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Editorials

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Milk and the Public Health—A New Advance Urged

MILK inspection and supervision were originally inaugurated by the government to protect the public from milk-borne disease. Enabling ordinances are usually written to give the enforcement officer discretionary power in drawing rules and regulations that are helpful to insure the production and distribution of milk that is reasonably safe. "Reasonably safe"—milk that is as safe as the application of safeguards that are effective within the limits of costs of application and conventional standards of quality can make it.

The "cost of application" is determined usually by the official budget agency of the governmental unit under whose direction the inspection program functions. The enforcement officer perforce must trim his methods and the scope of his work to the dimensions of his available funds and the qualifications of his personnel. He does the best he can with the facilities afforded.

"Conventional standards"—there's the rub. What are they? They remind the observer of Joseph's "coat of many colors." Although so many of the milk laws and ordinances set requirements and standards that differ greatly, often are contradictory, yet all agree that the milk must be produced by healthy cattle under clean conditions, carry a low content of bacteria, possess a certain food value, then be effectively pasteurized, and protected from re-contamination. These principles are universal; their detailed applications are variable.

Following such a course, our milk supervisory forces have achieved an enviable record. Milk-borne disease is now almost non-existent where any honest-to-goodness inspection functions. Milk quality, in the physical sense of cleanliness, sets the pace for the lagging food industry at large.

But a new aspect of the relation of milk to the public is beginning to reveal itself. For the past twenty years or so, public health workers have been recognizing increasingly the important influence that an adequate nutrition exerts on the public health.

As Sebrell points out, we are seeing a new field of preventive medicine open before us as the attitude of the health officer changes from one of simply defending his community against infectious diseases, to one of building a strong and healthy population with the highest resistance to disease. Such a program must improve personal efficiency and strengthen the productive capacity (and wealth) of the community. The people must be taught to look to the health department for authoritative information on the prevention of dietary diseases, just as they have been taught to look to it for authoritative information on the prevention of infectious diseases. Adequate and satisfactory nutrition is the foundation on which the public health must rest. All the factors contributing to such a desideratum have passed the experimental stage. The facts await their application on a community scale.

Yet the recent survey by Stiebeling and Phipard of the U. S. Department of Agriculture shows that only about 15 percent of our people are well fed, that 35 percent have diets of only a "fair" quality and that 50 percent subsist on an inadequate diet. It is clear that the population needs to consume more nutritious food. This situation is glaringly accentuated by the reports of the rejects by the military, amounting to about 8 percent on account of nutritional deficiency. Every person in poor health is a potential health hazard to his neighbors. Infections, low earning capacity, menace to safety, and mental backwardness are concomitants of mal-nutrition. The prevention of these conditions is a responsibility of society in its program for self protection.

Milk consumption has a part in this prophylaxis. Milk is generally recognized as the one food which most adequately meets man's nutritive needs. It has the unique property of supplementing the inadequacies of the usual unbalanced diet. Therefore, if the public would consume more milk it would build up its resistance to the ill effects of faulty diets.

There are two factors which curtail the consumption of milk. These are price and flavor.

The question of price is outside the scope of this particular presentation. But off-flavor is a property that milk inspection can improve. These offensive characteristics are often remediable. There is no excuse for an off-flavor from garlic, silage, feed, unclean utensils, dirty barn odors, high bacterial content, "sunburn," cappy flavor, and so on. These faults of mal-odor and off-flavor are deterrents to milk consumption by many persons. It is a factor that helps to keep down the use of adequate amounts of milk in the daily diet.

Now that nutrition statesmen are emphasizing our nutritional needs so clearly, we see our way clear to take an advanced step in milk regulatory practice. It is this: any milk that does not taste or smell like good normal milk should be prohibited by health officers from sale as fluid milk for human consumption.

For a long time, milk inspectors have depended on the dealers to reject milk that is organoleptically unsound. They considered that matters of flavor and dietary appeal did not lie in the field of health. Subconsciously they have been considering this to be important as evidenced by their encouragement of the dealers to do the rejecting of such milk.

No, the milk inspectors were not afraid to reject this milk. They only thought that they had no legal ground for taking such relatively drastic action. Even under present ordinances, the provision that milk must be "normal" would technically debar any milk that was even only temporarily abnormal, although the abnormality was just in flavor.

Well, has the situation changed any? Yes. The leaders in the fields of medicine, nutrition, public health, and social well-being unanimously urge twice the present consumption of milk. We hold that any deterrent to such increased consumption that can be prevented, is a public health problem. What are we paid for unless it is to exercise every reasonable precaution to protect the food supply and render it wholesome and fit to eat? Dirty food does not kill folks—but the public would not employ an inspector who ignored this universal repugnance to dirt in food. Then, off-flavor milk is likewise anti-social.

This doctrine certainly has the support of the "rule of reason." The latter is the basis on which regulatory officers draw rules and regulations for the enforcement of laws and ordinances. It is a recognized prerogative under the police powers of government. In this matter of organoleptic wholesomeness, the regulatory officers have the support of the thinking of the best minds in the field. So we plead for the recognition of this aspect of milk inspection now. The literature is full of support.

The new *Ordinances and Regulations Committee* of the INTERNATIONAL ASSOCIATION OF MILK SANITARIANS is engaged on the great task of appraising what many sanitarians consider to be the essential factors in milk control. Out of this study will presumably come a codification of the basic principles and minimal fundamental requirements for a satisfactory milk control program. These will probably be used as a basis for many new milk ordinances. The time is opportune to take an advanced step in quality control. We urge that this Committee declare boldly that the production and sale of off-flavored milk is counter-current to good public health control. We hope that they will state unequivocally that distasteful milk is not acceptable by the guardian of the health of the community. Any position is unsound where we do not stand four-square that any milk that does not taste and smell like good, clean, normal milk is "abnormal" milk, fit only for pigs. So we should reject such objectionable milk—exclude it.

Milk sanitarians, let's help the dealers in quality control. An increased milk consumption will be our reward. J. H. S.

On Letting Down the Bars

IN the piping times of peace we enthusiastically went about the problems of improving our milk supplies. Communities enacted "these and those" new requirements. Some got the idea that such-and-such a measure would be good—and adopted it was. Many ideas were good. Necessary? How necessary? Was the milk any safer? Did it taste any better? Did the new measure make the milk cost any more? If so, was this measure worth it? We don't know—and often, neither does anyone.

Along comes a great war. The whole country is thrown off-balance, so to speak. We find that the regulatory structure of milk control is a deterrent to the war effort and a potential hazard to the public health (by curtailing availability of adequate supplies of good quality). So, with statesmanlike vision, we begin to lop off those regulatory requirements which seem to constitute non-essential bottlenecks in securing enough good milk.

We believe that there is not a milk sanitarian in the country who promulgated milk rules and regulations for any other reason than to produce what he considered to be better milk—or to be insurance against a fall to a lower level of quality. But when present exigencies of supply arose, every intellectually-honest and socially-minded inspector is made to ask himself the question: If such-and-such a regulation is debarring a milk supply which I honestly and candidly know to be safe, then am I not duty-bound to modify my requirements wherever this can be done without hazard to the public health? That fellow is of statesman calibre.

So now we come to grips with hard reality. This is no time for hair-splitting distinctions between the values of mooted requirements. The very fact that really intelligent milk regulatory men differ on various requirements is *prima facie* evidence that these particular items are not so terribly necessary. The experience of communities that operate under a given code of requirements is rather convincing evidence (to a jury) that that particular level of enforcement procedure is adequate. Anything more is unnecessary.

So the trend toward modification of the present differing structures of milk control does not mean that we are permitting a lowering of quality. This revision of our practices toward recognition of the fundamentals bespeaks a keener appreciation of the needs of the situation than does a stand-pat position that maintains that because such-and-such has been done, anything different is wrong. Let's admit (what we all know) that many of our actions are based on only belief that a given regulation would be good but none of us would defend it as essential.

Then let us be tolerant of honest efforts to meet some of the back-breaking regulatory demands of the present for good, safe milk. To charge that standards are being lowered with attendant exposure of the public to unsafe milk is as unfair as it is untrue. No milk inspector is or wants to be either. Then let us rally around our one objective, and pull together for the common weal: safe, clean, good, wholesome milk, enough for everybody. J. H. S.

Alert!

Doubtless all of us have observed the efforts of "government" to control the food supply in one way or another. A lot of it seems to be experimental. Certainly some of it appears to be the ill-advised or poorly conceived measures of persons who are indifferently acquainted with many of the important factors involved in the chain of causes and effects. No one is more conversant with the many ramifications of the milk industry than milk sanitarians and health officers, particularly in their relation to the health of the community. Therefore, it behooves each such official to be alert as to the effects of new food measures. When necessary, speak out.

Recently the Commissioner of Health of New York City, Dr. Ernest L. Stebbins, wrote to Dr. Charles J. Blanford, Milk Marketing administrator of the New York Metropolitan Marketing Area, declaring himself as being opposed to reductions in the current fluid milk consumption of New York City, as per the recent Food Distribution Order No. 79 of the War Food Administration, dealing with the conservation and distribution of milk and cream. Commissioner Stebbins wrote substantially as follows:

> ". . . From a nutritional standpoint it is hardly necessary to emphasize the extreme importance of an optimum consumption of milk by the public. This is particularly true at the present time when war conditions have created shortages of other foods essential to our daily diet, and when the population lives under great tension.
>
> "In view of this situation I would not be inclined to look favorably upon the establishment of a milk quota for this city which would in any way curtail normal consumption.
>
> "In accordance with your request, I am indicating on the attached sheet the broad classifications of current milk uses in New York city.* I feel that no reduction should be made in the milk supply of institutions, nor in the amount of milk sold at stores, or through retail deliveries for home use. I would also be opposed to the curtailment of the 'Penny Milk Program,' and feel that this milk as well as that required by child caring institutions be not considered a part of the general New York City quota if such quota is established on a dealer basis.
>
> "If it becomes absolutely imperative to reduce the fluid milk consumption in New York City, the only possible curtailment which might be made, without great disturbance, would be for restaurant and soda fountain use. Even here industrial workers who are accustomed to having milk with their lunches would be adversely affected from a nutritional standpoint.

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(Continued on page 334)

Precision Timing of Short Time-High Temperature Pasteurizers*

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When the period of time involved in the holding of heated milk is measured in terms of only a few seconds, precision in the measurement becomes of increasing importance. The time factor in short time-high temperature pasteurization is defined in Massachusetts, for example, as sixteen seconds, which presumably allows for an adequate margin of safety with the thermal exposures employed. Deviations of only a few seconds either way from the prescribed holding time would be unsatisfactory to all parties concerned.

Several methods have been devised to measure with a reasonable degree of accuracy the time required for a given particle of milk to pass through the holding tube of a short time-high temperature pasteurizer. No originality is claimed for any of these precedures, and they are herein described only for the benefit of those who may wish to employ them for the first time.

Briefly, these methods consist of introducing either a salt solution of high conductivity or a highly colored dye near the upstream end of the holding tube, and by means of appropriate measuring devices determining the time required for the injected solution to reach the downstream end of the holding tube.

Colored Dye Solutions

The authors have had only a limited experience with the method involving the use of a highly colored dye solution. This method has the disadvantage of discoloring the holding tube and is also believed to be less sensitive. In one of our plants, however, the installing engineer had previously adjusted a new short time-high temperature unit to a holding time of 16 seconds plus, by use of a dye solution, and when rechecked by other methods practically the same holding time was obtained.

The procedure is as follows:

(1) Disconnect the indicating thermometer at the outlet of the final heater section and just above the point of the inlet to the upstream end of the holding tube. Insert a threaded fitting to which may be attached an alemite gun. The regular alemite fittings should be replaced with threaded pipe fittings and the small pipe connecting the gun and the cap end should be fitted with a stopcock.

(2) Insert a small petcock in a cap end at the downstream end of the holding tube.

(3) Operate the pasteurizing unit with water instead of milk at regular operating temperatures so that the flow diversion valve will remain in the forward flow position.

(4) By means of the alemite gun, inject approximately one-half pint of a 0.5 percent solution of Venetian red or other suitable dye, and immediately start a stop watch.

(5) After about 10 seconds have elapsed, open slightly the petcock at the downstream end of the holding tube so as to allow water to drip rather rapidly into a test tube. While holding the test tube in one hand and the stop watch in the other, observe the tube of water very carefully and stop the watch when the first trace of color appears.

Conductivity Methods

Manually Operated Set. Figure 1 shows the ammeter and resistance box, the electric wire leads, the stop watch, and two types of the electrodes used in timing a short time-high temperature pasteurizer by the conductivity method.

Each of the ammeters in the box is connected with a dry cell through a switch and the two lead wires. The

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* Presented at the Twentieth Annual Conference of the New York State Association of Milk Sanitarians, Albany, September 23, 24, and 25, 1942.

ammeter labeled "input" which is connected with the electrodes in the upstream end of the holding tube registers 25 milliamperes, whereas a more sensitive ammeter (5 milliamperes) is connected with the electrodes in the downstream end because of the greater dilution of the salt solution by the time it reaches the end of the holding tube.

The knob on the dial in the center of the box is connected with a resistance coil to be used only when the conductivity of the water supply used to operate the pasteurizer during the testing period has a sufficiently high conductivity to deflect the needles of the ammeters before the salt solution is injected. Under these conditions the ammeter is less sensitive and the measurements are less accurate.

Two types of electrodes are shown in the illustration (Figure 1). One of these is called the single electrode. A stainless steel or brass rod about six inches long is inserted through a hole bored in the center of a spare cap-end plate. The electrode is properly insulated from the cap-end plate with a plastic sleeve. One of the leads from the ammeter is connected with this electrode and the other lead is grounded on the stainless steel holding tube. Two such cap-end plates equipped with single electrodes as shown in Figure 1 are prepared, one of which is mounted on the upstream and one on the downstream ends of the holding tube. The grounded lead attached to the holding tube may be the same for both the input and output ammeters. The single electrodes are somewhat less sensitive and hence less satisfactory than the double electrode also shown in Figure 1.

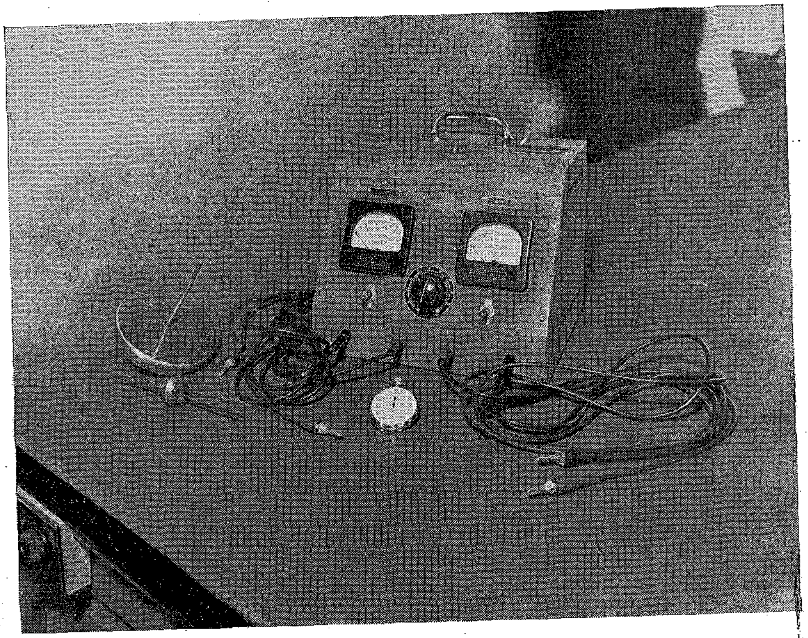

FIGURE 1

The manually controlled ammeter box with resistance coil, lead wires, the single and double types of electrodes used in timing short time-high temperature pasteurizer.

The double electrode is made by inserting two brass or copper wires through a two-hole rubber stopper and mounting the stopper in a beveled metal ring. One set each of these electrodes is inserted in the upstream and downstream ends of the holding tube. Due to the fact that the double electrodes are closer together and the salt ions must travel a shorter distance, this type of electrode has been found more sensitive than the single electrode using the holding tube as a ground.

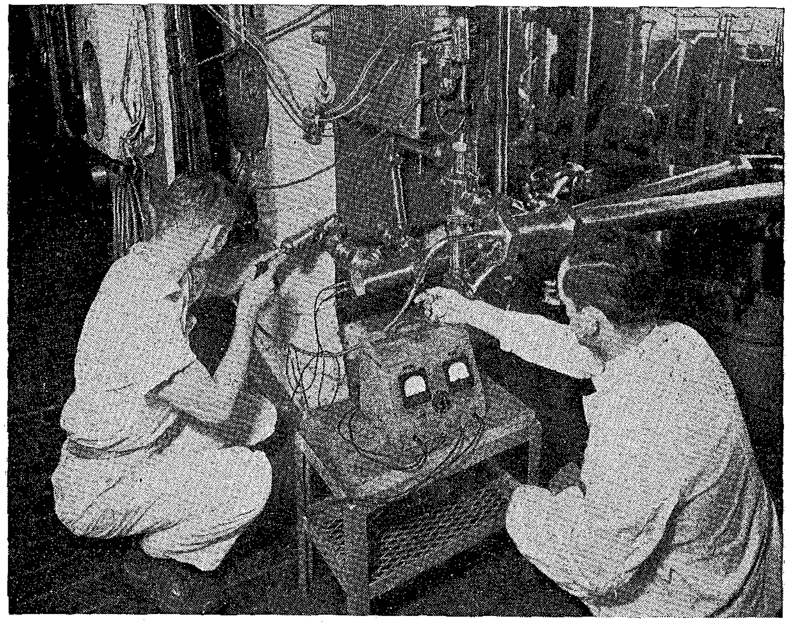

FIGURE 2

The manually-controlled ammeter box, alemite gun filled with salt solution, and the stop watch in actual operation of timing a short time-high temperature pasteurizer.

Figure 2 shows the assembly in place and the timing in process. The man on the left has attached an alemite gun to a special cap end through one-half inch threaded brass pipe fittings. The indicating thermometer between the outlet of the final heater section and the upstream end of the holding tube has been removed and the alemite gun assembly has been inserted at this point.

