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Editorials

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

Annual Meeting at Atlantic City

THE annual meeting of your Association has been scheduled for October 24, 25 and 26, 1946, at Atlantic City, New Jersey, with the Seaside Hotel as headquarters. All members are urged to make plans to attend this meeting, as many important business matters must be decided and a full attendance is needed so that all decisions will be truly representative of the will of the membership.

The Executive Board, at a meeting in Detroit, decided to submit certain changes in the Constitution and By-Laws of the Association to the membership, which you have probably received by this time. The changes proposed will accomplish the suggested enlargement of scope of the Association to include those persons interested in restaurant and food sanitation, which was briefly discussed at our last meeting two years ago, the provision for a single class of membership with each member having all privileges now reserved for Active members, and the standardization of membership fees at the uniform level of Two Dollars per year. All of these items are of vital importance and the membership is asked to give them careful consideration and plan to be in Atlantic City to discuss them.

I am looking forward to seeing you in October at our official meeting, which gives every promise of having a very timely and worth while program.

R. R. PALMER, *President*

Is Water Necessary?

ONE of the prime requisites for any food industry is an abundance of clean, pure, potable water conveniently located throughout the factory. Water is the cheapest, best, and most universal solvent known to man. Ethyl alcohol is the only other solvent even approaching water in its universal use. One can hardly picture a food factory without water. It is used to wash and blanch the raw food products in the frozen, dehydrating, pickling, and canning industries; and in the last named industry to sterilize and cool the cans. In all these industries water is used in abundance to clean the machinery, utensils, floors, walls, windows, and whatever else needs cleaning.

Water is not used in as many different ways in the dairy industry as in some of the other food industries but is used in abundance in cleaning utensils, machinery, walls, floors, and the like, and of course in most types of pasteurizing machines. Certainly no dairy could operate without an ample water supply.

In all cleaning operations water greatly reduces the number of microorganisms by washing them away. Where the equipment, utensils, floors, and walls are soiled with fatty and protein materials, detergents and wetting agents are added to the water to increase its efficiency as a solvent. Where disinfectants are to be used to sanitize these surfaces, the disinfectants work much better if the surfaces are clean. A clean surface is not hard to sanitize because there is no organic matter to use up or combine chemically with the disinfectant and because the cleaning operation has or should have greatly reduced the number of microorganisms present. So there are fewer to kill.

Paradoxical as it may seem, the dairy and some of the other food industries have found that they have been using water too abundantly and not too intelligently. For example, to have the floors, walls, and ceilings wet with condensed steam and water all the time is not healthy for the employees and favors the growth of microorganisms. Microorganisms do not grow on dry surfaces. Therefore, the new idea is to keep food plants as dry as possible. This is accomplished in several ways. Machines are disassembled and the parts placed on a movable rack where they are transported to a separate washroom. There they are washed, dried, and protected from dust, flies, insects, rodents, and vermin until they are ready to use. The removable parts of the machine are wash and dried with compressed air and likewise protected from contaminating agents. The floors are then cleaned and mopped dry. There is also a safety factor in clean, dry floors since the danger of falling is greatly reduced. One of the attractions for flies, cockroaches, insects, and rodents, besides food, is water. They must have food and water to live. They require a great deal more water than is generally appreciated and find plenty of it in most food factories.

Therefore, the general idea today is to use water abundantly but intelligently, to keep the plant and machinery clean and dry. This condition makes for a more contented and healthful environment for the workers and a less likely one for microorganisms, insects, and rodents.

F. W. F.

Bovine Mastitis and Human Health

THIS comment is being written in Florida in the month of March. A home-town paper which came to me early in the month contained an item concerning a bill then pending in the New York State legislature making a large appropriation for the "eradication" of bovine mastitis. It provided, among other things, for indemnities to be paid to dairymen for cattle condemned and slaughtered because of udder infections. The item included this statement: "The bill . . . is primarily a health measure because mastitis is a great hazard to human consumption." Presumably the same or a similar item appeared in other papers.

The quoted statement typifies the confusion still existing in the minds of a great many interested people concerning the relationship between bovine mastitis and human health. The fate of the bill in question will have been settled long before this discussion appears in print. But a review of some of the known facts still may not be untimely.

The statement was, perhaps inadvertently, quite definitely misleading. While some types of udder infection, under certain conditions, are a menace to health, there is little, if any, sound basis for the conclusion that the application of such a general measure for control of mastitis would have any significant effect in protection of the health of consumers. Such measures, assuming that their general and efficient application was practicable, would be primarily economic in their effect, and beneficial chiefly to the dairy and milk industry.

Mastitis control, applied as it frequently is, in individual herds and under skilled direction, increases milk production by eliminating animals with poor udders and improves the general "sanitary" and commercial quality of the product. Applied intensively under such conditions, all infected animals being promptly excluded, the milk may be made safer for human consumption. Due, however, both to its initial cost and lack of sufficient interest on the part of the rank and file of dairymen, such intensive and scientific application of control measures, on any state-wide or general scale, has not yet been practicable.

It is well known that the mastitis which prevails generally is that incited by what we often speak of as the "bovine type" of streptococcus or "*Streptococcus mastitidis*," also *Streptococcus agalactiae*. While there is very little evidence that organisms of this group may occasionally be associated with certain low-grade infections in man, the association must at least be relatively rare, and such infections apparently have never been traced to milk. Thus it seems reasonable to accept the quite general conclusion that these organisms are not ordinarily pathogenic for man.

There are three types of organisms, on the other hand, which, when present in the bovine udder and assuming that the milk is to be consumed without pasteurization, create real hazards. These are Brucellae (under certain conditions not yet fully understood), hemolytic streptococci of Lancefield's Group A, and certain hemolytic staphylococci.

The control of Bang's disease is a problem by itself. Obviously, general measures for control of mastitis cannot be expected to prevent or control the occasional udder infections with the Brucellae. In fact, the only generally applicable measure upon which we can depend for protection against milk-borne brucellosis is pasteurization.

Numerous and serious outbreaks of streptococcus infection (so-called scarlet fever and septic sore throat) have followed infection of bovine udders with hemolytic streptococci *of human origin*. Relatively, however, such infections occur only occasionally. They occur only when these pathogenic organisms are transmitted from infected persons to the bovine udders, usually via the hands of infected milkers. They would not be prevented by general and routine mastitis control measures.

Pathogenic staphylococci, usually of the *aureus* variety, if allowed to stand for a few hours at room temperature in milk or other suitable media, will produce a toxin which has been responsible for many outbreaks of so-called food poisoning. The JOURNAL, within the past year or two, published a report of such an outbreak which resulted from milk being allowed to stand over night, at room temperature, before being pasteurized. Pasteurization, incidentally, will destroy the organisms but not the toxin.

Udder infections with these pathogenic staphylococci seem to be relatively uncommon. There would be little likelihood of their being prevented by routine mastitis control measures. Protection from such relatively rare milk-borne outbreaks lies in continuous refrigeration of the milk up to the time of pasteurization or, if not to be pasteurized, up to the time of human consumption.

The general control of bovine mastitis is, obviously, something to be highly desired. Its eradication is, at least, "something to aim at." It is a serious question whether general control measures can be expected to be effective enough to warrant the cost of their application until a foundation of education has been laid. The rank and file of dairymen need to recognize, first of all, that the eradication of mastitis from their herds means an economic saving to them; that it is primarily in their interest. They need to have a working knowledge of the relation of bacteria to mastitis, how they are transmitted and how their inroads may be prevented. In any event, legislation designed to effectuate mastitis control should be presented in its true light, as primarily economic and not public health.

P. B. B.

ANNUAL MEETING, OCTOBER 24–26, 1946
ATLANTIC CITY, N. J.

Official Headquarters
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Significance of Concentration of Coliform Organisms in Raw Milk Upon Survival of Pasteurization

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THE coliform test has been receiving a great deal of attention as an indicator of the sanitary conditions under which milk is pasteurized and handled. The test has been found especially valuable in detecting faulty cleaning and sterilizing of equipment and other sources of contamination of milk after pasteurization (1). Coliform organisms are frequently found in pipe lines and other equipment that have not been properly cleaned and sterilized or have become recontaminated. Their introduction into pasteurized milk, even in small numbers, may be readily detected by using selective media such as brilliant green lactose bile broth. Since the total bacteria count does not differentiate between those organisms which normally survive pasteurization and those due to contamination after pasteurization, the coliform test serves a very useful purpose in the control of pasteurized milk.

Since coliform organisms are usually present in raw milk (2, 3), it is necessary to understand and be able to detect conditions which allow coliform organisms to survive the pasteurization process, in order to apply the coliform test as an index of contamination after pasteurization. Among these conditions are: inadequate pasteurization, presence of heat-resistant strains, and presence of a large number of coliform organisms in raw milk.

Inadequate pasteurization can be readily detected by using the phosphatase test (4).

Heat resistant strains have been found by many workers. Stark and Patterson (5), found that 18 of 505 strains tested survived pasteurization at 140° F. for 30 minutes, only 4 survived 143° F. for 30 minutes, and none survived 145° F. for 30 minutes. The organisms were grown 24 hours in nutrient broth and inoculated into sterile milk, giving a concentration of approximately 100,000,000 organisms per ml. before pasteurization. Minkin and Burgwald (6) found 35 percent of approximately 140 strains tested survived pasteurization conditions. Beavens (7) reported that 32 percent of 100 samples resisted the heat treatment; and Ayers and Johnson (8), studying the thermal death points of 174 strains of colon bacilli (all but 3 were Escherichia strains), showed that 95 (54.59 percent) survived 140° F. for 30 minutes, 12 (6.89 percent) survived 145° F. and 1 (0.57 percent) survived 150° F. When the resistant culture was retested at 150° F., it failed to survive. The 12 cultures surviving 145° F. were each retested six times at the same temperature with results varying from no survivals to 9 survivals. Tanner and Windsor (9) found that 4 strains of 23 tested survived 30 minutes or more at 145° F. These strains were retested using varying concentrations of organisms, the variation in one case was from 10^5 to 10^8, but in the others the range was less wide.

In the studies reported in this paper, an attempt was made to determine the effect of the total number of organisms present before pasteurization upon survival, by heating series of tubes of milk containing varying concentrations of organisms.

EXPERIMENTAL

The strains of coliform organisms selected for testing were recovered from raw milk, pasteurized milk, and ice cream. Isolated colonies were fished from the surface of EMB agar plates and the strains were then classified by the IMViC method recommended by Parr (10).

The organisms were prepared for testing by spreading 0.1 ml. of a 24-hour broth culture over the surface of a nutrient agar slant and incubating the slant at 37° C. for 48 hours. The growth on the agar slant was then suspended in 2 ml. of sterile nutrient broth. This was considered the original suspension. Five serial one hundred-fold dilutions were made in sterile water giving dilution of 10^{-2} to 10^{-10} of the original suspension. The dilutions were made in 99 ml. water blanks in glass-stoppered 240 ml. bottles, and each bottle, during a time interval of 7 seconds, was shaken 25 times over an excursion of one foot to assure good distribution.

At the time the dilutions were made, 0.5 ml. of the original suspension and of each dilution were inoculated into 4.5 ml. of sterile skim milk in a 12 mm. x 120 mm. test tube. Immediately after all of the tubes were inoculated they were placed into an electrically heated, thermostatically controlled water bath at a temperature of 62° ± 0.1° C. The water in the bath extended ½ inch above the top of the column of milk in the test tube in the bath. The temperature of the milk was determined by placing a "titre test" thermometer into an uninoculated tube of milk. After the milk had been held at 62° C. for 30 minutes, the tubes were removed from the water bath and cooled in ice water. The contents of the tubes were then poured, using sterile technic, into large lactose broth fermentation tubes, which were incubated 72 hours at 37° C. and examined for gas.

In order to determine the number of organisms in the original suspension, 1.0 ml. and 0.1 ml. each of the 10^{-8} and 10^{-10} dilutions were placed into sterile petri dishes. About 15 ml. of tryptone glucose extract agar were poured into each dish, mixed with the sample, and allowed to harden. After 24 hours of incubation at 37° C., the colonies were counted and the number of organisms present in the original suspension calculated by multiplying the average of all plates containing between 30 and 300 colonies by the dilution. From this calculation the number present in each tube was determined.

FINDINGS

Results of tests on eight strains each of *Escherichia*, Intermediate and *Aerobacter* organisms are shown in Table I and Table II. In every series, survival occurred in at least the tube containing the greatest concentration of organisms. Every series also had at least one tube in which the organism failed to survive. Survival did not occur in any tube containing less than 700 organisms per ml. With the exception of strain C118, all series showed a sharp end point, concentrations greater than the end point always survived and concentrations less than the end point always failed to survive.

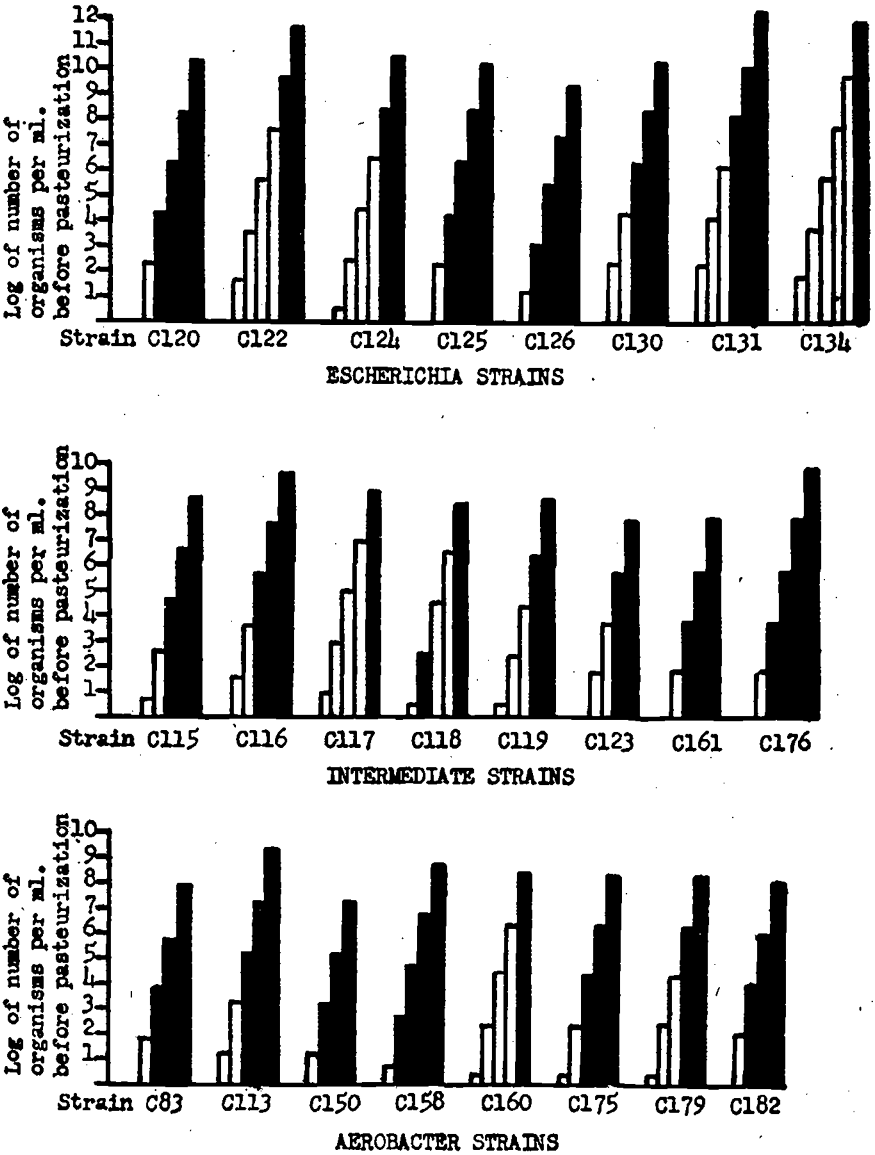
Comparing the relative resistance of the three groups, the average end point was approximately 16,000,000 per ml. for the *Escherichia* group, 1,000,000 per ml. for the Intermediate group and 50,000 per ml. for the *Aerobacter* group. The number of organisms necessary for survival varied widely in different series within the groups. Similar results were found for multiple series run on single strains in experiments not included in this report.

DISCUSSION

One of the objections to the use of the coliform test as a routine method of detecting milk that has been pasteurized and handled under insanitary conditions has been the presence of coliform organisms in small numbers in

TABLE I

EFFECT OF NUMBER OF COLIFORM ORGANISMS PRESENT IN MILK ON THEIR SURVIVAL AFTER BEING SUBJECTED TO 62°C. FOR 30 MINUTES



■ Tubes of milk containing viable coliform organisms after pasteurization

□ Tubes of milk from which no coliform organisms could be recovered after pasteurization

TABLE II

EFFECT OF NUMBER OF COLIFORM ORGANISMS PRESENT IN MILK ON THEIR SURVIVAL AFTER BEING SUBJECTED TO 62° FOR 30 MINUTES

	Strain No.	*Survival After Pasteurization* — *Dilution of Original Suspension* 10^{-1}	10^{-3}	10^{-5}	10^{-7}	10^{-9}	10^{-11}	*Organisms per ml. in last tube showing survival (end-point)*	*Log of end-point*
ESCHERICHIA STRAINS	C120	+	+	+	+	—	—	171×10^{2}	4.23
	C122	+	+	—	—	—	—	38×10^{8}	9.58
	C124	+	+	—	—	—	—	187×10^{6}	8.27
	C125	+	+	+	+	+	—	205×10^{2}	4.31
	C126	+	+	+	+	—	—	136×10^{2}	4.13
	C130	+	+	+	+	—	—	228×10^{4}	6.36
	C131	+	+	+	—	—	—	147×10^{6}	8.17
	C134	+	—	—	—	—	—	62×10^{10}	11.79
INTERMEDIATE STRAINS	C115	+	+	+	—	—	—	60×10^{3}	4.78
	C116	+	+	+	—	—	—	48×10^{4}	5.68
	C117	+	—	—	—	—	—	115×10^{7}	9.06
	C118	+	—	—	+	—	—	38×10^{7}	8.58
	C119	+	+	—	—	—	—	30×10^{5}	6.48
	C123	+	+	—	—	—	—	8×10^{5}	5.90
	C161	+	+	+	—	—	—	8×10^{3}	3.90
	C176	+	+	+	+	—	—	108×10^{2}	4.03
AEROBACTER STRAINS	C83	+	+	+	—	—	—	48×10^{2}	3.68
	C113	+	+	+	—	—	—	57×10^{3}	4.75
	C150	+	+	+	—	—	—	30×10^{2}	3.48
	C158	+	+	+	+	—	—	71×10^{1}	2.85
	C160	+	—	—	—	—	—	33×10^{7}	8.52
	C175	+	+	+	—	—	—	182×10^{2}	4.26
	C179	+	+	—	—	—	—	166×10^{4}	6.22
	C182	+	+	+	—	—	—	121×10^{2}	4.08

pasteurized milk when careful study reveals no source of contamination.

