

OCTOBER, 1960

Vol. 23

No. 10

*Journal of*

# MILK and FOOD TECHNOLOGY

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*Official Publication*

International Association of Milk and Food Sanitarians, Inc.



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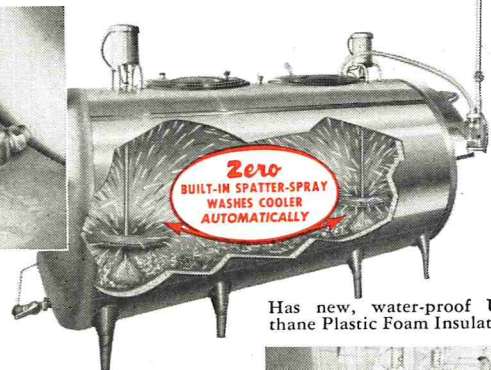
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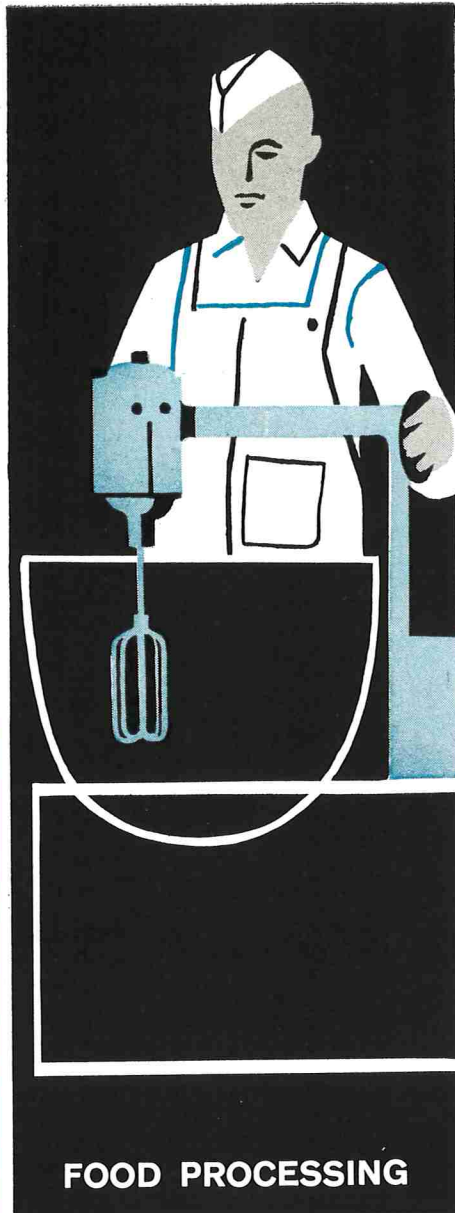
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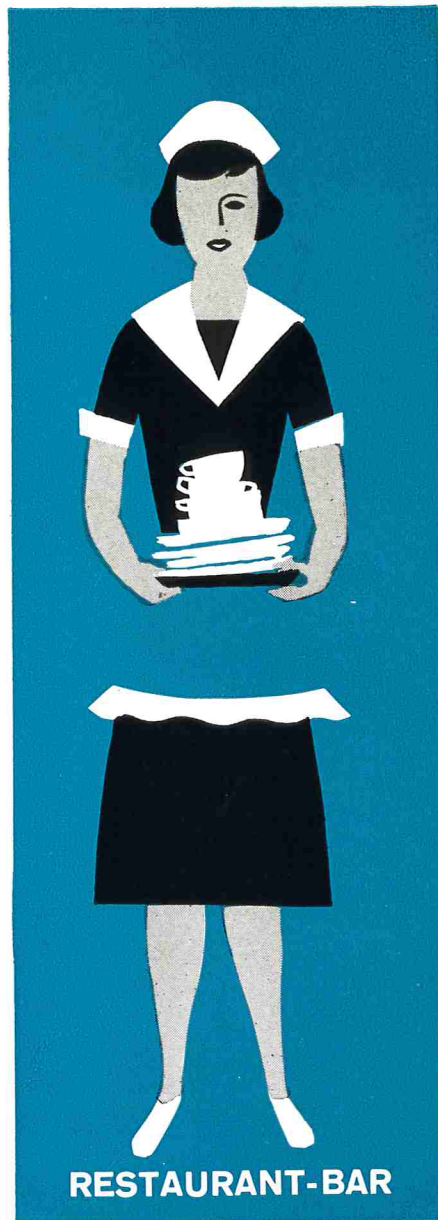




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Vol. 23 October No. 10

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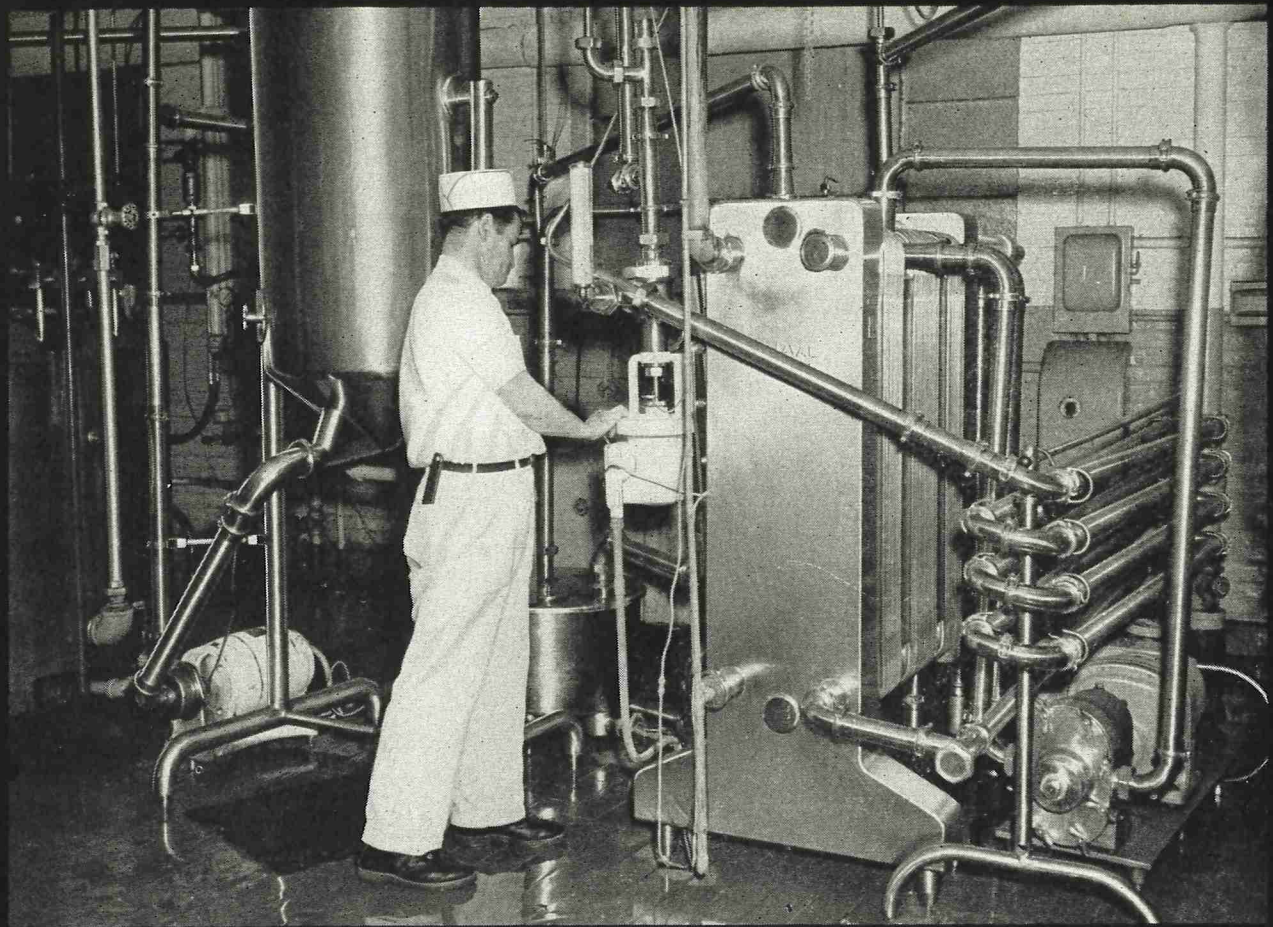
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Trial 1	98.9	99.5	98.0	100
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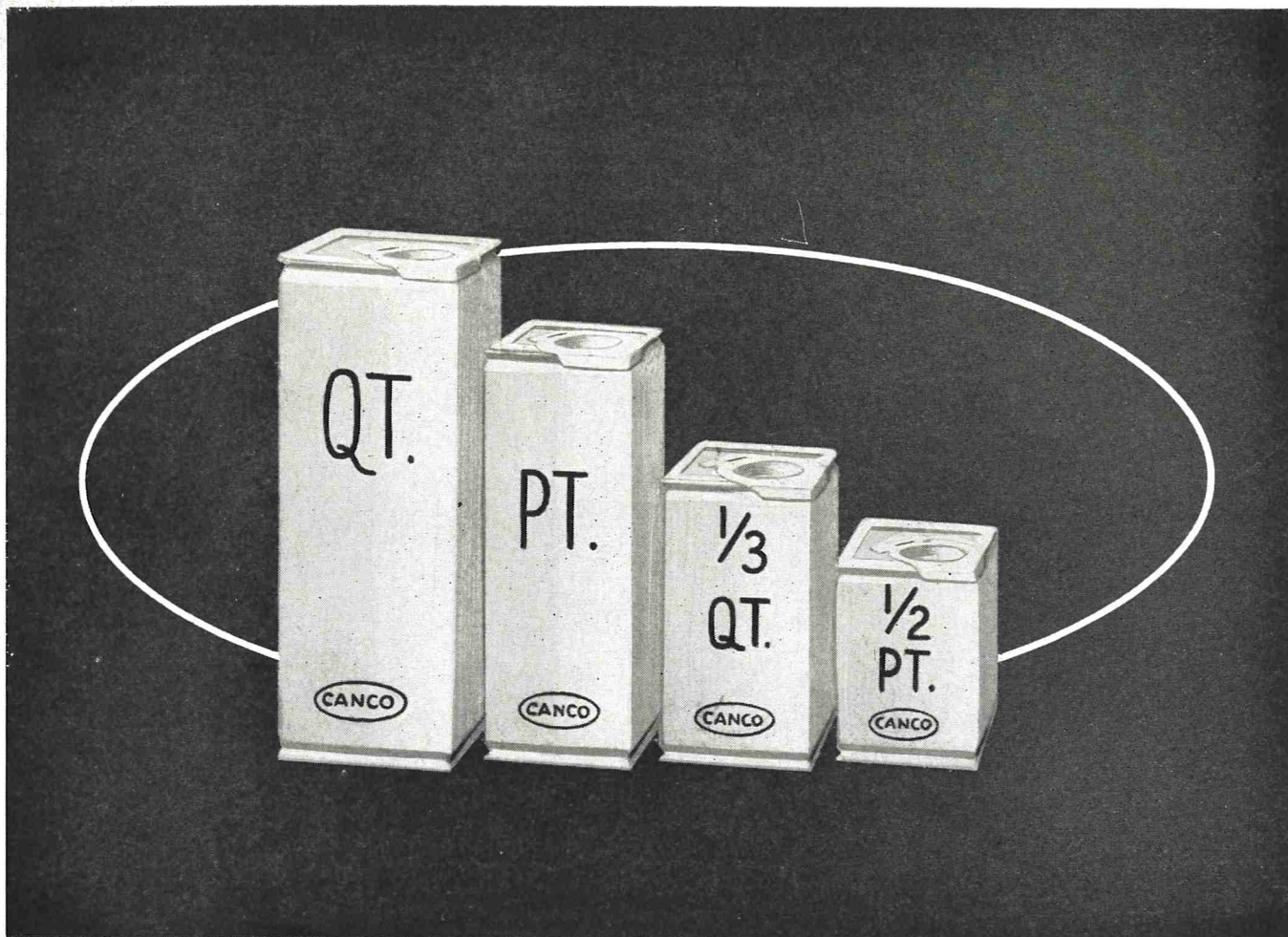
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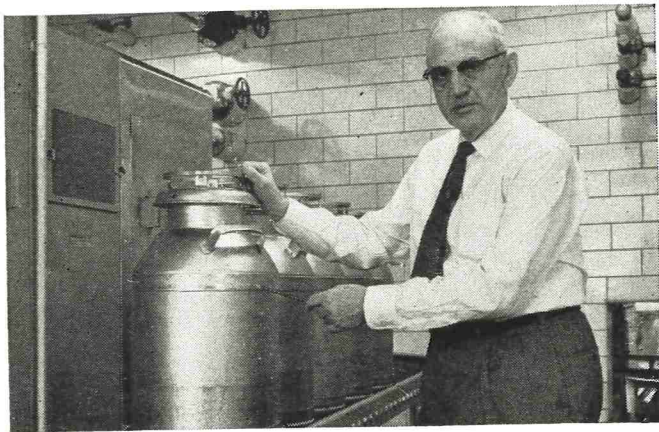
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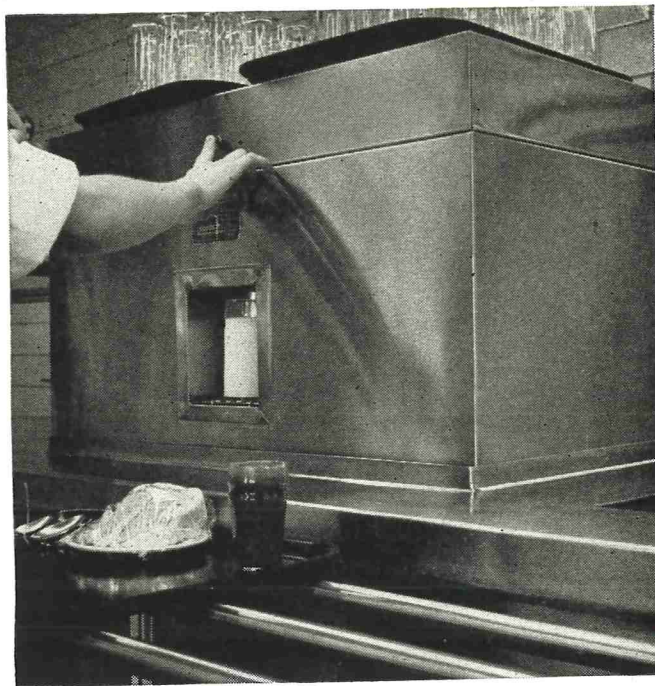
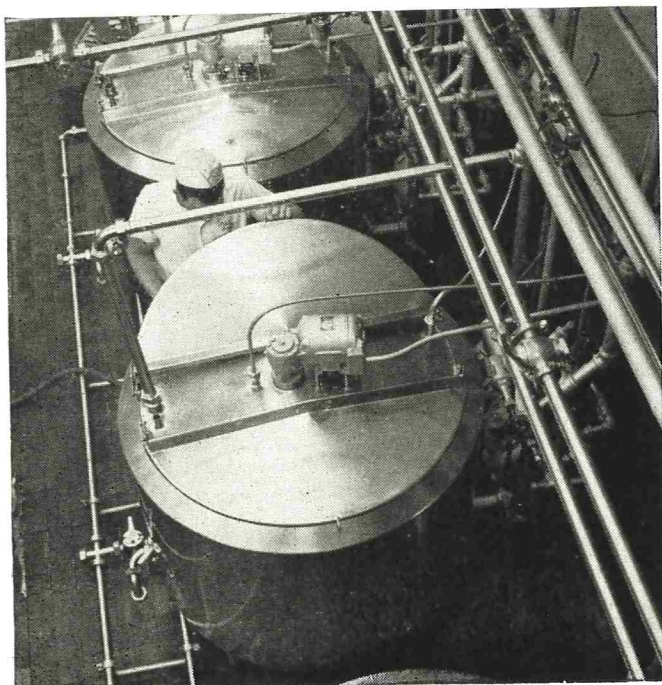


