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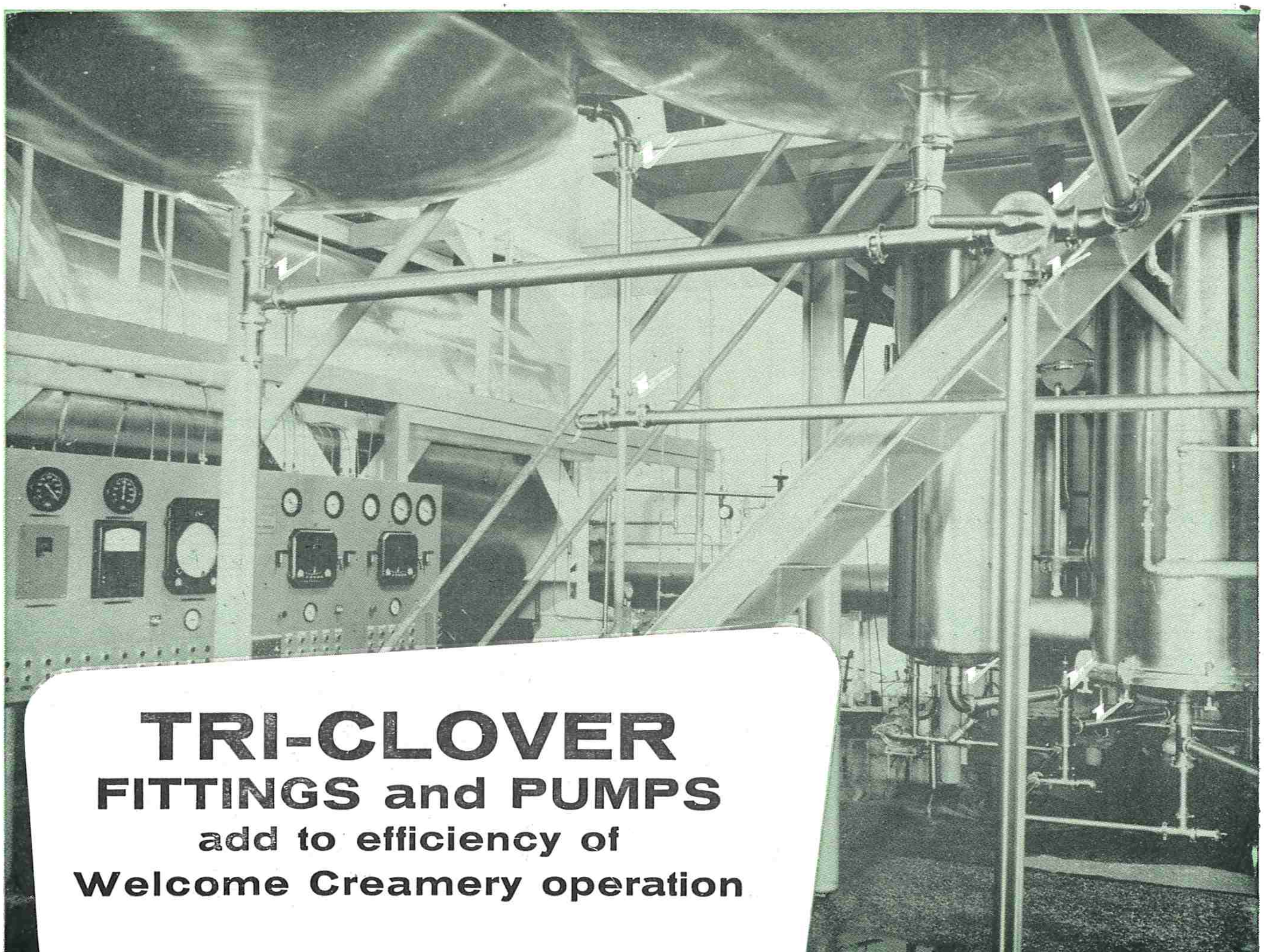
International Association of Milk and Food Sanitarians, Inc.



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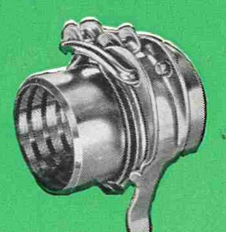

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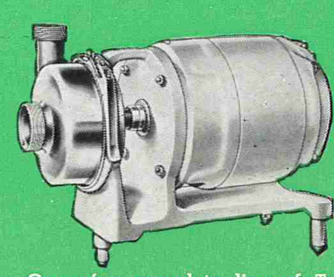

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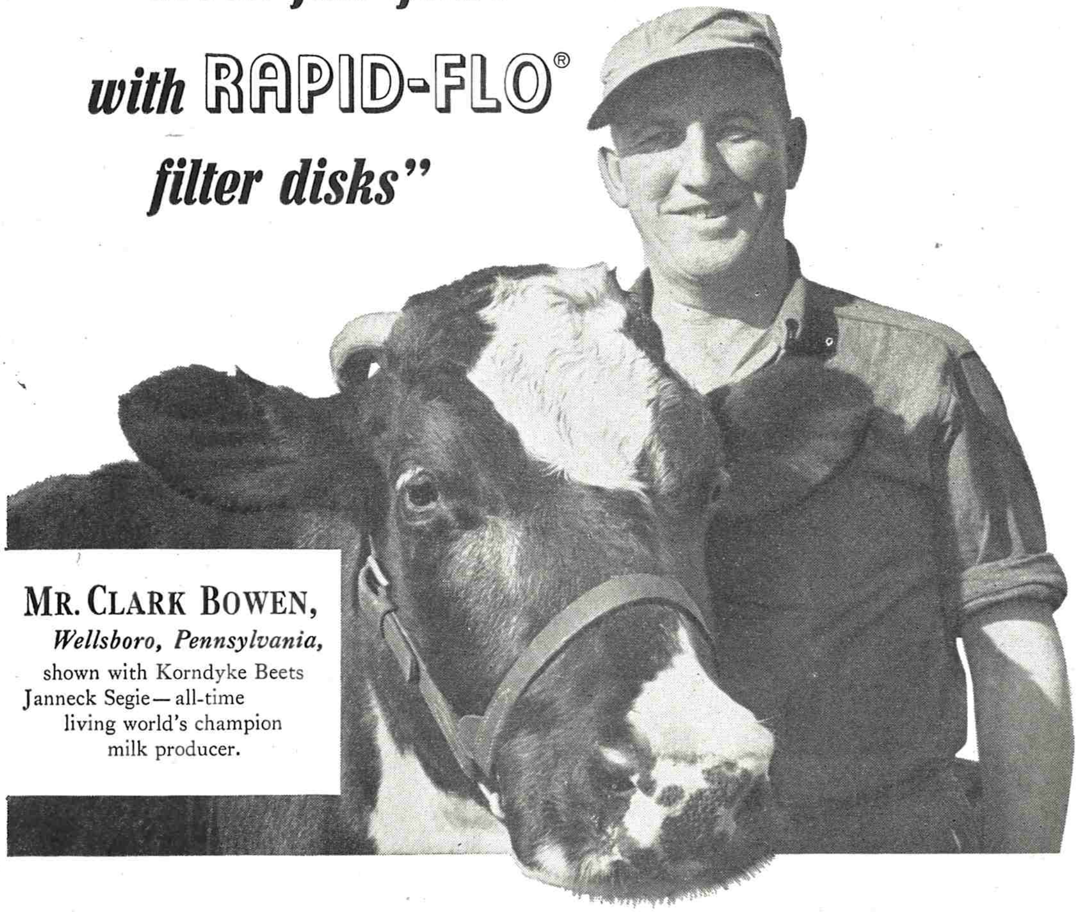

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International Association of Milk and Food Sanitarians, Inc.

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Contents

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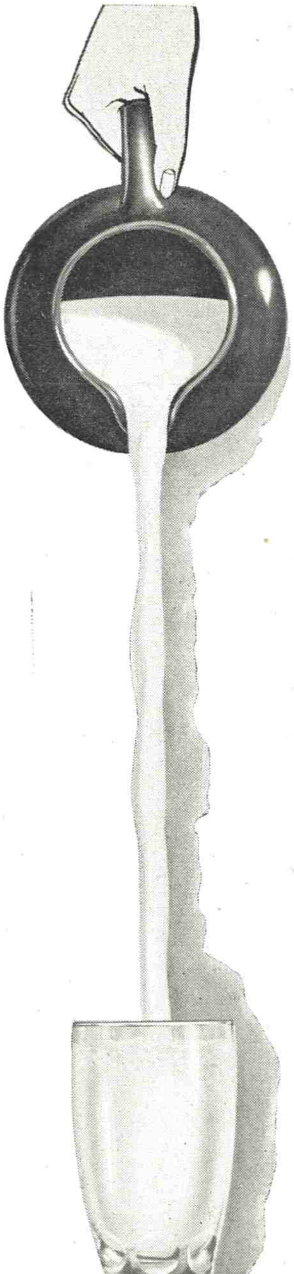

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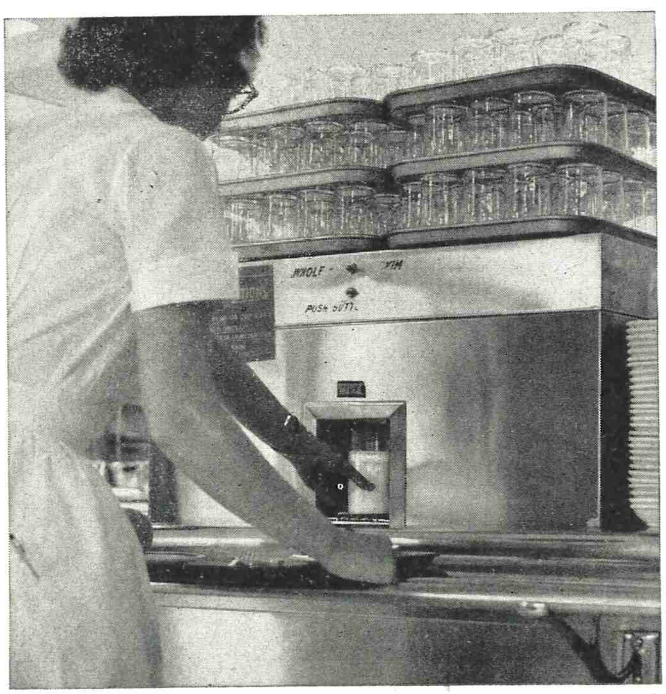

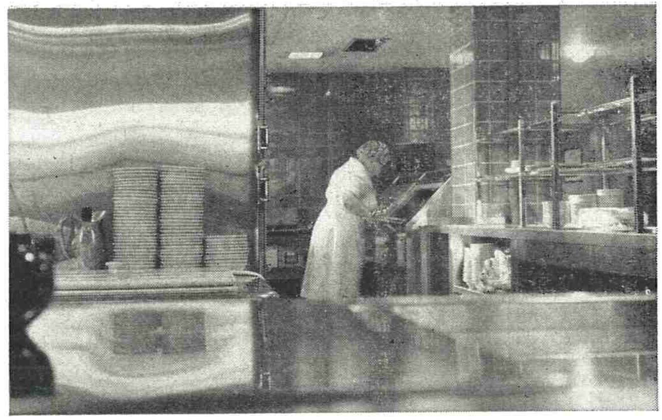

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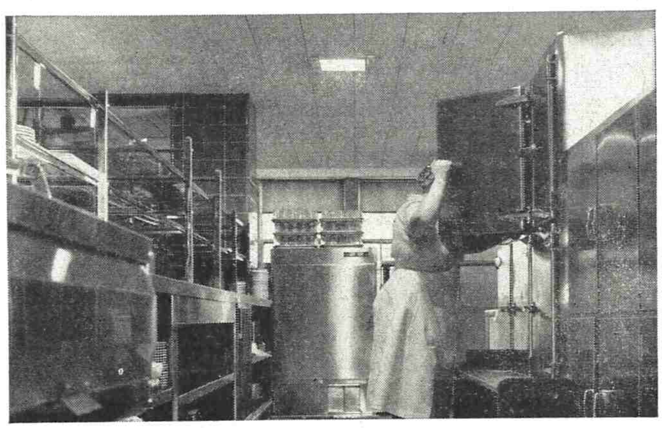

If you would like to have more information about Stainless Steel milk dispensers, write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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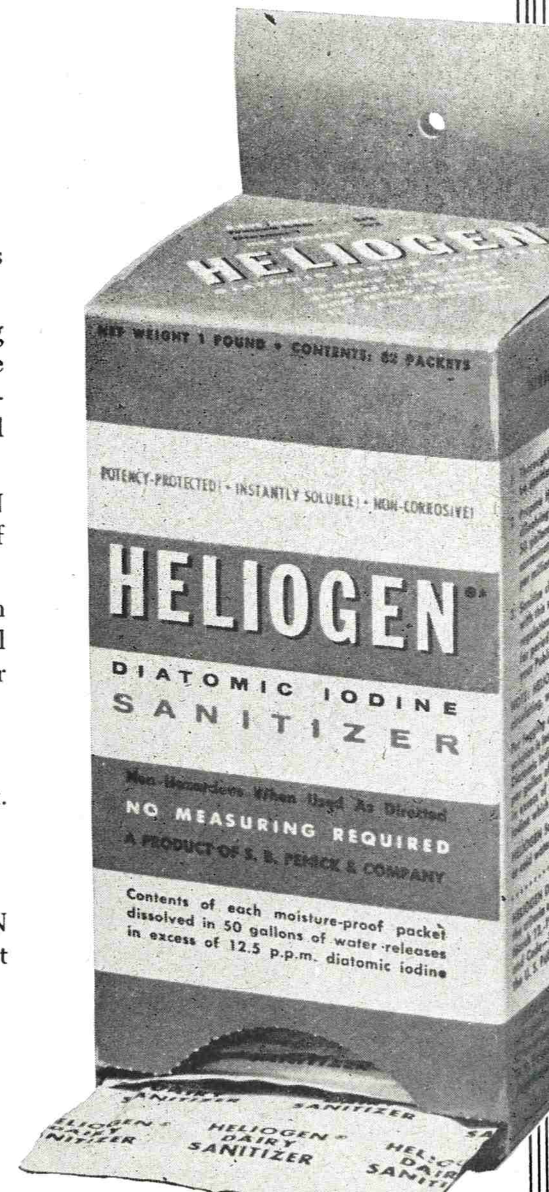

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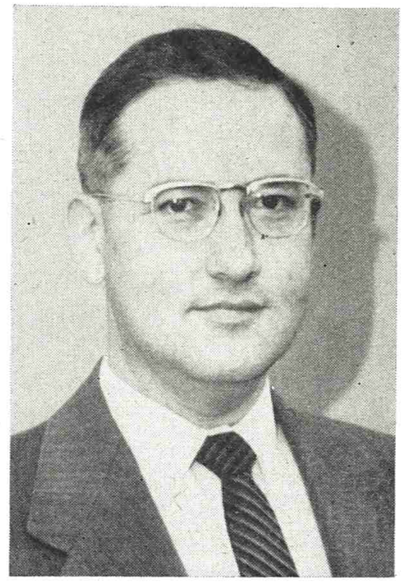
ANTIBIOTICS IN DAIRY PRODUCTS[1]

Arnold N. Morton

Seattle District, Food and Drug Administration,

Department of Health, Education, and Welfare

There is a growing demand from consumers, members of industry, and law enforcement officials for authentic information concerning the chemicals that appear in our food. The dairy industry and milk sanitarians are concerned particularly with antibiotics (as well as other substances) which have been detected in milk supplies and in products manufactured from milk. These are basic foods consumed throughout our lifetime and their safety is of prime importance to the public health. My comments will outline the problem of antibiotics in dairy products, the cause of the problem, and the steps which have been taken by the Food and Drug Administration designed to obtain authentic information regarding the problem and to minimize or eliminate the problem.