The brass pipe connecting the alemite gun and the cap end is fitted with a small stopcock to permit the removal of the alemite gun for refilling without the removal of the cap end from the line.

With the electrodes properly mounted and connected to the ammeter box, the alemite gun full of saturated sodium chloride solution and connected to the assembly as shown in Figure 2, the pasteurizer operating with water instead of milk at normal temperatures so as to keep the flow diversion valve in the forward flow position, the measurement is ready to be made. The stopcock in the one-half inch brass pipe connecting the alemite gun and the "milk" line is opened and immediately the salt solution is injected by shoving the piston of the alemite gun forward. The pressure applied to the piston of the alemite gun should be firm but not sufficiently rapid to encourage driving of the salt solution into the tube at a rate faster than the normal speed of flow of the water (or milk) through the tube. The pressure applied should also be uniform with replicate measurements. It is important to note that the salt solution is injected into a tube which is at right angles to the holding tube. This is done to avoid channeling of the salt as might be done if the alemite gun were attached to the inlet cap end of the holding tube and the salt solution forced directly into the channel of the stream.

Almost immediately after the salt solution is injected (Figure 2), the needle on the input ammeter will be suddenly deflected because the ions of salt have greatly increased the conductivity of the water separating the electrodes in the upstream end of the holding tube, thereby completing the circuit of the battery and the ammeter. The stop watch should be started at the first deflection of the needle of the input ammeter. At this time the needle on the output ammeter shows no deflection because the electrodes are separated by pure water which is a poor conductor. The instant the injected salt ions reach these output electrodes, however, the needle shows deflection, and the watch should be stopped. Although a large amount of salt is injected, it is sufficiently diluted in its travel around the holding tube to make the deflection of the needle on the output ammeter less sharply defined than is obtained with the input ammeter. For this reason a more sensitive ammeter is needed for the output assembly and more attention must be given to the sensitivity of the electrodes employed at this point. The electrodes may be rendered more sensitive by making them longer or by placing them closer together. The electrodes should not be so long as to extend beyond the "T" fitting in the end of the holding tube. There is a practical limit, however, beyond which the sensitivity of the output assembly should not be increased, because the normal conductivity of the water may cause deflection of the ammeter and thereby interfere with accurate determinations. Although some difficulty may be encountered in determining just the instant to stop the watch, reasonably uniform replicate determinations can be made with a little experience and perhaps some trial and error readjustments of the electrodes at the output end of the assembly.

Automatic Electric Timer. Figure 3 shows the equipment designed by the Standard Electric Time Company of Springfield, Mass., for timing short time-high temperature pasteurizers.

The automatic timer is plugged into any electric convenience outlet to supply the current for operating the electric clock. The electric clock is connected with a clutch which is engaged or disengaged by one of two relays. The relay which engages the clutch and starts the clock is connected with the electrodes at the input end of the holding tube, whereas the relay which disengages the clutch and stops the clock is connected with the electrodes at the downstream end of the holding tube. Two kinds of electrodes are shown in Figure 3, one pair is mounted in a spare cap end and the other pair is mounted in a rubber stopper and beveled metal ring. Considerable difficulty was encountered at first in adjusting electrodes to the proper sensitivity for satisfactory operation of the relays which indirectly start and stop the clock through a clutch. Attention is called to the fact that electrodes in Figure 3 are insulated for a part of their length to decrease their sensitivity to an optimum point. Once the proper length of the electrode was determined by trial and error, the automatic timer gave highly satisfactory, and certainly more uniform measurements. Due to the fact however that the normal conductivity of water varies in different locali-

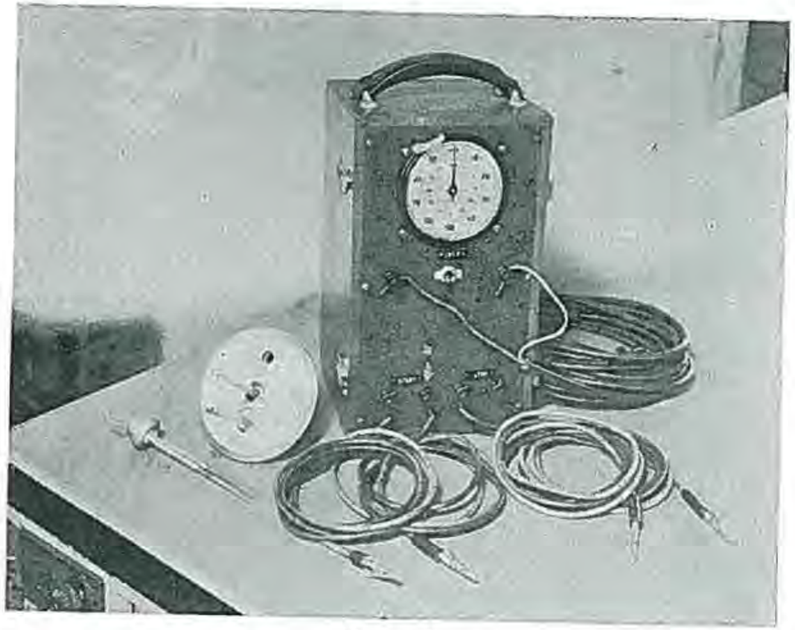

FIGURE 3

The automatic electric timer equipment, and two types of double electrodes used in timing a short time-high temperature pasteurizer.

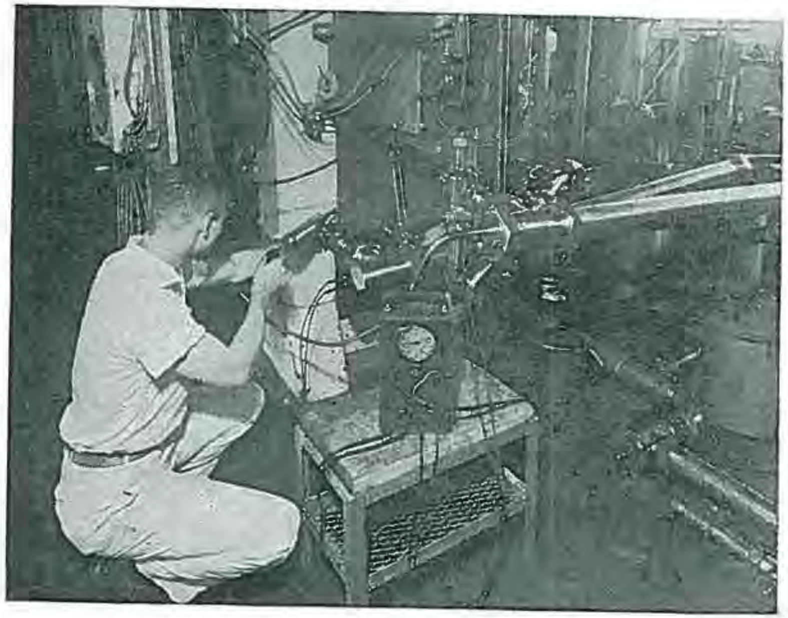

FIGURE 4

The automatic electric timer in actual operation of timing the short time-high temperature pasteurizer ties, it was necessary to employ shorter or longer electrodes (more or less insulation) when the timer was transported to different plants for use. The automatic timer is much more sensitive than the manually operated device shown in Figures 1 and 2 and requires more accurate adjustment of the electrode sensitivity to meet local water conditions.

Figure 4 shows the automatic timer assembly attached to the pasteurizer and ready for use. The timer is plugged into the electric convenience outlet, the electrodes from the input and output end of the holding tube are connected with the labeled binding posts on the timer, the clock hands are returned to zero by the small lever at the top of the clock face, the alemite gun and salt solution are attached as previously described, and the salt is injected with firm and uniform pressure on the alemite gun. When the salt ions make contact with the input electrodes the relay is activated, the clutch is released and the clock instantly starts. When the salt ions have traveled through the holding tube and contact the output electrodes, the relay disengages the clutch and the clock instantly stops.

TABLE 1

A COMPARISON OF THE TIMING OF A SHORT TIME-HIGH TEMPERATURE PASTEURIZER WITH MANUAL TIMER AND AUTOMATIC TIMER

	Manual Timer	*Automatic Timer*
	16.20 seconds	16.15 seconds
	15.20 "	16.35 "
	15.40 "	16.25 "
	16.00 "	16.09 "
	15.40 "	16.19 "
	16.00 "	15.80 "
	16.00 "	16.15 "
	16.20 "	16.40 "
	16.20 "	16.20 "
	16.20 "	16.19 "
Average	15.88 seconds	16.18 seconds
Maximum variation	1.0 second	0.6 second

Table 1 shows the results of replicate time determinations with the manual and the automatic timing devices. Although all of these determinations were made at the same time, they were not made alternately with one timing device and then the other. A study of these data shows that the automatic timer gave values which were slightly higher and more uniform than those obtained with the manual outfit.

Timing the Electropure Pasteurizer. Due to the fact that the Electropure pasteurizing equipment depends on the resistance of milk to impart heat, it is not possible to keep the flow diversion valve in a forward flow position while operating the machine on plain water. In order to time this equipment using salt injection method, it is necessary to remove the control bulb of the flow diversion mechanism and place it in a pail of water at a temperature sufficiently above pasteurizing temperature to keep the flow diversion valve open. When operating under these conditions the timing devices previously described may be used as outlined. Due to the differences in the design of the Electropure equipment, it is of course necessary to construct different attachments for the electrodes.

Another very simple, and apparently satisfactory method of timing an Electropure pasteurizer may be described as follows. With one hand on the power input control dial and a stop watch in the other hand, turn the power control dial quickly to the extreme right so that the indicating

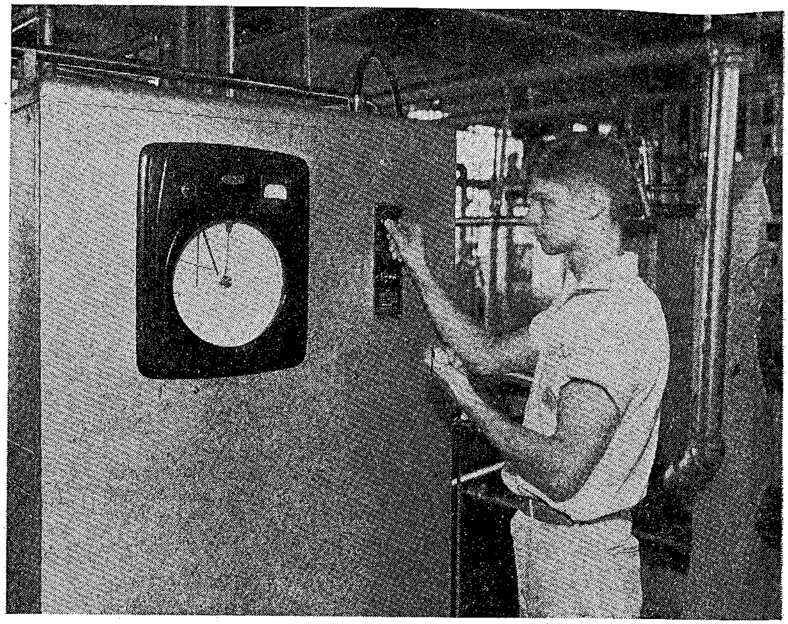

FIGURE 5

Timing the Electropure short time-high temperature pasteurizer.

arrow points to 7, then return the control dial to its normal position (usually to a reading of 3). Watch the voltmeter closely and start the stop watch the instant the needle deflects. This procedure sends a charge of overheated milk through the system, and as soon as it reaches the bulb of the recording thermometer there will be a sudden deflection of the pen arm. Stop the watch at the first indication of deflection of the pen arm. A few comparative tests of this method of timing with the more precise salt injection method indicates that it is somewhat slower due to the lag in response of the thermometer, but is near enough to be of practical utility for occasional measurements. It has the distinct advantage of being able to time the machine while it is in full operation with milk.

General Considerations. There are several points which should be considered in making accurate determinations of the flow rate of a short time-high temperature pasteurizer. Fundamentally, conductivity is affected by temperature, viscosity, the concentration of ions, area of the electrode surface, and the distance the ions have to travel. It is apparent that these factors should be uniform if consistency in measurements is to be expected. There is need for further work to determine the practical significance of these factors. Some of them may be only of theoretical import, whereas others are known to introduce demonstrable differences in measurements of the timing. For example if a machine is originally adjusted to a 16 second holding time with an insensitive ammeter and terminal electrodes (downstream end of the holding tube) that are short and far apart, it will be necessary to await the arrival of a heavy concentration of ions to provide sufficient conductivity to activate the ammeter. If this same machine is again timed with a highly sensitive ammeter and long electrodes placed close together, the relatively few ions which may be carried in the stream channel in advance of the main charge of salt will provide sufficient conductivity to activate the ammeter. Under these conditions a flow time of less than 16 seconds would be obtained and the operator would be required to slow down the pump. The public health official rightfully insists that no particle of milk pass through the machines until it has been held at pasteurizing temperature for the prescribed length of time. It would seem therefore that measurements should be made with a timing device that is as sensitive as the conductivity of the local water supply will permit. There is perhaps a need for developing standard procedures for making measurements of the timing of short time-high temperature pasteurizers by the conductivity method.

Some evidence has been accumulated to show that the timing may be slightly affected by the height of the milk in the balance tank. If the balance tank is full the time of holding may be somewhat less than if the balance tank is nearly empty. Although some of the differences observed were within the limits of error, they were sufficiently consistent to warrant the recommendation that timing be done with the balance tank full.

Rather wide variations in the daily timing of one new installation were traced to the fact that the pipe supports for the holding tube had not been fastened to the floor. As a result the upward pitch of the holding tube was different after each reassembly, depending on where the pipe supports happened to be placed.

It has been suggested that when the diversion valve goes into the diverted position and permits the milk to flow only through a short piece of pipe back to the balance tank instead of having to go through the regenerator plates, there might be an increase in the speed of the milk through the holding tube. If this were the case, the milk which was almost through the holding tube at the instant the valve returned to the forward flow position would not have been held the prescribed time. This suggests the need of timing the equipment also with the flow diversion valve in the diverted position. Several attempts to demonstrate this point by parallel determinations of a machine with the flow diversion valve in the forward flow and diverted positions have failed to show any consistent differences or trends.

The state law of Massachusetts requires that suitable equipment be provided in each plant for the timing once each week of each short time-high temperature apparatus. The plant operators must therefore be familiar with the methods of timing the equipment. In addition each machine is timed at regular intervals by the laboratory inspector of the plant, using the automatic electric timer previously described in this paper. Aside from the fact that the weekly timing makes the operator more "time conscious," relatively little value has been realized from the effort because of the continued constancy of the results after the timing has once been standardized. Except for occasional replacement of belts on the pumps or the exchanging of pumps it has not been found necessary to readjust the timing of the machines.

After the timing of the machine has been established and the pumps sealed, the exact time required for the machine to fill one ten-gallon can is determined by means of a stop watch. If platform scales are conveniently available, some operators prefer to allow milk (or water) to run into the can for a fixed number of seconds and use the weight of milk delivered as a variable. As a daily routine the operator is required by company rule to make this determination as a protection against any radical change in the efficiency of the pump. Accumulating experience is leading to the conclusion that this is a

more practical way of assuring the operator of satisfactory performance of the pump than he obtains from weekly measurements by the more time-consuming conductivity method.

Summary

In this paper an effort has been made to emphasize the need for precise methods of timing of short time-high temperature pasteurizers. The following methods of timing are described and some of them illustrated by pictures: (1) The use of highly colored dye solutions, (2) the conductivity method using the manually controlled ammeter device, (3) the use of the automatic electric timer, (4) a method applicable to the Electropure machine, and (5) the determination of the volume of flow delivered by the pump in a fixed time. Several precautions are listed which should be observed to insure uniform results in timing and the need for the development of a standard procedure is suggested.

Discussion by Mr. Powers

The operators in several of the New York City plants have checked from day to day, timing the filling of ten-gallon cans which is reasonably reliable. However, this method cannot be relied on for setting the speed of the pump. We like the conductivity method, whether done manually or automatically. I think the automatic method of determining holding time is desirable because it minimizes the human factor.

I recall a session in Utica some years ago in which the company with some health department men were trying to determine the length of holding time by the dye method of a unit just installed. That session started about seven o'clock at night and about one o'clock in the morning we had not approached a complete agreement on the holding time of this machine. We became disgusted with the dye method. In trying to improve it we used an alkaline solution, then we used some chlorine. Finally some people got to thinking on their way home and decided to use the conductivity method which worked better, and eventually that came through. I think it is more reliable by far than the dye method.

There is one other way of checking the output of a machine after the speed has been established. We have found it helpful to hook up the output pipe to a weigh tank if it is available. We have a 5,000 pound weigh tank for weighing raw milk and we have been in the habit of running into that weigh tank from the discharge of the unit, water to the extent of about 4,500 pounds, and then checking by stop watch the total time to discharge this quantity. From this we can figure the quantity discharged per unit of time which is a close approximation of the rated capacity. That has been helpful and it also can be done with milk.

There has been some criticism of the fact that we check all these machines with water and perhaps milk does not flow at the same rate, being a different substance. With this arrangement you can check the actual delivery of milk and by comparison with water calculate the actual holding time with milk.

Dr. Fay—Someone asked me a question a while ago which I will answer now. It is a little bit off the subject of timing equipment. It is how we control the starting and stopping of the machine with water. In starting up the machine and rinsing it out the first thing in the morning, the machine is started with water and then milk is turned in right behind that water. Similarly when we stop the machine, the last milk is driven through the machine with water. What control do we have over it? We determine the capacity of the machine so that we know how much milk or water it holds, then, for example, when we start the machine in the morning after it has been operated with water, the water is drawn down to the very last point in the balance tank and the operator has a valve at that point so that he can shut the water off and introduce milk instantly. We take samples when the machine is first installed of the delivery of that machine where pure water is coming through followed by milk. We then take samples at intervals of a few seconds, and run a copper serum index on them to determine the point at which the water is not evident. The values given in the A.O.A.C. methods for the copper serum index is 36, however, I do not think that is a reliable figure to use as a base line. The essential thing is to have the copper serum index of the milk you are then using and then take samples of the milk and water mixtures as they come through until the index reaches the predetermined value. If the index is 38 instead of 36, you have not gotten rid of all the water until it reaches 38 and you should not stop when you reach a value of 36.