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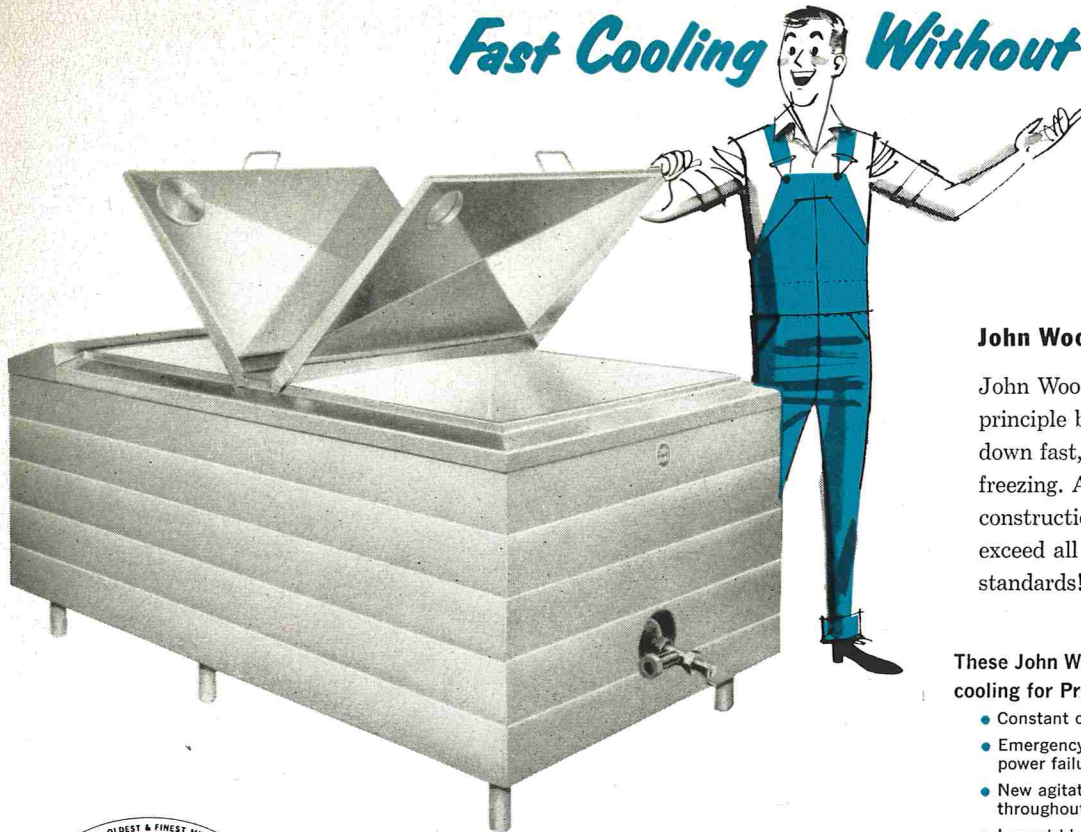


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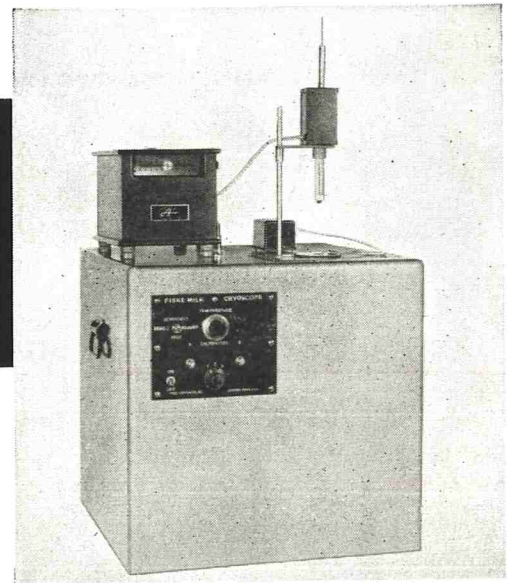
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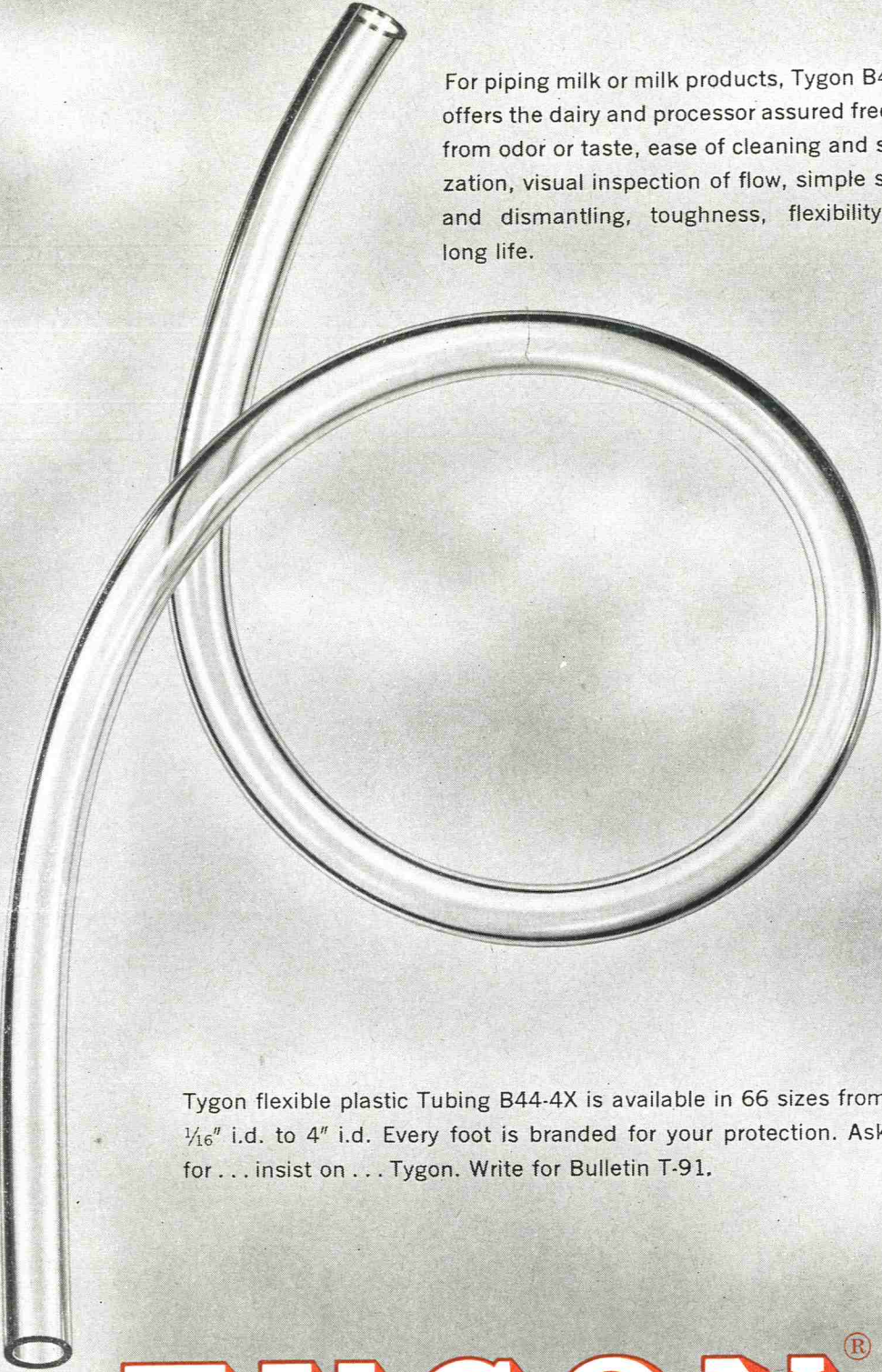
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# EDITORIAL

## ENVIRONMENTAL HEALTH AND ITS COMPLEXITIES

In March 1960, Representative John E. Fogarty of Rhode Island, opened a congressional hearing on environmental health problems with this statement, *The Committee over the past several years has become increasingly concerned about the environmental health situation and what is being done about it. We have questioned witnesses exhaustively, but we feel that the picture is so involved and its complexities are mounting so swiftly that we do not have a clear understanding of the whole situation.*

Environmental health workers should be both encouraged and heartened by Representative Fogarty's words. Many will recall that a few years back some authorities were recommending a de-emphasis in certain phases of environmental sanitation. Both morbidity and mortality from disease frequently attributed to faulty sanitation have shown a noteworthy reduction within the past few decades. And it cannot be denied that nationally, water borne, milk borne and insect borne diseases have been dramatically reduced. However, it is necessary to remember that these favorable changes did not take place over night. They represent the labors of a half century and demonstrate our advances in knowledge, understanding and technology.

Now we are faced with other problems that tax ingenuity and skill. It is hardly necessary to remind the reader of some of these socio-economic changes that are going on about us. An editorial in the May 1960 issue of the American Journal of Public Health is especially pertinent when complexities of this nature are discussed. Said the writer, *Large scale migration of population, shifting land use, disorganization of residual neighborhoods, fundamental changes in transportation technology and travel habits — these are only a few of the elements and aspects of the interrelated process of spreading urbanization, the metropolitan explosion.*

Conscious as we may be of these changes, are we, in the public health and sanitation field geared to meet them? How do we fit into the picture? Some one has said that one basic trouble with American society is that we devote too much of our resources to increasing an already affluent level of private consumption and *too little to public service of all kinds.*

If this is true, and it would appear there is more than an element of truth in it, then the sanitarian has a real challenge. It is he who can and must explain and interpret to the community the need for health

protection which these complexities have brought about. He must show the need for expanded facilities in public water, municipal sewerage, sanitary refuse disposal, air pollution control, food hygiene and similar services which are not presently provided to all the people.

