A STUDY OF WELDED LINES FOR PROCESSING MILK[1]

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A study was made of the sanitary aspects of using welded lines in the processing of milk. The criteria used included visual examination, swab tests, rinse tests and standard plate and coliform counts on the milk at various stages of the processing.

The results indicate that the use of welded lines of the type used in this plant in conjunction with an automatic CIP system is satisfactory for processing Grade A milk.

The cleaning of milk lines in-place (CIP) has rapidly gained popularity due to savings in labor and materials and to the sanitary efficiency of this system. Much research has been conducted on CIP methods. The fact that the Milk Ordinance and Code recommended by the U. S. Public Health Service accepts this method is evidence of its efficiency. Since CIP lines are not disassembled daily, the use of welded connections for permanently installed lines offers possibilities for savings, provided such construction would not impair the sanitary quality of the milk and milk products.

Havinghorst (*1*) presented the results of using welded lines in a milk plant in California. Bacterial counts were reported for the various fluid milk products processed during the last 16 weeks of operation of an old plant with conventional lines and manual CIP system, and for the first 15 weeks of operation after moving into a new plant with permanently welded lines and "push-button" CIP system. The average bacterial counts were lower on all six products processed with the welded lines and automatic CIP system compared to the counts obtained when the manual CIP system and conventional lines were used.

The work herein reported involved a study of the sanitary aspects of using welded lines in a milk plant processing Grade A milk products. A new milk plant was constructed in Oklahoma City and permanently welded milk lines were installed with the permission of the Local and State Health Departments. These agencies together with representatives of the U. S. Public Health Service assisted the plant personnel and the Oklahoma Agricultural Experiment Station in planning the study undertaken[3].

The U. S. Public Service Milk Ordinance and Code, 1953 edition, permits the use of welded sanitary milk lines where crosses or tees are placed at each change of direction to permit inspection. The plant studied in this work varied from that permitted under the Milk Ordinance and Code in that welded elbows were used instead of the crosses or tees. Permission by the regulatory agencies for the use of the welded elbows was granted on the basis of an experimental installation for the purpose of obtaining data on such construction.

General Procedure

The connections in the milk lines were welded by a method of fusion of the metal by heat in the presence of argon gas to prevent oxidation. These welds with slightly raised beads, were free from pits and crevices but, since they were not polished, they were slightly rougher than the adjoining polished interiors of the pipes. To facilitate sampling, four special inspection ports were installed in the lines: one each on the holding tube of the HTST pasteurizer, the skimmilk line to the cheese making room, the cream line, and the pasteurized milk line. These latter two were near the entrance to the holding tanks for the pasteurized products. In addition, a four foot removable section of pipe, the sanitary connection to the cream pump, and tees located at the fronts of two of the raw milk holding tanks provided a total of eight inspection and sampling ports for the study.

The plant employed an automatic CIP system controlled by a Taylor "Flex-O-Timer." The procedure involved a 1-minute rinse with cool water, 20-minute circulation of alkali and a 1-minute final rinse with water. The alkali solution was made up of 6 pounds of a commercially available chlorinated detergent per 100 gallons of water. The alkali solution was cir-

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culated at a return temperature of 145°F. and at a velocity of approximately 8.75 feet per second. All lines were sanitized just prior to use by rinsing with a solution containing 200 ppm available chlorine.

At each examination several criteria were used to determine the sanitary condition of the milk lines and the equipment associated with the processing of the milk. At each of the eight inspection ports, visual examinations were made with the use of a flash light. Swab tests then were made, the ports closed and rinse tests were run with chlorine treated water and the Millipore technique (2).

