

OBSERVATIONS ON THE PASTEURIZATION AND SUBSEQUENT HANDLING OF MILK IN CITY MILK PLANTS

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The business of handling and distributing milk in cities has reached a point of considerable importance. It is a business which must be considered as an "essential business" and of equal or greater concern to the general welfare of the community than the questions, food, clothing, housing, water supply and waste disposal.

Importance is placed upon this business because of the fact that milk is an essential food, it is a cheap source of animal protein and fat in a form which is practically 100 per cent digestible. The health of the community may become vitally concerned if the proper attention is not given to the question of safe production and handling of milk.

From the point of view of many health officials, who are apparently well informed on the subject, the pasteurization of all milk has been advocated as a solution of the many dangers that are liable to come from using raw milk.

It has been found, however, that the requirement of pasteurization alone does not solve the problem but that inspection developed to its highest practical degree followed by proper pasteurization brings the best results.

In other words, the pasteurization process was never intended to be used or advocated as a remedy for unclean or slack production under insanitary conditions, but rather to eliminate certain risks which cannot be eliminated in any other way, after the supply has been brought to a point of reasonable safety by inspection and education.

Within the last few years a large proportion of the milk supply in American cities has been sold as pasteurized milk and it seems reasonable to assume that the sale of this milk will continually increase.

The greatest feature of the process of pasteurization, *properly performed*, is that while no valid objections can be raised against the process, it causes an additional degree of safety in milk produced and handled even under the most effective system of inspection.¹

Doubtless it is the desire of every owner of a pasteurizing device to secure as high a degree of efficiency from the process as is possible and this paper has been prepared for the purpose of reviewing some of the observations that have been made on attempts to perform the process and the subsequent handling of milk.

It must be understood that the mere presence of the pasteurizing apparatus in the milk plant and the running of the milk through such apparatus without special attention to temperature and time and without proper cooling and storage under direct supervision by the manager or some other properly informed person does not secure desired results.

The process will not perform itself nor can it be left to inexperienced help who lack interest, and knowledge of the functions of the process. Pasteurization calls for supervision and control. In most of our cities there is a great lack of this proper control, and supervision by inspectors and health officers.

It may be that inspectors and health officers need to be enlightened as to how to carry on the proper supervision and control in order that they might in turn enlighten some milk plant owner who wishes to do what is proper.

There seems to be a growing tendency on the part of health officials to leave the supervision and control to the pasteurizing plant itself and to measure its efficiency by the bacteria count of the milk when delivered to the public.

The failure of some plants to come within the city requirements for bacteria count is no reason for condemning the process of pasteurization. It is in just such cases where the inspector should step in and help rather than criticize. A little education will often produce marked improvement and the dealer would be able to meet the city regulations.

¹ United States Department of Agriculture Bulletin 342.

This supervision and control of pasteurizing in milk plants can best be accomplished by trained men who have authority to carry on bacteriological control of the process. This control should be based only on accurate data which is current with the existing process. Because health departments have not interested themselves more deeply in this subject of control and assistance we find quite a few milk plants depending on private laboratories established for this purpose. Samples to these laboratories sometimes come from considerable distance and accurate tests are usually not possible. Such results usually tell of the difference between the raw milk entering the plant and the pasteurized milk after it is bottled and the number of samples tested for this information were usually limited to a few.

It seems to be the custom to expect a bacterial reduction of 99 per cent during pasteurization. This may be accomplished in some instances but the efficiency of the process can not be based on the per cent of bacteria destroyed. The condition of the milk when it is actually used is essential.

Often 99 per cent of the bacteria may be destroyed and yet the milk may still contain hundreds of thousands while in other cases in which it contains only tens of thousands the per cent of reduction may have been only 80 to 90.²

Because of the fact that not all of the bacteria are destroyed by pasteurizing the milk is therefore not sterile, it is still a perishable product and it must be handled, stored and used with the same precautions as raw milk. This point is too often lost sight of by all who have to do with pasteurized milk and for the protection of all concerned the proper labeling of the container with the date of pasteurization has proved to be best in increasing trade and satisfying consumers.

Pasteurization adds expense and from a strictly business point of view it is difficult to understand why, after the process has been properly performed, any manager will allow the results to become void because of some subsequent operation which causes inoculation of the milk.

² United States Department of Agriculture Bulletin 342.