Mr. Fogarty justifiably said he was increasingly concerned about the environmental health situation. Surely he was right. And a number of experts who testified at this hearing brought into sharp focus many of the urgent and current problems with which we are faced. One prominent public health officer summed up his testimony with these words: *Our environment is changing every day in a myriad of ways. Air, water, soil, and all the man made hazards interact to challenge our survival. We need first to prevent health hazards from occurring and also, we need to minimize those which have already occurred. There are many hazards in our environment that we do not yet know how to control. Because of this, we must give research equal priority with service during the difficult years ahead. The problem is so tremendous that all official and nonofficial agencies and private groups will be asked to contribute their personnel and substance. Today, as never before, the medical and allied professions must work hand in hand with the sanitary engineer and the sanitarian, the chemist and the physicist, the geologist and the ecologist. By deepening mutual insights we can build a rock-solid foundation for effective planning and execution to meet the difficult health problems of our times.*

Those of us close to the problem need to champion the cause at the local level. We need to stand up and be counted when some citizens feel that public utilities like water, sewers and other health protecting facilities, are something they can't afford. While the tax dollar seems stretched nearly to the breaking point, there are some health protective measures no community can afford to neglect.

Environmental health has always had complexities. Now they seem to be getting more numerous. Sometimes we wonder whether sanitarians are making enough noise to stir people to a better recognition of their community responsibilities. The job isn't easy but the rewards are great. Champion the cause! Environment sanitation is a product worthy of the salesman.

Harold S. Adams



# SEWAGE LAGOONS IN THE ROCKY MOUNTAINS<sup>1</sup>

DAVID P. GREEN

*Wyoming Department of Public Health, Cheyenne*

The sewage lagoon or oxidation pond has become a very popular method of waste treatment. Since 1954 47 municipalities have constructed or are in the process of constructing this type of waste treatment system, while only four conventional type plants have been built during the same period.

## ADVANTAGES AND DISADVANTAGES

The oxidation pond is certainly not a cure-all for the problems of sewage treatment. Used intelligently, it may be a very satisfactory and economical method of sewage treatment. Unfortunately, there is a growing tendency to overlook the necessary evaluation of any specific case and to recommend a pond immediately. The ponds do have a number of advantages where correctly used. Included in these are:

1. Low capital investment.
2. Low maintenance cost.
3. Low operational cost.
4. Simplicity of design.
5. Inherent ability to withstand shock loading.
6. Extremely high degree of treatment during warm months, and a reasonable degree of treatment even during the cold months.

There are always disadvantages to go with advantages. The more important of these are:

1. Land cost must be low.
2. Location of a satisfactory site may be difficult, particularly when the direction of growth of a municipality is considered.
3. Esthetic problems brought about from both detractors and over-enthusiastic supporters of this method of treatment.

These factors must all be carefully evaluated prior to deciding upon the lagoon method.

## TYPES OF LAGOONS

Insofar as the lagoon itself is concerned, several basic decisions must be made. It should be noted that these decisions may have already been made by the standards set up in any given State, or by topographical features.

The lagoon may be either the flow-through or the complete retention type. Both are in use in Wyom-

ing, although the complete retention systems are used only where no defined drainage exists. The complete retention systems are difficult to design since an exact balance must exist between precipitation and sewage flow on one hand and percolation and evaporation on the other. Although a number of engineers have tried to design these ponds, only a very few have achieved the nice balance necessary due to variations in precipitation and percolation. The current method is to design a complete retention pond as well as possible and enlarge it as experience dictates.

Since most sewage lagoons are of the flow-through type the remainder of this discussion will deal only with that type.

The flow-through lagoon itself may be of one of these types: (a) the "Raw Sewage Lagoon" which receives waste with no pretreatment; (b) the "Secondary Lagoon" which receives sewage which has been previously treated by sedimentation; and (c) the "Tertiary Lagoon" which is used to stabilize the oxygen demand due to nitrification of sewage after conventional secondary treatment and to further reduce the bacterial population.

The "Raw Sewage Lagoons" are the preponderant type in municipal systems in Wyoming. This has been due to the low cost of land and its ready availability over almost all of the State. In those few cases where conventional secondary plants have been built by municipalities, the land costs or location prohibited the use of ponds as a method of complete treatment.

The "Secondary Lagoon" is in use in several very small Wyoming municipalities following a septic or an Imhoff tank, and is often used in trailer courts following a septic tank.

The "Tertiary Lagoons" are very few in number and their use has more or less come about by accident rather than design. In the original state these ponds were emergency works with only a few days retention designed to protect streams from the effect of raw sewage discharges in the event of conventional plant failure. Their existence, then, has led to their use as a "Polishing Pond" which stabilizes nitrogenous demands and gives a further bacterial reduction in the final effluent.

## DESIGN FACTORS

The design of oxidation ponds has grown from a mass of observed data. We have felt for some time, that a rationale is called for to enable those in the

<sup>1</sup>Presented at a recent joint meeting of the Rocky Mt. Assoc. of Milk and Food Sanitarians, the Sanitation Section of the Western Branch of the American Public Health Assoc., and the Colorado Association of Sanitarians, May 24-26, Denver, Colorado.



field to design ponds for specific installations requiring a given degree of treatment. At present, in our opinion, the great majority of the ponds may easily have been overdesigned due to the lack of such a rationale. At present we are attempting to develop a method of design for these units.

Basically, there is nothing really new about the mechanics of an oxidation pond. In general, we believe that the ponds, within the limit of minimum amount of light, can be designed following the principles shown by Phelps and others. By over-simplifying the reasoning, somewhat, we might for purposes of discussion make the following assumptions: (a) all BOD is soluble; (b) all nitrogen is consumed by algae; (c) an excess of oxygen is present at all times; and (d) the minimum light or solar energy required is available. The mechanics, then, can easily be expressed by the integration of the equation  $\frac{dL}{dt} = e^{-kt}$  which is nothing more than a standard BOD remaining equation. The solution of this equation for various periods of retention will give values having reasonable agreement with data observed in comparable cases.

This simplification leads to a number of interesting conclusions:

1. It should be possible to design a pond for a specific degree of treatment.
2. A retention period exists beyond which further retention has no obvious effect.
3. An optimum retention period exists for any case if this is to be considered a method of secondary treatment.
4. Standards should not be the same in all places, but should deflect the variation of the rate constant with temperature and various other factors.

Since the bacterial die-off curve is also proximated by the same type of mathematical expression, the same type of reasoning can be followed in that investigation.

#### OPERATIONAL FACTORS

The actual case is not quite as simple as that which has been discussed. Problems are encountered in benthic decomposition since normal sewage does contain settleable solids which exert BOD. Anaerobic decomposition may occur, and heterogeneous reactions seem to occur under certain conditions of ice cover; all of which destroys many of the simplifying assumptions.

It should be pointed out that Wyoming feels that this rationale is sufficiently promising to allow two to three times the population load per acre of lagoon surface area if sedimentation is used ahead of the lagoon. To date, lagoon operation has borne this assumption out, and in one particular case, the un-

suspected presence of an unusual waste in a raw sewage lagoon has shown the effect of undesired sedimentation accompanied by the following benthic decomposition.

The existing standards used in Wyoming allow a BOD loading of 35 pounds per acre. It is generally believed that this load may be increased to around 50 pounds per acre in the more southerly states. This would be in accordance with the theory previously mentioned.

Insofar as shape is concerned, it is felt that a rectangular shape with no shore line irregularities is best. Inlet should be located near the center to assure complete dispersion of solids. It should be pointed out that some recognition might well be given to altered inlet location in small ponds (less than 10 acres) in areas with high wind velocity from a given prevailing direction.

The outlet from a pond should only remove water from well below the surface to prevent the skimming off of algae. It has been noted that ponds with surface outlets tend to give much greater difficulty than those with subsurface discharges.

The location of the outlet should be at the point most distant from the inlet. Although no evidence of short circuiting has been found in larger ponds exposed to the sweep of the wind, it is felt that this may occur in smaller ponds with strong prevailing wind. It would therefore seem that the strength and direction of winds may well require some adjustment of the outlet location in smaller ponds.

The pond should be constructed to operate at a minimum depth of 2½ to 3 feet to keep down the growth of rooted aquatic weeds which would encourage both the formation of sludge mats and mosquito propagation. The maximum depth of a pond should be approximately 5 feet. This will allow at least 2 feet of storage even under heavy ice conditions in cold areas or would allow a more favorable temperature condition in the pond in extremely warm areas.

Another item that should be mentioned is that of pond sealing. Although the type of soil is often adaptable to the use of lagoons, some soils require treatment to prevent excessive percolation which would lead to the exposure of solids.

Three methods have been used in Wyoming: (a) the application of a 4-inch clay blanket; (b) the application of an MC-Oil at approximately 0.5 gallon per square yard; and (c) the use of bentonite mixed into the upper few inches of the pond bottom. Each has proved satisfactory and choice is a question of economics.

It should be pointed out that the seal is only necessary for the first months of operation. After that



period the dispersed solids and algae will effectively plug soil interstices.

Since practically all the States have criteria for this type of treatment, there is little need for more specific discussion of standards than that which has just been made. It would seem to be more valuable to point out a few favorable and unfavorable results that have come to the writer's attention.

In general it has been shown that oxidation ponds in Wyoming give a degree of treatment comparable to that achieved by any conventional method of secondary treatment. It has been our experience that BOD removal may vary from a low of 75% during winter months to an average of 95% during summer months. Bacteriological reduction is usually somewhat better than 90% with warm weather values approaching zero MPN values.

We have had our share of difficulties in addition to our successes. Fortunately these difficulties are few and practically all can be listed as follows:

1. A pond wall failed structurally and allowed approximately one acre foot of stabilized water to flow down on a small residential area. The failure was investigated and found to be due to poor construction practices around the outlet structure.
2. The biota in a pond was completely wiped out and septic conditions prevailed. The pond did not restore itself to operating conditions as expected. Investigation found that an oil line under the pond had ruptured and was leaking toxic hydrocarbons into the pond. The pond rapidly became operational after this was corrected.
3. The pond became septic, large accumulation of floating solids were observed and the water was a

deep red. Investigation showed that a slaughter house with no pretreatment had been tied into the sewerage by the town. One interesting factor was that anaerobic conditions prevailed only from approximately 8 p.m. to 8 a.m. under a loading of approximately 100 pounds of BOD per acre.

4. One of two parallel cells in an oxidation pond became anaerobic and was characterized by deep red color while the other cell was aerobic and showed the usual green color. The water in the affected cell was found to have a high sulphur content, probably due to sulphur spring infiltration.
5. A large installation was found to have 2 aerobic and 2 anaerobic cells. Investigation showed that the loading had been equalized on the basis of an equal load to each pond, rather than equal loading per acre of pond surface. This has now been corrected and flow measuring devices are now required at all multiple cell ponds.

It is hoped that this discussion may serve as a simple introduction to sewage lagoons or oxidation ponds. In summary the following points are reiterated:

1. The sewage lagoon is not a magic tool to solve all sewage treatment problems.
2. Well designed ponds in correctly chosen situations will give sewage treatment efficiencies comparable to those of any other method of treatment and often at a fraction of the cost.
3. Operational difficulties have occurred due to misunderstood or ignored factors. A really good design of an oxidation pond takes quite a bit of thought, although the results are certainly worth while.



## EFFECTIVE MUNICIPAL RODENT CONTROL

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In order to carry out properly an effective rodent control program, the personnel utilized must have some good basic knowledge drawn from the fields of chemistry, architecture, engineering, pharmacology, veterinary medicine, and allied fields. Vector control generally, and rat control specifically, gives the sanitarian an excellent opportunity to exhibit his general skill in his chosen field of sanitary science (1).

Rats have been associated with man throughout recorded history. They have followed him into most of the habitable parts of the globe, and have become vectors of many of the communicable diseases of ancient and modern times. The rat has been charged with spreading typhus fever, bubonic plague, trichinosis and many other diseases. In addition to being spreaders of disease, rats are notoriously destructive because of their gnawing habits and it is an accepted fact that some of our worst fires have been attributed to rodents, such as rats and mice. Rats cost the United States \$500,000,000 each year. A rat costs and destroys \$200 worth of food annually (1).

Mice may also be considered an economic liability and are responsible for transmitting several forms of food poisoning, also typhus, plague, rickettsial pox and other communicable diseases. Mice quite obviously are incriminated as contaminators of food.

### ORGANIZATION OF THE PROGRAM

Generally speaking, every practical method should be utilized in a permanent control program. These methods should include such items as:

1. Good general sanitation in the area.
2. Adequate rat proofing and eradication in existing buildings.
3. Adequate rat proofing and eradication in new buildings.
4. Rat poisoning.
5. Control of rat ecto-parasites.

A preliminary survey should be made *before* rodent control measures are actually attempted. The area should be surveyed in order to understand the nature of the problem. The survey should attempt to find out such facts as:

1. The prevalence and location of rodents.
2. The species of the rodents and their fleas.
3. The presence and availability of their food supply.
4. The location of, and types of, harborage.

5. If the town is a seaport, the potential hazards of migration from boats to shore.
6. Estimate of costs of materials for each building and cost of the entire program.
7. Methods of financing the program by:
  - a. Local government or other agency that provides a revolving fund for labor and material.
  - b. Municipalities that furnish labor and merchants that furnish material.
  - c. Merchants who furnish labor and material (1).

### HABITS AND CHARACTERISTICS OF RATS AND MICE

There are three species of rats common to the North American continent. They are the brown rat or the Norway rat—*Rattus norvegicus*; the roof rat or Alexandrine rat—*Rattus rattus alexandrinus*; and the black rat or the ship rat—*Rattus rattus rattus* (2). Rats are nocturnal animals. Their principle harboring places are buildings, ships, dumps; wherever there may be a food supply. Contrary to popular opinion, rats are highly selective in their choice of food. They prefer fresh, wholesome, non-decomposed food. The rat is omnivorous but may have a capricious appetite, which poses some problems for the vector control specialist. Rats will, of course, scavenge when necessary.