For this test approximately 30 gallons of tap water were placed in the surge tank between the pasteurizer and homogenizer and chlorine solution was added to give 20 ppm. This was allowed to react 10 to 20 minutes and then sufficient sterile sodium thiosulfate was added to neutralize the chlorine and a sample was taken for analysis. The water then was pumped through the homogenizer and approximately 50 feet of line to the top of the surface cooler. A 200-ml. sample was taken at this location after most of the rinse water had passed through the lines. The samples taken before and after passage through the milk handling equipment then was filtered through type HA Millipore filter, using 10- and 100-ml. quantities. The media used for developing the colonies were BBL No. 330 M-Endo broth and BBL No. 01-417 M-dextrose tryptone broth for coliforms and total counts, respectively.

Standard plate counts were run on the raw milk and on these same samples after laboratory pasteurization. High-temperature, short-time pasteurization was used in this plant. An exposure of 143°F. for 30 minutes was used for the laboratory pasteurization because of inherent difficulties in control of time and temperature in HTST laboratory pasteurization.

At the beginning of the day's operation, samples were taken at various stages of processing to determine the degree of contamination from the various sources. Standard plate counts and coliform counts were run on these samples. All sampling and plating was done in accordance with the procedures in *Standard Methods for the Examination of Dairy Products* (3). Standard plate counts were run on Plate Count Agar (Difco) and the plates were incubated at 92°F. Coliform counts were run on desoxycholate agar (Difco) No. B-273 and the plates were incubated at 95°F. The plating was done by Experiment Station personnel in the well equipped plant laboratory, except for a few trials at the beginning of the study when the samples were iced and transported to the laboratory at Oklahoma State University for plating. Both the University laboratory and the laboratory of the milk plant were checked by a representative of the Oklahoma State Health Department for uniformity of compliance with *Standard Methods for the Examination of Dairy Products*. For certain samples with very low counts which yielded less than 30 colonies per plate a special technique was used. The count was determined on a one ml. sample by placing approximately half the milk in each of two plates and counting the total colonies developing on the plates.

Comparisons of the bacteriological quality of the products from the plant used in the study and those from similar plants in the same locality were made by obtaining the counts run by the Oklahoma City Health Department and the Oklahoma State Health Department. These latter plants employed conventional milk lines and manually operated CIP procedures.

Examinations were made on each day of operation during the first 2 weeks (8 trials), at weekly intervals during the next 3 months (14 trials) and at monthly intervals during the remainder of the study (7 trials) for a total of 29 examinations. The general procedure was to arrive at the plant just before the beginning of the day's operation at 1 to 3 A. M. without prior knowledge of anyone in the plant. Visual examinations, swab tests and rinse tests were run just before the pasteurizer was put in operation. Samples of the raw milk and first pasteurized milk through the lines were taken at different stages of the operation. Additional samples of raw milk as it entered the pasteurizer and of the finished pasteurized milk were taken at hourly intervals. All samples were iced immediately and plated as soon as possible. Normally the entire inspection and sampling required 8 to 10 hours.

RESULTS AND DISCUSSION

Visual Examinations

The visual examination of the pipe lines at 8 selected locations revealed no accumulation of milk stone at any time during the 11 months the plant was under observation. After approximately 5 months and again after 8 months of operation, sections of line, including welds, were cut out for close inspection. The welds were free from pits and crevices and there was no accumulation of milk stone. The welds appeared to be slightly raised above the adjoining interior surface of the line and had slightly wavy appearances. The dark color of the metal that was apparent just after welding had been entirely removed by the CIP cleaning.

Swab Tests

Swab tests were run in 28 of the 29 trials. Because of the limited surface area accessible, an area

TABLE 1—SWAB TESTS ON MILK LINES AT EIGHT SELECTED LOCATIONS (28 TRIALS)

Location	No. >100	Counts per 8 sq. in. Maximum	Log. av.
Skim milk line to cheese room	2	19,000	12
Raw milk line, tank No. 4	4	460	18
Raw milk line, tank No. 1	7	200,000	49
Pasteurizer holding tube	4	1,200	8
Connection to cream pump	3	560	7
Pasteurized cream line	2	320	8
Pasteurized milk line	3	100,000	9
Pipe section in cheese room	6	9,300	14

of approximately 8 sq. in. was swabbed at each of the 8 locations selected to give representative sampling points in both the raw and pasteurized milk line systems.