TABLE I
Pasteurization tests

DATE	RAW			HEATED			HELD			COOLED			BOTTLED	
	Place received	Temperature	Count	Place	Temperature	Count	Time	Temperature	Count	Place	Temperature	Count	Temperature	Count
							minutes							
June 6	Vat	71.0°	682,000	Holder	143.0°	83,000	30	145°	2,000	Bottler	60°	1,000	63°	13,600
June 8	Vat	72.0°	942,000	Holder	143.0°	105,000	30	144°	4,600	Bottler	60°	3,860	66°	11,400
June 8	Vat	72.0°	975,000	Holder	143.0°	86,000	30	144°	6,000	Bottler	60°	2,400	64°	9,600
June 13	Vat	72.0°	145,000	Holder	142.0°	30,000	30	144°	1,070	Bottler	48°	1,040	60°	2,000
June 13	Vat	72.0°	265,000	Holder	142.0°	30,000	30	144°	2,600	Bottler	48°	1,540	56°	3,000
June 15	Vat	70.0°	572,000	Holder	142.0°	71,000	30	143°	4,200	Bottler	50°	3,500	58°	2,800
								143°	3,700	Bottler	50°	4,400	58°	2,300
June 18	Vat	68.0°	381,000	Holder	142.0°	39,100	30	144°	500	Bottler	59°	300	54°	800
June 18	Vat	68.0°	278,000	Holder	142.0°	41,400	30	144°	500	Bottler	59°	300	54°	800
		70.6°	530,000		142.4°	60,700		144°	3,146		56°	2,038	59°	5,744
										Reduction 99 per cent			Reduction 99.6 per cent	

It is likewise difficult to understand just why the milk is allowed to pass through the pasteurizing apparatus under no supervision or control expecting the apparatus to do the work by itself.

Cases which illustrate these points are not difficult to find. It is not because there is anything at fault with the process of pasteurization as it should be done but rather that the process has merely been attempted and in reality no favorable results have been obtained.

To illustrate an instance where inoculation has occurred after the process has been performed and where the milk has not been properly cooled the preceding table is given showing actual tests at a large milk plant.

It will be noted that the reduction in bacteria count after the milk is cooled is 99.6 per cent and that it is 99 per cent after it is bottled. Without further comment such a reduction would seem to indicate that the pasteurizing was being done very efficiently but let us study the facts closer.

Having gained a reduction of 99.6 per cent it would seem to have been the best policy to have maintained that degree, but this was not done. The loss of 0.6 per cent does not seem to be significant but in reality it means that the average bacteria count was increased from 2038 to 5144 or 152 per cent during the bottling process.

The temperature of the milk increased from 56 per cent to 59 per cent during this process which shows that there was but little if any attempt to maintain the degree of reduction gained by the process itself.

An examination of the empty cans and bottles at this milk plant showed them to be practically sterile and the conclusion was drawn that the bottling machine constituted the source of inoculation after the cooling and prior to the bottling. This was confirmed when sterile water was run through the valves in a bottling machine and bacteria counts made on the water thus collected with the following results:

Bacteria count of water

Valve 1.....	336,000,000
Valve 2.....	126,000,000
Valve 3.....	216,000,000
Valve 4.....	165,000,000
Average.....	210,750,000

The estimate inoculation per 1 cc. of milk when 10 gallons are in the bottling machine would be

Valve 1.....	8400
Valve 2.....	3150
Valve 3.....	5400
Valve 4.....	4125
Average.....	5269

With these facts known it is not difficult to understand why there occurred an increase in bacteria count after milk passed through the bottling machine.

The following table illustrates another instance when the milk was allowed to pass through unsterilized apparatus after the heating and holding for thirty minutes at temperatures varying from 136°F. to 148° or an average of 140°F. This instance shows what usually happens when there is an absence of temperature record control.

The table shows that while a reduction of 97.8 per cent has been secured by the heating process there is an increase in bacteria count of 6 per cent after the milk has passed over the cooler, of 30 per cent more from cooler to bottler, of 33.5 per cent more from bottler to the bottle and of 335.7 per cent more after the milk has been stored for 24 hours before delivery.

From after the heating process until the milk was bottled there was an increase in bacteria count of 84.6 per cent.

The total increase in bacteria count from after the heating process until the milk was delivered was 704.2 per cent.

