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Newbould and Barnum (1956) found that a farm using a chlorine compound for udder washing and teat cup dipping had much larger numbers of staphylococci on the teat cup liners than 2 farms which used chlorhexidine. The farm using chlorhexidine at 400 p.p.m. had an average count several times lower than that using the same substance at 250 p.p.m. Since there was little difference between the 3 herds in the number of staphylococci being shed in the milk, these authors concluded that chief source of contamination of the liners was the teat skin and that clorhexidine was effective in reducing the numbers found there.

To test these hypotheses they changed the disinfectant used for udder washing to chlorhexidine on the first farm and to the chlorine compound on one of the others, while leaving the teat-cup dipping procedure unchanged. This was followed by a substantial and rapid fall in the number of staphylococci on the liners of the first farm and a rise in that on the liners of the second.

Confirmation of the efficacy of chlorhexidine as an udder wash was obtained by the present author in experiments with monozygous twins (Reports, 1958 and 1959). The object of these experiments was to determine whether sufficiently rigorous hygienic precautions at milking time would effectively control the transmission of staphylococci.

In an experiment on the control of staphylococci on the udder skin, 1:5,000 chlorhexidine was used as an udder wash in one group of cows, using a separate udder cloth for each cow, and the milking unit was flushed with running water after each cow was milked. In the control group, the udders were washed with water, again using a separate cloth for each cow, and the milking unit was transferred directly without rinsing.

This combination of precautions reduced the number of staphylococci found on the udder surface in the experimental group to less than one-eighth that in the control group.

In a further experiment, the cows were exposed to donor animals shedding a particular strain of staphylococcus in the milk. The donors were milked first and the same precautions were taken in the experimental group. The introduced staphylococcus caused mastitis in 5 of the 9 control cows but in none of those in the experimental group. As in the first experiment, there was a marked reduction in the number of staphylococci on the udder surface in the experimental group.

Thus, in these experiments, a combination of antibacterial udder wash, individual udder cloths and rinsing the milking unit with running cold water after milking each cow was effective in controlling the spread of infection and reducing the amount of mastitis.

Davidson, Ian: Staphylococcal mastitis: its epidemiology, *Veterinary Record* (London), 73, 43 (1961).

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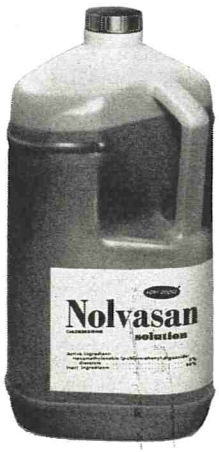

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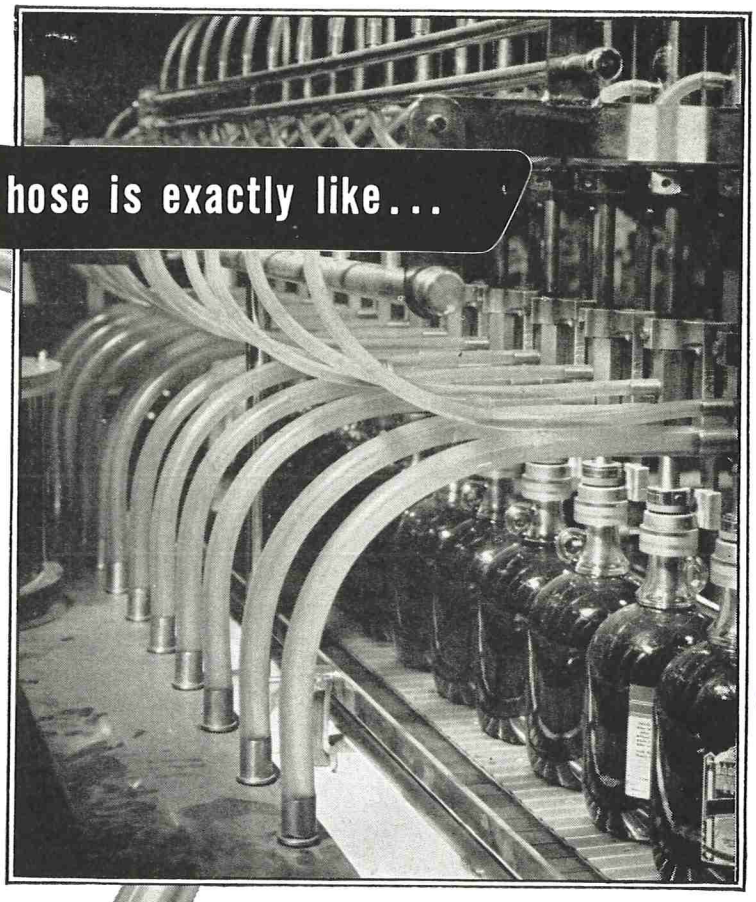

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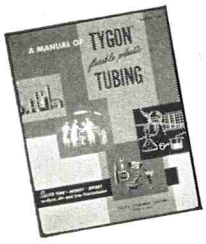

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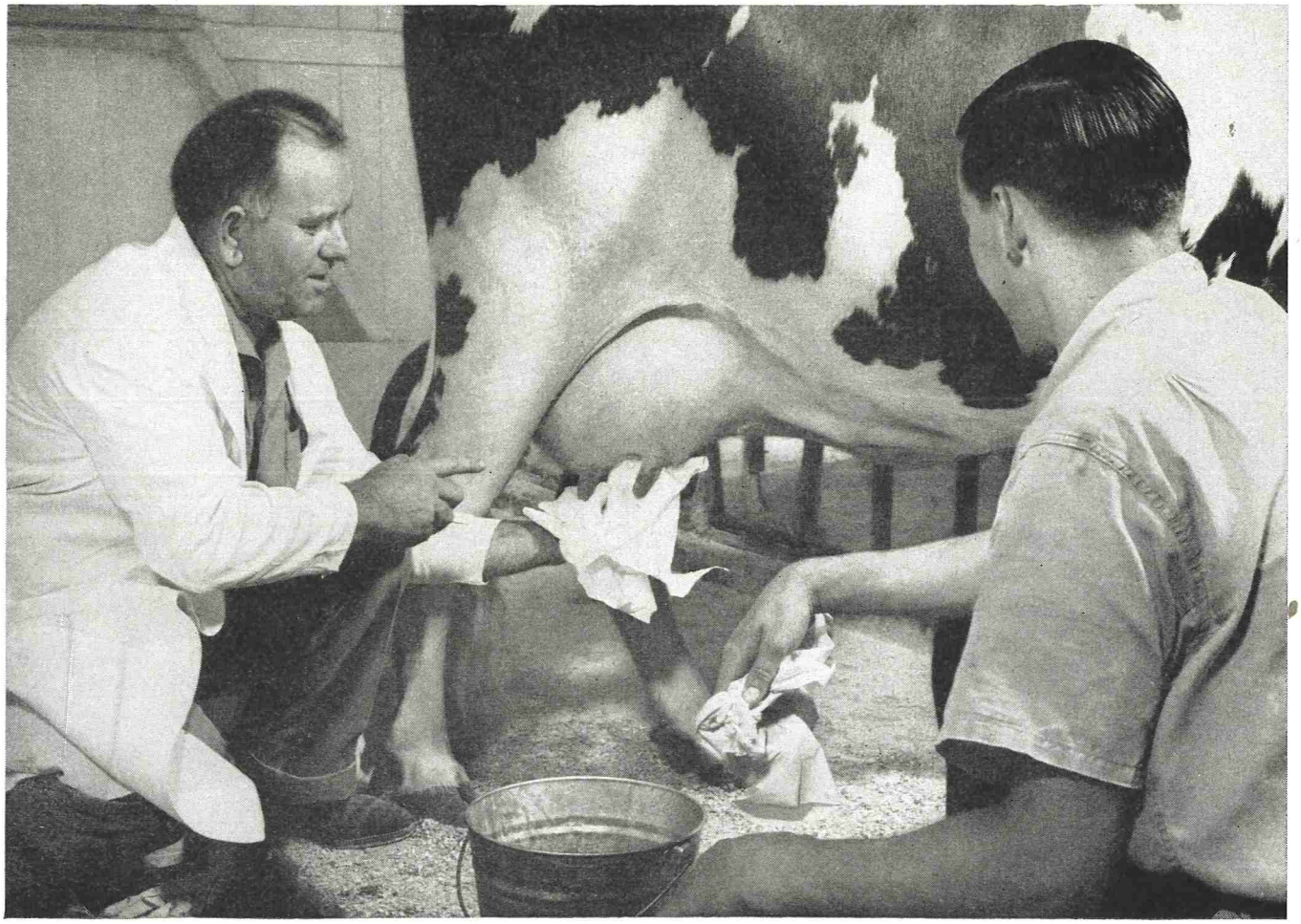

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Editorial

ZEROING IN ON FROZEN FOOD SANITATION

INTRODUCTION

Frozen foods today represent a major segment of the food industry. In 1962, over 7.5 billion pounds of some 500 different frozen products were packed. The retail value of 60 per cent of that volume was about four billion dollars, and the balance was wholesaled to institutional outlets.

Products of the frozen food industry thrive among the 8,000 items of the modern supermarket because it is our goal to pack only foods of the highest standards of quality. Many facts are available on the importance of cleanable equipment and orderly plant layout. Consequently, this editorial will concentrate on working tools the frozen food sanitarian uses to meet the industry goal by maintaining an efficient sanitation program during every production run.

We ask management to arm the sanitarian with the muscle to back up his decisions. To do this, the National Association of Frozen Food Packers (NAFFP) developed a SANITARY CONTROL EQUATION (SCE), which he uses with a stopwatch, thermometer and swab-product tests to check the sanitary pulse of the operation and its frozen products. Derivation and use of the SCE is fully detailed with bacterial growth rates from 32° to 110°F in a special leaflet prepared for letterhead request of us by *Journal* readers. The reversible SCE boils down to — — —

Initial Count —(Doubles 'N' Times)→ Final Count

Final Count —(Halves 'N' Times)→ Initial Count

where 'N' is the quotient of "*Exposure Time*" and "*Growth Rate*" with both variables expressed in minutes.

We urge the adoption of House Rules on Human Behavior. Enlisting compliance calls for unique salesmanship. The frozen food sanitarian employs psychodynamics — subtle and continuing reminders designed to give positive, voluntary and automatic responses on handwashing, care of fingernails and the taboo on misbehavior habits of nose picking, brow wiping, hair scratching and smoking at work station. He uses audiovisuals, posters, discussions and every available means to cultivate an instinct of sanitary workmanship and a credo of hygienic habits in the receivers, sorters, preparers, cooks, line operators, fillers, sealers and cleaneruppers that are the frozen food team.

We encourage a ball park of operating limits on bacteria counts. Foul lines are tailored to the product, with precooked items having the shortest distance to the fence. NAFFP methodologies have been issued on bacteria test procedures with comments on their limitations.

Standard Plate Counts (SPC) do not always fall in the area of a "black" or "white" decision, for even filth can be sterilized. Counts are a good indication of the sanitary condition under which sound, raw materials are processed and frozen. Many products meet and beat a SPC of 100,000.

Counts several fold greater are an alert for the sanitarian to seek and correct the cause and not necessarily a signal to scotch the product. Bacteria limits, even in contracts, require an escape clause for the "odd ball" count lacking scientific or rational explanation.

A majority "grey area" of frozen food microbiology is the significance attached to the harmless Aerobacter strains of coliforms in relationship to *E. coli*. Differentiating techniques are emerging. There is ample proof that coliform bacteria in frozen concentrates lack public health significance.

Although coagulase positive staphylococci die off in competition with natural microbiological flora of pot pies, for example, operating limits on these toxin-formers are kept as low as possible. The lack of a methodology to confirm salmonella is a critical problem blocking practical considerations of a zero tolerance.

Our sanitarians, then, use this briefly outlined program of on-the-job supervision and bacterial control to maintain the excellent public health record of the frozen food industry.

H. P. SCHMITT, *Research Director*
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Opinions expressed in this editorial are those of the author and do not necessarily represent those of the Association.

EFFECT OF A HEXACHLORAPHENE DETERGENT ON THE MICROBIAL POPULATION OF THE HANDS OF FOOD HANDLERS[1]

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Environmental Health Laboratories, School of Public Health
University of California, Los Angeles

A handwashing study was conducted to determine whether a 3% hexachloraphene hand detergent could materially reduce the normal bacterial population on the hands of food handlers. Total count, staphyloccoccus count, and total gram negative bacteria count showed significant reductions when the hexachloraphene detergent was used. No decline occured when three other hand detergents were used. It was suggested that the gram negative bacteria count may be a better indicator of transient organisms on the hands than the total count which includes a greater proportion of resident bacteria.

Transient organisms, as defined by Price *(15)*, collected fortuitously from the environment on the hands of food handlers are considered to be important because of the possibility that food poisoning or disease organisms may be among them *(8)*. These organisms are considered relatively easy to remove by conscientious washing with good detergents *(4)*. The resident flora, however, are refractory to removal and require a thorough scrubbing such as the surgical scrub used by physicians. Indeed much of our knowledge of handwashing detergents and procedures has resulted from studies of this technique.

The substance synthesized by Gump *(6)* and named hexachloraphene [bis (2 hydroxy -3, 5, 6 trichlorophenyl) methane] or G-11 has been shown to be actively bacteriostatic and germicidal in vitro *(12, 16, 21, 26)*. Shemano and Nickerson *(22)*, and Isikow and Gump *(9)* and others have shown by the use of radioactive tracers that this substance is deposited on the skin and remains for a considerable period of time. Studies on handwashing *(19)* have shown that hexachloraphene in combination with various skin detergents markedly reduces the resident and transient flora on the hands and keeps them at low levels as long as the detergent is used.

In view of the often demonstrated effectiveness of hexachloraphene in reducing transient and resident bacteria on surgeons hands, it was thought that a hexachloraphene detergent might bring about a reduction in the bacterial population of the hands of culinary workers also. To determine whether this could be brought about on hands which are constantly in food and dishwater was the purpose of this study.

[1]This study was supported, in part, by a grant from Winthrop Laboratories, 1450 Broadway, New York 18, New York.

Materials and Methods

Choosing a technique which could be effectively used under field conditions proved to be a problem. The Price *(15)* technique in which the hands are washed and the washings plated on nutrient media, with certain modifications, has been most often used by investigators *(2, 7, 13, 14, 25)*. The variation of Quinn *et al. (18)* is considered to be the most informative; however, because of its complexity and requirements for time and detailed and faithful performance, it was not successful as a field technique in this instance. The four basin technique of Lawrence *(11)* was used.

To each of four sterile 3.5-liter stainless steel basins was added 1 liter of sterile distilled water and a sterile piece of gauze. The subjects rinsed both hands in basin 1 and rubbed vigorously to wrist level with the sterile gauze for 30 to 40 seconds. The gauze was left in the basin. The subject then picked up the gauze from basin 2 and the amount of test detergent recommended by the manufacturer for normal use was dispensed onto the hand and gauze. The subject vigorously rubbed his hands with this detergent-pad for 50 to 60 seconds. If, during this time more water was needed for lather, the cloth was dipped into the basin and scrubbing resumed. Then the cloth was dropped into the basin. No other hand contact with this basin was permitted. The subject then rinsed in basin 3 for 30 seconds, using the contained gauze cloth to aid in removal of the lather. This procedure was repeated in basin 4. No visible detergent remained on the hands after rinsing in the last basin.

Immediately after the subject finished rinsing, samples were drawn from the four basins as follows: The gauze pad was swirled around the basin with the tip of a sterile 10-ml pipette and then squeezed against the side of the basin. This was repeated. A 10-ml sample was then pipetted into a 25-ml sterile tube. When cationic or hexachloraphene detergents were used, 10 ml of a sterile neutralizing solution was added to the tube prior to sampling. (Azolectin (lecithin) (0.25% solution) was used to neutralize the cationic detergent *(17, 3)* and 1% Tween 80 was used to neutralize hexachloraphene *(23)*. When neutralizers were used, a duplicate sample without neutralizer was run in parallel from basins

1 and 3 for comparison. No neutralizers were used with the anionic detergents.

Pour and surface plates for 5 groups of organisms were made within 1 hr using duplicate 1-and 0.1-ml portions of each basin sample. Total counts were determined by nutrient agar (Difco) pour plates, coliform counts and a total deoxycholate count(coliforms plus all other colonies) by deoxycholate agar (Difco) pour plates, staphylococci on Chapman-Stone agar (Difco) surface plates, and enterococci using KF agar *(10)* surface plates. The last test was discontinued after consistently negative results. Colonies were counted after 48 hours incubation at 36 C. On plates with more than 300 colonies estimates were made according to the procedure in Standard Methods for the Examination of Dairy Products *(24)*.