Mr. Arnold N. Morton received the B.S. degree in Chemistry from the University of Washington, Seattle. Since 1939 he has been a member of the staff of the Food and Drug Administration and has served in its various offices throughout the Northwest. Mr. Morton, presently, is Food and Drug Officer, Seattle district.

Very large amounts of antibiotics are used in the treatment of mastitis in milk producing cows. It is estimated that more than 75 tons of these potent drugs are used yearly in the treatment of this widespread infection. The greater proportion of infected cows are treated by udder infusion and a variety of drug products are available for this purpose. Penicillin is used in the greatest volume, since this drug is quite effective in those cases caused by streptococci, particularly *Streptococcus agalactiae*, the organisms responsible for most cases of streptococcal mastitis. There are other variants. As a result, other antibiotics such as dihydrostreptomycin, the tetracyclines, neomycin, bacitracin and the sulfonamides are used for treatment and prophylaxis. Treatment usually consists of a single tube or syringe full of the preparation for each infected quarter but as many as four treatments at 12-hour intervals may be necessary per quarter. Thus, with a single treatment an animal treated with a combination preparation may be administered 500,000 or more units of penicillin, 500 milligrams of dihydrostreptomycin, 500 milligrams of neomycin and one or more grams of one or more sulfonamide drugs. If the infection is severe, the animal may receive as much as four times these amounts within a 48-hour period.

By regulation, mastitis preparations must carry a warning in their labeling to the effect that "milk from treated quarters should be discarded or used for purposes other than human consumption for at least 72 hours after the last treatment." Comments on recent modification of this warning will be made later.

When the antibiotic drug used is effective, the clinical response is quite dramatic and a marked change in the appearance of the milk, teat, and udder takes place within 24 hours. However, the disappearance of the signs of infection and reduction in inflammation is not a guarantee the infection is eliminated. This can be determined only by a thorough bacteriologic examination of the milk. A favorable change of appearance in the milk or infected quarter is no guarantee that the drugs infused have been completely absorbed, or eliminated. Experimental evidence points to the contrary. It is necessary to milk infected cows twice daily for a period of at least three days to be sure that the great bulk of the drugs has been milked out. Experience has shown that substantially the entire amount of infused antibiotic is eliminated by regular milking over a period of three days. Excluding the possibility of illegal addition of antibiotics to milk as a preservative, failure

[1]Presented at the Washington Milk Sanitarians Association spring meeting, Everett, Washington, on the evening of June 4, 1957.

to follow the caution in the labeling of mastitis preparations, concerning discarding milk from treated animals, is largely responsible for antibiotic residues in our milk supply.

As long ago as 1948 it was noted that in some instances milk from cows treated for mastitis intramammary infusion contained enough drug to inhibit cheese starter cultures even though mixed with large quantities of antibiotic-free milk. Sometimes this resulted in serious economic loss. The cheese industry has largely eliminated this difficulty by insisting that their suppliers discard the milk of treated cows for three or more days following treatment, and by testing the milk for penicillin or other antibiotics.

The Food and Drug Administration has conducted three nation-wide surveys to determine the incidence of antibiotic residues in market fluid milk. In 1954, 94 samples were collected and examined: 3.2% contained penicillin. In 1955, the work was expanded by the collection of 474 samples of milk collected from all parts of the country; 11.8% contained antibiotics. The 1955 samples contained up to approximately 80 units of penicillin per quart. One sample in the first survey appeared to contain bacitracin and a single sample in the second survey appeared to contain one of the tetracyclines. However, there are no identity tests for small quantities of these antibiotics except penicillin, and the inhibitory activity shown by the two samples could not be attributed to these drugs with complete certainty.

The results of the 1955 survey were sent to a number of nationally recognized experts in the field of antibiotic therapy, pediatrics and allergy to obtain their opinion as to a possible public health significance of these quantities of penicillin in market milk. Little evidence was available on which to base an opinion and it was necessary for these authorities to arrive at their conclusions through their experience in their respective fields, plus their knowledge of the sensitizing potential of penicillin. The majority of these experts concluded that these amounts of antibiotics in milk were not dangerous for the consumer to ingest on the basis of his daily consumption. The majority expressed the opinion that these amounts would not sensitize the nonsensitive individual, would not cause emergence of resistant micro-organisms, would not change the normal intestinal flora, and would not change the normal oral flora. However, the great majority were of the opinion that the ingestion of the amounts of penicillin found in milk conceivably could cause a reaction in the extremely sensitive individual. With the consensus of these 31 nationally recognized medical experts on the results of our 1955 survey, the Food and Drug Administration initiated a third and considerably more extensive survey, completed in February, 1958, to obtain more accurate information as to the true incidence of antibiotic residues in the nation's milk supply. Each of the Administration's sixteen Districts participated in the survey and 1640 samples of pasteurized and 66 samples of raw milk were collected for a total of 1706. All states and the District of Columbia were included in the survey. After collection, the samples were frozen, packed in dry ice and shipped via air to the Division of Antibiotics in Washington, where they remained frozen until thawed for assay. Each sample was tested quantitatively for penicillin, streptomycin, bacitracin, and the tetracyclines. Of the 1706 samples tested in the survey, 101 or 5% contained residues of penicillin as confirmed by the penicillinase identity test. One sample contained both penicillin and streptomycin. The concentrations of penicillin found ranged from 0.003 to 0.550 units per milliliter. In the 1955 survey, you will recall, 11.6% of the 474 samples contained penicillin in concentrations ranging from 0.003 to 0.080 units per ml. Although the percent of samples with antibiotic residues collected in the 1956 survey is less than that for the 1955 survey, that is, 6.9% as contrasted with 11.8%, the average concentration of penicillin found in the positive samples of the 1956 survey is higher than that found in the 1955 survey. Furthermore, the highest concentration of penicillin found in individual samples collected in the 1956 survey was 0.550 units per ml. as contrasted to 0.08 units per ml. found in the 1955 survey. These higher concentrations may give us cause for concern. Although the medical experts which were consulted are concerned about the situation they are not sure that an imminent public health hazard has been demonstrated. Nevertheless the Food and Drug Administration is seeking means of getting penicillin out of milk. We have asked the U.S. Department of Agriculture to cooperate with us in a very broad educational campaign designed to acquaint dairymen with the steps they must follow to produce clean milk free of antibiotics. In February we published a proposed change in the Regulations limit the amount of penicillin in a mastitis preparation to 100,000 units per dose. The Federal Register of May 14 published the final order, establishing 100,000 as the maximum single dose to be recommended in the labeling. This notice states:

> "The principal adverse comments were: (1) that penicillin could be kept out of milk without reducing the unit dosage, by incorporating a nontoxic dye in the drugs, which will color milk from treated animals as long as penicillin is being excreted in the milk; and (2) that the public health would be adequately protected by restricting use of the drugs to or on prescription of licensed veterinarians.

"Consideration has been given all views and comments submitted, together with other available relevant information, including the fact that no non-toxic dye suitable for the intended purpose, has been found; that restricting such drugs to use by licensed veterinarians would involve added expense and possible hardship to the farmer, due to the inaccessibility to veterinarians in some geographical locations; and that adequate directions for lay use can be written for these drugs.

"On the basis of these facts, it is concluded that such amendments are necessary for the protection of the public health."

The possibility that the use of intramammary preparations might one day become a public health problem was recognized early in the use of these drugs. It was at this time in 1951 that a notice was published in the Federal Register. This notice to manufacturers and labelers of antibiotic drugs for veterinary use stated:

"Unless a proper interval of time is allowed following the use of antibiotic drugs for the treatment of mastitis in milk-producing animals, the antibiotic drugs may get into the general milk supply. Because of the specific action of antibiotic drugs on cheese starters, milk containing such drugs is of no value to cheese manufacturers. The direct or inadvertent addition of antibiotic drugs to milk to be sold for human consumption or for the manufacture of dairy products may constitute an adulteration within the meaning of Sec. 402 of the Federal Food, Drug, and Cosmetic Act. The labeling of antibiotic drugs intended for intramammary use in the treatment of mastitis in milk-producing animals should bear a prominent statement designed to prevent milk from treated portions of the udder from entering the general milk supply. The following statement is recommended for this purpose: Important: Milk from treated segment of udders should be discarded or used for purposes other than human consumption for at least 72 hours after the last treatment."

On April 22, 1957, the Commissioner of Food and Drugs, after careful consideration of the views and comments from interested parties and other relevant information available to him, amended the general regulations for the certification of antibiotic drugs intended for intramammary infusion in the treatment or prevention of mastitis in dairy animals. The amended regulation states that whenever the labeling of an antibiotic drug suggests or recommends its use in the prevention or treatment of masitis in dairy animals by intramammary infusion the label of such immediate container shall bear the statement "Warning—Milk taken from dairy animals within .... hours after the latest treatment for mastitis must not be used for human consumption," the blank being filled in with the number "72" unless the person who requests certification has submitted to the Commissioner information adequate to prove that milk from dairy animals treated with the drug as prepared by him contains no antibiotic after a time period that is shorter than 72 hours after the latest treatment. In such cases the blank shall be filled in with the number "60," "48," "36," or "24" as authorized by the Commissioner. This regulation will become effective on July 29 unless it is stayed in whole or in part by the filing of objections from persons who on reasonable grounds may be adversely affected.

Consumers, law-enforcement officials, and the dairy industry are concerned about any chemical which may be found in the nation's milk supply. Through cooperation of all interested parties and widening our joint educational efforts we believe that antibiotic residues in dairy products can be and will be eliminated.

A STUDY OF CLEAN MILK FOR AGED CHEDDAR CHEESE

B. E. Horrall[1] and E. E. Kihlstrum
Johnson & Johnson, Chicago, Illinois

(Received for publication February 21, 1958)

The problem of sediment in milk and its effect on the resulting end product has been discussed and written about for many years. There has been, however, differences of opinion within the dairy industry as to the part this plays in the quality of dairy products.

Marquardt *(2)* in 1944 found in New York that when more than 25 percent of the milk received contained excessive amounts of sediment, an unclean flavor was developed in a mixed tank of milk. This according to numerous observations took place in less than six hours even when the milk was cooled and held at 40°F. or below. Marquardt also studied the relationship of sediment to flavor and discovered that there was a correlation. He found that over 55 percent of samples were unclean at three plants before the clean-up program, and this was reduced to less than 19 percent after the program was started. Marquardt stated, "The average flavor score before the program was 19.9, and after the program 21.2. A score of 20.5 was the average of all of the cleanest milk before the program; this value was increased to 21.6 after the clean-up." His work also showed that ageing milk at 70°F. for four to six hours decreased the flavor score of dirty milk more than it did in the case of the clean milk. His data revealed that clean milk kept better than dirty milk, and pasteurization did not materially change the flavor scores.

Jensen and Jokay *(1)* stated, "Even under the finest conditions of pipeline milk production, some sediment will find its way into milk. Filtration is desirable to remove the sediment particles as rapidly and completely as possible." They also stated, "Filtering media served useful purposes in revealing care in milking practices and abnormal appearing milk."

The objective of the study reported herein was to determine the relationship between extraneous matter in milk supplies and the quality of aged cheddar cheese made therefrom. The milk supply selected was one where there were large producers so that it would take relatively few producers to produce a ten thousand pound vat of milk each day.

Procedures

The milk used in this project was produced in a northeastern state and was approved for use as fluid milk in one of the large metropolitan areas. The entire milk supply delivered in cans to the receiving plant (except the milk from individual patrons delivering their own milk) was used in this study.

Preliminary Survey

Each patron of the receiving plant was contacted and data was collected as to: filter media, type and condition of strainers, type of cleaners, type of bactericides and milk stone removers, number and type of milking machines, hot water heaters, wash tanks, other equipment, and use of antibiotics. Also, general observations were made as to over-all sanitation and housekeeping in effect on the farms.

Division of Patrons

The patrons were divided into two groups:

1. Experimental—Each patron in this group was instructed in the production of clean milk, taught proper filtration methods and how to use the disk as a check on the cleaniness of the milk, and the milking practices.
2. Control—These patrons continued to produce milk without benefit of an educational program.

The milk from the Experimental and Control groups was kept separate at the receiving plant and the milk from each group was made into cheddar cheese for ageing.

Sediment Tests

Off-the-bottom sediment tests at the start of the project were made every day on approximately one-half of each patron's cans in the Experimental group and once a week on a like number of cans from the Control group. The sediment on each disk was scored according to the American Public Health Association Official Milk Standards of 1953 *(5)*. The cans of milk that had 2.0 and over milligrams of sediment were rejected for use in the experimental cheese. For discussion and simplicity, 0.0 to 0.5 milligrams of sediment will be designated as Class 1, 1.0 milligrams as Class 2 and 2.0 milligrams and over as Class 3 or reject milk.

The used filter media from the Experimental herds were picked up at various intervals for the purpose of measuring progress on clean milk production.

[1] Dairy Consultant, Chicago, Illinois

Experimental and Control Milk

Three routes consisting of 36 patrons were used as the Experimental group and the other five routes, consisting of 63 patrons, as the Control group. The milk from the Experimental group was pumped directly from the weigh can to an upright tank in the cheese plant, mixed, and made into cheddar cheese for ageing using general commercial practice. The control milk was treated in a like manner.

Forty pound blocks of cheese were saved from each of the Experimental and Control vats of cheese and aged with the remainder of the cheese from those vats. The ageing of the cheese was supervised by experienced personnel at a commercial cheese warehouse.

RESULTS

Sediment Tests

The preliminary survey of the 102 farms selling milk to the receiving plant showed that 63.5 percent were using 7 and 8 inch flannel squares, 29.8 percent were using double faced disks, 6.7 percent were using single faced and plain disks. Ten different makes of milking machines were used. Only 29 patrons had hot water in the milk house, but all of the patrons had mechanical milk coolers. There were 109 strainers, and of these, 39 were good, 49 fair and 21 in poor condition. Eighteen different cleaners were used, which included scouring powder and a cake-type cleaner. Five different bactericides were used and only ten patrons used milk stone remover. Antibiotics were freely used and generally were administered by the patron.

Plant sediment records were studied on the milk delivered during January and February, 1956, before the project began. This was done to get a picture of the sediment content of the milk supply. This information is shown in Figure 1. These tests were taken by plant personnel with a hand sediment tester. The data show that 95.5 percent of the sediment disks had zero sediment and only 0.4 percent (2 cans) were rejected for sediment over the eight-week period.

To confirm these results as nearly as possible, trained technicians took sediment tests of the milk from the same patrons with an approved automatic tester. These technicians also graded the disks. Figure 2 shows the results of eight weekly tests from March to June. It will be noted when Figure 2 is compared with Figure 1 there is a different picture of the sediment content of the milk from the same patrons. There were very few zero sediments and appreciable more samples with 2.0 milligrams and over. It must be pointed out that the weather and season may have been factors to increase the sediment content in the milk shown on Figure 2. Experience has shown, however, that if sediments are taken and read correctly, there should be very few zero sediment test disks.