Reports that large percentages of the strains isolated from pasteurized milk were able to withstand pasteurization in the laboratory have made many inspectors doubt the practicality of the coliform test as a control measure. When the reports of heat resistant strains are analyzed on the basis of the work reported in this paper, many of the reports lose some of their significance. We have demonstrated that all of the strains tested will survive pasteurization if the original concentration is large enough. In reports in which the concentration was stated, it was frequently much greater than would exist in good raw milk. The resultant survival did not satisfactorily prove that the strain was inherently heat resistant. Survival in many cases probably depends upon the chance selection of a resistant organism. The factors that would influence the resistance of single organisms such as age, nutrition, enzyme activity, and other physiological factors are very difficult to control. It therefore seems impossible to draw any definite conclusions as to the relative heat resistance of any strain or group of strains from these reports or from the experiments reported in this paper. Before definite conclusions are drawn, a series of tests under accurately controlled conditions should be run on a strain, and compared with the results of series of tests on many other strains to establish the inherent comparative resistance of that strain. No report has been found in the literature of coliform organisms that are able to grow or remain static under pasteurization conditions. All of the strains show a marked reduction in numbers even when survival does occur. It does not seem definitely established that heat resistant strains, capable of surviving pasteurization when present in small numbers in raw milk, are frequently encountered as the cause of coliform contamination in pasteurized milk.

Another difficulty encountered in the practical application of the coliform test lies in determining the number of coliform organisms which should be considered significant in pasteurized milk. Vernon and Walker (11) and Barkworth (12) recommend incubation tests using large volumes of milk (80 to 100 ml.). By this method it seems quite possible frequently to pick up organisms which are a result of normal survival. In a series of 279 pasteurized milk samples on which 100 ml. portions were incubated in addition to the routine test using five 1 ml. portions, 91 samples contained coliform organisms in the 100 ml. portions whereas only 48 samples (52.8 percent) showed gas in one or more of the five 1 ml. portions. On the other hand, tests using 1 to 10 and 1 to 100 dilutions of pasteurized milk, as approved by the British Ministry of Health (13), may fail to detect the few coliform organisms surviving as a result of large numbers in the raw milk or those being introduced through contamination after pasteurization.

Even good raw milk may contain a total number in the entire batch as great as, or greater than, the number required for survival by most of the strains in this series. It seems, therefore, impractical to insist that pasteurized milk be completely free of coliform organisms. However, since the most resistant strain in this series required 700 organisms per ml. for survival, there should be a limit to the number that may be considered a result of survival. The problem then is to adopt a test sufficiently sensitive to detect poor quality raw milk or contamination after pasteurization without reporting too many coliform organisms that are a result of survival of pasteurization and have no particular sanitary significance.

The following test, which has been recommended by the Medical Department of the United States Army (14), seems to have satisfied the requirements mentioned above: Inoculate each of five Brilliant Green Lactose Bile broth fermentation tubes with 1 ml. of the sample. Incubate 48 hours and examine for gas. When all tubes remain negative or only one or two tubes contain gas, consider the sample negative. When three or more tubes show gas, complete the test and consider the contamination significant. Occasional positive samples should not be taken as final evidence that there is a serious operational flaw, but when a large percentage of samples contain significant numbers of coliform organisms, a careful study should be made to determine the cause of the condition. Of 217 positive coliform tests on pasteurized milk, 80 samples (37 percent) showed gas in only one or two tubes. Added significance is given to the other positive samples when these are eliminated.

When persistent or gross coliform contamination is found in a particular source of pasteurized milk, one of the following conditions may be involved: (1) contamination after pasteurization, (2) improper handling of milk after pasteurization allowing multiplication of those organisms normally present, (3) survival of pasteurization as a result of large concentrations in the raw milk, (4) inadequate pasteurization, and (5) heat resistant strains. All of those conditions except the last may be considered potentially dangerous in themselves. Heat resistant strains in the pasteurized milk may mask the introduction of other coliform organisms from a source which could make the milk unsafe for human consumption. It is therefore advisable to detect and eliminate the cause of coliform contamination. Certain routine laboratory tests may be used to help find the contamination. The standard plate count will reflect improper handling and the phosphatase test may be relied upon as an index of inadequate pasteurization. In addition to the routine tests such special tests as coli counts on the raw milk, pasteurization of the raw milk in the laboratory, and the testing of line samples taken at various stages during the pasteurization process may demonstrate whether the condition is a result of excessive numbers, heat resistant strains, or contamination after pasteurization.

When the source of the trouble has been located, corrective measures should be applied, such as cleaning and sterilization of equipment in both the dairy and the pasteurizing plant, even when the contamination may be definitely ascribed to heat resistant strains.

SUMMARY AND CONCLUSIONS

1. Eight strains each of *Escherichia*, Intermediate and *Aerobacter* coliform organisms isolated from raw milk, pasteurized milk and ice cream were all demonstrated to be able to survive 62° C. for 30 minutes in milk when present in sufficient number. No strain tested survived when the concentration before pasteurization was less than 700 per ml.

2. It is recommended that pasteurized milk should not be considered satisfactory for human consumption if it is positive for coliform organisms in more than two of five 1 ml. samples.

3. When gross or persistent coliform contamination occurs, one of the following conditions is probably involved: (a) contamination after pasteurization, (b) inadequate pasteurization, (c) improper handling of the milk after pasteurization, (d) excessive numbers of coliform organisms in raw milk, (e) heat resistant strains.

4. The routine use of the phosphatase test and the standard plate count in conjunction with the coliform test and the use, when indicated, of special tests including coliform counts and laboratory pasteurization of raw milk, and the examination of line samples, taken at the plant, may help to determine the specific cause of contaminations that prove difficult to control.

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The Efficacy of the Microscopic Examination of the Incubated Producer Milk Samples in Detecting Streptococcic Mastitis in Dairy Herds*

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AND

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The streptococci cause the major portion of the chronic infectious mastitis affecting many dairy herds. This dairy cattle disease is of great economic importance since it is responsible for a marked decrease in the milk production and in the quality of the milk produced by the affected cows. The infection is responsible for a large amount of herd wastage because it ultimately damages the udders severely. For these reasons dairymen, veterinarians and milk sanitarians are vitally interested in the problem.

The cooperative work of all interested persons is essential for the ultimate success of any program of mastitis control. If the results prove accurate the milk sanitarian can aid the "veterinarian-client" team by examining producer milk samples for evidence of the presence of streptococcic mastitis. This paper presents the results of examining producer milk samples for long-chained streptococci. To determine the accuracy of these results in indicating the presence of infectious mastitis in the herd, individual cow samples were properly collected from each lactating cow in 83 herds and examined for the presence of streptococci of mastitis.

Methods

The producer milk samples were collected, once each month, from the weigh tank at the milk plant. The dipper used for sampling was placed into chlorine solution (200 parts per million of available chlorine) between samples.

Eighty-three herds were selected for individual cow testing because the results of examination of producer samples had been consistently positive or negative. These herds were visited just before time for the regular milking. The first two streams of milk from each quarter were discarded into a strip cup and examined for physical appearance. Then two drops of milk from each quarter were placed each on its individual spot of the thybromol blotter test square for pH determination. The udder of each cow was then carefully sanitized by washing with an individual paper towel moistened in chlorine solution (approximately 200 p.p.m.). A composite cow sample of approximately 5 cc. was immediately collected in a sterile 8 cc. vial containing a differential preservative (1). After milking, a physical examination was made of each cow's udder according to the methods of Udall and Johnson (2). The data obtained were immediately recorded on the "Mastitis Herd Test Report" presented as Table 1.

All milk samples containing the differential preservative to be checked for the presence of streptococci of mastitis were incubated at 37° C. for approxi-

* Journal Article No. 789 N.S.

TABLE 1

MASTITIS HERD TEST REPORT

LANSING DEPARTMENT OF HEALTH
207 CITY HALL
Bureau of Sanitation and Foods

Name____________________ Address____________________

Data____________ Name of Dairy____________________ Patron No.________

KEY TO QUARTERS
Slight ..... /
Marked X
Dry........ O

KEY TO RESULTS
Negative.... –
Positive .... P
Suspect .... S

SERIAL NO.	TAG NO.	AGE	BREED OR COLOR	DATE LAST CALVING	STRIP CUP				ASYMMETRY				FIBROSIS				BROM. THYMOL	LAB. TEST	VETS RECOMMENDATION
					LR	LF	RF	RR	LR	LF	RF	RR	LR	LF	RF	RR			

Veterinarian____________________ Laboratory test by________________

Remarks: ____

mately 24 hours prior to microscopic examination. The interpretation of results of microscopic examination was made according to the methods of Bryan *et al.* (1).

RESULTS AND DISCUSSION

Eighty-three herds in the Lansing milk shed were selected for study because the results of microscopic examination of incubated producer milk samples revealed either the presence or the absence of long chain streptococci. The results of testing the 863 individual cows in these herds are presented in Table 2.

Ninety-nine lactating cows in 14 herds, varying in size from two to 13 cows each, were free from udder infection as determined by the bacteriological testing of individual cow samples. All of the producer samples from these

TABLE 2

THE RESULTS OF PRODUCER AND INDIVIDUAL COW SAMPLE TESTING FOR MASTITIS STREPTOCOCCI IN 83 HERDS

No. of herd	*Total No. of cows*	*No. of cows* *Strep.* +	*Strep.* —	*Producer sample**	*No. of herd*	*Total No. of cows*	*No. of cows* *Strep.* +	*Strep.* —	*Producer sample**
1	2	0	2	—	44	9	1	8	+
2	3	0	3	—	45	9	3	6	+
3	3	0	3	—	46	9	3	6	+
4	6	0	6	—	47	9	4	5	+
5	6	0	6	—	48	9	7	2	+
6	7	0	7	—	49	10	1	9	+
7	7	0	7	—	50	10	1	9	+
8	7	0	7	—	51	10	1	9	+
9	7	0	7	—	52	10	1	9	+
10	8	0	8	—	53	10	3	7	+
11	8	0	8	—	54	10	4	6	+
12	9	0	9	—	55	10	5	5	+
13	13	0	13	—	56	10	8	2	+
14	13	0	13	—	57	11	1	10	+
15	2	0	2	+	58	11	1	10	+
16	5	0	5	+	59	11	2	9	+
17	11	0	11	+	60	11	2	9	+
18	11	0	11	+	61	11	4	7	+
19	5	1	4	—	62	11	8	3	+
20	6	1	5	—	63	12	2	10	+
21	10	1	9	—	64	12	3	9	+
22	10	1	9	—	65	12	5	7	+
23	14	2	12	—	66	13	1	12	+
24	3	2	1	+	67	13	1	12	+
25	4	1	3	+	68	14	3	11	+
26	4	1	3	+	69	15	5	10	+
27	4	2	2	+	70	15	5	10	+
28	6	1	5	+	71	15	5	10	+
29	6	1	5	+	72	16	7	9	+
30	6	1	5	+	73	17	1	16	+
31	6	1	5	+	74	18	2	16	+
32	6	1	5	+	75	18	2	16	+
33	6	1	5	+	76	18	3	15	+
34	6	2	4	+	77	18	6	12	+
35	6	2	4	+	78	19	10	9	+
36	7	2	5	+	79	22	4	18	+
37	7	2	5	+	80	23	1	22	+
38	7	3	4	+	81	23	6	17	+
39	7	4	3	+	82	24	1	23	+
40	8	1	7	+	83	39	17	22	+
41	8	1	7	+					
42	8	1	7	+					
43	8	3	5	+					

* + Streptococci present, — Streptococci absent.

herds, that were collected at the milk plant on the same day of collection of the individual cow samples, were free from long chain streptococci. For these herds the results of examination of producer milk samples accurately revealed the absence of streptococcic mastitis. This information, so readily obtained by the milk sanitarian, can be a real aid to the veterinarian and his client in their fight against chronic infectious bovine mastitis.

In four additional herds the results were not consistent since long chain streptococci were found in the producer samples while the examination of individual cow samples revealed the absence of streptococcic mastitis infection. Since the producer samples were taken out of the weigh tank, there is a possibility of the long chain streptococci being carried over from a previously infected milk that was weighed to the following sample. This apparently occurred in the four herd samples cited. To overcome this opportunity of contamination, the producer samples should be collected directly from each can of milk from the herd in question. This is not common practice.

The negative results of producer sample examination in five herds, number 19 to 24, were erroneous in indicating the herd infection status. These herds of 5, 6, 10, 10, and 14 cows respectively had 1 infected cow in each except number 23 which had 2 infected cows. The reason for not finding the long chain streptococci on producer sample examination is not known. Either the milk from the infected cow or cows was withheld from the supply on that day or the dilution of the infected milk by that from non-infected cows may have been sufficient to miss the organisms. This factor should be borne in mind when making producer sample checkup for this purpose even though it apparently does not occur very frequently.

The remaining 60 herds ranging in size from 3 to 39 cows all had infected cows present, and in each case long chain streptococci were found on producer sample examination. The ratio of infected to non-infected cows, in these herds, varied from 1 in 23 to 2 out of 3.

Of 65 herds with streptococcic mastitis as determined by the examination of milk samples from individual cows, only 5 or 7.7 percent were missed on producer sample examination. On the other hand, 4 or 22.2 percent of the 18 herds negative on individual cow test were positive on producer sample test. These producer samples were collected from the weigh tank where streptococcus contamination was possible from a previous positive milk.

The herd results (either + or —) of individual cow and producer sample testing were in agreement in 74 or 89.2 percent of the cases. Therefore the finding of long chained streptococci in properly collected and incubated producer milk samples is good evidence but not specific proof, that one or more cows of the herd are suffering from streptococcic mastitis. Thus the milk sanitarian can aid the veterinarian and dairyman in their fight against infectious mastitis.

The data of Table 3 present the incidence of chronic streptococcic mastitis found in 83 herds of a typical dairy area as determined by the testing of individually collected cow samples. Sixty-five or 78.3 percent of all herds examined contained cows with streptococcic mastitis, and 189 or 21.3 percent of 863 cows were found to be infected. This presents further evidence of the magnitude of the problem of infectious mastitis to the dairy industry.

There was no correlation between the thybromol test results and the presence of udder infection. Seventy-seven of 226 cows that gave a positive thybromol test (above pH 7.0) result had udder infection while the remaining 149 were non-infected. One hundred and twelve of the 189 cows with udder infection yielded a negative thybromol

TABLE 3

THE INCIDENCE OF MASTITIS IN 83 HERDS OF A TYPICAL MILK SHED

	Herds		Cows	
Udder Infection	*Number*	*Percent*	*Number*	*Percent*
Streptococcus	65	78.3	189	21.9
None	18	21.7	674	78.1
Total	83	....	863	....

test reaction. Therefore it is clear that the thybromol test alone cannot be relied upon to locate the cows with udder infection.

Seven hundred and seventy of the 863 cows tested produced normal milk when checked in spite of the fact that 189 of the cows had streptococcus infection of the udder. Only 35 of the infected cows produced any abnormal milk, while 58 of the cows with no udder infection also produced abnormal milk. Thus the strip cup examination does not reveal the presence or absence of infection of the udder. However, it should be used routinely as a part of the milking process so that any abnormal milk may be withheld from the supply.

Physical examination of each cow's udder revealed that 238 of the 863 cows had areas of fibrosis. Eighty-two of these had streptococcus infection of the udder while the remaining 156 had no udder infection. There are many reasons for scar tissue formation in the udder. Irrespective of the cause, cows with marked fibrosis are not profitable milk producing animals and should be eliminated from the herd as soon as this is possible.

SUMMARY

A total of 863 cows in 83 herds were checked for the presence of streptococcic mastitis by the collection and examination of individual cow samples of milk. Of these 78.3 percent of the herds and 21.9 percent of the cows were found to be infected.

Producer samples of milk were collected on the same day from each of these dairy herds and examined microscopically, following incubation, for the presence of long chain streptococci. An analysis of these results indicates that:

1. In 60 herds a positive producer sample indicated accurately the presence of streptococcic mastitis, as verified by the examination of individual cow samples from each herd.
2. In four herds positive producer sample results were not verified on examination of cow samples. Since these producer samples were taken out of the weigh tank, the possibility of contamination from a previous infected sample is suggested. To overcome this source of contamination, producer samples should be collected directly from the cans.

TABLE 4

A COMPARISON OF UDDER INFECTION WITH THE THYBROMOL TEST RESULTS, THE STRIP CUP EXAMINATION FOR ABNORMAL MILK AND THD RESULTS OF PHYSICAL EXAMINATION OF UDDERS FOR FIBROSIS

Udder Infection	Total cows	Thybromol test		Abnormal milk		Udder fibrosis	
		Positive	*Negative*	*Present*	*Absent*	*Present*	*Absent*
Streptococcus	189	77	112	35	154	82	107
None	674	149	525	58	616	156	518
Total	863	226	637	93	770	238	625

(Continued on page 248)

The Proper Program for Dairy Plant Control Work*

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I. Introduction

The proper program for dairy plant control work, is the one which most economically insures: raw supplies and finished products, satisfying the licensing agency's requirements; and finished products capable of increasing consumer demand.

Code requirements have been much more subject to variation, up to this time, than consumers' desires. At present, the critical specifications for dairy products, both fluid and manufactured, are considered the special province of the individual community's licensing agency. This stems from the "home rule" principle; the founders of pioneer communities jealously guarded local sovereignty.

The local licensing agency is in the very best position to calibrate adherance to ultimate specifications of products distributed locally. However, when adjacent communities' standards differ in wording, interpretation, or enforcement, the more critical agency's requirements will be forced down to the level of the least critical, when the dairy supplies available do not exceed the market's demand.

The expansion of milksheds to the point where they are measured by states, has aggravated the situation. Unless the milkshed has been limited by illegal "restraint of trade" definition, a community cannot afford to assume complete policing of its fluid milk supply. Up to this time, reliable systems of industry "self-policing" have never been worked out, on a milkshed-wide, community operated basis.

* Presented January 8, 1946, at Annual Meeting of Connecticut Association of Dairy and Food Inspectors.

Even in normal times, the seasonal fluctuation of dairy supplies provides a means to break down the more critical features of local codes. The period of extreme shortage, which has just been experienced, has truly wrecked them.

They cannot recover; if products not adhering to local specifications were considered acceptable on an entire market basis on one day, how can a single non-complying product be kept off the market later on?

Before we can talk about a proper control program for the dairy plant operator, we must design a proper licensing agency program—one which will truly insure the consumer's receipt of consistently safe, health promoting dairy foods at all times.

II. The Proper Licensing Agency

There is no municipality whose fluid milkshed is not shared by at least one area which has no local code at all. When local codes break down, state codes cannot "hold the line" because first, they define only "minima" for fluid milk; second, the fluid milkshed exceeds individual states; and third, adjoining states' codes differ markedly from each other.

"State versus Municipal" control of fluid milk supplies has been discussed for years—but in all this time, the reasoning assumed was that the most important service to be maintained was inspecting milk producers' barns and milkhouses—this, in spite of daily proof that men who want to can produce milk meeting the most critical standards, even when the animals are housed in hovels.

Attempting to continue the farm facility inspection as the major policing activity broke down the systems of those states which experimentally assumed the entire fluid milk control burden. During half of the year, inspectors could not get to the farms, just as they did not under municipal programs. In these areas, "milk control" was returned to the individual communities.

Since the milk is the material to be consumed, and not the barn or milkhouse, is it not time that the basis for the acceptability of a fluid supply be primarily the character of the milk? Many municipal codes describe standards for an acceptable quality of raw milk, measured by bacterial levels. But what municipality can afford a laboratory so vast as to provide for the critical, routine examination of all of the raw supplies of its milkshed, with sufficient frequency, during all seasons, to "police" it? A staff sufficient merely to collect the samples would bankrupt the municipality. It would even bankrupt the state.

Before butterfat testing was standardized and supervised critically, payment on weight and test basis resulted in some extraordinary skullduggery, on the parts of some producers and receivers. The development of critical standardization and supervision was welcomed; it insured fair treatment to all producers and all receivers.

The state program involved the licensing of samplers and testers, after they demonstrated their ability to do their work properly, according to a definitely stardardized routine, and after they signed agreements to perform their work honestly, using only approved methods and equipment, and to report test data promptly, to both receivers and shippers, and to the state agency.

