200	2,600
Martha	RH	2	.62	Underdeveloped	Normal	9,700	11,200
Cosmos	RF	4	.80	Normal	Normal	44,000	44,000
Duchess	LF	2	.37	Normal	Normal	1,400	2,200
35	RF	1	1.20	Normal	Normal	2,000	1,900
35	LF	1	1.00	Normal	Normal	11,200	9,500
35	RH	1	3.50	Normal	Normal	16,300	20,900
186	LF	1	20.00	Normal	Normal	700	1,100
Trixie	RH	1	.59	Normal	Normal	30	1,300
Violet *	LF	2	5.00	Sl. swollen	Flakes	30	430

[a] Numbers 1 and 2 are interpreted as negative, Number 3 as suspicious, and Numbers 4 to 6 as positive.
[b] In millions.
[c] Where all colonies identified were not *Str. uberis*, a proportionate subtraction was made from the total count of green-producing organisms.
* Hand milked into an open-top pail.

enough to influence the plate count of high-count milk. In some instances, as in a small herd, or in a herd in which the incidence of *Str. uberis* is high, organisms released from the infected animals might materially increase the total plate count.

ACKNOWLEDGEMENT

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ANNUAL MEETING, NOVEMBER 2–4, 1944

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A Comparison of Two Standard Media for the Detection and Enumeration of Escherichia and Aerobacter in Milk

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IN RECENT years there has been a renewed interest in the coli-aerogenes group of bacteria in milk, both pasteurized and raw. Some workers hold that the presence of these organisms in milk is an indication of either insufficient pasteurization or of recontamination after pasteurization. Breed (personal communication) states that the coliform test has become very common for pasteurized milk in the important dairy state of New York. Also, it is becoming more evident that the enumeration of these bacteria in raw milk, if not so good an index of quality as the official plate count, is at least an excellent corroborative criterion of quality. At present the test for coliform organisms is made routinely for certified milk in this country.

Possibly one of the reasons why the enumeration of these bacteria in milk has not been more generally adopted is the difficulty of counting them. In the hands of many workers, direct plating and counting of colonies has not been particularly successful when these bacteria are greatly outnumbered by other organisms. The dilution-extinction method should be satisfactory if a proper medium and a sufficient number of replicate tubes for each dilution are used. This procedure is one of the Standard Methods [1], but the details as given could be improved.

There are two media suggested by *Standard Methods:* the brilliant green-lactose-peptone-bile broth, and the sodium formate-sodium ricinoleate-lactose-peptone broth, hereafter in this paper designated bile broth and formate broth respectively. Lactose broths without inhibitory agents are entirely unsatisfactory for reasons well understood by workers who have dealt with the coli-aerogenes bacteria in milk. Since both these media contain inhibitory agents, it is quite possible that one medium might inhibit more of the coli-aerogenes bacteria than the other. It is difficult, and frequently impossible, to get an inhibitory agent in a medium at any concentration sufficient to inhibit *all* the undesired bacteria and also at the same concentration to permit the growth of *all* the desired bacteria.

It has been pointed out by pioneers in bacterial metabolism that those bacteria which are able to form H_2 and CO_2 from glucose anaerobically also form it from salts of formic acid, which is presumably an intermediate compound in glucose decomposition. It has been pointed out (9, 10) that we could therefore expect gas to be produced in formate broth by organisms capable of producing H_2 and CO_2 from glucose but not from lactose. Moreover, it has been shown (11) that *Proteus* or *Salmonella,* in the absence of *Escherichia* or *Aerobacter,* do produce gas in the formate broth.

The present work was undertaken to determine whether one of the two standard media suppressed more of the coli-aerogenes bacteria than the other, and thus gave more false negative tests.

* It has been impossible to locate Mr. Honaas, hence he has had no opportunity to read the manuscript of this paper.

Also, we wished to determine whether milk inoculated into either of the media frequently produced gas in tubes from which coli-aerogenes bacteria could not be isolated, that is, if one medium gave more false positive tests than the other. Preliminary work by Skinner and Honaas (11), published without data, while indicative, needed confirmation and extension.

The media used in the series to be reported here were prepared from Difco dehydrated products, but those used several years ago by Skinner and Honaas were prepared according to the published formulae. The data of the previous work are also included in this paper. Sufficient phenol red was added to the formate broth to give it a pale orange pink color. The broths were dispensed in ordinary Durham fermentation tubes and were never allowed to stand more than a week in the laboratory before they were used. Five different sources of fresh bottled raw milk were used. Never more than two samples were run in any one day. Decimal dilutions were made in the usual way, and 10 replicate tubes of each medium were inoculated with 1 ml. from each dilution. The same pipette was used to inoculate each of the 20 tubes with its 1 ml. aliquot from the proper dilution. Otherwise separate pipettes were used for each manipulation. The tubes were incubated at 37° C. for 24 hours, after which all tubes showing 10 per cent or more gas from all dilutions in which any tube showed gas *, except the highest, were counted as positive. Streak plates of standard eosin methylene blue agar were made from all tubes showing gas in these highest dilutions. All other tubes were incubated another 24 hours, after which all reincubated tubes showing gas were streaked on eosin methylene blue agar for the confirmed test. The colony most resembling *Escherichia* or *Aerobacter* from each plate was picked for a completed test. Each of these was inoculated into lactose broth and on an agar slant. If gas was produced, and the organism picked was a Gram negative non-spore-forming rod, the tube was counted as positive; otherwise it was kept for repurification and identification. We counted as positive, then, all tubes showing gas in lactose broth in 24 hours, except those of the highest dilution, and also we counted as positive all tubes of the highest dilution and all other tubes showing gas in the 24–48 hour period from which Gram negative non-spore-forming facultative rods capable of forming gas from lactose anaerobically were obtained. At first we followed the procedure of Standard Methods of picking the two colonies from each plate which most resembled *Escherichia* or *Aerobacter*. After streaking more than 800 plates, we found that invariably if one of the colonies picked was a coli-aerogenes organism, the other was also, and if not, the other likewise did not ferment lactose. Hence we discontinued the streaking of two colonies and used only one. We do not believe that this departure from Standard Methods has materially weakened the reliability of our data or our conclusions.

Fifty-four samples of milk were tested; 31 samples gave 102 false positive tests in formate broth, and 2 samples gave 7 false positives in the bile broth. By false positive tests we mean tubes which showed gas but from which lactose-fermenting aerobes were not isolated. Of the 102 false positive tests in formate broth, 82 were caused by *Proteus:* from the rest, non-gas producers were isolated. Of the 7 from bile broth, 5 were caused by

* By gas formation we mean gas produced as a result of anaerobic respiration collected in a gas trap. Although it is usually apparent that this is meant from the context of most reports, we agree with Breed (2, 10) that the mere statement that a certain organism produces gas is not accurate since probably most, certainly many aerobic and facultative bacteria, produce CO_2 by aerobic respiration. We do not believe that the term "visible gas" now occasionally found in the bacteriological literature, is any more accurate, however, since visibility is a property of very few gases, and anaerobically produced CO_2 and H_2 are not among these.

Proteus. We did not encounter any *Aerobacillus* or *Salmonella.* Thus it would seem that the formate broth gives more false positive tests than the bile broth. By *Proteus,* we mean Gram negative non-spore-forming facultative rods capable of producing gas anaerobically from glucose and sucrose but not from lactose. All our strains liquefied gelatine.

The most probable number of coli-aerogenes bacteria were estimated by the use of Halvorson and Ziegler's (5) three dilution code tables. Usually more than three dilutions were made and the code selected was one having as many positive as possible in the highest, and as many negative as possible in the lowest dilutions. The "count" as obtained by the use of each medium was determined and compared. We do not report the dilutions used as they differ for different samples, nor do we report the actual "counts", but instead we report a comparison of "counts" as obtained by each medium. We are not interested here in the numbers of organisms in milk, but rather in the ability of the media to detect all that are present. It must be remembered that false positive tests explained in the previous paragraph are not included in the counts. Naturally, since the number obtained is an approximation and not the true number, the two media did not yield the same count in every case. If the two media were equally effective in allowing growth of and gas production from the organisms in question, and neither medium was more inhibitory than the other, we should expect to get some samples showing the same count with both media, some showing a higher count with one medium, and some showing a higher count with the other. Now if chance only were operating, as would be the case if the two media were of equal value, we should expect as many samples higher in count by one medium as by the other, within limits determinable by statistical methods. In the first series, we have 23 samples which gave a higher count by the formate medium, 10 samples which gave the same by both media, and 21 which gave a higher count by the bile medium, a total of 54, of which 27 would be expected to be higher in each. Dividing equally the 10 samples which gave the same count in both media, 5 to each, we find that the actual number higher by the bile medium is 28. A test for the significance of this divergence of the actual from the expected can be made as follows. The divergence would have to be at least 7.3, or twice the standard deviation (s) for one to be reasonably certain (95 percent) that the divergence was not due to chance.

$$s = \sqrt{\tfrac{1}{2} \times \tfrac{1}{2} \times 54} = 3.6742$$

Since the divergence, which is 1, is less than the standard deviation (3.7), there is no reason to suspect that the divergence is not due to chance. Since it is less than the probable error, (2.5), there is good reason to believe that it is fortuitous.

In the same way we can test the significance of the results when the data from the former series are included. In these experiments, only five replicate tubes were employed. It is permissible to include these, since the number of tubes used will have no bearing on the likelihood of one medium being more favorable than the other: Total number of samples counted = 111; expected to be favored by bile broth = $55\frac{1}{2}$; actually favored by bile broth = $51\frac{1}{2}$; divergence from the expected = 4; s = 5.27; 2s = 10.54; p.e. = 3.55.

Here again we have no evidence that either medium can be expected to yield more false negative tests than the other. Table 1 shows the range of variation between counts by means of the two media. It will be noted that the former series gave a somewhat higher count in the formate broth. It was noted in the preliminary abstract that the difference was not significant. Actually, divergence from the expected was less than the standard deviation but it exceeded the probable error, as does that of the combined series.

bacteria in our tests in milk or water control work, it would seem that much experimental work should first be done to determine the natural habitat of all

TABLE 1

COMPARISON OF BILE BROTH AND FORMATE BROTH IN EFFICIENCY OF DETECTING *Escherichia-Aerobacter* IN RAW MILK

	Present series	*Former series*	*Combined series*
Number of samples of milk in which count by bile broth exceeded count by formate broth.			
1.0–1.5 times	11	7	18
1.5–2.0 times	4	6	10
2.0 times or more	6	6	12
Number of samples of milk in which count by formate broth exceeded count by bile broth.			
1.0–1.5 times	7	7	14
1.5–2.0 times	6	8	14
2.0 times or more	10	10	20
Number of samples of milk in which count by each medium was the same	10	13	23
Total number of samples	54	57	111
Number of samples in which count by bile broth was higher	26	25½	51½
Number of samples in which count by formate broth was higher	28	31½	59½
Number of samples expected to be higher by each medium	27	28½	55½
Divergence from expected	1	3	4
Standard deviation (s)	3.6742	3.7749	5.2678
2s	7.3484	7.5498	10.5356
Probable error (.67449s)	2.4782	2.5461	3.5531
Total number of tubes of media used in counts	3,240	1,710	4,950

DISCUSSION

We have found no evidence that either the standard formate or the bile broth gives significantly more false negative tests for coli-aerogenes bacteria. It is shown that the formate medium gives many false positive tests, and furthermore that a considerable proportion of these false tests are due to a species of *Proteus*. If the formate broth is to be used as an enrichment medium for *Escherichia* and *Aerobacter,* it is poorly chosen. However, if the test is intended to include *Proteus* and *Salmonella,* the latter of which we encountered twice in the first series, and not at all in the second, the medium should be suitable. However, before it is decided to include these species of *Proteus* and to determine the thermal death time under all conditions of pasteurization of the various strains that are likely to get into milk. Standard Methods states that the medium is to be used for the coliform group, and it was for these bacteria, "colon organisms", that it was suggested when it was first described in the literature (12).

In the preliminary abstract of Skinner and Honaas it was stated that the addition of phenol red to the formate medium made it possible to pick out tubes in which the gas produced was due to glucose fermenters. These tubes naturally became basic, since it is the sodium formate which is 'fermented". This was not found to be true in all cases in the series run more recently. In two tubes the medium became acid and *Proteus* was isolated, although no colonies resembling either *Aerobacter* or *Escherichia* were noted when streak plates were made from these tubes and none of the 10 colonies picked, proved to be coli-aerogenes organisms. In 5 tubes the medium became basic and both *Aerobacter* and *Proteus* colonies were found. In most cases, however, the indicator is of benefit, and in pure culture work it can be depended upon.

Our results are in line with those obtained by Farrell (3). He inoculated 66 samples of raw milk into formate and bile broths and obtained gas from 61 and 44 samples respectively. But he could recover *Escherichia* or *Aerobacter* in only 32 (52.5 per cent) of the 61 positive formate broth tubes as contrasted to 35 (79.5 per cent) of the 44 positive bile broth tubes. There was no significant difference in the number of confirmed tubes, 32 as opposed to 35, so there is no evidence that the formate broth gives more false negative tests. But the false positive tests, 29 from formate broth as opposed to 9 from bile broth, are believed to be significant. The percentage of completed tests might have been greater if the completed tests had been carried out after 24 hours incubation instead of after 48 hours. We calculated our data from the present series in a manner somewhat similar to that of Farrell, and it can be seen that the same conclusions may be reached. The total number of positive tubes with gas from the highest dilutions which showed gas was 186 from the bile broth, 179 (96 per cent) of which yielded *Escherichia-Aerobacter*. The formate broth showed 206 tubes with gas in the highest dilution (not necessarily the same dilutions as in the bile broth and therefore the total number is not comparable), of which 147 (71 per cent) yielded *Escherichia-Aerobacter*. These results, as well as those of Farrell, are not in line with those of Leahy (7), who, in testing pasteurized milk and ice cream (542 samples), got 219 positive tests (exactly the same) in each. There were approximately the same percentages of confirmation in each, 90 per cent from the bile broth, 88 per cent from formate broth. Details of the methods were not given. Possibly it will be found that *Proteus* is as readily destroyed by pasteurization as *Escherichia* and *Aerobacter* and therefore, if one group is destroyed, the other will be also. If this were the case, and Leahy used large aliquots of pasteurized products, adequately pasteurized and unrecontaminated products would have shown no gas, but improperly pasteurized or recontaminated products might have yielded one or both groups of organisms, and if both were present, the *Escherichia-Aerobacter* would show up on the completed test. The fact that Leahy got exactly the same number of positive tests with each medium would indicate that the aliquots which gave positive tests were probably heavily seeded.

Although the data of Noble and White (8) have been interpreted as showing that the bile broth is less productive than the formate broth, or, stated in another way, that it gives more false negative tests, an analysis of the data does not show this conclusion to be justified. These workers found that when 4 broth cultures of *Escherichia* were counted by means of 50 replicate tubes of bile broth and 50 of standard lactose broth, the bile broth gave lower counts in 3 out of the 4 cultures. If the two media were equally productive, the binomial distribution shows that it would happen, by chance, 5 times out of 16, that 3 or 4 of the 4 cultures would yield a lower count by the bile broth. The bile broth counts of the 4 samples were 89.7 per cent, 108.7 per cent, 66.9 per cent, 82.3 per cent of the standard broth counts. Fisher's (4) "method of t" demonstrates that the chance of such differences between counts with the two media being fortuitous is between 20 per cent and 30 per cent. Likewise the three formate broth cultures counted would yield a lower count than when counted in lactose broth three times out of three, by chance alone once out of 8 times. The count with formate broth yielded in the three cultures 95.9 per cent, 98.6 per cent, and 90.1 per cent of the count with standard broth. The chances of such differences between counts being fortuitous is between 10 per cent and 20 per cent. Thus there is no reason to suggest that formate broth is more productive than bile; rather from the data one could better conclude, but with little reason, that the formate broth is less productive, that is, that it gives more false negative tests.