During March, April and May, sediment tests were taken weekly on all patron's milk. All the sediment tests taken in this study except those used in preparing Figure 1 were taken and read by trained technicians. The results of these tests for March and

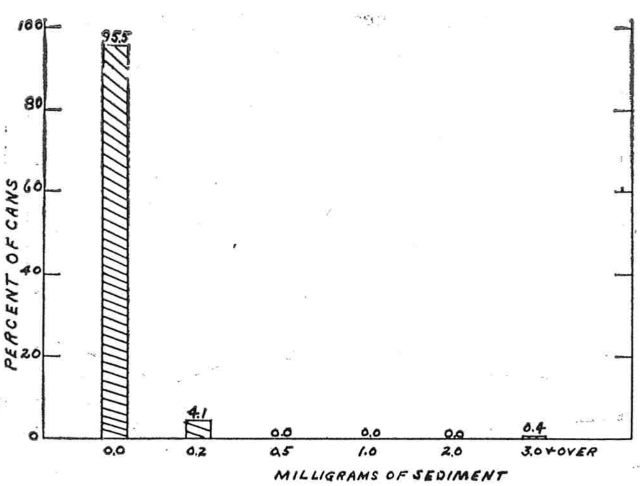


Figure 1. Sediment Tests Taken and Graded by Plant Personnel January and February, 1956.

Figure 2. Sediment Tests Taken by Trained Technicians (Eight Weekly Tests, March to June, 1956)

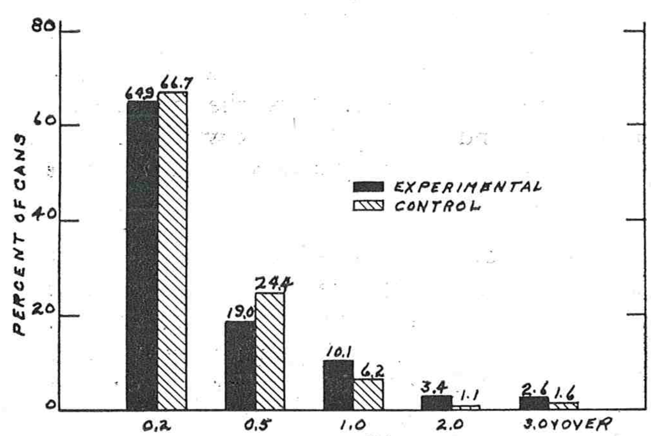


Figure 3. Comparison of Sediments of the Experimental and Control Groups Before Program Started. (March and April, 1956)

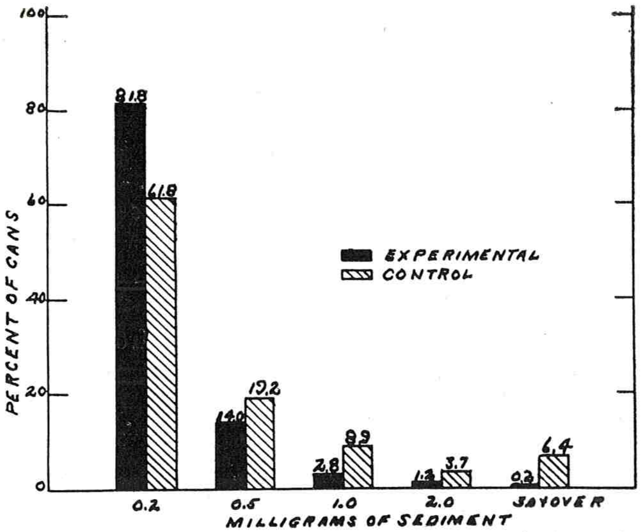


Figure 4. Comparison of Sediments of the Milk from the Experimental and Control Groups Immediately after the Program Started. (June and July, 1956)

April are shown in Figure 3. The similarity of the two groups in sediment content is very striking. This was before any work was done with the Experimental group. Similar results were obtained from the tests made in May.

All Experimental patrons were changed on June 6, 1956, to 6½" Single Faced Rapid-Flo Fibre-Bonded Filter Disks and were taught proper methods for filtering the milk; also, they were instructed in methods of clean milk production and in the use of the filter disk as a check-up for sediment. During the months of June and July, sediment tests were taken every day on the Experimental group and once a week on the Control group. Sediment tests were taken of as many cans from each patron as possible with one automatic sediment tester without slowing up the dumping of the milk. This averaged about one-half of the cans received. If the sediment in the milk of any Experimental patron exceeded 2.0 milligrams, the milk was diverted and was not used in the Experimental cheese. Also, the producer was contacted to find out why the milk was high in sediment and necessary changes were made to produce clean milk.

Figure 4 shows the comparison of the sediments of the two groups during June and July, after the Experimental group had been changed from the filter media they were using. This graph shows the results of sediment tests immediately after the change of filter disks were made and after instructions were given in methods of clean milk production. The Experimental group had 95.8 percent of the milk in Class 1 (0.0-0.5 mg) as compared to 81.0 percent of the Control. There was only 1.4 percent of the Experimental as compared to 10.1 percent of the Control milk in Class 3 (2.0 mg and over).

In August, September and the first part of October, sediment tests were taken of every can of milk every day in the Experimental group and every can of milk in the Control group once a week.

Figures 5, 6 and 7 give the comparisons of the daily sediments of every can of milk in the Experimental group and the weekly sediments of every can of milk in the Control group, for a period of nine weeks from July 24 to October 10. The data for three graphs was taken from 16,303 sediment tests.

Figure 5 shows how consistent the low sediment tests were in the Experimental milk, and the irregularity of these in the Control milk. This Figure also reveals that sediment in milk can be controlled by proper instruction of patrons in methods of clean milk production, in correct filtration of the milk immediately after milking, and in checking the used filter disk for sources of possible extraneous matter and making necessary corrections.

Figures 6 and 7 show the 2 and 3 sediment classes, respectively, of the milk in both groups over the 9 week period. These show the low number of cans of

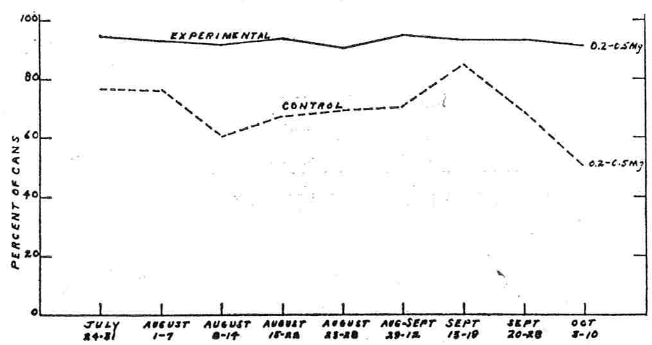


Figure 5. Class 1 Sediments of Every Can of Milk from all Patrons in Experimental and Control Groups. (July 24 to Aug. 10)

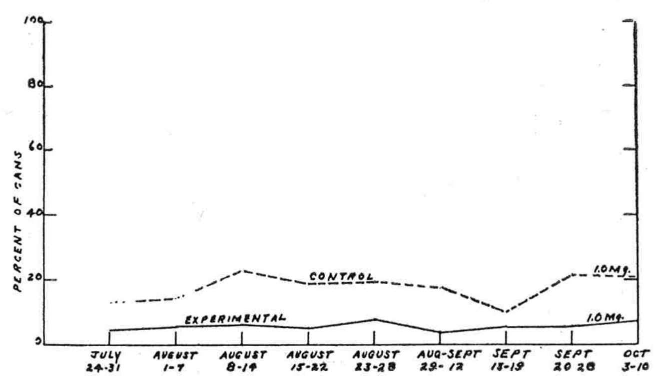


Figure 6. Class 2 Sediments of Every Can of Milk from all Patrons in Experimental and Control Groups (July 24 to Aug. 10)

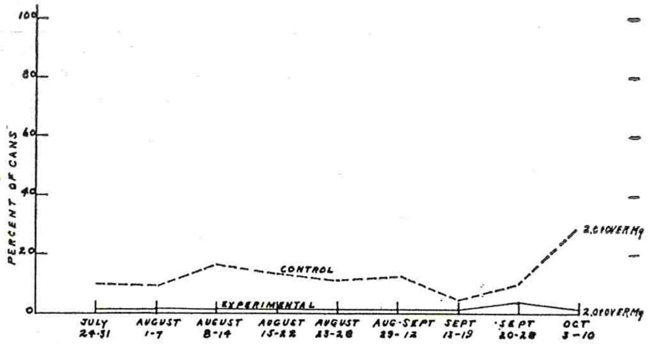


Figure 7. Class 3 Sediments of Every Can of Milk from all Patrons in Experimental and Control Groups. (July 24 to Aug. 10)

milk that had large amounts of sediment from the Experimental, while the Control group had many more cans of milk consistently in the higher sediment classes.

If all of the milk containing 2.0 mg and over of sediment had been rejected from June to October 13, there would have been 99,760 pounds of the Control milk as compared to only 6,192 pounds of the Experimental milk.

Other Tests

During the course of the experiment, other tests were made on the milk and cheese. Isolation and counts of the enterococci was made on 54 vats of cheese (27 vats on each of the Experimental and Control). The reason for making these counts was to determine if the cheese from the two groups of milk would be significantly different in count. Certain investigations have indicated that the presence of large numbers of this group of organisms was associated with the development of inferior cheese when aged. The medium and the procedure used for plating and isolation of the enterococci was that of Reinbold *et al. (3)*.

The counts of enterococci ranged from 14 million to 540 million per gram of cheese. There was no correlation between the numbers of organisms and the flavor score of the aged cheese.

A curd test was made on 186 vats of milk. The test used was a modification of the Wisconsin Curd Test *(4)* and was designed to give an indication of the quality of milk for cheese making. The procedure used was as follows:

1. The milk was taken from the cheese vat in a sterile wide mouth 16 oz. mason jar after the milk had ripened and the rennet had been added.
2. After the curd had set, the jar was rotated gently to break it from the sides of the jar.
3. The contents were heated to 100° - 101° F. until a greenish color appeared in the whey.
4. The curd was then cut with a clean spatula into small pieces about ⅜″ and cooked for one-half to one hour at 100° - 104° F.
5. After cooking, the whey was poured off every 20 to 30 minutes from 3 to 5 times. The curd was turned with a clean spatula at each pouring of the whey.
6. After the whey stopped draining freely, the curd was incubated at 98° - 100°F. overnight.
7. The next morning the odor of the curd was checked as the jar was opened and the curd was cut with a sharp knife and graded as follows:
   - No. 1.—Firm body, close texture, good lactic aroma.
   - No. 2—Slight gas, slight defective texture.
   - No. 3—Gas, weak body, off odor.
   - No. 4—Very gassy, yeasty, spongy, soft body, off odor.

There were 63 vats of the Experimental milk and 123 vats of the Control milk tested by the curd test.

TABLE 1—COMPARISON OF THE EXPERIMENTAL AND CONTROL MILK AS SHOWN BY THE MODIFIED WISCONSIN CURD TEST

Grade	Percent of Experimental Vats	Percent of Control Vats
1	85.7	40
2	14.3	39
3	0.0	21

The results of the modified curd test as shown in Table 1 definitely indicated that the Experimental milk was better from the standpoint of the presence of gas and off-odors that developed during overnight incubation at 98° to 100°F.

Odor tests on the milk from individual herds were taken throughout the experiment. The milk samples were taken from the weigh tank after all of the milk from a patron had been dumped. The samples were taken with a long handled 20-ml. dipper which had been rinsed in warm water and then dipped into a 200 ppm. chlorine solution. These samples of milk were put into sterile screw top test tubes and incubated at 45° to 48°F. for five days. The samples were then warmed to 80° to 85°F., shaken and smelled The odor tests were made to give another indication as to the quality of the milk. Also, by using low temperature, selective development of psychophilic organisms, many of which cause off-flavor in milk such as fruity, putrid, stale and rancid, was obtained.

Table 2 indicates the various odors found in the milk from individual herds in the Experimental and Control groups. There were 2,019 samples of milk tested. The data on the Experimental group is divided into two periods. The first period (May 13-July 1)

TABLE 2—ODOR TESTS ON INDIVIDUAL PATRON'S MILK

Odor	Experimental May 13 to July 1 No. samples	Per-cent	Experimental July 4 to Oct. 18 No. samples	Per-cent	Control July 4 to Oct. 18 No. samples	Per-cent
O. K.	394	56.4	531	68.1	262	50.2
Putrid	84	12.0	67	8.6	76	14.6
Fruity	24	3.4	13	1.7	16	3.1
Feed	13	1.9	6	0.8	5	1.0
Cowy	72	10.3	39	5.0	56	10.8
Barny	72	10.3	46	5.9	46	8.8
Rancid	7	1.0	3	0.4	2	0.4
Sour	29	4.2	62	8.0	54	10.3
Medicine	3	0.4	5	0.6	2	0.4
Malty	1	0.1	5	0.6	2	0.4
Musty			2	0.3		
TOTAL	699		799		521	

covered milk that was produced before and just a short time after the change in filter disks was made and after instructions were given in the production of clean milk. The second period (July 4-October 18) covered the time the Experimental patrons were definitely on the program of producing clean milk. Milk samples from the Control group were taken on the same day as those from the Experimental. The data show that there was an 11.7 percent increase in the satisfactory samples (Experimental) during the second period; also, there was an increase of 3.8 percent in the sour samples which had no other off-odor. There was a decrease in the putrid and fruity odors of 5.1 percent. The barny and cowy odors decreased from 20.6 to 10.9 percent. Part of this reduction may have been due to the cows being on pasture. Furthermore, the comparison of the milk from the two groups revealed that the Control group had 17.9 percent less samples in the satisfactory class and had 7.4 percent more samples having putrid and fruity odors than the Experimental group during the same period. There were 8.7 percent more cowy and barny samples in the Control than in the Experimental milk.

QUALITY OF THE AGED CHEDDAR CHEESE MADE FROM EXPERIMENTAL AND CONTROL MILK

The final scoring of the cheese, by three experienced judges, was made after it was from ten to fifteen months old. The following criteria were used in the scoring: 36.5 or less was off, undesirable flavor; 37 to 38—slight off-flavor; 38.5 to 41—clean desirable cheese flavor.

Figures 8 and 9 show the percentage of vats of cheese having flavor scores of 38.5 and over and less than 37, respectively. There were 130 Experimental vats and 285 vats of Control aged cheese graded. During the month of May, 1956, samples of cheese were made from all the producers milk and were scored at 15 months of age to give an indication of the quality of cheese made before the program started. The percentage of cheese which scored less than 37 and which

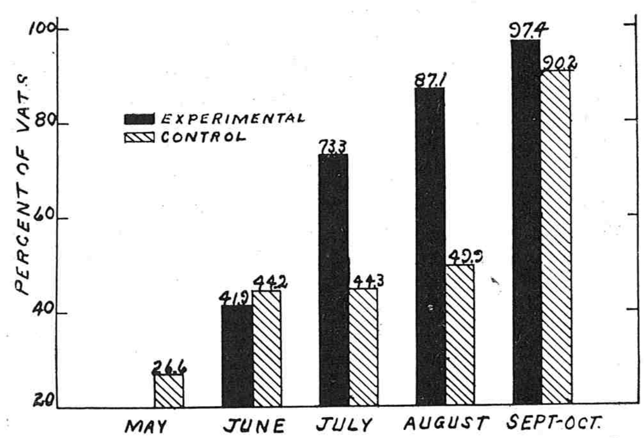


Figure 8. The Percentage of Aged Cheddar Cheese with a Flavor Score of 38.5 and Over made from Experimental and Control Milk.