After the milk had been cooled the temperature was allowed to rise 8°F. Assuming that 300 gallons of milk passed over the cooler and afterwards the temperature increased 8° the loss in terms of ice at 15 cents per hundredweight would be 120 pounds

TABLE 2

DAYS	AVERAGES OF SAMPLES	RAW MILK		HELD			COOLED				BOTTLED		STORED 24 HOURS	
		Tempera- ture	Count	Time	Tem- pera- ture	Count	Off cooler		Into bottler		Tempera- ture	Count	Tempera- ture	Count
							Tempera- ture	Count	Tempera- ture	Count				
14	210	73°	970,000	30 <i>min.</i>	140°	20,475	44°	21,750	47°	28,305	52°	37,800	52°	164,710
				Reduction 97.8 per cent		Reduction 97.7 per cent		Reduction 97 per cent		Reduction 96.1 per cent		Reduction 83.2 per cent		
									TEMPERATURE		BACTERIA COUNT		PER CENT BACTERIA INCREASE	
Average increase off cooler.....											1,275		6.0	
Average increase cooler to bottler.....									3°		6,555		30.0	
Average increase bottler to bottle.....									5°		9,495		33.5	
Average increase bottled to 24 hours old.....											126,910		335.7	
Total increase pasteurizer to bottle.....									8°		17,325		84.6	
Total increase pasteurizer to delivery.....									8°		144,235		704.2	

or 18 cents for the entire amount or $\frac{2}{3}$ pounds per gallon. This represents actual loss and when multiplied by the repetition of the same process for the fourteen days under observation the loss becomes \$2.52. This would be further increased with the frequency of the process.

At another milk plant observations were made on the holding of milk after it had been heated, the holding temperature varying from 85° to 130° for thirty minutes according to the temperature of water in the water jacket surrounding the holding compartments.

The tests were made while the milk was being run through the pasteurizing apparatus by inexperienced men and it clearly shows the necessity of supervision and control of the process. The milk was cooled in the usual way but no attention was given to the temperature at which the milk was held for thirty minutes.

The table shows that after heating raw milk, having a bacteria count of 31,575 and holding it for thirty minutes at 85° there was an increase of 5.7 per cent in the bacteria count. This milk was passed over a cooler, it being the first milk over and the bacteria count was increased 346 per cent above the count of the raw milk.

Heating the raw milk and holding it at 100° F. for thirty minutes resulted in an increase in bacteria count of 39.4 per cent and after it was stored at 44° for twenty-four hours the increase in bacteria count over the raw milk was 789 per cent.

Heating the raw milk and holding it at 110° for thirty minutes resulted in a 42.2 per cent reduction in bacteria count but when stored for twenty-four hours at 44°F. there was an increase of 654 per cent over the original count of the raw milk.

Heating the raw milk and holding it at 115° for thirty minutes resulted in a 59 per cent reduction in bacteria count but after storing at 44° for twenty-four hours there was an increase of 454 per cent over the original count of the raw milk.

Heating the raw milk and holding it at 130°F. for thirty minutes resulted in a 70.2 per cent reduction but after storing for twenty-four hours at 44° there was an increase of 527 per cent over the bacteria count of the raw milk.

TABLE 3
Special tests showing heating and holding milk at different temperatures and cooling in the usual way under actual commercial conditions

RAW MILK				HEATED			COOLED		BOTTLE OR CAN			STORED 24 HOURS		
Before clarifying		After clarifying		Tem- per- ature	Time	Count	Tem- per- ature	Count	Place	Tem- per- ature	Count	Place	Tem- per- ature	Count
Temperature	Count	Temperature	Count	minutes										
42.0°	33,000	90	35,300	85°	30	33,400	40°	1st over 142,000						
42.0°	42,000	90	32,000				40°	140,000						
40.0°	24,000	110	29,600	5.7 per cent increase			346 per cent increase							
40.0°		110	29,400	100°	30	33,700	40°	31,300	Pint	48°	32,500	Pint	44°	265,000
				100°	30	54,400	40°	31,300	Pint	48°	36,200	Pint	44°	297,000
				39.4 per cent increase			8 per cent reduction					789 per cent increase		
				110°	30	19,400	40°	24,600	Pint	48°	32,200	Pint	44°	162,000
				110°	30	17,000	40°		Pint	49°	43,200	Pint	44°	314,000
				42.2 per cent reduction			22.1 per cent reduction		19.4 per cent increase			654 per cent increase		
				115°	30	13,100	38°	17,200	Pint	48°	31,200	Pint	44°	175,000
				115°	30	12,600								
				59 per cent reduction			45.5 per cent reduction		1.2 per cent reduction			454 per cent increase		
				130°	30	9,400	38°	12,000	Pint	50°	38,200	Pint	44°	198,000
				130°	30	9,400								
41.6°	33,000	100	31,575	70.2 per cent reduction			62 per cent reduction		21 per cent increase			527 per cent increase		

The conclusions that can be drawn from these tests are convincing and they prove that the process of pasteurization must not be left to novices but rather to experienced operators who have knowledge of the objects of the process and the correct way to secure and maintain results.