We find for example, the machine should be allowed to run 50 seconds or 60 seconds to free it of water, then we run it some little time beyond that to be reasonably sure that there is no water getting into the milk and that there is no more in the lines. This is checked once a week. In fact we check it every day for the first two weeks that the machine is in operation so that the operator is thoroughly familiar with what is happening in his machine, and subsequent to that it is checked once a week by the copper serum index tests. The first milk through the machine in the morning and also the last milk that is bottled every day is checked.

RESEARCH INDICATES NEW OUTLETS FOR LACTIC ACID

New industrial uses for lactic acid are indicated by recent research of the U. S. Department of Agriculture.

The development consists in improved methods, worked out by the Agricultural Research Administration at the USDA Eastern Regional Research Laboratory near Philadelphia, for converting lactic acid to methyl acrylate. Methyl acrylate has been known to industry for some time, and commercial concerns have been experimenting with it on a large scale for the production of plastics and synthetic rubber. In the past methyl acrylate has been made synthetically from organic compounds. Its production from lactic acid would mean an additional outlet for farm products since lactic acid is produced by fermenting such agricultural carbohydrate materials as molasses, starch, and the whey of milk.

Lee T. Smith and his associates of the Bureau of Agricultural and Industrial Chemistry, who are conducting the investigations in the Philadelphia Laboratory, have found that the acrylic esters obtained in this process can be polymerized in mass, water emulsions, or in organic solvents. Because these polymers possess a wide diversity of properties, they may find outlets in the production of adhesives, adhesive tapes, and impregnating and coating materials. The coating materials can be applied to paper, textiles, leather, wood, plaster, and other products.

A number of commercial manufacturers are now experimenting, on a pilot-plant scale, with the lactic-acid method of producing methyl acrylate.

An Epic Investigation of Streptococcal Fever[*]

C. S. LEETE

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MEMBERS of this department, representing the District Health Office, Division of Communicable Diseases, Division of Laboratories and Research and Division of Milk Sanitation, inaugurated and carried to a successful conclusion an outstanding investigation of a milk-borne outbreak of streptococcal fever. As this discussion is mainly concerned with the investigation of the milk supply and its source rather than the epidemiological and diagnostic aspects, particular reference is made to the exceptional work carried on by Doctors Conlon, Graves, Presler, Nichols, and Schacht and Messrs. Beckler, Colvin, and Mellon. Acknowledgment is also made of the cooperation extended by the management of the plant involved and of the owner of the herd which ultimately was found to be the source of the trouble.

A well-thought-out plan for the investigation of a suspected milk-borne outbreak, when put into operation through the coordination and cooperative efforts of epidemiologists, milk sanitarians, veterinarians, and laboratory personnel can bring about results which, to say the least, are startling. This was demonstrated recently, when one cow out of a possible six thousand was found to be the source of a milk-borne outbreak of streptococcal fever.

This discussion will describe how this was accomplished. On April 16, a district milk sanitarian, during his routine work, found that there was an undue number of cases of scarlet fever and septic sore throat in a small community in his district. This was reported to the district health officer who on the same day made an investigation and reported her findings to the central office. On April 19, material and personnel for carrying out a field investigation were assembled. On April 20, this personnel proceeded to the scene, and actual field operations began on April 21. Pasteurization of all milk which might be involved was ordered on April 22. On April 23 the first suspicious cows were found and segregated. Their milk from then on was discarded and not used for human consumption until subsequently released. A positive finding of hemolytic streptococci Lancefield Group A in one quarter of one of these suspicious cows was reported on April 29. On that day this cow was condemned.

Briefly, the data collected by the epidemiologists which pointed to milk as being responsible for the outbreak were as follows:

1. Of the twenty-three cases reported at the beginning of the outbreak, twenty-two had consumed raw milk from a common source and one had eaten a milk product made from this milk.
2. All of the cases (with the exceptions to be noted) were employees of a dairy products manufacturing plant or members of their families.
3. Employees drank milk while at the plant and used milk from the plant for their family supply.
4. The three cases who were not actual employees were carpenters working on a repair job at the plant. Two of these drank milk and the other ate green cheddar cheese curds made from this milk.
5. No other cases were discovered in this community at the time of this preliminary investigation. Later investigation showed more cases but they too, were related to the same milk supply.

These data implicated the raw milk handled at a certain dairy manufacturing plant as the source of the streptococcal fever.

Immediate investigation at the plant

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[*] Presented at the Twentieth Annual Conference of the New York State Association of Milk Sanitarians, Albany, September 23, 24, and 25, 1942.

revealed that this plant manufactured cheddar cheese from raw milk, skim-milk powder and raw cream, the latter product being sent to New York for pasteurization. Approximately 123,000 pounds of milk were handled daily. Of this, 48,000 pounds were delivered directly to the plant by 113 producers. The main plant operated a receiving station located about forty miles distant, at which 218 producers delivered daily 75,000 pounds of milk. This milk was weighed and cooled and then sent by tank trucks to the main plant. On receipt at the main plant it was used for manufacturing. The milk from the receiving station and that delivered directly to the main plant were not handled separately, but used indiscriminately as the manufacturing needs demanded. The entire supply under suspicion therefore consisted of 123,000 pounds of milk produced by 331 herds consisting of 6,069 cows. The milk was delivered in 2,029 cans. This figure is interesting as future discussion will show.

Past experiences have indicated that in milk-borne outbreaks similar to this, one quarter of one cow has been responsible for the outbreak. In this outbreak, therefore, we were confronted with the question "Was it worthwhile to try to find one particular quarter of an udder out of a possible 24,000 quarters, or in other words, one cow out of a possible 6,000?" The job at first glance appeared to be as difficult and time-consuming as finding a needle in a haystack—perhaps even harder as speed was required, for oftentimes infections temporarily clear up, or at least the organisms are not being shed into the milk at times, whereas the needle in the stack stays put.

There were two determining factors which led to the decision to go ahead:

1. Several years ago we were faced with a somewhat similar situation, and although that job was large it was not equal to the present one in size. We did find one cow which was the cause of the outbreak, out of a possible 200 herds. We learned something about the mechanics required in carrying out a large scale investigation. So in the present outbreak we should not be starting from scratch, but had a precedent to follow.

2. The possible ultimate destination of the cheese manufactured at this plant was a deciding factor. The plant, in the past, had manufactured and sold raw cheese to a wholesaler, who through Lend-Lease had probably disposed of it through channels which led to England and other United Nations. When it is remembered that organisms causing a streptococcal fever can survive in cheddar cheese which has been aged under certain conditions for at least 160 days and that much cheese is now consumed rather green, it was evident that there could be but one decision—"to look for the needle in the haystack."

With the above facts in mind, three steps were taken immediately.

1. All milk received at the plant was ordered to be pasteurized.

2. A field investigation was started, the aim being to find the guilty cow.

3. An embargo was placed on all available cheese in storage which had been made during the outbreak from raw milk and for thirty days prior thereto. Such cheese is still under embargo and will remain so until it is demonstrated that it is safe for human consumption. At the present writing a request has been received to release this cheese so that it may be made into process cheese. Due to the length of time the cheese has been in storage and the fact that it will be heated to 170° F. during manufacture into process cheese the embargo will be lifted.

Obviously with the personnel available, it would have been impractical to examine over 6,000 cows in a limited time. Other means were necessary. Three tests were instituted which acted as screens, sorting the suspicious cows from the normal ones. The first test reduced the number of possible animals which might be responsible from 6,069 to 1,931, the second test reduced the number to approximately 150, and the final test identified the one animal responsible for the outbreak.

It is known that milk from a quarter which is infected with the organism causing streptococcal fever is abnormal. The first sorting test, therefore, was used to determine which herds were producing abnormal milk. The direct microscopic examination of the milk was relied on to give this information.

Plans were therefore made to sample each of the 2,029 cans of milk received at both the main plant and its feeder station. The same procedure was used at both places in sampling and examining the samples. A field crew of four men worked at each plant. Each crew consisted of two milk sanitarians and two veterinarians. On the morning of April 21 the field work began. As the milk was delivered at the platform in the farmers' cans, a sample of each can was procured with a loop rather than a Breed pipette. A loop has proved faster than the pipette, and for our work quantitative accuracy was not needed. Smears were immediately made on slides. After all cans had been sampled, the smears were stained and immediately read.

On the platform one man acted as clerk, recording the patron's number and number of cans received; another sampled and turned the loop over to a third man who made the smears. The fourth man double checked the patron's number, number of cans, and slide identification. By this method the time taken to receive the milk at the main plant was extended only twenty minutes over the normal receiving time. Due to a less convenient receiving platform at the receiving station, the delay caused by sampling each can there was a little over an hour.

The slides were stained in the early afternoon with Newman's No. 2 Stain. By four o'clock of the same day veterinarians were in the field making physical examinations of suspicious herds. Any sample which showed long chain streptococci with or without phagocytosis or a cell count of approximately 500,000 or more was considered abnormal, and the entire herd from which the sample was procured was classed as suspicious. If a patron sent in ten cans of milk, ten samples were obtained, smeared and stained. However, if the first sample examined was classed as suspicious the remaining nine samples were not examined. It was not necessary to examine the remaining nine as the first sample classed as suspicious, automatically called for the application of the second sorting test. At the main plant very valuable assistance was given by three New York City inspectors in the examination of smears. At this plant, all the smears had been examined by evening of the day following collection. At the other plant, with less personnel, all direct microscopic examinations had been made by April 24, that is, within three days after the samples were taken. The veterinarians, however, were in the field as soon as any of the herds were classed as suspicious. The direct microscopic examination therefore comprised the first sorting test. Out of the original 313 herds, seventy-three were classed as suspicious. This first sorting test eliminated 260 herds comprising 4,138 cows from further consideration. At this point the milk sanitarians' part of the work was completed.

The veterinarians then examined 1,931 animals in the seventy-three suspicious herds. On arrival at the farm, a careful physical examination was given each animal. History of past injury to the udder or teat and history of past flare-ups of clinical or active mastitis was secured for each cow. If an udder was found which showed evidence of mastitis, past or present, a brom-thymol-blue test was made of milk from each quarter. If the evidence so far secured still indicated that an animal might be the guilty one, samples from abnormal quarters were sent to the Division of Laboratories and Research. Here it was determined whether these samples showed the presence of hemolytic streptococci, Lancefield Group A. To this group belong the organisms causing a streptococcal fever. This laboratory examination was the third and final sorting test.

The second sorting test, that made by the veterinarians, resulted in reducing the number of suspicious herds to fifty-five from seventy-three. From these fifty-five herds, 150 samples were sent to the laboratory. Of these a sample from one quarter of one cow was found to contain hemolytic streptococci, Lancefield Group A. Even though the Division of Laboratories and Research identified the guilty cow long before all the suspicious herds had been examined, the veterinarians continued to make examinations of the herds for there was the possibility that more than one cow was involved.

The first examination of the cow which proved to be guilty was made on April 23, and showed (1) pus on the strip cup, (2) medium green bromthymol-blue reaction in the right rear quarter, (3) history of udder injury about a month before the outbreak, and (4) use of a teat dilator just before the outbreak.

A subsequent investigation by our medical staff supplemented by laboratory analysis of throat cultures from members of the owner's family and milk handlers revealed a positive culture of hemolytic streptococci, Lancefield Group A. A person having such throat had worked with the cows and treated the injured udder mentioned above. Typing of cultures obtained from the throats of persons who were ill and of a culture from the milk of the cow proved to be the same strain as that found in the milk handler's throat. These data indicate that the chain of infection was from the milk handler, to the cow, into the milk and thence through the milk to the cases.

By applying the sorting test method of investigation to 331 herds, comprising 6,069 cows, a cow was found whose milk contained streptococci of the group which is usually associated with human infections. The guilty cow was positively identified just seven days after the field investigation began, although she had been classed as suspicious and segregated within forty-eight hours.

The cow was slaughtered on May 8, 1942, in the presence of official witnesses. The decision to try to find "the needle in the haystack" was worthwhile.

ALERT!

(Continued from page 320)

"Rather than reduce the amount of milk consumed even in restaurants, it would seem preferable to first prohibit the use of milk for luxuries, such as whipped cream, table cream, candies requiring the use of milk products, and to further reduce milk solids going into frozen desserts manufacturing.

Very truly yours,
(Signed) Ernest L. Stebbins, M.D.,
Commissioner."

CLASSIFICATION OF TYPES OF MILK DELIVERY SERVICES IN ORDER OF RELATIVE IMPORTANCE:

	Estimated Quarts Daily
1. To institutions	75,000
2. To schools (penny milk and free lunches)	150,000
3. To retail stores and direct to houses	2,545,000
4. To restaurants and soda fountains	430,000
Total	3,200,000

We heard rumors (in the trade) that if appreciable quantities of milk from approved farms on the city's milkshed are diverted to manufactured products, these farms and/or plants jeopardize their permits to sell later in the New York milk market. This may or may not be true, but the public can take drastic measures when aroused. Milk control men, you are the public's milk supply sentinels.

J. H. S.

Gramicidin and Tyrothricin Therapy in Chronic Streptococci Mastitis*

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It is recognized by workers engaged in the study of bovine mastitis that the chronic form of the disease caused by *Streptococcus agalactiae* is responsible for a marked reduction in milk yield and butter fat production, when compared with the yields of herds free of the infection. Moreover, the milk from affected quarters is usually of an inferior quality. The loss in milk yield and the corresponding reduction in butterfat may be around 22 and 24 percent, respectively. These figures are more striking when computed on a cow basis per lactation period, for it has been estimated that the reduction in milk yield alone may vary from approximately 400 to 900 pounds per animal.

The dairyman is thus faced with a considerable loss in revenue not only because of this marked reduction in yield but also because of the fact that a number of cows with udder disease have to be eliminated from the herd each year. In the United States alone, at least 15 percent of the annual replacements are necessary because of mastitis.

In 1941 as a part of the National Defense Program, our government requested dairymen to increase their yearly production of milk over 1940 quotas. Due to the scarcity of labor, to the high cost of dairy feels and cow replacements, as well as to the difficulty of procuring dairy equipment, many dairymen were faced with a difficult problem in meeting this obligation.

In peacetime or during a national emergency to increase production most economically, it is necessary to eliminate from the herd the low-producing or unprofitable cows, replacing them with disease-free animals. The mastitic cases can in many instances be successfully treated and returned to the milking line.

Chemotherapy

In the United States during the past three years, much progress has been made in the chemotherapeutic treatment of the chronic form of bovine mastitis caused by *Str. agalactiae*. Pioneer research studies carried out with udder therapy in the treatment of this disease, particularly in foreign countries, had demonstrated that many affected cases could be successfully cured by the infusion of the udder with aqueous solutions of the acridine derivatives. More recently in this country udder therapy has been simplified. Equally good or better results have been obtained by injecting directly into the udder cistern small amounts of a number of different bactericidal agents, either in mineral oil or in aqueous solution, without infusing the entire quarter. This procedure therefore offers certain advantages over the infusion method, since smaller volumes of a more concentrated solution, withdrawn directly from a bottle with a syringe, can be immediately injected, thus greatly reducing the time spent in treating a case when more than one quarter is involved. In addition, less equipment is required and the sterilization of the instruments is simplified,

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facilitating the treatment of a greater number of cases at one time.

Of the bactericidal agents now being used for udder therapy, one in particular should interest the dairyman, for it is obtained indirectly from the soil he tills. In 1939, Dubos[1] reported that gramicidin, an alcohol-soluble, water-insoluble substance, had been extracted from cultures of a soil bacillus, *Bacillus brevis*. Organisms of the group to which this bacillus belongs are commonly distributed in nature. Certain kinds of fermented cheese are rich in *Bacillus brevis*. The crude material extracted from the bacillus is called tyrothricin, and from this two different crystalline products have been separated, tyrocidin and gramicidin. The former *in vitro* is bactericidal against Gram-positive and Gram-negative bacteria, while gramicidin is effective only against Gram-positive microorganisms.

For udder therapy, gramicidin or tyrothricin[2-6] in powdered form is dissolved in 95 percent alcohol so that each cubic centimeter of the stock solution contains 20 to 40 milligrams of the material. Appropriate amounts of the alcoholic stock solution, depending on the mode of administration, the extent of the infection, and the size of the udder, are either mixed with 1,000 ml. of sterile doubly-distilled water and infused into a quarter, or added to a mixture of 15 ml. of sterile distilled water and 25 to 50 ml. of sterile heavy mineral oil (Squibb), and injected directly into the cistern. As much as 240 milligrams of gramicidin or tyrothricin have been infused into a single quarter and as much as 160 milligrams in mineral oil have been injected. The recommended dosages are, however, from 20 to 80 milligrams. After the solution of gramicidin or tyrothricin in water and oil has been partially mixed, a more suitable suspension for the injection is obtained by repeatedly drawing the mixture back and forth into a 50 ml. syringe until it becomes milky in appearance and less viscid.

In the treatment of streptococcic mastitis, gramicidin and tyrothricin have been rather extensively used by workers in the United States, and a preliminary report has appeared from studies conducted in England.[7] The results obtained by different workers using these bactericidal agents in the treatment of streptococcic mastitis are summarized in Table 1. On the whole, gramicidin or tyrothricin therapy in bovine mastitis has been most satisfactory, not only in the treatment of the lactating udder but in the dry udder as well. Some authors have reported an efficacy of over 90 percent in the sterilization of infected quarters.

The reports summarized in Table 1, from authors actively engaged in the experimental study of bovine mastitis, offer much hope to the dairyman in his struggle to increase milk production by reducing losses due to infections of the udder. However, the dairyman must not be led to believe that he can in most instances reproduce the high percentage of cures obtained by the experimentalist. For it must be remembered that these experimental cases were properly identified and in some instances carefully selected by workers experienced in the bacteriologic aspects of the disease and the medication was carried out under the most favorable conditions.