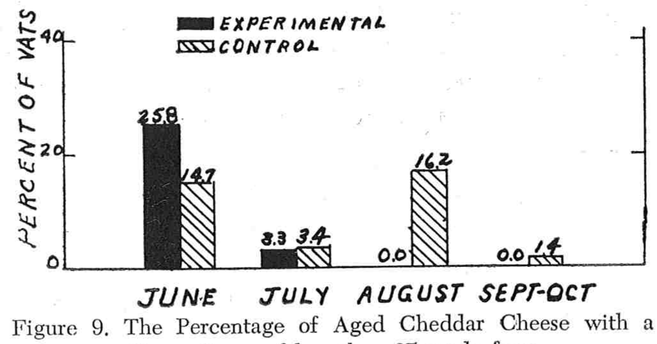


Figure 9. The Percentage of Aged Cheddar Cheese with a Flavor Score of less than 37 made from the Experimental and Control Milk.

would be undesirable as far as flavor was concerned was 26.7; the percentage of cheese which scored 38.5 and above was 26.6 (Figure 8). For the month of June, the Experimental had 41.9 percent and the Control had 44.2 percent of the vats of cheese in the clean, desirable cheese flavor class (Figure 8). In July when the clean milk program had definitely been established with all of the Experimental producers, the picture changed from practically the same quality aged cheese in both groups to 73.3 percent of the Experimental cheese scoring 38.5 and over in flavor while the Control cheese showed nearly the same percentage having this score the previous month. In August, the Experimental had 87.1 percent of the cheese in the no criticizable off-flavor class while the Control aged cheese had 49.9 percent. The September and October cheese was ten and eleven months old when it was scored and had been aged at 35°F. Whether or not the cheese would have developed more off-flavor if it had been forced at the end of the ageing period, as the rest of the cheese was, is not known. No satisfactory explanation can be given as to why the Control cheese increased from 49.9 to 90.2 percent during this period. It is known, however, that forcing the ripening of cheese at higher temperatures often brings out flavors in aged cheese that are not apparent in cheese not forced.

Figure 9 shows the percentage of cheese from the two groups that scored less than 37 in flavor score and was considered to be undesirable.

In June, before the clean milk program had started in its entirety, the Experimental had 25.8 percent of the cheese in the undesirable flavor class while the Control had only 14.7 percent. Then in July, the two groups had practically the same percentage in this class. For August, September and October, there was no Experimental cheese in the undesirable flavor class while the Control cheese had 17.6 percent.

Summary and Conclusions

A study of milk approved for fluid use was made in a northeastern state to determine if clean milk would improve the quality of aged cheddar cheese.

A preliminary survey of the 102 patrons selling milk to the receiving plant showed that 63.5 percent were using 7″ and 8″ flannel squares for straining the milk. Ten makes of milking machines were used. Hot water heaters were used by only 29 patrons. Eighteen different cleaners were used including common household scouring powder and cake-type cleaner. Antibiotices were used freely and generally were administered by the patron.

Preliminary plant data revealed that 95.5 percent of the cans of milk had 0.0 milligrams of sediment during January and February, 1956. Tests taken later by trained technicians showed only very few cans of milk from the same patrons had zero sediments and the milk had a much higher sediment content than previous tests had indicated.

The patrons were divided into two groups—Experimental and Control. The Experimental group was given an educational program on clean milk production, while the Control group continued to produce milk without benefit of such a program.

A comparison of sediment tests on milks from the Experimental and Control groups before the program was started showed very little difference in the sediment content of the milk.

After the Experimental patrons were instructed on clean milk production, were provided with 6½″ Single Faced Rapid-Flo Fibre-Bonded Filter Disks, and were taught to use the disks to detect and control sources of sediment, a marked decrease occurred in the sediment content of the Experimental milk. The sediment content in the Control milk fluctuated and was significantly higher during the experiment.

The data on every can sediment tests over a nine week period showed how consistent the low sediments were in the Experimental milk and the irregularity of these in the Control milk. The data also revealed that sediment in milk can be controlled by proper instruction to the patron on correct filtration of the milk immediately after milking, and in using the used filter disk for detecting and controlling sources of sediment.

Over 24,000 off-the-bottom sediment tests were taken by trained technicians during a period of nine months for this study.

Enterococci counts showed only four Experimental vats of cheese higher in count then the Control cheese. There was no correlation between the counts and the quality of the aged cheese.

A curd test on the vat milk from the two groups indicated that the milk used for the Experimental cheese was of higher quality than that used for the Control cheese.

There were 2,019 odor tests made on patrons' milk during the experiment. The Control milk samples had less satisfactory odors and substantially more putrid, fruity, cowy and barny odors than the Experimental samples.

The final grading of cheese made from these milks was scored at the age of ten to fifteen months by three experienced judges. The flavor scores showed that the cheese from the two groups was practically the same during June before the entire program was started with the Experimental group. The Experimental cheese had 41.9 percent in the 38.5 and over class (no criticizable off-flavor) and the Control 44.2 percent. In July and August, the Experimental cheese had 73.3 and 87.1 percent, respectively, in this class while the Control remained practically the same (44.3 and 49.9 percent). The cheese criticized for undesirable flavor and scoring less than 37 showed that in June the Experimental cheese had 25.8 percent to only 14.7 percent for the Control cheese. In July the cheese from both groups had practically the same number of vats in this undesirable flavor class. For August, September and October, there was no Experimental cheese scored with an undesirable flavor while the Control had 17.6 percent.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the assistance given by Mr. A. M. Cheney, Jr., Mr. R. L. Oliver and Mr. G. M. Jones of Johnson & Johnson for helping with the sediment testing and supervision of the Experimental patron, also the filter Products Division of Johnson & Johnson for supporting and making this project possible.

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CHANGES IN THE pH AND THE REDUCED ASCORBIC ACID CONTENT OF MILK HELD FOR EVERY-OTHER-DAY PICKUP IN FARM BULK MILK TANKS[1 2]

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Since the bulk system of handling milk was first introduced, a practice commonly referred to as every-other-day pick-up has been adopted in many producing areas. This is used primarily to reduce transportation costs by combining milk routes and increasing the pay load of tank trucks.

When this system of milk pick-up is used, the milk is held in the farm tank from 36 to 48 hours. During this time warm milk is mixed with cooled milk as the milk from each subsequent milking is added to the holding tank. Usually, the contents of the holding tank are agitated during the cooling period after each milking. These treatments may cause various physical and chemical changes in the milk.

Sommer *(9)* stated that sudden changes in holding temperatures of milk cause variations in the pH equilibrium. Rapp *(7)* reported that raw whole milk held at 5°C. for 48 hours showed a rise in pH from 6.54 to 6.76.

The changes in temperature and periods of agitation may have an effect on the ascorbic acid content of the milk. Holmes *(4)* found that raw whole milk stored in darkness in a closed container, at 10°C. for 96 hours showed a 64 percent loss of reduced ascorbic acid. Hand *(3)* showed that bottled whole milk stored in a refrigerator at 1°C. for a 6-day period lost 60 percent of the ascorbic acid originally present.

This study was undertaken to determine the changes in pH and reduced ascorbic acid content of milk held in farm milk tanks over a 36-hour period during which time the warm milk was added after each successive milking, stirred and cooled to the appropriate temperature.

PROCEDURES

The studies were made with one 200-gallon and one 150-gallon direct expansion refrigerated farm bulk milk holding tank at the University of Wisconsin Dairy Farm. Both of these rectangular tanks were equipped with mechanical agitators mounted vertically in the center of the tank. The agitator motors were wired so that when the refrigeration compressor was operating during the cooling phase the agitator was in motion.

The agitator motors could be switched to manual control for independent operation. The agitator in the 200-gallon tank was designed with two 12-inch

[1] Approved for publication by the Director of the Wisconsin Agricultural Experiment Station.

[2] Contribution from Wisconsin Agricultural Experiment Station as a collaborator under North Central Region Cooperative Research Project NC-23, entitled "Ways of Reducing Labor Costs and Improving Quality of Milk." U. S. Department of Agriculture cooperating. Supported in part by a grant from the United States Steel Corporation.

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propellor type blades and operated at 115 rpm. The 150-gallon tank had an agitator with 5 flat blades, 3 blades on the lower level, each 9 inches long, and two blades on the upper level, each 6½ inches long. This agitator operated at 36 rpm.

Representative milk samples were obtained from the tanks by using a 50-ml. stainless steel dipper. This was inserted 3 inches below the surface of the milk during agitation and then drawn upward. Samples of milk were placed in closed glass jars and stored in ice water until analyzed. All samples were analyzed within one hour of collection. The reduced ascorbic acid content of the milk was measured by the method of Sharp *(8)*. Observations on pH were made using a Beckman Model H2 pH meter with glass electrode.

Samples were taken at the following times: one sample from each tank was taken after the first milking had been introduced into the tank and had been cooled to the proper holding temperature. The milk in the 200-gallon tank was held at 48°F. and the milk in the 150-gallon tank at 38°F. for the first half of the study. For the second part of the study, the milk in the 200-gallon tank and the 150-gallon tank was held at 38°F. and 49°F. respectively. The second sample from each holding tank was obtained just prior to the addition of the second milking. A third sample was taken after the second milking was added and cooled. This same procedure was followed for each tank for the third milking. A sample was taken just before the fourth milking, but no sample was taken after the fourth milking giving a total of six samples of milk from each tank over a 36-hour period.

A 40-qt. can of milk was taken when the first portion of milk was placed in the bulk tank cooler. This can was placed in a spray type cooler and was held at 40°F. for a 36-hr. period to compare it with the milk placed in the bulk tank. No additions of warm milk were made, but the samples were withdrawn, as previously described, at 12-hour intervals. The milk in the can was well mixed each time a sample was removed. The four samples taken over a 36-hr. period were analyzed in the same manner as the samples obtained from the farm holding tanks.

Results and Discussion

The data on pH determinations for the milk from the two holding tanks and the 40-quart can are shown in Figure 1. The changes in pH are plotted against time in hours for each experimental unit. Each point on the graph represents an average of six determinations.

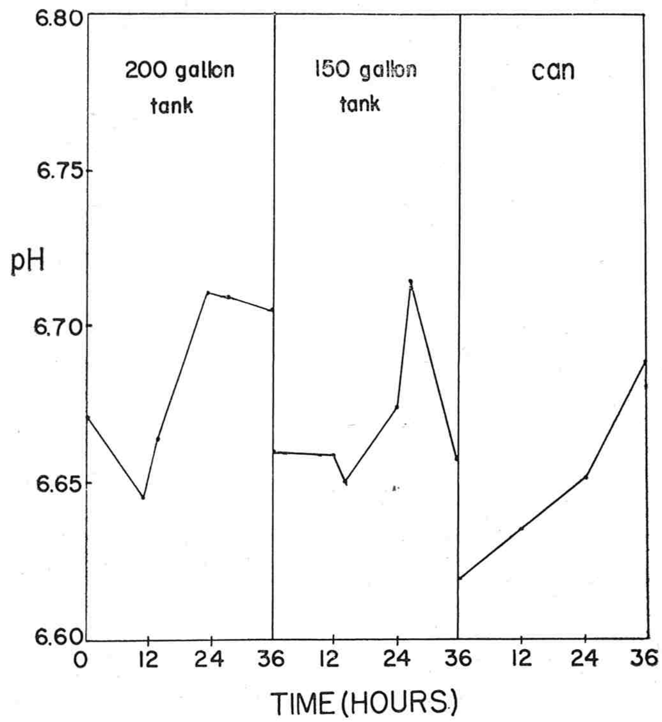

Figure 1. Changes in pH of milk during a 36-hour holding period.

The milk stored in the 40-qt. can showed a constant increase in pH over the holding period. However, the milk stored in the two farm milk tanks showed uneven changes in pH as successive milkings were added to the tank. Sometimes, especially at the time of the first addition of warm to cold milk at the 12 hour level, a marked decrease in the pH of milk occurred in both holding tanks. The variations in pH of milk in the holding tanks usually did not exceed 0.05 pH units. The same was true for the milk held in the can.

The observations of the changes in reduced ascorbic acid are presented in Figure 2. Each point on the graph represents an average of three replicates for the milk from each bulk tank at the two different temperature levels. Results shown in Figure 2 represent per cent loss of reduced ascorbic acid as compared to the holding time of the milk. The milk stored in the 40-qt. can shows a loss of approximately 25% of its original ascorbic acid content, which is spread evenly throughout the 36-hr. holding time.

For the milk held in the two bulk milk tanks the loss of reduced ascorbic acid is significantly higher. The milk held in the 200-gallon tank shows losses of reduced ascorbic acid of nearly 50% at 38°F. and 55% at 48°F. after 36 hours. Milk stored in the 150-gallon tank had the highest losses, about 70% at 38°F. and 78% at 49°F. after 36-hour holding time. Some of this variation between the two tanks may be due to a diff-

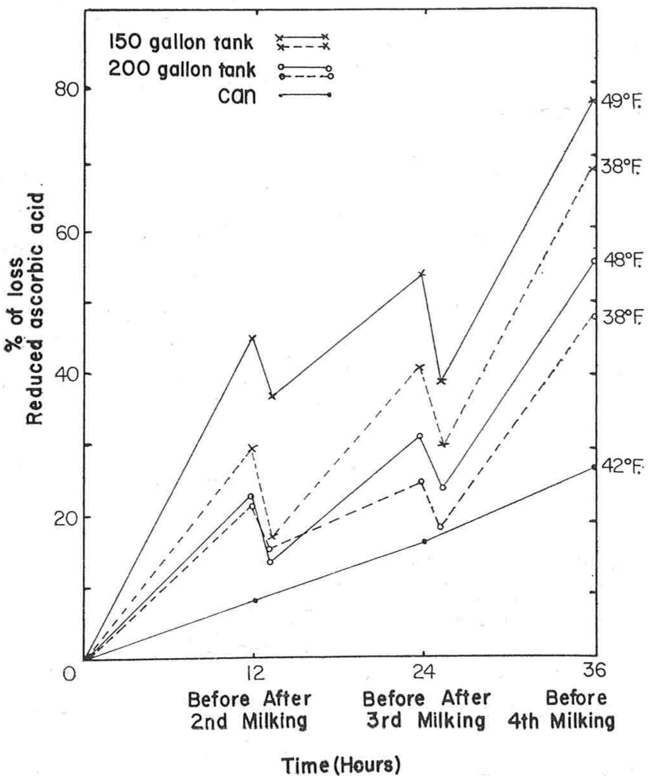

Figure 2. Percent of reduced ascorbic acid lost during a 36-hour holding period.

erence in agitators. The agitator in the 200-gallon tank was a propellor type which rotated under the surface of the milk causing a rolling action to occur. The agitator in the 150-gallon tank was larger and protruded above the surface of the milk and caused more splashing of the milk. This splashing incorporated more air into the milk which probably caused faster ascorbic acid destruction.