The state program provided, too, that its own representatives check equipment suitably, and check-test samples, and the operation of samplers and testers, with frequency, but on a variable schedule.

The supervisory function for the fat test program belongs more logically to the state than to an individual municipality. To do the work properly, specialized training is needed. None but extremely large municipalities could afford the specialized personnel, and the size of the milkshed would result in more time lost by travel, than expended in work. Municipalities did not feel that their sovereignties had been violated; they could test the fat contents of the consumer items which were locally available, at any time they pleased.

That bacterial levels and types are most suitable for determining the adequacy for human use, of fluid milk supplies, is well enough established. If adherence to specific, clearly defined bacterial requirements, calibrated by strictly applied, quantitative methods, by agencies maintained by the industry, but responsible to the state, is mandated as necessary to admission to the fluid milkshed, a state maintained unit can regularly, efficiently, and at fractional cost police and truly provide break-down proof, state-wide quality control.

The adoption of the identical program for fluid milk supervision by the various states, and the standardization of agency-licensing regulations by interstate commissions established for the purpose, will guarantee uniformity throughout the milkshed. Milk and milk products to be consistently "safe, health promoting" cannot mean one thing in one place, and another somewhere else, whether a thousand feet, or a thousand miles away.

The characteristics of milk and milk products, from the health standpoint, are best expressed by the bacterial and related data of the raw and processed supplies. So that the proper dairy plant operation control program may be planned, let us assume the following promulgated by the new and uniform state codes.

III. BACTERIAL AND RELATED STANDARDS, METHODS

A. Standards for Fluid Milk.

Milk, to be suitable for sale or distribution as fluid milk, shall demonstrate, when tested by standardized procedure, by licensed personnel, that it:

1. Be derived from healthy cattle, maintained free from udder infection;

2. Contain no greater than the following bacterial concentrations per ml., sampled (a) from entire 24 hour herd shipments of raw milk, or arrival at receiving stations; (b) from blended raw milk immediately before bottling, or heat treatment, and (c) from packages immediately before delivery to consumers; these latter shall contain (d) not more than the following coliform concentrations per ml.:

Milk for	*a.*	*b.*	*c.*	*d.*
1. Consumption "raw"	20,000	40,000	50,000	10 *
2. "Superior" ** pasteurized	30,000	100,000	10,000	2
3. "Regular" pasteurized	150,000	400,000	30,000	2

* Milk for consumption "raw" shall be derived only from *Brucella*-"negative" herds, where animals shall be blood tested at least once every three months.

** "Superior" by any symbol, device, designation, representation, or statement.

3. When identified as "pasteurized," demonstrate no dairy phosphatase enzyme activity; when identified as "raw," demonstrate dairy phosphatase enzyme activity characteristic of raw product.

4. When identified as "homogenized," demonstrate a difference of butterfat content between the top 4 ounces and the balance of quart containers, after 48 hours refrigerated storage following processing, of not more than 10 percent.

5. When identified as "sonic vibrator treated" (or its equivalent), or when represented as "soft-curd," after 48 hours of refrigerated storage following processing, demonstrate a curd tension of less than 30 grams.

B. Standards for Cream, Other Products.

1. Consumer packages of pasteurized cream, flavored milk and drink, frozen ice cream, shall demonstrate bacterial concentrations of less than 30,000 colonies per ml.; not more than 2 coliforms per ml. or gram, and no dairy phosphatase enzyme activity.

2. Consumer packages of cultured milk and drink, other cultured products, and unripened cheese, shall demonstrate not more than 2 coliform per ml. or gram, and no dairy phosphatase enzyme activity.

3. Consumer packages of "raw" cream shall conform with the standards for consumer packages of "raw" milk, and shall be derived from milk adhering to the standards for milk to be consumed "raw."

4. Consumer packages of pasteurized cream, flavored milk and drink, frozen ice cream, cultured milk and drink, other cultured product and unripened cheese, represented as "superior" by any symbol, device, designation, representation or statement shall be derived from milk adhering to the standards for milk for "superior" pasteurized milk.

C. Responsibility for Adherence to Standards; Frequency of Testing.

1. The milk receiver shall determine the suitability of the milks he receives, and accept only those which demonstate consistent adherence to standards.

2. The milk receiver shall sample and test herd milks intended for consumer use as "raw" or "superior pasteurized" fluid milks at least once every 15 days. He shall sample and test herd milks for ultimate use in "regular pasteurized" fluid milks at least once every 30 days.

3. The milk receiver shall sample and test blended herd-milk shipments

at least once weekly. Samples of blended milk shipments for ultimate use in "pasteurized" milk shall be "laboratory pasteurized" to determine their thermoduric levels.

4. The milk processor shall determine the suitability of the milks he will process, and again after processing them, before delivery to the consumer.

5. The milk processor shall sample and test blended milk just before it is bottled for consumption "raw," or subjected to heat treatment, at least once weekly. He shall sample and test packages just before delivery to consumers, at least once weekly.

6. The processor of cream, flavored milks or drinks, frozen ice cream, cultured milk drink or other product, or unripened cheese, shall sample and test consumer packages to determine adherence to standards, at least once weekly.

D. Test Reports; Records; Non-Compliance With Standards.

1. Results of herd-milk tests shall be reported by the milk receiver, in writing, to herd managers, without delay. Results of blended milk shipment tests shall be reported, in writing, to the shipping station manager, without delay. Receivers shall enter monthly or semi-monthly tests on record cards, so that the individual herd performance can be reviewed conveniently. Herd records shall be maintained for three years.

2. Herd milks, designed for use in milk to be consumed "raw" shall, if their samples demonstrate udder infection, be diverted immediately to milk for pasteurization processing. Herd milks which have demonstrated udder infection shall be resampled between 5 to 10 days after the herd management has been so informed. If the second test again shows udder infection, a third shall be taken within 5 to 10 days of the report. If the third test is positive, the milk shall be diverted to "other than fluid milk use" until a satisfactory test has been reported.

3. Herd milks, which have demonstrated bacterial levels above the concentrations recited in Section A No. 2, shall be resampled within five to ten days after the herd management is so informed. If the second test still shows non-compliance, the milk shall be diverted to the category it satisfies. If it does not comply with the standards for "regular" pasteurized milk use, it shall be diverted to "other than fluid milk use" until a satisfactory test has been reported.

4. The handling of blended milks, whose component herd samples conform, but which themselves do not, shall be reviewed critically by the plant management. If the subsequent weekly test does not show conformity, the handling operation shall be line checked to locate the complicating factor, or factors.

5. The handling of consumer packages, whose component blended and herd samples conform, but which themselves do not, shall be reviewed critically by the plant management. If the subsequent weekly test does not show conformity, the handling operation shall be line checked to locate the complicating factor, or factors.

6. Non-compliance with the bacterial level standard, of blended supplies, or of consumer packages for three successive weeks shall be followed by diverting the supply to the next category. Failure to achieve the coliform level or phosphatase or other standard shall be followed by the critical review of the handling procedure, and by line test, when indicated to be necessary. If the standard for "regular" pasteurized milk is not achieved, the milk shall be diverted to "other than fluid purposes."

E. Bulk Milk Containers; Transportation.

1. Bulk milk containers, supplied by receivers to milk producers, shall be substantially freed from microorganisms, immediately after being emptied. The first and last farm-filled bulk containers emptied at receiving stations,

once or twice monthly, depending on the milk utilization, shall, after washing, be rinsed with sterile buffered water; the rinsings plated, and the bacterial levels reported. Substantially bacteria-free rinse waters shall be used as the index of adequate can washing.

2. The refrigeration, provided on receiver-operated trucks which transport milk from farms to receiving station, shall be adequate to retard bacterial development.

F. Licensing of Samplers, Technicians, Laboratories.

1. On the satisfactory passage of an examination, and on the signed agreement of samplers, technicians, and laboratory managements to adhere faithfully to standardized methods (accepting such changes in them as may be made), and maintaining records, and issuing reports, as required, the State Commission shall issue licenses to samplers, technicians, and laboratories.

2. These licenses shall be suspended or revoked by the State Commission for cause, and shall be reinstated when warranted, at the Commission's discretion.

3. These licenses shall expire on the last day of the year. Applications for renewal shall be made before December 1.

4. Results of periodic and check sample tests, typewritten on forms supplied by the Commission and signed by the senior technician or laboratory manager, are to be forwarded to the State Commission directly on completion of the tests; except that clear carbon copies of forms approved by the Commission, similarly signed, may be used. The State Commission will, once weekly, forward to each local health department, which requires them, photostatic copies of the data pertaining to products distributed in the area involved.

5. Representatives of the State Commission will, at irregular intervals, observe samplers and technicians in the performance of their duties, and will review laboratory facilities and record maintenance.

G. Standardized Sampling and Test Procedures.

All samples are to be taken by licensed samplers, and tested by licensed technicians in licensed laboratories, employing the Commission's standardized procedures abstracted below.

1. Herd Milk Samples: shall be taken when the milk leaves the farm-filled bulk containers, and shall accurately represent the full 24 hour shipment. If any interval intervenes between receiving at the station and emptying containers, the time in hours is to be recorded.

2. Sampling Procedure: sanitary, approved, non-corrosive metal dippers, rinsed in approved chemical sterilizer or suitably immersed in hot water between samplings, shall be used to remove samples of well mixed bulk shipments, and to transfer them to heat-sterilized, glass jars or vials of 4 ounce or smaller capacity, equipped with non-corrosive metal screw closures. These are to be immediately labeled, then packed in cracked ice.

3. Determination of Udder Infection: one one-hundredth (0.01) of 1 ml. of the well mixed sample, smeared over a one sq. cm. area of a permanently marked, suitable microscope slide, dried without excessive heat (within ten to fifteen minutes) stained with approved stain, shall be examined using both low power and oil immersion objectives to locate leucocyte clusters harboring microorganisms. Immersion oil shall be cleaned off carefully, and slides shall be kept on file for 60 days following sampling. Data shall be kept on file one year.

4. Bacterial Concentration: A one ml. portion of the well mixed sample, measured accurately, shall be diluted with sterile distilled, ion free, or other, non-bacterial growth inhibiting water, in calibrated glass dilution bottles equipped with non-corrosive metal

screw capped closures. Dilution bottles are swirled to homogeneity. Two dilution levels, measured by accurate approved pipette, shall be used to charge two plates per sample as a minimum, except that two plates may be prepared at one dilution level of pasteurized milks, whose records show consistent yield of 30 to 300 colonies at that level. Ten to 12 ml. of sterile, fully tempered, accurately formulated tryptone glucose extract skim milk agar shall be poured per plate, and carefully swirled to homegeneity with the dilution charge. Plates shall be incubated for 48 hours±3 hours at 37° C.± 0.5° C., without crowding, in approved incubators, then examined by Quebec counter, or equivalent magnification, illumination and background. Existence of spreaders, and extent, shall be noted. Full counts made of all plates containing 300 colonies or less; careful estimates of plates containing more. Counts shall be reported to two significant figures, dilution factor calculated, of plates yielding between 30 to 300 colonies. Every batch of plates shall be accompanied by controls of medium, dilution blanks, glassware. Records shall be kept of medium tempering bath, incubator temperature, individual plate data, for one year.

5. Coliform Concentration: two presumptive methods, one for identifying adherence to standards, the other to enumerate coliforms if in excess of standard, are required by the standardized procedure.

a. Tube Method: two-tenths (0.2) ml. portions of the well mixed milk shall be inoculated into each of five 16 x 150 mm. test tubes, containing 15 ml. of approved presumptive broth and 10 x 75 mm. inverted vials, by means of sterile, accurate 1 ml. Mohr pipettes. Tubes shall be incubated for 48 hours± 3 hours at 37° C.±0.5° C. Liquid from tubes showing any gas formation shall be streaked on approved confirmatory medium, whose plates shall then be incubated 24 hours at 37° C. Positive coliform recovery from less than 5 tubes shows adherence to "raw" consumer package standard. Positive recovery from one or none, shows adherence to "pasteurized" consumer package standard.

b. Plate Method: One ml. portions of the well mixed sample shall be charged into each of two sterile petri dishes, then swirled with 10 to 12 ml. of carefully tempered approved direct plating presumptive medium. After hardening, the inoculated medium shall be covered with bland, sterile agar. Plates shall be incubated as required, characteristic coliform colonies counted on each, and average per ml. determined.

c. Appropriate controls shall be prepared per batch; data of individual presumptive tubes and confirmatory tests, and of individual presumptive plates shall be recorded and filed for one year.

6. Phosphatase Test: To 10 ml. of fresh "Scharer Field Test" buffer substrate at 37° C., in a chemically clean test tube, shall be added 1 ml. of the well mixed sample, using a chemically clean pipette. Plug with chemically clean stopper. Invert six times to mix tube contents, then incubate 10 minutes at 37° C., in a water bath. Add 0.2 ml. fresh B.Q.C. solution. Invert six times, then incubate 5 minutes at 37° C. Add 4 ml. neutral, fresh, normal butyl alcohol, flowing it down side of tube. Bring tubes to horizontal slowly, tilt tubes to surge liquid from one end to the other to extract color completely (twenty times) yet not form emulsion. Bring to vertical, and compare color of alcohol layer with that of boiled milk and reagent controls, and color standards. Data shall be kept on file for one year.

7. Laboratory Pasteurization: Ten ml. of the well mixed sample shall be carefully placed into the bottom of a 16 x 150 mm. pyrex test tube of standardized wall thickness. The tube shall be plugged and placed into a rack. A control tube containing 10 ml. of milk at the same temperature, whose stopper supports a sensitive limited-range ther-

mometer, shall also be inserted into the rack. The rack shall be immersed in water at 150° F., and then moved gently to circulate the milk, so that it is brought to 145° F. within five minutes. The rack shall be transferred now, to a thermostatically controlled water bath at 144° F. ± 1° F., whose water level is well above that of the milk in the tubes. After 30 minutes, the rack shall be transferred to a cold water bath, and the milk brought to 40° F., or below, within 5 minutes. If the laboratory pasteurized samples are not to be plated immediately, the tubes shall be packed in ice—ice water (32°–35° F.) until dilutions are made. Data shall be kept on file for one year.

8. Homogenized Milk Butterfat Testing:

Babcock Test: Add regular quantity of regular acid, but in three portions, shaking after each portion. Centrifuge 10 minutes in a heated machine. Then shake bottles vigorously until clear fat appears on top of acid-milk mixture. Add 150° F. hot water to base of neck, then centrifuge 5 minutes. Add hot water to 7 percent mark and centrifuge 3 minutes. Temper at 140° F., for 5 minutes, then read immediately.

Gerber Test: Increase centrifuge time 50 percent.

Data shall be kept on file for one year.

9. Curd Test: Only a Hill or a Submarine Signal plunger type curd knife shall be used. Temper milk samples in water bath. Make homogeneous by pouring back and forth into tempered containers immediately before adding coagulant. Make up fresh coagulant mixture before each day's test. Prepare three containers for each sample. Add coagulant in uniform manner, and swirl uniformly to avoid erratic results. Temper inoculated containers in thermostatically controlled bath. Average three readings to nearest gram. Data shall be kept on file for one year.

10. Type Analysis by Microscopic Method (Optional): Types other than udder infection groups may be located while examining for udder infection. Continue examination to obtain sufficient data to establish predominant groups. Clarifier use will substantially eliminate large udder and other groups. Homogenizer use will break up large groups. Plasmolysis will interfere with reconstruction of prepasteurization history. Thermophils in large concentration will be paralleled by pinpoint colonies on agar plates. Bacterial level may be estimated, but no relationship to agar plate level shall be formulated.

11. Type Analysis from Nutrient Agar Plates (Optional): Types other than thermodurics may be noted on plates of pasteurized products. After determining total count, ratio of thermodurics to other may be calculated. Identification of microorganisms by cultural methods may be practiced.

IV. *Selection of Mechanism, Standards, Methods.*

The mechanism was planned to insure the consumer "truly satisfactory products" throughout the year, and to be fair to all portions of the dairy industry as well.

The standards set up are not at all different from the ones that appear in many municipal codes but if incorporated into the state law, and applied as indicated, would apply equally, to every one, at all times. Milk producers will withhold milk from diseased animals only if they know every one else must, too. Receivers will not accept such milk only if they know that no one else can, either. And the bacterial levels will be met, too, only when the fluid milk market demands it as a primary essential.

"Standardized" methods from which variations are not permitted were developed to insure fully representative samples, and fully reproducible data. The requirements regarding check tests, reporting and filing of data, and full licensing of all personnel and facilities will insure honest performance.

The method submitted, to identify

the presence of udder infection, is extremely practical and sound, though only rarely mentioned in dairy science literature. The number of leucocyte clumps harboring microorganisms, ejected into milk from definitely infected udders, is large (1). The low power objective, used to locate such groups anywhere in the whole square centimeter smear area, is not very time consuming, nor is it fatiguing (2). The number of clumps permits ready identification even when the dilution from animals' number is great. The very demonstration of leucocyte groups harboring microorganisms shows the infection to be more than the random shedding of microorganisms which are associated with infection (but which may be living passively in udder tissue), and frequently picked up in blood agar plates (3), and Hotis tests (4). Neither of these latter techniques can be applied to pooled market milk samples. It is much more accurate than tests based on leucocyte concentrations which can vary for many reasons (5); or on tests based on leucocytes reactions (6) which are similarly unreliable.

No better demonstration can be given of the advantages of the "standardized" agar plating technique than by assembling, in one laboratory, a large group of presumably "skilled" technicians, and having them all test as different "unknowns" three portions of the identical sample. After the plates have been incubated and counted, the detailed "standardized" procedure is explained to the group, after which the members are again all given three "unknowns," all derived from the identical sample. When the variables have been eliminated, as in the "standardized" procedure, the tight grouping of data permits the procedure to be termed an "analytical" one; the data becomes reproducible. No better arguments in favor of the enumeration of microorganisms by the petri dish culturing method can be given than by the review of data obtained by different technicians (or even by the same technicians) who examine the same stained slide at different times (7). Though it has been demonstrated that reproducible count data of market milks may be obtained by microscopic method, it was shown that the time and effort involved make it impractical for raw milks and of questionable merit in examination of pasteurized supplies—where plasmolysis varies depending on the portion of the batch from which the sample was derived (2). As to the use of the dye reduction methods, the literature has too clearly established that they are too uncritical for use with market milk supplies (8).

Some will question why all raw supplies are not recommended to be subjected to laboratory pasteurization test. If the raw supplies are restricted to the low count levels demanded, laboratory pasteurization of herd supplies will rarely be required. Blended milks must be laboratory pasteurized to calibrate processing operation efficiency, through comparison. That staphylococcus enterotoxin may readily develop in even milk from healthy cattle, if poor care has permitted the count to rise (9), and that staphylococcus enterotoxin is not destroyed by pasteurization (10) mandate the restriction of the fluid market to "low total count" supplies.

The double presumptive for coliforms, following the tube method by confirmation on Endos or E.M.B., is essential, as a minimum, to use the criterion effectively. Presumptive plate methods, though more attractive than tubes, may yield false positives, too. The regular confirmation from tubes will avoid embarrassment.

The simplest of the phosphatase techniques has been demonstrated to be more practical, while as accurate as the more involved methods (11). The laboratory pasteurization procedure outlined parallels holder process; no practical laboratory method for paralleling high temperature processing has yet been devised. The differences in high temperature heating and cooling make this a more difficult problem than it may seem at first glance (12).

The homogenized milk fat test modifications (13) are simple, but more effective than some of the routines proposed heretofore (14). Before curd testing is done, the operator must become fully acquainted with the limitations of the method, and the necessity of triplicate trials before a value is calculated.

V. *The Proper Control Program for the Plant Operator.* (Merely to outline, as a review, the primary points of a satisfactory program.)