We have implied that the method of determining the "count" of coli-aerogenes bacilli in milk as published in Standard Methods could be improved upon. We wish to point out that if 5 replicate tubes of 3 decimal dilutions are used, and the most probable number is determined from the tables of Halvorson and Ziegler, or the average number, ordinarily very close to the most probable number, is determined from other tables or from formulae, either number is only a rough approximation. For instance, if we get 5 postive tubes out of 5 inoculated with 0.1 ml., 5 positives inoculated with 0.01 ml. and 2 positives inoculated with 0.001 ml., the most probable number per ml. is 542. Actually, all we can state with 95 per cent assurance is that the count is somewhere between 152 and 1789 (6). The accuracy of the most probable number decreases precipitously as fewer tubes are used. We suggest the inclusion of tables in Standard Methods based on 10 replicate tubes per dilution, together with the limits to be relied upon, or a simple method to arrive at these limits. The same tables can be used for those who wish to use 5 replicate tubes, but it should be emphasized that if a "count" is justified at all, it would seem that the true number should be at least within 44 per cent and 250 per cent of the count. This is all that can be relied upon (95 per cent) when 10 replicate tubes are used. If 5 replicate tubes are used, the true number can be expected to be between 28 per cent and 330 per cent of the "count". This may be sufficiently accurate for certain types of work.

By using the tube racks described by Ziegler and Halvorson (13), the time consumed in making series of counts is less than in making a similar number of plate counts. One point might be mentioned here, that proper technique in making dilutions requires that a pipette having been dipped into a dilution should never be dipped into a less concentrated dilution, and that if 0.1 ml. is used in any procedure, this should certainly be added directly to the liquid and not be allowed to run down the side of the tube. One of the authors has seen individuals in different laboratories whose technique in ordinary plating procedure was beyond criticism, make these two fundamental errors in counting by dilution extinction methods. The excuse given was that "statistics eliminate the inaccuracies", certainly a prostitution of a branch of mathematics which is becoming more and more useful in all fields of biology.

SUMMARY

Dilution extinction counts of coli-aerogenes bacteria in raw milk with standard brilliant green bile broth and formate ricinoleate broth have demonstrated that neither gave significantly more false negative tests than the other. False positive tests were much more frequent with the formate ricinoleate broth and these were shown to be due largely to species of *Proteus*.

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(Continued on page 210)

POWDERED WHOLE MILK AND MILK PRODUCTS—THEIR POSSIBLE EFFECT UPON THE FUTURE OF THE DAIRY INDUSTRY *

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The preservation of food by drying has been practiced by man for many hundreds of years. Even the drying of milk is not new, for a product of this nature is described by Marco Polo, who traveled through Asia in the 13th century. Dried whole milk and milk products have been manufactured on a commercial basis in this country since before the last war. Although the sale of dried whole milk, cream, ice cream mix, and special milk products has been somewhat limited, the demand for powdered skim milk has increased rapidly. The global war has, of course, greatly increased our interest in all dried foods. Dried milk is in great demand for lend lease purposes and for feeding the armed forces. Dried milk occupies less valuable shipping space than does evaporated milk. It is more palatable, is not damaged by freezing, and when properly made, will keep six months or longer, even when stored under summer conditions.

Much speculation has been made as to what part dried milk and milk products will play in the dairy industry of tomorrow. Many have asked these questions: To what extent will consumers continue to use powdered whole milk after the war is over? To what extent will new consumers be found for this product? Assuming that powdered milk will gain in popularity, which markets will suffer the most—the evapprated or fresh milk markets? Will dried ice cream mix supply most of the ice cream manufacturers who are now buying prepared mixes? Will powdered milk solids continue to gain in popularity in the manufacture of bread, ice cream, and candy at the expense of sweetened and unsweetened condensed milk? To what extent will powdered butter milk solids replace other milk solids in food manufacture?

To answer properly these questions, one must consider certain fundamental principles affecting the operation of the dried milk industry. To be successful a new product or a new method must result in one or more of the following:

1. Improvement over the former product or method.
2. Greater convenience.
3. Lower cost.

The importance of any one of these factors as related to the others will depend to a certain extent on the kind of society we will have when this war is over. If our mass of working people are forced to compete with low-paid workers of China, India, and Japan, the cost item will be of greatest importance. Likewise if we suffer a serious and long depression, cost will be a very important factor. If we enjoy continued prosperity, convenience will be more important than cost. On the other hand, if the government practices a controlled economy so that free competition ceases, then it makes no difference which type of milk product the consumer is supplied with as it is assumed that by government subsidy any one branch of the industry will be protected against the competition of other branches of that industry which are more efficient, and therefore in a position to sell at a lower cost.

Quality of Dried vs. Fresh Milk

One of the limiting factors in the successful manufacture of powdered

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whole milk has been the development of a stale, oxidized flavor. Although the complete solution of this problem is not in sight, sufficient progress has been made to enable one to predict that after this war is over, methods for the manufacture of powdered whole milk of good keeping quality will be so far advanced that oxidation will cease to be a major problem. The flavor of reconstituted powdered milk does not equal the flavor of fresh milk of high quality and the discriminating buyer undoubtedly will continue to use fresh milk. However, for a large mass of people, the difference in flavor will not be great enough to cause them to refrain from the use of powdered milk.

The importance of good flavor in market milk has been stressed for several years because of its relation to the consumption of milk in fluid form. Milk dealers who put out bottled milk that is rancid, oxidized, sour, or has a strong feed, or sunshine flavor are playing into the hands of the drug store milk dealer of tomorrow. Powdered whole milk properly made and packed may be slightly cooked in flavor but is likely to be free of those off flavors so common to fresh milk. Studies have shown that both the condensing and drying operations remove certain undesirable flavors which may be present so that the reconstituted milk may be superior in flavor to the fresh milk.

Powdered milk of the future will probably be uniform in composition, one of the factors that has been instrumental in winning for evaporated milk the demand it has experienced in recent years. Uniformity is desirable not only for household use but for food manufacturing purposes as well.

Since the margin of profit on powdered whole milk is likely to be low, its manufacture will be largely in the hands of large operators. Because organizations of this size are usually in better position to exercise complete laboratory control over all operations, milk powder should produce a reconstituted milk of high sanitary quality. This will give this product a decided sales advantage over fresh milk supplies in some markets.

CONVENIENCE AS LIMITING SALES

One very important factor which will affect the sales acceptance of powdered milk is convenience. Housewives object to kitchen drudgery. This will be particularly true of the housewife of tomorrow, who today is a much saluted officer in the WAVES or WACS or who holds down an important defense job. Unsliced bread, regardless of how good it may be, cannot compete with sliced bread sold at the same price. One reason for the popularity of homogenized milk is that it does not have to be mixed before pouring. The reconstitution of powdered whole milk by the housewife must be made simple enough that she will not object to the labor involved in mixing the powder with water. It will be important that the industry manufacture a powder that is quickly, easily, and completely dissolved in cold water without elaborate equipment.

Certain conveniences in connection with the use of powder may be mentioned:

1. Several days or even weeks supply can be kept on hand.
2. No daily or every other day delivery of milk will be necessary.
3. Only periodic trips to the grocery or drug store to obtain a supply will be necessary.
4. It will not be necessary to wash and return bottles.
5. When traveling, camping, or going on picnics, the milk supply problem will be simplified.
6. Because of its highly concentrated form, the powder will have a wider range of uses in cooking and baking.

Whether or not the conveniences of the use of powdered whole milk will outweigh the inconveniences will probably depend upon each individual's viewpoint, as well as the success of the advertising program which the dried milk industry will use in marketing its product.

Relative Cost of Powdered and Fresh Milk

Probably the most important factor related to the future success of powdered whole milk will be the relative cost of a quart of fresh milk and a quart of reconstituted milk. Since powdered milk will be competing with evaporated milk as well as fresh milk, its price will need to be such that the cost of four ounces of powder will be approximately the cost of a 14½-ounce can of evaporated milk. Under present market conditions, this means that a quart of reconstituted whole milk would cost the consumer 9–10 cents. There is no question but that powdered whole milk would find a ready market at this price today.

On the basis of large scale production it should be a simple matter for powdered whole milk to compete with fresh milk for the following reasons:

1. By handling large quantities daily only a small profit margin will be necessary.
2. Powder can be produced in those sections best suited for the economical production of milk.
3. The high rent and labor costs of the milk producer located in the city milk shed can be avoided.
4. There is less labor, heat units, and refrigeration applied per pound of solids in giving milk powder form and place utility than is necessary for fluid milk.
5. The labor used in the processing of powdered milk will usually be less costly than that used for processing fluid milk.
6. Since milk powder will be sold largely through stores, the cost of marketing will be less than that of fluid milk sold on the milk route.
7. Unreasonable milk ordinances are not so likely to be a factor in increased production costs in the case of powdered milk.
8. The concentration of dairying in those sections best suited for this industry will result in the establishment of a highly specialized type of producer who should be able to produce milk of high quality at a lower cost.
9. The manufacture of milk powder will escape a number of minor costs which confront the city distributors of fluid milk such as:
   a. High property taxes.
   b. Returns from stores and routes.
   c. Local advertising.
   d. Local charity solicitations.
   e. Dating regulations.
   f. Losses in handling.
   g. Local licenses and permits.

Oxidized Flavor a Major Problem

Much criticism has been made of the powdered whole milk served our men in service—and rightly so. Some of it has been fishy and much of it has been oxidized in flavor. While studies of this problem have been under way for a good many years, a great deal was not known about methods of control. Few universities have been equipped to study the problem, so that most of the experimental work has been done by industrial research laboratories. Studies on this problem are under way at the University of Illinois at the present time. While the studies are by no means completed, certain interesting trends have manifested themselves at this time. These data might be summarized as follows:

1. High forewarming temperatures (170° F., 20 minutes—250° F., 1 second) are beneficial.
2. High concentration of the milk is desirable.
3. Copper must be reduced to a minimum (1.5 p.p.m. or less).
4. Large particle size powder keeps better than extremely fine powder.
   (a) Low spray pressure.
   (b) Low spray temperature.
   (c) Low homogenizing pressure.
5. Powder packed hot keeps better than packed cold.

6. Anti-oxidants such as wheat germ oil and sodium ascorbate will retard oxidation.
7. Packing with nitrogen is essential for the manufacture of good keeping powder.
8. In much of the commercial packing there is not sufficient removal of air to prevent oxidation from taking place fairly rapidly. The oxygen level should be one-half percent or less.
9. Re-gassing after 24 hours is helpful in retarding oxidation.
10. Peroxide value measurements will not accurately predict the keeping quality of the powder nor will it accurately indicate its immediate quality.
11. Storage temperature is a very important factor in the keeping of the powder. Powder keeps best at low temperatures.

DRIED MILK PRODUCTS IN THE POST-WAR PERIOD

Much of what has been said for powdered whole milk will hold true for other dried milk products. The excellent program of the Dried Milk Institute will continue to build up sales for dried milk solids. Most bakers prefer dried milk to sweetened condensed milk for bread making. This product will probably gain in popularity in the ice cream industry, and in certain milk sheds it will be used for the manufacture of cultured milk and chocolate milk drinks. Powdered sweet cream butter milk has proven very satisfactory for mix manufacture. Powdered cream will prove popular as a companion product for powdered whole milk. Large quantities of powdered ice cream mix are being made for the government at the present time. The use of this product in the post-war period by counter freezer operators and certain of the smaller manufacturers seems logical. Special dried milk products, such as milk drinks, baby foods, and ice cream mix for home use undoubtedly will be developed.

ADVERTISING WILL BE IMPORTANT

To sell successfully dried milk products to the housewife will require a tremendous amount of expensive advertising. The use of these products will be a decided departure from the conventional way of doing things. To convince the housewife that she should change from getting her milk in bottles to getting it in packages will necessitate the cooperation of some of our most expert sales organizations. I would hesitate to say it cannot be done, for items much less useful to the health and happiness of the human race have been firmly established on the dealer's shelf through the wisecracks of high-priced radio talent.

ENTHUSIASM OF INDUSTRY IMPORTANT

The enthusiasm of the dairy industry itself will be an important factor in determining the success of the powdered whole milk in the post-war period. As previously indicated, the manufacture of dried milk naturally gravitates into the hands of a few large producers. Many of these organizations are also interested in the manufacture of either powdered skim milk or evaporated milk or both and they may even be distributors of fresh milk. Under such conditions they naturally will not be so interested in developing methods of manufacturing and marketing a product competitive with their present line. There would also be the question of developing new sources of raw milk, as the present supplies are likely needed for the present market. If there is a continued high level of production in the post-war period and a decreased demand, it may be advisable, however, to develop new products as a means of utilizing this surplus milk to advantage.

Another point to consider is the possibility of competition from foreign manufacturers such as those located in Canada, New Zealand, and Australia, who undoubtedly have made rapid strides in the manufacture of powdered whole milk during the war and who will be interested in finding suitable outlets abroad for their surplus solids. Competition of this type and that which may come from certain enthusiastic domestic promoters of dried foods may lead to a general interest in the expansion of the dried whole milk industry in the United States.

FUTURE SUCCESS OF DRIED MILK WILL DEPEND LARGELY UPON RESEARCH

The predictions made regarding the future of dried whole milk and milk products in the post-war period are based upon the assumption that through research the industry will be in a position to supply consumers with products of satisfactory quality. Much is yet to be done in the development of satisfactory methods of manufacture. There is also need of development of milk drying equipment. Rapid methods for removing the oxygen from the packaged powder, charging it with nitrogen, and sealing without exposure to the atmosphere are greatly needed. The economical production of dried whole milk and milk products should be the goal of our research workers of today so that after the Axis powers no longer exist, we will be ready to contribute our part to the building of a post-war industry that is economically sound.

ENUMERATION OF *Escherichia* AND *Aerobacter*

(Continued from page 205)

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A Cheese-borne Epidemic of Typhoid Fever*

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THE County of Champlain is on the northern shore of the St. Lawrence River, between Quebec and Montreal. It may be considered the geographical centre of the Province. Its county town, Cap de la Madeleine, is the half-way mark on the road from Quebec to Montreal. Bounded to the south by the St. Lawrence river, the county stretches for a distance of twenty-seven miles from the City of Trois-Rivières and the St. Maurice river, which form the western boundary, to the limit-line of the County of Portneuf in the east, and northwards for a distance varying from eighteen to twenty-five miles up to the County of Laviolette. The population in 1941 was 29,338.

During the fall of 1941, three neighbouring municipalities of the eastern part of the county experienced an epidemic of typhoid fever which began in Batiscan, a village of 1,231 population, located eighteen miles east of Trois-Rivières (see figure I). The other municipalities attacked were La Pérade, population 2,477, five miles east of Batiscan, and Ste. Geneviève, population 1,590, four miles northwest of Batiscan. From September 1st to 30th, 34 cases of typhoid fever were reported from these localities. In addition 6 cases associated with this outbreak occurred in Montreal and Boucherville. A total of 40 cases was thus registered, with 6 deaths—a mortality rate of 15 percent. Table I presents the cases by date of onset.

THE BATISCAN EPIDEMIC

On September 18, 1941, we first learned of the existence of two cases of typhoid fever in the Municipality of Batiscan, through the reports of the Provincial Laboratory. Both cases were investigated on the same day.

The first patient, L.L., had worked at the cheese and butter factory R. at Batiscan until July 1st, and later at the butter factory S.C. in the same locality from July 1st to September 10th. This young man felt the first symptoms of the disease on or about September 1st, but kept on working until the 10th of the month.

The second case, C.M.P.E., also reported on September 18th, knew definitely the date of onset of his illness, September 1st. The two cases were thus concurrent. During the epidemiological investigation of C.M.P.E., it was learned that his father, C.M.C.E. (case no. 13), and four members of a neighbouring family (cases 4, 7, 8 and 9), were sick and they were visited without delay. A diagnosis of typhoid fever was made and the family doctor was advised of the diagnosis and instructed to notify the families concerned. It is to be noted that the first patient, L.L., had a medical consultation only twelve days after the onset of the disease, while C.M.P.E. waited for nine days before calling a physician.