TABLE 1

TREATMENT WITH GRAMICIDIN AND TYROTHRICIN

Author	*No. of quarters treated*	*Percent cured*
Little *et al.*[4,6]	60	73.3
Greenberg and Bryan[8]	20	95.0
Schalm[9]	89	82.0
Allcroft *[7]	25	84.0
Tripp and Lawrence[10]	20	80.0
Bryan *et al.*[11]	(157 cows)	90.0
Martin[12]	130	90.0
Bean *et al.*[13]	35	51.4
Dry udders	47	92.1

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* Reviewing work of Edwards.

In the average herd, however, the percentage of cures to be anticipated with most bactericidal agents may be 50 percent or less, provided a successful treatment is determined not only on the sterilization of the quarter but on the quality of milk secreted. On the other hand, in herds in which a mastitis control program has been in operation, where the acute and chronic cases of the disease have been segregated from the normal members of the herd and gradually eliminated, the percentage of cures may be much higher, for many early and mild infections will be treated.

It seems likely the efficacy of either gramicidin or tyrothricin in lactating udders, with the dose properly adjusted, is higher than that of some of the other agents now being used. In other words, the reaction of the udder may be so mild and the milk production so little affected that the cow may be out of production not more than a few days.

As additional workers took up the chemotherapeutic study of the gramicidin and tyrothricin treatment for bovine mastitis, some disagreement arose in regard to their irritating effect on the sensitive udder tissue, their effectiveness in lactating versus dry udders, and the selection of a suitable vehicle for their administration. Most workers agree, however, that either gramicidin or tyrothricin is more effective in the sterilization of the lactating udder than Entozen, acriflavine, trypaflavin, or Novoxil. On the other hand Bean *et al.*[13] recently reported a higher percentage of cures in the dry udder with tyrothricin than with these other agents, and the lowest efficacy in lactating udders. Of all the agents which he used, tyrothricin was the least irritating. This was contrary to the findings of Schalm[9] who recognized the higher efficiency of tyrothricin in the lactating udder as compared to Entozon, etc., but he found it to be the most irritating unless the dose was carefully adjusted.

A preliminary report in 1941 by Edwards of England (*see* Allcroft[7]), showed that his results with the gramicidin-oil mixture confirmed those of American workers. He found that generally the treatments were equally successful in cows in full milk as in those at drying.

In our original studies we compared the irritating effects of both gramicidin and tyrothricin in aqueous solutions and in mixtures with mineral, almond, olive, and peanut oils. The comparison was based chiefly on the clinical response of the treated quarter, the cell count, the chloride content, and the microscopic appearance of the foremilk. It was concluded that less irritation occurred with a mineral oil preparation. This finding is contrary to the results of Greenberg and Bryan,[8] who reported that the mineral oil combination was more irritating than the aqueous solution, and to those of Tripp and Lawrence,[10] who found olive oil to be the least irritating.

One fact which should not be overlooked is that when mineral oil is injected into an affected quarter in the absence of gramicidin or tyrothricin, the oil in many cases temporarily inhibits the development of the streptococci. In some instances the streptococci could not be detected in the fore milk or strippings for nine days thereafter. It seems reasonable to assume, then, that with the oil combination in udder therapy, the addition of the bland mineral oil is beneficial in curtailing the multiplication of the streptococci during the period in which the bactericidal agent is active. Similar results were not so striking with the other oils tested.

PROGRAM OF CONTROL

Although many of these suggestions or recommendations have been made before by other authors and by me, they bear repeating:

1. It has been clearly demonstrated that the chronic form of streptococcic mastitis can be eradicated from a herd by the complete removal or segregation of all the infected animals, identified by cultural tests applied to the milk of separate quarters of individual cows. In such herds the replacements were from home-grown heifers or outside cows which were not harboring *Str. agalactiae* in their udders.

2. Staphylococcal infections or infections caused by other microorganisms or by streptococci other than *Str. agalactiae* are of particular clinical significance in certain herds. On the whole, however, only occasionally do such infections produce the marked characteristic changes in the udder and secretion that are encountered in the typical chronic form of streptococcic mastitis. Usually the milk from a herd, once freed of this infection, is of a better quality—regardless of the other existing infections.

3. Before treatment is begun in any herd, the kind of organism responsible for the infection should be determined by the cultural examination of the milk. A bacteriological examination of the foremilk (first two or three ml.) plated in horse or ox blood agar[14] is the most desirable test for the detection of infection. For practical field purposes, however, when the cost of these examinations and lack of laboratory facilities are items to be considered, the Hotis test[15, 16] or the Modified Hotis test[17] are more informative than the examination of stained milk films from incubated samples, especially so when the negative Hotis samples and the suspicious reactions are filmed. The development of certain characteristic changes in the Hotis test, such as yellow balls or flakes along the side of the tube, a yellow deposit underneath the cream line or yellow precipitates in the bottom, is indicative of *Str. agalactiae*. (*See* Appendix for Modified Hotis Test.) An additional advantage is that the pH reaction of the milk can be determined from these samples.

4. A positive brom thymol blue reaction of the milk from an affected quarter does not necessarily signify that the alteration in the character of the secretion is due to the presence of *Str. agalactiae* or any other microorganism. In many instances certain microorganisms, especially coliform bacteria and other types of streptococci responsible for mastitis may disappear from the udder early in the course of the infection. The increase in the pH of the milk from a quarter at the time of treatment may simply indicate a physiological reaction resulting from an increased permeability of the secretory tissue. Frequently in advanced lactation and at parturition an increase in the alkalinity of the milk is not associated with infection. In the absence of a cultural examination of milk from quarters showing an increase of pH of the milk, whether previously infected or not, treatment is contraindicated, for the resulting irritation caused by the introduction of a bactericidal agent may terminate in complete destruction of the quarter.

5. The main objective in the application of a workable diagnostic field test is to make it as searching and complete as possible in the detection of infection. The most practical routine procedure to follow with the simplified tests in making a preliminary cultural examination of the milk from a herd is to collect quarter samples of fore milk from all clinical cases of mastitis, similar samples from cows with a previous history of some udder derangement, and composite samples from the supposedly negative animals. Another cultural examination of the milk should be conducted within a week or so. This examination should include a recheck on the positive cows, composite samples from the negative members of the herd, and quarter samples from any cows in the supposedly negative group in which streptococci were observed on the previous test. Thus composite samples reduce the cost and labor when a large number are collected, and especially so when films are prepared from each negative or suspicious reaction for a microscopic study.

6. Chemotherapy of the udder with any bactericidal agent is a surgical procedure and it should be conducted by a veterinarian. He is aware of the limits of usefulness of the various bactericidal agents and the dangerous features which may follow their administration. In addition, he can determine the animals suitable for treatment and what form of medication is preferable, since the dosage for each individual case should be judged according to the size of the udder and the extent of the infection.

7. Udder therapy should be attempted only in herds where a strict mastitis control program is in force. Such a program would be confined to herds under the supervision of a veterinarian where the infected animals are identified by some simple cultural test and the extent of the disease is ascertained by the physical examination of the udder.

From the results of these tests the practitioner can then determine the number of cases in which the infection has permanently damaged the secretory tissue. If the udder is fibrotic and the secretion scanty or of a poor quality, he may be able to predict within a reasonable degree of accuracy whether or not these conditions will be improved following the elimination of the streptococci. In these herds, the suspicious and infected animals will be strictly segregated

so that the negative cows can be kept by themselves and milked first. In addition the udders will be properly washed and dried before milking, while an examination of the udder and fore milk will be carried out before the cows are milked. When this program is in operation to control mastitic infections, the appearance of flakes or slugs in the fore milk and any abnormal swelling of the udder will be recorded for future reference in order to detect the mild or early cases of the disease. Moreover, the milking apparatus and utensils will be properly sterilized, and in hand-milked herds the hands of the milkers will be washed and dried between cows. All of these suggestions are of little consequence unless the herd replacements are free from infection. First-calf heifers or outside cows which, as shown by repeated examinations of the fore milk from separate quarters, are not harboring *Str. agalactiae* in their udders should be selected and should head the milking line in the mastitis-free group.

8. Once the affected animals in a herd are identified and classified by the veterinarian according to their infections, all infected quarters should be treated on one visit regardless of the stage of lactation. If cows in full milk yield do not respond to a single treatment or possibly a second one, further medication should be discontinued until the cow is dry, for repeated treatments at this time may excite the irritation already existing in the quarter. The main objective is to reduce the incidence of infection in a herd as quickly as possible and cut down the cost of the treatments.

9. Successfully treated animals should be kept in a separate group before being put with the normal animals until it is definitely established that they are free from infection. These cows are susceptible to reinfection, so they should be carefully observed.

10. Of the agents which have been thoroughly studied in udder therapy, either gramacidin or tyrothricin apparently may be preferable for the treatment of lactating udders, since usually fewer injections are required and the reaction may be so mild that the cow is out of production for only a short interval.

11. In a successful treatment the disease-producing streptococci in the udder are completely destroyed. This can be determined only by a searching bacteriological and laboratory examination of the milk. Besides the elimination of the causative organisms responsible for the infection, the milk should be of a good quality so that the cow will pass the inspections required by public health officials engaged in milk sanitation. These examinations might eliminate a certain number of successfully treated cows if the quarters were fibrotic and the secretion appreciably decreased and watery or off color in appearance.

12. Possibly in the future many new so-called sure-shot remedies will be developed for udder therapy, especially if the dairymen attempt to treat their own cases. Undoubtedly, certain preparations will be publicized as being more effective in freeing the udder of its infection than some of the bactericidal agents which are being carefully studied in many research institutions. The choice of medication to be used for udder therapy should not, however, be the concern of dairy sanitarians and dairymen; let the practitioner be the one to select the bactericidal agent most suitable for the individual case to be treated. From the literature available in veterinary journals, he is in a position to decide on the effectiveness of the various preparations at his disposal.

In the complete eradication or in the control of the disease, however, dairy sanitarians are in a position to render a worthwhile service to the dairyman by urging him to adopt the proper control and sanitary measures so essential in the identification, isolation, and care of the normal and infected members of the herd before udder medication is begun.

When such control measures are carefully carried out in a herd and the dairyman realizes that none of the bactericidal agents now available for udder medication can be considered as a cure-all but simply an adjunct to be used in the economical eradication of the disease, the usefulness of many infected dairy cows will be prolonged for a number of lactations if properly identified and treated.

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APPENDIX

The Modified Hotis Test[17]

"An equal amount of sodium azide (1 : 500) and brom cresol purple (0.5 percent aqueous solution) was added to samples of milk, 0.5 ml. to 9.5 ml. of milk from single quarters, and 1 ml. to 19 ml. of composite samples. The pH of the milk was recorded and the tubes were incubated and the samples studied as recommended for the original Hotis test, the reactions being recorded at 24 and 48 hour intervals. The effectiveness of the Hotis test was greatly improved by the addition of sodium azide, since the samples could be incubated much longer and many misleading reactions were eliminated. On the other hand, except for the typical chronic infections the characteristic growth of *Str. agalactiae* in tubes containing sodium azide and brom cresol purple usually was not quite as informative as when brom cresol purple was used alone, since in mild infections the yellow deposits may appear only underneath the cream line or in the bottom of the tube."

When samples are not transported too great a distance from the laboratory and when collected in clean stables, the amount of sodium azide can be reduced in order to accentuate the characteristic development of *Str. agalactiae*. A combination consisting of one part of sodium azide to three parts of brom cresol purple can be substituted. After 48 hours' incubation, films are prepared from all samples or only those showing a negative or suspicious reaction. In the practical application of this test for large-scale work the tubes showing the characteristic growth of *Str. agalactiae* can be considered positive without further examination. The films when dry are stained either in Neumann Stain Formula No. 2 or the Broadhurst-Paley stain.

DISCUSSION

Dr. Dalrymple: We have been experimenting with mastitis therapy on state institution farm herds. The work has not gone far enough to draw conclusions. We do not expect as good results as have been reported by Dr. Little because we have included animals with chronic mastitis among those treated. I am working in cooperation with Dr. Johnson. Except for chronic cases we feel our results have been fairly comparable with the results given by Dr. Little.

Dr. Nichols: I should like to ask whether treated cows will pass for certified milkers.

Dr. Little: Before answering your question there is one point which I neglected to discuss that should be mentioned here. Some of the really effective bactericidal agents now available for the treatment of chronic streptococci mastitis may cause some irritation when injected directly into the udder cistern, even though the dose is properly adjusted. In acute mastitis, therefore, in order to avoid aggravating the existing irritation, I would advise treating such cases after the acute symptoms have subsided.

In regard to whether successfully treated cows will pass the inspections required for certified milk herds, I have found that if the streptococci have been destroyed, the udder is not too severely damaged and the milk is of a good quality, the cow will pass the veterinary inspection. On the other hand, if the quarter is severely atrophied or indurated and the milk is watery in consistency or off color, the cow will be rejected. When an animal is rejected simply because of a positive brom thymol blue reaction of the milk, later on she may be acceptable if the reaction of the milk becomes normal.

It seems to me that it is important for the practitioner to grade the infected cases and tell the dairyman before treatment is started which ones he considers suitable for udder medication. In other words, will the cows in the advanced stages of the disease, even if successfully treated, be capable of producing a good quality of milk and pass the inspections required by public health officials?

Dr. Brooks: Dr. Little, from a purely public health standpoint, we are interested chiefly in those occasional cases of mastitis in which the human types of streptococci, that is Lancefield's Group A, are involved. The source of infection is discovered only when a milk-borne outbreak of streptococci throat or scarlet fever, or both is traced to them. The cows' udders in these instances are infected in one way or another with human organisms generally from a milker with a streptococci sore throat. What I should like to ask is whether, in your work, any of the human type of infection was discovered, and in any event, how do you feel about the feasibility and advisability when such a case is discovered, of trying to cure such cows and continue to have the milk used.

Dr. Little: I would not recommend the treatment of a cow harboring human streptococci in the udder. The sooner you can get such an animal to slaughter, the better. Treatment is contra-indicated, for these cases are too dangerous to have around.

Unidentified person: Do you find staphylococcus infections generally associated with streptococcus infections in udders?

Dr. Little: It has been the opinion of some workers that staphylococcal infections may so change the character of udder secretion that various kinds of streptococci become more readily established in the udder. With this in mind, mild staphylococcal infections were experimentally maintained in the udders of first-calf heifers and later small numbers of streptococci were introduced beyond the meatus of the teat, with the result that these quarters were no more susceptible to that particular dosage than were normal quarters of other young cows.

The appearance of staphylococci in treated quarters following the successful destruction of the streptococci needs some explanation. In many instances the staphylococci may have been present but not recognized in the quarter before treatment, and the eventual elimination of the streptococci simply made conditions more conducive to their development; or the quarter may have been more susceptible to reinfection with any microörganism than a normal untreated quarter.

Mr. Molyneux: As milk sanitarians, we are interested primarily in a milk supply that is safe and wholesome. However, we also welcome anything that will make it easier for dairymen to maintain healthy herds. Dr. Little has given a splendid paper containing findings of considerable importance. I would like to ask Dr. Little how cows in herds producing fluid milk should be handled during treatment.

Dr. Little: Cows should be segregated during treatment and the milk discarded until each animal has been passed by a veterinarian.

Mr. Vedder: Can the Hotis test be used successfully by a person who has not been specially trained in its use?

Dr. Little: Yes. However, it requires a little experience to read the Hotis reaction properly and interpret the results. I see no reason why an inexperienced person cannot eventually become proficient in interpreting the reactions. For a beginner I would advise the preparation of stained milk films from all samples to determine the kind of organisms which produce the different reactions.

Milk Filtration With Cotton Media*

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THE purpose of milk filtration is to remove visible extraneous matter. Whether justifiably or not, one of the most widely used tests of milk quality at receiving stations is the sediment test. This depends on catching on a dense cotton disk (Lintine) or other specially prepared sediment retainer the particles of dirt suspended in the milk, and constitutes a direct check on the sanitary procedures of the producer or on the effectiveness of the filter arrangements he employs.

Any student of milk problems must take into account the generally insanitary conditions which prevail in the majority of milk barns. Public health officials and milk sanitarians have led the general populace a long way along the road of appreciating and achieving clean milk supplies. Sanitation in the milk plants, pasteurization of milk, and sterilization of equipment and containers have all contributed to the reduction of milk-borne infections and epidemics. But in many cases these people have failed to look back to what happened to the milk before it reached the milk plant or receiving station. They have failed to remember the poor milker who had to get out of a nice warm bed about 4:00 A.M., and dig his way through the dark and the snow drifts out to a barn that was about 10° below zero, and coax some milk out of a herd of cows that did not enjoy life just then any better than he did. Then there was that time in July with temperature about 100° in the shade when the young cyclone that came along dumped several handfuls of dirt and muck from the barn floor straight into the milk bucket. Of course he picked out the dead flies, but a man cannot be expected to dump out a whole bucket of milk. Anyway he didn't drink any of it!

Certainly this is pretty crude, but it does not overstate the case. Milk is one of man's best foods—and it is also one of the best natural culture media for bacteria. It starts on its way to the consumer from very insanitary surroundings, and real health protection must start at the cow.

We shall not here maintain that milk filtration through cotton web media is a panacea that will guarantee clean milk, but it will help. We cannot prove that filtering milk significantly reduces its bacteria counts, although we know that many bacteria added to milk are carried on particles of dust and dirt which may be filtered out. Commercial filter disks which as taken from the box show very few organisms in a bacteriological test, remove from clean milk many millions of bacteria—and they could come only from the milk. We cannot prove that filtering a poor-tasting or bad-smelling milk will make it sweet and attractive, but we do know that, so far as these defects are attributable to dirt getting into the milk, prompt removel by filtration will reduce their dispersion through the milk.

THE DIRT IN MILK AND THE PROBLEM OF ITS REMOVAL

The recognized sources of external contamination of milk are:

1. Wind-blown dust, dirt, debris, bedding, and manure from floors, walls, animals, etc.,
2. Hair, epithelial cells, and dirt adhering to the cow's flanks, udders, and teats,
3. Similar material on the hands and clothing of milkers,
4. Similar materials sucked into the teat cups of milking machines dropped or kicked to the floor.