1. Water Supply: Test samples for total bacterial and coliform levels once monthly. Take samples direct from well and storage tank taps, and from a plant faucet and a hose.

2. Can Washer: Have operator check jet openings, filter screens, pump operation, water and solution tank temperatures and pressures, and steam pressures, daily before operation. Check chemical concentration in solution tank twice daily at beginning and end of operation. Once monthly, have solution tank sampled every 15 minutes; determine chemical utilization, and adjust feed rate accordingly. Rinse cans as required by code for bacterial level of rinsings. Have operator tag visibly defective cans as they come from washer. Washer should yield clean, dry, cans showing less than 300 colonies per ml. on direct plating of 1 ml. portions of 100 ml. buffeted rinse.

3. Receiving Equipment: Have operator sterilize fully cleaned (clear draining) equipment by introducing sterilizer at dump tank and circulating to final storage tank, or equivalent. After use, have equipment rinsed with softened water not above 120° F., containing calcium sequestering agent, before further cleaning is begun. Test sterilizer solutions for strength, daily; for bacterial contents after use, weekly.

4. Weigh Tank Practice:

(a) Odor Test: Daily, loosen each can lid, lift slightly and smell. Reject cans showing off odor: tag, with description of odor. Stir and sample, tagging with same description, for field and laborotory men.

(b) Strainer Dipper: Use this test on all odor-rejected cans, and on all cans once weekly. When dipper shows whitish particles, "rope," reject and tag cans, take samples for field man and laboratory.

(c) Sediment Test: (Note: Control system should outlaw farm straining; because: first, the extra operation means another piece of equipment which may inoculate microorganisms of external origin, and second, it condones producers letting sediment in, provided they can take it out. The sediment particles on a farm disc are washed four times, on an average, by milk; so that the bacteria generally get into the milk, though the particles may remain on the disc.)

Test every can for sediment once weekly; use "bottom gathering" type testers; rinse testers by working them in two changes of water between shippers. Mount discs (tagged blotting paper will do), dry, and return to shipper.

(d) Lactometer Reading: Temperature Reading. Once weekly, stir every can to homogeneity before dumping; insert accurate graduated, limited scale, thin-stemmed, recalibrated lactometer equipped with accurate thermometer. Correct reading for temperature; if reading is in other than normal range, take pint sample for fat and total solids tests by laboratory. Watered or skimmed milks are most readily detected from the individual can samples, unless the shipper is really systematic and wants to go to a lot of trouble. The lactometer method is not sensitive enough to disclose water addition of less than 5 percent. The standardized system will blacklist the waterer from the fluid milkshed.

(e) Butterfat samples: These are to be taken from the dump tank except at small plants which have none. Dump tank must be equipped with baffle plate which automatically makes milk dumped homogeneous. Portions for composite samples taken daily. Tested twice monthly.

(f) Bacteria samples: These are to be taken from the dump tank, unless none is available, in which case aliquotes are prepared. Order of sampling recorded by sampler (required by detailed standardized method). Data sheet should also list number of pounds delivered, so composite can be made in laboratory to compare with plant blended supply. Bacteria samples are taken once or twice monthly, depending on utilization of milk (cans emptied without stirring).

5. Storage Tank Practice: Determine how long each storage tank and tank truck must be stirred by its agitation equipment, to come to homogeneity (fat tests from top and bottom identical). Take sample directly after filling, to compare with weigh tank laboratory-made composite, once or twice monthly. To check effect of intervening equipment, line-test batch pumped from pump tank, sampled at each equipment joint. Tank truck shipments and blended supplies before processing, are to be tested once weekly. (Note on clean up: see that goosenecks of storage tanks are disassembled completely, daily. See that foreman gets into storage tanks and truck tanks with a drop light, to inspect them critically, after clean up. If you would avoid rapid bacterial development, do not hold over small batches of milk in large tanks. To avoid killing the cream line in milk to be high-temperature processed, use slow, large-vaned agitators instead of small, rapid ones.) Once weekly, sample for total count (to be reported) and for laboratory pasteurization (to be reported if the milk reached the plant via tank truck).

6. Cream Line Study: During processing draw off, at beginning and toward end, fill two one-quart bottles to ⅛ inch below cap seat with raw milk and place in refrigerator. Take bottles from filler when some milk is being bottled, and also store. Paste on ½ inch wide strips of gummed paper or adhesive tape. Mark cream line levels at 4 or 6, 24, and 48 hours. After 48 hours, open bottles; check appearance of cream layer; take samples of milk from bottom of one bottle of each set for butterfat test. Incorporate cream of other bottle completely with skim milk, and run fat test. Pour water into bottles to bottom line on scale, and measure cream volumes at 4 or 6, 24, and 48 hours, in ml. Divide by fat test to get readings comparable from day to day.

7. Processing Practice:

Daily: Sterilize entire system as a continuous line, right up to bottle capper assemblies. (Review bottle, valve, and capper handling for coliform control, with bottle washer and filler crews.) Check recorded timing and temperature registration daily.

After pasteurization is completed, use calcium sequestering agent in first rinse water. Use acid containing rinse solution daily, in addition to regular alkaline cleaners, to prevent milk stone build-up.

Weekly: Packages are to be taken for total bacterial level, coliform and phosphatase tests, microscopic examination, etc. (not to be reported). Packages taken on retail routes to be submitted to identical tests. (To be reported; report form identifies route.)

8. Homogenization: Whenever homogenizer gauge needle vibrates erratically, or unit operation sounds abnormal or otherwise, once weekly, dilute sample of milk with 20–25 parts of water, put drop on haemocytometer slide, cover with thin cover glass, and examine for globule size, using oil immersion or high dry objective. If many globules are found above 3 microns diameter, have machine operation checked. Samples of product may not meet requirement. Once weekly, two homogenized packages which traveled route, are taken; one is given bacterial,

coliform, and phosphatase analysis (to be reported); the other is held until 48 hours after processing, for fat tests of top 100 ml. and balance of bottle (to be reported).

9. Sonic Vibration: When wattmeter gauge needle vibrates abnormally, or registers below 2,900 watts, check for air entrapment. If, after valve is bled, needle vibration continues, increase resistance. If needle vibration still continues, have air gap between diaphragm and pole piece adjusted. Once weekly, take sample which traveled route (to be reported) to be analyzed for bacteria and coliform levels, phosphatase, and curd tension.

10. Clarifier Use: Clarifiers are sometimes used to filter the entire milk supply. If the sediment holding capacity of the bowl is exceeded, passage through the clarifier will affect total count adversely, and will also break up leucocyte clusters and discharge the leucocytes back into the milk. To check on clarifier operation, take samples before and after the clarifier, at the beginning and end of the run, on the longest operating days. Check for total and laboratory pasteurized counts, and check stained smears for leucocyte levels. Adjust clarifier practice as required. (Tests not to be reported.)

11. Bottle Washers: See that operator tests solution strength twice daily (beginning and end). Once monthly, have samples taken every half hour to determine if charging rate is adequate. See that operator does not start washing until solution and water have come to proper temperature. Once weekly, check empty bottles; add 10 ml. buffered water and rinse; plate undiluted —2 plates nutrient agar, 2 plates coliform agar. These should show less than 10 per plate on nutrient medium, and no coliform. (Not to be reported.)

12. Cream and Other Products: Packages, which have traversed routes, to be sampled once weekly and analyzed by standardized methods as required, for report.

Viscosity of cream, buttermilk, and sour cream may be determined by flowmeter, falling ball, or torque viscosimeter.

VI. *The Proper Municipal "Dairy Plant Control" Program.*

The state program contemplated above will provide for the inspection of farms and plants of the fluid milk supply, by state-employed, qualified, licensed personnel, regionally distributed so that each portion of the state is adequately policed. Samplers, testers, and laboratories will be inspected by other state-employed, qualified, licensed personnel.

It is anticipated that qualified farm and plant inspectors at present employed by municipal units will obtain employment with the state body. Municipally employed technicians and laboratory facilities will be licensed on the same basis as those employed by the industry. The municipality, which possesses the adequate technical staff and laboratory facility, will police the consumer items locally distributed. State employed samplers will regularly collect consumer items distributed in areas which maintain no adequate laboratory facility, for analysis by state maintained regional laboratories. These regional laboratories will analyze samples from farms and plants, submitted via the regional inspectors. The industry submitted data will thus be subjected to regular verification by officially operated agencies.

VII. *Conclusion.*

1. Milk was called nature's "most nearly perfect single food" long before Pasteur's time. It was demonstrated shortly thereafter, that though this might be true from the biochemical and physiochemical composition of good milk, it was not necessarily so for all milk.

2. The engineering of milk handling equipment has been improved tremendously during the past fifty years, but the quality of the raw supply definitely has not. Since the processed milk or

product reflects the characteristics of the raw supply, this is as true of them, too.

3. The attempt of individual municipalities to "control" ever expanding fluid milksheds, has resulted in confusion.

4. A system comprising the features most important from the health standpoint, and the manner to achieve truly satisfactory fluid supplies on a milkshed-wide scale is presented. The adoption of this state-supervised, industry-maintained system would for the first time stabilize the fluid market on an honest quality basis, and give the consumers consistently "safe—health promoting" products.

5. When requirements are clearly defined, the proper dairy plant control program is readily developed, since it must satisfy these first, then those features, not related to safety, but conducive to repeat sales. The dairy plant operator's control system is briefly reviewed from these aspects.

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Water and Sewage Problems as Related to Milk Sanitation*

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PROGRESS and growth in the dairy industry have created increased demands for satisfactory and adequate water supplies. Though surface waters are sometimes used, the major source is ground water obtained from wells drilled to the water-bearing formations which yield safe water in sufficient quantity to permit maintenance of sanitation at the dairy farms and plants.

POLLUTION SOURCES

Location, construction, and operation of water systems are important considerations if water supplies are to be maintained in a safe condition. The well should be located as far as practicable from any possible source of pollution such as barnyard, septic tank, leaching pool, filter bed, or disposal field. Many authorities require a minimum distance of 50 feet. It should be not less than 15 feet from any existing or probable sewer, drain, sump, or similar source of contamination. The site of the source should not be subject to flooding, and should be so graded and drained as to facilitate the rapid removal of surface water.

That unclean water can readily drain into a well that is not sealed watertight at the surface is easily understood because such an occurrence can be observed. Less obvious is the possibility that contaminated water can trickle or flow into wells through underground channels. These channels may be natural or artificial.

The natural openings that permit passage of unclean water are the cracks and crevices in the rock formations and the pore spaces in the gravel and course sand deposits. The nearer these lie to the surface, the greater the danger that contaminated water can move or flow to a well that is constructed through or terminated therein.

The numerous excavations and other openings established by man are the artificial channels through which unclean water moves beneath the surface. Among the most dangerous are sewers, drains, cesspools, existing water wells that are no longer in use or are being misused as drainage or sewage disposal outlets, and annular openings surrounding the casing pipe or curbing which are, incidentally, developed but left unsealed when constructing a well through relatively firm deposits like clay.

It is clear, then, that every such opening connecting with any source of contamination will convey pollutional matter to whatever depth it extends unobstructed. This is manifestly a dangerous condition that merits the best efforts of everyone concerned to prevent its development or to eliminate or offset it wherever it exists. Fortunately, this is possible and practicable through diligent adherence to proven standards for well construction and pumping equipment installation and for maintenance of sanitary conditions in the vicinity of wells.

WELL CONSTRUCION

The importance of location of the well cannot be overstressed but of still greater importance is the construction of the well through the vertical zone of pollution.

Where rock formations lie at or near the surface, it is practically impossible to secure and maintain a sufficient distance between sources of pollution and water wells to prevent the movement

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of unclean water through underground channels between them. Particularly serious conditions are developed when the filth-laden effluent from sewage disposal systems is permitted to leach directly, or practically so, into the opening in broken rock formations. To prevent drainage of such polluted water into a well, it is essential that all cracks in the rock formation that connect with the well be effectively sealed through that depth from the surface to which pollutional matter may be conveyed. That depth is known as the "vertical zone of pollution."

Proper construction is designed to take advantage of the fact that the downward movement of water percolating through the "dry zone" above the water table becomes a horizontal movement as the water enters the ground water body and moves with it; thus, the entering water tends to remain in the upper horizon. Should such water be polluted, it tends to concentrate in the zone immediately below the watertable. When the well is pumped, however, the ground water level in the immediate vicinity of the well is lowered approximately equal to the amount of "drawdown." Polluted water in the upper zone of the ground water body moves downward an equal amount. Hence, to prevent the entrance of polluted water into the well, the watertight construction must extend to a safe depth (minimum 15 feet) below the level of the water in the well when pumping.

If the rock formations are so fractured that there is less resistance to downward than horizontal movement of water, there is a strong possibility that pollutional matter will be conveyed more than 15 feet below the water level in the well when pumping. A 6-inch diameter or larger drillhole permits future extension of the watertight construction to such depth as may be necessary to protect the water supply at minimum cost.

The depth of the natural vertical zone of pollution is sometimes limited by an impermeable rock formation which prevents the downward movement of water contained in overlying fractured formations. Drilling through such an impermeable formation establishes an opening through which the pollutional matter can reach the ground water body, unless the well is so constructed that the natural barrier is maintained. This is effectively accomplished by terminating the watertight (cased and cement grouted) construction of the well within an impermeable rock formation, limiting the natural vertical zone of pollution.

Where substantial depths of sandstone formations exist, the depth of the natural vertical zone of pollution is limited to the upper 5 to 15 feet of unbroken formation because bacteria are removed by filtration as the water percolates through a sufficient depth of sandstone. A safe source of water supply can, therefore, be assured by extending the watertight (cased and cement grouted) construction of the well to a point at least 20 feet into unbroken sandstone formation.

While Wisconsin well construction regulations permit a minimum bore of 2 inches when a well is cased into sandstone formation, there are important economic considerations in favor of a 4-inch minimum diameter. A 6-inch or larger drillhole is advisable, however, because it permits a broader choice of pumping equipment and future extension and reconstruction at minimum cost, should this become necessary due to development of conditions over which the well owner has little or no control.

Sometimes bacteria or other pollutional materials are accidently introduced into structurally safe wells during construction, repair or installation work, or as a result of unusual conditions in the surroundings. Such conditions can be effectively remedied by disinfection with chlorinated lime. Disinfection, however, cannot prevent pollution; it can only eliminate pollution which presently exists in the well.

If, after several careful and thorough attempts at disinfection the unsafe condition persists, the State Board of Health, Bureau of Sanitary Engineering, or the nearest district office should be contacted. Personnel of the Board will advise and assist in correcting the conditions which give rise to water supply pollution troubles.

There are many kinds of power units used for pumping water. They may range from the man-power operated hand pump to the more complicated diesel engine or electric motor. Before installation of any pumping facilities it is necessary that the upper terminal of the well casing extend sufficiently high enough above grade to prevent entrance of surface water. The annular space around the casing pipe should be thoroughly sealed with puddled clay or similar impervious material to a depth of 12 to 20 feet or more is possible. The grade around the well should be raised 4 inches to 6 inches above the surrounding grade and the top of the floor or platform should slope away from the well. About ¾" space should be left between the casing and the platform, this space to be filled with a high grade plastic compound. It is important that the pump be attached to the well watertight and that a screened well vent be extended to a point above the natural surface elevation.

Effective and permanent safeguarding of a well against pollutional matter often requires considerable skill on the part of the well constructor and extra expense on the part of the well owner. Any such effort and expense may be completely nullified and a positive menace to the safety of the water supply established through improper installation of the pumping equipment. The cost of a thoroughly sanitary, frost-proof, and trouble-free pumping equipment installation is generally less than that of an inferior installation.

Safe water is usually assured when the well is properly constructed down to a safe source and the pumping equipment is properly installed. Periodic analysis of water samples from the well will provide a record of the water quality over a period of time. The facilities of the State Laboratory of Hygiene at Madison are available along with those of the nine branch and cooperative laboratories located at Rhinelander, Beloit, Green Bay, Kenosha, La Crosse, Oshkosh, Sheboygan, Superior, and Wausau. Samples should be collected in sterile containers supplied by the laboratory and forwarded to the nearest one for analysis. There is no charge for laboratory service.

A well is deemed to be unsafe when organisms of the coliform group are present in the water yielded by the well. These bacteria, invisible to the naked eye, are found in the intestinal tract of man and the higher animals. The presence of coliform organisms in a well is, therefore, conclusive evidence that the surface water or sewage is gaining access to the well. Some of the organisms associated with *B. coli* are capable of inducing dangerous communicable diseases, such as typhoid, while others are comparatively harmless. The presence of disease-producing bacteria in a well not properly safeguarded is not predictable. It may occur today, tomorrow, or any other time. Again, it may never occur. The menace lies in the fact that the *B. coli* and associated organisms come from the same sources and enter wells in the same way; hence, when *B. coli.* are found in water it is considered unsafe for human consumption or for use in the preparation of foods.

Milk, the perfect human food, is at the same time a good medium in which bacteria can rapidly multiply; therefore, every possible precaution should be taken to avoid introduction of bacteria into the milk.

SAFE PLUMBING

A properly constructed well producing a safe water as indicated by analysis does not guarantee the delivery of safe water where needed in the plant. Certain precautions must be taken to avoid contamination of the water, after it is drawn from the well, either in the piping system or at the various fixtures through which it is discharged. Cross connections and submerged inlets must be eliminated. A cross connection is any connection between a safe supply and an unapproved supply of water. The most dangerous of course is the connection with non-potable supplies. Placing of a valve between a safe supply and an unsafe supply is not considered adequate protection. There should be no physical connection with an unsafe supply; this should be abandoned. Submerged inlets occur in lavatories and toilet bowls and similar plumbing fixtures and if not eliminated will permit back siphonage of polluted water into the piping system and provide an opportunity for spread of disease and spoilage through contamination of the water and the food products. Cross-connections on lavatories can be eliminated by raising the faucets one inch above the rim of the bowl. Flushbometer valve operated toilets can be protected against back siphonage by means of the vacuum breaker. Vacuum breakers and check valves should also be used on can washing machines to prevent back-siphonage. Hose used in washing equipment should not be left unattended, and submergence of the outlet end below liquid level should be avoided.

WATER CONSERVATION

In the cleaning of equipment as much water as is necessary to accomplish satisfactory cleaning should be used, and no more. Wasting of water should be avoided because excessive use of water increases the total cost of pumping and, further, complicates the problem of waste treatment by unnecessarily increasing the volume.

In order to conserve water, the legislature recently enacted the following statutes:

"144.03 (6) It is declared that the public health, comfort, welfare, and safety requires the regulation by the state of the use of subterranean waters of the state in the manner provided in this section.

"(7) In order to promote the conservation of ground water supplies, it is provided that no new, additional, or reconstructed old wells shall be constructed, installed, or operated to withdraw water from underground sources for any purpose or purposes whatsoever where the capacity and rate of withdrawal of any such well or wells singly or in the aggregate, or the total capacity of the rate of withdrawal of old, new, and reconstructed wells on or for use on one property is in excess of 100,000 gallons a day without first obtaining the approval of the State Board of Health.

"(8) If the board finds that the proposed withdrawal at a rate of more than 100,000 gallons of water from any such well or wells will adversely affect or reduce the availability of water to any public utility in furnishing water to or for the public, it shall either withhold its approval or grant a limited approval under which it shall impose such conditions as to location, depth, pumping capacity rate of flow, and ultimate use so that the water supply of any public utility engaged in furnishing water to or for the public will not be impaired. The board is empowered to issue such general or special orders as it deems necessary to insure prompt and effective administration of this section."