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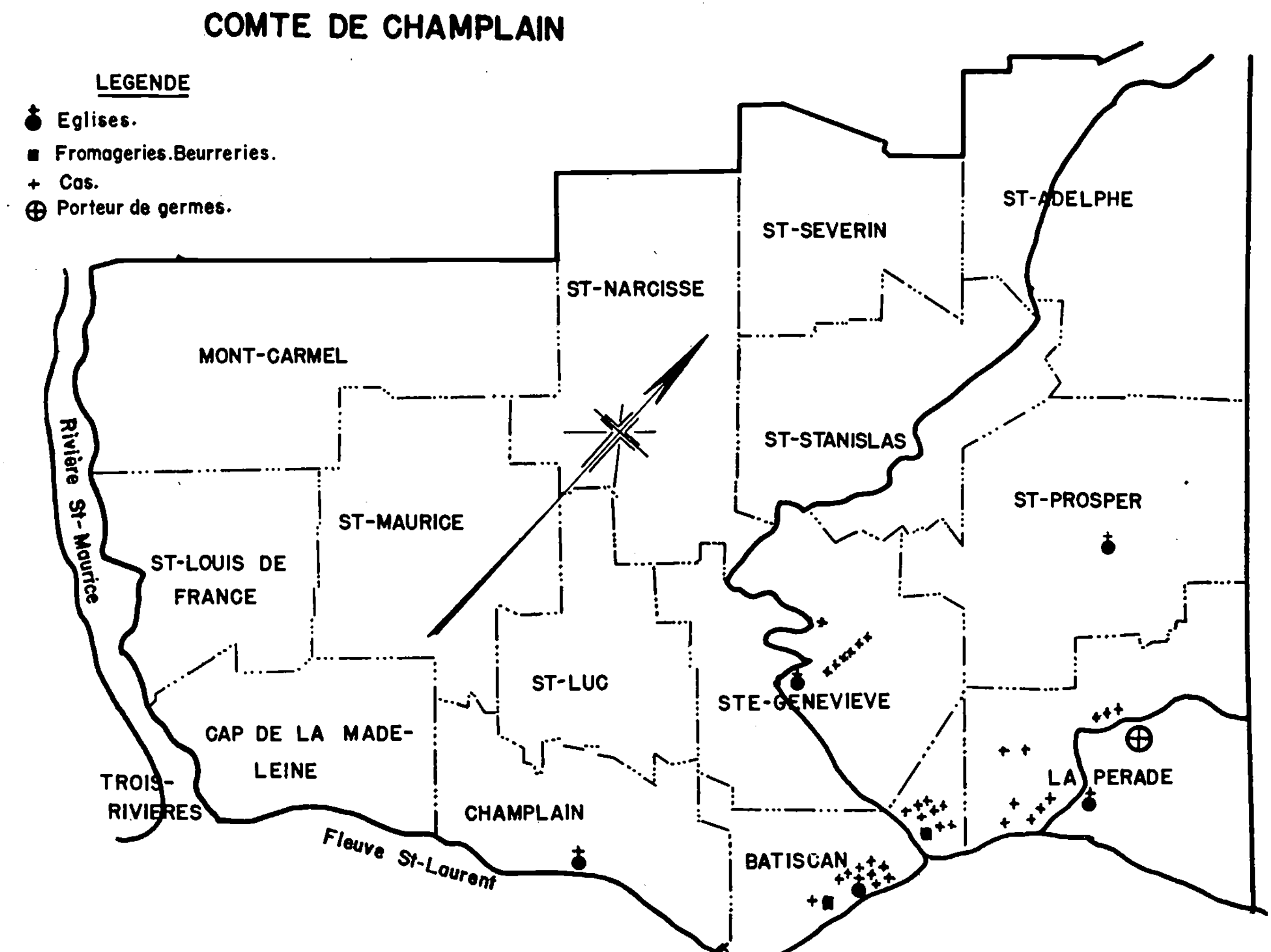
COMTE DE CHAMPLAIN
LEGENDE
Eglises.
Fromageries.Beurreries.
Cas.
Porteur de germes.
MONT-CARMEL
ST-NARCISSE
ST-SEVERIN
ST-ADELPHE
ST-STANISLAS
ST-MAURICE
ST-LOUIS DE FRANCE
ST-PROSPER
ST-LUC
STE-GENEVIEVE
CAP DE LA MADE-LEINE
TROIS-RIVIERES
CHAMPLAIN
BATISCAN
LA PERADE
Rivière St-Maurice
Fleuve St-Laurent

FIGURE I

TABLE I

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC
SEPTEMBER, 1941

Cases by Date of Onset

Case No.	*Initials*	*Age*	*Sex*	*Deaths*	*Onset*	*Municipality*
1	L.L.	21	M		1	Batisçan
2	C.M.P.E.	20	M		1	Batiscan
3	L.J.G.	8	M		6	La Pérade
4	C.L.	23	M		9	Batiscan
5	B.M.	18	F	x	9	Montreal
6	D.D.V.	27	F		10	Montreal
7	C.C.	30	M		11	Batiscan
8	C.J.	64	M		12	Batiscan
9	C.D.C.	22	F		12	Batiscan
10	B.G.	11	M	x	12	Ste. Geneviève
11	B.R.	16	F		12	Ste. Geneviève
12	C.H.	44	M	x	14	Batiscan
13	C.M.C.E.	47	M		14	Batiscan
14	B.T.	17	F		14	Montreal
15	R.G.	22	F		15	Ste. Geneviève
16	C.P.	12	M		16	Batiscan
17	C.R.	19	M		16	Batiscan
18	C.J.	6	M		16	Batiscan
19	B.L.	14	F		16	Ste. Geneviève
20	L.C.	27	M	x	17	La Pérade
21	S.-O.D.	17	M		18	Batiscan
22	C.M.	24	M		18	Batiscan
23	B.P.	17	M		19	Batiscan
24	L.G.	22	F		19	La Pérade
25	L.D.A.	35	F		19	La Pérade
26	L.J.	27	M		19	La Pérade
27	C.J.A.	4	M		20	Batiscan
28	B.T.	34	F		20	Ste. Geneviève
29	B.P.	17	M		21	Ste. Geneviève
30	N.B.	22	M		22	Batiscan
31	L.J.	7	M		24	La Pérade
32	M.M.	13	M		24	La Pérade
33	H.A.	31	M		25	La Pérade
34	L.M.C.	25	F	x	25	Batiscan
35	L.Y.	18	F		25	Montreal
36	H.Y.	30	F		25	Boucherville
37	G.A.	46	M	x	26	Boucherville
38	B.D.A.	57	F		27	Ste. Geneviève
39	L.A.	41	M		28	La Pérade
40	M.A.	18	M		30	La Pérade

Of these 7 cases of typhoid fever, 6 cases (2, 4, 7, 8, 9 and 13) were living in an area in which a private syndicate supplied water to 19 families, as well as to the R. Cheese and butter factory. The other case (case 1) worked in the same area. The water system was poor; both the intake and the watershed were not satisfactory, and although improvements had been requested, nothing had been done. It was obvious that this water supply might be the cause of the epidemic. Every patient used it, including L.L. on his visits twice a week to the R. cheese and butter factory where he drank water many times. All the cases could be explained very easily—perhaps too easily not to leave doubt as to the cause of the epidemic.

SUMMARY OF CASES

Data concerning the age, sex, date of onset, etc., of the 7 cases at Batiscan are presented in table II. The ages ranged from 20 to 64 years, with four persons in the 20–24 age-group. Six cases were in males. All the cases had

TABLE II

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC, SEPTEMBER, 1941

Summary of Cases at Batiscan

Cases	*Age*	*Sex*	*Date of onset* (1)	*Lab.*	*Type*	*Water* (2)	*Milk*	*Butter* (3)	*Cheese* (3)	*Butcher*	*Grocer*	*Baker*
L.L.	21	M	1	F.+	D1	S	Labissonnière	R	R	Baril, Léveillé	St. Cyr, Bailly Marquin	Lachance, Germain, Trottier
C.M.P.E.	20	M	1	F.+	D1	S	Farm	R	R	Croteau, Léveillé	Arcand, Roy	Croteau, Léveillé
C.L.	23	M	9	F.+	D1	S	Farm	R	R	Léveillé	Arcand, Roy	Lachance
C.C.	30	M	11	F.+	D1	S	Farm	R	R	Léveillé	Arcand, Roy	Lachance
C.J.	64	M	12	F.+	D1	S	Farm	R	R	Léveillé	Arcand, Roy	Lachance
C.D.C.	22	F	12	F.+	D1	S	Farm	R	R	Léveillé	Arcand, Roy	Lachance
C.M.C.E.	47	M	14	F.+	D1	S	Farm	R	R	Croteau, Léveillé	Arcand, Roy	Frigon, Lachance

(1)—September, 1941. (2)—Private company owner of water system. (3) "R"—Initial of owner of cheese and butter factory.

the onset of their disease in the first fortnight of September: 2 in the first week, 4 in the second, and the seventh case on the first day of the third week. Laboratory specimens were submitted for each patient and *Bact. typhosum* was isolated from the faeces. An attempt was made to type these strains by the method of Craigie and Yen, but the strains were found to be resistant to all the phage preparations available at that time. Each patient had drunk water supplied by the private syndicate, and all but one consumed milk and cream from his own farm. Butter, cheese, meat, groceries and bread were supplied by the few local dealers. There was no new nor old case of typhoid fever in these dealers' homes and the only common vehicle of infection appeared to be water.

EXTENSION OF THE OUTBREAK

A few days later, inoculation against typhoid fever was offered to the 19 families supplied with water by the syndicate. On the day of the first injection, September 22nd, it was learned that there were doubtful cases in the Village of Batiscan. These new cases were visited without delay. Five new cases (nos. 12, 17, 18, 22 and 23), with 4 in one family, now had to be accounted for. Our theory of water-borne infection could no longer be substantiated, as the village is supplied by another system and these new patients had not drunk water provided by the syndicate. We had, therefore, to look elsewhere for the real cause of the epidemic.

Case histories were taken as soon as possible. It was established that each of the 12 known cases had eaten dairy products from the R. butter and cheese factory, on September 22nd. Both these foods could be incriminated as they were the only common foodstuffs. The butter, although made from pasteurized cream, had been churned in doubtful water supplied by the syndicate. The cheese, of the cheddar type, had been made from raw milk and consumed in the green stage, some ten days after manufacture. As the infection was spreading, vaccination was offered to the population of Batiscan, while a serious investigation progressed at the R. factory. The plant was rather filthy and foul with flies. On September 25th the owner was ordered to cease the sale of butter and cheese; the products were impounded in a special warehouse, and the establishment was cleaned and disinfected under the supervision of our engineer and our sanitary inspector. The owner and the employees were questioned very carefully, but in none of them could a history of previous typhoid be suspected. Nevertheless, samples of faeces and urine were taken. The findings are presented in table III. The 6 persons submitted 20 samples, all of which were negative.

TABLE III

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC, SEPTEMBER, 1941

Laboratory Examination of Specimens from Employees of the R Factory at Batiscan

Employee	*No. of samples*	*Results*
Owner	2	Negative
Cheese-maker	5*	Negative
First helper	3	Negative
Second helper	3	Negative
Third helper	4	Negative
Fourth helper	3	Negative

* Administration of cholagogue.

EPIDEMIOLOGICAL FINDINGS

A little later, new cases were detected in or reported from Batiscan, Ste. Geneviève, La Pérade, and even Montreal. A detailed epidemiological investigation of each of the 40 cases was made.

The map of the County of Champlain (figure I) shows the geographical distribution of cases occurring in the territory served by the County Health Unit. In Batiscan, focus of the epidemic, there were 17 cases; in La Pèrade, 10; and in Ste. Geneviève, 7. To this total of 34 cases must be added 6 extra-territorial cases—4 in Montreal and 2 in Boucherville. The presence of a known typhoid carrier in La Pèrade is also indicated on the map.

DISTRIBUTION OF CASES ACCORDING TO DATE OF ONSET

The distribution of cases according to date of onset is presented in figure II. The epidemic curve of this bar diagram climbs rapidly to a peak dur-

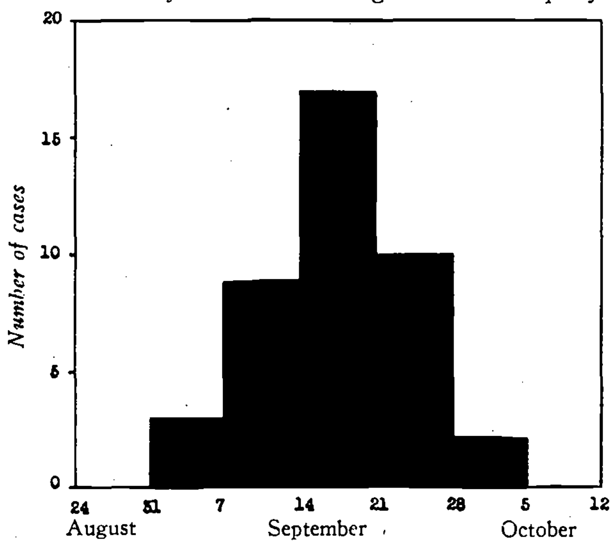

FIGURE II

Distribution of cases by date of onset ing the week of September 14th and falls back to the abscissae in the same period of time, indicating a massive and well-limited infection.

As the investigation had not brought to light any abnormal number of dysentery cases, the premonitory sign of a water-borne typhoid outbreak, nor any secondary cases covering a period of weeks, our research was directed towards a food infection.

Age and Sex Distribution of Cases

The age distribution of the 40 cases (table IV) is very interesting. There was only one case in the age-group 0–4 years, and 3 in the age-group 5–9 years. Thirteen cases (one-third of the total number) occurred in the group 10–19 years, and 12 cases (30 percent) in the group 20–29 years. Thus nearly two-thirds of the cases were in these two groups. In the group 30–39 years there were 5 cases (12.5 percent) and in the group 40–49 years, 4 cases (10 percent). Only 2 cases (5 percent) were over 50 years of age. As to sex, 65 percent of the cases were in males and 35 percent were in females. The 10–29 age-group suffered a heavier attack, as is often the case in water-borne contamination or in an infection caused by a food other than milk. The only case in the infants' group disproved a theory of milk-borne infection. On the other hand, the rather high proportion of cases (27.5 percent) occurring in those over 30 years of age would be abnormal in a water-borne infection, and in the latter the cases would be more evenly distributed by sex.

Laboratory Confirmation of Cases

All the cases were confirmed by the laboratory. *Bact. typhosum* was isolated in 36 cases through cultures from faeces and in 4 cases from blood culture. Among the latter persons, all living outside the county, there were 2 deaths. As in each case *Bact. typhosum* was isolated, a special study of positive serum agglutinations was not included, since it is not possible to interpret such findings without full clinical information relating to each case.

The distribution of deaths by age and sex is presented in table V. A high fatality of 15 percent was experienced in this outbreak, indicating a heavy systemic infection. One of the patients, L.M.C. (case no. 34), presents a history worthy of mention. This

TABLE V

Typhoid Fever, Champlain County, Quebec, September, 1941

Distribution of Deaths by Age and Sex

No.	*Case*	*Age*	*Male*	*Female*
5	B.M.	18		x
10	B.G.	11	x	
13	C.H.	44	x	
20	L.C.	27	x	
34	L.M.C.	25		x
37	G.A.	46	x	
	6 deaths		4	2

TABLE IV

Typhoid Fever, Champlain County, Quebec, September, 1941

Distribution of Cases by Age and Sex

Age groups	*Cases*	*Percentage*	*Male*	*Female*
0–4	1	2.5	1	0
5–9	3	7.5	3	0
10–19	13	32.5	8	5
20–29	12	30.0	7	5
30–39	5	12.5	2	3
40–49	4	10.0	4	0
50 and over	2	5.0	1	1
All ages	40	100.0	26 (65%)	14 (35%)

girl had received three doses of typhoid-paratyphoid B vaccine of ¼, ½ and 1 cc. during February, 1941, six months before the beginning of the epidemic. It is reasonable to assume that she had developed a good immunity before the epidemic, so that a massive infection was necessary to cause a severe form of the disease resulting in death.

HISTORY OF VACCINATION

Of the 40 cases, 8 had received T.B. vaccine, 4 just before the first cases appeared and 4 at the beginning of the outbreak (table VI). One patient had been vaccinated in 1932 and 2 in 1934, in addition to case no. 34, previously mentioned. The disease was mild in 2 cases, severe in 5, and fatal in 1. It is not felt that the vaccine had any influence on the course of the disease, whether the patients had been previously vaccinated or had received the vaccine just at the onset of their illness.

In the population of 1,000 families exposed to the infection, only 15 were attacked. This familial attack rate of 1.5 percent establishes a well-localized infection. However, in the families attacked, the number of patients is important, another indication of a virulent method of infection. Of the 15 families, 8 had 1 case each and 7 had a total of 32 cases—an average of 4.6 patients per family. One family had 2 cases, two families 3 cases, one family 5 cases, two families 6 cases, and one family 7 cases.