The various populations are reported on the basis of total bacteria removed (*i.e.* the sum of 4 basins). Determinations were made on the contents of all basins since preliminary studies showed that no prediction could be made as to the contents of which basin or basins would yield the highest counts and also on the theory that the sum of the counts in the contents of all basins used should be more indicative of the actual number removed.

The detergents used in this study were a standard anionic liquid yellow soap[2], a pure white neutral medium titered bar soap[3], a cationic detergent bar[4], and a liquid detergent[5], containing 3% hexachloraphene as the active ingredient.

Four subjects from the dietary section of the University of California Hospital, Los Angeles volunteered for the study. One worker was a dishwasher, one a waitress-short order girl, one a chef, and one a tray line worker. Each subject was given a small pocket or purse size container of the test detergent and asked to use its contents exclusively at home as well as at work. Otherwise no special instructions were given. Testing took place twice a week immediately after the peak work load before the subjects would normally wash their hands. The handwashing procedure was performed under the supervision of one of the investigators in as uniform a manner as possible.

Each subject was given the standard liquid anionic detergent for a period of time until a "normal" bacterial flora pattern could be established (for each person). Then testing was continued with one person remaining on this detergent as a control while each of the other subjects received one of the test detergents. After a period of time, when it was felt that sufficient data had been obtained, usage of the various detergents was switched so that each subject had an opportunity to use the hexachloraphene detergent. The study was continued until some pattern was apparent. Changes of detergent were made three days prior to a scheduled test washing.

Miscellaneous observations were made on irritation complaints, whether the subjects "liked" or "disliked" the detergent they used, with reasons if possible, and faithfulness in use of the assigned detergent.

RESULTS AND DISCUSSION

Within the first two weeks of the test, the subjects had discontinued using the assigned detergent outside of working hours. Questioning brought out the fact that each person used his detergent approximately six times during the working day at varying intervals. Each reported faithful use during the working day. Toward the end of the eighth week a noticeable reluctance to continue the study appeared in the volunteers and this aided in the decision to terminate the study.

During the study the only comment received on any of the detergents concerned the hexachloraphene - pHisoHex. All subjects thought it cleaned the hands well but expressed a dislike for the product. Their reason was that it felt unnatural when compared to the expected slippery feeling associated with more familiar detergents. Most, however, did not seem to mind after becoming used to the new feeling. There were no irritation complaints.

Cade *(1)* suggested that transient organisms could be distinguished from resident organisms since the former are removed more readily and should result in much higher counts in the first few basins. Results of an attempt to duplicate this with ten basins or bowls is presented in Figure 1. One attempt with cloth swatches accomplished this fairly well, but one attempt using hand friction failed to show any uniform decline. Counts of each basin for the four culinary workers showed no reasonable pattern of decline - some went up, then down, some went down, then up and in general were very erratic. This method of distinguishing resident and transient flora could not be reliably used based on the data from these experiments.

Results of the handwashings are presented in Figures 2, 3, 4 and 5 as the logarithmic average of all test days during the use of a given detergent. It is felt that this method of presentation fairly repre-

[2]Standard liquid yellow soap-manufactured by the Univ. of Calif., L. A. hospital pharmacy from sodium hydroxide, vegetable fat, yellow pigment and perfume. Medical Center, Univ. of Calif., Los Angeles 24, California.

[3]Ivory-Proctor and Gamble Co., Gwynne Bldg., Cincinnati 1, Ohio.

[4]Zest-Proctor and Gamble Co.

[5]pHisoHex-Winthrop Laboratories, 1450 Broadway, New York 18, New York.

sents such data. Since the number of coliforms on many days was below the minimum necessary for a count, these figures are plotted as actual count. Chapman-Stone agar counts are reported as staphylococci since gram stains of random representative colonies indicated only this cell form. Random colonies appearing yellow or yellow plus gelatinase activity were picked for coagulase testing. None were recovered using the Difco dehydrated plasma tube test.

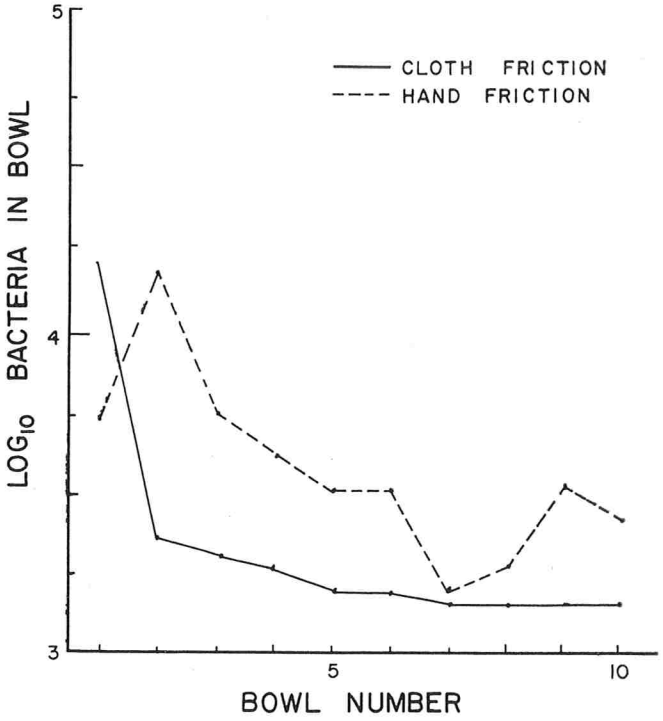

Figure 1. Number of bacteria removed from the hands in each of ten bowls using two methods of washing.

The total counts and staphylococcus counts very likely represent both transient and resident organisms and while it would seem reasonable in many instances that the former could occur in higher numbers than the latter, exact figures of each are not determinable. Thus these counts could not be used to distinguish the two groups of flora.

Originally only coliforms were to be counted on deoxycholate agar as indicators of possible fecal contamination, or at least as transient organisms. Reference to Figures 2, 3, 4, and 5 however, show that these counts are extremely erratic, only occasionally following the total count pattern. Explanation for this is very likely to include consideration of their presence in food handled by the workers, personal hygiene, and relatively low level environmental contamination. In any event, the occurrence of these organisms was sufficiently low and erratic in enough instances to make interpretation of detergent effect questionable. At the same time the coliform counts were made, it was noted that many other colonies were present on the deoxycholate medium. Since growth on this medium is restricted to gram negative bacteria, although not all of this group will grow, the coliform count and this count were combined to make a total deoxycholate count. This count of gram negative bacteria is considered by the authors to be much more representative of, if not composed solely of, transient organisms. Further study is being pursued on the possibilities of this point.

As can be seen in Figures 2, 3, 4, and 5 all workers presented a fairly uniform pattern of total count, staphylococcus count and total deoxycholate count during the period of establishing the "normal" level of contamination with the anionic yellow soap. Individual variation between workers existed but all total counts averaged about 10^6 and two were above 10^7. The staphylococcus and total deoxycholate

Table 1. Percent Reduction of Bacterial Counts on the Hands of Culinary Workers Using pHisoHex

Worker	% reduction[a] in Total count	Staph-ylococci	Deoxy-cholate
Chef	96.4	94.2	98.6
Waitress-short-order girl	98.0	95.7	56.1
Dishwasher-tray-line girl	97.4	97.9	30.0
Tray-line girl	70.0	37.2	0.0

[a]Percent reduction based on "normal" contamination level

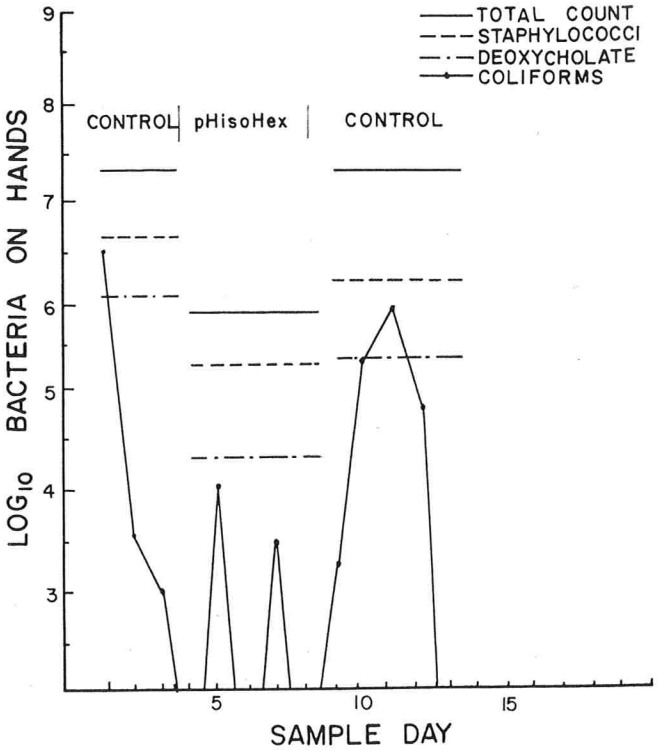

Figure 2. Test period logrithmic averages of total counts, staphylococcus counts and total deoxycholate counts and counts of coliforms from the hands of the chef, male.

counts were somewhat lower but followed essentially the same pattern.

Introduction of the hexachloraphene detergent brought a marked reduction in the average counts (see Table 1). Reduction was most marked for the total count. In those cases, Figure 2 and 3, where a return to the control soap was made the average total and staphylococcus counts essentially returned to their former values. This is advanced as evidence that the "normal" level of contamination for these two parameters has real meaning. The total deoxycholate count cannot be as easily interpreted. Percent reduction varied from 98.6 to 0 (this last actually was an increase) and the influence of hexachloraphene was not as apparent. Coliforms could not be interpreted satisfactorily because of the large number of zero readings and the high variability. The other test detergents did not bring about significant changes from the control soap which further supports the validity of the apparent effect of hexachloraphene. It should also be noted that reductions with the hexachloraphene detergent occurred in spite of its use only during working hours.

Tentative interpretation of these results is that the hexachloraphene detergent leaves a deposit on the skin as Fahlberg *et al. (5)* and Gump and Cade *(7)* have shown and that continuous use of this detergent reinforces this deposited material. This deposited material amply demonstrated with surgical scrub studies, prevents the growth of resident flora resulting in a marked reduction of those counts which include these organisms. The transient organisms represented by gram-negative bacteria, are usually readily removed by washing and normally do not have a great opportunity to grow on the skin of the hands. Indeed, these gram-negative organisms are rarely included among the resident bacteria *(20)* and they may very likely be found on the hands only when fortuitously obtained from the environment. Even then they tend to die rapidly by dessication *(20)*. If this is indeed the case then gram-negative bacterial counts of the hands would be expected to vary considerably and be lower than the total count. A glance at the Figures confirms this. Furthermore, since most of these would be removed with washing and

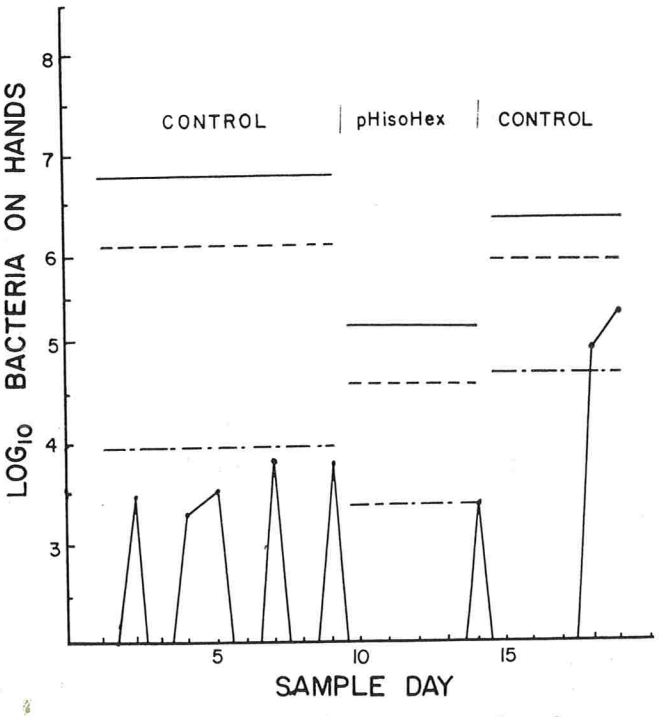

Figure 3. Test period logrithmic averages of total counts, staphylococcus counts and total deoxycholate counts and counts of coliforms from the hands of the waitress - short order girl.

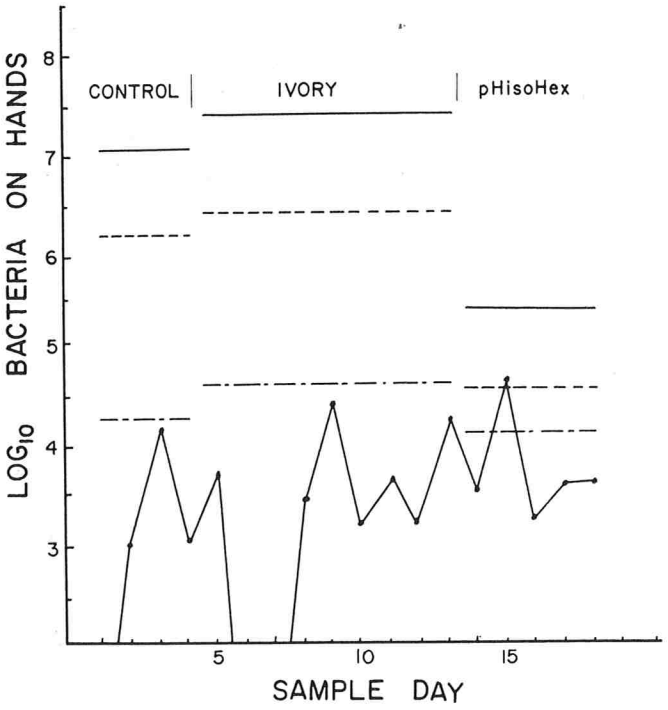

Figure 4. Test period logrithmic averages of total counts, staphylococcus counts and total deoxycholate counts and counts of coliforms from the hands of the dishwasher-tray line girl.

re-added from the environment, the influence of hexachloraphene would not be as pronounced as on the resident flora, especially with the frequency of hand washing reported here. Part of the explanation for this lies in the fact that hexachloraphene is considered primarily a bacteriostat but may kill with time. Thus its effect on the transient organisms should be less pronounced than on the resident organisms. Figures 2, 3, 4, and 5, and Table 1 indicate that this probably happened, although the Chef (see Figure 2) showed a marked reduction. His hands were commonly in contact with foods known to have high counts of gram negative bacteria (raw hamburger, chicken, etc.). This may account for the very high initial counts and possibly for

some of the apparent reduction during use of hexachloraphene when contamination may not have been so high. Table 1 indicates a high degree of variability with this group of organisms. Indeed there was actually a slight increase in numbers on the hands of the tray line worker (see Figure 5). This person also showed the least reduction of the four workers in the other counts. Suggested explanations include: failure to use the hexachloraphene, use of hand creams, etc. that neutralize or remove the deposited material, or continuous contamination by a wide variety of organisms of the transient type. The exact reason was not determined.

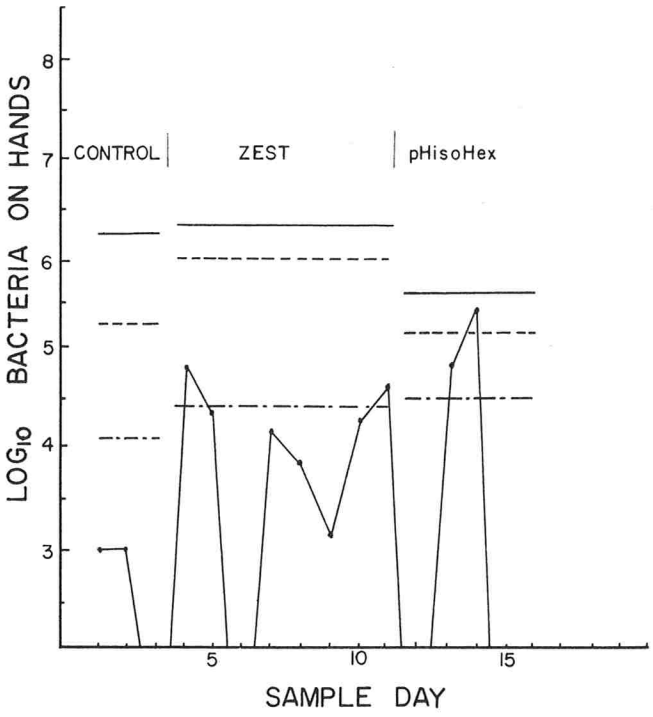

Figure 5. Test period logrithmic averages of total counts, staphylococcus counts, total deoxycholate counts and counts of coliforms from the hands of the tray line girl.