The standard plate counts of the swab tests are shown in Table 1. Coliform counts were also run on desxoychocolate agar but only two samples were positive, each with one colony per plate. The standard plate counts are shown as the number per 8 sq. in. with counts of 100 or less being satisfactory according to "Standard Methods" (3). The results revealed generally low swab counts, with most of them well below the standard of 100 per 8 sq. in. However, it appeared that the lines were not properly sanitized in a few instances. A notable example was the one count of 100,000 (est.) on the swab sample from the pasteurized milk line. Since only two other counts (260 and 270) at this particular location were above 100, it appeared that the extremely high count must have been due to the lack of the usual sanitizing by rinsing with chlorine. The results indicate, in general, that when the prescribed cleaning and sanitizing procedures were used, the welded lines were in satisfactory sanitary condition.

Rinse Tests

The results of the rinse tests, run at the time of the last 8 monthly inspections, are shown in Table 2. It appears that the rinse water used was not sterile in any of the trials as the counts ranged from 11 to 840 per 100 ml. In 4 of the trials there appeared to be an increase in total count incident to passage through the milk line; however, in the remaining 4 trials there appeared to be a decrease which may have been due to residual chlorine in the line from the sanitizing treatment. In two trials there appeared to be significant increases in coliforms, while in the remaining 6 trials no coliforms were found in 100-ml. quantities of the rinse water. The results indicate, in general, that the lines were receiving satisfactory sanitizing treatment prior to use. It should be emphasized that if the counts recorded were reduced to a per ml. basis, the counts on the rinse waters would all be less than 5 per ml.

Line Counts

Samples of milk were taken at various stages of processing to detect the extent of contamination from the equipment with which the milk came in contact. A total of 29 trials (see Table 3) were made but these are reported in two sections of 14 and 15, respectively, because of a change in sampling procedure for the last 15 trials.

The first 14 trials were run from March 29 to May 22, 1958, inclusively. The plant operated four days a week and the first 8 trials were on every day's operation for the first two weeks and the remaining 6 trials were at weekly intervals. The samples were taken at the following locations:

TABLE 2—RINSE COUNTS OF WELDED LINES PRIOR TO USE (MILLIPORE TECHNIQUE)

Date	Number of colonies per 100 ml. of rinse water before and after passage through milk lines					
	Total counts			Coliform counts		
	Before	After	Change	Before	After	Change
July 26, 1958	840	360	−480	0	50	+50
August 27, 1958	11	13	+2	0	0	0
September 29, 1958	20	80	+60	0	0	0
October 27, 1958	120	0	−120	0	0	0
November 29, 1958	31	0	−31	0	0	0
December 22, 1958	660	6	−554	0	0	0
January 12, 1959	70	200	+130	0	0	0
February 26, 1959	420	460	+40	10	92	+82

1. Raw milk from surge tank immediately before pasteurization.
2. Pasteurized milk either from the surge tank between the pasteurizer and the flow metering pump, or from the sanitizing solution drain valve.
3. At the inlet to the surface cooler after passing through the homogenizer and approximately 50 feet of 2-inch milk line.
4. From trough after passing over the surface cooler.
5. From pasteurized milk storage tank taken from a tee at the front of the tank on the milk line to the carton filler.
6. At inlet to filler bowl after passage through approximately 75 feet of 2-inch line.
7. From filler bowl.
8. Fifth carton filled by the ½ gallon Pure-Pak Machine.
9. Half gallon carton taken at random after filling several cases.

After the first 14 trials the sample from the pasteurizer (No. 2) was eliminated because of difficulty in getting a satisfactory sample. Also, the sample from the bottom of the surface cooler (No. 4) was eliminated because the counts were practically the same as those taken as the milk entered the top of the cooler. In place of these samples, collections were made from the outlet of the pasteurized milk storage tank and at the inlet to the filler bowl.