DISTRIBUTION OF CASES ACCORDING TO WATER SUPPLY

The private syndicate at Batiscan supplied 9 cases with water analyzed as bad. Eight cases were served by the public system at Batiscan, 7 at Ste. Geneviève, 6 at La Pérade, and 4 in Montreal. Bacteriological examination of samples of water from these different water-works was favourable. Two cases were supplied by the water system of Boucherville, and 4 cases by water from two wells; analyses of all three were bad. The cases were therefore supplied from eight different sources, and 25 of them had drunk only safe water. Water then had to be excluded as the possible cause of the epidemic.

MILK AND CREAM SUPPLIES

Twenty-six cases used milk and cream exclusively from their own farms, which numbered 10. The other 14 cases were supplied by 7 different distributors. Among these 14 cases were 6 who drank pasteurized milk only. Milk and cream were distributed by 17 different dealers. Two of these distributors had 4 cases each among their customers, one had 2 cases, and four had 1 case each. The epidemic therefore could not be traced to milk and cream supplies.

BUTTER SUPPLY

Sixty percent of the cases, or 24, used butter sold by the R. factory, and the other 16 were served by five dif-

TABLE VI

TYPHOID FEVER, CHAMPLAIN COUNTY, QUEBEC, SEPTEMBER, 1941

History of Vaccination of Cases

No.	*Case*	*Date of inoculation*	*Doses*	*Onset September*	*Severity of disease*
14	B.T.	Sept. 17, 1941	1	14	Severe
24	L.G.	1934	3	14	Severe
25	D.L.A.	Sept. 25, 1941	1	19	Severe
32	M.M.	1934	3	24	Mild
33	H.A.	1932	3	25	Mild
34	L.M.C.	February, 1941	3	25	Fatal
35	L.Y.	Sept. 17–24, 1941	2	25	Severe
39	L.A.	Sept. 25, 1941	1	28	Severe

ferent dealers. The distribution of the cases was as follows: Manufacturer R., 24 cases; S.C., 1 case; P., 2 cases; C.S.C., 4 cases; J., 7 cases; and V., 2 cases.

Of these six butter-makers, all of whom manufactured a pasteurized product, only one, R., could be suspected, as 24 of the patients were customers of his. It was established, however, that up to the 26th of August the butter sold by the R. factory had been made in the S.C. factory at Batiscan, but wrapped in an R. paper label. Before this date, the R. factory had produced cheese only. The butter was salted, pasteurized, and sold only a few days after manufacture. There was no doubt that another source of contamination was yet to be found in the R. plant to explain the large number of cases among its customers. As it was established that 15 patients had not even tasted this butter and that only one case might be attributed to its consumption when sold under label S.C., it was obvious that the same butter in label R. was not responsible for the epidemic.

Meat Supplies

Six butchers supplied the meat used by 37 cases, while 3 patients used products from their own farms. No new nor old case of typhoid fever could be traced to the butchers' families. In any event, one could not conceive that six butchers, living in five different municipalities, could at the same time be the cause of typhoid outbreaks among their respective patrons. Butcher M., of La Pérade, who had the largest number of cases (14) among his customers, served only a third of the cases. Butcher shops could therefore not be considered the agents of propagation of this epidemic.

Groceries

Of the fifteen grocers, one could be credited with 12 cases, one with 10, one with 9, and one with 7. Again, no common factor of contamination could be found.

Bread Supplies

Of the eight bakeries, one was associated with 17 cases, two with 6 cases each, one with 4 cases, two with 2 cases, and two with 1 case each. Nine patients bought bread from more than one baker. Ten cases were in families that baked their own bread.

Patient L.A. (case no. 39) was a delivery man for the L. bakery, whose products were consumed by 17 patients. There was a previous case in the same family, D.L.A. (no. 25), whose date of onset was September 19th. Three days later, delivery-man L.A. stopped work at our request. He developed typhoid fever six days later. He had therefore to be accounted a victim, and not a cause, of the epidemic.

Pastries bought in restaurants were made by large bakeries. Their methods of manufacture were sanitary, their products were sold in the entire eastern section of the province, and they were of good quality. The principal distributor, V. of Ste. Marie, Beauce County, was the object of a special investigation by one of the authors during the months of August and September. No case of enteric fever among the customers of V. could be traced to the use of his pastries.

The other two dealers, Va. and B., both of Quebec, also had sanitary bakeries. Of the patients, only 8 used pastries manufactured outside their homes. Thus the outbreak was not attributable to bread and pastries.

Ice Cream, Sea Foods, and Restaurants

There was no use of ice cream in 13 instances. Five patients ate the product of an unknown manufacturer in different localities. The remaining 22 cases consumed ice cream manufactured by three large and reliable firms, which marketed a pasteurized product in many cities and numerous counties. No case of typhoid could be traced to this food beyond the limits of the three municipalities attacked.

Oysters and other sea foods were not consumed by even one patient. Only 8 patients ate occasionally in restaurants. No history of typhoid could be found in the families of the owners of the restaurants.

CHEESE SUPPLY

Each of the 40 patients had eaten cheddar-type cheese manufactured by the R. factory. The products of C. and K. in addition to cheese supplied by R. were consumed in one family with 4 cases; and cheese made by T. was used, along with the cheddar-type supplied by R., by two families in which 1 case each occurred. The three brands, C., K., and T., were pasteurized cheese. The Canadian cheddar-type cheese, made by R., was the only food common to all the patients.

The epidemiological history of Doctor B.'s family, from Montreal, established positively that cheese was the vehicle of infection. On September 1st this physician made a short trip to Ste. Geneviève, and before returning to the metropolis bought fifteen pounds of the R. cheese. We do not know exactly how many people had eaten cheese from this portion, but 7 persons developed typhoid fever: B.M. (case no. 5), B.T. (no. 14), L.Y. (no. 35), D.D.V. (no. 6), G.E. (no. 37), and H.Y. (no. 36), all living in Montreal or Boucherville; and R.G. (no. 15) of Ste. Geneviève. Two of these died. Case no. 15, R.G., a niece of the doctor, accompanied her uncle to Montreal, remaining there from September 1st to 13th. There she ate a small portion of the cheese. Two days after her return home, she came down with typhoid fever.

There can be no doubt that the cheese produced by R. in the latter part of August and the beginning of September was contaminated; but how could this contamination be explained? Should it be attributed to a typhoid carrier working in the cheese factory? to the water system supplying the plant? or to polluted milk used in the manufacture of the cheese?

But it has already been related that typhoid bacilli could not be isolated from samples of faeces submitted by the employees of the cheese factory. None gave even a doubtful history of typhoid fever. For these reasons, it was not possible to prove the presence of a typhoid carrier in the R. plant.

The water of the plant comes from a badly protected supply. Contamination of this water with *Bact. typhosum* would, of course, be possible, but there was not a single case of typhoid fever on the watershed. Moreover, if contamination had occurred, there would have been at least one case among the 14 families who used this water, as 9 cases developed in the 5 other families who used the same water and also had eaten cheese from the R. factory. On the other hand, the equipment of the factory was sterilized with steam and there was no addition of water to the milk during the process of cheese-making. Finally, even if this water had been contaminated with *Bact. typhosum*, it could not have been the source of infection for the patients living in the other localities.

The milk used in the manufacture of cheese could easily have been infected by a typhoid carrier or by a patient. The milk used in the R. factory was produced on 80 farms, 39 at Batiscan and 41 at La Pérade. There was no history of typhoid amongst these people, with the exception of a known carrier, who had received proper instructions concerning her condition and her duties. While investigating the case of L.J.G. (no. 3), son of a milk producer for the R. plant, we learned from his mother that two other children of the family, Ce, and Ct., had suffered from a disease of doubtful aetiology during August, 1941. L.J.G.'s attack of typhoid fever had been rather mild; he was feverish for two or three days and his may be termed an ambulatory case. His brothers, Ce. and Ct., had had the same form of disease. The elder one, Ct., was assigned to the milking of the cows and resumed this work after recovery from a few days' illness.

Eight specimens of faeces from Ce., taken between October 11 and November 14, 1941, proved negative, as did five specimens from Ct., taken during the period from October 10th to November 17th.

In spite of these negative results, the possibility of typhoid fever in these children could not be excluded, as more than two months had elapsed since the onset of their disease. Samples of blood were taken for sero-agglutination by different antigens. The results are presented in table VII.

TABLE VII

BLOOD SPECIMENS FROM CHILDREN "L."

Initials	*Antigens*	*Dilution*	*Results*
Ce.	Typhosum O	1/50	Slightly positive
	Typhosum H	1/75	Slightly positive
	Typhosum Vi	1/25	Slightly positive
Ct.	Typhosum O	1/375	Strongly positive
	Typhosum H	1/375	Strongly positive
	Typhosum Vi	1/50	Strongly positive
	B. Paratyphosum B.	1/375	Strongly positive
	B. Dysenter. Newcastle	....	Positive

Analysis of the blood sample submitted by Ce. might indicate that he was a typhoid carrier even if he had not had the clinical form of the disease. However, he was never vaccinated and eight specimens of faeces were negative. Ct. received two doses of typhoid vaccine, ¼ cc. at the end of September and ½ cc. at the beginning of October. This explains the presence of agglutinins in a high dilution. On November 3rd a bacteriological report on a sample of faeces of Ct. indicated the presence of *B. dysenteriae, newcastle* type, though there was no clinical evidence of recent dysentery.

Could this be the explanation of the doubtful disease in the L. family during the month of August? It must be admitted that the investigation in connection with this family had not been successful. They could not be accused of being the cause of the epidemic, but a contrary theory could not be disproved.

LABORATORY INVESTIGATION

A large number of faeces, 443, from the patients and from the doubtful cases was sent to the Provincial Laboratory for investigation. From these, 161 cultures of *Bact. typhosum* were obtained, all of which proved to be resistant to a new series of phage preparations supplied by Dr. J. Craigie. This new series of phages for the typing of *Bact. typhosum* is prepared in accordance with the schema proposed by Craigie (1) in which Vi forms are subdivided in α, β, and γ groups. The α group includes the stable, and therefore epidemiologically significant, types which are fully susceptible to type II phage. The β group comprises partially resistant types of uncertain identity. The α group includes type D_1 and those phage resistant forms formerly designated as "imperfect V forms". Many of these owe their resistance to the fact that they carry a phage of low and limited lytic activity (2).

It was not possible to investigate the 6 cases living in Montreal and Boucherville as regards the type of *Bact. typhosum* causing their infections. Cultures isolated from 30 of the other 34 patients were investigated by Dr. Craigie, who identified them as type D_1 by phage typing and also demonstrated in all the presence of symbiotic phage characteristic of this type and some other γ types (2). All the cultures isolated from the same person were of the same type. The 4 patients for whom the typing could not be made belonged to families in which there were mutiple cases and the cultures isolated from these other familial cases were all typed as D_1.

PERIOD OF INCUBATION

To establish the most probable period of incubation during this epidemic, 4 cases had to be studied more intensively. Of these, 3 lived in Montreal and became ill after the consumption of a portion of the cheese bought by Dr. B. on September 1, 1941.

First Case, B.M. (no. 5). The earliest date on which this person could have eaten the contaminated cheese was September 1st, and the first symptoms of the disease appeared on September 9th. Incubation period: 8 days.

Second case, D.D.V. (no. 6). This lady did not eat cheese before September 1st and the onset of the disease was placed at the 10th of the same month. Incubation period: 9 days.

Third case, B.T. (no. 14). This young girl may have consumed the contaminated food from the first day of September, and the disease began on September 14th. Incubation period: 13 days.

Fourth case, C.L. (no. 4). The history of this case is more conclusive, because cheese had been consumed only once. On Labour Day this young man went to Batiscan to pay a visit to his parents and there he ate a piece of cheese. On September 9th he felt the first symptoms of his illness. Incubation period: 8 days.

One can gather from these histories that the minimum incubation period of the disease was 8 days. On the other hand, it is impossible to state the maximum period, as the patients ate cheese on many different days. These four cases are the only ones in which the date of consumption of the product could be established; however, the histories of the other patients lead us to believe that the incubation period was rather short and may be placed at from 8 to 10 days.

It is not easy to give the number of primary and secondary cases in the 40 registered patients, because the majority of them had eaten repeatedly of the contaminated food. Should one conclude that we had to deal with 40 primary cases? It is to be expected that, with such a high number of cases, secondary infection is apt to occur, in spite of extensive control measures. However, after a careful review of the cases, it is not possible to mention a single person who was infected directly or indirectly by a patient, a fact which may be considered unusual. As proof cannot be established, we shall not attempt a classification.

CAUSATIVE GERM CARRIER

Contamination of the cheese cannot be explained by polluted water, or by milk infected by a patient, the L. incident being excluded. What about germ carriers? Our investigation was directed towards the only known typhoid carrier of the region, Mrs. C.A., of La Pérade. The latter submitted two specimens of faeces, with positive results. The isolated cultures gave the following reactions on typing:

First sample, November 3, 1941: "Culture cannot be typed."

Second sample, December 2, 1941: "This culture of *Bact. typhosum* gives the same reactions as the cultures isolated in the Batiscan epidemic."

This typhoid carrier was questioned very carefully. She admitted that during the latter weeks of August she had milked cows, against our orders, and that the milk was sold to the R. cheese factory. A logical chain of arguments led us to this carrier as the causative agent of the epidemic. Mrs. C.A. had had typhoid fever twenty years before in Deschambault and since that time she may well have been the cause of small outbreaks at La Pérade, namely in 1931, 1932, and 1934. In the future, it will be easier to trace a new occurrence as typing for *Bact. typhosum* is now done as a routine at the Provincial Laboratory of the Ministry.

METHODS OF CONTROL

In the control of this outbreak, the following measures were taken:

1. Isolation of patients and disinfection of excreta.
2. Early vaccination of familial contacts.
3. Appointment of a person not connected with the family to handle the milk when a case occurred in a producer's home.
4. Early and thorough epidemiological investigation, the contaminated food being known five days after notification of the first two cases.
5. Rigorous disinfection of the cheese factory and prohibition of the sale of cheese and butter produced therein.
6. Storage of the contaminated cheese in a warehouse for a minimum period of six months.
7. Detection of doubtful cases by physicians and staff of the Health Unit.
8. A large number of specimens of faeces and urine sent to the laboratory for confirmation of diagnosis, *Bact. typhosum* being isolated in each of 40 cases.
9. General vaccination in the attacked municipalities, with the following results:

Municipality	*Population*	*Population vaccinated*	*Percentage protected*
La Pérade	2,477	1,617	65.2
Ste. Geneviève	1,590	720	45.2
Batiscan	1,231	843	68.4
Total	5,298	3,108	60.0

10. Each patient released after two negative faeces specimens submitted with an interval of one week.
11. A closer control over the known typhoid carrier.
12. Final shut-down of the R. factory on October 25, 1941.

As a result of this study, three important measures were recommended in the Province:

1. Early notification of each case of enteric fever.
2. General check-up of typhoid carriers.
3. Pasteurization of cheese, or at least the holding of the product for a three-month period of maturation before release for consumption.

REFERENCES

1. Craigie, J. The Present Status of Phage Typing. *Canad. Pub. Health J.*, 1942, 33, 41.
2. Craigie, J. Personal communication.

(The reader is referred also to the report of a typhoid epidemic in Indiana traced to the consumption of green cheese. See *Public Health Reports,* April 21, 1944.)