An important trait of the rat is that of migration. Rats will migrate according to the variation in abundance and accessibility of food and the availability of shelter. Such migrations may be seasonal, for example, from the buildings to the fields in spring and back to the buildings in the fall. Buildings are often vacated permanently when the food source nearby is removed.

There are four subspecies of wild house mice which belong to the species *Mus musculus Linnaeus*. Three of these have been closely associated with man. The subspecies *Mus musculus wagneri* has evolved two commensal forms—*Mus musculus domesticus* and *Mus musculus brevirostris*—which were imported from Europe to the United States; the former being found in the Northern States and the latter, a smaller type, being found in the Southern States. There are, in addition, about 250 different forms of native mice in the United States; among them are the very prevalent white-footed and meadow mice. House mice vary widely in color, but generally are tawny to dark grey



on the back, with the color changing to an ashen grey on the abdomen. Their eyes are smaller than the native white-footed type; the feet are shorter, broader and darker; and the tail is shorter. House mice all have very much the same habits.

Mice are able to flourish in extremely hot or cold temperatures, and can exist in a variety of habitats ranging from tunnels beneath foundations to boxes of stored goods left in attics. They have keen senses and are excellent swimmers and climbers. They are omnivorous, but prefer seeds, grains and cereal products.

#### ENVIRONMENTAL SANITATION AS A FACTOR

Good general sanitation, insofar as rat control is concerned, entails a continuous program of rubbish and debris clean up, in proper sequence and relationship to the exterminating phase of the program. Adequate garbage and refuse collection, storage and disposal is also mandatory. There are a number of satisfactory disposal systems. The one that seems to be most popular throughout the United States is the Sanitary Landfill. This system combines good sanitary practices with good reclamation practices.

The Sanitary Landfill becomes a most effective part of the insect and rodent control programs of the modern community (3). It gives the city a profound psychological advantage to be able to show that it has taken the lead in removing a focal point of vector infestation; and in addition, plans to turn what very likely may be an insanitary, odorous, fly and rat breeding haven, into a clean and eventually useful piece of land.

#### RAT-PROOFING

The passage of an adequate ordinance requiring the rat-proofing of existing business buildings, of all future buildings, and of all residential buildings is mandatory. Upon inspection, information relative to the art of building out rodents must be given to the owner. This "building out" process is done by eliminating all of the enclosed spaces, such as openings in hollow walls, between floors and under foundations. These are all areas where rodents may live and breed. Property owners and householders should be told to eliminate or block all entrances into buildings via drain pipes, missing bricks in walls, and unflushed doors and windows. They also must be advised that all inadequately protected foundations must be eliminated or blocked. Foundations should be eighteen inches to twenty-four inches deep and have diverting aprons of twenty-nine gauge, galvanized, corrugated iron or sheet metal installed. Windows and grills may be satisfactorily protected by eighteen gauge, one-half inch mesh, galvanized, ex-

panded metal; or sixteen gauge, half inch, galvanized, wire cloth. Cement floors should be at least three inches thick and properly tied in with the foundation. In this connection, it should always be remembered that an adult rat can get through any opening that a man can put his thumb through.

The sanitarian or vector control specialist should not forget that the food supply of the rodents must also be eliminated once the area has been freed of the rats. The availability of food and shelter are of great importance to the rat. A municipality may help the householder starve rats out of an area by passing and enforcing an ordinance requiring that garbage be stored in tightly covered metal containers, which should be kept at least eighteen inches off of the ground. The premises must also be kept free from rubbish, and feeding stations for birds must be eliminated if the householder wishes to keep rats from his property.

#### EXTERMINATION

Although good environmental sanitation, which includes rat-proofing and the elimination of harborage and food, is still considered a major plank in the platform of a satisfactory rat control program, these tenets must be redefined in relation to the sequence in which they must be used in any specific area. They should not be recommended as steps which must precede the phase of extermination. The first step in the program for a specific area of infestation is that of the destruction of rats, with the steps of cleaning up, building out, and starving out following as preventive measures, to protect against reinfestation.

The anticoagulant rodenticides such as Warfarin ( $C^{19}H^{16}O^4$ ) and Pival ( $C^{14}H^{14}O^3$ ) have proven so effective that the strategy of extermination first and sanitation second has proven feasible. It must be admitted that the idea of considering sanitation as a secondary step, sequentially speaking, is difficult for a professional public health worker to accept. This logic runs counter to all of the training that the writer has received, and contrary to basic concepts instilled previously in my professional training (4).

It has been shown that the susceptibility of various species of rodents differs. Consequently, it is desirable that the lowest bait concentration, consistent with the most effective control, be used in the interest of economy and safety. Anticoagulants are highly effective rodenticides, and available to the private exterminator and to the government official. These may be offered to the rodent in several highly acceptable forms. The anticoagulant baits may be used for initial rodent control under essentially any conditions. A minimum baiting period of two weeks is



recommended (5).

Field tests indicate that the roof rat requires the use of a concentration of 250 ppm of anticoagulant in the finished bait which contains 0.025% anticoagulant. Satisfactory control of the Norway rat may be had with a concentration of an anticoagulant at 50 ppm. Mice react in the same general way as do Norway rats, although more individual variation is indicated. Where the species of rat involved is not definitely known, or where roof rats are concerned, a concentration of 250 ppm should be used (5).

Commercial concentrates generally contain 0.5% anticoagulant in corn starch. One pound of concentrate (0.5%) must be diluted with 19 pounds of bait to obtain a concentration of 250 ppm. Corn meal and some other ground grains have proven to be acceptable material when repeated use over a period of several days is desirable. Where there are a variety of foods other than bait available to the rodents, the anticoagulants should be offered in water to which 5% sugar has been added.

Mice can be controlled with anticoagulants by using the same exposure techniques that are employed for rat control. Because they are smaller, and eat more often, it is most effective to have a large number of bait stations in their feeding areas. A tablespoonful of bait should be sufficient (5).

#### SUMMARY AND CONCLUSION

In conclusion, it should be stressed that a municipal rodent control program must:

1. Have adequately trained personnel.
2. Make a preliminary survey to determine the scope of the problem.
3. Properly organize the program to effectively make use of personnel available and data obtained.
4. Operate under adequate municipal ordinances controlling food sources and harborage, by stipulating proper collection and disposal systems, and by setting forth adequate rat-proofing standards.
5. Choose an effective bait, and carry out the extermination of the rodents in the proper sequence.

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## A SURVEY OF COTTAGE CHEESE QUALITY<sup>1</sup>

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Cottage cheese curd and cream cottage cheese production in the United States in 1958 amounted to 549,523,000 and 703,523,000 pounds, respectively (1). Production has more than doubled during the past ten years. State and Federal standards for plain cottage cheese and creamed cottage cheese establish a maximum moisture content of 80 percent and require a minimum fat content of 4 percent in cream cottage cheese (2).

One of the most difficult problems in marketing cottage cheese is maintaining its freshness and desirable qualities. The results of surveys made in Connecticut (3), Iowa (4), Illinois (5), and Michigan (6) indicate that greater care and stricter sanitary precautions are needed in the production and handling of cottage cheese. Many samples of cottage cheese were contaminated with coliform bacteria. It was not uncommon to find slime and mold on the surface of the cheese. Bitter, fruity, yeasty, and other off-flavors were observed in many samples. From a public health standpoint, it is important that cottage cheese be produced and handled so the finished product will be free from harmful microorganisms. There is ample opportunity to contaminate the product from the makers' hands, impure wash water, or added cream. Cottage cheese is very perishable. Losses due to spoilage may result and more severe consequences may occur should any pathogenic bacteria be present.

The survey reported here was to secure information on composition, sanitary quality, and safety of cottage cheese sold in Kansas. Microbiological, chemical, and organoleptic analyses were made on 142 samples of cheese collected from 15 retail stores. Products from 27 manufacturers were examined.

### MICROBIOLOGICAL EXAMINATION

Samples were mixed in the original container with a sterile metal spoon and 11 grams were weighed, aseptically, into a sterile, tared Waring blender; 99 grams of sterile 2% sodium citrate solution were added and agitated for 4- to 15-second intervals with 5-

second interspaced stops to allow curd particles to contact the knife for more effective cutting. This procedure satisfactorily disintegrated the curd. This blended mixture was transferred to a sterile container and plating and tubing procedures were immediately carried out.

### Coliform Counts

Violet Red bile agar (Difco) was incubated at 37°C. for 24 hours. Colonies typical of the group were counted with a Quebec counter. A secondary surface layer of the medium facilitated the development of typical colonies.

### Yeast and Molds

Potato dextrose agar (acidified) (Difco) was used. Incubation was at 25°C. for five days.

### Psychrophiles

Psychrophilic counts were made in tryptone glucose extract agar (Difco). Incubation was at 45°F. (8°C.) for five days. Counts were made using a Quebec colony counter. These plates were also examined for evidence of *Pseudomonas* spp. by observing for (a) the development of a water soluble blue-green pigment and (b) odors (tri-methyl amine, May apple, or pineapple) associated with certain *Pseudomonas* spp.

### Staphylococci

Staphylococcus medium 110 (Difco) was used to search for members of the staphylococcus group which could be potential food poisoning types. Solidified medium was surface inoculated with 0.1, and 0.01 gram of cheese. Incubation was at 37°C. for 48 hours.

### Litmus Milk

Additional evidence of *Pseudomonas* spp. was obtained by inoculation of suitable dilutions into litmus milk. Incubation was carried out seven days at 8°C. Typical fruity (May apple) (pineapple) odor of *Pseudomonas fragi* was taken as additional evidence of *Pseudomonas* spp. Two samples, in litmus milk, gave rise to a "potato-cellar" odor commonly associated with *Pseudomonas graveolens*.

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<sup>2</sup>Present address Fairmont Foods, Omaha, Nebraska.



## CHEMICAL ANALYSES

A 50-gram sample of cheese was taken from the original and mixed on a Waring blender or by using a mortar and pestle. The following determinations were made:

*Fat Content*

The percentage of butterfat was determined by a modified Babcock test described by Tuckey (5). A 9-gram sample of mixed cheese was weighed into a 50-ml. beaker. Two ml. of concentrated ammonium hydroxide was added and thoroughly stirred using a glass rod. Three ml. of n-butyl alcohol was added and thoroughly stirred using a glass rod. Next, 9 ml. of dilute sulphuric acid (3.5 parts acid + 1 part water) was added and mixed thoroughly. The contents of the beaker were poured into an 18-gm. milk test bottle, and the beaker rinsed with 9 ml. of concentrated sulphuric acid (sp. gr. 1.82 - 1.83, acid rinsings added to the test bottle). After centrifuging for 5, 2, and 1 minutes the test was read using glymol and the reading multiplied by two.

*Total solids*

The total solids content was determined by the Mojonnier Method (7).

*Acidity and pH*

Titrate acidity was determined by titrating a 9-gram sample of cheese diluted with 9 ml. distilled water, plus three drops of phenolphthalein indicator to a permanent pink endpoint with 0.1N sodium hydroxide. Duplicate determinations were made. The pH was determined with a Beckman glass electrode pH meter Model H2. Readings were taken in duplicate after immersing the electrodes directly into the sample of triturated cheese.

*Phosphatase*

The New York City field test was used to determine the presence of phosphatase. After allowing the triturated cheese samples to stand over night, 0.5 ml. of supernatant whey was withdrawn with a sterile pipette. Phosphatase determinations were made on the whey from each sample according to standard methods (8). Values equal to or greater than two units were recorded as positive phosphatase tests.

TYPE OF CHEESE, STYLE OF PACKAGE, WEIGHT, SCORE,

## APPEARANCE, AND DEFECTS

The net weight of the cheese was determined by taking the difference between the weight of the full and empty package. After samples were taken the cheese were scored by two or more judges for flavor,

body, texture, color, appearance, and package. The samples were stored and examined after three and seven days for the presence of mold and off-flavors.

## RESULTS

*Microbiological*

Coliform, yeast, and mold counts obtained on 142 samples of cottage cheese were classified into six groups. The number and percentage of samples classified in each group are presented in Table 1.

*Coliform content*

The examination of 142 samples of cottage cheese revealed that 71.2% of the samples were contaminated with 10 or more coliform organisms per gram.

Samples of cheese examined during the summer (100) and spring (42) showed the presence of 10 or more coliforms in 80% and 50% of the samples, respectively.

The number of samples, yielding 100 or more coliform organisms was 89 or 62.4% of all samples examined. More than 100,000 coliform organisms per gram were found in 11 or 7.7% of the 142 samples examined. This is in contrast to 8 (8%) and 3 (7.1%) for the summer and spring samples, respectively (Table 1).