The deoxycholate count is not considered to be a count of all gram-negative bacteria present and thus is somewhat limited. However, it is suggested that this count is highly indicative of the group of gram-negative bacteria and the transient organisms in general. However, it must be noted that certain environmental sources such as the nose and mouth may not have as high gram-negative as gram-positive counts, thus these organisms would not satisfactorily measure this source of contamination. Virtually all other bacterial sources have a large compliment of gram-negative bacteria. Further studies on this subject with other hexachloraphene hand detergents will include a count more fully representative of the gram-negative bacteria.

Conclusions

Hexachloraphene, a bacteriostatic and bactericidal agent, is deposited on the hands of users of the commercial detergent pHisoHex. In a study of four culinary workers this detergent brought about a marked decrease in the total bacterial population and total staphylococci (including both resident and transient organisms) and affected the total gram-negative bacteria (as determined by counts on deoxycholate agar) erratically. The gram-negative bacteria are thought to more accurately reflect environmental contamination than do the other two counts which include a far greater proportion of resident bacteria. However, more work needs to be done on this point. It is concluded that hexachloraphene can bring about a considerable reduction of resident flora on the hands of culinary workers and appears to have some effect on the transient flora, although this point needs further clarification.

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EFFECT OF ACIDIFICATION ON STABILITY AND BACTERICIDAL ACTIVITY OF ADDED CHLORINE IN WATER SUPPLIES[1] [2]

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Studies were conducted to determine the effect of acidification on the bactericidal activity and stability of added chlorine in water supplies. The destruction of P. fluorescens, P. fragi and A. metalcaligenes by 5 and 10 ppm available chlorine at different pH levels was determined. Results indicated that bactericidal efficiency of hypochlorite solutions was greatly increased when the dilution water was acidified below pH 6.0. Studies to determine the effect of acidification of the water on the ability of the available chlorine indicated that at various pH levels from pH 4.0 to 9.0 there is little loss of available chlorine within 24 hrs.

Several studies *(4, 6, 7, 8, 9)* have demonstrated the need for bactericidal treatment of food plant water supplies to destroy bacteria that enter and cause spoilage in products like cottage cheese. In many instances chlorination of such water just before use at a level of 5 to 10 ppm available chlorine would suffice to destroy spoilage bacteria that would enter the food product from that source. There is considerable evidence also, however, that spoilage bacteria in some water supplies are not completely eliminated by this treatment, possibly because some waters are so highly buffered at an alkaline pH that chlorine compounds added to them cannot accomplish rapid bactericidal action. To overcome this difficulty, acidification of cottage cheese wash water was recommended in earlier reports *(4, 9)*.

Furthermore, the time required for 99.99 per cent destruction of several *Pseudomonas* and *Alcaligenes* species by 3 and 5 ppm available chlorine was shown to be greatly increased at low temperatures and high pH *(3)*. In view of the wide spread interest in many parts of the country in systems for combined acidification and chlorination of plant waters, it was decided to conduct studies on bactericidal activity of chlorine over a wide pH range, using representative spoilage bacteria. Also, since no information appeared to be available on stability of low concentrations of chlorine at such pH levels, a number of stability determinations were included.

METHODS

Pseudomonas fluorescens IM, *Pseudomonas fragi,* and *Alcaligenes metalcaligenes* were used as representative types of bacteria present in water supplies which cause spoilage in dairy products. The organisms were grown 24 hr on bottle slants of tryptone-yeast-extract-glucose agar, removed by washing with sterile phosphate-buffered water and filtered through Whatman No. 2 filter paper. The method of preparing the cultures and the technique of evaluating bactericidal activity were those described by Chambers *(2)*. Calcium hypochlorite was used as the chlorinating agent. A sufficient number of trials also was carried out with sodium hypochlorite to demonstrate similarity in results with these two types of compounds. The available chlorine was determined by the standard thiosulfate titration *(1)*. The germicide was buffered with 0.01 M solutions of appropriate buffer systems; pH 4.0 and 5.0 with sodium acetate-acetic acid, pH 6.0 and 7.0 with

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potassium acid phosphate-disodium phosphate, pH 8.0 and 9.0 with borate-boric acid, and pH 10.0 and 11.0 with disodium phosphate-sodium hydroxide buffer. The solution used to neutralize the germicide was 0.0004 M sodium thiosulfate prepared in phosphate buffer at pH 7.2. One series of trials was carried out at 21°C (72°F) using the standard bactericidal procedure *(2)*. A second series was conducted at 4.4°C (40°F) at pH 6.0, 7.0 and 8.0 using exposure periods of 15 and 30 sec and 5 and 10 ppm calcium hypochlorite. Cell concentrations exposed to germicide included one series of 100,000,000 cells per ml and a second series of 10,000 per ml.

Chlorine stability of calcium and sodium hypochlorite solutions was checked under two conditions. The approximate dilutions of 5, 10, 50 and 100 ppm available chlorine were made up in flasks with distilled water acidified with phosphoric acid to about pH 4.0 Another series was diluted with a buffered synthetic hard water *(5)* containing approximately 500 ppm hardness. The concentration of available chlorine was determined by standard thiosulfate titration immediately and after 2, 5, and 24 hr in open flasks at 21°C (72°F) to determine stability. The pH of the solution was recorded at the beginning and at the end of a 24-hour storage period.

RESULTS

Results in Figure 1 are representative of the destruction of *P. fluorescens* by 5 ppm available chlorine at different pH levels at 21°C. At pH 5.0 this concentration of chlorine was effective within a 15-sec exposure period, but, as the pH was increased above pH 6.0, there was a corresponding decrease in destruction of the organisms. Similar results were obtained when *P. fragi* and *A. metalcaligenes* were used as test organisms. There was complete destruction by 5 ppm available chlorine at pH 5.0 and 6.0 in 15-sec, but, as the pH was raised to 7.0 and above, there was a progressive increase in the number of surviving organisms. Increasing the time of exposure up to 5 minutes did not overcome the adverse effect of high pH levels. Similar results also were obtained in other studies with *Pseudomonas viscosa*, a common cottage cheese spoilage organism very similar to the strain of *P. fluorescens* used here.

Trials also were conducted using 10 and 20 ppm available chlorine. Although a concentration of 10 ppm was more effective than 5 ppm there was a similar picture of reduction of activity as the pH of the germicide was raised above pH 6.0 and an exposure period greater than 15 seconds was required for destruction of the organisms. The effect of the pH was diminished when the concentration of the germicide was increased to 20 ppm available chlorine. At this concentration there was a complete destruction of the test organisms with a 15-sec exposure period when the germicide was buffered as high as pH 8.5.

A slower rate of destruction was shown in trials using increased numbers of cells and also in trials using 48-hr cultures instead of 24-hr cultures, but the general effect of the pH was similar. Rate of thandestruction also was shown to be slower at 4.4° than at 21°C when high concentrations of cells (100 x 10^6 per ml) were used. However, when a more realistic level of 10,000 per ml of cells was exposed, complete destruction was accomplished with 5 and 10 ppm available chlorine in 15-and 30-sec periods at pH 6.0, 7.0 and 8.0.

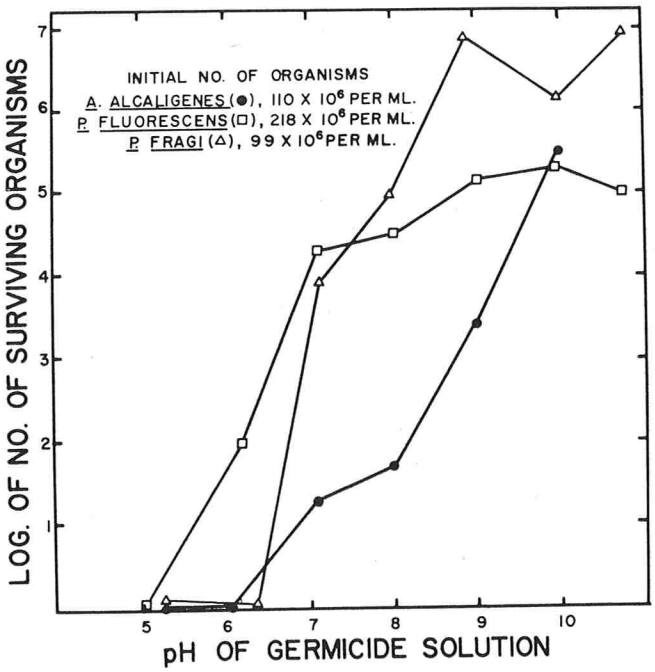

Figure 1.—Effect of pH on rate of destruction of various organisms by 5 ppm hypochlorite solutions at 21°C for 15 seconds.

Table 1 shows the stability of calcium hypochlorite solutions of approximately 5, 10, 50 and 100 ppm available chlorine over a period of 24 hr. When the solution was adjusted to pH 4.0, the drop in concentration at the 5 ppm level was 0.2 ppm, and 10 ppm showed no significant decrease. At the higher concentration of 50 ppm the decrease in 24 hr was 0.4 ppm while 100 ppm solution showed a decrease of 0.8 ppm. When comparable solutions were made with a buffered hard water the decrease in all concentrations was also less than 1 ppm in 24 hr. The variations in concentration probably were within the range of experimental error with the method used for determination.

Table 2 shows the stability of sodium hypochlorite solutions. These results show that under these conditions the loss in available chlorine in 24 hr at 21°C

TABLE 1.—STABILITY OF CALCIUM HYPOCHLORITE SOLUTIONS AT 21°C IN ACIDIFIED WATER AND IN BUFFERED HARD WATER

	Water adjusted with H_3PO_4		USDA water 500 ppm hardness	
Hours	pH	Available chlorine	pH	Available chlorine
		(*ppm*)		(*ppm*)
0	4.0	5.2	8.4	5.0
2		5.1		4.9
5		5.0		4.6
24		5.0		4.7
0	4.3	10.1	9.1	10.0
2		10.1		9.9
5		10.0		9.8
24		10.0		9.6
0	4.0	50.4	9.0	50.8
2		50.0		50.2
5		50.0		50.2
24		50.0		50.4
0	4.0	101.5	8.7	102.2
2		100.9		101.8
5		100.7		101.3
24		100.7		101.3

is less than 1 ppm. When 5 ppm available chlorine solutions of sodium hypochlorite and calcium hypochlorite were adjusted to pH 4.0 and held in open flasks for 24 hr at 21°C there was a loss of approximately 0.5 ppm available chlorine. The solutions of 10 ppm showed a drop of 0.6 ppm for the sodium hypochlorite ad 0.1 ppm for the calcium hypochlorite.

TABLE 2—STABILITY OF SODIUM HYPOCHLORITE SOLUTIONS AT 21°C IN ACIDIFIED WATER AND IN BUFFERED HARD WATER

	Water adjusted with H_3PO_4		USDA water 500 ppm hardness	
Hours	pH	Available chlorine	pH	Available chlorine
		(*ppm*)		(*ppm*)
0	4.05	5.3	9.0	4.8
2		5.0		4.8
5		5.0		4.5
24		4.8		4.6
0	4.2	9.9	9.0	9.7
2		9.7		9.8
5		9.8		9.5
24		9.7		9.4
0	4.05	49.6		
2		49.4		
5		49.2		
24		48.1		
0	4.0	98.8		
2		98.6		
5		98.6		
24		98.3		

DISCUSSION

The results of this study show the very marked effect of pH of dilution water used in chlorination on the destruction of food spoilage organisms. At low concentrations of chlorine the decrease in efficiency is very marked as the pH rises. With higher concentrations of available chlorine the difference is less marked, but at a concentration of 5 ppm or less some adjustment of highly buffered alkaline water would be warranted. In instances where higher concentrations of chlorine in wash water might contribute off-flavors to food, it might be possible to eliminate the spoilage organisms with as little as 5 ppm available chlorine by adjusting the pH of the water. This was further suggested by results of studies carried out at 4.4°C using approximately 10,000 test organisms per ml of water. Under those conditions complete destruction of test organisms occurred with 5 ppm available chlorine at pH 6.0, 7.0 and 8.0 in 15 and 30-sec exposure periods. It was observed that in some instances bactericidal activity of chlorine at high pH levels such as pH 11 might be slightly greater than at pH 9 or pH 10. This may have been due to a bactericidal effect of pH alone which would likely become more pronounced as the pH increased at high levels.

The results of studies on the stability of hypochlorite solutions diluted with an acidified water indicate surprisingly that the loss in available chlorine over a period of 24 hr is no greater than the loss which might occur in a buffered alkaline water. In all cases the loss which occurred was less than 1 ppm. This demonstrates that cottage cheese wash water could be acidified to increase the germicidal action without appreciable loss of the chlorine.

The results suggest that an acidification-chlorination system in which water is to be treated can first be acidified and then chlorinated. The question often arises in installation of such systems as to whether acidification should precede or follow injection of chlorine. In such a system with acidification preceding chlorination, any exposure to chlorine will be conducted at the most bactericidal or acid pH levels. Also assuming the system is free of organic matter or other interfering substances, sufficient chlorine will remain in solution to continue bactericidal activity even over extended retention periods before use. This may be important where the original bacterial load is high or rate of application of chlorine is low, or temperature of water treated is low. Another interesting observation was the surprising stability of higher concentrations of sodium and calcium hypochlorite, even at concentrations up to 100 ppm and pH levels as low as 4.0.

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STUDIES ON DISC ASSAY METHODS FOR DETECTION OF ANTIBIOTICS IN MILK

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Studies on disc-assay procedures for detection of milk-borne antibiotics indicated that the "quick" test could regularly detect 0.05 unit penicillin per ml of milk if: (a) petri plates were poured with 5 ml of Penassay agar seeded with at least one but not more than 10 million spores of Bacillus subtilis per ml and (b) an incubation of 3 to 4 hr at 98 F. was used. Storage of poured plates (with Penassay agar) at 40 F. for 72 hr or use of plastic instead of glass petri plates did not reduce sensitivity of the test. A procedure found suitable for detection, in milk, of relatively low levels of antibiotics other than penicillin is based on: (a) use, per petri dish, of 5 ml. Penassay agar seeded with 100,000 to 1,000,000 spores of B. subtilis per ml and (b) an incubation at 72 F. for 16 to 18 hr.

Problems associated with antibiotic residues in milk have been discussed by Marth *(6, 7)*, Marth and Ellickson *(8, 9)*, Albright, *et al. (1)* and Storgards *(10)*. Detection of antibiotics in milk requires use of a method which is both sensitive and suitable for routine plant use. Many tests have been devised and were reviewed by Marth *(7)*. One procedure, described by Arret and Kirshbaum *(2)*, is a disc assay method claimed to detect at least 0.05 unit penicillin per ml of milk in 2.5 hours. Johns *(4)* evaluated the method and found it to be less reliable, sensitive or simple than previously described disc-assay techniques. Preliminary trials conducted in this laboratory indicated that the test, when performed according to the published procedure, failed to detect the indicated penicillin level in the alloted time. It then became apparent that further studies were necessary before desired performance could regularly be obtained from the rapid disc-assay test.

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Experiments described in this paper were designed to: *(a)* determine exact conditions necessary for successful use of the rapid disc-assay procedure and *(b)* develop a disc-assay procedure with sensitivity for detecting a variety of antibiotics in milk.

METHODS

Preparation of Antibiotic Solutions

The methods used for preparation of all antibiotic-milk solutions during these studies are described below.

Penicillin. A weighed sample of penicillin-G was dissolved in sufficient phosphate buffer, pH 6.0, (8.0 g KH_2PO_4 plus 2.0 g K_2HPO_4 per liter) so the solution contained 1,000 units of antibiotic per ml. This mixture was then further diluted with the buffer solution to reduce the antibiotic concentration to 100 units per ml. Subsequent dilutions to obtain desired antibiotic concentrations were made with antibiotic-free milk.

Tetracyclines (chlortetracycline, oxytetracycline and tetracycline). A weighed sample was dissolved in sufficient 0.1M HCl to yield a solution which contained 1,000 μg antibiotic per ml. This mixture was further diluted with 0.1M phosphate buffer, pH 4.5 (13.6 g KH_2PO_4 per liter) so the resultant solution contained 100 μg antibiotic per ml. Further dilutions to obtain desired concentrations were made with antibiotic-free milk.

Neomycin or Streptomycin. A weighed sample was dissolved in sufficient 0.1M phosphate buffer, pH 8.0, (0.523 g KH_2PO_4 plus 16.73 g K_2HPO_4 per liter) to give a solution which contained 1,000 μg of antibiotic per ml. This solution was then further diluted with the phosphate buffer so the mixture

contained 100 μg antibiotic per ml. Subsequent dilutions to obtain desired antibiotic concentrations were made with antibiotic-free milk.

Preparation of Spore Suspensions

The procedure, described by Arret and Kirshbaum *(2)*, was followed for production of spore suspensions of *Bacillus subtilis* ATCC 6633 and *Bacillus cereus* var. *mycoides* ATCC 11778.