EXTRACTS AND SUMMARIES OF SOME PAPERS PRESENTED AT THE WISCONSIN DAIRY MANUFACTURERS' CONFERENCE HELD AT THE UNIVERSITY OF WISCONSIN, MARCH 30 AND 31, 1944

Rapid cleaning of milking machines was carefully discussed by M. F. HELMBRECHT of the Kraft Cheese Company of Wisconsin. Mr. Helmbrecht proffered the following procedure as being a very successful one:

1. Flush with clean cold water—at least three gallons per unit, immediately after milking. This is done by raising and lowering teat cups in the water to allow air to pass through with the water, thus thoroughly rinsing.
2. Clean with hot water to which has been added a cleansing powder, preferably soapless. Use the same amount of water per unit as has been used in the first or cold water rinse.
3. The complete teat cup assembly, including milker hose, is then placed in the wash tank or other satisfactory receptacle in a hot water wash solution, the insides of the teat cup inflations brushed with a rotary brush, and the milker hoses rodded with a burr of proper size. The size is of great importance.
4. The teat cup assembly is now ready for rack until the next milking.
5. All rubber parts should be examined for pin holes and cracks, so they will hold solution to the level of teat cups and milker hose, and so they will be completely covered or submerged.
6. The milker bucket or pail and all metal parts are then scrubbed with brush and cold water before placing in tank of hot water wash solution. The reason for this is that foreign matter is not added to wash water and a cleaner wash job will result.
7. The rubber gasket on the milker head should always be removed as milk wastes collect underneath.
8. All small openings in the head should be brushed with small brushes for that particular purpose. Don't use brushes that have no bristles left on them.
9. Place parts on metal rack, bucket inverted.
10. Sterilize with 200 p.p.m. just before milking.
11. The air hoses should be rodded as often as necessary. Greater collection is found in some machines than in others, probably due to milk fumes that escape into the air hose.
12. In the inspection of dairy farms, fieldmen and inspectors will usually find certain producers that have badly neglected the milker and it is in a condition where the ordinary wash job will not restore the machine to safe use. In these cases, the boiling of the rubber parts is advisable. The procedure is as follows:
    1. Place all rubber parts in granite-ware pan. Add enough cold water so all parts will be completely submerged.
    2. Add sodium hydroxide, sodium metaphosphate, or washing powder to make a 2 percent solution.
    3. Allow solution to come to the boiling point, and let continue to boil for 5 minutes.
    4. Pour off solution and wash in the regular manner in washing solution.
    5. The boiling of rubbers in this manner will remove all foreign matter as well as restore the elasticity of the rubber. It would be well to do this every 15 to 20 days or oftener, if necessary.

* Other papers will be published *in toto* in our next issue.—EDITOR.

In the cleaning of milkers, control of water hardness is just as important as in washing one's face—we are all agreed that a much better job can be done with soft water.

On many of our dairy farms we have used sodium metaphosphate in place of sodium hydroxide in milker storage solutions. This we have found very effective in keeping the milker in a sanitary condition, and it leaves little or no residue or deposit on the insides of the rubbers. Also, it rinses free and does not leave the rubbers slippery. Two ounces to one gallon of water makes a satisfactory solution.

* * *

Three minute milking was discussed and demonstrated by Dr. E. E. HEIZER of the University of Wisconsin. Important features of the procedure were the use of hot water at 130° containing 250 p.p.m. of chlorine, separate cloths for massaging and wiping the udders, and prompt testing of the fore milk with the strip cup with immediate placement of the milking machine cups. Successful use of the three minute milking procedure requires establishment of a good routine, but this yields a tremendous saving in milking time. Introduction of the three minute milking system may require a short period in which cows become accustomed to the procedure. The milk production record has not in any way been interfered with, and the indications of many farmers using the procedure is that mastitis is not as prevalent.

* * *

P. H. TRACY, University of Illinois.—"Planning for Future Operations in the Market Milk Industry." The speaker upon returning from an extensive study of the market milk industry throughout the eastern states finds that a great deal of thought, discussion, and planning is being carried out for the postwar period.

A short historical resume of business development was given in which the period up to 1870 was essentially a period of aid to the development of business by the government and its laws while from 1870 to 1930 developments were essentially to protect individual business from aggression by privileged interests. The period from 1930 to present was and is a period for the promotion of the general welfare and benefit of the nation as a whole, i.e., the present war regulations of buying and selling are to promote the general welfare.

The dairy industry cannot expect the removal of all war regulations when peace comes. It will be necessary for government regulation to maintain purchasing power and curtail inflation. Immediately after the war, rationing will probably be continued due to increased consumption and continued export demand for a readjustment period. Should nutritionists of the modern day have their say, the consumption of milk will be doubled in the future.

The author believes that there are four classifications of business justified for government regulation. They are: (1) a monopoly, (2) a natural resource, (3) service vital to everyone, and (4) an industry that involves the greater share of the consumer's dollar. The dairy industry comes under the fourth classification since 23 percent of the consumer's food dollar is spent for dairy products. It is therefore the speaker's opinion that control of the dairy industry by control over labor, wages, product analysis, and sanitation requirements is an excellent move for the promotion of the general welfare.

Several predictions are forecast for the postwar period and the future of the market milk industry: (1) the inefficient processing and distributing plant will be eliminated, (2) store sales are scheduled for a definite increase, (3) area covered per milk plant will be larger, (4) single service containers will replace the glass container to a greater extent, and (5) there will be increased integration of methods and processing aiming for large volume and low unit costs.

GREATER EFFICIENCY MUST FOLLOW

If the predictions we have made are even 50 percent accurate, the market milk plant operator must establish for his plant greater efficiency, if he is to survive. Surveys that have been made in recent months indicate that much can be done to reduce costs. In many cases costs are excessive due to plant arrangement. Obsolete equipment and methods are often the cause for much inefficiency and will be one of the big problems in the postwar reorganization period. Some of the other conditions that have been observed that were thought to contribute to high plant costs are as follows:

1. Excessive man hours (some as low as 26 gallons of milk per man hour) for the amount of milk handled.
2. High fat loss (up to 3%).
3. High glass bottle loss (22 cents per 100 lbs. of milk handled—two-thirds plant labor cost).
4. Returned milk.
5. Delivery expense high.
6. Office expense high (45 cents per cwt. lbs. milk).
7. Maintaining too many grades of milk and cream.
8. Special delivery.
9. Not enough attention paid to personnel problems.

CONDITIONS CONTRIBUTING TO GREATER EFFICIENCY

1. Location of Plant—rent and accessibility for incoming milk and distribution.
2. Every other day delivery of milk. To do this more storage space for both raw and pasteurized milk is necessary. Alternate-day delivery of milk has made possible an average reduction of truck mileage in Connecticut markets of 44 percent. The mileage savings and increased deliveries per stop reduced route time by nearly one-third, which in turn made possible increased loads and some consolidation of routes. The program reduced requirements for gasoline and tires by approximately 40 percent. Man-hours were reduced 30 percent. If alternate-day deliveries are continued in the post-war period, and if weekly earnings of routemen return to the normal pre-war levels, total delivery costs would be approximately 2.74 cents per quart (a savings of 1.32 cents).' (*Conn. Expt. Sta. Bul.* 247.)
3. Reduction of floor levels to one if possible.
4. Centralization of storage rooms for bottled milk.
5. Ample storage rooms for supplies and conveniently located.
6. Centralization of garage operations.
7. Heated garages for storing trucks and for repair work.
8. Use of high temperature pasteurization.
9. Streamline containers by:
   a. Use of single service bottles.
   b. Use of economy bottle.
   c. Use of square bottle and smaller case.

   Weight of 12 qt. paper case and filled bottles—27.5 lbs.
   Weight of 12 qt. standard glass case and filled bottles—60.5 lbs.
   Weight of 12 qt. square glass case and filled bottles—49.5 lbs.
10. Permanent system of glass bottle deposits (bottle losses have been reduced 50 percent by the establishment of this system in some markets).
11. Limit number of grades of milk and cream. The establishment of a wide range of grades of milk and cream in order to cater to the whims of as many customers as possible has led to increased costs.
12. Abolish system of dating milk and reduce returns to as near zero as possible.
13. Permanent discontinuance of special delivery systems. Some plants have had one special delivery truck for every ten to twelve retail trucks.
14. Simplify route bookkeeping and other office expenses. In one plant labor costs were 33.4 cents per 100 lbs. milk handled, while office expense was 45.2 cents.
15. Create better employee relations.
   a. Equalize pay to plant employees and drivers.
   b. Improve conditions under which men and women work, especially in bottle unloading, sorting and washing rooms. Workers should be made more comfortable—heat, light, humidity and ventilation should be better controlled.
   c. Develop social and recreational programs.
   d. Improve locker rooms to make them more attractive.
   e. Provide better lunch room facilities.
   f. Provide vacations with pay for all employees.
   g. Provide health aids and insurance program for workers.
16. Standardize and systematize all operations, particularly washing and sterilizing procedures.

17. Diversify plant labor so that each man can perform two or more jobs,
18. Emphasize good housekeeping.
19. Establish complete laboratory control to check on the efficiency of plant operations. Plant losses should be held to one half percent. This means extreme care must be exercised in all operations. For example, losses may be due to:
    a. Excessive foaming of milk and cream due to excessive pumping and agitating. This can be minimized by use of steam.
    b. Over filling at bottles. An extra 1 ml. of milk in each half pint bottle means a shrinkage of about 0.4 percent. In the case of 19 percent cream this value would be nearer to 2 percent as based on the original milk.
    c. Leaky valves, fittings and packing.
    d. Over filling of vats and cans.
    e. Inaccurate standardizing. An excess of .05 percent fat in the case of a 4 percent milk means a fat loss of 1.25 percent.
    f. Accurate weights and tests of milk and cream purchased.
20. Utilize plant facilities for a period of two labor shifts leaving one swing for clean up purposes.
21. Do not attempt dual installations for glass and paper bottles.
22. Place the plant engineering department under the plant superintendent.
23. Abolish overlapping inspection services and regulations.
24. Unify regulations governing production of milk, regardless of use.
25. Do away with any unnecessary frills pertaining to regulations of milk production and distribution. For example, dating of milk.
26. Encourage farmer to produce milk more efficiently by improving his breeding stock, feeding methods and herd management practices.
27. Encourage greater winter production of milk in order to minimize the seasonal surplus problems.
28. Improve the salability of milk by:
    a. Making it more drinkable through better control of flavor.
    b. Making it more nutritious by raising vitamin content to a higher level through improved feeding methods.
    c. Educating eating establishments on proper way to serve milk—cold.
29. Do a better job of advertising milk—take a lesson from the evaporated milk people. Advertise not only the merits of milk but attempt to establish more confidence in the industry among users of milk. Public relations will be a very important factor in the future program for the market milk industry.
30. Promote research to broaden our present knowledge of the nutritional value of the product as delivered to the consumer.
31. Streamline plant operations so as to reduce labor costs and introduce labor saving devices wherever possible.

There are those who believe the future of the market milk industry will be jeopardized by development of such products as frozen milk, powdered milk, reconstituted milk and improved evaporated milk. However, I am more concerned about the future of this industry as it may be affected by government regulations and costs. The bottle of fresh milk has three definite sales advantages: (1) it usually has a superior flavor, (2) it is fresher, (3) it is more convenient for the housewife to use. These are three good reasons why this industry will survive, but in order to do so it must be in a position to supply the consumer with a product high in quality and low in cost. The market milk plant operator of the future in order to be successful must be a man of good business judgment, he must understand how to handle labor, he must understand the technical problems involved in plant operations and must see that the men he hires are capable of adapting his ideas to the operation of his business. There will be no short cuts to cover inefficiencies, yet there will be excellent opportunities for men with the proper qualifications for leadership.

* * *

H. L. TEMPLETON of the Fairmont Creamery Company, Omaha, discussed "What the Ice Cream Industry May Look Forward To."

The future of the ice cream industry will be an outgrowth of our experiences of the past, and not least of these experiences will be those of the past few years of war time restrictions. When peace comes there will be, undoubtedly, many service men who will enter the industry, and so there will be added competition.

The expensive practice of stocking a great variety of flavors has largely disappeared because of the lack of competition and the great demand for the ice cream that is made. The industry should profit by this experience and when things return to normal not get into the same competitive cycle, but rather stock two or three standby flavors such as vanilla, chocolate, and a fruit flavor and then sell to the housewife flavoring materials which she can use to add to suit her taste.

The practice of the ice cream maker freezing his own fruit purees from fruits in season is increasing.

We may look forward to giving sherbets and ices a more prominent place than they had before the war, for due to milk solids shortages the public is gradually becoming accustomed to them and we may look forward to some continued demand.

With the advent of home freezer units, or ice cream compartments in home refrigerators, we will probably see ice cream, largely as packaged goods, delivered by the milk man. Powdered ice cream mix for the home freezer is definitely with us.

After Federal restrictions on solids are lifted, there should be established a Federal law governing composition of ice cream to avoid the wide differences there have existed between states. This will facilitate interstate trade. The deluge of milk-solids-substitutes in many states at present should disappear after the war.

When the paper supply is again normal, we will probably see the paper ice cream containers largely replacing the metal containers.

* * *

R. M. LEMBETH of the Grand Rapids Cabinet Company, Grand Rapids, Michigan, reviewed "The future of home freezer storage units and their potential effect on the dairy industry."

The home freezer storage units of tomorrow will be patterned after the present day ice cream cabinets. We may look forward to seeing many homes having them in their basements, where they can store from ten to fifty dollars worth of frozen goods at a time. The cost of operating the cabinets is estimated at only a dollar to a dollar and a half per month.

Many people now prefer the frozen fruits, vegetables, and meats to those which are canned. In the future we can look forward to the frozen food industry competing with canned goods. The post-war period will see a great increase in the acceptance of the frozen products.

Along with other things, ice cream will, no doubt, be a popular item in the storage units. If it is always on hand at meal time without the bother of having to go to the corner drug store, we can expect a great increase in its consumption. Ice cream manufacturers should not overlook this sales outlet.

There are at present three and a quarter million lockers in the United States serving over three million families. These will not necessarily disappear with the advent of home storage facilities, but rather will be used to augment the home supply of frozen foods. Farmers as a group have been especially quick to adopt the frozen storage methods, possibly because they are in a position to store much of the meat, fruits, and vegetables which they produce.

The war has brought a great demand for all storage cabinets now on the market, and with the coming of peace there will be buyers for every cabinet that can be produced for five years. The sales campaign will probably parallel that which was launched by the kitchen refrigerators in their day.

* * *

CLIFFORD M. HARDIN of the University of Wisconsin discussed the experiences of Wisconsin dairy plants in paying for milk on the basis of fat and solids-not-fat. Approximately 50 plants in the State of Wisconsin are now using the method and reports are definitely favorable. The experiences of most plants indicate that the new method necessitates less bookkeeping work. Although the amount of solids-not-fat in different milks from various patrons varies, there has been no significant effect of use of the method on shift of patrons. The frequency by which the value of fat per point above or below 3.5 percent fat is out of line with existing fat values was cited by Professor Hardin.

* * *

M. S. EL-RAFEY of the University of Wisconsin reviewed the subject: "Butteroil Manufacture, Its Problems, Its Future."

"The preparation and use of butteroil in the United States may serve the war effort, the dairy manufacturers and consumer, and help in the rehabilitation program after the victory is won."

Butteroil is another term for the relatively pure milk fat prepared under commercial conditions. It is made from butter by the removal of water, salt, and curd. This is usually accomplished by one or a combination of three general methods. The decantation or filtration, the centrifugal and the boiling off methods were discussed, and the details of the modern large scale manufacturing methods used in New Zealand, Australia, Germany, Switzerland, and the United States were presented. The variation in these details affects the keeping quality and the flavor of the product. "The preparation of butteroil directly from cream involves the use of some means for breaking the emulsion or removal of the fat globule membrane." Those include the use of heat, freezing, whipping or addition of rennet or acid, followed by additional heat treatment or washing with hot water and centrifuging in oil separators.

If the 1944 butter supply allocated to the armed forces and lend-lease requirement is converted to butteroil it will result in the unnecessary shipping of over 97 million pounds of water, salt, and curd and dispense with the need for refrigeration. Nutritional experiments at the Wisconsin Experiment Station revealed that butteroils have the same superior quality of butter. "The non-fat constituents contribute more to the deterioration and spoilage than to the nutritional value."

The superior keeping quality of butteroil as compared to butter or cream may be of value to the manufacturer who stores milk fat from one season to another. Experimental evidence was presented to show this comparison. Methods are now available to reconstitute butteroil into butter, and into milk, cream, or ice cream that behave as the natural products, e.g., in creaming, rebodying, or whipping.

Butteroil may help extend the uses of butter where refrigeration is lacking or where it is not convenient to take butter along such as in camping. It has potential markets in the baking, ice cream, and candy industries, in restaurants and homes for cooking, and in other food canning isdustries such as enriching soups.

The major cause for butteroil deterioration is the oxidative rancidity. "The keeping quality is influenced by the balance between several internal and external factors." The degree of unsaturation, the presence of pro-oxidants or anti-oxidants, light, temperature, copper content, and the amount of oxygen dissolved in the fat are among the factors involved. The usual means of prolonging the keeping quality are: the protection from oxygen, the addition of anti-oxidants, and the control of the manufacturing process. Spoilage due to microorganisms is not a problem in butteroil unless the water content increases over 0.3 percent. This may result in water separation and the bacterial growth in the separated layer. The rate of cooling is an important factor in controlling the separation of water, the texture, and taste. Large crystal formation as formed by slow cooling is not desirable.

Other problems in separation, the relation of pH adjustment in the serum to the sludge formation, the formation of creamy emulsions, the type of butter preferred, containers, fat losses, and cost were mentioned.