TABLE 1—NUMBER AND PERCENTAGE DISTRIBUTION OF COLIFORM, YEAST, AND MOLD COUNTS ON 142 SAMPLES OF COTTAGE CHEESE

	Summer 100 samples		Spring 42 samples		All 142 samples	
	No.	%	No.	%	No.	%
<i>Coliform</i>						
2-9	20	20	21	50	41	28.8
10-99	6	6	6	14.2	12	8.4
100-999	27	27	5	11.9	32	22.5
1,000-9,999	22	22	5	11.9	27	18.9
10,000-99,999	17	17	2	4.7	19	13.3
over-100,000	8	8	3	7.1	11	7.7
<i>Yeast</i>						
2-9	26	26	17	40.4	43	30.1
10-99	16	16	4	9.5	20	14
100-999	30	30	4	9.5	34	23.8
1,000-9,999	8	8	10	23.8	18	12.6
10,000-99,999	12	12	4	9.5	16	11.6
over-100,000	8	8	3	7.1	11	7.7
<i>Mold</i>						
2-9	81	81	38	90.4	119	83.3
10-99	8	8	1	2.3	9	6.3
100-999	4	4	2	4.7	6	4.2
1,000-9,999	5	5	0	0	5	3.5
10,000-99,999	1	1	1	2.3	2	1.4
over-100,000	1	1	0	0	1	.7



*Yeast counts*

Examination of the 142 samples in this survey revealed that 43 (30.0%) were free of yeast in 1.0 gram amounts. The 99 samples found to contain yeast varied widely in the numbers of yeast present. Fourteen percent (20 samples) contained from 10 to 99 yeast cells per gram, 34 samples gave counts within the 100 to 999 per gram range. Thirty-four samples yielded from 1,000 to 99,000 yeasts per gram and eleven samples contained more than 100,000 per gram. The yeast types present were quite variable as evidenced by differences in pigmentation and colony type (Table 1).

*Mold prevalence*

Molds of different types were present in varying numbers. One hundred and nineteen samples (83.3%) were found to contain fewer than 100 molds per gram. The remaining twenty-three samples (16.7%) yielded molds varying in number from 100 per gram to more than 10 million per gram (Table 1).

The mold content of the spring and summer samples of cheese did not vary significantly (Table 1).

*Pseudomonas*

The presence of species of *Pseudomonas* was noted as previously described. Strong presumptive evidence was found to indicate the presence of one or more species of this genus in 63 (44%) of all the samples examined. The influence of the season of the year on the presence of pseudomonas types is evidenced by the fact that 24% and 53% of the spring and summer samples, respectively, gave strong presumptive evidence of the group (Table 2).

TABLE 2—NUMBER AND PERCENT OF *Pseudomonas*, PSYCHROPHILES, AND STAPHYLOCOCCI FOUND IN 142 SAMPLES OF COTTAGE CHEESE

	Summer 100 samples		Spring 42 samples		All 142 samples	
	No.	%	No.	%	No.	%
<i>Pseudomonas</i>						
Evidence	53	53	10	24	63	44
No evidence	47	47	32	76	79	56
<i>Psychrophiles</i>						
Fewer than 1,000					7	4.9
1 M <sup>a</sup> - 9.9 M					19	13.4
10 M - 99.9 M					11	7.7
100 M - 99.9 M					14	9.9
1,000 M - 9,999.9 M					16	11.3
10,000 M - 99,999.9 M					4	2.8
More than 100,000 M					71	50.0
<i>Staphylococci</i>						
<sup>a</sup> M = thousand	none		none			

*Psychrophiles*

At least 100 psychrophilic organisms per gram were found in 135 of the samples examined. The high percentage of samples (95%) that contained this type of organism in various numbers seems rather important from the standpoint of keeping quality. Seventy-one samples (50%) yielded plate counts of over 100 million organisms that would grow at low temperature (Table 2).

*Staphylococci*

Completely negative results were obtained relative to the presence of staphylococci (Table 2). Only two samples of cheese yielded micrococci which were atypical types.

## RESULTS OF CHEMICAL ANALYSIS AND OTHER ORGANOLEPTIC TESTS

*Types of Cheese*

The labels on 111 packages identified the type of curd by use of the following terms: Creamed Cottage Cheese (34), Old Fashioned (23), Country Style (10), Creamed Old Fashioned (9), Large Curd (6), Farm Style (5), Small Curd (4), Dutch Style (5), Sweet Curd (6), Rich Curd (2), Velva Whip (1), Grade A Creamed (1), Creamed Country Style (1), Old Fashioned Large Curd (1) and Pasteurized Creamed Cottage Cheese (3). The samples were about evenly divided between large and small curd types with 51 of 99 samples labeled large curd and 48 small curd (Table 3).

*Weight of Samples*

The number of samples of cheese weighing 12 ounces (340 gm) or more was 61; the number weighing fewer than 12 ounces (340 gm), 81. Of the 81 samples 34 were from 0 to 0.49 ounce underweight and 46 were 0.5 ounce or more underweight. Of the 61 samples, 32 were from 0 to 0.49 ounce overweight and 29 were 0.5 ounce or more overweight (Table 3).

*Moisture*

The moisture content of the cheese varied from a low of 71.1% to a high of 83.6% with an average of 78.7%. Forty-seven samples (33%) had a moisture content greater than the maximum 80% allowed for legal cottage cheese (Table 3).

*Fat*

The fat content of the cheese varied from a low of 2.0% to a high of 9.0%, with an average of 3.8%. Sixty-three of the 142 samples were labeled creamed cottage cheese. Thirty-five (55.6%) of the samples labeled creamed cottage cheese contained less than 4% fat, the minimum allowed for legal creamed



TABLE 3—CHEMICAL ANALYSIS OF 142 SAMPLES OF COTTAGE CHEESE

Determination	Range	No. of samples	Percent
Moisture %	71.1-80.0	53	67.0
	80.1-83.6	47	33.0
Fat %	2.0-4.0	77	54.2
	4.1-9.0	65	45.8
Acidity %	.80-1.88	61	43.0
	.36-.75	81	57.0
pH (130 samples)	4.0-4.49	9	6.93
	4.5-4.99	82	63.07
	5.0-5.49	39	30.0
Phosphatase (130 samples)	negative	9.8	75.39
	positive (2 units)	32	24.61
Type of curd (99 samples)	Large	51	51.5
	Small	48	48.5
Weight	(gms.)		
	less than 327	46	32.4
	328-339	35	24.6
	340-355	32	22.5
	356 and over	29	20.5

cottage cheese. Of the 142 samples, 77 (54.2%) contained less than 4% fat and 65 samples (45.8%) contained more than 4% fat (Table 3).

#### Acidity

The titratable acidity of the samples varied from a low of 0.36% to a high of 1.88% with an average of 0.78%. Eighty-one samples (57%) had a titratable acidity of less than 0.8% and 61 samples (43%) had a titratable acidity in excess of 0.8% (Table 3).

#### pH

The pH values of the 130 samples tested varied from 4.0 to 5.49. Nine samples (6.93%) were in the

4 to 4.49 range; 82 samples (63.07%) were in the 4.5 to 4.99 range and 39 samples (30%), 5 to 5.49 (Table 3).

#### Phosphatase

Phosphatase determinations made on 130 of the 142 samples showed that 98 samples (75.39%) were below 2.0 units of phosphatase and 32 samples (24.61%) reacted positively to the phosphatase test (Table 3).

#### ORGANOLEPTIC EXAMINATION

##### Flavor scores and criticisms

Flavor defects found in the cottage cheese and the number of times each flavor defect was found were tabulated.

Twenty percent of the samples were criticized as being too high in acid, 16.4% had a bitter flavor, 11.2% contained some foreign flavor, 10% had an unclean flavor, 9.4% were criticized as being yeasty or fermented, and 7.6% were rancid. In addition to those listed, several other off-flavors were observed (Table 4).

The samples were assigned a numeral score ranging from a low of 35 for samples with a poor flavor to a high of 40 for samples with the most desirable flavors.

Fifty-four (37.9%) of the samples scored below 37 and 62.1% scored higher than 37. Only 40 samples (28.3%) had what would be considered an excellent flavor score of 39 and above, at the time the samples were judged (Table 4).

##### Body and texture scores and criticisms

Fifty-eight (33%) of the samples were criticized as having a tough rubbery texture, 25 samples (17%) had a mealy texture and 26 samples were too firm or too dry. Thirty points were allowed on the score card for body and texture. Fifty-two samples (36.6%) of the samples scored 29 or more; 30.4% scored below 28, the minimum for a satisfactory body and texture score (Table 5).

TABLE 4 — FLAVOR, BODY AND TEXTURE SCORE OF 142 SAMPLES OF COTTAGE CHEESE.

Flavor				Body and texture			
Score	Range	No.	%	Score	Range	No.	%
39	or over	40	28.3	29	or over	52	36.6
38	38.9	22	15.5	28	28.9	47	33.6
37	37.9	26	18.3	27	27.9	26	18.4
36	36.9	21	14.7	26	26.9	17	12.0
35	35.9	33	23.2				



TABLE 5 — FLAVOR AND TEXTURE AND COLOR DEFECTS IN 142 SAMPLES OF COTTAGE CHEESE.

Flavor			Body and texture		
Defect	No.	%	Defect	No.	%
High	34	20	Rubbery	58	53
Bitter	28	16.4	Mealy	25	22.7
Foreign	19	11.2	Dry	26	23.4
Unclean	17	10	Unsatisfactory	1	.9
Yeasty	16	9.4		—	—
Rancid	13	7.6	No. times observed	140	100
Flat	11	6.5			
Musty	10	5.8	Color and appearance		
Old cream	9	5.3	Unabsorbed cream	51	34.5
Feed	4	2.4	Uneven particles	49	33.0
Fruity	2	1.2	Mushy	21	14.2
Woody	2	1.2	Wheyed off	18	12.2
Salty	2	1.2	Unnatural color	4	2.6
Oxidized	2	1.2	Lacks cream	3	2.0
Cooked	1	1.2	Uneven color	2	1.4
	—	—		—	—
No. times observed	170	100	No. times observed	148	100

#### Color and appearance

Fifty-one samples (34.5%) contained unabsorbed cream, 49 samples (33%) had uneven curd particles. Twenty-one samples (14.2%) were mushy and 18 samples (12.2%) were wheyed off or had an uneven and unnatural color (Table 5).

#### DISCUSSION OF RESULTS

The results of this survey indicate that there is a serious need for manufacturers of cottage cheese to pay more attention to the details of the manufacturing process to insure the consumer that the composition of the cheese conforms to legal standards and that the cheese is wholesome and palatable. The coliform count of the samples, with 71.2% of the samples containing an excess of 10 or more per gram, is far above the limits generally accepted as satisfactory. Since 44% of the samples contained *Pseudomonas viscosa* which produces a yellowish or brownish colored slime, it is probable that this organism was largely responsible for such flavor defects found as fruity, rancid, bitter, and flat. The presence of yeast and mold in the cheese may not be harmful, however, these organisms influence the flavor of the cheese. Poor keeping quality of the cheese is indicated by the high percentage (95%) of the samples containing these organisms.

No attempt was made to associate the number and type of organism present with the acidity and pH of the samples. Since no staphylococci were found in any of the samples, it may be assumed that they were all destroyed by pasteurization of the milk used in

the manufacture of the cheese, did not grow, or survive at the pH of the cheese, or were not present in detectable numbers.

The data presented indicate that manufacturers should pay more attention to the fat and moisture content of the cheese to avoid the manufacture of an illegal product.

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# THE MICROBIOLOGY OF SELF-SERVICE, PACKAGED, SQUARE SLICES OF COOKED HAM<sup>1</sup>

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The microbial flora of 113 packages of sliced cooked ham was studied over a period of 11 months (samples purchased bi-weekly). When opened and analyzed, 49 packages from stores I and II revealed counts of 1,000 to 42 million per square inch of surface area. Samples from 17 of 49 packages were sour (buttermilk odor) after 3 to 7 days at 4 to 11°C. The dominant organism in the sour samples was a non-heat resistant *Microbacterium*.

Twenty-four samples from packages of vacuum-packed, sliced ham from store III showed counts of fewer than 248,000 per square inch; 3 samples were sour at 7 days (4 to 11°C.) Eighteen packages of sliced ham from stores I and II were stored at 4 to 11°C for 7 days before opening; counts ranged from 3.4 million to 650 million, and 8 packages were sour. Eleven of 20 packages of vacuum-packed ham stored 7 days at 4 to 11°C before opening (store III) showed counts of 1,000 to 60,000; no souring was observed in any of the 20 packages.

Considerable work has been done on the microbiology of meats, especially beef. Slicing and packaging various meat products for self-service marketing may increase the possibilities of surface contamination with spoilage microorganisms; consequently, additional microbiological studies are indicated for these products.

Ayres (1) believed there was urgent need for more information regarding types of microorganisms on packaged meats, and the relation of such organisms to deterioration or spoilage. He stated that off-odor has been commonly used as a method for measuring storage life of meats, but that with cured meats, less work relating to microbial loads at the time of spoilage has been reported. It was his opinion that strong natural odors of these products kept off-odors from being readily detected. Surface contamination was thought to be largely responsible for microbial deterioration in packaged meats.

Jensen (3) reported that in the case of self-service packaged meats, a major problem for the producer is maintenance of quality during the time between production and consumption.

Sulzbacher and McLean (6) studied the bacterial flora of fresh pork sausage, and indicated that species

of *Microbacterium* may be responsible for development of an acid taste in sausage stored at home refrigerator temperature (5 to 8°C).