The data show that there appeared to be a slight build-up of contamination during the handling of the pasteurized milk from the pasteurizer to the finished carton and that the contamination was excessive in only a few instances. The average standard plate counts in the first 14 trials show a marked decrease from the pasteurizer to the inlet to the surface cooler. From close examination of the individual counts, it appears that the sampling procedure for the samples taken from the pasteurizer was unsatisfactory as coliforms were detected in 5 of the 14 trials, whereas no coliforms were found in laboratory pasteurized samples of this same milk. It appeared that the drain valve and pipe from which the samples were taken were not exposed to the sanitizing solution long enough during the drainage of this solution from the system. Another factor partially responsible for the lower counts on the milk samples taken at the entrance to the surface cooler was the dilution with residual sanitizing solution in the line. This was verified by running total solids on several of these samples. They were invariably low – about 5 to 6 percent.

TABLE 3—RAW MILK COUNTS AND LINE COUNTS ON PASTEURIZED MILK

Milk Sample	Standard plate counts			Coliform counts	
	Log. av.	Maximum	No. >2,000	No. positive	No. >10
	First 14 Trials — March 29 - May 22, 1958				
Raw	485,700	18,000,000	14	–	–
From pasteurizer	1,680	5,900	5	5	4
Inlet to surface cooler	440	3,300	2	0	0
Outlet from surface cooler	510	3,200	1	0	0
Carton filler bowl	1,280	4,900	3	1	1
Fifth carton	1,560	8,400	3	8	1
Random carton	1,980	13,000	5	3	0
	Last 15 Trials — May 29, 1958 - February 26, 1959				
Raw	110,000	500,000	15	–	–
Inlet to surface cooler	1,040	7,700	3	2	3
Outlet from storage tank	1,590	32,000	5	4	3
Inlet to carton filler	1,340	12,000	5	0	0
Carton filler bowl	1,880	12,000	5	1	0
Fifth carton	1,440	8,900	6	2	0
Random carton	1,340	7,500	6	2	1

The results in the first 14 trials indicate some contamination from the carton filler machine as shown by the increase in total counts and incidence of positive coliform tests after passage through the filling machine. It may also be noted that the average total count on the random carton was 1,980 compared to 1,560 for the fifth carton. However, there was only three samples with positive coliforms on the random cartons compared to eight for the fifth carton.

The results obtained in the last 15 trials were, in general, better than those in the first 14 trials. The counts on the raw milk supply were much improved and the average count on the pasteurized milk was significantly lower. Although there were fewer pasteurized milk counts below 2,000, there were fewer instances of samples with coliforms. The somewhat erratic results obtained during the first few months of operation were probably the result of inexperience on the part of the personnel. This was a new plant with all new personnel, many of whom were untrained or had limited experience in modern dairy plant operations. The very satisfactory results obtained during the latter part of the study are a credit to personnel in adjusting themselves to the operations in this plant.

In the last 15 trials, the average count on the milk leaving the storage tank was 1,590 and after passage through approximately 75 feet of milk line to the filler bowl it was 1,340. This would indicate that there was no contamination from the milk line. The higher plate counts of the milk at the storage tank may have been due to some contamination in the valve and from the tee from which the sample was taken.

The overall picture in the 29 trials indicates generally satisfactory results as the average count on the random cartons was only 1,620 and there were only 5 of these samples positive to coliforms with only one having more than 10. The majority of the counts at each of the stages in the handling of the milk were less than 2,000. Using the number of counts over 2,000 as a criterion, it appeared that the carton filler was the greatest source of contamination.