"Since butteroil is consumed by more than half of the world population, it is reasonable to believe that it will play an important role in the postwar international trade." "The manufacturer may do well to consider the food habits of the populations"—for example, India is accustomed to the flavor and aroma of butteroil prepared by the boiling off method, while the British consumer does not accept the heated flavor in butteroil.

Reserves of correctly prepared butteroil may be stored from now, without fear of spoilage, to help carry out the rehabilitation program outlined by the United Nations. "The enrichment of butteroil with vitamin D may help the starved children of Europe build their depleted bodies."

The total world production of milk at the prewar level was 580 billion pounds—this provides only 290 pounds per person or one third the per capita consumption in the United States. Therefore, in order to achieve the better nutrition program outlined by the United Nations at the Hot Springs Conference the world dairy industry would have to go a long way before the potential markets are nutritionally satisfied.

* * *

G. R. SPENCER of the University of Wisconsin discussed "Mastitis Control Methods up to Date." This troublesome disease offers a different problem in each herd. To control the disease it is necessary to detect and segregate infected cows and then to exercise proper sanitary precautions.

The disease may be acute or chronic. In the acute form it comes on one cow quickly and does not spread easily. The farmer can recognize the symptoms easily but there is little to do because the cow is soon well or dead. To prevent this acute form, injuries to the udder must be avoided and cows must be kept clean. The chronic form is more difficult to detect because there are few visible symptoms. Chemical tests have been successful, but bacteriological tests are more sensitive. The Hotis Test is preferred in Wisconsin.

The carrier cows are a danger to the herd and must be segregated on one side of the barn or at the end of the milking line.

Sanitary precautions to observe in herd management are:

1. Milking machines must be sterilized between milkings. Dipping of teat cups in chlorine between cows will not give absolute control but will help if chlorine gets up into teat cups.
2. Complete milking is essential; flare-ups occur when milk is left in a quarter.
3. Rapid milking is good if complete. Since the organism causing chronic mastitis can live for days on the milker's hands it is essential that the milker dip his hands in chlorine between each cow.
4. Barns must be kept sanitary with plenty of clean bedding; organisms can live 24 hours on bedding and floors.
5. Teat injuries especially at the end are dangerous.
6. Reduce grain rations of infected cows.
7. Keep diseased animals out of clean herds; veterinary examinations will do this but even the strip cup will help.
8. A right herdsmen's attitude is essential.

Treatments for the disease are uncertain. Sulphanilamide in oil may be safely used on either dry or milking cows and although it has only cured about 30 percent of cases it will usually reduce symptoms. Tyrothrycin will help dry quarters but must not be used on inflamed quarters. Colloidal silver oxide which appears to bring about some clinical improvement should also be injected into udders of dry cows to avoid causing inflammation.

* * *

"Potentialities in Condensary Operations" was discussed by H. H. SOMMER of the University of Wisconsin. The future developments in this industry depend on how the public will take to the use of dry milk and upon the outcome of the oleo-butter controversy.

Recent trends in sterilizing milk have been attempts to produce a sterile product with minimum chemical changes. One approach has been treatment of the milk before canning; another has been to increase the speed of heating and cooling of milk in cans; still another treatment has been a combination of these first two practices. The freshly prepared products by the combination treatment are excellent but with aging they develop an oxidized flavor. This objection can be met with a 30 day turnover.

Another potentiality is the freezing of concentrated milk. This is practical and the frozen product may command a place in home freezer cabinets.

The oleo-butter fight is important in future developments because if restrictions on oleo sales are removed, then the industry can look for attempts to produce and market milk products with vegetable fats substituted for milk fat.

* * *

"Developments to Come in the Cheese Industry" was the important subject reviewed by W. V. PRICE of the University of Wisconsin.

The demand for cheese in the years immediately ahead should be excellent. Sixty-six percent of the people in the world are reported to be underfed, and even in the United States it is estimated that 36 million people consume less dairy products than they need. Cheese contains milk protein and other valuable food elements in a particularly desirable form. Five ounces of cheddar cheese are approximately equivalent to the nutritive value of one quart of milk which would make cheese worth 48 cents a pound to the consumer when milk is worth 15 cents per quart. Such a price for cheese exceeds the current values enough to provide, in normal time, a margin adequate to pay for improvements in equipment and processes used in making cheese.

Developments in equipment will probably be accomplished with improvements in materials and in the designing of equipment for greater ease of handling and cleaning. The development of new equipment may be indicated by existing needs. Such needs might be listed as better automatic controls for starter making; improved pasteurizing equipment to provide economical pasteurization at approved temperatures and holding periods; better protection of the curd in terms of temperature control during the making process and improvements in curd handling procedures; protection of the curd against contact with extraneous matter; and the development of labor saving devices for handling curd in the vat and out of the vat. Special developments may well include simplification of analytical procedures and a continuous process for producing cheese.

The requirements of the new Food, Drugs, and Cosmetics Act are being met as rapidly as possible by industrial attempts to establish minimum requirements for cheese factories and by certification of plant conditions, milk quality, and factory practices. Such certification and milk quality programs require experienced men trained in dairy technology. These men seem to offer the industry's best assurance of compliance with the requirements of the Federal and State regulations.

(Continued on page 241)

Legal Aspects

Food Carrying Vehicles *

City ordinance regulating food carrying vehicles upheld.—(Illinois Supreme Court; *General Baking Co. et al.* v. *City of Belleville,* 51 N.E.2d 546; decided November 19, 1943.) An ordinance of the city of Belleville, Ill., made vehicles carrying and delivering foodstuffs for human consumption in the city subject to daily inspection and required a license fee of $50 a year for each vehicle except those vehicles which were used to deliver foodstuffs from food-dealing establishments in the city, licensed and inspected as such, and which were inspected under other ordinances. Some baking companies situated in Missouri sought to recover money paid as license fees under the ordinance. The plaintiffs alleged compliance with all of the public health laws of Missouri affecting the manufacture, wrapping, and sealing of all products delivered in Belleville and claimed that the ordinance contravened the commerce, equal protection, and due process clauses of the Federal constitution.

The Supreme Court of Illinois stated that the generally recognized rule was that ordinances to protect public health cannot be said to have so burdened interstate commerce as to render them repugnant to the Federal constitution if the license fees bear a reasonable relation to the cost of enforcement and the terms of the ordinance bear a reasonable relation to the purpose for which passed and are not discriminatory. The fact that the plaintiffs were manufacturers outside of the city, and in no wise subject to other regulations and license fees as were their resident competitors, afforded, according to the court, a reasonable basis for excluding from the general application of the licensing features of the ordinance those who paid license fees under other city ordinances to which the plaintiffs were not subject. It was pointed out that all other provisions of the ordinance attacked were applicable to resident as well as nonresident vendors. The court was of the opinion that there was no unlawful discrimination against plaintiffs and that the requirement that they pay the license fees did not constitute an illegal burden on interstate commerce. The ordinance was not, therefore, open to the constitutional objections urged by the plaintiffs and the lower court's judgment dismissing the complaint was affirmed.

* *Pub. Health Repts.,* April 28, 1944.

Chlorination Upheld *

Town water supply—order of state department of public health regarding chlorinating equipment upheld.—(Massachusetts Supreme Judicial Court; *Commonwealth* v. *Town of Hudson et al.,* 52 N.E.2d 566; decided December 29, 1943.) A Massachusetts law enacted in January, 1942, provided as follows: "If the department of public health determines that, during the existence of the present state of law, it is necessary for a city, town, district, or water company maintaining a water supply to provide equipment for such supply, including treatment equipment, or additions to existing equipment, for the protection of the public health, said department may order such city, town, district, or company to provide such equipment or to make such addition to any existing equipment. The supreme judicial or the superior court shall have jurisdiction in equity to enforce any such order." The state department of public health sent a notice dated April 10, 1942, to the defendant town signed "By order of the department of public health. Paul J. Jakmauh, M.D., Commissioner of Pubiic Health." This notice stated that "the department hereby determines that it is necessary for the town of Hudson to provide treatment equipment for chlorinating all water supplied to the town during the existence of the present state of war," and under the authority of the above-quoted statute ordered the town "to provide such chlorinating equipment forthwith." At a special town meeting held on April 29, 1942, it was voted "not to authorize the commissioners of public works to install chlorinating equipment for the town's water supply as ordered by the state department of public health." In October, 1942, the Commonwealth, by the Attorney-General, brought a bill in equity against the town, its commissioners of public works, and its selectmen, praying that they "be ordered forthwith to provide treatment equipment for chlorinating the water supplied to the town of Hudson, as ordered by the department of public health."

The water supply of the defendant town came from a well-isolated pond situated in a wooded section of another town. The water had never been treated, it satisfied state and federal standards for drinking water, and was rated as very good. Several industrial plants in the town were engaged in

* *Pub. Health Repts.,* April 7, 1944.

producing goods needed for the war and a large number of their employees lived in the town. The pond was guarded constantly by one armed guard and two dogs. The state department's determination was based wholly upon the danger of pollution by "sabotage." The trial court reserved the case for the state supreme court without decision.

The latter court held the order to be within the authority given the department by the statute. According to the court it was unnecessary to give the town an option to purify the water in some other way. The department had authority to specify even more particularly than it did the kind and amount of equipment to be provided. The fact that the evil to be avoided was one feared rather than one presently existing was no reason for denying legislative authority to guard against it. Also the fact that chlorination would cost the town money was not a constitutional objection to a legislative act requiring that precaution.

Concerning the question of delegation of legislative power the supreme court stated that the fact that the legislature, instead of requiring chlorination by its own act, left the selection of the water systems requiring such treatment to the department did not give rise to any constitutional objection. It was pointed out that one of the exceptions to or qualifications of the doctrine that the general power to legislate cannot be delegated was that the legislature could delegate to a board or an individual officer the working out of the details of a policy adopted by the legislature. The order in the instant case was stated by the court to be plainly a valid exercise of the state's police power. Even though made by the department it was made under a valid delegation of power by the legislature and had the same force as though made by the legislature itself.

With respect to giving the town a hearing the court held that there was no constitutional need therefor. The legislature was dealing with an emergency affecting many water systems throughout the state and a hearing by the department in each case would delay needed action and tend to defeat the statute's purpose.

That the town's water was naturally pure was said by the court to be beside the point. The department reasonably could find that the guard placed over the water supply could not insure against pollution by disease-producing organisms introduced by enemy agents or sympathizers and that chlorination would reduce the danger to public health if such pollution took place. The department's action was of the very kind contemplated by the statute and the problem was the state's business and not that of the defendant town alone. "An epidemic originating in Hudson might sweep the commonwealth. The town cannot ask the courts to try the legislative question whether chlorination is needed. [Case cited.] Still less has it the right to nullify the order because not convinced of its necessity. There was never any sufficient reason for the town to doubt the validity of the order or to refuse to obey it."

A decree in accordance with the opinion was ordered entered by the supreme court.

New Books and Other Publications

Handbook for the Etiology, Diagnosis, and Control of Infectious Bovine Mastitis, by I. A. Merchant and R. A. Packer. Published by the Burgess Publishing Company, Minneapolis, Minn. 1944. 66 pages. $1.25.

This planograph booklet was prepared from lecture notes and field experience of the authors for students of veterinary medicine, although it will be found useful for the field man. The chapter headings read: Predisposing factors in mastitis, Bacteriology of mastitis, Diagnosis of mastitis, Control of mastitis, Conclusions, and References (50 in number). The most commonly used procedures are given in detail with interpretation. It will be found useful for those who want a brief, clear, authoritative account of this disease in its relation to the milk industry.

A Handbook on Fast Milking and the Early Control of Bovine Mastitis. Prepared by the Department of Public Health, Rockford, Illinois. 1944. 18 pages.

The preface states: "Based on a considerable amount of mastitis in the dairy herds of Winnebago County supplying milk to the City of Rockford . . . this handbook has been prepared as a review of some of the newer concepts in the prevention of this disease. Likewise, some of the ideas on fast milking, made possible through a clearer and better understanding of the physiology of the cow's udder, are discussed in terms of mastitis, following which the early control of the disease is considered." The pages are 8½ by 11 inches, bradded together in the form of typewritten sheets. The question and answer form so simplifies the presentation that the ordinary, "practical" farmer can understand the essentials of good husbandry from the standpoint of mastitis. It is an excellent educational measure of a wide-awake, aggressive health department.

Sanitation Manual for Public Ground Water Supplies. Prepared by the Public Health Service. Published in *Public Health Reports,* February 4, 1944. 39 pages.

"This manual has been prepared by the Public Health Service for the guidance of states, municipalities, and health districts in order to encourage a greater uniformity and a higher level of safety in the sanitary control of public ground water supplies. . . . The form followed in other Public Health Service manuals has been adopted in this manual, that is: statement of the requirement, the public health reason for the requirement, and what constitutes satisfactory compliance. . . . This manual will be subject to periodic review and revision for incorporation of such changes as will increase its usefulness."

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Association News

Connecticut Association of Dairy and Milk Inspectors

The summer meeting of the Connecticut Association of Dairy and Milk Inspectors was held at the Connecticut Agricultural Experiment Station on June 27th.

A committee of officials, dealers, inspectors, and research men met at the office of the Dairy and Food Commission and drew up proposals to govern the installation and operation of short time-high temperature pasteurizing equipment. These are listed as follows:

Rules for the Installation and Operation of Short Time-High Temperature Pasteurizing Apparatus

Excerpt from Section 2488, paragraph (k): "The process of heating every particle of milk or milk products to one hundred and sixty degrees Fahrenheit, holding the same at that temperature or above for not less than fifteen seconds in apparatus designed and operated in accordance with the specifications approved by the Dairy and Food Commissioner and then cooling it immediately to a temperature of fifty degrees Fahrenheit; provided nothing contained in this definition shall debar any other process which has been demonstrated to be of at least equal efficiency and is approved by the Milk Regulation Board."

1. Owner or Manager shall submit with the application for the privilege of installing and operating S.T.H.T. milk pasteurizing equipment, an authentic diagram of all equipment together with a chart describing the flow of milk. True copies of the equipment diagram (or adequate descriptions) and milk flow chart shall be available at the plant.

2. No change shall be made in the equipment or milk flow until supplementary diagrams and flow charts have been submitted to and approved by the Dairy and Food Commissioner.

3. S.T.H.T. apparatus shall be equipped with a flow-diversion valve located at the outlet of the holding section of the pasteurizer and so constructed, installed and maintained that the valve will operate to divert the milk before the falling temperature of the milk reaches 160.0 degrees F. There shall be no application of heat on the holder section during the holding period.

B. Such valve will operate to divert

the milk when the primary motivating power shall fail.

C. Such valve shall be leak escape protected so that when the valve is in diverted position no milk can leak into the outlet line.

D. The "cut-out" mechanism of the flow diversion valve shall be independent of the temperature pen-arm response such as by means of separate elements actuated by the same bulb system.

E. It shall be impossible to operate the timing pump during pasteurization unless the flow diversion valve is correctly assembled.

F. The diverting portion of the flow diversion line shall be self-draining during operation or attached directly to the suction side of the timing pump so that the suction of the pump can completely drain the line. There shall be no valve between the diversion outlet and the pump or raw milk supply tank as the case may be.

4. Each apparatus using regenerative heating and cooling shall be so constructed and maintained that the pasteurized milk shall at all times be under greater pressure than the raw milk on the opposite side of the heat exchange element.

In cases where an auxiliary milk pump is used, an automatic pressure control shall be so constructed, installed and maintained that the pressure of the pasteurized milk at its lowest pressure point shall always exceed the pressure of the raw milk at its highest pressure point by, at least, one pound pressure.

5. Each apparatus shall at all times during the pasteurization period contain in the outlet of the holding section of the pasteurizer a mercury in glass thermometer which conforms to the following specifications:

A. The thermometer shall be accurate to within 0.5 degrees F. (plus or minus) between the temperature of 155 degrees to 165 degrees F.

B. The thermometer shall have a vertical scale the smallest division of which shall not be more than 0.5 degrees F. and not less than 1/16 inch apart.

C. The glass stem shall be etched at 160 degrees F.

D. The thermometer shall register each degree of temperature within 0.5 seconds between the range 158 degrees F. and 164 degrees F. (This paragraph will be supplemented by the descriptive prelude used in U.S.P.H.S. code rule, same subject.)