At this same plant a series of tests were made when the heating process was under control but inoculation from some source occurred after the heating.

Inoculation of milk after it has been pasteurized is one of the most important problems of the present day milk problem. It has been pointed out that the failure to properly wash and sterilize milk cans causes them to become a serious source of contamination.³

CONTAMINATION OF MILK CANS

Supplementing these studies the writer has conducted similar tests at twenty-one milk plants located in different sections of the country. These studies however were concerned with freshly washed cans which were to be filled with pasteurized milk for the trade. To determine the initial inoculation which would be given to milk placed in the cans the same technic was employed, namely: rinsing the can with 200 to 500 cc. of sterile water, drawing off some of the rinse water from each can and making a bacteriological examination of it. By running high dilutions on the sample of rinse water the total bacteria count of the can may be computed. The result is then divided by the capacity of the can in cubic centimeters, the final result being the estimated initial inoculation given by the can to 1 cc. of milk.

This will be the initial inoculation of bacteria which will develop under favorable conditions either in the milk or in the can itself.

It is therefore important to reduce this initial inoculation to the minimum. In the examination of 236 milk cans under all conditions of washing and steaming the initial inoculation when ready for filling was found to vary between zero and 7,920,000

³ Observations on the washing of milk cans. R. O. Webster and R. S. Smith, (*Int. Assn. of Dairy & Milk Inspectors*, Report 1917, pp. 54-56.)

TABLE 4

DAYS	AVERAGE OF SAMPLES	RAW MILK				HEATED			COOLED		BOTTLE OR CAN		STORED 24 HOURS	
		Before clarifying		After clarifying		Temper- ature	Time	Count	Temper- ature	Count	Temper- ature	Count	Temper- ature	Count
		Tem- per- ature	Count	Tem- per- ature	Count									
5	128	45.7°	54,074	84°	152,375	145°	minutes 30	6,240	45.2°	8,452	51°	15,592	42.2°	24,386
						96 per cent reduction			94.4 per cent reduction		89.7 per cent reduction		85 per cent reduction	

	TEMPERATURE	BACTERIA COUNT	PER CENT BACTERIA INCREASE
Increase off cooler		2,212	35.4
Increase cooler to bottler	5.8°	7,140	83.4
Bottled to 24 hours old.	Decreased 8.8°	8,894	57.0
Total increase pasteurizer to bottle	5.8°	9,352	149.8
Total increase pasteurizer to delivery	Decreased 3°	18,146	290.8

bacteria. The following table shows to some extent why can washing in different pasteurizing plants plays an important rôle in the condition of the milk after it has been pasteurized, it being understood that initial inoculation is noted and not the growth in the milk as the result of the initial inoculation of bacteria.

Typical results of examination of freshly washed milk cans from different plants

Different plants and varied conditions:	Average
Initial bacterial inoculation of 30 cans varied from 30.0 to 162....	82.0
Initial bacterial inoculation of 4 cans varied from 23.0 to 945....	264.0
Initial bacterial inoculation of 10 cans varied from 2.0 to 120....	42.6
Initial bacterial inoculation of 3 cans varied from 1.0 to 48....	17.6
Initial bacterial inoculation of 29 cans varied from 37.0 to 2250....	684.0
Initial bacterial inoculation of 10 cans varied from 2.7 to 100....	38.2
Initial bacterial inoculation of 10 cans varied from 18.0 to 16....	5.2
Initial bacterial inoculation of 24 cans varied from 1.1 to 75....	41.0
Initial bacterial inoculation of 25 cans varied from 0.2 to 562....	52.8
Initial bacterial inoculation of 6 cans varied from 60.0 to 360....	168.3
Initial bacterial inoculation of 19 cans varied from 12.0 to 840....	207.0
One plant:	
Cans placed over steam jet, 10 cans varied from 52 to 675.....	206.6
After new can steamer was installed, 9 cans varied from 1.5 to 441	97.3
Difference of 53 per cent due to new steamer.	
One plant:	
Clean water and steam jet and drainage, 5 cans varied from 80 to 2,750.....	1010.0
Two other days, 13 cans varied from 500,000-7,920,000 (gas in 100 per cent of tests).....	2,277,900
Dirty water and steam jet no drainage, 6 cans varied 1,200,-000-5,490,000 (gas in 50 per cent of tests).	