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This dirt will vary from particles of dust of submicroscopic size to straws, hairs, etc., inches long. Practically any sieve will remove the larger pieces, old clothing scraps and flannels will remove finer particles, but cotton web filter media do the best job of all. In part the removal by all is a simple sieve action, and all media possess some effectiveness here, but in part the dirt-stopping power of a filter medium is achieved by causing the finest particles of dirt to adhere to or to be adsorbed on individual fiber surfaces. The sieve action is related to a kind of porosity or to the size of pores of the medium, but this adsorption is directly related to the character and extent of the surface exposed to the milk flow. The cloth or napped flannel exerts a sieve action, but the finest sieve is a well-made cotton web filter medium. It is "all nap," and exposes a tremendous surface on which dirt particles adhere. The pores of even such a web are large compared with bacteria, but stained particles not much larger than bacteria are found thickly pepper over the fibers of such a web after filtration of a suspension, and clumps of bacteria are readily caught.

It can be shown that most cotton filter disks will catch from suspensions particles caught on a 200 mesh screen (particles more than 74 microns in their least dimension), but will permit to pass particles passing a 325 mesh screen (44 microns), except those adsorbed on the fibers.

It is to be remarked that a very large proportion of market milk is put through the process of filtering. Model dairies are known, producing certified milk, which add to all their other safeguards, that of filtration through cotton webs. Efficient filtration depends on well-designed and constructed metal equipment, kept in good order and cleanliness. It also depends on efficient filter media, capable above all else of removing the maximum percentage of the dirt present. An important feature of such a medium is the maintenance of its integrity and uniformity, free from washing or distortion during its useful life.

THE STRAINER-FILTER DISK RELATIONSHIP

The nation-wide distributor of filter disks must become familiar with all the many varieties of strainers in use on American farms. Cotton web filter media are sold as plain, single-faced, or double-faced (with gauze) in order to meet all possible demands. Aside from actual dimensions the most important demand which the strainer makes of the disk is that the disk withstand the impact and flow of milk without permitting the fibers to move with relation to each other and so produce thin spots or holes for the passage of dirt.

This phenomenon of "washing" should be the controlling factor in the choice of strainers and disks. On the prevention of this depends very often the success of the filtration step.

Considerable study of commercial milk strainers convinced us that, from the viewpoint of the effect on the disk, they could be grouped as belonging to three types. In many strainers on the market the cotton disk rests on a grid or slotted or perforated metallic surface, clamped in by a metallic dome or other baffle device. This so effectively breaks the falling impact of the milk and retards the velocity of flow that such strainers can be classified as Type One. These are served adequately by plain cotton disks.

In many strainers there is metallic support for the disk, but the baffle device is not effective in preventing washing if a plain disk be used. For these Type Two strainers, it is necessary to protect the upper surface of the disk from washing. This is usually done by facing the *upper* surface of the disk with a gauze layer. This use of the gauze *on top* is contrary to one's inclination, but is obvious when the purpose is shown.

Finally there are commercial strainers, belonging to Type Three, which offer no support under the disk, and often inadequate protection from washing above. For these, cotton disks baced on *both* sides are required. In certain strainers, even double-faced disks are likely to wash somewhat. The surface fibers of disks may be so firmly bonded to each other that they will not wash under the conditions of normal use. Many months' field tests of these disks have demonstrated clearly that this added protection will provide the needed increased assurance of effective filtration.

Such a classification of strainers as was outlined above was designed to systematize our own experience and practice, but it can rest finally only on an empirical basis. Any strainer may be classified merely by pouring two or three buckets of warm (35° C.) water through it. If its mechanical construction might put it in class one or two,, these possibilities can be distinguished by finding that a plain disk is not washed (Type One), or that a single-faced disk is required to be used gauze up (Type Two). If there is no mechanical support under and directly in contact with the disk, the strainer may be Type Three. Use a double-faced disk. The water tests for washing are more severe than an equivalent volume of milk. Such a classification is valid only with disks which have not received the wash-resistant treatments mentioned.

THE TYPES OF FILTER MEDIA USED

Historically, wire screens, pieces of Aunt Minnie's petticoat, and various types of woven fabrics and of fiber webs have been used. Today most milk is filtered through cotton flannels or through cotton webs. Probably the least satisfactory present choice is the flannel bought in the roll or large piece and cut off as needed. Better are the flannels bought in apppropriate sizes and withdrawn one at a time from the box. Some of this flannel is of heavy yarn and heavily napped; much of it is not much more than a heavy gauze. Flanned filter media have these innate defects.

A. They are considerably more expensive than cotton webs and so drive the ordinary user to attempt various economies, as
  1. They are often given a more or less superficial rinsing and used many times.
  2. They will frequently be dried by hanging out of doors exposed to dust and flies.
  3. Washing tends to shrink the disks so that they no longer clamp securely in the strainer, and thus permit bypassing of the milk and dirt.

B. Such values as they have depend considerably on the nap raised. This tends to mat down or to wear off during repeated use.

C. Except in the very best grades the combination threads and nap falls in actual effectiveness considerably below the cotton web in dirt removal.

The single-service cotton web filter media present a decided contrast to the flannel. Virgin cotton fibers are cleaned, boiled in alkali, washed, bleached, washed again, thoroughly dried, and then handled in modern cotton machinery to produce a web that is, aside from the final package sterilization, the practical equivalent of high grade surgical cotton and gauze. In fact bacterial tests indicate that these disks carry very few organisms. Any such product stored in boxes and used in a milkshed would promptly pick up bacteria, but the evidence is clear that the millions of bacteria found in a used disk were removed somehow from the milk that passed through. Even more convincing is the observation of visible dirt caught on such a disk from a moderate quantity of relatively clean milk, and the essential absence of fine sediment on the dense cotton sediment disk used to check the performance of the larger lighter disks.

This sediment test together with odor and bacteriological examination control the acceptance or rejection of milk in a large majority of our most enlightened jurisdictions. Wholly commendable is the attitude of many milk authorities to the effect that clean milk is far preferable to cleaned milk. An efficient adequate single service filter disk carefully used provides each producer with his own sediment test, and the conscientious producer will at once seek and eliminate the source of the dirt he finds on his filter disk. He will then have nothing to fear from the receiving plant inspector.

SOME REASONS WHY COTTON FILTER MEDIA SHOULD BE REQUIRED

There is a growing realization of the importance of prescribing the constant, intelligent, faithful use of effective single-service cotton web filters. Some of the reasons impelling such provisions in a growing number of milk codes (Wisconsin, Tennessee, other states, and many cities) are the following:

A. Well-made clean cotton media offer the only method of insuring a single-use procedure. The higher cost of the other media plus the fact that they will stand re-use tempts every producer and impels the unscrupulous to use them as many times as possible. Re-use is not possible with the cotton web. It affords a clean product which must be discarded with its load of dirt and bacteria.

B. Such cotton media, containing a sufficient weight of high grade cotton, and constructed so as to present a uniform web (no thin spots), will remove efficiently a very high percentage of soil and other dirt so universally found in freshly-drawn milk. They will demonstrate a clear superiority over all except the most expensive flannels, and these are undesirable because of the inevitability of their re-use.

C. Students of milk problems who have had practical experience in milk barns or who are realists recognize that much milk filtration will probably always be necessary. Even though we agree it is preferable to keep the dirt out in the first place, it still remains true that when one considers the source from which milk starts to the consumer, the information and interests of many of the people who gather it, and the conditions of that start, it is necessary to provide all possible protection. If all the milk were gathered in enameled sterilized laboratories by bacteriologists with all their knowledge and skill, we might not need filtration—even though we know of dairies in which such conditions prevail, and expert technicians still employ cotton web filters as the first process step. So long as we have the careless, the uninformed, and the unlucky, we shall need milk filtration. Any other counsel has overlooked the basic facts in the process. If milk inspectors could inspect filter disks instead of sediment disks, some useful advances would be made.

D. These facts indicate the continual entrance of extraneous matter into milk as a result of carelessness, ignorance, or just plain accident. It follows that the prompt removal of this foreign material by an efficient, sanitary, necessarily single-use cotton web will improve the milk quality—certainly as regards the sediment test and its esthetic appeal, probably also in other ways. Consistent, careful, intelligent use of such cotton web filter media will help to make milk and milk products more welcome and wholesome health foods.

Strenuous efforts are being made by all elements of the dairy industry to produce more and better dairy products for the nutrition of the world. The industry has achieved unprecedented results in quality and quantity and it is the duty of every one of us to do all we can to eliminate any losses and to ensure increasing supplies of milk of the highest quality.

War Time Milk Transportation Problems*

CHARLES H. MILBURN

Standard Brands, Inc., New York City

WHEN I accepted the invitation of your secretary to address you, I could not figure who had to bear the responsibility of burdening you with a paper such as I would present especially as I was given the subject "War Time Milk Transportation Problems," but thought that a title such as "A Traffic Man's Dream Dairy Farm" would probably be more interesting. I am a traffic specialist—but don't let this get out—I am also a dairy farmer operating a dairy farm and I have a natural suspicion regarding any one who belongs to an association of milk sanitarians.

I have served in traffic work for the last thirty years with Standard Brands Incorporated whose principal product is a perishable one—yeast. During disaster caused by storms and floods, it has been one of my duties to see that shipments of this product reached their destinations regardless of any conditions disrupting transportation facilities, and it is the proud boast of my company that to date no customer has ever been out of this important ingredient in the baking of bread. Because of my association with this type of work, Commissioner Woolley of the New York City Department of Markets asked for, and our President James Adams granted my services to New York City for war activity with the Metropolitan Food Committee. The work of the committee is to assist in getting food into New York City in case disaster of any type should strike and disrupt the regular channels through which the enormous supplies of food move daily into New York City.

This problem is of such magnitude that I cannot adequately cover all parts in the time allotted, but I will do my best to give you a good picture of the system which we think will assure a supply of food within the fifty mile circle that comprises the New York City Metropolitan Area, regardless of any disaster less than actual invasion.

This system protects all foods but to be in keeping with the purpose of this meeting I will confine myself to milk.

I do not like to quote statistics for often they do not represent the exact conditions. This was the case when Nora, a nice little Irish girl, got married and proceeded to have a baby at regular intervals until having four she suddenly stopped. After a year or so went by her father confessor thought he should check up on the matter and asked her the cause. "Sure, Father," said she, "I read in the report on vital statistics that every fifth baby born in Albany is colored, so Pat and I don't intend to take any chances."

However a little statistical background may help in giving a better idea of the size of our problem. The daily total food consumption in the New York Metropolitan Area is 27,700 tons per day or an average of 4.6 pounds per person, of this 6,306 tons or about one-fourth is milk. This means that around six million quarts of milk must reach the people in the Metropolitan Area every day. It is the largest amount of any one perishable food required, and when defense activities started this fact was recognized and it was decided that

> "In any disaster affecting the people, the supply of this vital food must and will continue to flow, vigilance in maintaining its purity will be unceasing and the rigid tests of normal times will continue."

When war was declared and it came time to devise a method for handling the transportation problems in the Metropolitan Area, the Defense Councils of New York, New Jersey, Connecticut and New York City formed the Metropolitan Defense Transport Committee composed of one member from each state and additional members representing the Port of New York Authority, and Office of Defense Transportation together with liaison members of the Army and the Office of Civilian Defense.

This committee appointed committees for various sections of the work. The one for food is the Committee on Emergency Control of Primary Food Distribution which set up the Metropolitan Defense Committee on Food Supply and selected an outstanding man in each food industry to form a working committee with other members of his industry and to prepare all necessary data needed for that section. The members of Milk Committee are:

Milk Industry—Robert M. Wellwood, *Chairman*, Sheffield Farms Co., Inc.
Greater New York Milk Institute—Morris H. Adler, Sunshine Farms
New York Metropolitan Milk Distributors—Joseph O. Eastlack, Borden Farm Products Co.
Independent Dealers — Isadore Eisenstein, Rockdale Creamery Co.
Dairymen's League Cooperative Ass'n, Inc.—George R. Fitts
Northern New Jersey Milk Council—W. R. Hale, Woodbrook Farms
Milk Processors' Ass'n of Northern New Jersey—Raymond Lotz, Lotz Bros.
Research and Statistics — Genevieve Zarkowsky
Federal-state Government—Dr. Anson Pollard, Market Administrators Office

and also now rendering invaluable assistance in all counties within the Metropolitan Area are G. W. Molyneux, Westchester County; E. J. Buckley, New York District; Forrest Wales, Nassau County, and other district directors of the Emergency Milk Supplies of which Mr. Tiedeman is state director.

It will not be amiss at this time to record the fact that these committees have completed a survey and compiled a set of records that give in detail every fact necessary for the functioning of the Metropolitan Area Milk Industry in time of attack and deserve the commendation not only of the State War Councils but also of every member of their industry.

With this background we can proceed to outline briefly the working of our system.

Each pasteurizing, bottling or distributing plant within the area, selected from two to five locations where they could conduct their business should they for any reason be forced to abandon their regular plant.

These locations were then tabulated on master cards which are filed by police precincts at main headquarters in the Department of Markets. From these other cards are made up and distributed to every state road control station.

Road control stations are buildings located at strategic highway points generally near important traffic intersections and are manned by representatives of the State War Councils. In New York State they are under the control of the State Police and in New Jersey men are manned by the Department of Highways. When necessary, additional help will be furnished by the OCD. These stations will also be used by the military authorities to assist movement of their men and equipment.

The highways are now divided into primary and secondary routes. In case military necessity compels the primary highways to be taken over by the armed forces all civilian traffic moves over the secondary roads.

In addition to information recorded on the master cards each milk plant must print an emergency business card on which is shown the address of the firm's regular place of business and on the reverse the addresses of all alternates in the same order as shown on master cards. These business cards are distributed to all truckmen, transportation companies, employees and

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* Presented at the Twentieth Annual Conference of the New York State Association of Milk Sanitarians, Albany, September 23, 24, and 25, 1942.

customers doing business with that firm.

When these records are completed we will have our system set up and be ready to go into action should disaster befall. I might state that this is one time when we hope and pray that the occasion to use something on which we have spent lots of time, labor and money never comes.

However if it does, this is how the system functions. We will imagine New York City is bombed and a large pasteurizing plant is struck and destroyed. A bomb falls in another street cutting off water and light from another plant but not hitting the plant. At the first signal of attack the wardens and police go into action, all buildings are checked and a report of conditions is relayed to control headquarters. In important precincts having large food plants there are special food wardens with direct emergency telephone connections. The one located in the precinct attacked passes information regarding the two milk plants to headquarters where the message is checked and sent out by the Police Department to the New Jersey State Police at Trenton, N. J., New York State Police, Hawthorne, N. Y., and Mineola, L. I., and Connecticut State Police at Danbury, Conn., who relay the message to all metropolitan road control stations within their states.

Inspectors at road control stations then stop all trucks and any destined to the wrecked plant or the one temporarily out of commission are rerouted to the first alternate located in an undamaged area and the driver is given a pass to proceed. This pass not only enables the driver to get through any damaged areas enroute but also shows roads that are open and over which vehicles can travel. The military authorities will even allow use of primary roads to food trucks when such traffic will not affect movement of their own forces. Our military forces agree that milk for civilian use is essential and will assist us in every way to get it to its destination.

Back in the precinct that has been bombed customers and employees are trying to reach damaged plants but are turned back by the police with the information that these plants are out of commission. They then refer to the firms' business cards, go to the alternates, secure a supply of milk and proceed to give service to the public as usual.

It is a workable system. Continual tests have proved that both the public and the industry can rest assured that everything possible has been, and will be done to keep the milk moving. This concludes the problem of transportation during disaster periods.

There is also the problem of how long milk can be moved by trucks. We know a plan has been suggested to transfer milk to the rails and thus save gas and rubber. I have attended meetings where this has been discussed and I understand a report has been given to the ODT showing that only about 6 percent of the milk now carted by trucks can be transferred to rail. Commissioner Woolley of the Department of Markets has reported that tin is even scarcer than rubber and that the enormous quantity of new cans that would be needed to handle the volume now transported by trucks if it was transferred to refrigerator cars would take an indefinite time to be manufactured and we would still have the problem of trucking at the delivery point as New York City has only three pasteurizing plants located on rail lines. We believe that this transfer will never be made basing our belief on the action and words of President Roosevelt himself, who, when setting up the various committees for conservation of rubber, called their attention to the importance of some rubber for civilian use to take care of essential needs, and specifically used the words and I quote, "like getting milk to the consumer."

From these words there is no doubt that the administration considers milk essential and I believe that the rubber will be forthcoming for our milk transportation system.

In attending meetings on transportation problems we learn that the present policy is truck transportation for short hauls, rail for long hauls with prompt unloading. The milk industry has been doing this for years so I see no reason to expect any change in handling of milk from farm to city plants in this area.

Statements have been made that there will be serious shortages of food next year but no actual hunger. There is talk of food rationing which will be more complex. This means more milk and more transportation of milk. Farmers cannot be forced to produce it, but they can be paid and if they can get the help the output will be increased. Perhaps the government will have to make some kind of subsidy to farmers so that they can pay the wages necessary to keep labor on the farms for if the farmer must pay labor out of income it will cause a sharp rise in prices and while a subsidy will not keep them from rising it will at least prevent a runaway.

If this condition occurs and more milk is produced it is thought that the present equipment will be sufficient to handle it.

I think I have covered the important parts of my subject so I want to close with a sigh that I did not get around to my dream farm although I am going to tell you about one barn.

I have a dairy farm at Tranquility, N. J. It has a lot of fine Jersey cows and I got to thinking that perhaps I could handle them differently from any cows have ever been treated before so I started a new barn. I dont know much about barns but I wanted an L shaped barn with two silos at the corners of the L. One section of the L was to be for the bulls, a maternity ward and calves. This part was started before the war and is finished. The maternity section is all box stalls but air conditioning is still to come. The calf section can be converted into separate stalls, housing from one to nine and I thought I would be the first to use wire floors for the calves so I had a wire company make these up for me and they were put in and I san say it was worthwhile. We haven't lost a calf and the bedding is always sweet and dry. I have a row of stalls for yearlings with removable partitions so that they can run and get some exercise in cold weather, and my bulls are in a separate section at one end of the building with runs crossing a brook, and a bridge to keep them out of the water, but having a passage way to let them go down to drink whenever they want to.