In administering this section the first step taken by the board of health will be a review of the uses of water in the plant to determine if there are any points at which waste can be eliminated and if any of the water can possibly be reused where contamination of products will not result.

Waters used in the various plumbing fixtures become contaminated wastes which require treatment as do the equipment and floor washings.

Compressor cooling water can be reused as boiler water and should not be mixed with the other wastes.

At condenseries the barometric leg water used to maintain the vacuum on the condenser is contaminated with milk entrained in the vapors from the evaporator and though it is not ordinarily treated because of the expense of removing small amounts of contamination from the large volume of water, it is not reused except where there is a water shortage and then only after passage over a cooling tower.

WASTE DISPOSAL

Before discussing the waste disposal problem in detail it is first essential that the extent of the problem be investigated.

A review of recent literature discloses that milk production in Wisconsin in 1945 will total fifteen billion pounds. Studies made by the Wisconsin State Board of Health indicate that sewer losses at milk plants on the average amount to approximately two percent of the milk produced by the cow. This means that three hundred million pounds of milk will be discharged to sewers during 1945. This represents an annual loss of seven and one-half million dollars. One fifth of this is a loss to the farmers in terms of milk that sticks to the can and is therefore not weighed. The remaining four-fifths or six million dollars represents the loss in the plants. The above losses are based on present day normal operation and do not include the dumping of spoiled milk or of surplus milk during flush periods.

Wastes from milk products plants vary considerably in character and strength. They may be grouped briefly and described as follows: (1) Milk can and truck washings, essentially a weak solution of whole milk; (2) floor washings, containing spilled milk, cream, buttermilk, and skim milk, along with any dirt that may collect; (3) buttermaking wastes, inclusive of churn washings, essentially dilute buttermilk; (4) cheese vat wastes, washings containing more or less whey; (5) condenser waters, milk content of which depends on entrainment losses in operation; (6) ice cream machine washings; (7) miscellaneous equipment and utensil washings, along with cooling waters used in the various processes.

Strong effluents, such as whey, skim milk, buttermilk, and testing reagents are considered in a special class as they are generally utilized or should be disposed of separately from the washings. The domestic sewage, being different in composition from milk wastes, is usually disposed of by septic tank and dry well or soil absorption systems, or is discharged directly into public sewerage systems.

The discharge of untreated milk wastes or of concentrated wastes to streams results in the pollution of those waters causing destruction of fish life and in most instances makes the water unsuitable for stock watering. It is a well established fact that cattle will refuse to drink grossly polluted water and consequently because their intake of liquids is reduced the milk yield drops. Thus milk losses which contribute to the pollution of surface waters cause an indirect loss in terms of reduced milk yields.

A program of elimination of stream pollution and of local objectionable nuisances due to milk wastes should have as its basis, first, the reduction of milk losses wherever possible and next the treatment of the remaining wastes in disposal plants designed to reduce the pollutional characteristics of the wastes to a minimum.

Most manufacturers will agree that it is more economical to spend money on avoiding waste and on utilizing waste products than to spend it on enlarged and non-profitable waste disposal plants. The reduction in milk losses is facilitated by the use of improved milk handling equipment and by establishment of "good housekeeping" methods.

The introduction and use of a good standard quick draining streamlined milk can will reduce waste and incidentally, provide a greater return to the farmer because of the saving in milk. Provision of drip collectors on mechanical can washers will reduce losses to the sewer. The collected drip milk can be either utilized as stock feed or for manufactured products. Leaky pumps and fittings are another source of loss mainly because of poor maintenance. It has been the general practice at many milk plants to wash these losses into the sewer. Would it not be better to maintain the pumps and fittings in a satisfactory operating condition in order to avoid leaks? Pumps should be so located that in the event of an emergency, drip collecting pans may be placed under them to prevent loss to the sewer. Properly constructed vats and tanks so located that complete draining can be accomplished will still further reduce losses in the plant.

Entrainment losses from evaporators can be reduced by the use of entrainment traps which return the milk to the evaporator. Thorough training of operating personnel is considered essential to the development of a sound program of waste prevention. This is especially true in the operation of evaporators where foaming can result in high milk losses.

Application of definitely established control practices will be effective in substantially reducing losses below those of the present day and reduce the burden on waste treatment facilities thus reducing the cost of treatment.

Most of the milk waste treatment installations originally made in Wisconsin were septic tanks with dry wells or subsurface tile systems for disposal of effluent by soil absorption. With fairly porous soil conditions and a reasonable amount of attention, these installations have often furnished a solution for nuisance and pollution problems. Where clay or relatively impervious soils were encountered, contact beds or sand filters were used for providing additional treatment for effluents from septic tanks prior to discharge into drainage ditches or water courses.

Biological trickling filter systems consisting of a holding tank, rock filter, and final settling tank giving approximately 85 percent reduction in waste strength have been installed at a number of milk plants in recent years. The effluents from properly operated plants of this type are relatively stable and their discharge does not result in pollution of streams. A number of milk plants located in the larger municipalities or in communities where adequate municipal treatment facilities were made available have made arrangements for joint treatment of wastes with those of the municipality.

Thus with the cooperation of certain individual milk plant owners some reduction in stream pollution due to milk plant wastes has been accomplished.

The establishment of a cooperative control program by representatives of the entire industry and the Wisconsin Committee on Water Pollution is essential to a more complete effective solution of the problem.

1. Informational Publications Relating to Water Supply, Wisconsin State Board of Health, Bureau of Sanitary Engineering, Well Construction Division (1945).

2. Trebler, H. A., "Waste Saving by Improvement in Milk Plant Equipment," *Proceedings of the First Industrial Waste Utilization Conference,* November, 1944, pp. 6–21.

3. Warrick, L. F., "Treatment of Dairy Plant Wastes," *Creamery Journal,* August, 1942.

Freon and Ammonia as Refrigerants*

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Tied very closely to the subject of freon and ammonia as refrigerants is the design of refrigerating compressors, condensers and evaporators for use with these refrigerants. That subject alone would be very difficult to cover in so short a time as we have to discuss the problems. I will, therefore, touch on it only where it may be of importance in the discussion of the refrigerants themselves.

The history of refrigeration is one extending over many years. Since about 1873 when experimenters such as David Boyle in the United States and C. P. G. Linde in Germany, began producing commercially successful ice machines, developments in refrigeration have been closely allied to the history of ammonia. In the past few years, several other refrigerants have been utilized and new ones developed to meet the the needs of a widening field of application for refrigeration.

In order for us to judge the value of a refrigerant, it is necessary for us to know the properties desired in refrigerants. These properties are:

1. Suitable evaporator pressure.
2. Suitable condensing pressure.
3. High critical point; low freezing point.
4. Low price.
5. High coefficient of performance.
6. Low density of vapor and liquid.
7. High latent heat, and high specific heat of vapor and low specific heat of liquid.
8. Low piston displacement.
9. Inertness.
10. Stability.
11. Non-corrosiveness.
12. High electrical resistance.
13. Low viscosity both gas and liquid.
14. High conductivity and film coefficient.
15. Suitable properties with respect to oil.
16. No toxic properties.
17. No explosive properties.
18. No irritating properties.
19. No properties injurious to goods, foods, etc., depending upon application.
20. Detectable leaks; low leakage loss.

Undesirable features invariably accompany desirable ones. For example, we cannot have the advantages of compactness of equipment without bringing in the disadvantages which go with high pressure, such as tendency toward leakage and requirement of heavier equipment for structural strength. In practice we seek refrigerants with the maximum of good features and unaccompanied by excessively bad ones.

The selection of a refrigerant depends upon the type of machine or system in which it is to be used. We have reciprocating, rotary, and centrifugal compressors, dry expansion and flooded systems with high and low side floats, expansion valves and capillaries. Each varies from the others in refrigerant requirements. Broadly speaking a refrigerant should have such physical, chemical and physiological properties that a practical machine can be built which will operate efficiently and safely to produce a desired effect.

The ASRE Data Book lists approximately 30 refrigerants. Of these, the ones in more or less universal use are the several Freon refrigerants to-

* Presented at the Annual Wisconsin Dairy Manufacturers' Conference, at the University of Wisconsin, Madison, Wisconsin, on April 18–19, 1946.

gether with ammonia, methyl chloride, butane, carbon dioxide, sulphur dioxide, and methylene chloride. Perhaps the best known to new comers in the refrigerating industry, and particularly well known to all air conditioning engineers, are the Freon group.

There are many of these, each having its own particular field of application. Of these, the best known and most widely used, are Freon 12, dichlorodifluormethane: Freon-11, trichlormonofluormethane; Freon 22, Freon 113, Freon 114. You will note that the chemical terms designating the Freon group of refrigerants are very long and difficult. Their manufacturer did a very good job of preliminary selling in introducing these refrigerants. Naturally, such names would become a headache and retardment to popularity, and therefore, the catchy trade name of "Freon" with numeral designations indicating which of the Freons was referred to, was selected.

We will discuss the general application and equipment for use with several of these Freon groups as well as the equipment using ammonia.

AMMONIA

Anhydrous ammonia (NH_3) is the oldest universally used refrigerant because of its universal cheapness together with that of steel, its usual confiner, and its thermodynamic properties. For maximum economy, it still holds its place in the industrial field. However, on small and fractional tonnage application its use is diminishing.

The evaporating pressure of ammonia at 0° F. is about two atmospheres. At 5° it is about 20 lb. sq. inch gauge. From this point up and down the scale for 40° or more, ammonia offers great advantages. The condenser pressures range from 100 to 200 lb. sq. inch gauge, with various common water temperatures, by no means high when compared to pressures encountered in industry today. The critical point and freezing points of ammonia are well out of the range of ordinary operation. Operating costs per ton, both theoretical and practical, are lower for ammonia than any other refrigerant used in industrial systems.

The vapor density of ammonia permits high vapor velocities through valves, suction and discharge piping—4,000 to 6,000 ft./min. Streamlining of vapor ports and manifolds is not mandatory, as it is with heavier vapors. The displacement required is the lowest of any common refrigerants. The latent heat values have long been recognized as greatly to the advantage of ammonia. As for chemical stability, it is high, while ammonia is highly soluble in water, forming usually a nonfreezing solution.

The corrosive effect of anhydrous and aqua ammonia on steel or iron piping is practically nil, although some adverse reports have been heard regarding galvanized or tinned surfaces.

The toxicity of ammonia is well established as to fact and quantitative measurement. Three parts per ten thousand are tolerable.

Ammonia has adequate warning properties. The influence of ammonia vapor leakage on fruits, vegetables, and usual textiles appears to be mild.

Until recently, the most common sources of ammonia was illuminating gas plants which produced it as a by-product in distillation of bituminous coal. Twenty years or so ago, however, the synthetic process of manufacturing this refrigerant came into prominence and now produces a very large proportion of the present ammonia consumption.

The function of a refrigerant compressor is to draw heat-ladened vapors from the evaporator and to reduce that vapor in volume and increase it in pressure and temperatures to the point that readily available means of heat dissipation may be utilized to reconvert the vapor to a liquid. This liquid refrigerant is then passed to the evaporator where it is re-expanded, and upon expansion again picks up a heat load. The cycle is continuous, the refrigerant returning to the compressor from where it again travels through the system.

Early ammonia machines were heavy, well built, and extremely rugged, and operated at very low speeds as compared with present day equipment. Whether of vertical or horizontal design they were patterned after the current steam engine design with external crank, cross head, and sliding piston rods working through a stuffing box. Because of the differences in pressure always existing between the suction and discharge side, the valves were operated by these differentials in pressure instead of by mechanical means.

As the field of refrigeration application broadened, subsequent designs were necessarily aimed at reduction in space required by the machines and by a marked increase in speed, which was obtainable with the lighter and better valve design.

You will see from the above that ammonia equipment was the first refrigerating machinery to be used. Its design, however, has kept pace with general improvement in machine design. This was due solely to the fact that there is no better industrial refrigerant either from the standpoint of the materials used to confine it, or its chemical or physical properties, than ammonia. It does not have any chemical reaction in the presence of steel and is not exceeded in thermodynamic properties for maximum economy. On account of its large refrigerating effect per pound and the relatively small volume of gas required for circulation per ton of refrigeration, it can be used in reciprocating compressors with fairly small cylinder dimensions. Its solubility in oil is comparatively low. Ammonia compressor valves need not be of heavy construction to handle the light gas, and therefore, can be designed to operate quietly.

Present day ammonia equipment design is showing a marked trend to decreasing of compressor stroke with a relatively greater increase in bore and with a much higher RPM, to attain the required displacements. Modern equipment is now available with 4, 6, and 8 cylinders to run as high as 1,050 RPM and to deliver, at these high speeds, as much as 140 to 160 tons of refrigeration per machine at standard conditions of 20# S.P. and 155# C.P.

This trend in equipment design and increase in speed and capacity lends itself most admirably to the accomplishment of complete heat balances in many industries. The use of steam turbine as prime movers with their great flexibility and economy often allow the competent engineer to design installations in which the refrigeration is practically a by-product of a large heat using operation.

Ammonia condensers are made of durable steel or other ferrous materials and are so designed as to require minimum amounts of condensing water. In general, the use of ammonia as a refrigerant for single stage application should be limited to temperatures above —30° F. However, ammonia lends itself to compound compression, and with compound compression, temperatures as low as —60° F. are readily obtainable.

FREON GROUP

During the past few years, by far the greatest activity in new refrigerants center around the development of the several fluorine derivatives of hydro carbons. These are the Freon group mentioned above.

Freon-12, probably the most common of the Freon group, has thermodynamic properties which make it highly desirable for reciprocating machines. Freon-22 is of the same general class. For Freon-12, the displacement volume requirements are approximately 60 to 70 percent more than that for ammonia. Since pressures encountered with Freon-12 are are somewhat lower, machine construction may be of lighter materials. It lends itself beautifully to the use of copper and aluminum tubing of nominal wall thicknesses. Compressor valves must be designed to handle the heavier gas.

Freon is an active cleaning agent. Therefore, great care must be used in any system using it to see that it is thoroughly cleaned before being charged with the refrigerant.

Freon is not miscible with water, hence Freon systems should be free from moisture when operating with temperatures below 32°. Any water in the system will tend to form particles of ice at the point of expansion and will cause considerable difficulty by its presence.

Oil and Freon are miscible in all proportions. Consequently, Freon evaporators must be designed to provide easy return of oil with the Freon gas to the compressor crankcase. Once the point of equilibrium is reached, the oil in the crankcase will remain at a practically constant level.

Since Freon is odorless and nontoxic, it is a popular refrigerant in air conditioning applications. In fact, it is one of the few refrigerants universally acceptable for this application.

Refrigerating compressors for use with Freon-12 are available in sizes as large as 500 tons of refrigeration. Small self-contained condensing units, however, are built by thousands, and are generally employed on the commercial refrigeration applications.

Freon-12 has not yet been universally applied to industrial refrigerating problems. It is rather an expensive refrigerant, in small quantities costing as much as $1.00 per pound. Its lack of odor does not warn of presence of a leak. The fact that it is not miscible with water is a source of trouble where extreme caution is not used in applications operating below 32 degrees. Its complete miscibility with oil creates problems of oil return. The general design of equipment for use with Freon-12, particularly, its handling as a liquid, in the evaporator, have not been perfected to a suitable point as yet.

Freon-22 in its application on low temperature work is becoming more used as a refrigerant. The equipment design is identical to that of Freon-12 equipment, but the two are not completely interchangeable due to small factors which are not important to the layman.

Freon-11 is particularly suitable for application where required temperatures are above 32 degrees, and where large tonnages are required.

It is an extremely stable refrigerant having a boiling point of 74.67° above zero at atmospheric pressure and condenses at 86° F. at a pressure of 3.6# gauge. The heat content of this refrigerant in BTU per pounds of saturated vapor at 5° evaporator is 91.2. Therefore, it must be handled in very large quantities. It is the common refrigerant for use in compressors of the centrifugal type and is seldom used in systems requiring less than 250 tons of refrigeration. To my knowledge, it is never used in the commercial field, but has received widened usage in the large air conditioning field.

GENERAL CONSIDERATIONS

I should like now to give you pertinent information concerning the conditions under which the several refrigerants should be used. In the design history of refrigerant compressor and refrigerating equipment, the new group of air conditioning equipment manufacturers and household unit manufacturers did both good and harm to the industry. This highly competitive situation gave impetus to new research by manufacturers with already suitable facilities. Considerable progress was made in the development of equipment, such as the static and dynamic balance of rotating machines to cut down wear and noise factors, and to increase its economy of materials.

Perhaps due to the sale aggressiveness of the newcomers, the terms horsepower and ton became practically synonymous in the minds of some buyers. The term horsepower was something that the average mind could understand. Perhaps in air conditioning, the use of the two terms synonymously was at least partially right, but we all know that in general refrigeration applications, it is far from being true.

To illustrate this, let me give you the range of capacities of an ammonia compressor when operating at a given speed and with a given condensing pressure but varying the temperature of the evaporator through the range from 0# which is minus 28° F. to 65# which is 44.6° F. This data is tabulated in Table 1.

For this example, we shall use a *6½" x 6½"* compressor operating at 400 RPM and at a condensing pressure of 155#G.

With so wide a range in B.H.P/Ton the selection of the properly sized compression equipment is important. The selection of the proper evaporator assumes the same degree of importance for upon its design and size depends the temperature that the compressor must maintain in it to obtain the required tonnage and temperature. It is necessary therefore to select and match these two component parts of a system carefully to obtain the proper balance of capacity and temperature. Failing in this, the user invariably suffers loss due to inefficiencies.

TABLE 1

Suction Press. #G	Suction Temp. °F	Tons	B.H.P.	B.H.P./ Tons
0#	—28°	8.66	24.4	2.82
5#	—17.2°	12.00	27.1	2.17
10#	— 8.4°	15.50	29.0	1.87
15.7#	0°	19.30	30.7	1.59
20#	5.5°	22.4	31.5	1.41
25#	11.3°	25.8	32.1	1.25
30#	16.6°	29.39	32.7	1.11
35#	21.4°	32.72	32.8	1.01
40#	25.8°	36.08	32.9	0.91
45#	30.0°	39.59	33.0	.845
50#	33.8°	42.7	33.0	.75
55#	37.5°	46.6	32.2	.69
60#	40.9°	50.3	31.9	.635
65#	44.6°	54.2	31.1	.575

It is well to bear in mind that the first cost of equipment is seldom of great importance, as it occurs only once, while the economy of operation is of utmost importance because it continues as long as the equipment is in use.

In conclusion, each refrigeration application and proper selection of both the refrigerant and equipment, depends upon the purpose to be accomplished. Only by the judicious consideration of all factors entering into the problem can the proper selection and application be made.

ATLANTIC CITY RESERVATIONS

Requests for reservations for the Atlantic City Meeting should be addressed to the Atlantic City Housing Bureau, Pier 16, Atlantic City, N. J. The Housing Bureau has a list of our members. Requests will be checked against this list. The Bureau will request a designated hotel to make the reservation. Reservation will be confirmed by the hotel directly to you.

State in your request your choice of hotel, approximate price of room and what accommodations are desired. Insofar as possible, members will be assigned to the Seaside Hotel (official headquarters).

MAKE RESERVATIONS NOW!

Technological Developments in the Butter Industry*

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Marvelous developments in all branches of scientific activity have taken place during the past 50 years. There has been the adoption of new methods and processes in the established industries, and through inventions new industries of far-reaching importance have been established, giving employment to millions of people and contributing to the health, wealth, and general happiness of human beings.

A period of fifty years is a relatively short time. Yet, during this brief span we have seen the introduction in the butter industry of pasteurization, the combined churn and worker, the air tight separator, butter culture, automatic butter printers and wrappers, to mention but a few of the outstanding developments, and scientists have shown that butter possesses *natural* nutritional properties necessary for our general welfare.