It is interesting to note that gas formers were found to be present in the drain water from all of the 13 cans examined at one plant on one day and in 3 of the six cans examined on the other day and that the presence of gas formers in the milk from this plant was in part attributed to this source.

Too much emphasis cannot be given to the fact that only thorough washing, steaming and drying produces a sterile container for milk and that milk should not be allowed in any other than a sterile container at any time, and particularly if the milk has been pasteurized or otherwise heated. Voiding of the process of pasteurization by introducing inoculating factors is poor policy. Not only is the object of the process defeated and the

time and cost of operation lost but the condition of the milk may become an actual menace to the health of the community.

EXAMINATION OF MILK BOTTLES

The washing and sterilizing of returned empty milk bottles to a city milk plant constitutes a big problem. Bottles are received in varying conditions of cleanliness and from the many and varied sources of collection and it becomes somewhat of an accomplishment to make them sterile containers for milk.

Under varying conditions of washing and steaming at different milk plants the initial inoculation which would be given to the milk by the empty bottle was found to vary from zero to 1636 bacteria per cubic centimeter. A total of 268 empty bottles have been examined by rinsing with 20 to 30 cc. of sterile water and then making a bacteriological determination of the rinse water and dividing the result by the capacity of the bottle in cubic centimeters.

Typical results of examination of empty milk bottles
(Bottles were ready to be filled with milk)

			<i>Average</i>
Initial inoculation of	16 pint	bottles varied from 0.3 to 1008...	23.9
	5 pint	bottles varied from 4.1 to 126...	52.1
	4 pint	bottles varied from 32.0 to 57...	44.4
	45 pint	bottles varied from 0.0 to 900...	72.3
	6 pint	bottles varied from 2.0 to 36...	13.6
	10 pint	bottles varied from 61.0 to 1408...	392.2
	10 pint	bottles varied from 33.0 to 1130...	236.0
Tests at same plant	12 quart	bottles varied from 26.0 to 1636...	482.2
	22 pint	bottles varied from 28.0 to 245...	89.5
Tests at same plant	12 pint	bottles varied from 55.0 to 228...	141.0
	10 quart	bottles varied from 25.0 to 143...	82.0

While the inoculation may be deemed small in some instances it must be emphasized that the tests show the initial inoculation which would be present and which would develop rapidly under favorable conditions in the milk.

It is interesting to note the difference in the result of the different milk plants and in the difference in results on pint and quart bottles in the same plants. The amount of drain water in 22 bottles in one plant taken at random from bottles

stored without inverting in cases showed a range of from 1 cc. to 6.2 cc. with an average of 2.8 cc. Such bottles stored in a warm room and having drainage present to act as an inoculating agent are hardly suitable final containers for milk especially if the milk has been pasteurized.

The inoculation from the empty bottle can be reduced to a minimum by thorough washing, steaming and draining and as this is possible and highly important from a health point of view no other method should be tolerated.

Placing pasteurized milk in a bottle which has not been sterilized just previously lessens the efficiency of the pasteurized process and helps to defeat its purposes.

EXAMINATION OF MILK BOTTLE CAPS

In the examination of 2166 milk bottle caps in batches of from 28 to 68 taken from the caps in use at different pasteurizing plants the initial inoculation per cubic centimeter of milk from the cap was found to range from zero to 453. The surface in contact with the milk is limited to the under side of the cap.

The bacteriological examination of batches of caps washed with sterile water in the laboratory showed a high total count present in some instances but when divided by the number of caps and by one-half the cap surface the inoculation to 1 cc. of milk became small.