Disc-Assay Procedures

Petri plates. Tests were conducted to compare the suitability of plastic and scratch-free glass petri plates for use in the disc-assay test. These studies were conducted since petri plates suggested by Arret and Kirshbaum *(2)* were awkward to use and were not generally available in dairy plants.

Level of Inoculum. Varying quantities of spore suspensions were added to agar media so that final concentrations were obtained which ranged from 10,000 to 50,000,000 spores per ml agar.

Agar Media. Media used in this study were: Penassay Seed agar (Difco) and Whey agar (Difco).

Level of Seeded Agar per Plate. Petri plates in these experiments were poured with 3, 4, 5, 10 or 15 ml of seeded agar. Most tests, however, employed 5 ml of seeded agar.

Paper discs. Schleicher and Schuell paper discs (0.25 and 0.50 inch in diameter) and Difco discs (about 0.25 inch in diameter) were employed in these investigations.

Incubation Times and Temperatures. Assay plates were incubated at 98F for 2.5 to 4 hr, 86F for 16 to 18 hr or 72F for 16 to 18 hr depending on the particular investigation.

Preparation of Assay Plates. The desired quantity of inoculated agar medium was pipetted into sterile petri plates which were placed on a level, flat surface. Sterile paper discs were then dipped into milk-antibiotic solutions, allowed to drain and aseptically placed on the surface of the solidified, inoculated agar medium. All tests were done in triplicate. Plates were incubated at temperatures under study and examined at appropriate time intervals for zones of inhibition.

RESULTS

Preliminary studies in this laboratory on the rapid disc assay method suggested by Arret and Kirshbaum *(2)* indicated that the test, as described, failed to detect penicillin in milk at the level or in the time claimed. Consequently, modifications were believed necessary.

The level of seeded agar added to petri plates was reduced from the suggested 10 ml to 5 ml since it is commonly known that sensitivity of a disc assay test increases as the quantity of agar decreases *(4)*. Cerny and Morris *(3)* suggested use of 6 ml inoculated agar while Johns and Berzins *(5)* found four ml to be satisfactory. A 5-ml quantity was chosen for use in these studies because: *(a)* this amount adequately covered bottoms of regular glass or plastic petri plates and *(b)* it was believed to be a level convenient for plant use since two petri plates could be "poured" with the contents of a 10-ml pipette.

The number of spores per ml of agar needed for sufficient test sensitivity was not indicated by Arret and Kirshbaum *(2)*. This factor together with size of assay discs was investigated and results are summarized in Table 1. When Penassay agar (the same as Medium 1 of Arret and Kirshbaum *(2)*) was used,

TABLE 1.—MINIMUM CONCENTRATIONS OF PENICILLIN (UNITS PER ML.) DETECTED WITH DIFFERENT SIZED DISCS AND SPORE LEVELS[a] [b]

	Units per ml of penicillin detected by number of *B. subtilis* spores per ml agar medium indicated		
Disc size	1 x 10^5	1 x 10^6	1 x 10^7
0.25 in. diam.	1.0	0.05	0.05 - 0.25[c]
0.50 in. diam.	1.0	0.05	0.25

[a]Test solutions contained 0.025, 0.05, 0.10, 0.25, 0.50 or 1.0 unit penicillin per ml.
[b]Five ml inoculated Penassay agar medium used per petri plate, plates incubated at 98F for 2.5 hr.
[c]Substantial variation in results was noted in this instance.

the test was sufficiently sensitive (detected 0.05 unit penicillin per ml milk) with either 0.25-or 0.50-inch (diameter) discs provided the agar contained one million spores of *B. subtilis* per ml. A smaller inoculum (100,000 *B. subtilis* spores per ml of agar) resulted in reduction of sensitivity under these conditions. Sensitivity also decreased with an increase in the inoculum to 10 million spores per ml of agar.

Table 2 summarizes data obtained on the minimum

TABLE 2.—EFFECT OF AGAR LEVEL AND POURED PLATE STORAGE ON MINIMUM PENICILLIN LEVELS DETECTED IN MILK[a] [b]

Treatment of plates and agar level	Penicillin detected (Unit/ml)
Freshly Poured:	
3 ml	0.02
4 ml	0.02
5 ml	0.03
10 ml	0.05
Stored at 40F for 72 hr:	
5 ml	0.01
10 ml	0.01

[a]Test solutions contained 0.01, 0.02, 0.03, 0.04 or 0.05 unit of penicillin per ml.
[b]Penassay agar, incubation at 98F for 2.5 hr, 1.0 x 10^6 spores of *B. subtilis* per ml agar medium and 0.50-inch discs were used.

concentration of penicillin in milk which could be detected with fresh or stored plates that contained different levels of Penassay agar inoculated with one million spores per ml. In these experiments it was possible to detect 0.05 unit penicillin with 10 ml inoculated agar in freshly poured plates. The sensitivity of the test increased as the level of agar decreased. With 5 ml medium it was possible to detect 0.03 unit penicillin per ml of milk. This was increased to 0.02 unit when 3 or 4 ml inoculated agar were added per petri plate.

Storage of plates poured with Penassay agar at 40F for 72 hr prior to use had no harmful effect on test sensitivity. Both 5 and 10 ml of medium permitted detection of 0.01 unit penicillin per ml milk in 2.5 hr at an incubation temperature of 98F provided that 0.5-inch discs and a controlled spore inoculum were used.

Data in Table 3 verify conclusions reached in earlier tests that 5 ml of agar and 0.50-inch discs are most suitable for use in the rapid disc assay procedure. The use of 5 ml agar (inoculated with 1 million spores per ml of *B. subtilis*) and 0.50-inch discs resulted in 100% detection of 0.05 unit penicillin per ml milk in a series of tests. Frequency of detection was reduced to 80% by use of 0.25-inch discs and 5 ml inoculated agar. When 10 ml of inoculated agar were used, the frequency with which 0.05 unit penicillin per ml milk was detected with 0.25-inch discs was reduced to 67%, but with 0.50-inch discs it increased to 77%.

The effect of different types of petri dishes on sensitivity of the disc assay was studied. Results, summarized in Table 4, show that glass and plastic petri dishes were equally suitable for use.

Studies reported above were concerned with a rapid disc assay procedure for detection of penicillin in milk. It was felt that the disc assay procedure should be sufficiently sensitive to detect antibiotics other than penicillin which may be present in milk. The next series of experiments were designed to determine conditions under which maximum sensi-

TABLE 3—NUMBER OF POSITIVE TESTS OBTAINED WITH DIFFERENT LEVELS OF MEDIUM AND SIZES OF DISCS WHEN MILK CONTAINED 0.05 UNIT PER ML OF PENICILLIN[a]

Agar level and disc size	No. of tests	No. of positive tests	Per cent positive tests
Five ml. agar:			
0.25 in. diam.	30	24	80
0.50 in. diam.	60	60	100
Ten ml. agar:			
0.25 in. diam.	12	8	67
0.50 in. diam.	30	23	77

[a]Penassay agar, an incubation of 98F for 2.5 hr and 1.0 x 10^6 spores were used.

TABLE 4—EFFECT OF QUANTITY OF AGAR, DISC SIZE AND KIND OF PETRI PLATE ON MINIMUM LEVELS OF PENICILLIN DETECTED IN MILK[a] [b]

	Discs used in different petri plates					
	0.25 in. diam.		0.50 in. diam.		Difco	
Quantity of Penassay agar used	Glass	Plastic	Glass	Plastic	Glass	Plastic
	(*unit per ml*)					
5 ml	0.05	0.025-0.05	0.025	0.025	0.05	0.05
10 ml	0.05	0.05	0.05	0.05	0.10	0.10
15 ml	0.10	0.10	0.10	0.10	0.10	0.10

[a]Test solutions contained 0.025, 0.05, 0.10, 0.25, 0.50 or 1.0 unit penicillin per ml milk.

[b]Incubation at 98F for 2.5 hrs, and 1.0 x 10^6 spores of *B. subtilis* per ml Penassay agar were used.

TABLE 5—COMPARISON OF TEST ORGANISMS, MEDIA AND INCUBATION CONDITIONS IN PROCEDURES FOR DETECTING DIFFERENT MILK-BORNE ANTIBIOTICS[a]

Organism and concentration per ml agar medium	Time and temp. of incubation	Agar medium	Minimum level detected in milk			
			Penicillin	Chlortetracycline	Streptomycin	Neomycin
			(*unit/ml*)	(*μg/ml*)	(*μg/ml*)	(*μg/ml*)
B. subtilis						
1.0 x 10^5	16 hr-86F	Penassay	0.02	0.10	0.50	0.50
		Whey	0.01	0.01	0.20	0.20
3.0 x 10^6	4 hr-98F	Penassay	0.03	0.10	0.50	ND
		Whey	ND[b]	-[c]	-	ND
B. cereus						
1.0 x 10^5	16 hr-86F	Penassay	0.05	0.10	4.0	4.0
		Whey	0.04	0.02	4.0	4.0
1.4 x 10^6	4 hr-98F	Penassay	ND	0.10	4.0	ND
		Whey	ND	0.20	4.0	ND

[a]Five ml of agar medium per petri dish was used.

[b]ND = Test was not performed.

[c]Substantial variation in results was observed.

tivity to several antibiotics could be obtained and still have the test remain practical for routine plant use.

Table 5 reports results obtained when *B. subtilis* and *B. cereus* were used in "rapid" and "over-night" tests to detect four different common antibiotics. Equal or lower levels of all 4 antibiotics were detected by *B. subtilis* as compared to *B. cereus* in an "over-night" test. Use of whey agar in this procedure improved sensitivity over that obtained with Penassay agar. Whey agar, however, appeared unsuitable for use in the "quick" test. *B. subtilis*, when used with a 5-ml level of whey agar and 16-18 hr of incubation at 86F, detected 0.01 unit penicillin, 0.01 μg chloretetracycline, 0.20 μg streptomycin or 0.20 μg neomycin per ml milk. Sensitivity of the test for 2 of the 4 antibiotics tested was similar when a higher spore inoculum (3.0 x 10^6 per ml agar), Penassay agar, and an incubation at 98F for 4 hr were used. Table 6 summarizes data on minimum levels of 4 different antibiotics detected in heated and unheated milks when the agar medium, spore concentration in the agar and incubation conditions were varied.

Tests generally appeared better able to detect slightly lower levels of most antibiotics in unheated rather than in heated milks. This trend was most noticeable in experiments with penicillin and streptomycin, less in studies on neomycin and not observed in results obtained with chlortetracycline.

Use of whey agar occassionally permitted detection of lower levels of penicillin and chlortetracycline than did Penassay agar. The reverse was true in tests with streptomycin.

Conditions needed in the "quick" test to obtain greatest sensitivity to all four antibiotics include use of: *(a)* Penassay agar, *(b)* about 2.5 x 10^7 spores of *Bacillus subtilis* per ml of agar and *(c)* 5 ml seeded agar per plate. Under these conditions the "quick" test (3-to 4-hr incubation at 98F) when applied to unheated milks, detected 0.03 unit per ml of penicillin, 0.1 μg per ml of chlortetracycline, 1.0 μg per ml of streptomycin and 4.0 μg per ml of neomycin.

The "overnight" test (16 to 18 hr of incubation at 86F) using 5 ml of Penassay agar seeded with either 1.0 x 10^5 or 2.5 x 10^5 spores of *B. subtilis* per ml was more sensitive than the "quick" test discussed above. This procedure detected the following antibiotics at the indicated levels per ml of unheated milk: penicillin - 0.03 unit, chlortetracycline - 0.1 μg, streptomycin - 0.5 μg and neomycin - 0.5 μg.

The "over-night" test was most sensitive and so additional studies were conducted on other antibiotics, different levels of spores added to the medium and various incubation temperatures. Generally, whey agar was unsatisfactory when plates were incubated at 72F since frequently *B. subtilis* failed to grow.

When Penassay agar was used, greatest sensitivity to all antibiotics tested was obtained at an incubation temperature of 72F if the medium contained 100,000 to 1,000,000 spores per ml of *B. subtilis*. Under these conditions the test detected the following antibiotics per ml of milk at indicated levels: penicillin - 0.01 to 0.02 units, streptomycin - 0.2 to 0.5 μg, neomycin -

TABLE 6—EFFECT OF INCUBATION TEMPERATURE AND TIME, SPORE CONCENTRATION AND AGAR MEDIUM ON DETECTION OF ANTIBIOTICS IN HEATED AND UNHEATED MILKS USING *Bacillus subtilis*

Incubation, spore concentration and medium	Minimum level of added antibiotics detected in heated and unheated milks.							
	Penicillin		Chlortetracycline		Streptomycin		Neomycin	
	Heated[a]	Unheated	Heated	Unheated	Heated	Unheated	Heated	Unheated
	(unit/ml)		(μg/ml)		(μg/ml)		(μg/ml)	
3-4 hrs at 98F[b]								
5.0 x 10^6/ml Agar: Penassay	0.03	0.03	>0.2	>0.2	1.0	0.5	4.0	4.0
Whey	0.02	0.01	>0.2	>0.2	>4.0	>4.0	>4.0	>4.0
2.5 x 10^7/ml Agar: Penassay	0.05	0.03	0.1	0.1	2.0	1.0	2.0	4.0
Whey	0.05	0.03	0.01	0.01	>4.0	>4.0	>4.0	4.0
5.0 x 10^7/ml Agar: Penassay	0.05	0.04	0.1	0.1	2.0	2.0	2.0	4.0
Whey	0.05	0.03	0.01	0.01	>4.0	>4.0	>4.0	4.0
16-18 hrs at 86F[b]								
1.0 x 10^5/ml Agar: Penassay	0.03	0.03	0.1	0.1	1.0	0.5	0.5	0.5
Whey	0.05	0.02	0.1	0.1	4.0	0.2	2.0	0.2
2.5 x 10^5/ml Agar: Penassay	0.04	0.03	0.1	0.1	1.0	0.5	0.5	0.5
Whey	0.02	0.03	0.1	0.1	4.0	0.5	2.0	0.2

[a]Milks containing antibiotics were steamed for seven minutes.
[b]Plates were poured with 5 ml seeded agar.

TABLE 7—EFFECT OF INOCULUM LEVEL, INCUBATION TEMPERATURE AND AGAR MEDIUM ON DETECTION OF ANTIBIOTICS IN MILK USING THE *Bacillus subtilis* DISC ASSAY[a]

Spore concentration and incubation temp.	Penicillin		Streptomycin		Neomycin		Chlortetracycline		Oxytetracycline		Tetracycline	
	Penassay	Whey	Penassay	Whey	Penassay	Whey	Penassay	Whey	Penassay	Whey	Penassay	Whey
	(*units/ml*)		(*μg/ml*)		(*μg/ml*)		(*μg/ml*)		(*μg/ml*)		(*μg/ml*)	
1.0 x 10^4/ml agar[b]												
72° F.	0.04	NG[c]	0.5-1.0	NG	0.5-1.0	NG	0.1	NG	NG	NG	0.4	NG
86° F.	0.01-0.2	0.01	0.5-1.0	2.0	0.5-1.0	1.0-2.0	0.1-0.2	0.5-0.1	0.4-0.8	0.4	0.8	0.4
98° F.	0.02	0.01-0.2	1.0	2.0	0.5	1.0	0.2	0.1-0.2	0.8	0.4	0.8	0.4-0.8
1.0 x 10^5/ml agar												
72° F.	0.01-0.02	NG	0.2-0.5	NG	0.5	NG	0.1	NG	0.8	NG	0.4	0.4
86° F.	0.01-0.02	0.01-0.02	0.2-1.0	2.0	0.5	1.0-2.0	0.2	>0.1	0.8	0.4	0.8	0.4
98° F.	0.02	0.01	0.2-1.0	2.0	0.5	1.0	>0.2	0.2	0.8	0.8	0.8	0.4
1.0 x 10^6/ml agar												
72° F.	0.02	NG	0.2-0.5	NG	0.5	1.0	0.1	NG	0.8	NG	0.4	0.4
86° F.	0.02-0.03	0.02	0.5	2.0	0.5-1.0	1.0-2.0	>0.1	0.1-0.2	0.8	0.4-0.8	0.8	0.4
98° F.	0.03-0.04	0.02	0.5-1.0	2.0	1.0	1.0-2.0	>0.2	>0.1	0.4-0.8	0.4-0.8	0.4	0.8
1.0 x 10^7/ml agar												
72° F.	0.03-0.04	NG	1.0	>4.0	0.5-1.0	2.0	0.1-0.2	0.1	0.8	0.4-0.8	0.8	0.4
86° F.	>0.05	>0.05	0.5-1.0	2.0	0.5-1.0	2.0	>0.2	0.2	0.4-0.8	0.8	0.4	0.8
98° F.	>0.05	>0.05	0.5-1.0	2.0	1.0	2.0	>0.2	>0.1	0.4-0.8	0.4-0.8	0.4	0.8

[a]Incubation was 16 hr. in all tests.