Another factor which may contribute to larger reduced ascorbic acid losses in the milk holding tanks is the addition of warm to cold milk. An increase in holding temperature from 38° to 48°F. increased the loss of ascorbic acid by about 10% in both holding tanks. It is common knowledge that most chemical reactions increase in intensity with an increase in temperature which may explain the greater ascorbic acid loss at the higher temperature.

This increased loss of reduced ascorbic acid may be important in two ways. Sommer *(10)* stated that milk will not have a distinct oxidized flavor until practically all the ascorbic acid is destroyed. Other workers *(1)* have reported that ascorbic acid can act to hasten or retard oxidized flavor development in milk. Olson and Brown *(6)* proposed the theory that ascorbic acid oxidation, in the presence of copper, hastens oxidized flavor development in milk. Later, Krukovsky and Guthrie *(5)* confirmed this theory. From these previous reports it appears that there exists some close relationship between ascorbic acid oxidation and oxidized flavor development in milk. Second, several research workers have reported a loss in ascorbic acid content of milk during low temperature storage. Elvehjem *(2)* and Woesner, Weckel and Scheutte *(11)* reported that approximately 20 percent of the original ascorbic acid of milk was lost during pasteurization, homogenization, bottling and distribution to the consumer. Therefore, the lower the ascorbic acid content when milk processing begins the less will be retained for the consumer.

SUMMARY

In this study, samples of milk from two different farm milk holding tanks were compared with samples obtained from a 40-qt. can of milk stored continuously at 42°F. for 36 hours, for changes in pH and ascorbic acid content. Milk stored in farm milk holding tanks lost between 50 and 75% of its reduced ascorbic acid content during a 36-hr. holding period as compared to only a 25% loss in milk stored in a 40-qt. can. A 10°F. increase in holding temperature of the bulk milk gave approximately a 10% increase in loss of ascorbic acid.

The difference in the type of agitation in the two holding tanks may be partially responsible for the large variations in ascorbic acid content between milk samples from the two tanks.

No significant difference was noted in pH changes among milk samples from two farm milk holding tanks and milk held in a 40-qt. can under the described conditions. However, from the results of this limited study, it appears that a significant loss of ascorbic acid occurs in milk stored in farm bulk milk tanks for a 36 to 48 hours as occurs when every-other-day pick-up is practiced.

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DYES AS MARKERS FOR ANTIBIOTIC-CONTAMINATED MILKS

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Treatment of bovine mastitis with antibiotics results in some market milks becoming contaminated with small amounts of the drugs *(3, 4)*. Quick detection, ten minutes or less, of such milk is not possible with present analytical techniques. Although the disc assay method is being used with good results, a period of from 4 to 6 hours is required for completion.

To overcome the present obstacle of a lack of quick detection method some thought has been given to adding dyes as markers along with the antibiotic insertion. The resulting colored milk might then serve as a psychological brake on the milk producer against incorporating this milk in the general supply and also quickly indicate to a supervising milk sanitarian or plant operator the presence of adulterated milk.

Dyes to be given any serious consideration must be harmless to man, non-irritating to animal tissue, inexpensive, easily spotted, and must have the ability to remain in the udder equally as long as the antibiotic. Preferably such dyes should be fat-soluble to forestall any separation of cream from a rejected milk.

The present investigation is concerned with the mechanics of dye marking, with observing the effectiveness of some selected dyes and with evaluating their practicability.

Miss Tunnee Smitasiri, a citizen of Thailand, has been at Cornell since 1956 studying for her M.S. in Food Science. She is a graduate of the University of Medical Science of Thailand, Bangkok, having received a B.S. degree in Pharmacy in 1955. Between 1955 and 1956 she was employed as a hospital pharmacist at the Police Hospital, Bangkok. Upon her return to Thailand this year, Miss Smitasiri plans to continue her activities in dairy chemistry research in one of her country's modern milk processing centers.

Methods

Four dyes used in the preparation of human foods were studied. These included annatto, Baker's red food dye, water soluble chlorophyll, and fat-soluble chlorophyll.[1] Dyes at various concentrations with 500,000 I.U. penicillin per quarter were inserted into udders of experimental animals. The penicillin salts were first dissolved in Penicle, a water-in-oil emulsion used as a dispersing agent.[2]

Five Holstein cows in normal health but of relatively advanced age from the Cornell Veterinary College herd were treated in this manner. One quarter of the udder of each cow was left untreated to supply the control milk.

Milks were collected in glass bottles on the first milking following administration of the antibiotic and dye and cooled to 40°F. until ready for observation and analyses. Milkings from treated cows were continued until samples no longer showed presence of dyes. The color of the milks was compared visually to that of the control milk and testing for residual penicillin was by the APHA standard disc assay method *(1)*. In addition milks dyed with fat-soluble chlorophyll were diluted with uncolored white milk until color no longer was apparent.

Results

Milks from the udders of Holstein cows treated with the experimental antibiotic-dye combinations were colored from deep yellow to red and green (Table 1). The color intensity and persistency in following milkings were dependent upon type of dye, its concentration and the amount of milk produced.

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[1] Annatto butter color from Chr. Hansen's Lab., Inc., Milwaukee, Wisconsin; Baker's food color from Baker's Extract Co., Springfield, Mass.; chlorophyll — water-soluble — copper fixed and chlorophyll — fat-soluble — copper fixed from Magnus, Mabee & Reynard, Inc., New York, N. Y.

[2] Aqueous penicillin (6) from Bristol Laboratories, Syracuse, N. Y.

Penicle Vehicle from Pitman-Moore, Indianapolis, Ind.

TABLE 1. — THE EFFECTIVENESS OF DYES FOR MARKING COW'S MILK FOLLOWING ADMINISTRATION OF AN ANTIBIOTIC-DYE PREPARATION

Dye	Holstein cow (No.)	Concentration of dye in each of cow's udder quarters (ml.)	Color of milk following first milking	Retention of visible color (No. milkings)	Ave. amount milk per quarter (lbs.)
Annatto	404	0	White	—	—
		1	Yellow	3	2.1
		3	Yellow	1	4.4
		6	Yellow	1	4.8
Red food	747	0	White	—	—
		1	Pink	4	1.9
		3	Pink	5	1.9
		6	Pink	6	1.9
Water-soluble chlorophyll	658	0	White	—	—
		1	Green	5	4.0
		3	Green	5	2.8
		6	Green	6	3.4
Fat-soluble chlorophyll	404	0	White	—	—
		1	Green	10	1.6
		5	Green	14	1.6
		10	Green	17	2.0

Annatto dye, giving a yellow cast to the milk, was least effective because of its lack of vivid contrast. Red food dye gave better results but it too produced colored milks with relatively poor color contrast.

Chlorophyll dyes produced vivid green colors in the milks from treated cows and with greater persistency than either annatto or red food dye. The fat-soluble chlorophyll was much more effective than water-soluble chlorophyll (Table 1). For this reason more attention was devoted to the former as a marker for antibiotics.

Fat-soluble chlorophyll in concentrations of 5 and 10 ml. per quarter persisted in milk from the 1st through the 18 milkings (Table 2). This persistency has not taken into consideration the differences in milk volume produced per individual quarter. A concentration of dye of 0.5 ml. per quarter showed color persistency through 5 milkings, and a concentration of 1.0 ml. per quarter lasted through 10 milkings which represented just about the number range required to clear the milks of their residual penicillin from an original insertion of 500,000 units (Table 3).

Chlorophyll has the ability to fluoresce as a vivid red color at about 7000 Angstroms. No attempt was made in present experiments to observe this fluorescence in milk containing chlorophyll, but it is possible that observations of this type might be useful in certain circumstances.

Normal milk dilutions necessary to completely remove green color of the first milking following treatment was 1:300 when 10 ml. of oil-soluble chlorophyll were used and 1:7 when 0.5 ml. dye was inserted into the udder (Table 3). Successive milkings naturally required less dilution.

Fat-soluble chlorophyll did not, in the presence of penicillin, adversely affect the bacteriostatic properties of the latter as test bacteria were effectively inhibited by antibiotic milk containing large concentrations of dye. Neither did infusion into individual cow udders of quantities of dye up to 10 ml. inflame tissue as observed through clinical examination.

The application of fat-soluble chlorophyll in the manner described in these experiments led to two interesting phenomena. Often observed on the surface of the dyed milks, even after several milkings, was a greenish-cast oil slick. A more significant characteristic was the appearance of greenish-black, discrete particles floating in the dyed milk. These were comprised of either undissolved dye particles or heavily stained churned fat particles or both. Appearing in all the fat-soluble chlorophyll stained milks, these particles persisted, though reduced in number and size, even after the disappearance of the uniform color in subsequent milkings. Straining of the milk through cloth filters removed all but the extremely fine particles.

DISCUSSION

Fat-soluble chlorophyll, which was obtained as copper-fixed to provide more stability, displayed some good properties as a color indicator for the presence of antibiotics in milk. At the minimum concentrations, 0.5 to 1.0 ml. per quarter, it colored milk from treated animals so that it could be differentiated without difficulty over 5 to 10 milkings, a period roughly equivalent to the residual penicillin retention from a treatment of up to 500,000 I.U. The presence of this dye did not interfere with the activity of the antibiotic, did not irritate animal tissue, and could be applied at a reasonable cost. For example, at these minimum concentrations a single administration of dye would cost less than one cent.

TABLE 2. — COLOR AND RESIDUAL PENICILLIN OF MILK FROM HOLSTIEN COW TREATED WITH PENICILLIN AND PENICILLIN-CHLOROPHYLL INSERTIONS[1]

	Start of treatment October 27, 1957				Start of treatment November 10, 1957			
Milking following treatment	Udder treatment	Color	Disc assay (Dia-cm.) zone	Milk per quarter (lbs.)	Udder treatment	Color	Disc assay (Dia-cm.) zone	Milk per quarter (lbs.)
1st	a) Pen.	White	4.2	4.2	a) Pen.	White	3.9	5.0
	b) Pen. + 10 ml. dye	Green	3.8	1.8	b) Pen. + 5 ml. dye	Green	3.9	1.8
2nd	a) As above	White	3.1	4.0	a) As above	White	2.8	3.5
	b) As above	Green	3.0	4.5	b) As above	Green	2.4	2.0
3rd	a) As above	White	2.8	3.8	a) As above	White	2.4	5.8
	b) As above	Green	2.5	2.3	b) As above	Green	1.8	1.5
4th	a) As above	White	2.2	5.0	a) As above	White	1.9	3.5
	b) As above	Green	1.5	2.5	b) As above	Green	0.0	1.5
5th	a) As above	White	1.7	4.0	a) As above	White	1.6	3.5
	b) As above	Green	0.0	1.8	b) As above	Green	0.0	1.5
6th	a) As above	White	0.0	4.5	a) As above	White	1.5	3.5
	b) As above	Green	0.0	1.3	b) As above	Green	0.0	1.8
18th	a) As above	White	0.0	4.3	a) As above	White	0.0	3.3
	b) As above	Sl. green	0.0	2.0	b) As above	V.Sl. green	0.0	1.8

[1] Cow 404

Pen.=1000,000 I.U. Penicillin per quarter.

Pen.+10 ml. dye=100,000 I.U. Penicillin+10 ml. oil-soluble chlorophyll per quarter. per quarter.

Pen.+5ml. dye=100,000 I.U. Penicillin+5 ml. oil-soluble chlorophyll per quarter. per quarter.

These same studies indicate some disadvantages of fat-soluble chlorophyll and raise questions as to its general practicability. Low levels of color may limit detection or make it impossible if attempts are made to dilute out colored milk with white milk. Just as serious is the presence of dark-colored particles persisting long after the disappearance of green color in the milk. Perhaps this condition could be eliminated by homogenizing the dye throughout the antibiotic preparation in the original preparation.

A need is indicated for extensive study on variability among cattle to withhold dye in their udder tissue, on the effectiveness of dye retention when varying milk volumes and fat content are produced among different cows, and on the extent to which milk dilution practices might negate the initial value of the dye.

It is well known that individual cows vary in their ability to retain antibiotics. In Danish studies Hovmand *(2)* found one herd eliminated only 2.7 to 15.7 per cent of penicillin administered, while another herd eliminated from 72 to 84 per cent. To some extent this is related to the volume of milk produced, but in addition physiological differences between cows are important and also pathological conditions of the udder. Experimentally, for some cows a specific concentration of dye, such as chlorophyll, can be selected to disappear with the last traces of antibiotics, but if different cows vary widely in their ability to retain dye in udder tissue, the question may be raised as to whether a commercial dye-antibiotic insertion satisfactory for one cow will be equally satisfactory for another. It is clear already that milk volume fluctuation will shorten or lengthen the time factor for antibiotic retention, but in the case of a fat-soluble dye not only is volume of milk critical but also butterfat content, for this is where most of the dye resides. A milk producer will show little patience for a system which colors milk from some of his cows longer than that from others when given the same treatment.

The dilution factor is of importance. For a con-

TABLE 3.—THE DILUTION POTENTIAL OF MILK OBTAINED FROM THE UDDER AFTER APPLYING ANTIBIOTIC WITH FAT-SOLUBLE CHLOROPHYLL (Cow 404)

Concentration of dye in penicillin insertion (ml.)	Retention of green color in milk from treated udder (Number of milkings)	Dilution necessary with normal milk for green color disappearance (First milking only)	Average amount of colored milk per treated quarter (lbs.)
10	17	1:300	2.0
5	14	1:250	1.6
1	10	1:25	1.6
0.5	5	1:7	4.1

scientious farmer the appearance of color in the manner proposed is conceivably a warning that antibiotics are still present in the milk of his treated cows. But for a producer unwilling to lose a certain volume of milk there is little to prevent his diluting out the colored milk in a milk can or a bulk tank of white milk. Thus, with one of the cows under study, at the end of the first milking 2 pounds of milk from an udder treated with 10 ml. dye could be added to 600 pounds before color would disappear, while for a smaller quantity of dye used (1 ml) green color could be obliterated by mixing with 50 pounds or less than one milk can of white milk.

Finally, the use of dye, either as color or fluorescent, carries with it the danger of practicing one adulteration to check another. If this system were adopted extensively, a portion of our market supplies undoubtedly would contain not only antibiotics as contaminants but also, through carelessness or design, dyes. The effects on man would not be harmful if only food dyes are to be used, but the effects on the integrity of the classical philosophy of maintaining milk pure and free of chemical additives might be pronounced.

These points are brought in for discussion not to preclude any future use of dyes but simply to point out some of the existing general problems which are independent of the immediate technical success of any given dye as a marker for antibiotic contamination of milks.

SUMMARY

In a study of four food dyes, fat-soluble chlorophyll was the most promising of the lot to serve as a color marker of antibiotic insertions in udders of cows. At concentrations of 0.5 to 1.0 ml. per quarter fat-soluble chlorophyll persisted in milk as a vivid green to from 5 to 10 milkings following drug treatment. The promising comparison of fat-soluble chlorophyll to other dyes studied does not guarantee its immediate acceptability in practice because its use led to the occurrence of dark, heavily stained particles in the milk which persist long after green color is depleted. Another factor which may seriously handicap chlorophyll and other fat-soluble dyes as color markers for the presence of antibiotic-contaminated milks is a critical lack of information upon variability among cows, normal and diseased, in their ability to retain antibiotics and/or dye. More research on these points is necessary to fully evaluate and justify this type of method for antibiotic contamination control.