6. Each permittee shall use the indicating thermometer and not the recording thermometer as an index of the temperature of the milk, and shall use a certified thermometer (as prescribed in Sec. 2488 P. X.) for checking the indicating and recording thermometers twice weekly.

7. Each apparatus shall at all times during the pasteurizing period contain in close proximity to the indicating thermometer bulb and immediately upstream from the flow diversion valve a second bulb containing the actuating elements for (1) a recording thermometer and (2) a flow diversion valve.

8. Each permittee shall cause to be kept connected to this recording thermometer bulb a recording thermometer which conforms to the following specifications:

A. The reading of the thermometer on the chart shall at no time differ more than 1 degree F. between the temperatures of 157 degrees and 162 degrees F. from the simultaneous reading of the corresponding indicating thermometer.

B. The recording thermometer shall be provided with an extra pen-arm which shall at all times during pasteurization indicate the time and duration of any operation of the flow diversion valve. The clockwise setting of both pen-arms shall correlate.

C. The scale divisions on the chart between the temperatures of 150 degrees and 165 degrees F. shall not be more than 1 degree and not less than 1/16 inch apart.

D. The pen of the recording thermometer shall be so constructed and maintained that the line drawn by it shall not be wider than one-fourth of the smallest scale division of the chart.

9. Each permittee shall provide and install equipment of such construction that the speed of the pump may be sealed at the maximum rate of operation so that the speed of the pump cannot be increased without breaking the seal.

10. Each permittee shall provide and install equipment of such construction that the temperature at which the flow diversion valve operates may be sealed and cannot be changed without breaking the seal.

11. Seals shall be applied by, or in the presence of, agents of the Dairy and Food Commission. In any case where seals are broken the Dairy and Food Commissioner shall be immediately notified.

12. Each permittee shall cause the temperature control of the apparatus during pasteurization to be operated automatically and not manually.

13. Each permittee shall cause to be available suitable attachments by means of which the holding period may be accurately checked.

14. Before the beginning of the day's work each permittee shall cause the action of each flow diversion valve to be checked by lowering the temperature of the liquid passing through the pasteurizer at a rate of not over one degree for each thirty seconds until the flow diversion valve operates, and he shall record or cause to be recorded on each recording thermometer chart the following data:

Identification of the equipment (if more than one unit is used).

Time of testing.

Reading of indicating (mercury) thermometer when valve diverted.

Reading of indicating (mercury) thermometer when valve resumes flow.

Signature or initials of operator making check.

15. Each permittee shall cause the apparatus to be taken apart and cleaned at the close of each day's work or oftener if necessary.

16. No permittee shall permit the operation of any high temperature short time pasteurizing apparatus by other than certified operators who have been thoroughly and correctly instructed as to the construction and operation of the apparatus.

H. C. GOSLEE,
Secretary-Treasurer.

Michigan Association of Dairy and Milk Inspectors

The Michigan Association of Dairy and Milk Inspectors will hold its annual meeting at Michigan State College on November 9th and 10th in connection with the Dairyman's Conference held annually at that time.

Dr. C. S. Bryan, President of the Michigan Association, became Professor of Medicine and Surgery in the Department of Veterinary Science and Hygiene at Michigan State College, effective July 1, 1944.

HAROLD J. BARNUM,
Secretary-Treasurer.

ANNUAL MEETING, NOVEMBER 2–4, 1944

LaSalle Hotel Chicago, Ill.

REPORT OF THE COMMITTEE ON ARMY RECOGNITION OF THE QUALIFIED MILK SANITARIAN *

In accordance with the action taken at the annual conference of the New York State Association of Milk Sanitarians held in Albany, N. Y., on September 25, 1942, the committee was organized and met on several occasions to discharge its duty. The meetings were arranged when committee members were in a certain vicinity on other business and included considerable correspondence, which held expenses to a minimum. One meeting was held in conjunction with the committee from the International Association of Milk Sanitarians, which was appointed for the same purpose.

The following resolution was promulgated by the committee, approved by the Executive Committee and forwarded December 9, 1942, to the Secretary of War, Surgeon General of the Army and Chairman of the Military Affairs Committee of the Senate and House.

"At the annual conference of the New York State Association of Milk Sanitarians held at Albany, New York, on September 25, 1942, the program being followed by the army for the sanitary control of its fluid milk supply was considered. It was stated that this work is being performed exclusively by veterinarians commissioned in the Veterinary Corps who, in many instances, do not have adequate training and experience in modern milk sanitation. The discussion revealed a number of instances in which this lack of experience has led to placing emphasis on relatively insignificant phases of milk production and processing and at the same time to an oversight of factors directly affecting the safety and sanitary quality of milk supplies for the armed forces.

"Milk sanitation is generally recognized today as being a highly specialized field. Trained milk sanitarians having had long experience in the sanitary control of milk supplies for large civilian populations are available and anxious to serve. Such persons, however, except for a very small percentage who happen to have veterinary degrees, are barred from serving their country in a capacity in which they could be most useful.

"There are 691 persons enrolled in this Association representing official, state, and municipal milk control agencies, the quality control divisions of the milk industry, agricultural colleges, and experiment stations.

"After due consideration of a report submitted by a committee appointed to study this problem, the Executive Committee of this Association respectfully recommends (1) that persons, including veterinarians, not specially trained and experienced in the field of milk sanitation should not be assigned to the sanitary supervision and quality control of milk supplies, and (2) that consideration should be given to utilizing in the armed forces the services of trained and qualified milk sanitarians who are not necessarily veterinarians."

The above resolution was acknowledged and answered by letter dated December 15, 1942, signed by Brigadier General R. A. Kelser, Office of the Surgeon Geeneral, Washington, D. C., which outlined the policy of the army with respect to the control of milk supplies. It did not offer any hope of a change in procedure. The answer was not acceptable to the committee, which resulted in a further letter dated February 6, 1943, to Brigadier General L. B. McAfee, Office of the Surgeon General, supplementing the previous request for additional data. On February 22, 1943, Brigadier General Kersel acknowledging the letter reiterated his former response.

Several other associations throughout the country have made similar appeals, apparently with no success.

The committee now feels that the only approach to the problem is a long range program of education. The proper recognition of the qualified milk sanitarian should be established in civilian capacity as well as in the armed forces.

Respectfully submitted,
G. W. Molyneux, *Chairman*
Samuel Abraham
W. D. Tiedeman
George A. West

October 25, 1943.

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* From Seventeenth Annual Report of the New York State Association of Milk Sanitarians, 1943.

THE VALUE OF MEMBERSHIP IN THE WISCONSIN MILK SANITARIANS ASSOCIATION TO WISCONSIN MILK SANITARIANS *

K. G. WECKEL, *President*

Wisconsin Milk Sanitarians' Association, Madison, Wisconsin

The **Wisconsin Milk Sanitarians Association,** in Wisconsin, is a new organization. It was voluntarily formed on June 19, 1943, at Fond du Lac, Wisconsin, by some fourteen Wisconsin members of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS. It was the desire of this group to bring to sanitarians in Wisconsin the opportunities of service that such an organization can render, and to aid in solving some of the problems of sanitarians peculiar to Wisconsin. The **Wisconsin Milk Sanitarians Association** has grown slowly. Nevertheless, it has done so wisely. The present membership of some seventy individuals is encouraged that the objectives of the organization are sincere, and that the organization can benefit those engaged in milk sanitation work.

There are a number of reasons why those engaged in milk quality, and milk inspection work, and who are charged with public health responsibilities should become members of the Wisconsin organization.

One of the important needs of the profession is simplification and understanding of our methods of quality appraisal. Conflicts in the procedures and in the appraisal of the results of methods, whether it be a laboratory test, or in an inspection, or in an interpretation of regulations, do not simplify the work of sanitarians, nor encourage the desired results in the industry. There must be complete understanding of our problems and a meeting of minds concerning them.

Sanitarians are inevitably going to be called upon to participate in aiding in a future farm building construction program. Farm property has deteriorated, and many farm operators now have funds with which to engage in new or re-construction. This is perhaps one of America's big potential activities. If sanitarians as a group are to encourage the kind of construction deemed best, they must be in a position to take advantage of the knowledge becoming available in this field, and to propose to producers as well as operators the more acceptable tenets of the industry.

The State of Wisconsin is an exporting dairy products state. It has a resident population of some three million, and a cow population of nearly two million. Obviously the products derived from the milk of two million cows cannot be consumed within the state and must be sold elsewhere. The successful and profitable merchandising of the tremendous output of dairy products from Wisconsin directly or indirectly affects the economic status of every one engaged in this industry in the state. It is to the interest of sanitarians, as well as the industry that Wisconsin dairymen do the best job possible in making available quality Wisconsin dairy products.

Milk sanitarians are largely responsible for the educational material on the subject of milk production and handling which comes before milk producers and plant operators. It is the sanitarian who must eventually focus the emphasis on certain problems. It is important that the sanitarian bring to these groups the best information

* Presented before the first annual meeting of the Wisconsin Milk Sanitarians Association, Madison, Wisconsin, March 30, 1944.

there is that will enable simplification of the operations and attainment of the desired results.

One of the needs of sanitarians is professional dignity. Milk sanitarians as a group do shoulder heavy responsibilities. Upon them rests the standards of production of products of organizations representing years of operating experience and large capital investments. They are responsible for the improved standards of public health, so evident in this country. There is no reason those engaged in milk sanitation work should not be measured in terms of their contribution to the society in which we live.

In view of these responsibilities sanitarians must have available the tools by which they can keep abreast of the new developments. The profession of sanitation work is subject to as many new developments as other professions; Wisconsin sanitarians should welcome the educational tools that are available.

The **Wisconsin Milk Sanitarians Association** was organized to bring Wisconsin sanitarians together, to enable a meeting of minds on current problems, and to make available the newer knowledge of the profession through the medium of the *Journal of Milk Technology.*

Every member of the Association owes it to every other sanitarian to indicate the objectives of, and to encourage his identification with this organization.

WISCONSIN DAIRY CONFERENCE

(Continued from page 230)

The cheese factory system is rapidly changing as evidenced by the decrease in numbers of factories and the increased production per factory. The limits of production per factory for the State as a whole seem to have been reached so that new and larger factories will probably be built to replace those which are now operating under the handicaps imposed by crowded workrooms and inadequate making space. How large such factories will be will probably depend upon the possibility of combining cheese factories with plant operations designed to conserve the by-products such as whey and whey fat. It is possible that groups of cheese factories may pool their resources, establish facilities for making cheese and utilizing by-products on the large scale in order to take advantage of increased labor efficiency, increased factory efficiency and for greater control of composition and quality. Factories participating in such a project may then be operated as receiving stations where the milk will be weighed, sampled, cooled, and shipped in tank trucks to the central plant. Operators of such receiving stations might conceivably be trained fieldmen who would be responsible for highly important milk quality control work.

New Members

INTERNATIONAL ASSOCIATION OF MILK SANITARIANS

ACTIVE

Murphy, Joseph N. Jr., Laboratory Consultant, State Department of Health Laboratory, 2503 Spring Lane, Austin, Texas.

Oggel, Henry F., Milk Inspector, City Hall, Kalamazoo, Mich.

ASSOCIATE

Albrecht, M. F., Purchasing Agent, Oatman Bros., Inc., 735 Prairie Road, Aurora, Ill.

Bates, Charles G., Beatrice Creamery Co., 2836 East Admiral Court, Tulsa, Okla.

Begeman, L. H., City Health Department, Room 207, City Hall, Lansing, Mich.

Bertrand, L. U., Mgr., Verifine Dairy Products Co., 520 Cedar St., Green Bay, Wis.

Burger, H. J., Sanitary Inspector, Janesville, Wis.

Burgett, M. J., Grayslake Gelatin Co., Grayslake, Ill.

Carlson, Walter C., Fieldman, Hampshire Milk Co., Hampshire, Ill.

Chaney, Woodrow W., Beatrice Creamery Co., 911 So. Richmond St., Tulsa, Okla.

Crandall, Dr. James C., Veterinarian and Milk Sanitarian, Board of Health, 163 Ulster Ave., Saugerties, N. Y.

Dornon, Ellwood G., Sanitarian, State Department of Health, District No. 5, Romney, West Virginia.

Emerson, Robert D., Plant Supt., Middletown Milk & Cream Co., 164½ South St., Middletown, N. Y.

Fredenburg, Lester A., Inspector, Sheffield Farms Co., 17 N. Main St., Moravia, N. Y.

Flohr, Vernon, Plant Mgr., Sidney Wanzer & Sons, Servia, Ind.

Gould, Dr. Ira A., Dairy Department, Michigan State College, East Lansing, Mich.

Guerin, William J., Chief Sanitary Officer, Chicago Board of Health, Chicago, Ill.

Hales, Myron W., Sales Mgr., Hansen's Lab., Inc., 9015 W. Maple St., Milwaukee 14, Wis.

Hardell, Robert E., Swiss Cheese Specialist, Kraft Cheese Co., 2234–16th St., Monroe, Wis.

Harrison, Harold, City Health Department, Room 207, City Hall, Lansing, Mich.

Hartman, Arthur, President, Hampshire Milk Co., Hampshire, Ill.

Haugen, Ernest K., Director of Laboratory, Golden Guernsey Dairy Coop., 4209 North 40th St., Milwaukee, Wis.

Heinemeier, Roy F., Plant Mgr., Pure Milk Association, Hinckley, Ill.

Hermann, George, Jr., Fieldman, Burlington Milk Products Co., Burlington, Ill.

Hicks, Franklin B., Laboratory Technician, General Dairy Service Corp., 1231 Gray Ave., Utica, N. Y.

Hiller, H. A., Fieldman, Kennedy-Mansfield, 750 S. Lewis St., Columbus, Wis.

Hupach, Melburn, Plant Supt., Oatman Bros., Inc., 735 Prairie Road, Aurora, Ill.

Jensen, William P., Laboratory Technician, Pet Milk Co., 216 Pine St., Sparta, Wis.

Krause, Harold C., Engeneering Aide, Lawrence Co. Health Unit, Court House, Lawrenceville, Ill.

Link, H. A., Fieldman, Sidney Wanzer & Sons, 417 West Ninth St., Rochester, Indiana.

McGrath, Lt. John T., Willow Run Airport, Station Hospital, Ypsilanti, Mich.

Madden, I. A., Mgr., Producers Dairy Co., 200 N. Ninth St., Springfield, Ill.

Mott, Mrs. R. E., Laboratory Technician, City of Ames, 228 Welch Ave., Ames, Iowa.

Newman, Phillip C., Dairy Fieldman, Coon Creek Dairy Impt. Coop., 205 Park St., Westby, Wis.

Noth, Alvin, Fieldman, 10th Dist. Pure Milk Prod. Coop., Norwalk, Wis.

Olson, O. M., Plant Supt., Bancroft Dairy Co., 237 E. Sunset Court, Madison 5, Wis.

Patchen, Wayne, Food Inspector, City Health Department, 3212 W. 138 St., Cleveland 11, Ohio.

Pire, Fred C., Mgr., Klenzade Products, Inc., Box 124, Appleton, Wis.

Reynolds, Bruce, Beatrice Creamery Co., 2436 North Main St., Tulsa, Okla.

Peterson, Peter P., Dairy Inspector, Dept. of Agriculture, 512 S. Court St., Sparta, Wis.

Radenbusch, S. M., Pennsylvania Salt Mfg. Co., 581 S. Saratoga St., St. Paul, Minn.

Schairer, Floyd L., Mgr., Burlington Milk Products Co., Burlington, Ill.

Schoolfield, Miss Alice B., Sanitary Inspector, State Dept. of Health, 816 Second St., Pocomoke City, Md.

Sellers, Alden, Beatrice Creamery Co., 301 South Adair St., Pryor, Okla.

Shannon, Major J. Vernon, Veterinary Corps, Camp Gruber, Oklahoma.
Snell, C. H., General Sanitation and Quality Control, Stella Cheese Co., 903 N. Wilson Ave., Rice Lake, Wis.
Steinlage, Paul, Quality Dairy Co., Inc., 4630 W. Florissant Ave., St. Louis, Mo.
Taylor, Tom, Beatrice Creamery Co., 1438 No. Boston Pl., Tulsa, Okla.
Valleskey, Norbert W., Dairy Inspector, Dept. of Agriculture, 1234 Arlington Ave., Manitowoc, Wis.
Van Hyning, Robert E., Sanitary Inspector, City Health Department, City Building, Barberton, Ohio.
Vocke, Clarence O., Fieldman, Dairy Dist. Inc. Coop., 3359 N. 30th St., Milwaukee 10, Wis.
Vroman, H. S., Vice-President, The Defiance Milk Products Co., Defiance, Ohio.
Weavers, Harvey J., Senior Marketing Specialist, Dept. of Agriculture, Madison, Wis.