## EXPERIMENTAL PROCEDURE

Beginning July, 1958, packages of square slices of cooked ham (displayed in self-service cabinets) were purchased bi-weekly from 3 of several stores doing a large volume of business in Riley County, Kansas. Within 15 minutes after purchase the packages were placed at 4° to 5°C; many shoppers probably unavoidably allow a longer time interval to elapse between purchase and refrigeration of such a product. Generally, initial microbiological analyses were made on an outside slice from each package 20 to 24 hours after purchase, although some packages were stored 7 days at various temperatures before opening.

No arrangements were made for obtaining temperatures of self-service cabinets; moreover, it was not known how long the packages were in the cabinets before purchase.

Six portions from at least 3 slices of each package opened 20 to 24 hours after purchase were re-wrapped in "saran wrap." Two of the 6 portions were placed at each of the following temperatures: 4 to 5°C, 7 to 8°C, and 10 to 11°C. After 3 to 4 days one sample from each of the 3 temperature ranges was removed and analyzed. The remaining 3 samples were stored 7 days before testing.

One square inch of lean ham (0.5 sq. in. of surface area on each side of slice) was excised with sterile scissors, and placed in 99 ml. of 0.15% peptone water (in 6-oz. screw-cap bottle). Straka and Stokes (5) observed that bacterial losses can be avoided for at least 1 hour by using as little as 0.1 per cent peptone as a diluent. Plate counts, using tryptone-glucose-yeast extract agar, were based on the numbers of microorganisms removed from 1-sq. in. area of meat by vigorous shaking for exactly 2 minutes on a Kahn type shaker, followed by appropriate dilutions in 0.15% peptone water (shaken 25 times by hand).

Plates were incubated 3 to 4 days at 20°C. In addition, comparable plates (prepared from the first 12 packages of meat) were incubated 1 week at 7 to 8°C; however, the lower incubation temperature was

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TABLE 1 — MICROBIAL POPULATIONS OF PACKAGED (VACUUM AND NONVACUUM PACKED) SLICED COOKED HAM SOON AFTER PURCHASE, AND AFTER STORING AT 4 TO 11°C. FOR 3 TO 7 DAYS.

Type of Product	Source	Number of packages	Initial counts	Approximate numbers of microorganisms per square inch of surface area						Total pkgs. sour after 3 to 7 days at 4 to 11°C.
				Time and temperature of storage (unopened packages; and portions of opened packages)						
				3 to 4 days at:			7 days at:			
				4 to 5°C	7 to 8°C	10 to 11°C	4 to 5°C	7 to 8°C	10 to 11°C	
Cooked ham	Store I	14	<1T to 25M	<1T to 300M	<1T to 1.3B	6T to 330M	<1T to 2B	600T to 7B	7M to 1.1B	4
			Store II	12	<1T to 5M	<1T to 30M	158T to 250M	800T to 460M	500T to 90M	
Cooked ham	Stores I and II	9				a	3.4M 3.6M 4.6M	40M 156M 325M	65M 204M 650M	5
"Chopped" cooked ham	Store I	12	<1T to 52M	7T to 67M	670T to 600M	1M to 130M	10T to 810M	100M to 1.4B	160M to 600M	5
			Store II	11	5T to 2.2M	7T to 74M	1.1M to 326M	2M to 149M	1.4M to 200M	

T = Thousand  
M = Million  
B = Billion

<sup>a</sup>Three packages of meat at a time were purchased periodically; the three counts corresponding to each purchase are listed horizontally. Packages not opened until 7 days storage.

abandoned when it was observed that counts were approximately the same or lower at 7 to 8°C when compared with counts obtained at 20°C.

After storage, and before microbial analyses, samples were inspected for abnormal odors; observations were recorded only if odors obviously indicated spoilage.

## RESULTS

### *Bacterial counts on packages of meat held at 4 to 5°C 20 to 24 hours after purchase.*

Initial counts made 20 to 24 hours after purchase, on sliced cooked ham and sliced "chopped"<sup>2</sup> cooked ham (Table 1) from store I, revealed 14 (54%) of 26 packages having plate counts from <1,000 to 650,000 per sq. in., while 12 packages ranged from 1.1 million to 52 million per sq. in. In similar products from store II, initial counts per sq. in. in 19 (82.6%) of 23 packages were <1,000 to 540,000, and 4 packages varied from 780,000 to 5 million. In vacuum-packed sliced cooked and vacuum-packed cooked "chopped" ham (Table 2) from store III, 24 (92.3%) of 26 packages yielded initial counts of 1,000 to 247,000, with 2 packages showing 620,000 and 1.1 million.

*Bacterial counts and condition of samples from opened packages stored 3 to 4 days, and 7 days at various temperatures.*

*Store I (sliced cooked ham and "chopped" ham):* Samples held at 4 to 5°C for 3 to 4 days, and 7 days, showed 10 of 26, and 7 of 26, respectively, having counts per square inch of 1,000 to 460,000; whereas at 7 to 11°C, inclusive, after 3 to 4 days, only 4 of 26 samples yielded counts of fewer than 1 million. After 7 days at 7 to 11°C, only 1 sample of 26 was below 1 million; the remaining 25 samples ranged from 3 million to 7 billion microorganisms per square inch (Table 1). Samples from 9 of 26 packages were sour after storing 3 to 7 days at 7 to 11°C.

*Store II (sliced cooked and "chopped" ham):* Eight of 23 samples revealed counts of fewer than 550,000 after 7 days at 4 to 5°C. Only 2 of 23 samples were below 600,000 after 3 to 4 days at 7 to 11°C, and no sample was below 7 million after 7 days at the same temperature range (Table 1). Eight of 23 packages yielded samples that were sour after seven days, with 1 sample sour after 3 to 4 days.

*Store III (vacuum-packed sliced cooked and "chopped" ham):* Twenty-four (92%) of 26 samples carried fewer than 248,000 microorganisms per square inch on initial counts; after 7 days at 4 to 5°C, 14 of 26 samples gave counts of fewer than 100,000. At 10

<sup>2</sup>The square slices of "chopped" ham were from irregular pieces of meat that had been compressed into a loaf.



to 11°C, 10 of 26 samples showed fewer than 429,000 organisms after 3 to 4 days; however, at 7 days (7 to 11°C) 23 samples yielded counts from 1.2 million to 585 million per square inch (Table 2). Samples from only 3 packages of the 26 were sour after 7 days at 7 to 11°C.

*Bacterial counts and condition of packages stored 7 days before opening.*

*Stores I and II (sliced cooked and "chopped" ham):* Five of 6 packages held at 4 to 5°C showed counts from 3.4 million to 39 million per square inch with one package having 50,000 (Tables 1 and 2); no noticeable spoilage odor was observed. Plate counts on 12 packages at 7 to 11°C were from 26 million to 650 million organisms per square inch. Of the 12 packages kept at 7 to 11°C, 8 were sour upon opening for analyses (Tables 1 and 2).

*Store III (vacuum-packed sliced cooked and "chopped" ham):* Nine of 20 packages yielded counts per square inch of fewer than 10,000 when stored at 4 to 11°C (Table 2); two packages gave counts of 40,000 and 60,000. The remaining 9 packages varied from 1.8 million to 325 million. No sour odor was observed in any of the 20 packages, opened after 7 days at 4 to 11°C.

*Nature of the microbial flora.*

The odor of sour samples referred to may be best

described as being similar to buttermilk. The dominating microorganism which was placed in the genus *Microbacterium*, was almost invariably associated with the souring mentioned above. This organism, a Gram-positive, non spore-forming rod, had an optimum temperature of approximately 20°C, and was catalase positive. Surface colonies tended to become rather large (3 to 4 mm. in diameter after several days). Smears made from surface colonies revealed organisms frequently indistinguishable from cocci, whereas sub-surface colonies of the same organism showed definite rods. Unlike *Microbacterium lacticum*, as described (2), the organism in question was not particularly heat resistant. It did not survive 72°C for 5 minutes. At 60°C for 5 minutes there were only approximately 70 surviving cells per ml out of 360,000 (original inoculum); however, there were still some survivors after 30 minutes.

The species of *Microbacterium* was present on slices of ham in approximately 60 per cent or more of 113 packages and dominated the flora in at least 50 per cent of samples after 3 to 7 days. Yeasts and micrococci were found on meat in 25% or more of the packages, and dominated the flora in approximately 7 to 10%. Microbacteria, yeasts, and micrococci were often present together in approximately equal numbers. Other microorganisms encountered less frequently were lactobacilli, streptococci, and pseudomonads.

No sour odors were noted when micrococci domi-

TABLE 2 — MICROBIAL POPULATIONS OF PACKAGED (VACUUM AND NON VACUUM PACKED) SLICED COOKED HAM SOON AFTER PURCHASE, AND AFTER STORING AT 4 TO 11°C. FOR 3 TO 7 DAYS.

Type of Product	Source	Number of packages	Initial counts	Approximate numbers of microorganisms per square inch of surface area						Total pkgs. sour after 3 to 7 days at 4 to 11°C.
				Time and temperature of storage (unopened packages and portions of opened packages)						
				3 to 4 days at:			7 days at:			
				4 to 5°C	7 to 8°C	10 to 11°C	4 to 5°C	7 to 8°C	10 to 11°C	
"Chopped" cooked ham	Stores I and II	9			a	39M 50T 6.5M	132M 650M 26M	450M 500M 170M	3	
Vacuum packed cooked ham -Store III own label	Store III	15	0.9T to 1.1M	1T to 2.6M	<10T to 500M	<10T to 118M	<2T to 11M	26T to 320M	<10T to 380M	3
Vacuum packed cooked ham -Store III own label		20				a	<10T <1T <10T 4.5M 1.8M <1T —	40T 2T <10T 65M 300M <1T 2.2M, 325M	60T 13M <10T 75M 11M <1T —	0
Vacuum packed "chopped" ham -not Store III label		11	0.2T to 44T	<1T to 240T	<1T to 32M	33T to 30M	<1T to 32M	54T to 176M	2.6M to 585M	0

T = Thousand  
M = Million  
B = Billion

<sup>a</sup>Three packages of meat at a time were purchased periodically; the three counts corresponding to each purchase are listed horizontally. Packages not opened until 7 days storage.



nated the flora (over 350 million per square inch in some samples) in 8 of 11 packages of meat from store III (not its own label). It was unusual also, that this was the only series of meat samples in which *Microbacterium* was not observed on the plates.

#### DISCUSSION

Packages of sliced ham were stored 7 days before opening for analyses to ascertain if there would be any difference in the microbial flora, etc., as compared with re-wrapped samples from similar packages opened 7 days previously. Multiplication of microorganisms (stores I and II) on ham slices from packages opened at 7 days was comparable to growth at 7 days on samples from previously opened packages. In general there were little or no observable differences in the types of microorganisms on meat from opened and unopened packages after seven days storage. Although different packages were involved, counts were appreciably lower in more vacuum packages stored 7 days at 4 to 11°C before opening, than in samples from opened, but previously vacuum-processed, packages stored at the same temperature range for 7 days (Table 2).

It is not known whether or not the over-all lower counts of the vacuum-packed meats were the result of better sanitation, etc. at the time of processing, or that possibly some microorganisms did not find conditions as favorable for growth in the unopened vacuum packages. It is possible that a combination of the above factors may have prevailed.

McLean and Sulzbacher (4) proposed the name *Microbacterium thermosphactum* for a non-heat resistant organism they repeatedly isolated from pork sausage. Their organism had characteristics similar to the bacterium found commonly present on pack-

aged sliced cooked ham in this study. Wolin, Evans and Niven (7) reported that although an irradiation dosage of 44,000-66,000 rads was sufficient to kill virtually all pseudomonads on fresh beef, the product eventually spoiled due to radiation-resistant organisms apparently identical to *Microbacterium thermosphactum*.

It is known that certain meats may carry large populations of microorganisms without undergoing deterioration. Members of the genus *Microbacterium*, although present in excessive numbers on sour ham samples, are harmless from a public health standpoint.

#### ACKNOWLEDGMENT

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# STATISTICAL ANALYSIS OF STANDARD PLATE COUNTS OF MILK SAMPLES SPLIT WITH STATE LABORATORIES

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The split sample procedure is designed to check the performance of laboratories examining milk for interstate shipment by providing actual data from their comparative analyses of milk samples. The procedure generally requires that a sample of fluid milk be divided into portions which are shipped to participating laboratories for examination by agar plate and other methods. The results reported by these laboratories are inspected to determine if any laboratory reports unusually high or low counts. In addition, the counts may be checked to see if they agree within 10 or 20 percent (or some other arbitrary figure) of the counts reported by one or more reference laboratories. The belief was expressed at the 1959 National Conference on Interstate Milk Shipment, that such criteria may not be based on realistic limits of variation and that standards are needed to judge split sample performance (4). This paper attempts to develop such standards or limits, based on the statistical analysis of standard plate counts reported by central State laboratories in two split milk sample evaluations.

## MATERIALS AND METHODS

Table 1 shows that in the first evaluation five series of split milk samples were sent out between December 1957 and April 1958 and that the 42 participating states were divided into five groups of seven to nine states each. Each group examined one of the five series of samples. In the second evaluation (Table 1) only two series of samples were shipped out: the first in October, 1958, to a group of 22 states, the second series in November to a different group of 21 states.