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SPECIFICATIONS FOR GERBER GLASSWARE FOR DETERMINING THE FAT CONTENT OF MILK AND CREAM

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Before Gerber *(1)* described the volumetric method, now identified by his name, for determining the fat content of milk and other dairy products, he probably compared many series of determinations thereby with results by the then prevailing gravimetric methods for fat determinations in different types of dairy products. From such calculations he selected a combination of reagents that gave fat mixtures the volumes of which serve as a basis for marking graduations on necks of Gerber butyrometers or test bottles. That Gerber was able to arrive at such a close approximation to the true value as he did with the apparatus and comparative methods of analysis available prior to 1892 is most amazing.

The columns to be measured above the acid-digest mixture consist of a mixture of milk fat and amyl alcohol, the proportions of which vary with different compositions of the acid-digest mixture resulting when different types of dairy products are tested. Inquiries from various sources and an examination of the original text *(1)* have revealed no documented data on which to establish the correct proportion of amyl alcohol in mixtures in the graduated necks of bottles. Current observations herein reported disclose that the proportion of milk fat to amyl alcohol remains practically constant throughout the column regardless of the fat content in the sample when either whole milk or cream are tested.

Among the earlier sales announcements released in this country on equipment for the Gerber method *(2)*, including the multiple pieces of apparatus for the test as applied both to fluid milk and cream and to other dairy products, the following items were specifically listed for the milk fat test:

1. Sulfuric acid, H_2SO_4, water clear, containing 9-10% H_2O so that sp. gr. is 1.820-1.825 at 15°C.
2. Amyl alcohol, fat free special for Gerber, with sp. gr. 0.815-0.818 at 15°C. and boiling point at 128°-130°C.
3. Pipette, with straight side bulb, *to deliver* when last drop is blown from tip, 11 ml. milk at 15°C. (As determined in part by calculation, average delivery is 11.24 g. or 10.90 ml. milk, sp. gr. 1.0315 at 20°C.)
4. Pipette, 10 ml. for transfer of H_2SO_4 test acid.
5. Pipette, 1 ml. for transfer of amyl alcohol.
6. Milk test bottle or butyrometer, neck graduations for 5%, 7% and 9% bottles. No procedure for checking the accuracy of graduations was given.
7. Special stoppers and key for adjusting height of columns for reading their length.

Since 1911 major changes in specifications for glassware and materials have become official in England *(3)* and in the Netherlands *(4)*. On June 2, 1951, C. F. Vester, Secretary to the Netherlands Standards Commission, Rijks Zuivelstation, Vrewykstraat 12, Leiden, Netherlands, advised that on October 1, 1951, the Gerber milk pipette to be used officially in the Netherlands will be constructed to contain 10.77 ml. at 20°C. Their former pipette was constructed to deliver 10.969 $\pm$0.025 g. water at 20°C.

Extensive unpublished comparative data submitted December 5, 1951, to the authors by D. B. Rogers, General Milk Products, Ltd., Dumfries, Scotland, using both the 10.77-ml. and the 10.969-ml. pipette (latter usually referred to as the 11-ml. pipette) and using for reference determinations by the Mojonnier method, substantiates the accuracy of the recent decision by the Netherlands Standards Commission. The new Netherlands pipette will deliver approximately 11.006 g. or 10.67 ml. of milk with a sp. gr. of 1.0315. The significance of this modification is explained later.

Assuming that the old style 11-ml. milk pipette transfers approximately 11.24 g. of milk, sp. gr. 1.0315, the weight equivalent to an 8.0% reading of fat alone will be 0.8992 g. Dividing this value by 0.9 the commonly used sp. gr. of milk fat, the volume occupied by the fat *only* in the graduated neck of the test bottle will be 0.999 ml. Obviously this measurement fails to include the volume increase attributable to the amyl alcohol in the column. (Because of the small percentage of amyl alcohol, sp. gr. 0.815-0.818, present in the alcohol-fat mixture, the effect of differences in sp. gr. between the two substances on the calculated total volume in the column is for all practical purposes disregarded in the above and subsequent calculations. Furthermore, because of the small volume of mixture measured, differences in sp. gr. at

$$\frac{15^\circ}{15^\circ}\ \frac{40^\circ}{15^\circ}\ \text{and}\ \frac{60^\circ}{15^\circ}$$

for milk fat and amyl alcohol are disregarded also.)

Because of the range in the sp. gr. of normal milk and the practical need in this country to pipette test portions of composite samples at about 38°C. (instead of at 20°C.), it is necessary in the calculations herein to recognize average values and accept certain deviations from standard analytical technic. For milk, these include recognizing *(a)* an average sp. gr., *(b)* an average weight delivery from the pipette, and *(c)* measurement of the fat column at about 60°C. The degree to which some of these factors influence the results is explained subsequently. Over the ususal range for sp. gr. for unadulterated milk, variations in the weight of milk delivered at 20°C. by the Babcook pipette will not exceed 18.00±.05 g., and by the Gerber pipette will not exceed 11.006±.04 g. Calculations for charges with the Babcock and Gerber pipettes corrected for temperature differences from 20°C. and for cubical coefficient for glass expansion as per Smithsonian Physical Tables, but not for differences in residual milk adhering to interior of pipette, show average amounts of milk delivered at different temperatures as follows:

WEIGHTS OF MILK DELIVERED BY VOLUMETRIC PIPETTES, ASSUMING AVERAGE SP. GR. OF MILK TO BE 1.0315

Temperature			
°C.	°F.	Babcock	Gerber[a]
4.44	40.0	18.027 g.	11.032 g.
15.00	59.9	18.005 g.	11.009 g.
15.56	60.0	18.004 g.	11.009 g.
20.00	68.0	18.000 g.	11.006 g.
21.11	70.0	18.000 g.	11.006 g.
32.22	90.0	17.992 g.	11.000 g.
37.78	100.0	17.986 g.	10.996 g.

[a]10.77-ml. capacity at 20°C.

The magnitude of the above differences indicates that they may be ignored in the practical application of the test, because *(a)* the accumulative effect of the above range and temperature deviations would be positively undetectable on the neck graduations on bottles the specifications for which permit a much wider graduation tolerance error, and *(b)* sometimes the width of the graduation lines on bottles are such as to cause differences in readings by different technicians which approach or exceed in magnitude the differences in the charges of milk delivered to bottles at the above temperatures.

Furthermore, attempts to correct determinations by adding or subtracting a variable value, depending upon the extent to which the reading on the Gerber test bottle is more or less than a selected reference value, ascribes a degree of accuracy which the method inherently does not possess as it is used in this country by commercial licensees for reading tests to the nearest first decimal place. When reading tests closer than the first decimal, frequent disagreements over intangible opinionated differences in the position of the slowly but continually shrinking meniscus between the closely-spaced parallel lines add confusion in reporting results by a volumetric method which possesses an inherent series of (fortunately) nearly-compensating errors. Despite the above limitations, the test serves a very useful purpose. In the hands of more highly skilled workers using selected glassware, readings can be estimated at closer than 0.1% intervals.

In the State Food Laboratory the following procedure was used for determining the volume in the graduated necks of the test bottles. A sufficient portion of the bulb on the Gerber cream test bottle was ground off to permit fitting a rubber stopper in the hole. After performing the test in the usual manner, 2 successive portions of the column (each nearly 0.5 ml.) were removed. The fat in each portion was extracted by the Roese-Gottlieb method and the percentage of milk fat determined. The above steps were repeated on a number of samples to establish a mean value for the proportion of milk fat to amyl alcohol. Similarly, the bulb on the Gerber milk test bottle was ground off and the proportion in the column of milk fat to amyl alcohol was determined.

Determinations showed that amyl alcohol will mix with the milk fat in the column of Gerber milk and cream test bottles in essentially a constant portion of about 214 (range 212-217) parts of amyl alcohol to 9786 parts of milk fat. It is believed because of different compositions of the acid-digest mixture beneath the column that this proportion will differ when dairy products other than fluid milk and cream are tested. It was concluded that the graduated columns for both milk and cream test bottles should be constructed so that they contain essentially 2.14% of material calculated as amyl alcohol in addition to milk fat.

Calculated values, based on the above determinations, support the adoption by Netherlands Standards Commission of a Gerber milk pipette that *contains* 10.77 ml. at 20°C. Assuming that the 10.77-ml. pipette will deliver 10.67 ml. of milk, sp. gr. 1.0315, the weight of milk testing 8% fat so delivered will be 11.006 g. and the weight of the fat therein will be about 0.8805 g. (With this amount of milk, the residual traces of fat in the acid layer and the traces of water, amyl alcohol, etc. in the fat column are such that the total errors nearly compensate for each and the corresponding readings, by appropriately increasing the volume in the graduated portion of the test bottle to include the amyl alcohol mixed with the fat, closely indicate the correct percentage by weight of fat in milk. An appropriate allowance is made uniformly in the graduated portion of the bottle for the distribution of about 2.14% of amyl alcohol in the fat column.) Dividing this value by 0.9, the volume of such fat is about 0.978 ml. Since the mixture is approximately 97.86% milk fat, the total volume for the mixture would then be 1.0 ml. (more exact 0.999-ml.)

The British Standards Institution in B. S. 696 (1936) provided for a 70% Gerber cream test bottle with a 5-g. charge. The volume prescribed for the corresponding total graduations in this bottle is 3.974 ml. Since in America preference is for a 50% Gerber cream test bottle with a 5-g. charge *(5)*, it is expected that the weight of the fat from a 5 g. charge of a 50% cream in such a bottle will be 2.5 g. (The above parenthetic explanation applies similarly to the cream charge.) Dividing this figure by 0.9, the commonly used sp. gr. of the milk fat, the volume of such fat in the 50%, 5-g. charge cream test bottle will be 2.777+ml. Then, dividing this volume of milk fat by 0.9786, the total volume of the mixture in the graduated neck of the Gerber cream test bottle will be 2.84 ml. (more exact 2.8395 ml.).

By direct proportion computation of the volumes of amyl alcohol-milk fat mixtures in the 70%, 5-g. British cream test bottles, and in the 50%, 5-g. American cream test bottles, the calculated volume is found to be essentially 2.84 ml., also. Other calculations show that the 3.974 ml. (more exact probably 3.9739 ml.) graduated volume on the 70%, 5-g. British cream test bottle, is constructed to contain a mixture of about 3.888+ml. of milk fat and 0.0851 ml. of amyl alcohol.

The above record on volume measurements was presented to representatives of the Corning Glass Works, Corning, N. Y., an American manufacturer of certain types of Gerber glassware. Subsequent to quoting the figure of 2.84 ml. for the total graduation in the 50%, 5-g. Gerber cream test bottle, it was disclosed that a specification of 2.839 ml. had been furnished the Corning Glass Company. To arrive independently at such close agreement on specifications was gratifying.

A comparison of the calculations and measurements between the Babcock and Gerber test bottles follows:

	Babcock bottle	Gerber bottle
	(8% milk)	(8% milk)
Pipette, H_2O capacity at 20°C.	17.60 ml.	10.77 ml.[a]
Milk, sp. gr. 1.0315 capacity	18.00 g.	11.006 g.
Milk, sp. gr. 1.0315 delivered	17.45 ml.	10.67 ml.
Weight of fat in charge of 8% milk	1.44 g.	0.8805 g.
Volume of fat in charge of 8% milk	1.6 ml.	0.978 ml.
Graduated neck capacity	1.6 ml.	1.0 l.[b]
	(9 g., 50% cream)	(5 g., 50% cream)
Cream charge	9.0 g.	5.0 g.
Weight of fat in charge of 50% cream	4.5 g.	2.5 g.
Volume of fat in charge of 50% cream	5.0 ml.	2.84 ml.[b]
Graduated neck capacity	5.0 ml.	2.77+ml.

[a]Since 1951 the British Standard Institution have announced a different pipette specification.

[b]Allowance included for amyl alcohol in milk fat-amyl alcohol mixture in column.

SUMMARY

Application of the revised specification for the Gerber milk transfer pipette, authorized by the Netherlands Standards Commission on October 1, 1951, is discussed. For the first time, the basis for the overgraduation of the volume in the necks of Gerber test bottles for milk and cream is explained. The determination is based on the quantity of milk fat recovered by the Roese-Gottlieb method from the amyl alcohol-milk fat mixture in the column.

The above determinations provided a basis for the test portions of milk and cream used in the Gerber method and the graduations designed to include approximately 2.14% of amyl alcohol in the milk fat-amyl alcohol columns measured above the acid digest in the Gerber bottles.

It is concluded that the Gerber milk transfer pipette should be graduated to contain 10.77±.03 ml. H_2O at 20°C. The volume of the total graduated portion should be 1.00 ml. in the neck of the 8.0% milk test bottle and 2.84 ml. in the neck of the 50%, 5-g. charge cream test bottle.

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Special Service Article

PRIVATE SEWAGE DISPOSAL SYSTEMS

(Editors note: This is the third in series of three special articles on this subject. The first and second appeared in the July and August issues.)

In the preceeding article the function, size and capacity of the septic tank were discussed. In this, the third and concluding article of the series, factors of importance in planning and laying out the subsurface absorption system will be covered.

The Subsurface Absorption System

When a soil absorption system is determined to be usable as shown by the percolation test, two types of design may be considered, namely, standard trenches and seepage pits. The selection of the leaching system will be dependent to some extent on the location of the system in the area under consideration. A safe distance must be maintained between the site and any source of water supply. Ordinarily, the greater the distance, the greater will be the safety provided. As a general rule, all subsurface absorption systems should be kept 100 feet from any water supply well, 50 feet from any stream or water course and 10 feet from dwellings or property lines. Seepage pits should not be used in areas where domestic water supplies are obtained from shallow wells or where sink holes or limestone formations are prevalent. Seepage pits should be at least 20 feet from any dwelling or property line.

Standard Trenches

An absorption field or subsurface tile system consists of a field of 12 inch lengths of 4 inch agricultural drain tile, 2 to 3 foot lengths of vitrified-clay sewer pipe or, perforated, non metallic pipe, laid in such a manner that flow from this septic tank will be distributed with reasonable uniformity into natural soil. Individual laterals preferably should not be over 60 feet long with a maximum length of 100 feet and the trench bottom and construction lines should be laid at a grade of 2 to 4 inches per 100 feet. Use of more and shorter laterals is preferred because if something should disturb one line, most of the field will still be serviceable.

The depth of the absorption trenches should be at least 18 inches. Additional depth may be needed for contour adjustment or extra aggregate under the tile. In considering the depth of the trenches, the possibility of the tile lines freezing during prolonged cold weather is a point sometimes raised.. However, freezing rarely occurs in a carefully constructed system kept in continuous operation. It is important during construction to be sure the tile lines are surrounded by gravel. Lines under driveways or under other surfaces which are generally cleared of snow should be insulated.

Current practice for soil absorption fields calls for a trench 18 to 24 inches in width with the tile laid on 6 inches of gravel. Within this range and for trenches up to 36 inches, the absorption area per linear foot of trench is proportioned to the width of the trench, and the required area is predicated on the results of the percolation test. For example, for a 3 bedroom house on a lot where the percolation rate was 1 inch in 15 minutes°, the necessary leaching trench area will be 3 feet by 190 feet or 570 square feet. For trenches 2 feet wide with 6 inches of gravel below the tile, the required bottom length of the trench would be 570 divided by 2, or 285 feet. If this were divided in 5 portions, that is laterals, the length of each line would be 285 divided by 5, or 57 feet. The minimum spacing should be between 6 and 7.5 feet depending upon the width of the trench as shown in Table 1 below:

°Consult table in first article in July, 1958 issue.