[b]Plates were all poured with five ml of seeded agar.

[c]NG = No growth.

0.5 μg, chlortetracycline - 0.1 μg, oxytetracycline - 0.8 μg, and tetracycline - 0.4 μg.

If Penassay agar were replaced by whey agar, greatest sensitivity (considering all antibiotics tested) was obtained when: *(a)* agar contained 10,000 spores of *B. subtilis* per ml and *(b)* an incubation of 86F was used. Under these conditions the test detected the following antibiotics in milk at indicated levels per ml: penicillin - 0.01 unit, streptomycin - 2.0 μg, neomycin - 1.0 to 2.0 μg, chlortetracycline - 0.05 to 0.1 μg, oxytetracycline - 0.4 μg and tetracycline - 0.4 μg.

In general, the procedure described above was less sensitive if whey agar replaced Penassay agar.

DISCUSSION

In order to obtain satisfactory results with the "rapid" disc-assay test for detection of antibiotics in milk, it is necessary to closely control two factors which were not fully considered by Arret and Kirshbaum *(2)*.

The first of these is level of agar. Results of these experiments and others not described in this paper indicated that use of 5 ml of seeded agar enabled one to regularly detect 0.05 unit penicillin per ml of milk while 10 ml of seeded agar did not.

The second factor which requires close control is the level of spores added to agar. Use of an excessive number of spores results in over-growth without production of visible zones while use of an insufficient number is associated with lack of sufficient growth to show zones within the allotted time period.

Data in these studies indicate that at least 1 million spores per ml of agar are needed to obtain desired results from viewpoints of sensitivity and speed. Satisfactory results can also be obtained with a somewhat higher inoculum but when it approaches 10 million spores per ml, sensitivity begins to decrease. Since antibiotics other than penicillin are frequently employed in treatment of mastitis and hence may contaminate milk, experiments were conducted on ways in which the disc assay test could be modified in order to make it more useful for detecting such contamination. Increases in sensitivity to a group of 6 antibiotics were obtained by reducing the incubation temperature, (72F) reducing the number of spores (100,000 to 1,000,000 per ml of agar), extending the incubation time (16 to 18 hr) and using Penassay agar at the rate of 5 ml (seeded) per plate. Whey agar was unsuitable for use at an incubation temperature of 72F since it frequently failed to support growth of the test organism. It appeared quite suitable for use if the incubation temperature were raised to 86F.

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SPECIAL FEATURE

OUR HERITAGE — 50 YEARS IN RESTROSPECT

The Fourth Decade 1942-1951

MILTON FISHER
DIRECTOR OF MILK DIVISION
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ST. LOUIS, MISSOURI

Upon earning his D.V.M. degree from Ohio State University in 1925, Dr. Milton Fisher accepted a position as the director of meat and milk inspection with the city health department of Paducah, Kentucky. He remained in this capacity until 1933 when he resigned to accept employment with the St. Louis, Missouri, Health Department in milk control work. He has worked for many years in St. Louis as the head of the milk control section.

Dr. Fisher has left many milestones in his career in milk quality work. One of the first of these was the adoption, under his guidance, by the city of Paducah, Kentucky, of the United States Public Health Service Milk Control Ordinance. Puducah had, theretofore, not been under any national standard code. He has since been active in and devoted to improving the quality of milk and milk products through sound sanitation principles and competent application of effort in the St. Louis area.

Widely known in the Association, as a past-president, 1950, and 3 A Committee member, Dr. Fisher has remained in close proximity to the progress and improvements in the dairy industry. He has remained active in his association with his colleagues through membership in various organizations, among which are: Missouri Association of Milk and Food Sanitarians, the American Veterinary Medical Association, American Public Health Association, and the American Board of Veterinary Public Health.

His contributions have not gone unnoticed as he was cited by the Missouri Association and presented with a $100 award. He was also presented the Citation Award for his meritorious service to the International Association of Milk and Food Sanitarians.

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[1]The fourth of a series of reports covering each of the five decades of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC.

[2]President of IAMFS, 1950.

The fourth decade of the International Association of Milk Sanitarians was certainly one of tremendous growth both in number and scope — a growth which showed an increased interest in supplying the nation with an adequate and safe milk supply during a period when it was so vitally important. The Second World War had an impact on milk sanitation and quality that no other single event in the history of the Association had equalled.

As a result of increased demand for milk and milk products, amounts that had never before been required, there was seemingly a relaxation of standards for production and quality control which made the work of the milk sanitarians one of extreme importance. Along with the increased demands came problems of maintaining, at a high operating efficiency, the equipment necessary for this elevated production schedule. The mobilization of industry to meet the requirements of war production made it virtually impossible for the dairy producers and processors to purchase new equipment to help them meet the pressing demands of both the civilian and military populations. Thus, there was a concern on the part of the sanitarians for both the useable and rejected milk supplies. The latter, at times, hampered the efforts of the producers to meet the demands of the consumers. The responsibilities of the sanitarians increased and, consequently, they became key factors in the task of supplying safe and wholesome milk to this nation's people during these critical years.

The standards were, during the war, relaxed to allow the producers to meet the higher production

schedules, but this idea was not readily accepted by the milk sanitarians whose primary concern was quantity production without sacrifice of quality. These years brought about a review of standards governing milk and a closer look at the controlling Ordinance. A group of New Englanders was instrumental in initiating this scrutiny of standards.

The high production quotas called for during the war brought to light many inadequacies which had theretofore not been discovered and in part, re-defined the responsibilities and areas of concern to the sanitarians. The Association was very much interested in the activities concerning milk quality and wholesomeness. The Armed Forces asked in the early 40's guidance and direction from a group of 20 men, who represented the Association, in matters of quality milk for the Army.

Association committees took an active part in the investigations of the many problem areas brought to light during the war. So, it might be said that the war was in many ways responsible for a "growing up" period for the Association.

Concern during the post-war era was with re-defining, reviewing, re-writing and reconsidering the standards adopted during war-time to combat the struggle to keep pace with demands. All or most of the standards pertaining to quality production suffered during the war and there was great concern for the standardization of rules, codes and procedures to restore and improve the civilian population's milk supply.

The Association did its part during the war to contribute constructively to the solution of some of the problems encountered in assuring a safe milk supply. Lt. Babcock, IAMFS member, was cited by the government for his outstanding contributions in the Veterinary Corps to milk quality for the members of the Armed Forces. In spite of the fact that an Annual Meeting during the war, at which time the problems were acute, might have been beneficial, the Association felt that it could better serve in a responsible capacity by complying with a request from the Office of Defense Transportation not to hold the Annual Meeting in 1943. Therefore, the slate of officers that had served the preceding year remained in office.

The war years were also fruitful ones for the internal development and advancement of the Association. It was during this time that the affiliate and regional chapter structure was instituted. In 1943 a plan was devised and set up to provide for this still-flourishing type of organization structure. The philosophy behind this plan can be summed up as follows:

> "A long time ago, man learned that in union there is strength. He does not want this union to pin his ears back, grease him, and swallow him whole, but he does want enough tie to his professional colleagues to bring him the benefits of their assistance of one kind or another, and at the same time allow him reasonable freedom of action in local situations."

In 1944, when the affiliate structure was finally set up on a working basis, Illinois, Iowa, Michigan, New York and Wisconsin, as of October, 1944, made up the affiliate organizations.

Also, during 1944, it was explicitly spelled out by the Association leadership that more concern and interest should be shown in the fields of; study of proposed equipment, inclusion of sanitarians in the Association instead of only milk specialists, and an improvement of relations between the Association and its newly acquired affiliates. However, again, the Association was unable, in 1945, to hold an Annual Meeting to consider these problems and to work toward solutions to them. The War Convention Committee had established a ruling which, in essence, said that any convention which would attract more than 150 out-of-town visitors to any given city would not be allowed. Again, the Executive Board complied with the governmental request. It was not until the following year, 1946, that an Annual Meeting was held (Atlantic City) and the membership was provided the opportunity to confront some of the problems that had been accumulating since the early years of the war and at the beginning of the fourth decade.

It was during 1946 that Oklahoma was welcomed to the fold of the Association. Discussion groups of the Association and its affiliates indicated the forward-looking attitude of the Association; this actually showed more promise than the inclusion of one or two affiliates during the remaining five years of the decade. One of the most significant of these discussion topics was the consideration of including food sanitation within the scope of the activities of the Association.

From this point on, at the closing of the 40's, the progressive nature of the Association became evident. This progressiveness manifested itself first of all, in 1947, when the *Journal of Milk Technology* became known as the *Journal of Milk and Food Technology*. A second point here is that the Association, in the same year, also changed its name to the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS. The vote to change the name speaks for the attitude of the members concerning their eagerness to expand their scope of interest and to meet the increased demands placed upon them. The final vote for the name change was 267 for the change, and a mere 17 against.

The third very important factor in the growth pattern of the Association during this fourth decade was the employment of H. L. "Red" Thomasson as the full-time Executive Secretary of the Association. Red served his first year in this capacity while also serving his term as President of the Association. The creation of this position on a full-time basis had been recommended a few years earlier, but it was conceded that the Association was not ready for such a move at that time. This recommendation was made by the former Secretary-Treasurer, C. Sidney Leete, who had so faithfully and competently served in that capacity for ten years. At the Annual Meeting in 1947, Sidney Leete and H. N. Parker were both recognized for their contributions to the Association.

Another development was introduced in 1947 when C. A. Abele proposed, because of their definitive value to the sanitarians, that copies of the 3 A SANITARY STANDARDS be made available to the members at a reasonable cost. This practice has survived through the years and proven very beneficial to not only the members, but many others associated with the dairy industry and regulatory agencies. It is of interest to note here that the 3 A symbol was obtained and patented as a result of the DeLaval Separator Company relinquishing rights to the "A" as a symbol — rights which it had owned for 15 years.

In the latter part of the decade, the membership was deeply distressed by the loss of two very active and hard-working members — Sidney Leete and "Bill" Palmer. Both had been very closely aligned with the successes of the Association during this fourth decade of growth and were missed by all who worked with them professionally and personally.

With the foundation of a broadened scope for the Association through the inclusion of "food" in both its name and in the title of the Journal, plus the appointment of Red as the Executive Secretary, the Association was to embark upon a fifth decade which, as will be indicated in another paper in this series, proved to be one of unprecedented growth. During the fourth decade, the membership of the Association, in spite of the war years, showed a net gain in membership of approximately 750. In 1942, the membership figures were 1250 and at the time Red assumed his responsibilities they were approximately 2000. It should be noted, however, that in 1950 the membership classification was changed to include industry members as full members instead of associate.

News and Events

WE GOOFED!

In the April issue of the Journal, a story told that Dr. Carl C. Byers of General Motors Corporation would be the keynote speaker at the 1963 Annual Meeting. We have since realized that he will be the banquet speaker. Everything else in the story was true, however. Excuse the error, please.

POSTERS TO AID FOOD SANITATION

The Paper Cup and Container Institute has recently announced the availability of a poster set to aid in food service sanitation. The series, entitled "On Guard" depicts five of the important aspects of good food service protection and were developed to aid in creating a greater awareness of food service sanitation.

This poster series is the first visual aid of this nature to be made available to health departments and sanitarians. It has been requested by the Institute that anyone wanting these poster sets in any quantity remit 10 cents per set to partially offset the cost of handling and mailing. For further information write: Howard Hough, Public Health Committee, Paper Cup and Container Institute, 250 Park Avenue, New York 17, N. Y.

Cincinnati and Chicago Are Crumbine Award Winners

The Health Departments of Lake County, Illinois, and Hamilton County, Ohio, were cited April 24 by a jury of top public health officials and educators for developing outstanding programs in environmental health and in food and drink sanitation during 1962.

The two departments, serving the northern suburbs of Chicago and metropolitan Cincinnati, respectively, were designated to receive the two Samuel J. Crumbine Awards for 1963 in a competition open to more than 1200 local health units throughout the United States.

"The jury was impressed with the progress the Lake County Department has made in environmental health in the brief time since its establishment in 1958 and with its comprehensive planning for the future," according to Howard E. Hough, secretary of the Public Health Committee of the Paper Cup and Container Institute, sponsors of the awards.

"The food and drink sanitation program of Hamilton County's General Health District was judged to

be extremely thorough and imaginative," Mr. Hough said. "The jury was particularly interested in some of its innovations, including participation in advance planning of picnics and other outings where the possibility of food poisoning is a continuing problem."

About 50 lakes, excluding Lake Michigan, within Lake County's boundaries comprise the most important water recreational resource in the Chicago area. This means that water pollution control is a major environmental health problem.

"Lake County's population more than doubled between 1950 and 1960, but the Health Department has managed to keep informed on what the public considers its most pressing health problems and how they should be solved," Mr. Hough noted. "It has done this by a direct survey of county residents, followed up by periodic review of all individual requests for service and a careful study of health-related articles in county newspapers."

For the future, Lake County's department has prepared a comprehensive report on existing sanitary conditions and proposed facilities for water pollution control and abatement. A basic occupational health program is scheduled to get under way this year.

The Awards Jury felt that the Hamilton County General Health District's food and drink sanitation program was outstanding in its development of educational materials whenever and wherever the need for them arose, Mr. Hough said.

The Health District, in information submitted as a basis for the award, said its restaurant program in 1962 was the largest in its history. Food service licenses issued last year totaled 801 as against 757 in 1961. Sanitarians made 2090 food service inspections in 1962 — and average of two and one-half inspections per operation or, in some cases, more, depending upon the nature of the violation recorded, the Health Distirct stated.

The Crumbine Awards are made annually in memory of Dr. Samuel J. Crumbine, long-time Kansas state health officer, who pioneered much of the theory and practice upon which modern health departments operate.

Until he died in 1954, at age 91, Dr. Crumbine campaigned vigorously to eliminate the "common" public drinking cup and to educate the public to the sanitary value of paper drinking cups wherever mass drinking facilities had to be provided. At his death, he was a consultant to the Paper Cup and Container Institute's Public Health Committee.

Judges for the 1963 awards were Ralph T. Fisher, director, Division of Special Consultant Services, New Jersey State Department of Health; Harold S. Adams, associate professor, Department of Public Health, Indiana University School of Medicine; George H. Eagle, chief sanitary engineer, Ohio Department of Health; Mrs. Dallas Johnson, pamphlet and film coordinator, Public Affairs Film Committee, Washington, D. C.; Morton Hilbert, associate professor of environmental health, University of Michigan School of Public Health; and Dr. Harald M. Graning, regional medical director, U. S. Public Health Service, New York.

FARM TANK SURVEY SHOWS INCREASED INSTALLATIONS

The eighth annual Farm Tank Survey, conducted annually by Dairy Industries Supply Association and National Association of Dairy Equipment Manufacturers, shows 193,579 farm tanks installed and in use in the United States as of January 1, 1963.

This figure represents an increase of 13,701 over the 179,878 which were installed as of January 1, 1962. The percentage increase for the country nationally is slightly above seven per cent.

Earlier national figures on farm tank installations are 160,805 on January 1, 1961; 140,795 on January 1, 1960; and 117,103 on January 1, 1959. The widespread adoption of the farm bulk system of milk handling has been one of the most rapid and revolutionary changes within the dairy industries in recent years.

Here is a state-by-state scoreboard of installations in the twelve months of 1962:

State	Installations as of 1/1/63	Installations as of 1/1/62	Change
Alabama	1,495	1,524	-29
Alaska	46	25	21
Arizona	340	390	-50
Arkansas	1,166	1,380	-214
California	4,626	5,055	-429
Colorado	1,285	1,200	85
Connecticut	1,908	1,592	316
Delaware	370	350	20
Florida	895	900	-5
Georgia	1,800	2,000	-200
Hawaii	60	34	26
Idaho	1,110	1,098	12
Illinois	11,294	11,033	261
Indiana	7,374	6,846	528
Iowa	5,814	5,584	230
Kansas	2,968	2,491	477
Kentucky	3,949	3,293	656
Louisiana	3,029	2,949	80
Maine	2,395	2,145	250
Maryland	3,800	4,000	-200
Massachusetts	1,715	1,558	157
Michigan	13,000	12,900	100
Minnesota	12,259	11,675	584
Mississippi	2,205	2,096	109
Missouri	4,239	4,067	172
Montana	588	464	124
Nebraska	3,120	2,391	729

Nevada	155	159	-4
New Hampshire	1,311	1,114	197
New Jersey	1,538	1,171	367
New Mexico	324	430	-106
New York	10,590	9,622	968
North Carolina	3,800	4,000	-200
North Dakota	1,199	798	401
Ohio	17,952	14,000	3,952
Oklahoma	2,342	2,557	-215
Oregon	1,229	1,217	12
Pennsylvania	7,401	6,633	768
Rhode Island	309	294	15
South Carolina	850	831	19
South Dakota	2,502	2,342	160
Tennessee	3,344	3,152	192
Texas	5,440	5,809	-369
Utah	1,488	1,469	19
Vermont	5,189	4,281	908
Virginia	3,002	2,975	27
Washington	4,400	4,347	53
West Virginia	1,033	279	754
Wisconsin	25,193	23,203	1,990
Wyoming	140	155	-15
U. S. Total	193,579	179,878	13,701

Addendum To Special Feature

Letter To The Editor

Editor's Note: The Journal carried as a special feature in the March, 1963 issue, an article entitled "How to Inspect a Food Processing Plant," written by Vincent T. Foley. The below letter is being published as an addendum to the article with the express permission of Mr. Foley who indicated that he concurs with the writer of the letter, and is appreciative of his interest.