Churns

It is not many years ago since I received my first lesson in buttermaking. This was in a Danish creamery. The pasteurized sweet cream, ripened to a high acidity, was churned in a "Holstein" type of churn. This churn consisted of a straight-sided oak barrel having a smaller diameter at the top than at the bottom. The cream was added through the top opening. The barrel was stationary. Agitation was by means of a revolving paddle. The butter granules were lifted out of the churn by means of a hair sieve and were placed in a tub of water for washing. For working the butter, a revolving table "Mason Butter Worker" was used. When I, some time later, hired out as a butter maker in a large creamery in Queensland, Australia, we did not pasteurize the cream. Three box churns and a large Mason butter worker were used in the butter room.

In New Zealand the "Simplex" type of churn and butter worker has been common. A capacity of these churns (now of a combined type) of one hundred 56-pound boxes is not uncommon. For a number of years only minor changes in churn construction took place. The most radical change, occurring in the United States, has been the elimination of the internal rolls. Instead of employing the principle of pressing the butter between rolls, with the roll-less type of churn the butter is worked into a homogeneous mass by pounding.

A definite disadvantage of the present-day churn is its wooden construction. Milk solids which lodge between the staves and in cracks are difficult to remove. Thorough washing and rinsing with water at near boiling point followed by drying are necessary. As sterilization of the churn is impossible, either with chemicals or with hot water, microorganisms are always present in these milk solids. There are records of a large number of churnings that have been spoiled, during short time storage, by the activity of microorganisms that originated in the churn. Cheesy and even putrid flavors and moldiness are the most common defects in butter that result from contamination of churns.

The use of metal for churns has been contemplated by manufacturers for

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many years. The chief disadvantage of using metal for churns is that the butter is apt to adhere to the metal surface. By experimentation Mitchel, of Los Angeles, found that cast aluminum alloy, because of its porous rough surface, could be used satisfactorily as a material for churns. A considerable number of these all-metal cube shaped churns are being used in the west. Many millions of pounds of butter have been manufactured with this churn. One definite advantage of this type of churn is that all parts of the inner surface can be completely sterilized with hot water and steam.

Some western creameries have replaced the wooden butter packing utensils with utensils made from cast aluminum alloy. Aluminum butter tampers, paddles, and strikers are more sanitary than if they were made from wood.

Stainless steel butter moulds have been introduced. These are safer to use than wooden moulds as they can be easily cleaned and completely sterilized.

The metal churn constructed from stainless steel sandblasted on the inside was tested before the war in the Danish Experimental Creamery at Hillerod, Denmark. An innovation made was the mechanical removal of the butter from the churn. The finished butter was softened by spraying warm water on the outside of the churn while revolving. For summer-made butter the churn was revolved 10 revolutions per minute. Water at a temperature of 104° to 107° F. was used. By spraying the revolving churn for two minutes with warm water and continuing revolving for an additional five minutes the temperature of the butter was increased 3.2° F. A similar treatment also for two and five minutes resulted in an increase of 2.7° F. while a third similar treatment resulted in a further increase of 2.2° F. Thus, if the butter at the beginning was at a temperature of 61° F., the increase was 8 degrees, giving a final butter tempertaure of 69° F. This was followed by revolving the churn, without applying water to the outside, for an additional ten minutes.

For winter-made butter a slightly different procedure was followed. The churn room was maintained at a temperature of 61° to 64° F. Colder water was used so as to avoid melting the high-melting-point glycerides as this would result in crumbly butter. The water temperature varied from 82.4° to 86° F. In three treatments the temperature of the butter was increased from 59° F. to 75° F. before it was in a satisfactory physical condition for removal. Pressure at about 3 to 5 lbs. per square inch, using filtered air, was then applied to the interior of the churn. The butter could be forced out through a sanitary conductor to the butter firkin, standing on scales, by this means. It was reported that this treatment of butter had no detrimental effect upon the body and texture. This method of unloading a churn has so far as is known not been tried in the United States. (See 28th Report, State Experimental Creamery, Hillerod, Denmark.)

pH VALUE

Research at several state experiment stations and in commercial plants has definitely shown that butter which shows a low pH of the serum keeps poorly, even in cold storage at zero degree Fahrenheit. The most common and objectionable defect which develops is a fishy flavor. Fishiness in salted butter can be controlled by keeping metallic contamination to a minimum and by so regulating the acidity of the cream at churning that the pH of the butter serum ranges from 6.6 to 7.0. Control laboratories can assist the buttermakers in their effort to maintain a correct pH of the butter serum. Hussong in discussing the significance of the measurement of the pH of butter stated that: "The experience of three storage periods has confirmed the value of using pH as a means of controlling keeping quality. This season the pH of all butter scheduled for storage was determined and those churnings falling outside the desired range were not stored. The results of this procedure to date have been very satisfactory. In previous years those churnings which developed a fishy flavor showed pH values below the desired limit and confirmed observations made in the laboratory. The pH found to be most useful under the conditions studied was 7.0 ± 0.2 and it seems likely that the butter with pH values near the top of the range possessed better keeping quality than that in the lower range."

YEAST AND MOLDS

A few years ago it was demonstrated both in Canada and in the United States that a high yeast and mold content of the butter generally resulted when the cream was not pasteurized efficiently or when the equipment used for transferring pasteurized cream and the churn and butter packing utensils had not been properly cleaned and sanitized. With a high yeast and mold count would be associated a high bacterial count. As a result of this work recommendations for properly pasteurizing cream and for cleaning and sterilizing pumps, pipes, strainers, valves, churns, moulds, etc., have been published. By following these directions it is possible for efficient buttermakers to make butter which regularly has a low yeast and mold count, provided, of course, that the equipment is in a satisfactory physical condition.

PARCHMENT WRAPS

The proper preparation of parchment butter wraps is often overlooked. When received from the manufacturer, either in rolls or in reams, the paper is practically free from microorganisms. After it is exposed to the air in the creamery or has become damp it may be a source of bacteria, yeast, and molds. If used wet a good method of preparing wraps is to boil them in brine in a closed tank the evening before they are to be used. A metal tank, having steam coils in the bottom, with all parts constructed from stainless steel containing molybdenum is very satisfactory for this purpose. Treating parchment wraps with a solution of sodium proportionate is also satisfactory.

PASTEURIZATION

The temperature used for pasteurizing cream for butter has been increased during the past 10 years. The higher temperatures have been found beneficial in improving the keeping property of the butter. Instead of using a temperature of 145°–150° F. as was common a number of years ago when pasteurizing in a vat, a temperature of 155°–158° F. for neutralized cream and 160°–162° F. for sweet cream is now commonly used in western creameries. With the flash method, instead of the former 180° F., a temperature of 190°–200° F. is now used. In pasteurization of cream for butter the aim should be to destroy all enzymes and practically all microorganisms. All pathogenic organisms must be destroyed by any method of pasteurization. A scorched, or burnt, flavor should be avoided.

No method of pasteurization is a substitute for sanitation and proper care of milk and cream on the farm and in the creamery. By this process good quality butter cannot be made from poor quality cream. It is claimed that certain undesirable feed and weed flavors can be expelled by pasteurization. By the usual methods not much improvement is effected. Hunziker, a number of years ago, experimented with methods for the removal of undesirable feed and weed flavors. He found, that when treated in a vacuum some of the volatile substances responsible for the flavors could be removed. Equipment is now on the market, exemplified by the Rogers high temperature pasteurizer, for removing objectionable feed and weed flavor.

VACREATION

In New Zealand there has been developed a combination vacuum process of pasteurization and removal of feed and weed flavor, as well as other loosely bound extraneous flavors, by steam distillation, known as vacreation. This method of pasteurization has been tested at the Oregon, Iowa, and Manitoba experiment stations. Favorable reports have been published. The pasteurizer used, known as a "Vacreator",* is now being manufactured in the United States. In this process dry saturated steam is expanded as it continuously enters the vertical vacuum pasteurizing section and is thereby reduced in temperature to the desired pasteurizing point—usually between 195° and 200° F. The steam being introduced at the top of the pasteurizer travels downwardly, and into it is rained the incoming cream to intermingle and travel its course with the steam. At the steam temperature the cream-steam mixture enters a second or steam distillation section where a higher vacuum reduces the temperature to between 160° and 180° F. and where volatile flavor compounds are distilled off. In the third or high vacuum section further temperature reduction and vapor removal occurs thus bringing the cream temperature down to between 100° and 110° F. and restoring the cream to its original consistency. The flow cycle is from about 8 to 10 seconds of time only. The method gives exceptionally high pasteurizing efficiency, produces clean natural flavor in cream, and greatly enhances keeping quality. Vacreation of butter cream seems also to have a bearing on the improvement of body and texture. There is very little butter being made in either New Zealand or Australia today that is not produced from vacreated cream. About one hundred butter plants in Canada and the United States are now using this system of cream pasteurization.

* "Vacreator" is the registered trademark designating the Murray vacuum pasteurizers.

BUTTER TEXTURE

Crumbliness, stickiness and excessive hardness of fall and winter-made butter has been common, especially in sections where a large quantity of hay is fed to the cows. Buyers have complained that such butter cut badly when a mechanical butter cutter was used. Leakage of brine was excessive. Because of the hard and crumbly condition this type of butter did not enjoy favorable market acceptance when butter of a softer and waxier consistency was available. The problem was given attention by the Oregon Agricultural Experiment Station. In studies on the chemical and physical properties of the milk fat produced in the hay-feeding sections during fall and winter, it was found that the fat had a high melting point and contained a low percentage of the unsaturated and volatile fatty acids. Farm management practices did not permit a change in the feed in order to produce a lower melting point fat. It was necessary to develop a modified butter-making technique if butter of more desirable body and texture was to be made. During five years of experimentation one-third million pounds butter in 383 churnings was made. A satisfactory method of manufacture, known as the "50–45–40" method was developed. In brief this is as follows:

(1) The cream used must be in a good physical condition (not frozen, curdy, watery, etc.).
(2) The fat content of the cream should be controlled to range from 32 to 38 percent.
(3) The cream after pasteurization should be cooled to a temperature of 50° F.
(4) The cream should be held overnight at a temperature of from 50° to 55° F.
(5) Dilution of the cream with water must be reduced to a minimum.
(6) The temperature of the cream at the time of churning should be regulated so that the buttermilk can be drained within 40 to 50 minutes after churning is commenced.

(7) The butter granules should be the size of small peas.
(8) The butter granules should be washed and thoroughly chilled by means of cold water at a temperature not higher than 45° F.
(9) The buttermaker should adjust the amount of water added with the salt so that the butter when not completely worked will contain within 1 percent of the desired moisture.
(10) The final working after the make-up water is added should be so thorough that leakiness is not observed on the surface of the printed butter.
(11) The churn and butter worker must be in such condition that the butter does not stick to them.
(12) The churning, working, and packing operations must be done with dispatch.
(13) The freshly packed moulds or cubes of butter should be placed in a refrigerator maintained at a temperature of 40° F.
(14) The whole process of buttermaking must be done as directed with no deviation.

If the full benefit of this method is to be obtained there must be no short cuts. Expert workmanship on the part of the buttermaker is essential.

This method of butter manufacture is now used by a large number of western creameries and is being recommended by several large butter distributors in California, Washington, and Oregon.

FAT LOSS

Dairy technologists have given much attention to the control of the amount of fat lost during butter manufacture. Many creamery managers have not been aware of the importance of properly controlling this. Before research on this problem was started at the Oregon Agricultural Experiment Station a survey showed that in a large creamery, using the vat method of pasteurization, losses as high as 3 percent of the total fat churned were observed. The causes of an excessive quantity of fat being lost in the buttermilk are:

(1) Low testing or excessively high testing cream.
(2) Diluting the cream with water or with an excessive amount of starter.
(3) Improper neutralization and pasteurization.
(4) Slow cooling, excessive agitation during cooling, or forgetting to stop the coil when cooling is finished.
(5) Partial churning during pumping.
(6) Churning too soon after pasteurization and cooling, especially during spring and summer.
(7) Not holding cooled cream at low enough temperature after pasteurization.
(8) Churning at too high temperature.
(9) Warming the cream during churning.
(10) Excessive speed of churn.
(11) Overloading the churn.

Any one of these may cause an excessive loss. In an efficiently operated creamery, it should be possible to keep this loss of fat down to nearly 1 percent.

MOISTURE CONTENT

The control of the percentage of moisture in butter is important in any creamery, large or small. With modern churns and using good buttermaking practices it is now possible to control the moisture within narrow limits. A method of calculating the amount of water to add to churnings of partly finished butter has been developed at the Oregon Agricultural Experiment Station. On the basis of an algebraic formula a table has been prepared which shows the amount of water to add to various churnings ranging in size from 300 to 2,000 pounds fat and with moisture contents in the partly finished butter ranging from 13.5 to 16.4 percent when the desired moisture content of the finished butter is 16.5 percent. The table has been found very useful in many of the western creameries.

Not until the butter moisture standard was eliminated in Oregon in 1930 was it common to determine the fat content of the butter made in the creameries. The change to the single (fat) standard resulted in a lowering of the average salt percentage by 0.6 percent and a raising of the average moisture percentage of Oregon butter by 0.6 percent. As the composition of the butter marketed showed considerable fluctuation, it became necessary to assist the buttermakers in their composition control work. Specific directions for analyzing butter for fat, moisture, and salt were outlined. A manufacturer upon request constructed a balance with beams that permit the direct reading of both the fat and moisture percentages. A table was prepared that shows the pounds of fat in different lots of cream varying from 500 to 5,000 pounds with fat contents ranging from 29 to 42 percent, the pounds of butter that can be obtained (22.92 percent overrun) and the pounds of salt that must be added to the butter in each churning in order that the finished butter will contain 2.3 percent salt (allowing for a 0.1 percent loss). The composition of the finished butter to be 80.5 percent fat, 16.5 percent moisture, 2.3 percent fat, and 0.7 percent curd.

COMPOSITION

A patent (No. 2,331,656) was granted October 1943 to Conner, Bird, Flakker, and Johnson for "A Method of Controlling the Composition of Butter". The method involves the following steps: "Determining the percentage butterfat content of an unknown volume of homogeneous cream, determining the weight of the churning by churning the cream to the point of 'break' and then reading the liquid level of the buttermilk on a scale calibrated in weight units of the total churning based on the volumetric capacity of the churn, then, from knowledge of the percentage butterfat content and the weight of the churning, determining the weight of the butterfat in the churning, separating the butterfat from the buttermilk, determining the percentages of coloring matter, salt and moisture to be added to produce a uniform composition, then from said percentages and the weight of the butterfat determining the amounts of each to be added to the butterfat and thereafter thoroughly incorporating in the butterfat the determined amounts of coloring matter, salt and moisture."

LEAKAGE LOSS

A large percentage of the butter manufactured in the United States is printed by means of power printers. The butter must possess good "printability." That is, it must have a waxy body and a well-knit texture. It must not be hard and brittle, or greasy and leaky. The moisture droplets must be small and well distributed in the butter. A loss of brine of from 1 to 3 percent on the weight of the butter as the total loss during and subsequent to printing has been reported by butter distributors. With butter at 40 cents a pound, a loss of 1 percent due to brine leakage would amount to $4,000 on 1,000,000 pounds butter. Short-weight butter may be seized by regulatory officials. Work with a number of creameries marketing their butter through a central marketing organization has resulted in a substantial lowering in the leakage losses. It is not uncommon for these losses to range from only 0.1 to 0.5 percent when well-made butter is printed.

Loss of brine during and subsequent to printing is prevented by:

(1) Having the cream in the proper physical condition for churning.
(2) Placing the right amount of cream in the churn.
(3) Revolving the churn at the proper speed.
(4) Churning to granules the size of small peas.
(5) Using wash water at the proper temperature.
(6) Proper distribution of the salt.
(7) Working the butter until it is dry, but not so much as to cause salviness during summer or stickiness during winter.

CONTINUOUS CHURN

The "continuous" method of manufacturing butter is still in the experimental stage. It is claimed for the method that the butter made has a close texture, free from any leakiness, and has a waxy, pliable body. The fat loss in the buttermilk is said to be small. A definite advantage is that the butter can be extruded from the churn and placed in the final package without previous hardening. Another advantage of this method is that yeasts, molds, and undesirable bacteria can be effectively controlled. If this method of butter manufacture is found satisfactory under pilot plant operation, it will be the most outstanding development in buttermaking since H. E. Schuknecht first pasteurized cream in commercial buttermaking almost fifty years ago (1897) in Minnesota.

SELF-CLEANING FARM SEPARATOR

The twice a day disassembling and cleaning of a farm separator may soon be unnecessary if the "self-cleaning" separator now being tested at the University of Illinois proves satisfactory. An Englishman, H. W. Fawcett, has equipped a separator bowl with three ports, located in the bowl wall. These ports, closed when the bowl revolves at separating speed, open when the speed is reduced. When, after using the separator, cleaning solution, followed by a sterilizing solution, is run through the bowl, all milk and cream remnants and slime deposit are removed by the surging action of the solution, and the interior of the bowl is left clean and dry. A dependable supply of hot water must be available. Tests now being made by the Illinois Agricultural Experiment Station will show whether the separator bowl can be satisfactorily cleaned without disassembling it. The research workers will determine if the bowl can be adequately cleaned by this method twice a day for periods extending up to one or two weeks. The preliminary work by Tracy, Hussong, and Herreid shows no significant trend between the bacterial counts of the milk before separation and the counts of the cream and skim milk after separation during a seven-day test involving 14 separations. The counts of the raw milk and the counts of the cream and skim milk have the same relation to each other in the 14 runs. During the test the separator bowl was not disassembled. With the exception of a slight milk stone deposit on the disks, the bowl and parts were free from any milk or cream remnants or slime deposit at the conclusion of the test.

QUALITY CREAM

Good quality cream is fundamental to butter of good quality. It may be said that buttermaking begins on the farm. Cleanliness during production and handling of the milk and cream is necessary and preservation of the quality of the products by proper cooling and storage will mean greater returns to the producers. Prefabricated milk houses will soon be available. Automatic electric or gas water heaters are available at a reasonable price. A good supply of hot water is necessary on any dairy farm. New types of mechanical refrigerators for farm use are being developed. One of these new refrigerators has a side-opening door, thus eliminating any lifting. The compressor is operated by a ¼ h.p. motor. During cooling, refrigerated water at a temperature of 33° F. is sprayed on the cans. The smallest cabinet accommodates four ten gallon cans. Milk may be poured directly through a strainer into the can. The strainer fits in an opening in the top of the cabinet. Low-cost refrigerators for use in cooling cream on farms are being developed. The introduction of these on the thousands of farms that now have inadequate facilities for cooling cream will be a large factor in improving the quality of cream marketed. Cream stations will find the air-cooled cabinet developed by Downs and Yung of the Nebraska Agricultural Experiment Station satisfactory for storing cream held for shipment, or they may use the single-can cooler where a cooling unit is inserted into the can.

The Significance of Out of State Milk Regulations Upon the Dairy Industry of Wisconsin*

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WISCONSIN is recognized throughout the nation as the Dairy State. Its human population is about three million. Its milk cow population is about two and two tenths million. There are, therefore, about two cows present for every three inhabitants in the State. The State produces about 14 billion or about 12 percent of the nation's annual total milk production of an estimated 120 billion pounds. consume. Wisconsin cows produce annually the equivalent of about 464 U. S. gallons or nearly 3,900 pounds of milk per person. Obviously, most of the milk produced must be shipped to markets in other states, principally in the form of manufactured dairy products.