Table 1.—Distances Between Trenches

Trench width, inches	Minimum distance between centerline of trenches, feet	Trench width, inches	Minimum distance between centerline of trenches, feet
12 to 18	6	24 to 30	7.0
18 to 24	6.5	30 to 36	7.5

In the example of the 3 bedroom house cited above, where a two foot trench was used, the minimum total area for the absorption field required would equal (5x6.5x57) or 1852 square feet.

Construction Features

A satisfactory disposal field depends upon careful construction. Care must be taken to prevent sealing of the surface on the bottom and sides of the trench. Trenches should not be excavated when the soil is wet enough to smear or compact easily. Soil moisture is right for safe working only when a handful will mold with considerable pressure. Some smearing will occur or soil may become compacted in which case raking and removing loose material should be done before gravel is placed in trenches.

The tile, laid in a properly prepared trench should be surrounded by clean graded gravel, broken brick, washed rock or similar aggregate. The material may range in size from one-half inch to two and one half inches. Cinders, broken shell, and similar material are not recommended because they are generally too fine and may lead to early clogging or perforation. The aggregate should extend from at least two inches above the top of the tile to at least six inches below the bottom of the tile. The upper half of the joint openings should be covered with strips of untreated roofing paper or a specially fabricated clip designed for this use may be employed.°° The top of the stone should be covered with untreated building paper or a two inch layer of straw, hay or pine needles before backfilling. This will help prevent clogging of the aggregate by the backfill.

It has been found that root problems may be prevented best by using a liberal amount of gravel or stone around the tile. Clogging due to roots has occurred mostly in lines with insufficient gravel under the tile. In general, trenches constructed within 10 feet of large trees or dense shrubbery should have at least 12 inches of aggregate beneath the tile.

DISTRIBUTION BOXES

A distribution box is considered essential for every soil absorption field system. The purpose of the box is to insure equal distribution of the effluent to the several lateral lines. At least two lateral lines should lead from the box, and enough additional laterals should be connected to the box to provide effective percolation area. The design of the system can be varied to meet most topographical conditions encountered while giving proper grade and alignment for all laterals. The distribution box should be installed on a concrete footing to keep it permanently in place and in proper alignment with all laterals.

SEEPAGE PITS

A seepage pit is a covered earth pit with openpointed lining through which the effluent may seep into the surrounding porous soil. It is usually considered a less desirous method of disposal than the absorption field. They should never be used where there is likelihood of contaminating underground waters, nor where adequate subsurface disposal fields can be provided. When pits are used they should terminate four feet above the ground water table.

In some states, seepage pits are permitted as an alternative when absorption fields are impractical and where the top three or four feet of soil is underlaid with porous sand or fine gravel.

Where permitted, seepage pits may be either supplemental or alternative to the tile field system. When used in combination with absorption fields, the leaching area should be prorated or based upon the weighted average of the results of the percolation tests.

The capacity of a seepage pit should be computed on the basis of percolation tests made in each vertical stratum penetrated and the weighted average of results should be computed to obtain a design figure. Strata in which rates are in excess of 30 minutes per inch should not be included in computing the absorption area.

SAMPLE CALCULATIONS FOR SEEPAGE PITS

Assume that a seepage-pit system is to be designed for a 3 bedroom home where the minimum percolation rate of 1 inch in 15 minutes prevails. From the table of percolation rates appearing in the first article of the series (July, 1958 issue of this Journal) an absorption area of 570 square feet is needed. Assume that the water table does not rise above 27 feet below ground surface, that seepage pits with effective depth of 20 can be provided, and that the house is in a locality where it is common practice to install seepage pits of 5 feet diameter, (i.e. 4 ft. to the outside walls) which are surrounded by about 6 inches of gravel. Design calculations for the system are as follows:

Let x=depth of the pit in feet; D=pit diameter in feet:

$\pi Dx = 570$ sq. ft.

$3.14(5)(x) = 570$ sq. ft.

Solving for x, depth of pit=36 ft. (approx.)

Thus, to obtain in square feet the area needed, one 5 foot diameter pit, 36 feet deep would be required. However, since the maximum effective depth is 20 feet, it will be necessary to increase the diameter of the pit, or increase the number of pits, or increase both.

Design for 2 pits with a 10 foot diameter: x=depth of each pit

$2\,[3.14(10)(x)] = 570$ sq. ft.

$x = 9.1$ feet deep

Thus, two pits 10 feet in diameter and 9.1 feet deep would result in the area desired for absorption and would be sufficiently above the water table.

Experience has shown that seepage pits should be separated by a distance equal to 3 times the diameter of the largest pit. For pits over 20 feet in depth, minimum space between pits should be 20 feet. The area of the lot on which the house is to be built should be large enough to maintain this distance between the pits while still allowing room for additional pits if the first ones should fail. If this can be done, such a leaching system may be approved; if not, other suitable sewerage facilities should be required.

CONSTRUCTION CONSIDERATIONS

Seepage pits are usually circular in plan. The vertical walls are usually lined with masonry placed without mortar below the inlet. The section of the seepage pit above the inlet pipe should be laid with mortared joints or otherwise strengthened. Hard-burned brick, heavyweight concrete block, structural clay tile, and fieldstone are acceptable, if properly laid to provide necessary structural strength. If cored units are used, the cores should be laid in the vertical plane. Whatever the material, the walls should be laid close with no conscious attempt to provide openings between the units. The unevenness of the edges will provide all of the space necessary for the sewage to seep into the surrounding soil. Large openings invite trouble; they make the walls less stable structurally, and permit easier infiltration of the surrounding soil. Pits with large wall openings may be more likely to cave in or collapse than pits with closely built walls. The annular opening between the seepage-pit lining and the surrounding earth should be filled with coarse gravel.

In the construction of a seepage pit, it is particularly important that proper precautions be taken to prevent the side walls from collapsing while workmen are in the hole. Fatal accidents have occurred when this basic safety measure has not been observed. A common method of affording proper protection is through the use of sheeting formed by semicircular sections of corrugated metal, braced with semi-circular compression rods which are bolted on the inside with expansion bolts. In another type of seepage-pit construction, the walls are made of precast reinforced concrete sections with slotted holes. For deep seepage pits, or where there is any danger of caving, the sections are installed as the excavation progresses, and are used as the necessary protective sheeting.

Inspection before backfilling of new seepage pit installations is as important as in absorption-field construction.

Abandoned seepage pits should be filled with earth or rock.

CONCLUSION

In this series of three articles on *Private Sewage Disposal Systems* emphasis has been placed on the importance of soil conditions and the absorptive ability of the soil. The percolation test must be conducted to be certain that a properly designed and installed absorption system will work. The minimum size septic tank is 750 gallons but studies have shown that liberal tank capacity is not only important from a functional standpoint, but is also good economy.

While a satisfactorily designed and engineered septic tank system will give good results, connection to an adequate public sewerage system is the most desirable. Every effort should be made to secure public sewer extensions as the most satisfactory method of sewage disposal.

°°Boco Industries, Inc., 19424, W. 8 Mile Road, Detroit 19, Mich.

Referencess

U. S. Dept. of Health, Education, and Welfare. Public Health Service, Manual of Septic-Tank Practice. Publication 526. U. S. Government Printing Office, Washington 25, D. C.

Left, Karl A. Mohr receives Sanitarian's Award plaque from Harold S. Adams, Chairman of Committee on Recognition and Awards.

CARL A. MOHR WINNER OF ANNUAL SANITARIAN'S AWARD

Carl A. Mohr, Sanitarian and Deputy Health Officer of the Green Bay, Wisconsin Health Department was the winner of the annual Sanitarian's Award, presented by International. In addition to an appropriately engraved plaque, the recipient also received a check in the amount of $1000.

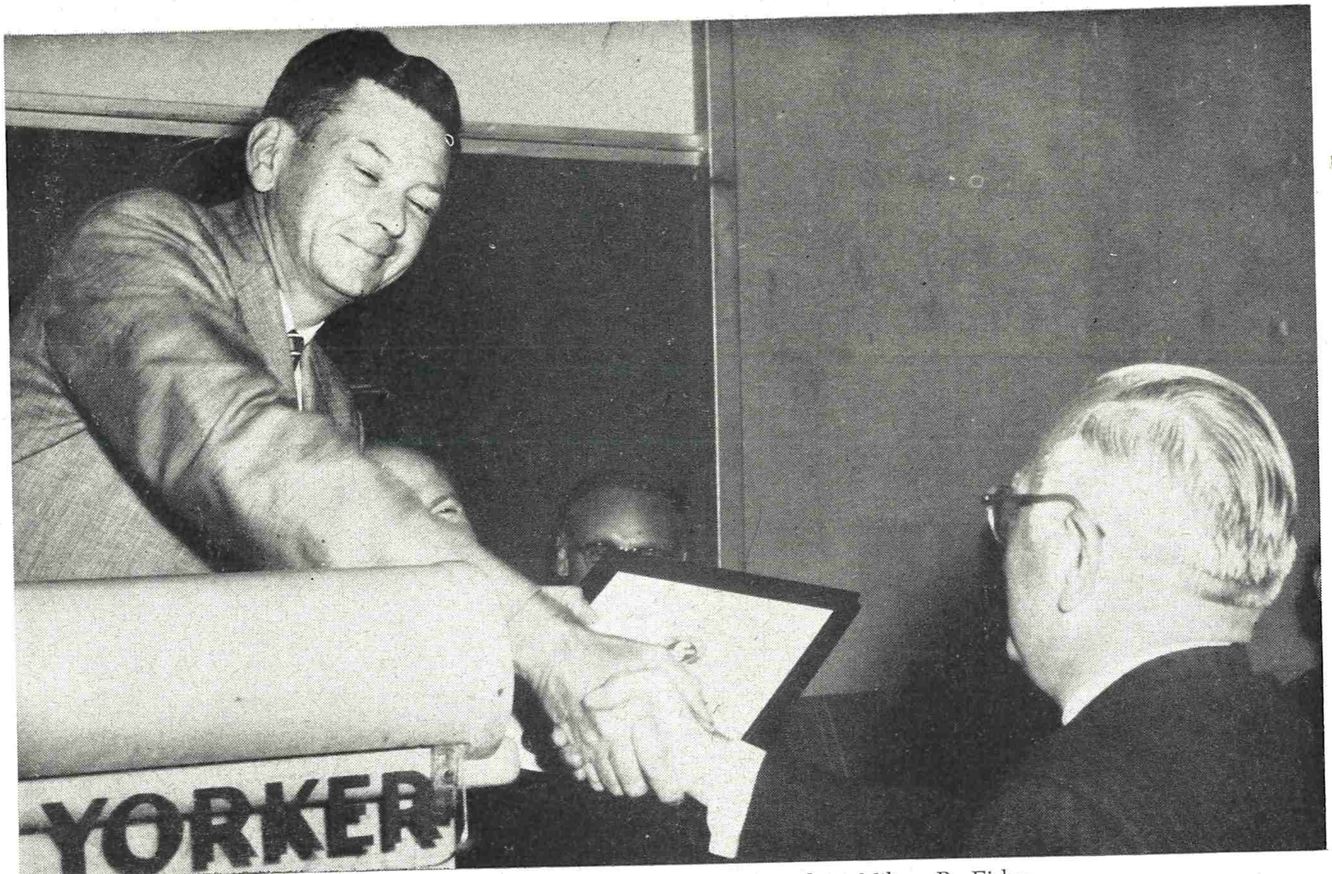
Mr. Mohr was cited for his accomplishments in the field of milk and food sanitation in Green Bay and for his contributions and influence, state wide, in the sanitary control of milk, meat and other foods. His work in organizing and promoting the Wisconsin Conference on Intrastate Milk Shipments has been outstanding and has resulted in the solution of intrastate milk shipment problems in some twenty-five Wisconsin cities. He serves presently as chairman of the Conference.

He has been instrumental in the enactment of modern milk, food, and meat ordinances in his home city and has greatly improved the sanitary quality of these products. Another outstanding contribution has been his program of environmental sanitation education in the high schools in Green Bay. When the Board of Education was retrenching its program in health education, Mr. Mohr personally offered his services with a planned program of sanitation education for the students. This has continued to be most successful, in fact has been expanded to the point where students carry on special field studies, take examinations and receive credit for the work.

In his home city, Mr. Mohr is active in city affairs and serves actively in clubs and associations whose objectives are civic improvement. He is looked upon in his native city as a man of outstanding organizational ability and with perserverance qualities to carry through to completion programs of public health improvement.

In addition to being awarded the Annual Sanitarian's Award by International, Mr. Mohr was also honored by the Wisconsin Association of Milk and Food Sanitarians at their recent meeting by being named outstanding sanitarian in Wisconsin for the year 1958.

Mr. Mohr is married and has three children.

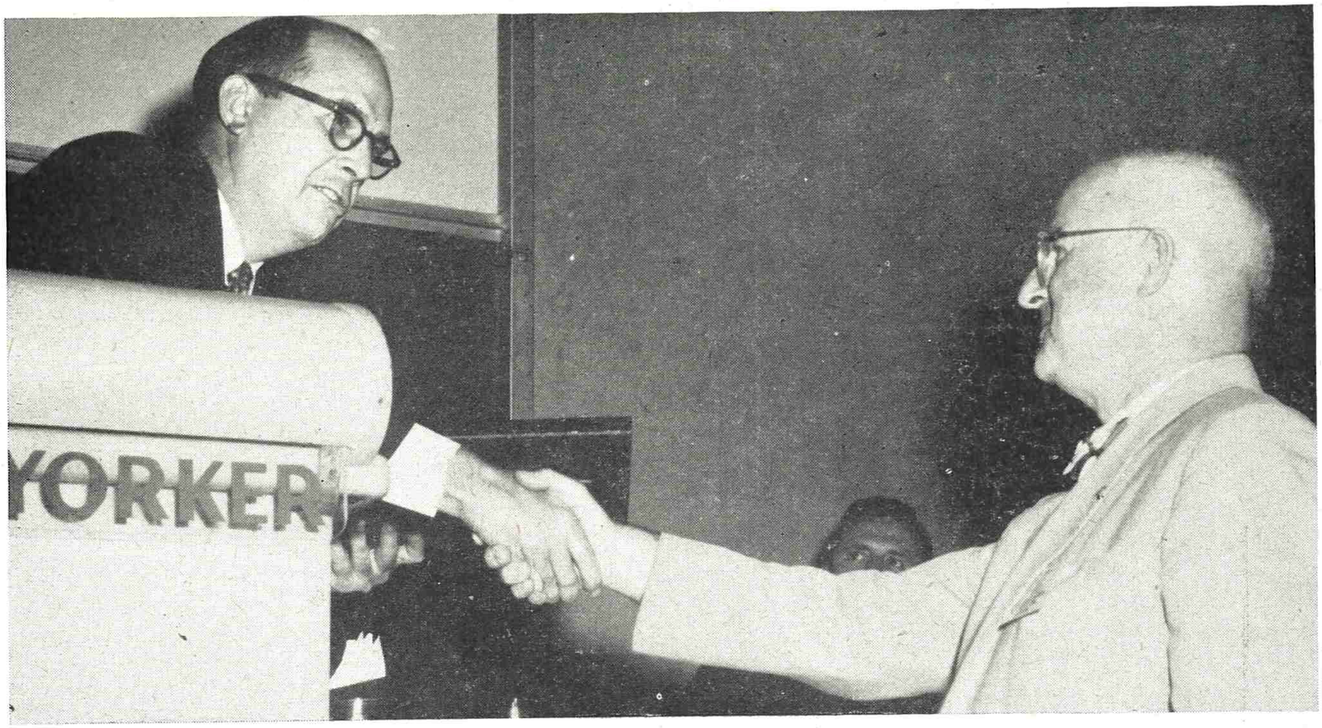


Harold S. Adams, left, presents Citation Award to Milton R. Fisher.