The other part of the L has never been started. This is to be the milking barn. Each stall is to be separate with solid walls except the side facing the aisle. This will be metal fencing with a sliding door. The manger is on this side with its end in the corner at the aisle to permit easy handling of feed. The manger is equipped with water and there is a small tie stanchion for use when the cow is milked. Each stall has a sump in the floor to collect liquid and manure. Ventilation is by means of pipes to each stall allowing a direct supply of fresh air to each animal.

You are all familiar with the rotolactor and milking parlors but my idea is to bring the parlor to the cow so I devised plans for a platform on which is hot water to wash the cow, an electric dryer, spray guns and milking machine with weighing bottles. After a cow is milked, bottles are emptied into an accumulator tank cooled with brine from our ice machine. There is also a desk for the dairyman to record weights, etc.

Plans also are started for another unit to collect manure. This is to be a unit equipped with a pump to clean out the sump and thus liquid and solid manure are collected together. The unit will then slide into our regular manure spreader and the ground gets full benefit of both solids and liquid. After the sump is emptied clean water and some superphosphate is put back to keep the stall fresh and sweet.

This part of the barn may never materialize but if it does I want this body to visit me and look it over and even if it does not, it will always be a pleasure to welcome any or all of you at Wayres' Farms, Tranquility, N. J., where a glass of good milk or other refreshment awaits every visitor.

Thank you for your courtesy in listening to my talk on "War Time Milk Transportation Problems" and the barn on "A Traffic Man's Dream Dairy Farm," may the first never come to pass, and may world conditions change to allow the second to arise as soon as possible.

TRUCK FLEET CLEANING

Of timely interest to fleet superintendents, maintenance supervisors and shop foremen is the newly enlarged and revised fifth edition of the Oakite manual of cleaning methods for dairy truck fleet operators. This fact-filled booklet is particularly significant today when wartime conditions impose the necessity for keeping transportation equipment in efficient operating order and for extending its normal service life by proper preventive maintenance measures.

Included in its 36 pages is a host of suggestions and tips for effectively handling over 21 cleaning and associated jobs, essential in any fleet maintenance program. Materials and methods are concisely described for cleaning transmission gears, connecting rods and other motor parts before repair; cleaning greasy, grimy motors and chassis; removing gummy carbonized deposits from aluminum and aluminum alloy pistons; desludging Diesel and gas crankcases before tear-down and major overhaul or for improved motor performance; cleaning concrete and cement garage floors; and many other diversified types of work. Copies of this interesting, informative and illustrated booklet are available upon request. Write to Oakite Products, Inc., 38C Thames Street, New York 6, N. Y.

SYMPOSIUM ON

Causes and Reasons for Rejected Milk*

Part I

R. L. Furnia

New York City Department of Health, Chateaugay, N. Y.

Although there has been much discussion among milk plant operators, inspectors and health officials regarding causes and reasons for rejecting milk at country receiving stations and pasteurizing plants, this subject still requires much study and consideration and still remains a problem to the milk sanitarians, milk plant operators, and producers.

From recent observation and past experiences, we know that there are three main causes for rejections, namely: poor cooling, dirty utensils, and mastitis. There may also be occasional rejections for excessive sediment or odors from barn, feed, and weeds.

To illustrate the problems confronting us in trying to keep the poor quality milk out of our milk supply, I want to quote a few figures taken from our yearly surveys and studies made during the past few months.

Extent of Condemnations

Since we started our regular deck inspection work in 1937 we have noticed some very drastic changes in the causes for rejected milk. In that year 1,062,497 cans of milk were examined by our department on the receiving platform and 20,397 cans, or 1.9 percent, were rejected by health department inspectors. This does not include quantities of milk rejected by operators. The three main causes for rejection were—improper cooling, 52 percent; dirty utensils, 16 percent; and abnormal udders (mastitis or garget milk) 10 percent. In 1941, the department examined 1,341,679 cans on receiving platforms and rejected 19,260 cans, or 1.43 percent. The rejections due to improper cooling dropped from 52 percent in 1937 to 28 percent in 1941, and those caused by dirty utensils increased from 16 percent in 1937 to 33 percent in 1941, and milk rejected because of mastitis increased from 10 percent in 1937 to 14.5 percent in 1941. These changes are explained by the fact that during this period of five years a large number of mechanical refrigerators had been installed on dairy farms, thus causing a decrease in the percentage of rejected milk for improper cooling. The addition of a large number of milking machines during this same period had a tendency to increase the percentage of milk rejected for dirty utensils. This is not the fault of the milking machines, but is due mostly to the shortage of farm help and lack of training in the methods of cleaning. It is expected that this condition will show much improvement in 1942, because extra stress is being placed on this unsatisfactory condition by our department, the milking machine companies, and the industry.

The increase in milk rejected because of mastitis or udder trouble from 10 percent in 1937 to 14.5 percent in 1941 was caused, to a certain extent, by heavy feeding and forced production. It is also possible that the use of unskilled labor (young boys and girls) made necessary by the draft and the defense effort has resulted in poorly cleaned milking machines and improper

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* Presented at the Twentieth Annual Conference of the New York State Association of Milk Sanitarians, Albany, September 23, 24, and 25, 1942

milking methods. Perhaps in many cases, cows were not milked out clean which would have a tendency to cause udder trouble. These are not facts, but probable causes. There is no doubt that the efficiency of our work has increased since 1937 which would also have some bearing on the amount of milk rejected for this cause.

In June of this year a survey was made of four large plants in one section of the milkshed to get some idea of the difference in quality, if any, between milk hauled long distances to the plants, as compared to short hauled milk. These four plants had from 220 to 360 dairies, or a total of 1,154 dairies. Of these, 545 dairies, or 47 percent, had their milk hauled from twenty to forty miles to the plant in trucks that were not iced. In general the cooling facilities on the long and short haul dairies will average about the same.

This survey shows that 196 or 35.96 per cent of 545 long haul dairies had milk rejected during that month, as against 148 or 24.3 percent of 609 dairies on the short hauls. Or in other words 11.66 percent more dairies had milk rejected on the long hauls than on the short ones. Approximately 8 percent more dairies had milk rejected for temperature on the long hauls than on the short ones, and 3.71 percent more dairies had milk rejected for odors and other causes on the long routes than on the short ones. This is a clear indication that the milk hauled long distances warms up enroute and many farmers are having milk rejected because of improper trucking facilities and because the truckmen do not take the pains to separate the morning's warm from the night's cold milk. As stated before, none of the trucks were iced.

The bacteria records of all the dairies for a period of thirteen months, from June, 1941, to June, 1942, inclusive, showed that the dairies on the long routes had an average of 5.82 percent high counts for this period while those on the short routes or local dairies showed the average of 4.89 percent high bacteria counts.

This again shows that the milk on the long routes is not quite as good as that on the short routes *when it arrives at the plant*. This may be because some uncooled morning's milk is four and perhaps five hours old when it is delivered and the night's milk warms up enroute.

CAUSES FOR REJECTION

As you know, the age old custom of judging milk was by odor and in many instances, by taste. Some of the old time milkmen, after detecting an odor, tasted the milk and if no abnormal taste were noticed the milk was considered satisfactory. We have since found that the taste is not nearly as sensitive as the odor test and tasting milk has been disregarded almost entirely as a means of judging whether or not a can of milk is satisfactory.

In the past it was the policy of our department to require an immediate follow-up inspection of all rejected milk at the dairy farm after the first unsatisfactory deck finding to determine and correct the condition leading to this rejection. This work is done by the company inspector when we ourselves do not have time to cover all dairies having milk rejected. It has also been our policy to have follow-up inspections made at the farm by the company inspector of any milk rejected or milk having a high bacteria count on days when we are not present. As part of the deck control program, we also require that each dairyman delivering to New York City approved plants have a quality control record on file at the plant where his milk is delivered. All the unsatisfactory deck findings are noted on this sheet by the company inspector or the milk plant manager. This includes milk rejected for odor, temperature, excessive sediment, flakiness and high bacteria counts, or for any other reason which may render the milk unsatisfactory.

		Long haul dairies							Short haul dairies						
			No. of dairies with milk rejected			Percentages of dairies with milk rejected				No. of dairies with milk rejected			Percentages of dairies with milk rejected		
Plant	*Total number dairies delivering*	*No. of dairies on long hauls*	*Total rejected*	*No. rejected for temp.*	*No. rejected for odor, etc. Percentage*	*Total rejected*	*Percentage rejected for temp.*	*Percentage rejected for odors, etc.*	*No. of dairies on short hauls*	*Total rejected*	*No. rejected for temp.*	*No. rejected for odor, etc.*	*Percentage total rejected*	*Percentage rejected for temp.*	*Percentage rejected for odors, etc.*
1	260	180	28	18	10	15.55	10.00	5.55	80	2	2	..	2.50	2.50	..
2	318	150	62	32	30	41.33	21.33	20.00	168	39	17	22	23.21	10.12	13.09
3	216	75	28	22	6	37.33	29.33	8.00	141	50	40	10	35.46	28.36	7.09
4	360	140	78	51	27	55.71	36.43	19.28	220	57	30	27	25.9	13.59	12.27
Total	1154	545	196	123	73	35.96	22.56	13.39	609	148	89	59	24.30	14.61	9.68

NUMBER AND PERCENTAGE OF HIGH COUNTS FOR 13 MONTHS, JUNE, 1941, TO JUNE, 1942 (INCLUSIVE), OF BOTH LONG AND SHORT HAUL DAIRIES

Number of long haul dairies which delivered during these thirteen months			Number of short haul dairies which delivered during these thirteen months		
Total dairies	*Total high counts*	*Percentage high counts*	*Total dairies*	*Total high counts*	*Percentage high counts*
6,927	403	5.82	7,797	382	4.89

NOTE: Number of dairies noted as rejected on both the long and short hauls refers to the actual number of dairies having milk rejected sometime during the month. If a dairy had milk rejected more than once, the predominating cause is the reason given for rejection.

This quality control record also contains the unsatisfactory conditions found at farms for which the dairy may either be put on five or ten days' reinspection or excluded. These records are transferred with the dairy in case a dairyman decides to change to another New York City approved plant.

In this way, we have a permanent record of every dairy delivering to New York City approved plants. Thus, if a dairyman continues to have a poor quality control record over a long period of time, drastic action may be taken. If it is necessary to exclude a dairy three or four times, it may be permanently excluded from the New York City market. I mention the above to show the importance of judging, on the receiving platform, whether or not a can of milk is satisfactory because as stated above, all unsatisfactory findings are noted on the control sheets.

However, owing to the present national emergency it has been necessary for us to change our policy somewhat, in following up rejections and other unsatisfactory findings at the farm. With the rationing of gasoline and tires, our department has endeavored to go along with the government in every way possible. In order to help the milk plant operators to conserve these materials we are not requiring them to check the cause at the farm after the first unsatisfactory deck test or high bacteria count, but instead, we are asking them to send out notices to the dairymen who have unsatisfactory or rejected milk, and only make a trip to the dairy farm after the second successive unsatisfactory deck finding.

Along with this program, it seems quite necessary to let the dairyman know without delay why his milk was rejected or why it was found unsatisfactory in order to have the condition rectified. Most farmers are not very good at finding their trouble or figuring out why their milk was rejected. Unless the exact reason for rejection is given, many of them are apt to attribute the rejection to the fact that the plant had too much milk. Unfortunately, a larger number of rejections are made during the flush season, thus giving the farmer the impression that his milk is rejected because of over-production and not because of poor quality. He does not realize that because of the warmer weather and the larger amount of milk produced, greater cooling capacity it needed. This, and the fact that in early summer he is very busy with the farm crops and does not pay as much attention as he should to the care of his milk and milking utensils, account for much of this rejected milk. Unfortunately, the farmer does not seem to realize these facts.

The milk plant operator or inspector must show him the exact cause for the unsatisfactory milk. When a can of milk is rejected the usual procedure is to place a red tag on the can and check off the reason for rejection. This is easy enough to do when the milk is found dirty, flaky, or too warm. If a can of milk is rejected for odor, the ordinary red tag is again placed on the can and a check mark is placed alongside the word "odor." This word "odor" covers a multitude of sins. When the farmer gets this can of milk back he does not know if the odor is due to mastitis, slow cooling, or dirty utensils and he is not certain how to correct this condition.

For this reason, it is very necessary to make a microscopic count of all rejected milk, especially that rejected for odors. These smears should be graded as soon as the milk is in and the farmer sent a notice that same day. We also get high counts of mixed contamination and in such cases the notice would naturally have to state each probable cause for the high count. This is one good reason why each plant should have a microscope and our recent observations bear this out very clearly.

We must also be able to judge feed and weed odors. Although some of these odors can be judged very distinctly in a can of milk, others are very confusing. One of the most common feed odors is corn ensilage and this can very easily be detected. Unless this odor is excessive, we do not feel that this milk should be rejected. The same applies to molasses and various other feed odors, especially the different grass odors which are so often detected when checking milk on the receiving platform. However, if an ensilage odor is very prominent, the milk should be rejected as this odor may follow through to the finished product. A strong ensilage odor may also cover up a bacterial odor.

As to weed odors, there are many. Only those that are most commonly found are mentioned here. Some of the most easily detected are those of leeks, garlic, or wild onions. When these odors are detected, the milk should be rejected as these will also be contained in the finished product, especially cream and butter. Cabbage and turnip odors can also be detected, but unless these are quite pronounced rejection of this milk would not be justified. We also find potato and apple odors. Some farmers, especially in the "North Country," feed small potatoes which are not salable; cull apples are also sometimes fed, or the cows may eat them while grazing on fall feeds in meadows or around orchards where they are allowed to roam after the harvest. These odors are fairly easy to detect but unless they are very prominent, the milk should not be rejected.

Barn odors are another source of worry and trouble to the deck man when checking milk. These odors range from very slight to very strong, and there is always a question of whether or not the milk should be rejected. I have made many Breed smears of such milk, but seldom find a high count. This is probably because most barn odors are found in mornings warm milk and the bacteria have not had time to develop sufficiently to show a high count. However, if the odor is very prominent, it should be rejected as such milk is almost always produced under careless and unclean conditions. The reason we do not get barn odors in the night's milk nearly as often as in the morning's is because during the cooling process much of the odor passes off, and if the odor is present it is harder to detect in cold milk. However, the most important thing in checking milk is to be able to detect the bacterial odors and to distinguish them from other types.

Of course, any can of milk in which a bacterial odor is detected must be rejected as this milk has poor keeping qualities and that, containing streptococcus mastitis organisms may be injurious to the consumer if there should be some failure in the pasteurizing process.

Dirty and flaky milk, as determined by the strainer dipper test, and also bloody milk should be rejected. By flakes we mean those due to garget, very slow cooling, or perhaps mixed milk; that is, morning's warm milk mixed with night's cold milk and left standing at atmospheric temperatures without agitation, causing a flaky or churned appearance. Milk showing flakes because of slow cooling and mastitis, would also have an abnormal odor and perhaps would be rejected on odor alone. However, the strainer dipper sometimes helps to substantiate our odor test and is often used for that purpose as well as to detect flaky and dirty milk.

A person cannot develop the technique of checking bacterial odors in milk in a short period of time. This is one job that is mastered only after a long period of deck work and experimenting; that is, to classify the odor in your mind and check with microscopic findings until your recognition of these odors agree nearly 100 percent with your microscopic examination of this milk.

During the past few months my coworkers and I followed up 100 different rejections by farm inspection of milk which showed high counts. The intention was to determine the most frequent cause for poor quality, and to see how closely we could correlate unsatisfactory deck and bacteriological findings with those previously indicated as representing the 1941 figure, for the entire milkshed. In general the causes found in these observations were similar to those in our last year's survey. These results also showed that out of the 100 rejections we were able to locate the cause for these high counts at the farm in 98 percent of the cases. From data gathered from other approved sources this high percentage of correlation in locating the cause of the high counts is not uncommon.

It was interesting to note that out of 100 rejections for bacterial odors, 16 of these were found to have mastitis organisms in the smears made of this milk. In checking these high counts at the farms, in all cases, we found from one to seven cows giving garget milk. Many of these were checked by a veterinarian. It is hard to understand why a dairyman milking these cows every day does not notice this before the milk is put into the can, or perhaps he does notice it and sends the milk to the plant just the same.

I had an amusing experience some time ago while following up a high count at a dairy farm. The Breed smear indicated mastitis, so naturally I made it a point to check the cows. This was a small herd of 12 to 15 cows and in a short time I found the cow causing the trouble. This was a Holstein and a heavy milker that had been fresh for about a month. It was found that one of her quarters was hard and swollen and giving very gargety milk. The dairyman was not home, but I interviewed his son and when I asked him if they were sending this cow's milk to the plant he frankly admitted they were. They had a nice calf tied back of the cows and I asked why they didn't feed this cow's milk to the calf instead of sending it to the plant and he promptly replied that his father said this milk was not fit for the calf—that it might harm him. Here was a case where a farmer sold milk for human consumption which he considered unfit for a calf. These are some of the problems we have to contend with in protecting our milk supply, and a very good reason why the deck man should be able to detect a bad can of milk and reject it. Bad milk can be detected nearly 100 percent of the time by odor, together with the use of the strainer dipper and other deck tests.

SUMMARY

In a brief summary, my observations indicate that the primary cause for rejected milk is dirty utensils, with improper cooling running a close second, and milk containing mastitis organisms third. Other less frequent causes for rejected milk, in order of their importance are, excessive sediment, barn, feed and weed odors.

In closing I would like to sound a friendly warning to milk sanitarians as well as to the industry that we should not use the War as an excuse to lessen our efforts to obtain a clean, wholesome and plentiful milk supply, but rather, we should put forth more effort to protect this most important food which is so essential to the well-being of all the united nations.