Mr. H. L. Thomasson
Journal of Milk and Food Technology
Box 437, Shelbyville, Indiana

Dear Red:

I have just read with appreciation Vincent Foley's article in the March, 1963 issue of the *Journal of Milk and Food Technology* on "How to Inspect a Food Processing Plant." He seems to have touched all the bases except one. Even though an element of it was implied, I should like to refer to it a bit more explicitly. This is the matter of organization and personnel by means of which the management of a food processing plant is to achieve conformity to good sanitary practice and official requirements and by which the official agency can have some assurance of its point of view being consistently represented within the plant.

All of the matters of concern to the regulatory agency with respect to plant sanitation and protection of food require not only the provision of suitable physical facilities and a willing management, but implementation of such facilities and the translation of willingness into actual performance, which means people with assigned responsibilities and the time and capability to carry them out. Within production and some parts of maintenance, the assignments are usually fairly clear, but who does sanitation is too often vague and clouded in double talk. If a plant management does not have the awareness of its needs in this area, then it should certainly be the prerogative of the official inspector to ask some searching questions and get some answers enlightening to both.

It seems to me that having an individual in the plant organization with prime responsibility for the handling of the sanitation function is far more important to the public health than screens on the windows or a wash basin in the production area. And in a list of violative conditions, this question of who has the sanitation responsibility should head the list. There shouldn't be any feeling of delicacy about exploring this key to plant sanitation. If the manager is ignorant, he should be enlightened; if he is laboring under the belief that he is saving money and getting by otherwise, the facts of industrial life should be explained to him. If his operation is small and his supervision of necessity has multiple assignments, then he should understand that one of the most important and clearly defined should be that of plant sanitation – and the inspector should have routine contact with the person so designated and give him support when that need is evident.

I'm sure Vince Foley will welcome this addendum to his excellent article.

Sincerely yours,
/s/J. Lloyd Barron
Consultant

Ulcer Diet May Aid Heart Disease

The diet that soothes the ulcer may increase heart disease, says a statistician at the University of Michigan School of Public Health.

His evidence comes from research involving 1300 ulcer patients in Detroit. He found that premature deaths from heart disease was markedly higher in this group than in the general population.

Dr. Richard D. Remington, Ph.D., University of Michigan biostatistician, found that "twenty-three male deaths occurred before age 55, compared with an expected number of 15.7." These figures, deaths from arteriosclerotic heart disease, appear in an extensive analysis of the overall mortality of these ulcer patients. These findings indicate a possible link between the two diseases, said Remington.

"They intensify suspecion that some characteristic of ulcer patients, or of their treatment, accelerates the process leading prematurely to death from arteriosclerotic heart disease."

The evidence collected so far does not give a clear answer.

Membership Adopts Name Change

Karl K. Jones, secretary-treasurer, has announced that the proposed constitutional amendment to change the name of the Association to include the term "environmental" has been passed by the required two-thirds majority vote of the membership.

The adopted amendment will change the name of the Association to the INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC. The amendment was proposed by the Georgia Association of Registered Professional Sanitarians at the 49th Annual Meeting in Philadelphia, October 26, 1962. Dr. John J. Sheuring, secretary of the Georgia affiliate, presented the amendments at the business meeting. The amendments read as follows:

> Article I—*There is hereby created the International Association of Milk, Food and Environmental Sanitarians, Inc., not for pecuniary purposes, which shall hereinafter be referred to as the Association.*
>
> Article II (9)—*To cooperate with other professional groups in the development of general and environmental sanitation.*

The name change will serve to further identify many members who have been active in Association affairs. Previous steps taken by the Association to better serve this segment of the membership have been: establishment of a Committee on Environmental Sanitation; holding of special sessions on environmental health during the Annual Meetings, and the inclusion of papers and news and events items in the *Journal* which are of interest to the men in this area of public health.

The total number of votes cast was less than ten per cent of the total membership figure. Of the 367 votes mailed to the executive office during the voting period, 245 were cast in favor of the name change and the remaining 122 against. South Carolina had the largest number of votes with 54 and Georgia was second with 51. Other affiliates with heavy vote counts were Florida, Indiana, Connecticut and New York.

A three-man audit group tabulated the votes and Karl K. Jones, secretary-treasurer, IAMFS, recorded the official count.

NOMINATION DEADLINE SET FOR IAMFS CITATION AWARD

The Committee on Recognition and Awards is privileged to present a Citation Award each year at the Annual Meeting of the International Association of Milk and Food Sanitarians. This award differs from the Sanitarian's Award in several respects. There is no cash with the award; the recipient is cited for meritorious service rendered to the I.A.M.-F.S., the professional sanitarian, public health, and its many and varied activities.

As in the past, the Committee will give careful consideration to the selection of the recipient. The advice and counsel of the Executive Board will be sought in making the selection. This Award represents an expression of gratitude from the entire Association membership. It is a coveted honor, and is given only to particularly deserving members of the Association.

Any member may submit a nomination for the Citation Award. Affiliate secretaries, in particular are urged to submit nominations after consultation with their officers or members. Presentation will be made at the Annual Meeting banquet in Toronto in October.

It is not necessary to prepare a brochure. A letter setting forth the reasons why you believe the nominee should be considered for the Citation Award will suffice. The letter should be submitted to the Chairman of the Committee on Recognitions and Awards by June 15, 1963.

Mail your request for a form to: Dr. John J. Sheuring, Chairman, Committee on Recognitions and Awards, IAMFS, Dept. of Dairying, University of Georgia, Athens, Georgia.

Harry Killion, 54, Dairy Specialist In Oregon, Dies

At age 54, Mr. Harry Killion, dairy plant specialist for the City of Portland Bureau of Health, passed away December 5, 1962. His untimely death was attributed to a heart condition.

Mr. Killion, prior to his work in a regulatory capacity, spent twenty years working with the dairy industry. As a charter member of the Oregon Association of Milk Sanitarians and as a long-time member of IAMFS, Killion took an active interest in the affairs and activities of the Association. He has made many valuable contributions to milk sanitation in Oregon.

Thomasson Receives Award At IPHA Annual Meeting

IAMFS Executive Secretary, H. L. "Red" Thomasson was recently honored at the Indiana Public Health Association Annual Meeting held April 24.

He is the 1963 recipient of the "Tim Sullivan Memorial Award" (Outstanding Sanitarian) which was given this year for the second time. The award was established to recognize an Indiana man who has made valuable contributions to the field of sanitation and public health. Thomasson was cited for his

Red Thomasson, IAMFS Executive Secretary, (left) accepts the "Tim Sullivan Memorial Award" from Frank Fisher, Director of the Food and Drug Division, Indiana State Board of Health, at the Annual Banquet of the Indiana Public Health Association. Red was recognized for his many important accomplishments in the field of sanitation.

"work on testing methods for HTST pasteurization, for his responsibility for the adoption of the Grade A milk program in Indiana in 1939, for his years of association with the dairy industry, and for his efforts in upgrading the professional sanitarian."

There were approximately 250 present at the IPHA meeting held at the Washington Hotel in Indianapolis. Mr. Frank Fisher, director of the Food and Drug Division of the Indiana State Board of Health made the award presentation at the banquet which highlighted the Annual Meeting.

Thomasson previously spent 14 years with the Indiana State Board of Health where he subsequently became Assistant Director of the Dairy Division. He has devoted many years to the improvement of public health through sanitation work in the dairy industry and has been a member of the International Association of Milk and Food Sanitarians since 1939. He served as president of IAMFS in 1951-1952. He was appointed a permanent member of the Executive Board of the Indiana Association of Sanitarians. In 1951, he assumed his responsibilities as Executive Secretary of the IAMFS and his work as an administrator and manager has been unprecedented in Association affairs. Our congratulations to Red for a well-deserved honor and award!

EVENTS IN JUNE AND JULY

June 4, 5, 6—Annual Meeting, Indiana Association of Sanitarians, Rice Hall, Indiana State Board of Health, Indianapolis, Indiana. Write: Karl K. Jones, Secretary, Indiana Association of Sanitarians, Indiana State Board of Health, 1330 W. Michigan, Indianapolis, Indiana.

June 17-19—American Dairy Science Association, Annual Meeting, Purdue University, Lafayette, Indiana. Write: H. F. Judkins, 32 Ridgeway Circle, White Plains, New York.

June 19—AAAS-IFT Pacific Coast Sections. Palo Alto, California. Write: H. S. Olcott, Department of Nutritional Sciences, University of California, Berkeley, California.

June 20—Evaporated Milk Association, Bimonthly Meeting of the Industry, Chicago, Illinois. Write: Fred J. Greiner, 228 N. LaSalle Street, Chicago 1, Illinois.

July 10—Ohio Dairy Products Association, Annual Dairy Outing, Westbrook Country Club, Mansfield, Ohio. Write: E. A. Graber, 1429 King Avenue, Columbus 12, Ohio.

July 10-12—North Carolina Dairy Products Association, Summer Meeting, Morehead Biltmore Motor Hotel, Morehead City, North Carolina. Write: J. E. Johnson, Box 10506, Releigh, North Carolina.

July 15, 16, 17—Eastern Division, American Dairy Science Association & North Atlantic Section, American Society of Animal Science, West Virginia University. Write: Professor Myron Lacy, Morrison Hall, or Professor Frank Shipe, Stocking Hall, Cornell University, Ithaca, New York.

July 17-23—Fifth International Pesticides Congress, London. Write: Honorary Secretary, 14 Belgrave Square, London SW1, England.

ULTRAVIOLET PROCESS AIMED AT FOOD SPOILAGE PROBLEMS

Spoilage losses in the food, confectionary, and beverage industries, at an annual cost of millions of dollars, may become a thing of the past as the result of a new ultraviolet process that kills micro-organisms.

The process, developed by the Aquafine Corporation of Los Angeles, utilizes high-intensity ultraviolet lamps developed by the Westinghouse Lamp Division. The equipment used in the process is inexpensive. In a typical installation it would cost less than $500 and maintenance is negligible.

Louis Veloz, president of Aquafine, pointed out that sugar syrup users especially have long been plagued by rapid build-up of yeast and mold in storage tanks. He said that the sources of contamination are numerous. Bacterial growth is most rapid, however, when water condensate dilutes the surface of the syrup in the tanks. Even with every precaution, counts of 100 to 10,000 yeast cultures per cubic centimeter are common. The count increases geometrically and frequently rockets into the millions. It is then necessary to dispose of the syrup.

Dr. Rudolph Nagy, who directs ultraviolet research for the Westinghouse division, said that yeast and thermophilic organisms are always present in syrup. The yeast can easily ferment the syrup used in beverages such as the common cola drinks. One bottler in the Northeast recently had to dispose of 50,000 bottles of a soft drink due to fermentation. The thermophilic organisms, which thrive at high temperatures, are a particular problem in the canning industry since they are not easily killed by heat.

The new ultraviolet process was first treated last September. Initial experiments were made on a 5000-gallon tank at the Ice Cream Division of Ralph's Grocery Co., Los Angeles. The bacterial count at the start of the test was in excess of 250,000 . At the end of twenty-four hours, it was three. Last November, a similar installation was made on a tank of the Kist Bottling Company in Covina, California, containing type "O" 66.5 brix liquid sugar, a syrup common in the beverage industry. The initial bacteria count was approximately 20,000. Here, tests showed a zero count in 48 hours. The counts have since remained essentially zero.

In both of the above cases, the tanks remained free of bacteria, even when the sterilizers were operated only five or six hours. a day. But when the sterilizer was discontinued completely for an entire day, the bacterial count began to rise again. Other tests made at canneries, bakeries and refineries confirm the results achieved at Ralph's Grocery Company and Kist Bottling Company.

BACTERIOLOGICAL RESULTS OF TEST ON LIQUID SUGAR SYSTEM OF THE ICE CREAM DIVISION OF RALPH'S GROCERY COMPANY USING AN AQUAFINE STERILIZER.

Date	Depth of Liquid in Tank	Bacteria	Yeasts	Molds	Comments
9/21/62	4' 6"	0	250,000	0	Aquafine sterilizer turned on.
9/22/62	10' 5"	0	3	0	Sterilizer on.
9/25/62	8' 7"	0	0	0	Sterilizer on.
10/10/62	7' 3"	25	1,000	0	Sample cloudy — contaminated with milk. New sample cock installed adjacent to sterilizer.
12/28/62	6' 2"	0	0	0	Sterilizer on.
1/ 7/63	9' 1"	0	0	0	Sterilizer on.

BACTERIOLOGICAL STUDY OF LIQUID SUGAR SYSTEM OF THE DOUBLE COLA & KISC BOTTLING CO., COVINA, CALIFORNIA, USING AN AQUAFINE STERILIZER.

Date	Depth of Syrup in Tank	Bacteria	Yeasts	Molds	Comments
11/ 8/62	4' 4"	100	15,000	0	Start of test. Aquafine sterilizer turned on and left on 24 hours per day.
11/12/62	3' 6"	0	0	0	Sterilizer on 24 hours per day.
11/16/62	11' 11"	0	0	0	Time clock set to operate Aquafine sterilizer approximately 6 hours per day.
11/21/62	10' 5"	0	0	0	Sterilizer on 6 hours per day.
11/30/62	7' 5"	0	0	0	Sterilizer turned off.
12/17/62	11' 7"	0	220	0	Sterilizer off.
12/19/62	10' 3"	0	450	0	Sterilizer turned on.
12/21/62	10' 2"	0	0	0	Sterilizer on.
12/26/62	9' 3"	0	0	0	Sterilizer on.

The sugar sterilizing equipment was developed in cooperation with Sugar Products Company, largest jobber and converter in the west. In the process, the liquid materials are pumped through a unit containing the Sterilamp ultraviolet tubes. These high-intensity lamps produce energy at a wave length of 2537 angstroms. This wave length is in the region of the spectrum where bacteria and yeast are most easily killed.

The enclosed charts indicate some of the results which were obtained with the new ultraviolet equipment.

National Dairy Products Announces Promotion Of Franklin Barber

Franklin W. Barber, past-president of the Association and recipient of the 1962 Citation Award, has been promoted to Division Research Director of the National Dairy Products Research Center in Glenview, Illinois. The announcement was made April

(Continued on page 165)

FOOD TECHNOLOGISTS GIVE HIGHEST AWARD TO MEYER

For "pre-eminence in and contributions to the field of food technology", Dr. Karl Friederich Meyer, San Francisco, California, was chosen to receive the 1963 Nicholas Appert Award of the Institute of Food Technologists.

The award was made in absentia at the 23rd Annual Meeting of the Institute of Food Technologists in Detroit on May 28. At that time Dr. Meyer was in South Africa on a mission for the South Africa Institute of Health and the World Health Organization. Upon his return Dr. Meyer will be presented with a bronze medal and an honorarium of $1,000 in recognition of his contributions to food technology. The Nicholas Appert award, one of the highest honors bestowed by the Institute is named after the distinguished French scientist who invented canning as a means of preserving foods.

Dr. Meyer, now director emeritus, George William Hooper Foundation for Medical Research, University of California Medical Center, after serving as director for 30 years, is a native of Switzerland who became a citizen of this country in 1922. He studied at the University of Zurich from which he received

his A. B., D. V. M. and Ph. D. degrees. He has since been awarded nine honorary degrees from eight institutions of higher learning.

Associated with the University of California since 1913, Dr. Meyer has been professor emeritus of experimental pathology since 1954. He was given the Albert and Mary Lasker Foundation Award from the American Public Health Association in 1951 and in 1956 was the recipient of the Walter Reed Medal from the American Society for Tropical Medicine. Many other awards have been bestowed upon the distinguished food microbiologist.

He is a fellow of the American Association for the Advancement of Science, the American Academy of Arts & Sciences and the National Academy of Sciences, among others. He is a member of the Commonwealth Club of California and the Family Club of San Francisco.

Barber Promoted . . . .

24 by Dr. Arnold H. Johnson, director of Research and Development.