FISHER RECEIVES ANNUAL CITATION AWARD

At the 45th annual meeting of the International Association of Milk and Food Sanitarians held at New York City, September 8-11, Dr. Milton R. Fisher, Chief of the Milk Sanitation Division, St. Louis, Missouri Department of Health was awarded the annual Citation Award. This award is presented for outstanding contributions to the work, program and progress of International. Dr. Fisher, for many years has made noteworthy contributions to the growth of the Association by serving on a number of important committees, on the Executive Board and as president in 1950. He has been very active in the Conference on Interstate Milk Shipments and serves currently as a member of its executive board.

Sponsors of Sanitarian's Award, left to right: William Dixon, Klenzade Products Corp.; C. A. Abele, Diversey Corp.; Mr. Mohr Award Winner, C. E. Brooker, Pennsalt Chemical, Inc.; A. E. Wennerstrom, Olin Mathieson Chemical Corp.; (Oakite Products, Inc. representative not present)



Harold B. Robinson, President, presents Honorary Life Membership Award to H. Clifford Goslee.

GOSLEE ELECTED TO HONORARY LIFE MEMBERSHIP

H. Clifford Goslee, elected to Honorary Life Membership, retired recently from the Connecticut Department of Agriculture where he served as director of the Division of Dairy Products, for many years. He has served since 1929 as the Secretary of the Connecticut Association of Dairy and Food Sanitarians and in that capacity was instrumental in increasing the membership to its current roster of about 300 members. He has served International as a member of the Sanitary Procedures, Membership and Resolutions Committee and has represented his state in the affiliate council. Through his efforts International has made beneficial changes in its administrative procedure to strenghten its service to the numerous affiliates. In addition to his diligent work with his own Association he has had prominent parts to play in the New York Association and with the Massachusetts Milk Inspectors Association. International wishes him well in his retirement and hopes he will continue his active interest in the affairs of the Association.

21st DAIRY INDUSTRIES EXPOSITION AT CHICAGO IN DECEMBER

The 21st Dairy Industries Exposition will be held at Navy Pier Chicago, December 8-13, 1958. The Exposition regularly attracts more than 25,000 dairy-industry related men and women, primarily dairy processors and including also dairy educators, dairy sanitarians, dairy technology students and limited qualified visitors. Nearly 400 firms will present exhibits, showing or bearing upon the use of every conceivable item of supply or equipment or service needed in the dairy processing field. The displays relate not only to improving operations in the plants, but to the packaging, selling, refrigerating, delivering and serving of dairy products of every type and style, including fresh fluid milk, ice cream and frozen novelties, multivarieties of cheese, butter, and dry, condensed and evaporated milks and specialty dairy items. They throw light on the resolving of dairy processor problems in general management, in financing, plant "housekeeping," marketing and distribution in all aspects. Exhibits by size range from three-story high processing machines to microscopic chemical entitles that play parts in human nutrition or food sanitation. Participating exhibitors range from giants of American business in the metal and motors fields to displays by small specialist companies.

The theme of the Exposition is, "Meet the Challenges," and a number of specific survival and growth challenges which the Show can help the dairy industries to meet are to be considered.

Admission to the Exposition is by badge only, and is free to all dairy processors, dairy regulatory officials, dairy sanitarians, dairy educators and dairy manufacturing students. Such visitors may receive their free badges upon identifying themselves at the entrance to the Pier where a corps of experienced registration personnel will quickly serve them.

NEW "STERILIZER" DEVELOPMENT

An all new "Sterilizer-Washer" for Milk Cans—Mixing Kettles—Stock Pots—Refuse Cans—Etc., was recently made available by "AerVoid-Vacuum Can Company" of Chicago. This revoluntionary development employs a Ball Bearing Cyclonic-Whirling Spray Nozzle that cleans with a scouring action. It Washes—It Rinses—It Sterilizes—It Deoderizes—It Preheats—It PreCools. It provides an easy, fast and sanitary method of performing all these operations by simple foot pedal action. It is especially suited for sterlizing and preheating Food and Liquid Carrier-Dispensers. Its installation is adaptable to all plumbing conditions; it will operate under any of the following set-ups: 1. Cold Water and Steam, 2. Cold Water, Hot Water and Steam, 3. Cold water and Hot water, 4. Hot Water Only, 5. Steam Only—Additional information and specifications are available for the asking—VACUUM CAN COMPANY, 19 SO. HOYNE AVENUE—CHICAGO 12, ILLINOIS.

ERRATA

Under Authorization to Use the 3-A Symbol, page 234, August 1958 issue of the Journal, there was an ommission in connection with the last item of the listing. This item should have read as follows:

Authorization Number	TANKS-AUTOMOTIVE
64	Atlas Metal Products, Inc. 554 Wilbur Cross Highway Berlin, Conn.

This concern did not apply for renewal of this authorization upon its expiration.

GUIDE LINES FOR USE OF INSECTICIDES IN THE DAIRY INDUSTRY

(*Prepared by the Food and Drug Administration, July* 1957)

1. Insecticides which are safe for spraying cows and other uses in and around the dairy barn, provided that utensils and the drawn milk are adequately protected from contamination:

Pyrethrins	MGK 264
Piperonyl Butoxide	MGK R-11 (repellant)
Allethrin	Tabutrex (repellant)

2. Insecticides which may be used for fly control around dairy barns, provided the insecticides are not sprayed directly onto the cow or on the feed or feed trough, and provided utensils and the drawn milk are adquately protected:

Diazinon - spray, bait, cords
Parathion - cords only
Malathion - spray, bait
Chlorthion - spray, bait
Dipterex - bait only
Lindane - spray, bait
Methoxychlor - spray only
TEPP - bait or floor spray only

3. Certain pesticides may be used on growing crops intended for dairy cattle feed provided the amounts remaining on the feed do not exceed approved tolerance levels. When the pesticides are used according to label directions, crops sprayed with the following pesticides are within legal tolerance levels and are considered safe:

Methoxychlor
Heptachlor
TEPP*
Rotenone**
Pyrethrum (Prethrin-piperonyl butoxide)**
Sabadilla**
Ryania**
Malathion
Parathion

*When used according to directions on growing crops, will not leave a residue.

**Exempted from requirement for tolerance, when used according to directions on growing crops.

Please Note: While this information is supplied in the public interest, all users must carefully adhere to label instructions to avoid personal hazard.

INDUSTRIAL-SANITATION SHOW SCHEDULED

The Third Industrial and Building Sanitation Maintenance Show, scheduled for Philadelphia's Convention Hall, November 3 - 6, 1958 will feature important speakers and panel sessions to highlight new advances in the field, the Institute of Sanitation Management show sponsors announced.

L. Lloyd Barron, Director of Sanitation of the National Biscuit Co. and president of the sponsoring group, announced that sessions on virtually every sanitation maintenance problem will be scheduled for every day of the show.

The board of directors of the Institute of Sanitation Management will meet during the evening of the opening day and the closing day. Election of officers and councils is scheduled for Wednesday morning, November 5, during which the various divisional institutes will also meet to cover regional problems. Divisions of the Institute are: Buildings, Food Processing, Industrial, Institutions, Mill and Bakery.

Another highlight of the forum sessions will be an exhibitors quiz meeting the evening of Tuesday, November 5. Coverage of labor, costs, training, inspection, equipment, floor maintenance, and similar subjects will be discussed the morning of November 6. During the latter, panelists will be on hand to answer questions from the floor.

This will be the show's first appearance in Philadelphia.

It is designed for the executive who specifies the purchase and/or buys industrial and building sanitation products and equipment.

CHERRY-BURRELL HEADQUARTERS MOVES TO CEDAR RAPIDS, IOWA

The general offices of Cherry-Burrell Corporation moved from Chicago to Cedar Rapids, Iowa about July 1st, according to the announcement of Howard H. Cherry, Jr., President.

The general offices will be located in the two story administration building at the Company's ultra modern, nine-acre factory at 2400 Sixth Street, S.W., Cedar Rapids, Iowa. This will permit the closest coordination between management, sales, and research, as well as a major manufacturing activity. The building is being remodeled to house the home office of the Company.

The Corporation's other large manufacturing facility, located at Little Falls, New York, was enlarged in 1955. This factory is being remodeled to accomodate the administrative and engineering activities connected with Little Falls operations.

The entire manufacturing operations of Cherry-Burrell are now centralized in two of the largest and best equipped factories in the world for manufacture of dairy and food processing equipment, according to Mr. Cherry.

In addition to centralizing and improving its manufacturing, selling, and administrative activities, Cherry-Burrell has established new technical and development engineering groups at the Cedar Rapids plant to accellerate its research program.

Mr. Cherry explained that the Company is demonstrating its faith in the future growth of the dairy and food processing industries by committing its full resources to accellerated technological development and revitalized manufacturing, sales, and service for these industries.

The Chicago Sales Branch, located in the Cherry-Burrell building at 822 West Washington Blvd. in Chicago, will remain in its present address and will be augmented as required to provide services previously available to branch customers from the nearby general offices.

DR. D. H. SEATH, UNIVERSITY OF KENTUCKY TO LECTURE IN DUBLIN, IRELAND

Dr. D. M. Seath, Head of the Dairy Section of the University of Kentucky, has been appointed Lecturer of the College of Agriculture, University College, Dublin, Ireland for the academic year 1958-59. He will be on sabbatical leave from the University of Kentucky from October 1, 1958 to July 1, 1959.

Dr. T. R. Freeman will serve as Acting Head of the Dairy Section in Dr. Seath's absence.

Courses to be taught by Dr. Seath while in Dublin include a formal course in Animal Breeding and a seminar in the same field. It is estimated that he will have about 60 four-year students in his courses.

Dr. Seath's appointment has been under the International Educational Exchange Program. Negotiations for the program between the Irish Free State and the United States only recently have been completed. Dr. Seath will be among the first to participate in the program in Ireland.

While in Europe he expects to study dairy programs in research, teaching and extension in Ireland, England, Scotland and Wales. Also, between terms at the Dublin university, Dr. Seath hopes to study educational and research facilities in Denmark, Sweden, Holland and the Channel Islands.

Before returning to the United States he will present a paper at the 15th International Dairy Congress to be held in London, England June 29 to July 3. The paper is entitled "Grain Feeding to Cows at Three Levels and How it Compares to Hay and Silage as Supplement to Pasture when Measured in Milk Production, Body Weight Change, Dry Matter Intake and Digestibility of the Ration" by Dr. Seath, Don Dowden, B. F. Brown, D. R. Jacobson and Joe Rust all of the University of Kentucky.

Mrs. Seath will accompany Dr. Seath. The Couple plans to leave Lexington about October 6th and fly directly to Ireland. They will return by boat to arrive home about July 15th.

3-A ACCEPTED PRACTICES

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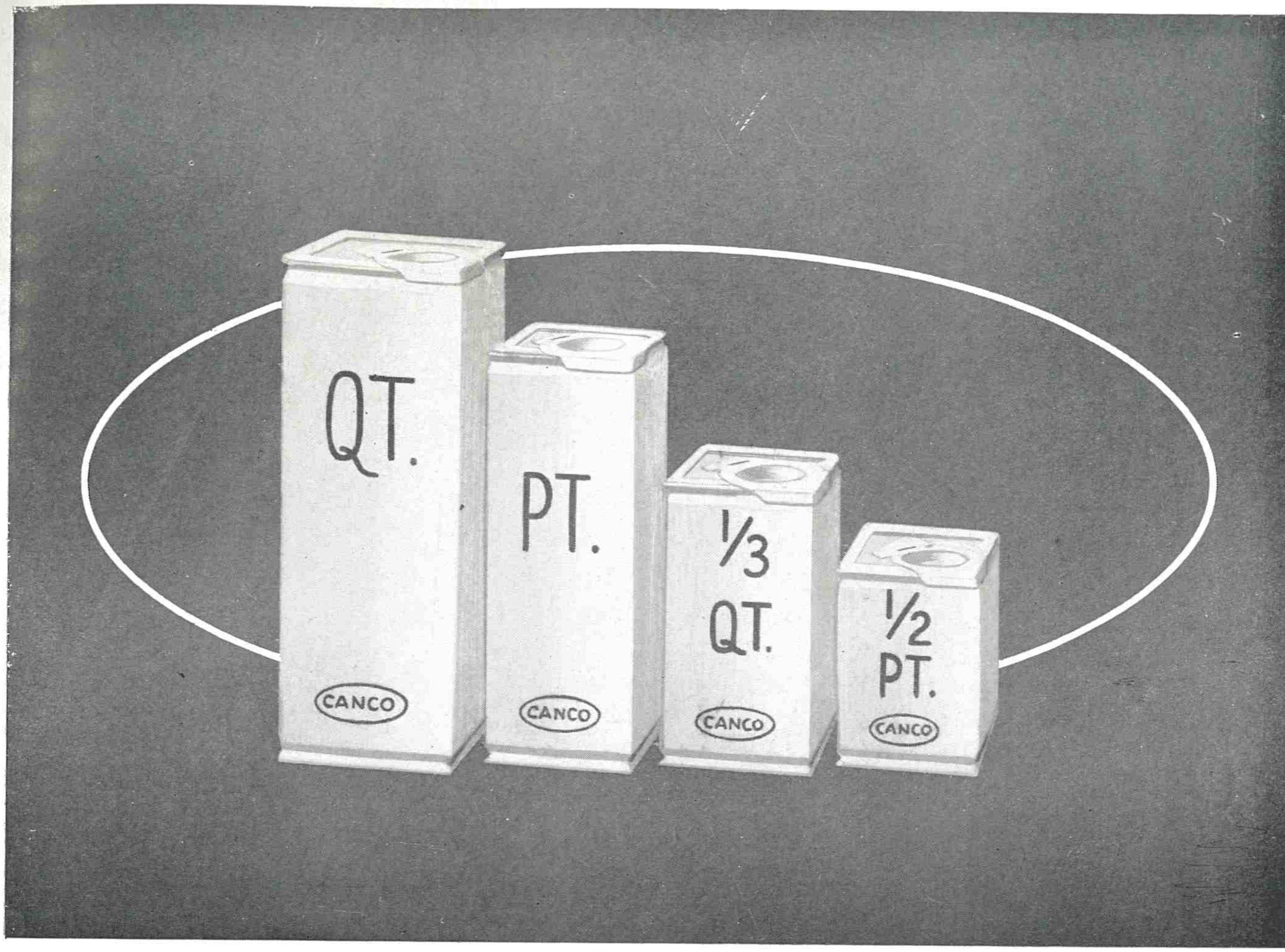
— INDEX TO ADVERTISERS —



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