The intensity of manufacture of dairy products in Wisconsin is indicated by the following:

Dairy Plants in Wisconsin

	Cheese	*Butter*	*Evaporated and Condensed Milk*	*Powdered Milk*	*Ice Cream*	*Market Milk*
1895	1,330	750	..	..	..	..
1920	2,770	780	65	..	..	..
1945	1,500	430	85	144	442	529

The value of the milking cows in the State is about 200 million dollars. The value of the milk products produced annually is about 250 million dollars. The business of dairying or milk production is participated in by a large number of farmers. There are about 170,000 dairy farmers in Wisconsin.

About 65 percent of all the cattle in Wisconsin are dairy cattle. Whereas about 20.3 percent of the nation's agricultural source of income is due to the production and use of milk, in Wisconsin milk accounts for 50.3 percent of the State's agricultural income.

The production of milk in Wisconsin is greater than its residents can

Wisconsin produces

- 10% of the nation's total butter production
- 50% of the nation's cheese production
- 30% of the nation's evaporated and condensed milk
- 30% of the nation's powdered milk supply

There are in the State of Wisconsin about 3,000 dairy products manufacturing plants. There has been a change in the size of plants, in the volume of milk handled in them, and a shift in the manufacture of certain dairy products.

A classification of the dairy products produced in Wisconsin is about as follows:

* Presented before Wisconsin Milk Sanitarians Assn. Annual Meeting, Nov. 9, 1945, Madison, Wisconsin.

PRODUCTION OF MANUFACTURED DAIRY PRODUCTS IN WISCONSIN

	Millions of Pounds 1935	1944
Creamery butter	155	125
Condensed milk products	55	196
Evaporated milk	725	1,053
Cheese	315	474
Ice cream (gallons)	4	12
Powdered whole milk	7	62
Powdered cream (thousands of pounds)	2	122
Powdered skimmilk for human feed	70	165
Powdered skimmilk for animal feed	43	38
Malted milk powder	10	33
Fat in cream shipped out of state	5	35
Fluid milk shipped out of state	240	676

A consideration of this information indicates that as a business in Wisconsin, the dairy industry of Wisconsin cannot live unto itself alone. Its existence depends in great part upon the impress it makes upon the buyers in the rest of the nation. In this respect, the State of Wisconsin is in somewhat the same role as the country of New Zealand. This country, slightly smaller than the area of Nevada, with a population of some 1.5 million, has the highest export rate in the world, ($180 per capita) over 90 percent of which is in dairy products, meat, and wool. New Zealand's farms are small, averaging 100 acres, and about 50 cows each. Eighty-seven percent of the dairy cows are milked by machine. The country has 105 butter factories, 245 cheese factories, and 53 joint butter and cheese factories. The production of export cheese in 1942 was over 300 million pounds. The *average* score for butter exported was above 93, and for cheese 92. New Zealand must export her products half way around the world to Great Britain. Yet this country has established a market in the face of competitive problems of transport distance, and of established efficient dairy regions.

Wisconsin shippers must face similar competitive problems: distance from its markets, operating efficiency of its competitors, and consumer acceptability of its products. Unlike New Zealand, Wisconsin ships fresh fluid as well as manufactured products. Consequently, an exacting competitive problem is that of meeting regulatory standards of care in production and handling of fluid dairy products.

The meeting of regulatory standards of quality of milk and cream for other markets necessitates a review of the purpose and function of milk ordinances.

PURPOSE AND FUNCTION OF MILK ORDINANCES

A milk ordinance or regulation is a designation of rules for the handling of milk enforceable under delegation of police powers. The utilization of "police power" for regulation of milk quality is permissible, constitutionally, upon the philosophy of government that it serves and is necessary for the common good. Milk ordinances have their being, then, as tools by which groups or numbers of people are governmentally protected against undesirable hazards.

It is frequently cited that ordinances of different cities or areas differ considerably in details. This is in part a result of and benefit of local and state government. It must be recognized that ordinances vary in design because of purely local characteristics: the concentration of population, the accessibility of milk, the average income and level of living, the ease with which supervision may be accomplished, the geographical factors of agricultural and industrial development, the significance of a hazard, and so on. Even nearby cities or communities in a given state have ordinance regulations differing in various aspects because of immediate local influences. It is true that seemingly many specific details are incorporated in ordinances, the justification of which is without local significance.

It is generally recognized that enforcement of sanitary regulations results in increased costs. Fluid milk supplies for cities demand greater prices for the producer, and from the consumer. In addition to selling milk, a producer and an operator sell a service and a "know how", the service of handling the milk the way a buyer or market desires it, and the benefit of knowledge involved in accomplishing the task. Wisconsin operators are generally agreed that it is economically beneficial to market milk in conformity to standards of high level. Specialization in quality has proven to be sound business. Understanding the problems of public health has paid economic dividends.

It is the duty of public health officers in their cities to see to it that their communities are provided with an adequate supply of the quality of milk and other dairy products deemed desirable for their communities. If the requirements of quality as presented are strict and rigid, the community must face the problem of acquiring the supply and of meeting the price necessary to acquire it. In the normal course of events, public health must be bargained for. In the normal course of events milk quality requirements are developed upon the basis of supply and cost.

Wisconsin operators and producers are in a position to recognize that the development of milk areas, the improvement of milk supplies, and of operating facilities have taken years of effort. It has not been done in weeks or months. It has taken years of hard work. In like manner, great sums of money and many years of hard effort have gone into the development of market milk supplies, its standards and its ideals in our major American markets.

If Wisconsin producers and operators wish to benefit from the outer markets, they must anticipate the necessity of conforming and adding to the regulatory standards of quality, rather than to stand askance and hope for modification in the direction of inferiority.

The exportation of fluid and manufactured products into out-of-state markets has presented Wisconsin operators with some problems, and some advantages.

In one Eastern city market, Wisconsin operators hold thirty percent of all permits issued to ship cream. The shipments of cream into this particular market have come from eight states and New England. The percentage of all cream shipments originating from Wisconsin have been as follows:

	Total Cream Shipments into Market	*Percentage of Total Shipments Originating in Wisconsin*
1940	560,000	6
1941	605,000	12
1942	583,000	10
1943	484,000	14
1944	433,000	17
1945 (to Sept.)	390,000	19

It is important to note that in this one market, as an example, some 55 holders of permits through compliance with the quality program are enabled to participate in what amounts to an "exclusive" market. The market represents approximately a volume of $12,000,000 per year. Non-holders of permits cannot and have not participated in this market. Thus regulatory standards, though seemingly exacting, protect holders of permits from indiscriminate or unfair competition. Regulatory standards in effect stabilize the market. It is of interest to note that some markets have incorporated into their regulatory standards the feature whereby holders of permits who comply with requirements for cream are enabled to ship not only cream but also milk. The market is thus protected more fully against shortages of seasonal nature.

It is sometimes overlooked that regulatory standards of out-of-state markets are not discriminatory; generally they do not impose requirements upon shippers at a distance more severe than upon those in their immediate territories. The principal barrier not imposed, however, is that resulting from the effect of duration of transportation upon the quality of the products.

One of the principal problems in the development or use of out-of-state markets is the variability of demand. In normal times there have been significant variations in the receipts of cream from midwest areas into eastern markets. Shipments from the west to the east are relatively unimportant in the flush season, but are of sizable magnitude in the fall months.

Facilities organized to meet regulatory standards of out-of-state markets utilized only periodically may be costly investments. It behooves Wisconsin shippers who benefit only periodically of out-of-state markets to impress the necessity of uniformity of demand in order to maintain standards.

The Effect of Shipments of Poor Quality

During the recent war years the demand for milk and cream in many outside markets has been far greater than the available supply. Many markets perforce have acquiesced to receipts of milk and cream below the standard nominally set for local shippers. The ordinance regulations in some markets provide that only milk of a certain quality may be sold "except during an emergency". For example, local milk in one market must have a bacteria count of 100,000 per ml. or less, and the pasteurized product shall not have over 20,000 per ml. During the emergency these standards in one market have been modified to enable receipts of milk having a microscopic count of up to 2,000,000 per ml. and this, in the voice of the administrator, has been liberally interpreted."

Many shippers are now shipping milk upon a war basis of shortage and relaxed standards that could not meet the standards otherwise. Some midwest shippers are now shipping cream to eastern and southern markets who before never shipped cream, and who previously had difficulty in producing 93 score butter. The shipments of poor quality of products from distant areas into inviting markets is bound to have only one effect. It imposes hardships upon the administrators responsible for a community's milk supply, and it strengthens the case for greater milk-producing activities around that community's area. Over the long term the shippers from a distance must suffer from their folly. As one official in a southern city advised me, "Our hope is that local production can be encouraged by improved labor conditions, decreased feed cost, and adequate equipment and building material, to meet our local demands". In effect, a failure on our part in Wisconsin to ship milk and cream that commands merit and praise can only create a loss of confidence in buyers in the future. It jeopardizes the establishments that have been developed in the past decade in this State.

Measuring Sticks

The conversion of milk supplies originally destined for manufacturing purposes into shipments as fluid milk and cream necessitates an analysis of our quality appraisal techniques. Reliance upon a single quality appraisal technique may be misleading. Milk and cream, flash heated prior to shipment, is again reheated and pasteurized at its destination. A good grading according to a methylene blue procedure may be meaningless in the light of the standards imposed on the product at the point of use. For example, a methylene blue test of six hours may actually represent a high bacteria count regardless of what a shipper may think. A milk remaining blue may represent a bacteria count of one million which from its flashing and subsequent pasteurization may pasteurize out of 100,000 per ml., which is far above the standards permissible for pasteurized products in nearly all city markets. Shippers of milk and cream should be cognizant of the limitations of their appraisal procedures. In all probability the newer technique of periodic inversion of the methylene blue test will become the recommended procedure. Mere inversion of the tubes speeds up the rate of reduction of the dye. Actually little change in bacteria numbers is affected, yet the appraisal of quality is seriously amended. As one operator stated, "What an awakening some people will have when they start using this method". As another example, the bacteria estimate by plate method of milk or cream at 37° C. may be entirely different at other temperatures such as 20°, or 45°, or 8° C. It behooves Wisconsin shippers to know their products.

VARIABILITY IN REQUIREMENTS

One of the most perplexing and confusing problems Wisconsin shippers of both fluid and manufactured products meet is the lack of uniformity, and the contradictory requirements in methods and for facilities for producing and handling milk. For example, the requirements of different out-of-state inspectors differ to the following degree: in one instance milk houses must be whitewashed, in another they dare not be; in one instance, milk house windows must be opened and screened, in another they dare not be opened and must be nailed shut; in some markets open pails are insisted upon while in others only hooded pails are permitted. In most or at least many cases these differences in inspection requirements do not change the quality of the product in the least. They serve only to confuse the producer. On occasions there are so many officers and inspectors on farms with conflicting viewpoints the farmer does not and cannot know who is right and wrong. We have instances in Wisconsin where milk producers are required to keep two sets of milk pails on the farm to satisfy the requirements of different inspectors.

Simplification and standardization would have three effects of benefit not only to Wisconsin dairymen but also to the markets where the products are utilized. First, it would enable dairy plants more easily, better and more economically to serve more than one market; second, it would remove a tremendous burden from the shoulders of fieldman who must counsel producers, and who after all are in effect serving the people who ultimately use the product; and, third, it would bring greater respect for the philosophy that better milk can be made available as a food, and for those who utilize the delegated police power in furthering the acquisition of milk as a food.

War time inspection has served to emphasize those points that are really of significance. In many instances "frills" have lost their meaning. Insofar as Wisconsin shippers are concerned, a program of Wisconsin inspection and certification capable of commanding the respect of all would do much to further Wisconsin's role of participation in our national markets. It appears correct to say that when Wisconsin can offer a plan and program that insures and guarantees quality, the "frills" will lose their meaning and significance, and in effect will become ridiculous.

PROBLEMS OF REJECTIONS

A survey of shippers of fluid milk and cream in Wisconsin, and of out-of-state receivers, has indicated that by and large there have been very few rejections of shipments despite the hazards of time and transportation. This is evidence in great part that Wisconsin shippers satisfactorily can meet the requirements of out-of-state markets. The biggest criticism observed as coming from buyers and receiving administrators appears to be of definitely controllable factors, specifically, high bacteria count, low weights, low butterfat tests, and inadequate icing. These are controllable. There appears to be a tendency for some shippers to hew too close to the line of minimum standards instead of aiming their sights for levels that enable them to be above reproach.

MANUFACTURED PRODUCTS

New plants, new equipment, new techniques are making possible greater distribution of certain manufactured products. In many instances these products are competing for the consumer's food dollar and with the fluid milk products. It is to be anticipated that quality standards of increasing rigidity will be assessed on manufactured dairy goods. Eventually, standards now in effect for market milk may be assessed for manufactured goods. As a manufacturing state Wisconsin cannot afford not to lead in having and improving high standards for its manufactured products.

It is wise to note that Wisconsin has expanded tremendously during the past decade in its facilities to produce manufactured products. These plants are new, with much new equipment, and geared to large scale operation. Whether Wisconsin will share favorably in the out-of-state markets for manufactured products, and whether Wisconsin can maintain the large scale enterprises, hinges to a great extent on its recognition that quality standards as embodied in ordinances for fluid milk and cream are likewise applicable to manufactured product operations.

MEETING THE PROBLEMS

There are several problems Wisconsin shippers and manufacturers must face:

A condition of affairs wherein shipment of milk and cream to cities from territories in the State without any inspection whatsoever, or of admittedly low standards, and of a quality that should never find its way into an outside fluid milk market will have the tendency in the long run to harm the producers of quality dairy products in the State. Uniform standards, and high standards of inspection, industry backing, will prevent this and establish the repute of operators in the State with out-of-state buyers.

Standards of quality are developed, and milk and milk products of quality acquired only when sanitarians with abilities lead the way. It has become increasingly evident during the past few years that the most successful organizations in terms of both public and consumer relationships, and with products of distinct recognized quality have the most capable and qualified sanitarians. The industry of Wisconsin can do no better than to encourage and demand high standards of evaluation of sanitarians, and to remunerate them accordingly.

The war time period has enabled Wisconsin shippers to participate in markets in a manner not previously so experienced. There lie ahead greater economic potentialities in the merchandising of milk and milk products. The realization of these markets depends in great part upon standards that are better than the minimum demanded in the markets.

There is great need for the elimination of unnecessary frills, and this requires organizations by industry and state of standards the level of which is superior to those demanded in other markets. Out-of-state ordinances should serve as the guide post by which our industry can set its sights.

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Association News

Florida Association of Milk Sanitarians

The second annual meeting of the Florida Association of Milk Sanitarians and second annual dairy sanitarians school were held May 13 to 16 inclusive at the Dairy Products Laboratory, Florida Agricultural Experiment Station, Gainesville, Florida. The short course was directed by Dr. E. L. Fouts, Dairy Technologist, of the Florida Experiment Station staff. Florida was well represented by 54 city, county and state inspection officials from every part of the state.

A well rounded program was presented by members of U. S. Public Health Service, State Department of Agriculture, City Health Units, University Experiment Station, and others. Nineteen papers were given dealing with chemical and bacteriological analysis of milk, sanitary production of milk on the farm, sanitary control in milk plants, new developments in dairy processing equipment, and other subjects of current interest to milk sanitarians.

The following officers were elected to serve for the coming year: president, Mr. W. Howard Brown, Director, City Health Department, Jacksonville; vice-president, Mr. Alex G. Shaw, State Dairy Supervisor, Florida State Department of Agriculture, Tallahassee; secretary-treasurer, L. E. Mull, Agricultural Experiment Station, Gainesville. C. O. Stoy and Dr. E. L. Fouts were elected to serve on the executive committee.

The Florida Association is affiliated with the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS. It appears that the membership of the state association will be somewhat greater than last year. Reports from various units throughout the state indicate that there will be even greater achievements in sanitation, inspection, and technology during the year ahead.

New York State Association of Milk Sanitarians

The regular Annual Meeting of the New York State Association of Milk Sanitarians is scheduled to be held at the Hotel Seneca in Rochester, N. Y., on September 18, 19, and 20, 1946.

The usual scarcity of hotel rooms is anticipated and members are requested to cooperate with the Housing Committee by sharing rooms with other members.

W. D. TIEDEMAN
Secretary-Treasurer

Wisconsin Milk Sanitarians Association

The annual meeting of the Wisconsin Milk Sanitarians Association will be held on September 12th in the Hardware Mutuals auditorium at Stevens Point.

Mr. Vern P. Melhuish, Chairman of the Program Committee, has announced that papers will be presented on the following topics: Sources and control of thermoduric bacteria; Detergents and sterilizing agents; Evaluation of a quality program; Minimum cheese factory requirements; Problems in hot-short pasteurization for cheese; and the Correlation of farm inspection with platform tests.

The meeting will be open to all persons interested, and copies of the program may be obtained from the Secretary-Treasurer.

The membership of the Wisconsin Association had grown to 241 by June 1st of this year. This represents a steady and encouraging increase in the three years since the Association was organized, but is still far short of the potential membership of such a group in Wisconsin. A particular invitation is extended to those in Wisconsin who are already members of THE INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, but have not accepted membership in the Wisconsin Association.

L. W. BROWN
Secretary-Treasurer

CONNECTICUT MILK REGULATION BOARD

April 11, 1946

Rules and Regulations for the Production and Sale of Special Milks Sold Under National Trade Mark or Trade Name

1. Herds accepted for the production of special milk and not having 50 percent of the milking herd registered with a National Breed Association shall be given one year in which to obtain 25 percent of the milking herd registered and shall be given two years to obtain 50 percent of the milking herd registered. The balance of females in the milking herd shall have breed characteristics including type and color.
2. Milk shall be produced, handled, and distributed in accordance with the established rules and regulations for Grade A milk.
3. Where the butterfat content is indicated on the label, the actual butterfat content shall not vary more than two-tenths of one percent as found by applying any butterfat test approved by the A.P.H.A. and/or the A.O.A.C.
4. False or misleading advertising shall constitute cause for prosecution under the dairy laws and/or the pure food and drug laws.
5. Permits for the production, handling and distribution of SPECIAL MILKS may be issued by the Milk Regulation Board through its Chairman. The Chairman of the Milk Regulation Board, after hearing, may suspend permits issued under these rules. Violations and/or infractions of these rules shall be reported to the Milk Regulation Board which Board may, with or without hearing, suspend or revoke permits issued under these rules. Issuance and renewal of these permits shall be in accordance with policy established by the Chairman of the Milk Regulation Board.
6. These rules and regulations shall take effect April 1, 1946.

DEFINITIONS

"Females in milking herds shall mean cows which are milking or have been in milk, but does not include heifers previous to first lactation."

"Farms which operate more than one barn unit may be permitted to produce Special Milk from a single unit provided the milk and the producing animals can be properly identified."

DAIRY INSPECTORS' AND SANITARIANS' SCHOOL

Michigan State College, East Lansing, Michigan, April 8–12, 1946

Front row, left to right: A. R. Drury, Pontiac; Dick VanderWal, Grand Rapids; J. Milo Wilson, Ludington; K. C. Bandeen, Mount Pleasant; Mason I. Smith, Fremont; A. J. Harvey, Cadillac; H. J. Burger, Jamesville, Wisc.; Arthur DeBusman, Eau Claire, Wisc.; Robert T. Coleman, Coldwater; Edward L. Stockton, Marshall; James G. Brown, Hastings; L. W. Nyss, Mason; Carl W. Carr, Jr., Iron Mountain; C. M. Killmar, Rogers City; Clarence C. Greer, Alpena.