Counts on Plant vs. Laboratory Pasteurization

In 25 of the 29 trials, samples of the raw milk were pasteurized in the laboratory at 143°F. for 30 minutes. The HTST method of pasteurization was used in the plant but was not used in the laboratory because of difficulties in controlling time and temperature for this method. Standard plate counts and coliform counts were run on the laboratory pasteurized samples. While an accurate comparison of these counts with those obtained on the finished milk in the random cartons cannot be made because of the differences in pasteurization exposures used, nevertheless, they agreed fairly well. In the 25 trials run, the logarithmic average count on the laboratory pasteurized samples was 1,460 and in the same 25 trials the average count on the milk in the random cartons was 1,720. Assuming that approximately the same percentage of kill was obtained with the two methods, the results indicate a slight build-up of contamination between the pasteurizer and the finished carton. The fact that no coliforms were detected in any of the samples which were laboratory pasteurized, while they were found in 5 of the 25 samples from the random cartons, indicates that there was some contamination.

Standard Methods (3) states (p. 50): "When Standard Plate Counts of samples of milk collected in sterile containers at bottle filler before bottling begins exceed that of samples removed directly from pasteurizing vats by 100 percent plus 2,000, sanitization of equipment is usually considered unsatisfactory." Using this as a criterion, there were 3 trials out of the 25 in which the equipment was unsatisfactory. An examination of the detailed data indicated that in two of these instances the contamination was primarily from the carton filling machine and in the other trial it was primarily from the pasteurized milk storage tank.

Counts on Random Cartons

Random half-gallon cartons were taken for the line tests and additional samples were taken at hourly intervals while the research workers were in the plant. Standard plate counts and coliform counts were run on 89 samples. A summary of the counts is presented in Table 4. The results show that the majority of the Standard Plate Counts (65) were 3,000 or less and there were only 2 counts over 9,000. The maximum count was 13,000, and the logarithmic average was 1,730. Coliform counts were run on 84 of the 89

TABLE 4—FREQUENCY DISTRIBUTION OF COUNTS ON RANDOM CARTONS OF PASTEURIZED MILK

Standard plate counts		Coliform counts	
Range	No.	Range	No.
<1000	27	<1	70
1000 to 3000	38	1-10	12
3000 to 5000	8	>10	2
5000 to 7000	5	Maximum count	16
7000 to 9000	9		
>9000	2		
Log. av.	1,730		
Maximum Count	13,000		

samples. A majority of these (70) were negative in 1 ml., 12 had from 1 to 10, only 2 had more than 10, and the maximum count was 16. These results indicated generally good sanitary conditions in the plant.

Hourly Samples Examined by Plant Laboratory

Laboratory personnel of the plant under study ran standard plate counts and coliform counts on random cartons of milk taken at hourly intervals during each day's operation. A total of 1,879 samples were taken during approximately 13 months of operation. The results are summarized in Table 5. Since the counts were predominately low and since the milk plant calculated the daily arithmetical average, the averages given are arithmetical rather than logarithmic. The general results indicate good sanitary conditions in the plant as the majority of the counts were very low. The average standard plate count for the 1,879 samples was 1,560, slightly below the average of 1,730 obtained on 89 samples taken by the research workers from the University. The maximum daily average count was 7,340. It may be observed that highest maximum counts and highest daily averages occurred during the months of May through October and that the lowest counts occurred during the months of January and February 1959 with averages of 390 and 320, respectively, on 160 samples each month.

The coliform counts were generally satisfactory as only 109 of the 1,879 samples were positive and only 7 of these had more than 10 per ml., with most of these occurring during the warm months. During February and March, 1959, a total of 316 samples were run and all were negative to coliforms.

Comparison with Milk from Similar Plants

As a further check on the sanitary quality of the milk from the plant with welded lines, counts on milk from other plants operating in the vicinity of Oklahoma City were obtained from the Oklahoma City Health Department and the Oklahoma State Health Department. Personnel from these two agencies selected the plants as being approximately equal in size and method of operation. These plants all distribute milk to several cities in the central part of Oklahoma. Samples of retail packages were taken in 12 cities and the counts were run in the Oklahoma State Health Department Central Laboratory or one of the State