The samples for both evaluations were essentially the same, consisting of raw, pasteurized, homogenized and chocolate milk, and of pasteurized cream. Each series included representative low, moderate, and high count samples, and two or more pairs of duplicates. In the first evaluation a set of eight split samples of 8-10 ml. was shipped to each State laboratory. In the second evaluation the set consisted of 10 samples of 20-30 ml. each. Each set was exam-

TABLE 1 — PLAN FOR EVALUATING CENTRAL STATE MILK SANITATION LABORATORIES BY SPLIT SAMPLE PROCEDURE

Evaluation	Group	Number of states	Number of analysts	Series of samples	Number of samples	
					Pairs of duplicates	Unmatched
Dec. 1957-	1st	7	17	1st	3	2
April 1958	2nd	9	14	2nd	3	2
	3rd	8	12	3rd	3	2
	4th	9	16	4th	3	2
	5th	9	17	5th	3	2
Oct.-	1st	22	51	1st	2	6
Nov. 1958	2nd	21	41	2nd	3	4

ined by one to four analysts in the State laboratory, and a set of each series was also examined by the senior author.

The preparation and shipment of the samples were essentially as described or suggested by Donnelly *et al.* (2) except that each series included certain samples inoculated with pure cultures to provide high plate counts. In most instances, samples were received and examined the day after shipment.

Each analyst was requested to prepare a 1:100 dilution of each sample, to plate duplicate 1.0 ml. (1:100) and 0.1 ml. (1:1000) aliquots from each dilution and to report the number of colonies per plate. From these counts the average number of colonies on duplicate plates and the standard plate count per ml. of milk were computed.

## ANALYSIS AND RESULTS

The results reported in each evaluation were analyzed primarily to estimate the average variation (a) among a large number of analysts examining the same samples of milk and (b) between duplicate counts from a single sample of milk prepared and read by the same analyst. This study of variation among analysts and "within" a single analyst was based on the standard plate counts (SPC's) reported



in both evaluations. Each SPC represented an average of one or two pairs of duplicate colony counts, depending on whether one or both dilutions yielded counts within approximately the 30 to 300 colony range. The logarithm of the SPC was used rather than the actual count since estimates of variation obtained under this transform were independent of fluctuating mean counts which ranged from approximately 5,000 to 150,000 per ml.

For the first evaluation, a separate analysis of variance was carried out within each group of states on the SPC's reported for each pair of duplicate samples, i.e., 15 analyses in all. The two unmatched samples were not included in these analyses as they yielded very low counts. In the second evaluation the standard plate counts for duplicate as well as for unmatched samples were analyzed, making a total of seven analyses.

In each of these analyses, the milk samples and the analysts were assumed to be random samples from their respective (infinite) populations. Variation in the log SPC was assumed attributable to three components: (a) differences in bacterial densities of apparently identical samples, (b) variation among analysts, and (c) residual variation, i.e., the average variation shown by a single analyst in replicate plate counts from the same milk sample. These variance components are set out in symbolic form in the following analysis of variance table (1).

In Table 2,  $p$  represents the number of analysts,  $q$  the number of replicate samples,  $\sigma_a^2$  the variance component attributable to different analysts,  $\sigma_s^2$  the component due to real differences between samples, and  $\sigma^2$  the average variation among log SPC's reported by a single analyst from aliquots of a given milk sample. This table assumes that "interaction" between sample and analyst may be ignored. Such interaction would arise (and inflate all the expected mean squares in Table 2 by the same amount) if some analysts were to report high counts in one of a pair of samples and lower counts in the second sample while other analysts reported the reverse. A later footnote indicates that this assumption is probably justified.

TABLE 2 — GENERAL ANALYSIS OF VARIANCE ATTRIBUTABLE TO DIFFERENCES BETWEEN ANALYSTS AND SAMPLES

Source of variation	Degrees of freedom	Expected mean square (MS)
Analysts	$p - 1$	$\sigma^2 + q \sigma_a^2$
Samples	$q - 1$	$\sigma^2 + p \sigma_s^2$
Residual	$N - p - q + 1$	$\sigma^2$
Total	$N - 1$	

Estimates of the first two variance components are given by the formulae:

$$\hat{\sigma}_a^2 = \frac{\text{Observed MS analysts} - \text{Observed MS residual}}{q}$$

and

$$\hat{\sigma}_s^2 = \frac{\text{Observed MS samples} - \text{Observed MS residual}}{p}$$

In general, in both evaluations the mean square between duplicate milk samples was not significantly greater than the residual mean square, indicating no real differences between such samples. However, the mean square among analysts was generally found to be much higher than the residual mean square, indicating significant variability among analysts. Individual estimates of this variance component, for each of the fifteen analyses in the first evaluation and the seven analyses in the second were quite heterogeneous. In the first evaluation, a substantial portion of this heterogeneity was traceable immediately to analysts from two particular laboratories whose discrepant results led to some unusually high later calculations. In the second evaluation, it was values of  $\hat{\sigma}_a^2$ . These results were omitted from all found necessary to omit data from only one of these laboratories.

The weighted average estimates of  $\hat{\sigma}_a^2$  (weighting by the degrees of freedom,  $p - 1$ , in each analysis) obtained from the two evaluations were .0069 and .0076, respectively, in terms of log SPC.

Estimates of residual variance  $\sigma^2$ , also weighted averages, were .0028 for the first evaluation and .0160 for the second. The latter figure was too high, due undoubtedly to the presence of substantial interaction between sample and analyst (which would affect the estimate of  $\sigma^2$  but not of  $\sigma_a^2$ ) in those portions of the second evaluation involving four or six unmatched samples. When these results were omitted, the average estimate of residual dropped to .0058, still higher than the estimate from the first evaluation. Nevertheless, striking some averages, results of the entire study point to a variance component between analysts of about .007 (in terms of log SPC) and a residual variance (within sample and analyst) of .004-.005.<sup>1</sup> This study indicates, therefore, that overall

<sup>1</sup>This is about the value one would expect if "interaction" between sample and analyst were absent. Consider, for example, an average colony count of 100, a typical value. The variance of replicate plate counts about this average would approximate the same value, 100. The variance of mean counts based on pairs of such replicates would be 50. Since the variance of the log SPC based on such a mean colony count is equivalent to the variance of the logarithm of the mean colony count itself, and since the latter variance is approximately equal to the variance of the mean divided by the square of the "true" count we obtain,

$$\text{Variance of log SPC} = \frac{50}{(100)^2} = .005.$$



variation among analysts should not greatly exceed .007 + .005, or .012. We may presume that these values hold at least within the plate count range of 5,000 - 150,000 per ml. of milk.

These results may be put in terms of the percentage difference between a pair of plate counts reported by a single analyst, or between SPC's reported by two different analysts. When a larger number of analysts are surveyed, as would be the most common situation, percentage difference generalizes to the ratio of standard deviation to mean. Under the logarithmic transformation, however, the standard deviation or its square, the variance, of the SPC becomes largely independent of the mean, at least over the range of practical interest. Hence an observed variance of log SPC (where each count is based on two plates) may be checked directly against the criterion .012 suggested by the results of this study to determine the acceptability of the observed results.

Table 3 lists data from the second evaluation, and illustrates the method of computing the variance of the log SPC. The counts of Sample A showed a degree of agreement among analysts typical of the study as a whole. The variance of the log SPC computed for this sample, .012, was, in fact, identical to the average level suggested by this study. On the other hand, analysts examining Sample B reported plate counts whose logarithms showed a variance of .051, approximately four times the average level of .012. Of course, this high value represents an extreme among the many samples distributed in this survey, and naturally we cannot judge the significance of this particular result by the ordinary statistical criteria that we would apply to a sample selected at random. However, if variances of this size were encountered frequently (in say, more than ten percent of samples) in future evaluations, one would certainly suspect that at least some of the analysts were not performing satisfactorily or that certain samples were not being split uniformly.

The problem then arises of determining which analysts need improvement. In general, this question cannot be answered with confidence unless results of all analysts are available on a series of samples examined as a whole. It is conceivable, though unlikely, that counts on each separate sample may show a high variance and yet none of the analysts report consistently high or low counts over all samples. Usually, certain analysts will tend to count consistently higher or lower than their colleagues. The simplest way of determining this is to rank the counts by size within each sample and then study the distribution of ranks for each analyst over all samples. Table 4 presents these ranks for the 21 analysts of

Sample B (Table 3) over the entire series of 10 samples examined (Sample B was No. 7).

We see immediately that certain analysts have consistently reported higher or lower counts than most of their colleagues. Analysts 2, 9, 11 and 14 clearly fall into the former category and Analyst 1 into the latter. More on the borderline are 13, 20 and 21, high, and 15 and 18, low. The column of total ranks helps to judge the consistency of each analyst.

Table 4 also discloses peculiar sets of ranks for two Analysts, 12 and 16. Analyst 12 ranked low on Samples 1, 2, 6 and 7 but much more typical or even high, on the remaining samples. Analyst 16, on the other hand, ranked very low on Samples 4, 5, 8, 9 and 10 but quite high on the other five samples. Reviewing the original colony counts, it was apparent that these surprising reversals were not due to under- or over-counting of crowded plates since both .01 and .001 dilutions of each sample showed closely consistent results. Some other defect appeared to have been

TABLE 3 - VARIATION AMONG ANALYSTS IN STATE LABORATORIES AS INDICATED BY THE VARIANCE OF LOGARITHMS OF STANDARD PLATE COUNTS

Sample A			Sample B		
Analyst	SPC/100	(Log SPC)-3	Analyst	SPC/100	(Log SPC)-3
A	130	1.114	1	100	1.000
B	130	1.114	2	320	1.505
C	130	1.114	3	270	1.431
D	130	1.114	4	290	1.462
E	120	1.079	5	200	1.301
F	110	1.041	6	140	1.145
G	130	1.114	7	240	1.380
H	130	1.114	8	200	1.301
I	120	1.079	9	240	1.380
J	93	0.968	10	240	1.380
K	130	1.114	11	320	1.505
L	120	1.079	12	150	1.176
M	120	1.079	13	210	1.322
N	110	1.041	14	270	1.431
O	110	1.041	15	200	1.301
P	40	0.602	16	260	1.415
Q	120	1.079	17	290	1.462
R	100	1.000	18	200	1.301
S	99	0.995	19	210	1.322
T	79	0.897	20	160	1.204
U	120	1.079	21	200	1.301

$$\text{Variance of log SPC} = \frac{\sum \log^2 - (\sum \log)^2}{21}$$

Sample A	Sample B
$\sum \log = 21.857$	$\sum \log = 28.026$
$(\sum \log)^2 = 477.72845$	$(\sum \log)^2 = 785.45668$
$\sum \log^2 = 22.981523$	$\sum \log^2 = 38.411906$
Variance of log SPC = 0.0116	Variance of log SPC = 0.0505



TABLE 4 — RANKING<sup>1</sup> OF COUNTS REPORTED ON EACH OF A SERIES OF TEN SPLIT SAMPLES (2ND GROUP, OCTOBER - NOVEMBER, 1958)

Analyst	Sample number <sup>2</sup>										Total Rank
	1	2	3	4	5	6	7	8	9	10	
1	5	11	1	2	4	3	1	2	1	2	32
2	15	18	17	18	21	17	21	16	15	19	177
3	10	15	4	12	7	7	12	20	10	9	106
4	17	16	10	10	15	9	19	17	3	14	130
5	14	6	15	17	8	8	6	10	7	6	97
6	4	8	18	6	5	2	2	7	11	10	73
7	7	7	13	7	9	11	14	6	19	11	104
8	8	10	14	8	11	12	8	19	21	20	131
9	20	20	21	20	14	18	15	15	20	17	180
10	9	19	8	4	12	4	13	4	9	4	86
11	21	21	20	16	20	21	20	18	12	21	190
12	1	2	7	14	10	1	3	13	17	7	75
13	16	14	11	19	17	16	10	21	8	13	145
14	12	13	16	21	18	20	17	9	18	18	163
15	13	4	3	11	3	5	7	5	4	5	60
16	18	17	12	1	2	19	16	1	2	3	91
17	11	5	6	15	13	13	18	11	14	12	118
18	3	1	9	3	1	10	5	12	6	1	51
19	6	3	5	9	6	15	11	8	13	8	84
20	2	12	2	5	16	6	4	3	5	15	70
21	19	9	19	13	18	14	9	14	16	16	147

<sup>1</sup>Rank 1 denotes the lowest count. Samples 1 and 6, 2 and 7, 4 and 8 were duplicates.

<sup>2</sup>Since standard plate counts were rounded to the nearest thousand, ties were frequently encountered. These could almost always be eliminated by reference to the original colony counts. In the rare cases where colony counts were also identical, the assignment of separate ranks was decided by tossing a coin.

responsible, particularly in the case of Analyst 16 whose counts of Samples 4, 5, 8, 9, and 10 were all far below average.