Second row, from left to right: Ellis C. Cottom, Traverse City; Wayne J. Juneac, Gladwin; Edward R. Friday, Madison, Wisc.; C. K. Luchterhand, Madison, Wisc.; Earl H. Martin, Midland; H. J. Crossman, Flint; Earl Weaver, M.S.C., East Lansing; Wm. Hendrickson, Gladstone; Fred S. Anderson, Menominee; Harold I. Neff, Gladstone; Frank J. Driedric, Manistique; W. V. Ross, Mason; E. J. Doane, Bay City; Claude Kistler, Traverse City.

Third row, from left to right: G. M. Trout, M.S.C., East Lansing; Lowell F. Telder, Sparta; Claude Landstra, Grand Rapids; Dale H. Childs, Flint; Eri E. Erwin, Flint; P. S. Lucas, M.S.C., East Lansing; G. E. Pumphrey, Detroit; Russell Palmer, Detroit; Arthur Hansen, Carney; Charles E. Gotta, Lansing; J. Russell Rugaber, Wayland; R. F. Genteman, Wayland; K. Philip Olmsted, Saginaw; R. J. Werdon, Grand Rapids; O. B. Foster, Adrian.

Back row, left to right: R. M. Keown, Elkhorn, Wisc.; W. J. Young, Saginaw; L. W. Engels, Traverse City; B. S. Stanis, Detroit; M. K. Perrine, Saginaw; L. H. Rothe, Corunna; J. Veenstra, Ann Arbor; W. E. McLellan, Lansing; F. L. Smith, Dowagiac; G. Selmo, Stambaugh; E. J. Horschak, Ann Arbor; K. R. Kerr, Grand Rapids; C. O. Widder, Sheboygan, Wisc.; H. A. Leonard, Lake City; J. E. Maxwell, Onsted.

Industrial Notes

Mueller Promoted in Corn Products

FRED MUELLER

The Board of Directors of Corn Products Refining Company announces the election of Fred Mueller, vice-president and general sales manager, as a director of the company.

Mr. Mueller began his service with the company in the Bulk Sales Department. In 1934 he was elected vice-president of Corn Products Sales Company. In 1944 he was made general sales manager of Corn Products Refining Company.

Pennsalt Names Dr. Gall Assistant Research Supervisor

Dr. W. A. Lalande, Jr., Director of Whitemarsh Research Laboratories, Pennsylvania Salt Manufacturing Company, has announced the appointment of Dr. John F. Gall as Assistant Research Supervisor to assist in the coordination of the experimental activities of the Research Division of Pennsalt's Research and Development Department.

Pennsalt Describes DDT Control of Cattle Pests

The use of DDT in control of insects in barns and on livestock is described in a four page color leaflet published by the Pennsylvania Salt Manufacturing Company. The leaflet gives detailed instructions for farm uses of the company's new product, Pensalco Livestock Spray, now sold in the new two pound bag. The leaflet is available on request from the company's main office, 1000 Widener Building, Philadelphia 7, Pa.

Wyandotte Chemicals Expanding Package Department

Use of smaller packages of cleaning, washing, and germicidal materials by the regular bulk users of Wyandotte Products as control units is gaining widespread acceptance. The dairy, dishwashing, maintenance cleaning, beverage bottling, hotel, restaurant, school, hospital, and food serving industries find that small unit packages fit into many of their operations. Many dairies, brewers, and bottlers make available to their suppliers, or to their distributors, the same Wyandotte cleaning and germicidal materials used at the production plant—but of course in package form.

THOLEN

To meet the needs of the many users in the score of basic industries served by Wyandotte Chemicals Corporation, the packaged products of the J. B. Ford Division of the company are now being expanded and restyled. This postwar activity is directed by F. H. Tholen.

Mr. Tholen joined Wyandotte Chemicals in 1929 as assistant manager of the Package Department. He was a partner in a brokerage business during 1940, and managed the Seattle office of the company in 1941 and 1942, returning to the Wyandotte office in 1943 with the Package Department.

LITTLE RETIRES AFTER TWENTY-SEVEN YEARS WITH MILK INDUSTRY

ROSCOE E. LITTLE
Retiring Executive Secretary
International Association of Milk Dealers
Chicago

Roscoe E. Little, who organized the first headquarters of the International Association of Milk Dealers in Chicago in 1920 and has been Executive Secretary continuously for twenty-seven years now, has retired following an expression of appreciation from the Board of Directors of the dairy organization.

When the Association started in 1920, there were 92 milk companies as members compared with 825 today, including leading dairy companies in the United States, Canada, England, Australia, and Argentina.

Mr. Little started his career as a clerk for the Grand Trunk Railway and served for seventeen years as a railroad man. For three years he was Secretary of the Milk Division of the Midwest Canners Association, the forerunner of the Evaporated Milk Association whose headquarters are in Chicago. Mr. Little, in 1926–27, was President of the Trade Association Executives' Forum of Chicago.

E. B. Kellogg, Assistant Secretary of International Association of Milk Dealers since 1929, has been appointed Acting Secretary.

MANUFACTURING CHEMISTS ELECT OFFICERS

The Manufacturing Chemists Association of the United States elected officers and 15 executive committee members at its annual meeting at Skytop, Pa., on June 6.

Charles S. Munson, chairman of the executive committee, U. S. Industrial Chemicals, Inc., was elected president to succeed H. L. Derby, president of the American Cyanamid and Chemical Corporation.

Leonard T. Beale, president of the Pennsylvania Salt Manufacturing Company, Philadelphia, and H. O. C. Ingraham, vice-president of the General Chemical Company, were elected vice-presidents.

J. W. McLaughlin, Carbide and Carbon Chemicals Corp., was named treasurer, and Warren N. Watson, Washington, D. C., was re-elected secretary of the Association, which maintains its headquarters in Washington.

The Association, an organization of some 80 chemical corporations, elected the following executive committee:

George W. Merck, president of Merck and Company, chairman; Lammot du Pont, chairman of E. I. du Pont de Nemours, vice-chairman; Mr. Derby; C. S. Hosford, Jr., president of the Victor Chemical Works; John L. Smith, president of Charles Pfizer and Company, Inc.; Clyde D. Marlatt, vice-president of the Martin Dennis Company.

W. S. Lander, vice-president of the Celanese Corporation of America; P. T. Sharples, president of Sharples Chemicals, Inc.; H. I. Young, president of American Zinc, Lead and Smelting Company; and William M. Rand, president of Monsanto Chemical Company.

DAIRY MANUFACTURING COURSE AT WISCONSIN

The winter course in dairy manufacturing at the University of Wisconsin will be conducted by the Department of Dairy Industry at Madison from September 30 to January 26, 1947.

The course is open to both men and women, who have graduated from high school or have had six months experience in a dairy plant. Furnished rooms may be had for $3.50 and meals for $10.00, respectively. The total expenses for a student will run about $296. Non-residents of Wisconsin will have to pay $100 additional. The course may be taken under the educational provisions of the G. I. Bill of Rights.

The number of applicants already is so great that only those who apply early may hope to be able to register. Address inquiries to Professor H. C. Jackson, Director, Department of Dairy Industry, University of Wisconsin, Madison, Wisconsin.

A Method for Making Bakers' Cheese from Dried Skim Milk

A method of making bakers' cheese from dried skim milk, instead of from liquid skim milk as has been the practice heretofore, has been announced by the U. S. Department of Agriculture.

The use of dried skim milk promises certain advantages over the conventional method, according to dairy specialists in the Department's Bureau of Dairy Industry. The manufacture of bakers' cheese need no longer be confined to the areas where fresh skim milk can be obtained, but it may be extended to areas far distant from the receiving and drying plants.

Some economies also would be possible if the cheese were manufactured at or near the bakeries where it is to be used, because the costs of transportation, storage, and freezing usually incurred in handling and shipping bakers' cheese could be reduced. Bakers themselves could store the relatively non-perishable dried skim milk and make the cheese as their needs arose.

The method was developed by the Bureau of Dairy Industry primarily in response to requests from manufacturers of bakers' cheese, who have found it increasingly difficult recently to meet the demand for their product. Much of the fresh skim milk formerly available for making bakers' cheese now goes to the drying plants.

Bakers' cheese is used by baking establishments for making cheese pies, cheese cakes, and other similar soft cheese pastries. The procedure for reconstituting the dried skim milk and making the cheese is simple and economical, and the usual equipment in a cottage cheese or Cheddar cheese factory can be used. Baking tests with cheese made by the Bureau's method have given satisfactory results, the dairy specialists report.

The method calls for reconstituting the dried skim milk with a quantity of water that will produce a milk with a higher solids content than normal milk. Good lactic starter and a small amount of rennet are added to the reconstituted milk and it is allowed to coagulate for 4 to 16 hours, depending on the temperature. When the curd is firmly coagulated it is placed in muslin bags (without being heated or cut) and allowed to stand until most of the whey has drained off. It is then ready for use or for packaging in suitable containers for marketing.

The yield of finished cheese varies from 1¾ to 2¼ pounds per pound of dried skim milk, depending on the conditions of manufacture and the amount of moisture wanted in the cheese.

New Members

ACTIVE

Christiansen, T. W., Sanitarian, Love-Marshall County Health Department, Box 392, Madill, Okla.

Hildebrand, Russell Marshall, Jr., Chief Sanitarian, Sumter County Health Department, Sumter, S. C.

Sanders, Dr. George P., Chemist, Division of Dairy Research Laboratories, Bureau of Dairy Industry, U. S. Dept. of Agric., Washington 25, D. C.

Snider, C. O., Sanitarian, Harrison County Health Department, Clarksburg, West Va.

ASSOCIATE

Bartmer, Ercelle D., Office Mgr., Dennery's Dairies, 127 W. King's Highway, Audubon, N. J.

Bartsche, W. H., Milk Inspector, Buffalo Health Department, 200 Blaine Ave., Buffalo 8, N. Y.

Bay, H. R., General Delivery, Boise, Idaho

Bean, E. E., Fieldman, Viroqua Co-op. Creamery Assn., 232 West South St., Viroqua, Wis.

Bender, John E., President, Model Milk and Ice Cream Co., 540 N. 7th St., Terre Haute, Ind.

Branstad, Art, Fieldman, Stella Cheese Co., Frederic, Wis.

Broyles, Leonard. Production Fieldman, Central Dairy Products Co., Shawnee, Okla.

Burns, Joseph, Sales and Service Representative, Schwartz Mfg. Co., 5546 S. Maryland Ave., Chicago 37, Ill.

Choniere, Leon, Inspector, Division Des Unites Et Districts Sanitaires, St. Hyacinthe, Quebec, Canada

Chubb, Richard Wellington, Cheesemaker & Fieldman, Stella Cheese Co., Box 715, Cumberland, Wis.

Chudnow, Joseph, Laboratory, Borden's Gridley Div., 536 N. 15th St., Milwaukee 3, Wis.

Covington, Junius L., Student, Oregon State College, 203 N. 21st St., Corvallis, Oregon

Davis, William D., Quality Man, Stella Cheese Co., Box 743, Cumberland, Wis.

Edens, Dale, Chilton, Wis.

Elder, Harold K., Fieldman, Fox Guernsey Dairy, 801 E. College Ave., Waukesha, Wis.

Erekson, Arthur B., Director of Research and Quality Control, Lakeshire-Marty Co., Plymouth, Wis.

Fishel, Nelle, City Bacteriologist, Health Department, 3509 Grand Ave., Des Moines 12, Iowa

Francois, Pedrito A., Public Health Engineer, Health Department, Box 543, Charlotte Amalie, St. Thomas, Virgin Islands

Gibb, E. O., Manager, The Fairmont Creamery Co., Box 239, Lawton, Okla.

Haun, Robert, Field Supervisor, Producers Creamery Co., P. O. Box 1427 SS, Springfield, Mo.

Hendrickson, J. R., Milk Inspector, City Board of Health, Room 11, City Hall, Shelbyville, Ind.

Hewer, Frank J., Mgr., Stella Cheese Co., Box 241, Pickford, Mich.

Inman, Marshall O., Fieldman, Pet Milk Co., New Glarus, Wis.

Isaacson, Arthur, Production Mgr., Lakeside Butter Co., Hotel Francis Drake, Minneapolis, Minn .

Iverson, Glenn C., Fieldman, Stella Cheese Co., Amery, Wis.

Johnson, David S., President, Guernsey Dairy Co., Oshkosh, Wis.

Kaeder, Edward A., Fieldman, Maple Island Farm, Inc., Amery, Wis.

Kaiser, L. M., Fieldman, Stella Cheese Co., Lewis, Wis.

Kingsbury, Elwood, Fieldman, Pure Milk Products Cooperative, Box 173, West Bend, Wis.

Klotz, William H., Jr., 4416 Devereaux St., Philadelphia 24, Penn.

Martin, Clark E., Fieldman, Sheffield Farms Co., Inc., 76 Borden Ave., Norwich, N. Y.

Mensch, A. J., Fieldman, Sauk County Co-op. Dairy Improvement Assn., R. 1, Spring Green, Wis.

Miller, Harry E., Plant Supt., The Borden Company, Ltd., 1816 Byng Ave., Niagara Falls, Ontario

Monk, David E., Milk Sanitarian, Dept. of Public Welfare, Wichita, Kansas.

Oberg, W. E., 1115 4th Avenue North, Fort Dodge, Iowa

Patton, Francis A., Sales Manager, Dennery's Dairies, 502 Chestnut St., Brooklawn, N. J.

Rasmussen, H. L., Contract Repr., Scientrol Incorporated Cooperative, 127 Pine St., Greenville, Ohio

Romberg, John W., Fieldman, Maple Island Farm, Inc., 212 No. Harriet St., Stillwater, Minn.

Sick, Dorson P., c/o Harrington & Co., Dushore. Penn.

Sjowall, A. L., Farm Service Director, Maple Island Farm, Inc., 219 N. Main St., Stillwater, Minn.
Sobrado, H. H., Student, Dairy Industry, University of Wisconsin, 720 Conklin Pl., Madison 5, Wis.
Sorum, Kenneth, Laboratory, Stella Cheese Co., Clayton, Wis.
Taylor, O. N., Supt., Central Dairy Products Co., Box 351, Shawnee, Okla.
Tooley, H. C., 9 Crescent St. Millers Falls, Mass.
Turner, Chas. L., Fieldman, Purity Cheese Co., Mayville, Wis.
Vernon, John L., Agriculture Instructor, Veterans Agricultural Training Program, Tangipahoa, La.
Wallace, K. L., President, Walker-Wallace, Ltd., 17 Cornwall St., Toronto 2, Ontario
Warner, Arthur P., Fieldman, Stella Cheese Co., R. 2, Amery, Wis.
Wegermann, Edwin N., Dairy Bacteriologist, Sanitary Farm Dairies, 864 18th St. S. E., Cedar Rapids, Iowa

CHANGES IN ADDRESS

Blackburn, Paul, from Huntington, Ind., to P. O. Box 128, Washington, Ind.
Brisbin, R. F., from Woodbridge, Conn., to 805 W. Sherman Ave., Fort Atkinson, Wis.
Brocker, Walter E., from Tomahawk, Wis., to Box 94, Gillett, Wis.
Carroll, Daniel, from Chicago, Ill., to 913 No. Michigan St., Plymouth, Ind.
Clarkson, Arthur W., from MacDill Field, Fla., to Route 2, Hannibal, Mo.
Downs, F. H., Jr., from APO, New York City, to Principal Sanitarian, Div. of Inspection, State Department of Public Health, Montgomery 4, Ala.
Everson, Harry L., from Shawano, Wis., to 305 Oak St., Green Bay, Wis.
Fischer, Arnold J., from Box 27, Prescott, Wis., to Box 13, Deer Park, Wis.
Hummer, Dr. Robt. L., from Carlisle Barracks, Penn., to Wilmington Road, New Castle, R. 3, Penn.
Legrid, Lester I., from Ashland, Wis., to 1728 Van Hise Ave., Madison, Wis.
Painter, W. E., from Golden State Co., Gridley, Cal., to R. 1, Box 9-H, Gridley, Cal.
Thomas, G. Hugh, from 308 N. Orchard St., Madison, Wis., to 211½ N. Randall Ave., Madison 5, Wis.
Thomas, Robert C., from Raleigh, N. C., to U. S. P. H. Service, 3rd and Kilgour Sts., Cincinnati, Ohio

SANBORN JOINS SYRACUSE FACULTY

Dr. J. R. Sanborn

We are pleased to announce that Dr. J. R. Sanborn has been made a member of our staff in our Department of Plant Sciences, as Professor of Bacteriology. It is expected that Professor Sanborn will concentrate most of his time and effort on research and investigation connected with biological problems involved in food packaging, together with formulation of the Sanitary Code involved in the packaging of foods.

Professor Sanborn's wide and long experience in industrial bacteriology will contribute greatly to our group of biological sciences and we are looking forward to his conducting a course for our advanced students in industrial bacteriology.

We are pleased that Dr. Sanborn has joined our staff, because it further contributes to our coordination and integration with the industrialists who are acquainted with biological problems and who are forward-looking in encouraging research, either applied or theoretical, in these fields.

Ernest Reed
Chairman, Department of Plant Sciences, Syracuse University

"Dr. Jones" Says—*

A letter I saw the other day from a fellow down in—well, anyway, he said he used to be told that flies carried disease germs and he wanted to know if they'd gotten so they were "germ free." He went on to say that two or three restaurants around his section, their pies were exposed to flies. He liked pies but he preferred 'em without flies. He reported it to the health office but they didn't seem to take it very seriously.

Remember the old story about the fellow at the railroad station lunch counter? The pies were set out on a shelf and flies were pretty thick. He said: "I'll take a piece of that currant pie." The girl waved her towel over 'em. "Shoo!", she says: "That ain't currant. It's custard."

Well, our ideas about flies carrying disease: the past thirty-odd years they've swung back and forth like the proverbial pendulum. The early days, when we knew less'n we did later about the ways diseases are spread, whatever we couldn't account for any other way, we'd lay it to flies. Diseases like typhoid—we saw flies feeding on all sorts of filth, then they came and ate at the table with us and walked around on our food. And I believe they found germs on some flies' feet and so on. But, later, when it was established that these diseases usually spread in more definite ways, we sort of crossed the flies off the list.

Here more recently poliomyelitis—they've found the virus in sewage and human excretions. And it's been found on several flies that've had access to such stuff, around where they were having polio. So now some of 'em are wondering if they might have something to do with the spread of that disease. They're working on it and we'll just have to wait and see.

But, in the meantime, one thing there's no question about: flies aren't socially acceptable. They aren't welcomed in the best families. When you go into a place, whether it's a home or an eating place, and find 'em thick, you know there's something wrong somewhere. One persistent fly, when you're trying to take a nap, can be as annoying as a burdock on a dog's tail. I won't mention any names but there's some pests we have to put up with. But we know how to get rid of flies. So the question is: "What are we waiting for?"

PAUL B. BROOKS, M.D.

* *Health News*, New York State Department of Health, Albany, N. Y., Oct. 1, 1945.

DETECTION OF MASTITIS

(Continued from page 201)

3. In five herds a negative producer sample result was not confirmed upon examination of the individual cow samples because in four herds one infected cow was found and in the fifth herd two were located. No explanation is offered for these results.
4. In the remaining 14 herds the negative producer sample results accurately indicated the freedom of the herd from streptococcic mastitis as confirmed by the results of individual cow testing.

LITERATURE CITED

1. Bryan, C. S., Mallmann, W. L., and Turney, G. J. Some Microscopic Technics for Determining the Bacteriological Quality of Milk. Vet. Med. 30(4): 49–156, 1935, and *Mich. Agr. Exp. Sta. Cir. Bul.* 186, 1944.

2. Udall, D. H., and Johnson, S. J. The Diagnosis and Control of Mastitis. *Cornell Agr. Exp. Sta. Bul.* 579, 1933.