Dr. Barber joined the company in 1945 as a research bacteriologist, and has recently been working as Assistant Research Manager. He is a graduate of Aurora College, (B.S. egree, 1943), and ultimately, received his Ph.D. degree in bacteriology in 1944 at the University of Wisconsin. He is a member of the International Association of Milk and Food Sanitarians, American Dairy Science Association, Institute of Food Technologists and American Society for Microbiology. He is also affiliated with the World Health Organization, and the Expert Committee on Environmental Sanitation on which he served as U. S. representative to the Geneva Conference on Milk Sanitation in 1959.

Dr. and Mrs. Barber and their two daughters have resided in West Islip, New York, for the past year and one-half.

Classified Ads

POSITION OPEN

Public Health Sanitarian Consultant for statewide environmental sanitation program. Requires Masters degree and two years experience. Salary range $550 to $680 per month with entrance dependent on qualifications. State retirement, social security and liberal personnel policies. Contact Administrative Officer, State Laboratory Building, State Board of Health, Helena, Montana.

FOR SALE

Single Service milk sample tubes. For further information and a catalogue please write, Dairy Technology, Inc., P. O. Box 101, Eugene, Oregon.

HELPFUL INFORMATION

Market planning for farm bulk assembly of milk. Indiana Agricultural Experiment Station, Res. Bulletin 747, Lafayette, Indiana.

1961 Horn fly control by Cable Rubbers. So. Indiana Forage Farm. Indiana Agr. Res. Progress Report 27, Lafayette, Indiana.

Herd size effects on labor for loose housing chore tasks. Minnesota Agricultural Experiment Station, Bulletin 462, St. Paul, Minnesota.

INDEX TO ADVERTISERS

New Members Of International

APRIL 1 TO APRIL 30

DIRECT MEMBERS

N. A. Perry
Villa Park, Illinois

James W. Pees
Oklahoma City, Okla.

J. R. Velez-Aymat
San Juan, Puerto Rico

Juan Mata
Edinburg, Texas

MICHIGAN ASSOCIATION OF SANITARIANS

John Kazsuk
Bay City

Ronald Pfeifle
Perry

Robert R. Earegood
Lapeer

MISSISSIPPI ASSOCIATION OF SANITARIANS

James Parker
Macon

Gus Stevens
Biloxi

Jack Ainsworth
Meridian

OREGON ASSOCIATION OF MILK SANITARIANS

Chuck Christy
Berkeley, Calif.

Douglas Clark
Portland

John Kunzman
Oregon City

Jerry Nudelman
Portland

N. A. Peters
Portland

William Paul Sells
Portland

Sam Latham
Oregon City

Bill Lee
Portland

Lloyd Marchel
Vancouver, Wash.

Jess Strickland
Cornelius

James J. McAllister
Boring

Edmond Sing
Portland

Omar Spencer, Jr.
Portland

Nester William Tan
Portland

Jim Watkins
Milwaukie

Raymond Wyss
Tillamook

CONSTITUTION AND BY-LAWS

INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC.

CONSTITUTION*

ARTICLE I.

ASSOCIATION

There is hereby created the International Association of Milk, Food and Environmental Sanitarians, Inc., not for pecuniary purposes, which shall hereinafter be referred to as the Association.

ARTICLE II.

OBJECTIVES

1. To foster efforts designed to improve the professional status of the Sanitarian.

2. Develop uniform and proper methods of supervision and inspection of dairy farms, milk and milk products plants, and food-handling establishments, including restaurants, warehouses, and transportation equipment.

3. Develop uniform and proper methods for the examination of milk, milk products and other foods.

4. Encourage improvements in sanitary methods of production of milk and related food products.

5. Encourage the development of equipment and supplies to improve the sanitary handling of dairy and food products.

6. Assist members in their technical work and development.

7. Cooperate with other professional groups in advancing the public health through improved milk and food-handling technology.

8. Disseminate information concerning sanitary milk and food-handling technology and administration through its official publication and/or by other means.

9. Cooperate with other professional groups in the development of general and environmental sanitation.

ARTICLE III.

MEMBERSHIP

Section 1. There shall be two classes of membership in this Association: Members and Honorary Members.

Section 2. The qualifications of the several classes of members, the dues of each, the manner of their election to membership, and their respective rights and privileges shall be prescribed in the By-Laws, except as otherwise provided in this Constitution.

***Amended by vote of members in session at the 49th Annual Meeting of the International Association of Milk and Food Sanitarians in Philadelphia, Pa., October 24-27, 1963.**

Approved by mail ballot of eligible paid members on March 26, 1963.

ARTICLE IV.

OFFICERS, EXECUTIVE BOARD & COUNCIL

Section 1. The officers of this Association shall be a President, a President-Elect, a First Vice-President, a Second Vice President, and a Secretary-Treasurer who shall hold these offices for one year or until their successors are elected or appointed, as provided in the By-Laws. At the termination of each Annual Meeting the President-Elect, First Vice-President, and Second Vice-President shall automatically succeed into the offices of President, President-Elect, and First Vice-President, respectively. A Second Vice-President and Secretary-Treasurer shall be elected by majority ballot at the Annual Meeting of the Association.

Section 2. The Executive Board shall consist of the President of the Association, the President-Elect, the two Vice-Presidents the Secretary-Treasurer, and the immediate two Past-Presidents. The Executive Board shall direct the affairs of the Association. A majority of the Executive Board shall be composed at all times of members who are officially connected with Federal, State, County, or Municipal Government or with an educational institution. If the status of any member of the Executive Board changes after election, or during his term of office, or after protem appointment as provided in Article II, Section 5, paragraph F of the By-Laws, so that a majority of members officially connected as stated herein, is not maintained in the Executive Board, then such member shall be deemed ineligible without prejudice for his office and such office shall be declared vacant.

Section 3. There shall be created a Council which shall consist of the Secretary or other authorized delegate from each Affiliate Association, and the immediate two Past Presidents of the Association. Each Affiliate Association shall have one vote at Council meetings. The Council shall select its Chairman and Secretary, shall keep a record of its proceedings, and shall, at each Annual Meeting of the Association submit its recommendations to the Executive Board.

Section 4. It shall be the duty of the Council to recommend to the Executive Board programs or activities for the Association; provided, that no recommendation of the Council is binding upon the Executive Board.

ARTICLE V.

AFFILIATE ASSOCIATIONS

Section 1. Members of this Association residing in the same geographical area, and also functioning organizations of milk and food sanitarians or closely related groups whose objectives are consonant with those of this Association, may apply for a Charter as an Affiliate Association under conditions stipulated in the By-Laws.

Section 2. Each Affiliate Association shall have one representative on the Council. The representative shall be the Secretary or other duly authorized delegate of the Affiliate Association.

ARTICLE VI.

MEETINGS

Section 1. Each year when possible, the Association shall hold an annual meeting, and such other meetings as the Executive Board deems necessary.

Section 2. In all meetings of the Association, a quorum shall consist of at least twenty-five members.

Section 3. In case there is no quorum present to transact necessary business, the Executive Board is authorized to act for the best interests of the Association, and the elective officers will continue in office until their successors are duly elected.

Section 4. The Executive Board shall meet at each Annual Meeting of the Association and at such other times as the President shall deem necessary. A quorum for Executive Board meetings shall consist of at least five members and decisions shall be by a majority vote of those present.

ARTICLE VII.

AMENDMENTS

Section 1. Any member may propose amendments by submitting them in writing to the Secretary-Treasurer at least 60 days before the date of the next announced meeting, and the Secretary-Treasurer shall promptly notify all members that the proposed amendments will be open for discussion at that meeting. Such proposed amendments, upon a majority affirmative vote of the members present shall be, within 90 days, submitted to the entire membership of the Association by the Secretary-Treasurer. All members voting on such amendments shall, within 60 days after issuance of such notification, register their vote in writing with the Secretary-Treasurer on blanks furnished by the Association. These ballots shall be opened, recorded and filed, and the results shall be reported by the Executive Board to the membership of the Association. If the proposed amendments are passed by a two-thirds affirmative vote of those members who register their votes with the Secretary-Treasurer, they shall become a part of the Constitution from the date of such report and notice by the Executive Board.

ARTICLE VIII.

BY-LAWS

Section 1. The parliamentary procedure of the Association shall be governed by By-Laws adopted by majority vote of voting members in attendance at a duly called meeting of the Association.

BY-LAWS*

ARTICLE I.

MEMBERSHIP AND DUES

Section 1. The membership of this Association shall be composed of any persons who are interested in the objectives of this Association and those engaged in milk or food inspection, or the laboratory control of, or the administration of any such function, or engaged in research or educational work relating to any aforesaid function.

Section 2. The annual membership dues payable to the Association, January first of each calendar year shall be seven dollars ($7.00) for each member paying dues directly to the Association, and five dollars ($5.00) for each member paying dues through an Affiliate Association.

Section 3. Honorary Members:

A. The Honorary Membership shall be composed of persons who, on account of their substantial contributions to the objects of this Association, have been nominated by the Executive Board and elected by the members to this class of membership.

B. Honorary Members shall not be required to pay dues, shall not be entitled to vote, or to hold office, but may attend the meetings of the Association and be accorded the privilege of the floor.

Section 4. Any person desiring membership in this Association will submit his application on a form supplied by the Secretary-Treasurer and endorsed by a member. The Membership Committee, by majority vote, will determine eligibility and acceptability as a member.

Section 5. Any person having once become a member may continue membership in the Association so long as the annual membership dues are paid, except insofar as provided in Section 6 of this Article. Any member who shall fail to pay annual dues within three months after first notification by Secretary-Treasurer that said dues are payable shall be placed on the inactive list. Any such member may be reinstated within 90 days thereafter, by the Membership Committee upon notification by the Secretary-Treasurer that the dues in arrears have been paid. Any member who is delinquent in dues for one year will be dropped

***Amended by vote of members in session at the 46th Annual Meeting of the Association in Glenwood Spring, Colorado, August 29, 1959.**

from membership, and can be reinstated only by filing reinstatement application in due form and accompanied by the annual membership dues for that year.

Section 6. A member of the Association may be expelled for due cause upon recommendation of the Executive Board after opportunity for hearing by the Board, as provided below in Article II, Section 5G of the By-Laws, and a majority vote of the members at any Annual Meeting. Any member so expelled shall have refunded such prorata part of his membership dues as may not be covered by his term of membership.

Section 7. Each paid-up member of the INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC., in good standing, shall receive at no extra cost, the regular issues of the Official Publication of the Association and such other publications as the Executive Board may direct for the year in which his dues are paid.

Section 8. A. The Secretary-Treasurer of the Association shall collect annual membership dues of seven dollars for each member paying directly to the Association, and five dollars from the Secretary-Treasurer of each Affiliate Association for each member paying membership dues through an Affiliate Association as provided in Article I, Section, of these By-Laws.

B. Members of the Association who pay local dues as members of one or more Affiliate Associations will pay Annual Membership Dues only once to the Association through an Affiliate Association, and shall receive only one annual subscription to the Journal so long as dues are paid to the Association.

ARTICLE II.

DUTIES OF OFFICERS, EXECUTIVE BOARD, AND COUNCIL

Section 1. The President shall preside at all meetings of the Association and the Executive Board. He shall appoint all committees unless otherwise directed by vote of the Association or by the Constitution and By-Laws, and perform such other duties as usually devolve upon the presiding officer or are required of him by the Constitution and By-Laws.

Section 2. The President-Elect shall perform the duties of the President in the latter's absence, shall succeed the President when the latter's term will expire, and shall be Chairman of the Program Committee which will be responsible for planning the program for the Annual Meeting.

Section 3. The Vice-Presidents, in order of their elected office, shall perform the duties of the President and President-Elect in their respective absence, and shall serve on the Program Committee.

Section 4. The following shall be the duties of the Secretary-Treasurer:

A. The Secretary-Treasurer shall record the proceedings of the Association and, unless an Executive Secretary has been appointed in accordance with the provision of subdivision B of this Section shall keep a list of the members, and collect all moneys due to the Association, giving his receipt therefor. He shall record the amount of each payment, with the name and address of the person so paying. He shall faithfully care for all moneys entrusted to his keeping, paying out the same only with the approval of the President and taking a receipt therefor. Unless the Association employs an Executive Secretary he shall, immediately after his election to office, file with the President of the Association a bond in the sum of Five Thousand Dollars ($5,000) the expense of which shall be borne by the Association and shall, at the Annual Meeting, make a detailed statement of the financial condition of the Association.

B. The following prescribed duties of Secretary-Treasurer may be delegated to an Executive Secretary appointed by the President upon approval of the Executive Board:

1. To keep a list of the members, and collect all moneys due the Association, giving his receipt therefor.
2. To record the amount of each payment, with the name and address of the payor.
3. To faithfully care for all moneys entrusted to his keeping, paying out the necessary expenses of the Association and giving an accounting thereof to the Board Members.
4. To file a surety bond with the President of the Association in the sum of Five Thousand Dollars ($5,000), the expense of the bond to be borne by the Association.

5. To give a detailed statement of the financial condition of the Association at the Annual Meeting.

6. The Executive Secretary will hold office until the Executive Board authorizes the President to appoint a successor, but the status of the Executive Secretary will be that of any employee of the Association.

C. The Secretary-Treasurer will serve as a member of the Membership and Publications standing committees.

D. The Secretary-Treasurer will be responsible for assembling and transmitting to the Editors of the publications of the Association all papers, addresses, and other matter worthy of publication as soon as possible after the Annual Meeting, and keep currently listed with the publications management the names and addresses of all members of the Association and Affiliate Associations entitled to receive the publications.

E. The Secretary-Treasurer will record and keep accurate minutes of the proceedings of all meetings of the Association and the Executive Board and prepare and keep them for permanent reference. He shall issue notices of all meetings, conduct correspondence pertaining to the affairs of the Association, and perform other duties incident to the office as the Executive Board may authorize.

Section 5. The full management of the affairs of the Association shall be in the hands of the Executive Board, as provided in the Constitution. The duties of the Executive Board shall be:

A. To direct the administrative work of the Association including all matters connected with its publication, its standardization work, its collaboration with other groups and institutions, and its professional development;

B. To act as trustee of Association property;

C. To recommend names for Honorary Membership;

D. To fix the time and place for the Annual Meeting;

E. To act for and in behalf of the Association in any administration, financial, legislative, educational, or other capacity of the Association may direct, or act on its own initiative between meetings and report such action at the next Annual Meeting;

F. To make protem appointments to fill any vacancy that may occur among the officers between meetings of the Association in the interest of the Association, and to recommend the replacement of an officer at the Annual Meeting, because of inability or inactivity or for other causes which may be in the interest of the Association;

G. To recommend expulsion from membership for cause by two-thirds vote of all votes cast, but in no case will revocation be recommended without giving the member written notice of reasons for the contemplated action at least one month before action is taken and an opportunity be given for a hearing in person and/or a rebuttal in writing;

H. To employ personnel, as the situation demands, and fix their compensation and duties;

I. To execute the policies of the Association and report to the Association at its Annual Meeting any action taken that was not specifically authorized;

J. The amount of the registration fee for the Annual Meeting shall be fixed annually by the Executive Board and shall be used for defraying the expenses of the Annual Meeting;

K. To authorize the issuance or revocation of a Charter to an Affiliate Association;

Section 6. The duties of the Council shall be:

A. To act as an advisory body to the Executive Board;

B. To serve as the means for the interchange of ideas and recommendations on programs, activities, and procedures among and between the Affiliate Associations and the Executive Board;

C. To aid in putting into effect policies and programs authorized by the Association and by the Executive Board;

D. To convey to the respective Affiliate Associations information on the activities of the Association;

E. To make a report of its activities to the Executive Board at the Annual Meeting;

F. The Chairman shall preside at all meetings of the Council. He shall appoint all Council committees unless otherwise directed by vote of the Council, and perform such other duties as usually devolve upon the presiding officer or are required of him by the Constitution and By-Laws.

ARTICLE III.

AFFILIATE ASSOCIATIONS

Section 1. The conditions for authorizing the issuance of a Charter to an Affiliate Association are as follows:

A. When a regional group of members of this Association want to form an Affiliate Association, a group of at least ten members of this Association will sign the application and forward it to the Secretary-Treasurer of this Association, accompanied with a list in duplicate of the names of the members of this Association suggested by the applicants for allocation to the Affiliate Association and also a definition of the area desired to be covered.

B. When an already-existing organization wants to become an Affiliate Association the Secretary or other duly authorized officer of the applicant organization will make written request for affiliation status, giving the name of the organization, a copy of the Constitution and By-Laws, an attested copy of the minutes authorizing said application, the names and addresses of its officers, the number of members, a statement as to the area now covered, and also the area that it desires to embrace.