CHANGES IN ADDRESS

Bischer, Edward J., Box 236, Troy, Penn.
Holford, Dr. F. D., 161 S. Broadway, White Plains, New York.
Minkin, Joseph L., District 4, U.S.P.H. Service, 1307 Pere Marquette Bldg., New Orleans, La.
Morrison, Jos. V., 529 Washington Ave., Albany, N. Y.
Mowry, Merlin M., 150 Prospect St., Middletown, N. Y.
Rowland, James L., Jr., 4127 University Blvd., Dallas 5, Texas.
Sattell, Irving, Cpl. Irving Sattell, 128th Station Hospital, A.P.O. 713, c/o Postmaster, San Francisco, Cal.

ALEXANDER R. TOLLAND

1887–1944

Alexander R. Tolland was born in Adams, Massachusetts, in 1887 and died May 3, 1944. He was appointed Dairy Inspector in Boston in 1913 and later made Superintendent of Pasteurization at the time Boston became one of the first large cities in the United States to require pasteurization. A few years ago he was given charge of dairy inspection for the City of Boston, which position he held until his retirement, because of poor health, in 1941. He joined the Massachusetts Association of Milk Inspectors in 1922 and became its President in 1934. In 1937 he was President of the International Association of Milk Sanitarians.

"Al," as he was known, was respected by his associates and the milk industry. He was a friendly person, interested in his work and well informed. His passing is a great loss to the industry as well as to his friends and it will be hard to fill his place.

Bulmer Leaves Birmingham

L. C. Bulmer, well-known over the country as the Director, Bureau of Food and Dairy Inspection, Jefferson County Board of Health, Birmingham, Alabama, resigned from this position in protest over a matter of policy.

In 1921, he was engaged as a dairy specialist by the Birmingham Board of Health. He found the milk supply to be poor in quality. The average bacterial count of the market milk (practically all raw) was 780,000 per cc., more than 50 percent of the supply adulterated with added water to the extent of 10 percent, the typhoid rate running over 67 (said to be the highest in the country), colitis of infants under two 184, and a per capita milk consumption of one-fifth pint per day.

The enactment of a regulatory ordinance by the new director of food and dairy inspection (Bulmer) was followed by many political attacks and litigation. Within three months, the health officer, Dr. J. D. Dowling, was kidnapped and flogged almost to death.

(Continued on page 248)

Correspondence

(COPY)

April 27, 1944.

Dr. J. H. Shrader,
23 East Elm Avenue,
Wollaston, Mass.

Dear Dr. Shrader:

In my article in the July-August issue of the JOURNAL OF MILK TECHNOLOGY I made the following statement: "Today, only sanitary engineers may hold commissions as milk sanitarians with U. S. P. H. S." This statement was refuted in the November-December issue, since a few dairy graduates have received commissions in the Public Health *Reserve*. This fact still does not alter the policy of the Public Health Service inasmuch as appointments to the *Reserve* are for the duration of the war, plus six months. Therefore, said commissions are only an emergency and a temporary matter—a fact undoubtedly recognized by the dairy graduates who hold civil service ratings with the Health Service, and preferred not to apply for commissions.

No, the dairy college graduate has still to be recognized in the field of endeavor for which he is particularly suited and *still* is being neglected. The matter is one which calls for concerted effort by all dairy colleges which apparently are little interested in the subject. Unless, and until they put their shoulders to the wheel and "cry havoc" the situation will not be remedied. It is squarely up to our dairy colleges whether or not dairy graduates are to receive recognition for milk sanitation work either in the Armed Forces, or the Public Health Service. Are they ready to accept the challenge?

Cordially yours,
(Signed) SIDNEY SHEPARD.

(COPY)

FEDERAL SECURITY AGENCY
U. S. PUBLIC HEALTH SERVICE
WASHINGTON 14

June 17, 1944.

Dr. J. H. Shrader
Editor, JOURNAL OF MILK TECHNOLOGY
23 East Elm Avenue
Wollaston, Massachusetts

Dear Dr. Shrader:

For the sake of the record, let me point out that before the war milk sanitarians were appointed to the Public Health Service from Civil Service lists to which dairy graduates, veterinarians, bacteriologists, and sanitary engineers were equally eligible. Of the nine Public Health Service men on field duty in milk sanitation before the war, three were veterinarians, three were sanitary engineers, two were bacteriologists, and one was a dairy graduate. Thus, even in that small prewar permanent staff all professions related to milk sanitation were represented. Furthermore, our peacetime prewar staff on milk sanitation included only one commissioned officer.

For the Chief, Sanitary Engineering Division.

Very truly yours,
(Signed) A. W. FUCHS,
Sanitary Engineer Director
In Charge, Milk and Food Section.

ANNUAL MEETING, NOVEMBER 2–4, 1944

LaSalle Hotel — Chicago, Ill.

Apr. 11, 1944.

To C. Sidney Leete, Sec.-Treasurer
International Assn. Milk Sanitarians
State Department of Health
Albany, N. Y.

Dear Mr. Leete:

The JOURNAL OF MILK TECHNOLOGY is a persistent piece of literature I'm glad to say. It has finally tracked me down in the wilds of New Guinea . . . and I assure you that the JOURNAL is a mighty welcome sight at mail call. I'd like to make it a little easier for future copies to reach me, so please forward my corrected address to the proper channels. . . . A.P.O. 713, Care Postmaster, San Francisco, Cal.

Although at present I am not engaged in milk sanitation, all our milk comes in the canned form, canned cow or armored cow as it is referred to. I am working in the medical laboratory here at the hospital where, at intervals, the problems of control and sanitation are laid. The applicability of milk control work and the technique of handling these problems are a decided factor in bringing our problems to a successful conclusion . . . which leads me to the foregone conclusion (ahem!) that a milk sanitarian is just as good a sanitarian in any other field he may find himself.

So I wish to thank you and the organization for the policy that keeps the journal coming to us who are in the forces. The journal is really a welcome interlude that helps pass away the monotony of life in the raw. With best wishes for the continued advance of milk sanitation at home, I remain

Very truly yours,
(Signed) IRVING SATTELL.

NEW PROBLEMS FOR SANITARIANS

(Continued from page 190)

supervision of the same office that handles milk and ice cream, it looks as if the milk sanitarians will find their attention devoted increasingly to a whole new field of supervision and instruction. This includes the restaurant trade, the baking and confectionery industries, the delicatessen establishments, the "hot dog" stands, and the whole "liquid refreshment" field. New equipment is being designed, and new firms will be entering the manufacturing fields, prodded by competitive pressure. These must all be educated. Many of these people are now, insofar as concepts of sanitation are concerned, where the milk industry was twenty-five years ago, the ice cream industry fifteen years ago, the butter people ten years ago, and the evaporated milk business five years ago. In-service job instruction is the great new development that constitutes the best insurance that supervisional effort will result in maintaining a satisfactory degree of compliance after the inspector has departed.

Then, there is soybean "milk" and "cheese." Are they really "milk" and "cheese" respectively under such labeling? If so, then they should be as rigidly inspected as any other dairy product. It would seem to this writer that inasmuch as the legislators quite generally hold that the oil (glycerides) of the soy bean does not make butter but only a margarine,* then consistency should maintain that the protein and carbohydrates of the soy bean do not make milk (like cows' milk).

It is easy to foresee that the cheese industry is in for more stringent supervision than heretofore. The public has as much reason to demand protection from hazards from this product as from butter and ice cream.

We had better plan to attend the annual meeting in Chicago on November 2–4 and check up on developments in meeting these problems—plus additional ones maybe by that time.

J. H. S.

* When so used.

The first letter of this series, with its introductory explanation, was published in the May-June issue, page 184.—Editor

Second Letter from Uncle Bob

Sunny Acres, Oregon, July 10, 1937.

Dear Nephew:

We read with delighted interest your account of the manner in which you are repairing and re-modeling the old home, and of your progress in the reconstruction of the dairy buildings and the gathering of a dairy herd. I told you that George Taylor would be a valuable man, and I am glad you have made him manager. You can not chide me for being amused over the fact that an inspector from the health department in the city drove into your place and surprised you in the process of construction. Even though you did not reply directly to the advice in my last letter, it seems to me that there are indications in your letter that you have been somewhat impressed by it.

I think I could write a scenario including almost every detail of the visit of this inspector. You were busy directing the carpenters, masons, and laborers, and irritated because the work was progressing so slowly. He walked up to you and introduced himself, and you shortly turned back to what you had been doing. He wandered around, looked over the situation, and then returned to you and began to ask questions and to offer suggestions. Some of his questions were pertinent, and several of his suggestions were good. But the fact that you had not thought of them reflected your inexperience, and hurt your pride. He made you feel like a novice (which you are), and because of that you have already formed a dislike for him. The idea of him, a mere dairy inspector, suggesting to you, the big-shot dairy owner, how your place should be built!

I think you are ripe for Lesson No. 2 of my course on "HOW TO OUTWIT DAIRY INSPECTORS"; so, here it comes. I hope it is not too late.

It may be presumed, I suppose, that you have by this time obtained a copy of the ordinances or regulations governing the production and sale of milk in the market in which you propose to sell your milk. It would also be a good move to get copies of the regulations of other nearby markets. Study them carefully, and understand thoroughly their various provisions. You should know all the requirements of the ordinance to which you are subject as well as, or better than, the inspector. I urge this for two reasons: first, in order to know what you MUST do or have; second, to learn what he can NOT require you to do or have.

Then you will be in position to request the inspector to look over your place and to instruct you concerning any construction or equipment you have overlooked, or arrangement of equipment not to his liking. But require him to cite to you the chapter and section of the ordinance covering every request, suggestion, or proposal he makes, and ask him about any item you think he has overlooked. Make notes on your printed copy, and keep it for future reference. If you can persuade him to do so, have him write his instructions over his signature, and date them. Save that document, too!

This course may subject you to the making of a few changes in your plans; or, if you have proceeded too far with construction, you may find it necessary to tear down a wall or partition, and rebuild it a short distance away; or, possibly, to add window area. But the result will be a dairy which meets all legal requirements with respect to construction.

This procedure will impress you as being so business-like and orthodox that you will be wondering why I consider it a lesson in outwitting dairy inspectors. Well, here is the answer!

You will recall that, in my last letter, I referred to the fact that inspectors sometimes change the emphasis, or point of view, of their inspections. If you follow the advice I have given you, this inspector will be on record as having instructed you to build, equip, and arrange your dairy in a certain way. He can not logically take exception if you decline to make further changes because he has changed his mind or point of view. Of course, if the regulations have been legally amended, the situation is altered; but such amendments are rarely retroactive. You will also have protected yourself against changes urged because of the different views of successors of this inspector.

. . . .

I have noted another feature of your letter which, it seems to me, makes it imperative that you have Lesson No. 3 without delay.

It is your privilege to dislike the inspector; but it will be a serious mistake for you to let him know it. Dairy inspectors react like humans (although this may appear a strange concession, coming from me). If you show your dislike of this one, he will eventually come to dislike you; and that feeling will inevitably color his attitude toward you and his reports concerning your dairy farm.

The winning of a favorable attitude of a dairy inspector toward a dairy operator is so simple and easy, that any one who fails to do so is either a congenital misanthrope, a dope, or a dunce. There are so many inexpensive products of the farm (many of which are wasted), of which the producer can make gifts to the inspector, or services which cost the farm owner nothing, by means of which he can keep the inspector perpetually in his debt. You have a garden, berry patch, and orchard, flocks of barn-yard fowl, and you butcher numbers of hogs each year, or will as soon as you get the farm into full production. In addition there were—and, I suppose, still are—game birds and rabbits in the fields and woods, and trout and pan fish in the pond and creek.

You and your family will never miss an occasional bunch of radishes, or a mess of vegetables, or a box of berries, or a peck of fruit from the orchard. On the other hand, any of these may be a welcome aid to the inspector's family budget. If he is a bachelor, and has no use for raw vegetables, he probably likes to hunt or fish. Invite him to do so on your place. Don't let him leave your place, after an inspection, without a small token of your regard for him—even if only a bunch of seasonable flowers for his wife—or an invitation to hunt or fish.

You will no doubt want to know why you should go to such length to win the friendship of a man you do not like. Remember that, whether you like him or not, his attitude toward you and your dairy farm is what counts. If he accepts these little gifts (you may wish to term them bribes, but they hardly fall into that category; but suppose they do! So what?), he becomes progressively obligated to you. He will hardly consider them bribes (and you must avoid any implication that you consider them such) because of their small or intangible value. But subconsciously he will realize that he is under obligations which he can repay in only one manner. Or, he will be reluctant to offend you, for fear these gifts will discontinue. When that stage has been reached you are set!

Should your inspector be of the opposite sex, you may have to modify the tactics suggested above. In that case a kitten or puppy may turn the trick. Flowers from your wife's garden might be effective, provided you can obtain her permission to present them to another woman. This latter will depend largely upon the age and appearance of the inspectress. You will know what I mean!

There are inspectors, I have been told, who will not accept gifts from dairy farm operators, because they wish to remain untrammelled in making inspections and in effecting such changes in practice, or improvements in structures or equipment, as they deem necessary. Should your inspector be of that type, by all means discard the precepts of this lesson. There are other means, less likely to backfire, of reaching such inspectors, which I shall discuss in subsequent letters.

Your Aunt and I appreciate your invitation to visit you as soon as your rehabilitation of the farm and house have been completed. Maybe we can arrange to do so next Winter, after the orchard crops have been packed and marketed.

Affectionately yours,
UNCLE BOB.

"Doctor Jones" Says—*

Well. Spring's just around the corner and that's the time when we always used to make a great point of having "clean-up week": digging out all our rubbish and getting it drawn off and all that. Of course there's other things associated with Spring I'd rather think about than getting rid of dirt: flowers coming up and the nice, balmy air, buds on the trees and what not. But, anyway, what made me think of it: the minister preached a sermon here recently on cleanliness. And a clean mind being full as important as a clean body or a clean house—of course he had considerable to say on that.

And I got to thinking: just what do we mean by cleanliness, anyway? And dirt: just what do we mean by that? A lot of the stuff that, clean-up week, we used to dump out on the pile, now they're collecting it up and it's helping to win the war. Our garbage—we don't have much any more because a lot that used to be wasted, now it's food. And green mold, that we stick up our noses at when we find it on food, they're growing all they can of it today to get this life-saving penicillin from it. And so it goes.

On the other hand disease germs and viruses that are really dangerous: we can have 'em on our hands or in the air and nobody sees 'em. And speaking of clean minds: thinking up something mean to say about somebody, some innocent sounding little quip that'll start gossip going around about 'em—to my mind that's the worst kind of dirt: in the same class with the disease germs.

Well, what it all comes down to: having things kept clean and neat and orderly—it's good for our state of mind, if nothing else, and I'm in favor of it; but even a cleaning-up job'll be more effective for having a little thought and discrimination applied to it.

Like the "forty-niners," we want to be sure we aren't throwing out any pay-dirt. I don't suppose waste is justified even in times of plenty. And we've wasted time and energy, to say the least, if when we get through all we've got is what Mayor Gaynor used to call "outward order and decency" and the dangerous dirt is still there.

Yes, what constitutes cleanliness—it's a question that'll stand considerable study. That's why I steer clear of these house-cleaning jobs: they don't allow me sufficient time to think 'em over.

PAUL B. BROOKS, M.D.

* *Health News*. New York State Department of Health, Albany, March 13, 1944.

Bulmer Leaves Birmingham

(Continued from p. 243)

A month later, an attempt was made to kidnap Mr. Bulmer but this failed. For nearly three years, it was necessary for the twenty dairy inspectors to visit dairies in pairs, armed with pistols. One inspector had his throat cut and twenty policemen were wounded, one killed, in coming to the rescue. A morning mail frequently brought anonymous letters, containing cow manure.

Today the typhoid rate is low, milk runs 4 percent butter fat and 100,000 organisms per cc. before pasteurization and 20,000 after. The Department of Health has earned the complete confidence and cooperation of the milk industry, and the per capita consumption of milk has increased.

Similar conditions prevailed in many other cities but happily those days are gone forever, thanks be to the pioneers who made the present day possible.

Bulmer is now a member of the Sealtest organization.