TABLE 5—SUMMARY OF HOURLY COUNTS OF RANDOM CARTONS OF PASTEURIZED MILK

Month 1958	No.	Standard plate counts			Coliform counts		
		Arith. av.	Max. count	Max. daily av.	No. positive	No. >10	Max. count
March	16	1,170	4,100	1,870	7	2	60
April	99	800	4,100	1,670	6	0	4
May	90	2,980	7,800	5,350	1	0	1
June	132	2,590	20,000	5,240	8	0	10
July	141	1,190	6,700	4,780	25	0	10
August	150	2,640	8,400	7,340	18	2	12
September	174	4,070	17,000	6,220	17	2	30
October	174	1,900	9,600	5,340	8	1	12
November	159	1,380	6,100	4,560	9	0	5
December	170	730	2,400	1,530	6	0	2
1959							
January	160	390	2,400	1,060	2	0	1
February	160	320	2,300	780	0	0	<1
March	156	510	2,270	1,290	0	0	<1
April	98	890	2,500	1,370	2	0	4
Total	1,879		20,000	7,340	109	7	60
Average		1,560					

TABLE 6—LOGARITHMIC AVERAGES OF COUNTS OF MILK DELIVERED IN VARIOUS CITIES

City	Plant: A		B		C		D		Plant under study	
	No. Samples	Av. Count	No. Samples	Av. Count	No. Samples	Av. Count	No. Samples	Av. Count	No. Samples	Av. Count
Ada	9	2,600	11	1,900	—	—	9	1,500	11	1,900
Anadarko	6	4,200	9	3,600	4	36,000	—	—	8	3,700
Chickasha	12	4,000	12	3,600	12	4,000	9	5,100	11	3,200
Clinton	11	2,000	—	—	11	2,400	10	2,500	12	1,700
Duncan	—	—	4	4,300	10	3,600	8	3,500	10	6,100
El Reno	12	2,500	12	1,800	11	2,600	12	1,700	12	3,100
Guthrie	—	—	12	2,700	—	—	12	2,100	12	2,100
Norman	15	2,000	20	2,300	12	2,500	11	1,700	9	1,600
Oklahoma City	12	2,100	11	2,900	11	2,800	11	2,100	13	1,800
Pauls Valley	18	2,900	16	1,500	10	8,100	2	2,000	11	1,500
Purcell	6	2,400	6	3,200	4	2,900	3	1,300	—	—
Shawnee	—	—	9	1,700	9	3,300	10	2,200	8	1,600
Weatherford	10	5,900	—	—	8	2,400	—	—	—	—
Total	111		122		102		97		117	
Av. all counts		2,800		2,400		3,600		2,200		2,300
No. counts 3000 or less	71		85		56		76		84	
% counts 3000 or less		64%		70%		55%		78%		72%

Health Department Branch Laboratories. The reports on the counts were compiled by the Oklahoma State Health Department for the cities other than Oklahoma City. The samples taken in the latter city were analyzed and the results compiled by the Oklahoma City Director of Sanitation.

A total of from 97 to 122 counts were obtained on each of the four plants and the results compared with those from 117 counts on milk from the plant under study. These results are summarized in Table 6. The results show that the counts on the milk from the plant compared very favorably with the counts on milk from similar plants located in or near Oklahoma City. The logarithmic averages of all the samples analyzed ranged from 2,200 for Plant D to 3,600 for Plant C, with the plant under study having the next to lowest average of 2,300.

Since the majority of the counts for each plant was 3,000 or lower and since some of the laboratories reported very low counts as less than 3,000, the numbers and percentages of the counts of 3,000 or less were calculated. The counts of 3,000 or less ranged from 55% for Plant C to 78% for Plant D with the plant under study having the next to highest with 72%. The ranking on the basis of percentage of counts of 3,000 or less agreed with the ranking on the basis of average counts. The general results indicate that the welded construction used in the plant under study did not impair the sanitary quality of the milk.