Section 2. Upon affirmative majority vote of the number of votes cast, by the Executive Board, the Secretary-Treasurer of this Association will notify the responsible officer of the applicant organization concerning the action taken. Upon receipt of any further information requested by the Secretary-Treasurer and receipt of remittances to cover the amount of the membership dues, as per provisions in the By-Laws, Article I, Section 2 and Section 8, he will execute a Charter to the Affiliate Association in form and substance as approved by the Executive Board. After the granting of the Charter by this Association, the Secretary of the Affiliate Association or other duly authorized officer shall submit the names and addresses of each member, dues, and other official business to the Secretary-Treasurer of this Association as may be required in keeping with the Constitution and By-Laws.

Section 3. Any Affiliate Association may use the expression "Affiliated with the INTERNATIONAL ASSOCIATION OF MILK, FOOD, AND ENVIRONMENTAL SANITARIANS, INC." or an equivalent legend that is approved by the Executive Board.

Section 4. An Affiliate Association Charter may be revoked by the Executive Board upon recommendation by the Council on two-thirds vote of the total number of votes cast by the Council, after due and reasonable notice has been given in writing at least three months before such intention and a reasonable opportunity is given for a hearing, for the following causes:

A. When the affairs of the Affiliate Association are not conducted consonant with the Constitution and By-Laws of this Association, or

B. When the Affiliate Association has ceased to function for two years.

ARTICLE IV.

COMMITTEES

Section 1. Standing committees of this Association shall consist of the following: Program, Membership, and Publications.

A. The Program Committee shall consist of the President-Elect who shall serve as Chairman, the two Vice-Presidents and the Executive Secretary.

B. The Membership Committee shall consist of a Chairman appointed by the President, the Secretary-Treasurer, one member from each Affiliate, and such other members as are deemed desirable by the Executive Board.

C. The Committee on Publications shall consist of the Editors of the Association's publication and the Secretary-Treasurer of the Association who will report all matters pertaining to the publications to the Executive Board at least once every year and whenever so requested by the Executive Board. This Committee will handle all editorial matters concerned in publishing the Journal of Milk & Food Technology, with the approval of the Executive Board.

Section 2. Each year, the President, as soon as convenient, but at least 30 days prior to the Annual Meeting shall appoint a Nominating Committee of seven members, other than officers of the Association. One member shall have been a member of the Nominating Committee from the previous year. This Committee shall submit to the Association at the Annual Meeting the names of at least one nominee for each elective office in the Association. These names, together with any other nominations duly made on the floor at the Annual Meeting, shall be voted upon. If there are more than two nominees for any office and none receives a majority of all the votes cast the candidate receiving the highest number of votes and the candidate receiving the second highest number of votes shall be retained on the ballot, all others being eliminated, and voting shall proceed on these two candidates.

Section 3. Other special committees and regular continuing committees may be authorized by the Executive Board or by the President for special work or assignment. The need for continuation of such committees shall be subject to annual review of the Executive Board. All appointments to continuing committees shall be made by the President-Elect prior to the Annual Meeting.

Section 4. The terms of office of all members shall expire at the end of the Annual Meeting next following their appointment, except as provided in Section 1, Paragraphs A, B, and C, above.

ARTICLE V.

MEETINGS

Section 1. The Annual Meeting of the Association shall be held at such time and place as shall be designated by the Executive Board. Twenty-five of the members registered at the Annual Meeting shall constitute a quorum for transaction of business.

Section 2. Special meetings of the Association may be called by the Executive Board, but in such cases due notice shall be given to the members by the Secretary-Treasurer.

Section 3. The Executive Board and the Council shall meet at the Annual Meeting and at all special meetings of the Association. A quorum of the Council shall consist of a majority of its members. When, in the discretion of the Executive Board it is considered advisable to conduct a vote on a question by mail vote, a majority of the votes cast will be necessary to carry the proposition.

Section 4. Robert's Rules of Order shall govern the procedures at all meetings. Voting by proxy shall not be permitted.

ARTICLE VI.

PUBLICATIONS

Section 1. All publications of the Association will be issued under the direction of the Executive Board, but any Affiliate Association may publish its own material if it assumes full responsibility therefor and obligates the Association in no way.

Section 2. The Journal of Milk & Food Technology will be the official organ of the Association. The Journal will be the property of the Association which will own the copyrights to the Journal and all articles published therein. The Editors will serve at the pleasure of the Executive Board.

Section 3. Any other publications of the Association will be produced and handled as the Executive Board will direct.

ARTICLE VII.

AMENDMENTS

Section 1. Any member may propose amendments to these By-Laws by submitting them in writing to the Secretary-Treasurer at least 45 days before the date of the next announced meeting, and the Secretary-Treasurer shall promptly notify all members that the proposed amendments will be open for discussion at the meeting. These By-Laws may be amended by a majority affirmative vote of the members present.

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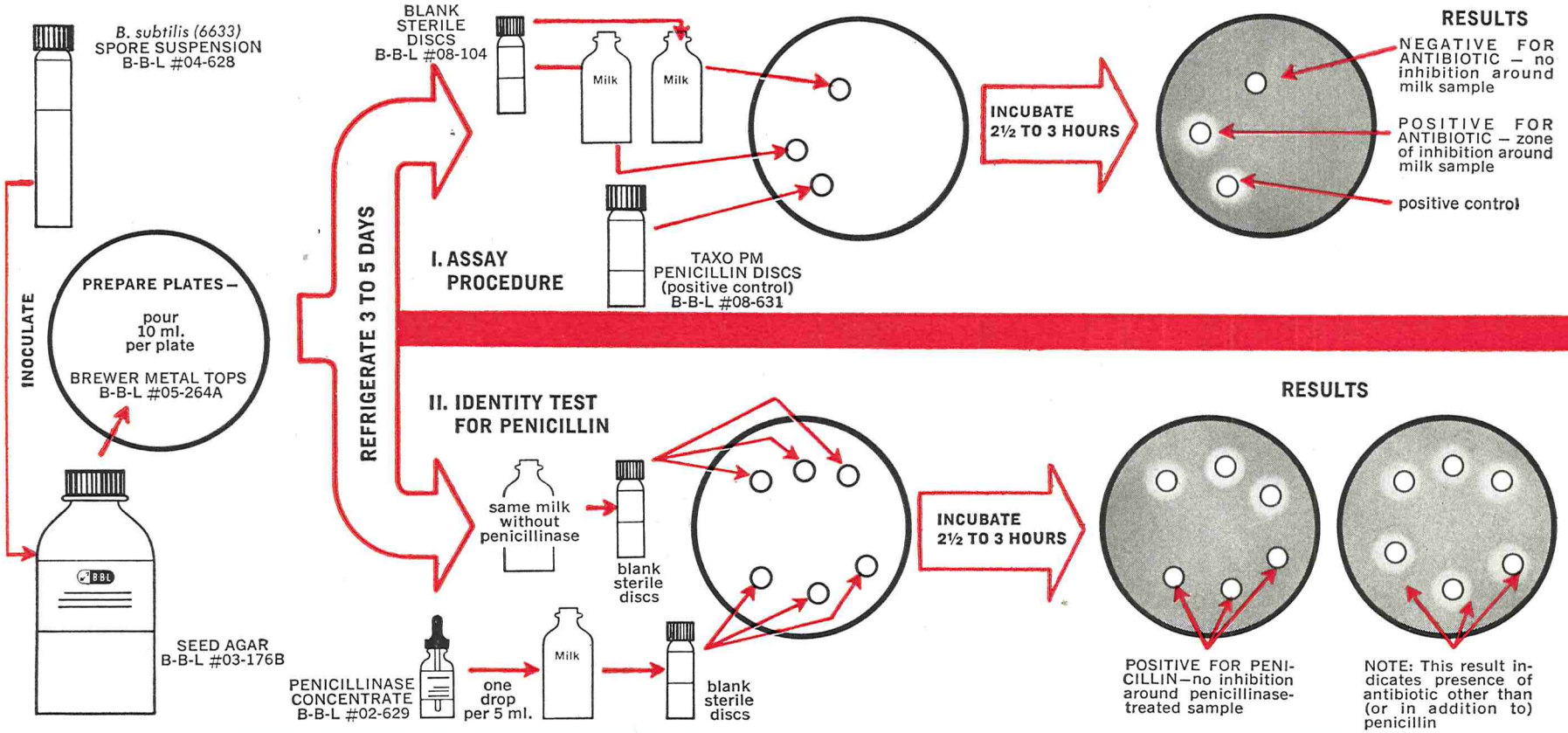
DETECTION OF PENICILLIN IN MILK



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*Arret, B., and Kirshbaum, A.: J. Milk and Food Technol. 22:329, 1959.

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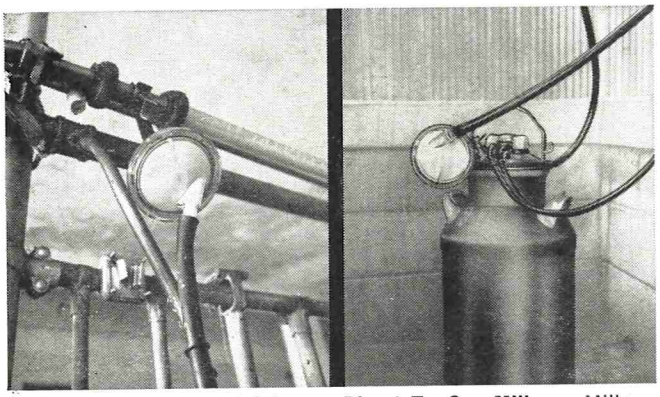

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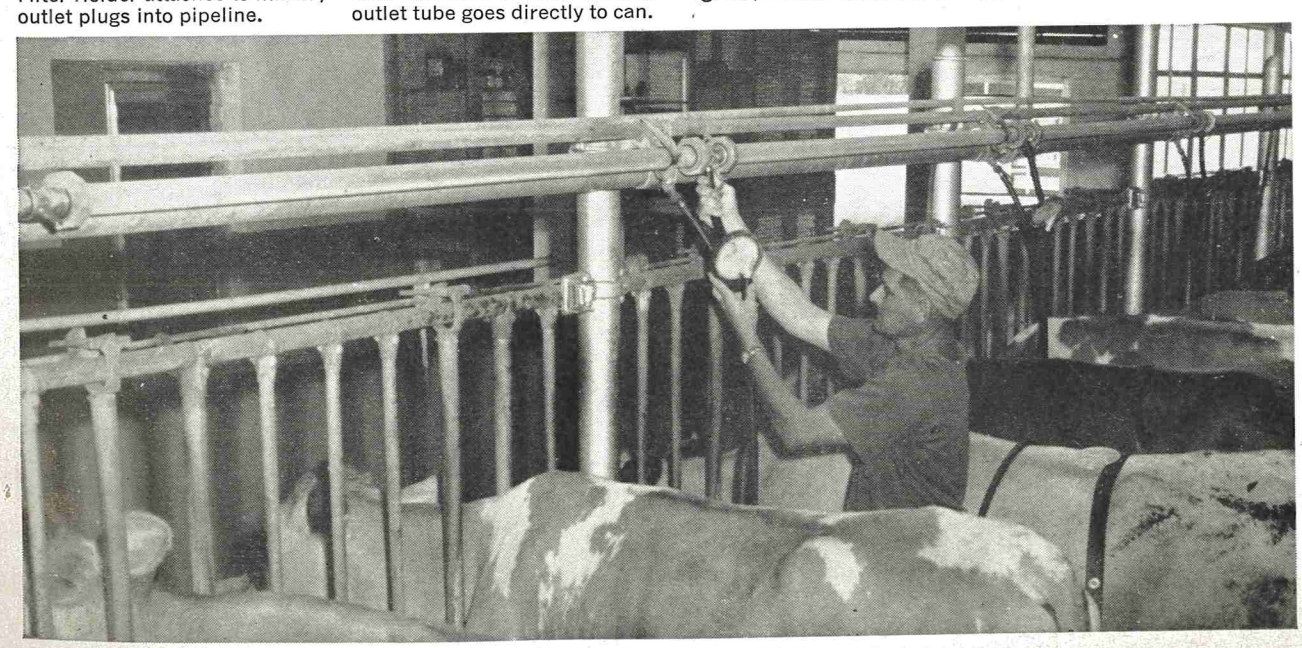

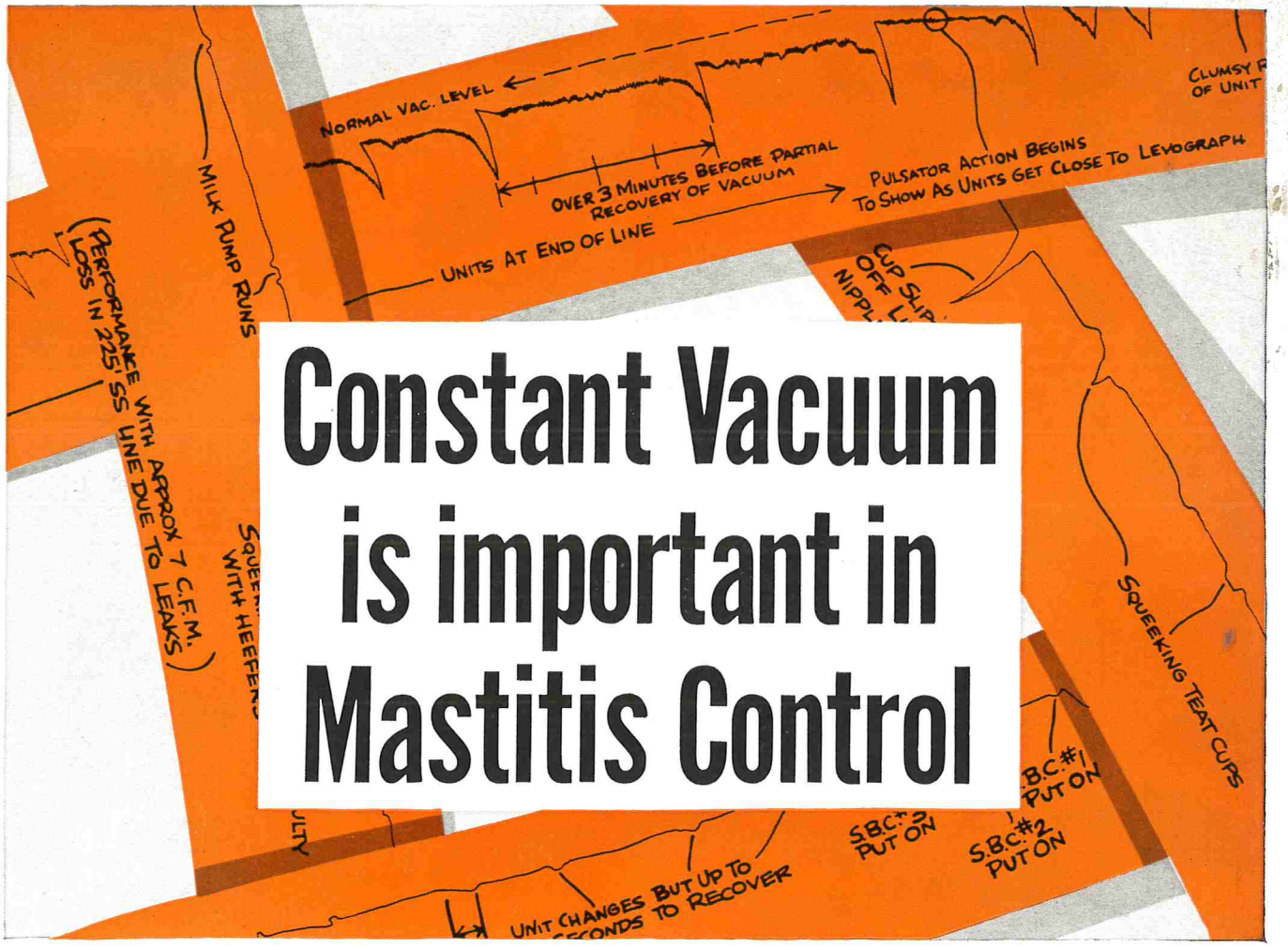

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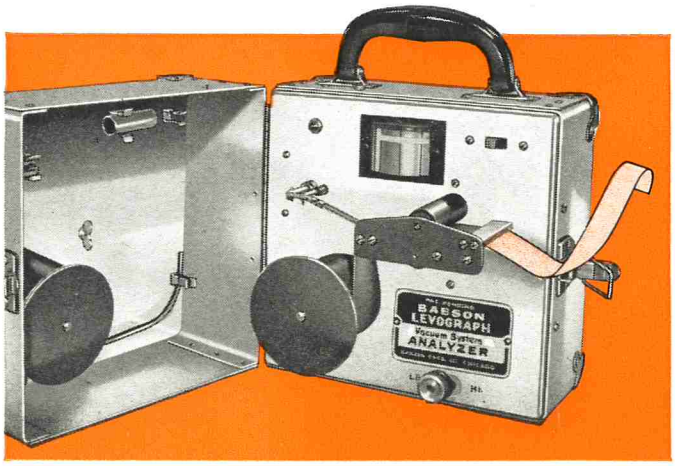

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