Part II

W. H. MANSON

New York City Department of Health, Millerton, N. Y.

THE modern concept of milk goes beyond the bare legal definition of the term. Merely conforming to a butterfat standard, and passing the raw milk through pasteurizing equipment do not of themselves necessarily mean safe or satisfactory milk. Even under present methods of pasteurizing plant control, we still have an occasional improperly pasteurized sample indicated by the phosphatase test. The proper supervision of the raw milk supply must be regarded as one of a series of methods which make up a chain of protection around our milk supply.

But in addition to the public health aspects of the raw milk supply, there is the additional esthetic angle. The presence of excessive bacteria, sediment, and off-flavors have a definite bearing on wholesomeness and consumption. It is true that proper pasteurization will make almost any milk safe but the eating of sterilized dirt is never particularly appealing nor can we always be sure that milk will be properly pasteurized.

If we wish to keep milk "the most nearly perfect food" we have ample reason for the rejection of raw milk which has been produced with disregard for the factors of safety, wholesomeness, palatability, and esthetic appeal.

We now come to a consideration of those factors which lead to the production of poor quality milk and its subsequent rejection:

Lax plant operation, and dairy farm control by company representatives:

(a) Untrained men receiving and dumping milk: It has been my observation that just so long as the operator will accept and dump poor quality milk, the producer will continue to send it without correcting the condition.

(b) Long periods between farm inspections with little interest in correcting existing conditions: It has been observed that a producer may have milk rejected for odor caused by slow cooling a number of times, and no effort made to eliminate the cause by constructive suggestions to that producer.

(c) Laboratory reports and records become routine habits and are not utilized for the purpose intended when the method of control was adopted: A careful study of the quality control records should be made to bring about necessary improvements and to aid the producer in correcting the cause of poor quality milk.

Poor herd management on the part of the dairyman with limited professional advice:

(a) Purchasing cows from questionable sources without physical examination by competent veterinarians.

(b) Disregard for regulations pertaining to segregation of unsound cows, and failure to exclude the milk from such cows.

(c) Careless practice in connection with handling and cleaning of milking machines.

(d) Poorly lighted, poorly ventilated stables, dirty floors and crowded conditions are all conducive to the causes for poor quality milk.

Lack of satisfactory cooling, washing and sterilizing facilities:

It is quite obvious that without the necessary tools the work cannot be properly done.

The dairymen in the business of producing milk who are not adapted to the job:

The production and control of good quality milk is not as complicated as many would like to make it appear. Good quality milk starts at the source of production. I will enumerate the factors necessary to obtain such milk:

(a) Sound disease-free cows, with professional advice to maintain them.

(b) Herd management by personnel capable of carrying on good milk production practices, and willing to learn improved methods.

(c) Stables which are maintained for production of milk.

(d) Equipment, and its care, with particular regard to cleaning and sterilizing practices.

(e) Plant operation and personnel who demand good milk, and disqualification of those who insist on accepting poor milk in order to maintain volume.

(f) Laboratory reports properly used.

(g) Last, but not least, confidence of the producer in those with whom he deals.

In conclusion, as milk sanitarians, we must maintain the quality of milk in accordance with its exalted position as "the most nearly perfect food." In doing this we must have the united efforts of company inspectors, veterinarians, and plant managers. All must do their jobs well.

Part III

E. R. McHale

New York City Department of Health, Lancaster, Pa.

Mr. Furnia and Mr. Manson have covered the subject of causes of rejections very well so I would like to stress how to prevent rejections and high counts. Mr. Furnia has stated that in 1937 there were 20,397 cans of milk rejected by the department of health representatives. Let us put that figure in dollars and cents. At $2 per hundred pounds cost to producer with 15 cents per hundred hauling cost from the farm, and 15 cents per hundred hauling cost returning milk to farm, we arrive at an approximate figure of $38,000. In the majority of cases this milk was a total loss.

In reviewing Mr. Furnia's paper, one may be inclined to assume that the causes of rejections rest only with the producer. I have contended for some time that odors are developed on the farm. Temperatures and sediments may be caused by the hauler. Some bacterial odors and high counts may be encouraged by the operator returning to the producer wet, unclean cans or cans in poor repair.

During the summer months of 1940 and 1941 a large percentage of the trucks in this district were heavily iced. A large percent of milk was being rejected mostly for bacterial odor. Bacteria counts were far too high and far too many. So riding on the trucks by the operator was encouraged to find the cause, and trucks were iced regardless of distance. This movement was started in the early part of 1940. Today 80 percent of the trucks use no ice. Some of the figures obtained at one plant are shown in Table 1.

The U. S. Department of Agriculture Bulletin No. 976 has this to say:

> "Dairymen lose millions of dollars annually because of poorly cooled milk and cream. The cooling of milk is done mainly for one reason—to hinder bacterial growth. Bacteria are like any other vegetation; they grow rapidly in warm temperature and slowly in cold temperature.

Pounds of ice melted in 12 hours in various type cooling tanks. Average outside temperature 84° F.

Galvanized iron tank without cover 143 lbs.; with cover 112 lbs.

Concrete tank without cover 107 lbs.; with cover 81 lbs.

Insulated tank without cover 40 lbs.; with cover 10 lbs.

TABLE 1

Cooling Medium Farm	*Temperatures Farm*	*Temperatures Plant*
Well*	60 F.	52 F.
Well (ice used)	59	50
Well	59	56
Well	62 rejected	Ice cooler ordered
Well	66 "	..
Spring	60	50
Spring (ice used)	58	54
Well (ice used)	62 rejected	..
Ice cooler (insulated)	40	43
Well	54	45
Well	60	54
Spring	56	55
Mechanical cooler	40	43
Well	60	48

Time of first pick up	5:50 A.M.
Time of last pick up	7:45 A.M.
Time at plant	8:00 A.M.
Total time on road	2 hours, 10 minutes
No. lbs. of ice used on load	400
No. miles from first pick up to plant	16

Realizing what a task it would be for me to ride at least 150 trucks, I turned to the next best method; namely to make a survey of the cooling mediums on the farms. At the plant receiving the milk at the temperatures I have quoted, as taken from riding the truck, improvements have been noted as shown in Table 2.

TABLE 2

Number dairies	*Well cooling*	*Spring cooling*	*Insulated ice box*	*Mechanical cooler*
		January 1, 1941		
198	100	71	24	3
		January 1, 1942		
182	56	65	24	27
		August 1, 1942		
178	0	33	85	60

First seven months 1941—551 cans milk rejected—65 high count
First seven months 1942—286 " " " —40 " "

To go further and study the causes of rejections for the same period the following will be found:

	1941		1942	
Bacterial odors	227 cans	—41%	85 cans	—34%
Feed	62 "	11	53 "	18
Temperature	104 "	18	103 "	36
Flakes	79 "	14	34 "	10
Sediments	19 "	3	9 "	3
Garlic	60 "	11	2 "	.7

All loads were iced during 1941. No ice was used on the trucks during 1942.

From this table it is shown that an improvement has been made, except in temperatures. This is partly, if not all, the fault of the hauler, due to the fact that he permitted cans of uncooled milk to stand next to cans of cold milk in transit.

As previously stated, odors are often a result of poor methods on the farm. Therefore I feel we must first have a proper cooling medium on the farm. As a result of such surveys and study there was less milk rejected in 1941 than in 1940, although production has greatly increased. For this district, at present, the figures are submitted in Table 3.

The springs used test 58° F. or lower. These have been tested during flood and drought periods.

It is felt that the enthusiasm shown in making improvements in any line, any plant, reflects the enthusiasm shown by the inspector of the district.

To obtain some of the improvements shown the following chart was used. This chart is called a "Monthly Summary" and contains the following information:

Number of Patrons Delivering
Number Using Spring Cooling

TABLE 3

	Plants	*Total dairies*	*Well cooling*	*Spring cooling*	*Insulated ice box*	*Mechanical cooler*
Number	13	1928	5	347	651	925
Per cent			.25	18	33.75	48

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* By well cooling I mean where no insulated icebox was provided although ice may have been used.

Number using Well Cooling
Number using Insulated Ice Box Cooling
Number using Mechanical Cooling
Number of Farms with Electricity Available
Number of cans of Milk Rejected
Causes of Rejection:
  Bacterial Odor
  Feed Odor
  Temperature
  Flakes
  Sediment
  Garlic
Number of High Counts
  Causes: Cooling
    Utensils
    Mastitis
Special Farm Visits
  Number of Stables Scored Satisfactory
  Number of Stables Scored Passing
  Number of Stables Scored Unsatisfactory
  Number of Special Smears Taken
  Number of Special Smears High
  Average Tank Count

At the end of the year this chart is summarized and a comparison made of each plant.

From the above chart, it was shown that in 1941, at all plants in this district, there were 6,502 cans of milk rejected for the reasons shown in Table 4.

TABLE 4

Bacterial Odor	2401	cans—	37%
Feed Odor	206	"	3
Temperatures	1372	"	20
Flakes	808	"	12
Sediment	1193	"	18
Garlic	522	"	7

The outstanding causes were bacterial odor, temperature and sediment.

Causes of high counts are listed in Table 5.

TABLE 5

	Number	*Percent*
Cooling	605	61
Utensils	239	24
Mastitis	148	15

The object of submitting the foregoing figures is to show the importance of cooling on the farms.

In this particular district milk must be hauled as far as eighty miles from the first pick up to the plant. This takes about three hours. The milk has to stand extreme temperatures at times such as 90° F. at six A.M.

In regard to trucks there are two types used. One the enclosed body, the other the open or stake body. In many sections enclosed body trucks are required. There are some bodies of this type in use in this district, and very good results have been noted. The most common truck is the stake body type. Where the stake body type is used the following should be encouraged:

A tight platform with sides and ends of matched boards which should be at least 2 inches higher than the cans. The sides should be so constructed that when the milk is loaded a small section of the sides may be removed instead of removing or lowering the whole side. The boards should be on the outside of the stakes.

Cans should be so loaded that the cold milk is separated from the warm milk. A large canvas should cover the entire body and should extend over the sides and end at least 10 inches. This canvas should be tied down tightly at all times, from the time the first milk is loaded until it reaches the plant. The empty cans should be covered on the return trip to the farm. This is how a hauler may prevent a rise in temperature, as well as keep cans clean and prevent sediment in the milk. Have you ever ridden behind a milk truck and observed the loose flapping sides, perhaps no end gate and the cover flying in the wind? They remind me of large birds flying.

TABLE 6

Time 1st pick up	*Temp. farm*	*Temp. plant*	*Temp. increase*	*No. patrons*	*Mi. 1st pick up to plant*	*Time on road*
5:45	38	52	14	33	80	3 Hrs. 45 Min.
6:30	41	54	13	21	50	3 " 5 "
7:00	49	53	4	9	25	1 " 45 "

My observations when riding trucks are tabulated in Table 6.

No ice on loads. Temperatures are the average.

On the eighty mile haul, cold milk was placed on the outside and the warm milk was placed in the center of the truck. The highest temperature of cooled milk found at any farm was 44° F. The sides of the truck were tight, the canvas was kept tight around the cans, and the canvas was used from the start.

On the fifty mile haul the sides were tight, cans of cold and warm milk were mixed, and canvas was not used until half of the milk was picked up; then it was thrown loosely on top of the cans. The highest temperature at the farm was 53° F.

On the twenty-five mile haul, the sides were tight, cans of cold and warm milk were mixed and the canvas was kept around the cans from the start. The highest temperature at the farm was 58° F.

On the farms visited, the water in the vat was slightly above the level of the milk, but did not come to the top of the overflow pipe. These facts should be noted by field men when riding loads.

The operator should periodically send literature pertaining to the cleaning of utensils, cooling, and the control of mastitis to the producer. He should check the cans often for rust and open seams. Frequently the producer is credited with a high utensil count when the operator is at fault in allowing an open seamed can to be used. He should also check the can washer for proper washing and drying of cans.

Too much emphasis cannot be placed on deck inspection. Under our present national emergency deck inspection is going to become more important. Therefore, there should be close cooperation between the field man and the deck man. If the deck man passes poor quality milk he has defeated all the efforts put forth by the field man.

The close checking of milking machines cannot be too strongly stressed. These machines need constant checking, and should not be overlooked at any time. This should be considered special work and not routine.

In closing I wish to say that the figures I have given represent a cross section of improvements shown throughout the milkshed. I have tried to supplement Mr. Furnia's paper by pointing out where the responsibility rests in preventing the rejection of milk, and at the same time improve the quality.

The producer has responded to his country's call in this great national emergency by a higher production of milk. Now let us do our share by eliminating the need for rejection of milk, by improving the quality.

Let us adopt the slogan—"We Can and We Will."

War Time Increases Our Responsibilities*

MILTON R. FISHER, D.V.M.

Chief of Milk Control, Department of Public Welfare, Health Division, St. Louis, Missouri

AMERICA is at war and each man, woman, and child must do his part in order for the United Nations to grow stronger each day and that we may win this war as soon as possible. The good people in the countries ruled by the dictators are already caught in our enemies' web and we must avoid such a catastrophe.

The health officer and the milk sanitarian who are located in the defense areas were the first ones to feel the sting of this war. In some cases the local population doubled within a few days due to the auto-trailer home. This increased the demand for milk and milk products, and the demand is still growing. Some of the equipment in our milk plants is being operated above capacity. Therefore, such equipment is depreciating more rapidly than in normal times. By now I am sure all of us are well acquainted with the word "priority" and its P. B. numbers.

The manufacturers of our dairy equipment are now producing war materials. This means that the dairy industry will not get new equipment for the duration. Therefore the present equipment in all of our milk plants must be cared for in such a way that its usefulness will be prolonged. Proper care will add to the life of any machine. This care must include all surfaces that milk contacts directly and the devices necessary for proper operation of the equipment. The manufacturers of dairy equipment issue written instructions pertaining to the cleaning of milk surfaces which include the kind and the strength of detergents which can be used satisfactorily. Also they include adequate lubrication instructions for all moving parts and warn against over-loading of motors and to protect against moisture. We should advise all operators to follow the manufacturers' instructions. Usually additional copies on the care of equipment can be obtained from the dairy equipment companies.

Inexperienced help is another mutual problem we have with the milk industry. There are two reasons why we find the inexperienced man in the milk plants today. First, some experienced men have responded to the call of our Colors. Second, our defense plants are paying higher wages. All new employees should know about each item required in our milk ordinance and the reasons why each is necessary. We should assist the plant management in this training.

The cry to lower public health standards for the duration of this war seems to be gaining momentum. And yet, it appears to me that the dairy business is very good now because the demand for milk and milk products has exceeded the production of milk. There are hundreds of milk plants which are doing more business today than they were doing two or three years ago, and oddly enough, no one was excited then. We must remember that our job is more important today and we must protect the consumers of milk and milk products. If our rules are essential during peace times, they are more important during war times. Why? Because our doctors are in the armed services and the public is looking to us for protection. *Now* is the time to apply preventive medicine to the highest degree. We cannot afford to have epidemics now. We milk sanitarians must not shirk our duties in these trying times. Remember, if the dairy industry or an individual milk company asks us to remove one of our public health protecting bars and we grant them permission, it will be our fault if trouble begins.

When new problems arise it is wise to take the subject under advisement and study the facts. They must be studied first, from the standpoint of our milk ordinance and, secondly, as to what effect it will have on the dairy industry in obtaining a safe, high quality product.

The time for standardizing our milk ordinance requirements to a minimum, uniform standard is past due. This war may prove to us milk sanitarians that we had been asleep at the post and that we now are about to face a disaster. The business of "supply and demand" has overcome the dairy industry until it is now clamoring for more milk. The local market is short because three things have happened: the consumers' purchasing power has increased; there is the increased population in our defense areas; and the armed forces require milk to be used in the men's diets. Our National Health Program which recommends the use of fluid milk in all diets may be another factor affecting our consumption. I might state here that we as health officials are in accord with all programs designed to increase the use of milk and milk products in our diets.

Most of us receive the public health reports published by our United States Public Health Service, and when we study the report on market supplies of August 14th, 1942, we find positive evidence that something is wrong. I will not attempt to deal with this subject in detail. However, we should pause for station identification. This report lists the cities by states that have a rating of 90 percent or more. There are three groups: Table I names the cities that have 100 percent pasteurization of milk. We find 6 states and 20 cities in this group. Table II lists the cities having both pasteurized and raw milk supplies with 90 percent plus compliance with the U. S. Standard Milk Ordinance. In this group there are 24 states with 135 cities. Table III showing those communities in which only raw milk is sold lists 7 states and 26 cities. This makes a total of 181 cities which have received a rating of 90 percent or above. The unfortunate condition in this report is that it is a report on certain cities and it should include all cities in all of our states. There are approximately three major reasons why this list includes such a small percentage of our milk-consuming population.

1. Too few states and cities have asked for surveys to be made by our United States Public Health Service.
2. Some cities do not have all the minimum standards incorporated in their local ordinance which may automatically cause their grade to be below 90 percent.
3. Other cities have incorporated in their local milk ordinance the minimum standards of the United States Public Health Ordinance. However, the health officer is not enforcing all of the regulations.

We all appreciate the fact that it is almost impossible to have an identical milk ordinance for each city or community. However, I agree with others that it is possible to set up minimum standards to be recognized as a yard stick for measuring the safety and quality of any milk supply. We must also admit that the above mentioned report shows conclusively that the Standard Milk Ordinance is the largest and most adaptable and widely used regulation of its kind. Now, if the minimum standards are not adaptable to all of us, they should be adjusted to our needs. However, such changes should include consideration for the health of the consumers concerned and at the same time give a quality product

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* Presented at the Thirty-First Annual Meeting of the International Association of Milk Sanitarians, St. Louis, Missouri, October 30, 1942.

to the processors of milk and milk products.