Summary and Conclusions

A study was made of the sanitary aspects of the use of welded milk lines in a milk plant processing Grade A milk and milk products. This plant used an automatic CIP system for cleaning. The research was conducted over a period of approximately one year and included 29 inspections and examinations of the plant. The sanitary condition of the lines was evaluated by visual inspection, swab tests, rinse tests and line tests on the pasteurized milk during passage through the equipment.

The sanitary quality of the finished product was evaluated by standard plate counts and coliform counts of random samples at each inspection and on hourly samples run by the plant personnel during each day's operation. Further evaluation was

obtained by comparing the counts on the milk from the plant under observation with those from similar plants operating in the same area.

The results indicate that there was no excessive contamination or build-up of milk stone in the welded lines used in conjunction with an automatic CIP system. The bacterial counts of the milk in the plant and of samples delivered to several cities indicated that the milk was of satisfactory sanitary quality. The counts of the milk from the plant under observation compared very favorably with those of milk from similar plants operating in the same area. When welds are made in accordance with the procedure used in this milk plant, it may be concluded that welded milk lines used in conjunction with an automatic CIP system are satisfactory for the processing of Grade A Milk.

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NEWS AND EVENTS

QUESTIONS AND ANSWERS

Note: Questions of technical nature may be submitted to the Editorial Office of the Journal. A question in your mind may be in the minds of many others. Send in your questions and we will attempt to answer them.

QUESTION:

When doing a routine plate count for coliforms in milk, I find colonies in Violet Red Bile Agar which are pin point in size and are too numerous to count. They are purplish red in color, but lack the surrounded reddish zone of precipitated bile salts characteristics of the coliform group. Can you help me classify this type of bacterium?

ANSWER:

Quite likely the small purplish red colonies appearing in large numbers on Violet Red Bile Agar are true coliform organisms which have failed to reach the normal size because of over-crowding. When such colonies are encountered it is well to fish one or two into Brilliant Green Bile Broth to make sure they are lactose fermentors. It is also possible that the pin point colonies are actually precipitated dye particles. This may occur if the medium is not mixed properly before the plates are poured. However, if the colonies in question are really true colonies they could be lactobacilli or yeasts.

"Standard Methods," page 147, states "Presence of dark red colonies at least 0.5 mm in diameter constitutes a positive presumptive test." To determine whether you have overcrowding make higher dilutions. Also, transfer some colonies to Lactose Broth. If gas is produced, confirm the coliforms by use of suitable media.

QUESTION:

Why should a dairyman use a strip cup or preferably a strip plate?

ANSWER:

There are three main reasons: (*a*) to make sure the teat and udder is examined for cleanliness, cuts, bruises, warts, cowpox and fungus growths prior to the attachment of the milking machine; (*b*) to eliminate the fore streams of milk which are normally heavily contaminated with bacteria; and (*c*) to examine the first few streams of the milk for any abnormal physical appearance. The strip plate should be used under good lighting conditions otherwise abnormalities of milk may be missed.

QUESTION:

Do washing powders and sanitizing compounds constitute a potential hazard in milk?

ANSWER:

Yes, they do. In practical use washing materials are not always thoroughly and properly rinsed off dairy utensils prior to use. Hence they may adulterate milk. If sanitizing agents are not used according to manufacturers directions, this easily may occur.

QUESTION:

What volume of water is used to in-place-clean farm bulk milk cooling tanks?

ANSWER:

This question is difficult to answer properly because little research work on this specific question has been published. In general, the amount of water used for tank size ranges from 200 to 600 gallons will be from 7 to 20 gallons per cycle. Thus, 20 and 60 gallons may be needed for a 3 cycling operation. In addition some water is necessary for fogging or spraying the tank with a sanitizing agent.

ANNUAL MEETING PLANS PROGRESS

"The 1960 meeting of the International Association of Milk and Food Sanitarians is scheduled to be held at the world-famous Morrison Hotel, Chicago, Illinois, on October 26-28, 1960. The Morrison Hotel is situated in the center of the Loop, in the center of things, in the center of life, in the center of the United States—the one and only Chicago, Illinois. The meeting this year will be held immediately preceding the