<i>Typical results in the examination of milk bottle caps</i>		<i>Average</i>
Initial bacterial inoculation of	206 bottle caps varied from 0.01 to 4.....	1.2
	33 bottle caps showed no inoculation	
	28 bottle caps showed no inoculation	
	41 bottle caps showed no inoculation	
	45 bottle caps showed no inoculation	
	68 bottle caps showed no inoculation	
	33 bottle caps showed no inoculation	
	35 bottle caps showed no inoculation	
	207 bottle caps varied from 2.3 to 12.8...	3.8
	84 bottle caps varied from 20.0 to 453.0...	5.6

A special study was made at one pasteurizing plant on different days to see if any difference existed between the use of loose

advertising bottle caps and the caps used in tubes as they are received.

Advertising caps

(Furnished by a local shoe repairing company and used on bottles of pasteurized milk)

		<i>Average</i>
Initial inoculation of	50 bottle caps	3.3
	70 bottle caps	6.4
	80 bottle caps	1.2
	56 bottle capr	2.2
	52 bottle caps	1.7
	34 bottle caps	1.9
	52 bottle caps	3.5
	—	
	394	3.6

Bottle caps in closed tubes

Initial inoculation of	52 bottle caps	0.9
	62 bottle caps	0.08
	48 bottle caps	0.2
	40 bottle caps	0.1
	40 bottle caps	0.1
	58 bottle caps	0.1
	40 bottle caps	0.8
	—	
	340	0.4

These tests show that the advertising caps furnished by the shoe repairing company in bulk in open boxes had an initial inoculation of 88.8 per cent greater than the caps in sealed tubes. The fact that the bulk caps had to be nested for use in the capping machine caused a handling that is avoided when tube caps are used.

While the initial inoculation from milk bottle caps may be small the importance of handling and of storage of the caps especially in bulk lots should not be overlooked. Often we find the caps being inserted by hand, a practice that should not be tolerated. While it may not be possible to measure the result by bacteriological examination the danger from possible typhoid carriers should serve as a warning against the practice and the necessity for the utmost precautions.

CONCLUSIONS

The process of pasteurization of milk as it is carried on in many city milk plants should receive more detailed attention.

In many instances only an attempt at the process is being made. This being due to either lack of attention or to the absence of understanding on the part of the operators as to the functions and reasons for the process.

Although the process causes a reduction of bacteria the per cent of the reduction is not a measure of the efficiency of the process.

If the milk becomes reinfected after the heating and holding process the intent of the process becomes void. Time and temperature control of the process together with bacteriological tests at different stages and afterwards is necessary if a safe product is to result.

City health officials should not rest assured of a safe product because of the mere presence of a pasteurizing plant in their city. Special attention must be given to the operation of such a plant in view of the fact that it is a chance source of infection of any sort to the entire community.

The operation of pasteurizing plants where the indiscriminate heating and handling is carried on as a remedy for poor milk condition under the guise of pasteurizing should be checked.

Permits for the sale of "pasteurized milk" issued by the health department only to such plants as have complete pasteurizing equipment with recording devices and where subsequent handling methods insure a safe product to the consumer will be a step in advance toward the present problem.

Bacteriological control of the process and of the condition of the subsequent containers and contact surfaces is essential, this examination should not be left to the pasteurizing plant but should be made frequently by competent officials under the direction of the health officials responsible for the health of the community. Employees whose duties bring them into contact with the milk after it has been pasteurized either directly or indirectly by contact with surfaces likely to be reached by the milk, should be medically examined frequently. All such persons

should be given the prophylactic preventative treatment now given by the army and navy.

The inoculation of pasteurized milk from improperly washed cans constitutes a problem that has been neglected. Only when a can is properly washed, steamed and dried should it be considered as a sterile and proper container for pasteurized milk.

The inoculation of pasteurized milk from improperly washed bottles makes it possible for the milk plant to become a disseminator of infection from many sources under the protection of the term pasteurized milk.

Only when bottles are properly washed, steamed and stored should they be considered as containers for pasteurized milk.

The inoculation of pasteurized milk from milk bottle caps is necessarily small because of the limited contact surface but nevertheless hand capping and the use of caps in bulk lots, especially those bearing advertising not related to the milk business and which are promiscuously stored and handled should not be tolerated.

The utmost precaution in the process of pasteurization of milk at proper temperature for the proper time and the elimination of the chances of reinfection or inoculation of the milk from persons and surfaces after the process has been properly performed constitute a vital and ever increasing problem.

It is hoped that some facts have been brought to the attention of owners and operators of pasteurizing plants that will cause them to realize their responsibility. It is also hoped that health officials and milk inspectors may also realize the extent of this current and future problem and that control and enlightenment are essential.