In reference to Mr. L. C. Bulmer's article in our September and October JOURNAL OF MILK TECHNOLOGY, I wish to say we do agree on several things. However, I cannot agree with him 100 percent at this time. We are in agreement that the United States Public Health Service should have minimum standards adaptable to all states and cities. He used the word "streamline" which I fear because in defining this word Webster used these words, "uninterrupted flow." Now if this means that the standard is to be lowered to a low level where epidemics may occur and where the quality of milk and milk products disappear, I object strenuously. Others will do likewise including the consumers, health officials, and members of the dairy industry because some of us do not agree with Mr. Bulmer that streamlining is the answer to our problems. I agree with others that some adjustments must be made to the demand of war time economics, because we have a war to win and it must be won, or, we will lose everything and become slaves. However, I do not think that it will be necessary for America to sacrifice everything. The facts of the case are: "We've Got a Job to Do" and we must do it. I am sure it will be done intelligently, economically, and at the same time maintain our present standards of quality and safety.

We should remember the milk sanitarians are servants of the people. Our official duties are first to protect the consumers of milk and milk products. We should not lose sight of our quality programs and foolishly agree to the covering up of a multitude of sins with the safety factor of pasteurization. All public health requirements should do two things: protect the people's health and seek to improve the quality of all milk products. This will assist the dairy industry in their quality program.

I might ask "What created the office of the early health officer and later that of his aides?" "Epidemics." In milk control it was the man who distributed inferior milk and milk products which caused milk-borne disease outbreaks. What did this do to the consumers? This created doctor bills, drug store bills, and in extreme cases undertakers' bills and cemetery lots. These are the things that gave us our present positions.

Milk sanitarians must be careful not to make concessions that would jeopardize the dairy industry, the consumers, or ourselves. If we agree to changes in our enforcement procedures without first changing our regulations, we alone assume the responsibility. Neither will the changing of our regulations be an answer to our problems, nor will it relieve us of our responsibility because if our public health control bars are lowered without our objections, we will again be subject to criticism if they do not protect the health of the public. I find it timely at this point to quote Dr. E. J. Buchan: "I would caution our politicians that germs do not have any brains and cannot be propagandized. Like the Nazi and Jap, they will, if given a chance, destroy humanity."

I am sure that the members of this association can work with other groups in search for the answers to most of our mutual problems. We should all unite and work together for a common goal. In closing may I ask "Why not use what we have and build to it, instead of trying to sink the boat on which a large number are riding and let some drown while trying to build another?"

LETTERS TO THE EDITOR

Simplification and Unification of Milk Quality Programs

I have been very much interested in the article by Dr. N. O. Gunderson in the JOURNAL OF MILK TECHNOLOGY, Volume 6, No. 4. I cannot wholly agree with the assumptions made in this article. It would be easier for me to do so if this were a pronouncement especially directed toward conduct of our inspection systems during the war emergency. However, the context of the article seems to apply to inspection during normal times. This presentment seems to be guided more by economic considerations than by the general thesis of continued and permanent improvements in milk supplies. While I am quite aware of the fine work done in Rockford, Illinois, and in other places where so-called platform inspection is in vogue, I am not convinced of the adequacy of such a system, everything being considered.

In the third paragraph of the article to which I refer this thought is brought to the surface in the statement "The economics involved is always a limiting factor in connection with control work." It has been realized for years that the amounts spent on milk inspection are entirely too low to be compatible with the benefit secured from the protection afforded, and I think greater effort could be expended to secure increases of appropriations rather than to cut our suit to fit the cloth that is now available.

Dr. Gunderson cites the additional cost in producing certified milk as an evidence that we cannot allow our esthetic desires to have full sway in milk production. Certainly we must maintain a certain esthetic standard. If not, we would go the other way and require none of the esthetic factors, which would result in perhaps lowering the cost of milk below the present level. I do not think many of us would want to go back to bulk crackers clawed out of an open barrel by a none-too-clean hand or to a number of other practices which have been relegated to the past.

Again, I can hardly agree with Dr. Gunderson when he says, "It is not surprising that our milk control efforts are not producing the results desired." It is admitted that we have not yet reached a standard of quality in our milk supplies that we would like to see, but to anyone who has followed the situation for the past 25 or 30 years the improvement has been outstanding and much of it has been secured with rather crude working tools.

It is perfectly true that environmental conditions have an effect on the quality of the milk produced. This may not hold true in certain individual or fairly isolated cases, but when we take large groups of farms it does hold true. Scores made with the dairy farm score cards on hundreds of dairy farms show that there is a definite relation between the score of the farm and the bacterial count of the milk. It may be true that certain things are enumerated which have no definite effect upon the milk in any scoring system, but the condition of the establishment or its psychological effect upon the operator does lead to the production of higher quality milk.

Dr. Gunderson cites the continued number of epidemics still reported in the use of raw milk as an evidence that our present milk quality standards are unsatisfactory. To me it is a wonder that, with the expansion of market areas and the taking on of new producers uneducated in the production of milk, the present incidence of milk-born disease is not even greater than it is.

The author of the article referred to advocates the "instant rejection of inferior milk on the spot" as far superior to routine farm inspection supported by plate counts. I wonder how much platform inspection can be so thoroughly done that it will prevent milk from entering commerce before the results of the platform tests are available. Certainly we cannot hold up milk on the receiving platform until smears are made and a microscopic examination is completed. It seems to me that one of the large questions which is apparently overlooked is the question of producer education, which should be accomplished through farm inspection. In other words, the problem is the same as in our modern preventive medicine, where we seek to find out and prevent foci of infection before they have had a chance to do their damage. I think no one would advocate the filtration or treating of drinking water of a large city without any regard to the sanitary conditions of the watershed. The same is true of milk supply with the added element of producer education.

In the earlier days of milk inspection I have seen many distressing cases where dairy farmers were ordered to appear before the Board of Health on the basis of high bacterial counts and were asked to explain why such counts had occurred. If a reasonable explanation was not forthcoming the supply was shut off. The average farmer at that time and many farmers at the present time were not well enough advised in bacteriology and sanitation to know the answers to these questions. If, however, an inspector can visit the farm and carefully and intelligently go over the equipment and methods used, he should be able to make suggestions that will insure in many cases a fairly uniform supply of high quality milk on that particular farm.

This is not written in criticism of platform inspection or of the particular article referred to. It is simply a plea for redoubled effort to surround all phases of milk production and distribution with as many safeguards as possible and to teach those methods which, if followed, should lighten the burdens of the milk inspectors to a considerable degree.

ERNEST KELLY

Dairy Graduates in U.S.P.H.S.

. . . .

In Mr. Sydney Shepard's article on the educational background of milk sanitarians in the July–August issue, the following statement appears on page 235: "Today, only sanitary engineers may hold commissions as milk sanitarians with the U.S.P.H.S.". I wish to point out that this was formerly the case but is no longer true. During 1943 a number of dairy graduates, veterinarians, bacteriologists, etc., have been commissioned for active duty on milk and food sanitation in the Public Health Service Reserve, and additional appointments are being processed. Other milk sanitarians on duty under Civil Service may be eligible for commission but prefer not to apply. Of the 30 milk and food sanitarians appointed to date for field duty, 5 are engineers (all commissioned), 4 are veterinarians (2 commissioned), 7 are bacteriologists, biologists, etc. (2 commissioned), and 14 are dairy graduates (10 commissioned). It is evident, therefore, that dairy graduates constitute the largest single professional group of Public Health Service milk sanitarians, both in total number and in commissioned personnel, and that engineers comprise a small minority.

The question of the proper qualifications for milk sanitarians is indeed a complex problem and one which must be treated with diplomacy and mature judgment so as to avoid apparent favoritism toward one group or another. Persons with several different types of education can and are rendering valuable service in milk sanitation work. The present war conditions demand the best efforts of milk sanitarians as individuals, the proper utilization of the skills of all of them, and above all the greatest possible unity of effort.

Very truly yours,
A. W. FUCHS
Sanitary Engineer Director
In Charge, Milk and Food Unit

New Books and Other Publications

The Meat You Eat, Report of the New York State Trichinosis Commission, Legislative Document No. 35 (1942). Illustrated. 141 pages.

This report covers the work of the Commission since the appearance of its first report, "Meat for Millions," reviewed in this Journal, September–October, 1941. The present report deals particularly with a survey of meat inspection activities in New York State. Almost 15 pages are devoted to "The Story of Trichinosis"; about 49 pages to "The Meat You Eat" (a popular build-up for inspection); and 9 pages on meat inspection practice in several communities. They reveal indifferent effectiveness: in some cases, plenty of law but poor enforcement; in others, neither.

Another interesting report on trichinosis is *Trichinosis Problem in California: Report of a Survey 1940–1941,* by K. B. Kerr. California Department of Public Health, Sacramento, California. 2 maps. 11 tables. 37 pages.

Bacteriological and Practical Aspects of Paper Containers for Milk, by M. J. Prucha and P. H. Tracy. Bulletin 495, University of Illinois, Agricultural Experiment Station. 1943.

This is a 58-page report of the results of the plant inspections, the laboratory tests, and the consumer reactions to the use of three types of paper containers for milk, as handled by the University of Illinois milk route. The tests were not exhaustive in number, but were numerous enough to confirm reports of others as to the sanitary quality, chemical stability, and consumer acceptance of the paper container.

Elements of Food Biochemistry, by W. H. Peterson, J. T. Skinner, and F. M. Strong. Published by Prentice-Hall, Inc., New York. 1943. 34 figures. 291 pages. $4.00.

This is an elementary text on the biochemistry of food constituents, written for undergraduates. The authors state that the material has been collected during more than thirty years of teaching the subject. Inasmuch as three previous editions in photo offset form have been used for about twenty years at the University of Wisconsin, the experience of the instructors at this great center of food teaching and research attests the practicability of this approach.

The material is well arranged for class room use. Formulas and equations are used extensively, a reliable aid in correlating conventional organic chemistry to this specialized branch of chemistry. The book is logically organized in chapters dealing with Carbohydrates, Fermentation, Food-Products, Acidity, Lipides, Proteins, The Mineral Elements in Nutrition, Water, Vitamins, and Enzymes. An excellent appendix carries tables of proximate composition of food, and especially useful tables of vitamin values expressed in exact mathematical quantities—milligrams per 100 grams of edible portion. Each chapter concludes with review questions and a dozen or so references for suggested reading, striking by reason that practically all titles were written within the past four years.

The format is very good. The printing is large and clear, the paper semi-gloss, and the pages lie flat when the book is open. It reads well.

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Association News

Iowa Association of Milk Sanitarians

Dr. B. W. Hammer, for years associated with the Dairy Bacteriology Department at Iowa State College, has resigned to engage in research with the Golden State Company in San Francisco. Dr. Hammer's work is widely known throughout the country. His book, "Dairy Bacteriology," is used as a text in our dairy colleges in many of the states. He will be missed at Iowa State.

Dr. M. P. Baker, also associated with the Dairy Bacteriology Department at Iowa State College, and past president of the Iowa Association of Milk Sanitarians, has taken a year's leave to associate himself with the Sealtest Laboratories in New York City.

Also of interest to his many friends is the announcement that Doctor I. A. Merchant, formerly Professor of Veterinary Bacteriology at Iowa State College, has been advanced to head the Department of Veterinary Hygiene which includes Veterinary Bacteriology.

The small town milk control units are proving successful in Iowa. The latest such unit includes the towns of Marshalltown, Newton, Grinnell, Toledo, Tama and Traer. The unit is in charge of C. A. Hooven of Marshalltown, where the laboratory is located. Mr. Hooven makes farm and plant inspections and laboratory examinations of milk and its products sold in the various towns. He also keeps the inspection records of all the towns. Each town contributes financial support to the unit in proportion to its population. In this way the unit is self supporting.

James R. Jennings,
Secretary-Treasurer.

Massachusetts Milk Inspectors' Association

The Massachusetts Milk Inspectors' Association had a Fall meeting on October 21 at the Springfield Country Club, West Springfield. The committee on arrangements were Harry R. Hamilton, Adren Allen, and Michael A. O'Connor, assisted by several other members.

The Secretary presented a paper in commemoration of the one hundredth anniversary of the birth of Stephen Moulton Babcock, inventor of the butterfat test.

Nomination of officers was made for election at the annual meeting. This will be held at Worcester on January 5 and 6, 1944, when a two-day program will be given at the Hotel Bancroft. All public health officials interested in milk inspection are invited to attend.

R. E. Bemis,
Secretary-Treasurer.

New York State Association of Milk Sanitarians

The Executive Committee of the New York State Association of Milk Sanitarians met in New York City on October 11, 1943. Among other things, consideration was given to the possibilities of holding an annual meeting in 1944. It appears likely that a meeting will be held unless the Office of Defense Transportation orders otherwise. A study is being made of the possibilities of having several regional meetings in the event that a state-wide meeting should be prohibited.

Typical of the comments on the cancellation of the annual meeting this year is the following:

"We can't seem to feel any holier for your sidetracking our annual conclave."

W. D. Tiedeman,
Secretary-Treasurer.

New Members

ACTIVE

Beechwood, Dr. C. Theodore, Assoc. Milk Specialist, U. S. P. H. Service, 120 State Capitol Bldg., Salt Lake City, Utah.
Doughty, James M., Jr., Supervisor Milk Sanitation, State Dept. of Public Health, Santa Fe, N. M.
Harmon, Prof. Laurence G., Assoc. Professor, Dept. of Dairy Manufactures, Texas Technological College, Lubbock, Texas.
Kehlet, Viggo V., Dairy Inspector, New Jersey Dept. of Health, 104 7th Ave., Long Branch, N. J.
Kirchoff, George F., Acting Director, Bureau of Food and Dairy Inspection, Jefferson County Board of Health, Birmingham, Ala.
Macleod, William R., State Laboratory of Hygiene, Health Dept., State House, Concord, N. H.
Sommer, Prof. Hugo H., Dept. of Dairy Industry, University of Wisconsin, Madison, Wis.

ASSOCIATE

Davis, Joseph T., Sales Representative, Calgon, Inc., 4504 N. Hermitage Ave., Chicago, Ill.
Dennis, T. M., Milk Inspector, Calhoun County Health Dept., 624 Keith Ave., Anniston, Ala.
Evans, Merton P., Sanitation Inspector, Sheffield Farms, 11 Church St., Newark, N. Y.
Glick, Dr. Dudley Peters, Assoc. Prof. Bacteriology, Colorado Experiment Station, Fort Collins, Colo.
Kaeser, W. G., Pet Milk Co., Madison, Wis.
Link, Thos. B., Principal Sanitarian, Washington County Health Department, Jonesboro, Tenn.
Loomis, Miss Lynette J., Laboratory Technician, General Dairy Corp., Afton, N. Y.
Murphy, Wm. J., Dairy Commissioner, State Department of Agriculture and Labor, Bismarck, N. D.
Rohde, G. M., Jr., Mgr. Rural Electrification, Westinghouse, 211 Adeline Ave., Mt. Lebanon, Pa.
Rose, A. G., Mgr., The Universal Milking Machine Co., Waukesha, Wis.

CHANGES IN ADDRESSES

New Addresses

C. E. Clement, Food Distribution Administration, Dairy and Poultry Branch, Room 2647, South Agriculture Bldg., Washington, D. C.
Fox, Wm. K., R.R. 1 North Sheridan Road, Waukegan, Ill.
Gavin, add zone number 15, Buffalo, N. Y.
Johnson, LaMar (Sergeant), Medical Detachment, Hammond General Hospital, Modesto, Cal.
Russell, David A., 10 Rowe St., Newport, Maine.
Stedman, M. A., Grandview Dairy Co., Wallace, N. Y.
Tranmal, Henry, 1000 Grove St., Evanston, Illinois.
Welch, R. C., Wilbur-Suchard Chocolate Co., Inc., Lititz, Pa.

"Dr. Jones" Says—*

The "phosphatase test"? Yes, I know something about it; not as much as some people but I can tell you what it is. It's a test that shows whether milk is pasteurized or not—and how well. Yes, sir, it's one of the most important developments in the field of milk sanitation in years—the phosphatase test is.

Pasteurization—of course you know that's heating milk to a temperature of 143° for 30 minutes; that's the common way. When that's done it'll kill any disease germs that might get into the milk. But to do an effective job the apparatus has to be properly constructed, in good working order and be properly operated.

The apparatus itself—there's various things that can happen: the temperature-regulating devices can get out of kilter so it won't get up to the right temperature or be held the full time or a valve can get worn so it'll leak raw milk into the pasteurized—and so on. Then there's what you'd call the "human element," like the operator getting careless or in too much of a hurry. Before they had this test they had to depend on inspection, and some of these things, they might not catch 'em.

Well, this test—it was developed first over in England and it's been improved on since. I wouldn't attempt to explain just how they do it but it's based on the fact an enzyme, phosphatase, that's in milk, is destroyed by heat—the amount required for pasteurization. A phosphate combination they use in the test—if this phosphatase is still there it'll break it up and that lets something loose that works on something else, and they finally get a blue color in the test tube. Deep blue means raw milk. If it ain't so blue it's partly pasteurized. If it's just faint blue it's properly pasteurized: practically all the phosphatase destroyed. They compare the colors with a color scale and read the results. If there's any raw milk there it'll show up.

One place they started taking samples one Monday morning, and they picked up a bottle of cream, labeled "Pasteurized." This was from a high-class concern. The test showed it was raw. They investigated and it seems the boss went away over Sunday and the fellow he left in charge, he ran out of pasteurized cream so he filled up the rest of the bottles with raw. I expect he hadn't heard of the phosphatase test up to then. Another place a bad valve was letting raw milk leak in and—oh, there's any number of things it'll show up.

Of course right now—this war situation—shortage of help and they can't get new equipment, this checking on pasteurization is especially important.

Paul B. Brooks, M.D.

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* Health News, New York State Department of Health, Albany, N. Y., May 10, 1943.

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To the International Association of Milk Sanitarians, Inc.:

Application for ☐ Active ☐ Associate Membership

(Membership includes subscription to Journal of Milk Technology)

Name ....

Address (mailing) ....

PRESENT POSITION

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

Organization ....

PREVIOUS POSITION

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

Organization ....

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

Organization ....

GIVE FOLLOWING INFORMATON

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

Give additional information you desire to have considered

....

....

....

Application endorsed by

Active or Associate member } ....

....

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

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

Active Membership open to Government officials and employees.

Associate Membership open to members of industry and others.