Ranking the reported counts within each of a series of samples, as in Table 4, clearly provides useful supplementary information on the relative accuracy and reliability of individual analysts. Statistical significance tests are available as guides in interpreting a table of ranks. For example, the variation in total ranks may be tested to determine whether some analysts consistently under- or over-counted samples. On the assumption that no such consistent differences existed, the expected variance of total ranks, say  $\sigma_R^2$ , is given essentially by the expression,  $\sigma_R^2 = \frac{mn(n+1)}{12}$ , where m is the number of samples observed, and n the number of analysts (3).

For  $n > 7$ , and assuming no ties, the ratio of the observed sum of squares of deviations of total ranks from their mean,

$$i.e., \sum_{i=1}^n (R_i - \bar{R})^2 = \sum_{i=1}^n R_i^2 - \frac{(\sum R_i)^2}{n} = say, S_R^2$$

to the expected variance given above may be tested by the  $\chi^2$  distribution with  $n - 1$  degrees of freedom.

In the present example, Table 4, we calculate

$$\sum_{i=1}^n R_i^2 = (32)^2 + (106)^2 + \dots + (70)^2 = 294,290,$$

$$\sum R_i = 2,310, \text{ and}$$

$$S_R^2 = 294,290 - \frac{(2,310)^2}{21} = 40,190.$$

$$\text{Also, } \sigma_R^2 = \frac{(10)(21)(22)}{12} = 385.$$

Hence,  $\chi_R^2 = \frac{40,190}{385} = 104$ , with 20 degrees of freedom. The probability of this high a value of  $\chi_R^2$  under the hypothesis of no consistent bias is extremely small, less than 0.5 percent. We have, therefore, statistical proof of what inspection of Table 4 clearly reveals — a strong, consistent bias in the counts of some analysts.

Crude statistical limits for isolating these analysts may be obtained by adding and subtracting twice the standard error,  $\sigma_R$ , from the average of the total ranks, i.e.  $\frac{m(n+1)}{2} \pm 2\sigma_R$ . All analysts whose total ranks lie outside these limits may be suspected of consistent bias, although under the hypothesis of no bias in any analyst, we would expect five percent of the total ranks to fall above or below these limits. In the present example,  $\sigma_R = \sqrt{385} = 19.6$ . Hence, the limits are  $110 \pm 39.2$  or 70.8 and 149.2. Analysts 1, 2, 9, 11, 14, 15 and 18 fall well outside these



limits, while Analysts 13, 20 and 21 are on the borderline as indicated earlier by inspection of Table 4.

#### SUMMARY

Standard plate counts (SPC's) reported by 41 State laboratories on five to eight split milk samples were analyzed statistically to estimate the average variation among groups of analysts examining the same samples of milk, as well as between duplicate counts from a single sample obtained by the same analyst and, further, to develop criteria for deciding which analysts need to improve their performance. Analysis of variance of the log SPC showed that overall variation among analysts should not greatly exceed .012. Two samples were selected to illustrate the calculation of variance and, in one case, was found to be .051, or about four times the typical value of .012. Variances of this size in more than ten percent of the samples provide a valid basis for suspecting inadequate performance by the analysts or nonuniformity in splitting the samples in question.

Further information about the performance of individual analysts may be obtained by ranking the counts according to size within each sample and computing the total rank of each analyst for the entire series of samples. All analysts whose total ranks fell above or below twice the standard error of the average total rank for the group of analysts may be regarded (tentatively) as showing consistent bias which should be corrected. In the example shown, seven of twenty-one analysts fell in this category and three others were on the borderline.

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1. Bennett, C. A. and Franklin, N. L. *Statistical Analysis in Chemistry and the Chemical Industry*, pg. 377. John Wiley and Sons, New York, 1954.
2. Donnelly, C. B., Black, L. A., and Lewis, K. H. Containers, Refrigerants and Insulation for Split Milk Samples. *J. Milk and Food Technol.*, 21: 5, 131-137. 1958.
3. Kendall, M. G. *Rank Correlation Methods*, pg. 98. Hefner Publishing Company, New York. 1955.
4. Minutes of Seventh Meeting, National Conference on Interstate Milk Shipments. St. Louis, Missouri, April 1959.

## NEWS AND EVENTS

### QUESTIONS AND ANSWERS

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

#### QUESTION:

What can a small dairy plant with some laboratory facilities do to ensure that milk they ship in interstate commerce will be free of pesticide residues?

#### ANSWER:

The problems of pesticide residues in milk are much more complex than antibiotics. Your laboratory will not be of much use to you in checking your milk supply as the test procedures are complex and beyond the resources of most dairy laboratories. However, your laboratory or some other member of your organization can prepare information on the problem and see that each individual patron is fully informed on the sources of the residues and what can be done to keep them out of the milk. You should work closely with your local regulatory agency in preparing a list of approved pesticides and herbicides with proper directions for their use. Your field force should be alerted to see that your patrons follow the directions you have outlined. In short, an intensive campaign of education and supervision is the only answer to the pesticide problem for the small plant.

#### QUESTION:

We hear about rancid milk resulting from improperly

installed pipe line milkers on the farm. Can improper plant practices also result in rancidity problems?

#### ANSWER:

Yes. The same factors can cause rancidity in the plant up to the time milk has been heated to 135°F. Air leaks should be avoided. Elevations of temperature should be avoided prior to heating for pasteurization. Addition of homogenized milk to raw milk must be avoided. The milk should not be homogenized until the temperature reaches at least 135°F.

#### QUESTION:

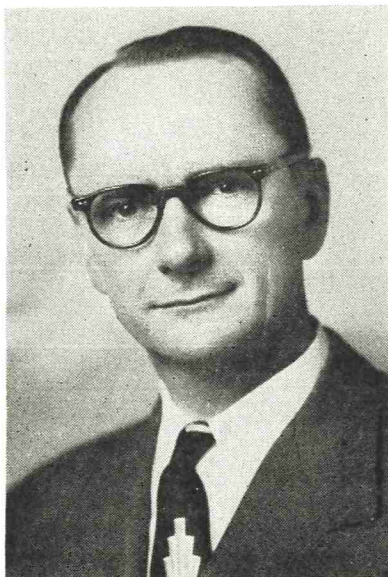
What is the Astell Roll tube method for bacteria counts?

#### ANSWER:

This is a procedure to measure the bacterial content of milk by adding the sample directly to a tube of melted agar and spinning it to form a film of hardened agar around the inside of the tube. Tubes are incubated and counts are made of colonies growing in the agar layer. This method is reputed to be less costly and time consuming than conventional plate counting. The initial investment is less than for a plate count procedure and should be adaptable to small plant laboratories. The method is to be included in the new 11th Edition of *Standard Methods for the Examination of Dairy Products*. Additional information can be obtained from the APV Company, Inc., 137 Arthur Street, Buffalo 7, New York.



## ALFRED RATZLAFF RECEIVES MINNESOTA SANITARIAN'S ASSOC. AWARD



The Minnesota Sanitarian's Association honored one of its distinguished members, Mr. Alfred Ratzlaff, Director of Quality Control for Marigold Dairies, Rochester Minnesota, at the Association's annual banquet Thursday evening September 15, 1960. In recognition of Mr. Ratzlaff's outstanding Service to the Association and the Dairy Industry of Minnesota, he was presented with the 1960 Sanitarian's Award. In addition to serving a number of years on the Board of Directors and later as Vice President and President of the Minnesota Sanitarian's Association Mr. Ratzlaff is a member of the Advisory Committee to the Commissioner of Agriculture, Minnesota Department of Agriculture; has served on panels at the National Conference on Inter-State Milk Shipments; and has participated on programs of the University of Minnesota's Dairy Products Institute and many other industry meetings. As Director of Quality Control for Marigold Dairies which operates several plants in southern Minnesota his work has been outstanding. Mr. Ratzlaff is a veteran of World War II having served in the Caribbean area and the European Theater. He is a member of the Toastmaster's Club and the Bethel Lutheran Church where he serves on the Stewardship Committee.

### PAPERS PRESENTED AT AFFILIATE ASSOCIATION MEETINGS

**Editorial Note:** The following listing of subjects were presented at recent meetings of Affiliate Associations. Copies of papers presented may be available through the Secretary of the respective Affiliate Association.

CONNECTICUT ASSOC. OF DAIRY AND FOOD SANITARIANS  
(Spring Meeting — May 11, 1960)

Sec., Dr. R. M. Parry, Dept. of Agriculture, State Office Bldg. Hartford.

#### DAIRY SECTION

*Antibiotic and pesticide control in Connecticut* —  
Panel Discussion

*The public health significance.* Mila Rindge  
*Testing for antibiotics.* Richard Eglinton  
*Testing for pesticides.* Lloyd Keirstead  
*The use of antibiotics.* W. N. Plastridge  
*The use of pesticides.* C. E. Smith  
*The regulatory control.* R. M. Parry

#### FOOD SECTION

*Poison and you.* J. McCullough Turner  
*Vending machine sanitation.* David E. Hartley

#### JOINT SESSION

*Dietary foods.* Harry J. Fisher  
*The food additive amendment.* Nevis E. Cook  
*How and when to use pesticides.* W. D. Tunis  
*Can we live with this and still farm?* Theodore Litivin

#### INDIANA ASSOCIATION OF SANITARIANS

(Tenth annual meeting June 7-9, 1960)

Sec., Karl K. Jones, Indiana State Board of Health, Indianapolis.

#### GENERAL SESSION

*Treatment of small water supplies.* J. C. Barringer  
*Fringe area sewage disposal problems.* Albert Klatte  
*Public health and bathing places.* George Fassnacht  
*Viruses and man.* S. D. Hopper

#### MILK SECTION

*What I expect from a dairy fieldman.* J. W. Dean  
*Radionuclides in milk and food.* J. E. Campbell  
*Mastitis, the cause of antibiotics in milk.* G. M. Kelley

#### FOOD SECTION

*Federal regulation of pesticides, rodenticides and bactericides.*  
J. C. Ward  
*My three years with vending.* David E. Hartley  
*Progress on the new food ordinance.* L. C. Peckham

#### WISCONSIN ASSOC. OF MILK AND FOOD SANITARIANS

(Sixteenth annual meeting, Sept. 12-13, 1960)

Sec., L. Wayne Brown, 421 Chemistry Bldg., Univ. of Wisconsin, Madison  
*Dairying in Russia.* E. E. Heizer  
*Mastitis and antibiotics from the regulatory viewpoint.* H. J. Weavers  
*The significance of staphylococci to the dairy industry.* E. McCoy  
*Herd management and mastitis control.* Wayne Thompson  
*The small dairy farmer.* James Crowley  
*Problems in bulk milk measuring procedures* —  
A panel discussion  
Norman Kirschbaum, C. K. Luchterhand and M. Palmer Welsh  
*The "protective screen" program for canned foods.* K. G. Weckel  
*Using pesticides properly.* Ellsworth Fisher  
*The scientific basis for safe tolerances for pesticides in milk.*  
John P. Frawley



MINNESOTA SANITARIAN'S ASSOCIATION  
(Fifteenth annual meeting, Sept. 15, 1960)

Sec., O. M. Osten, Minn. Dept. of Agriculture, State Off. Bldg., St. Paul

FIELDMENS SECTION

*Herd management improvement.* J. B. Williams  
*New developments in dairy cattle housing.* E. G. Bruns  
*Newer techniques in evaluating milk quality.* W. C. Lawton  
*Some common mistakes in milking machine care.* C. M. Crosby

FOOD AND ENVIRONMENTAL SECTION

*Housing maintenance—occupancy standards.* E. R. Krumbiegel  
*Air pollution in Minnesota: nature of the problem — what is being done about it.* H. S. Paulus  
*Some aspects of air-borne microbial contamination.* V. W. Greene  
*Current developments in the area of environmental sanitation.* W. E. Gilbertson

GENERAL SESSION

*Developments relative to a certification program for chemical sanitizers.* Karl Mohr  
*Practical psychology for the sanitarian.* L. A. Zahradka

### EDWARD MARLIN

Edward Marlin, Milk Sanitarian, City of Keokuk, Iowa, died of a heart attack on Monday, September 19, 1960. He was 44 years old and had been with the City Health Department since 1951. He is survived by a wife and six children.

### DR. READ JOINS NATIONAL DAIRY COUNCIL

Dr. Merrill Stafford Read became Director of Nutrition Service for the National Dairy Council on August 15, Milton Hult, NDC President, has announced. Dr. Read replaces Dr. Zoe E. Anderson, former NDC Director of Nutrition Research, who resigned on June 1 to become Head of the Department of Home Economics at Wayne State University.

Dr. Read comes to National Dairy Council from Virginia Polytechnic Institute where he has since last year been Visiting Professor, Department of Biochemistry and Nutrition. From 1956 to 1959, he served as Chief of the Irradiated Food Branch, U. S. Army Medical Research and Nutrition Laboratory, at Fitzsimmons General Hospital in Denver. In this latter position, Dr. Read's work included the direction of a research team of 10 scientific investigators in planning and administrative activities. He will continue as a member of the AEC Advisory Committee on Food Irradiation.

He is a graduate of Northwestern University, re-

ceived his Masters and Ph.D. in biochemistry at Ohio State University, is married and has one daughter. Dr. Read holds numerous memberships in scientific organizations including Sigma Xi and Phi Lambda Upsilon (national honorary scientific societies), the American Chemical Society and the American Association for the Advancement of Science. He is the author of 24 scientific articles.

As Director of Nutrition Service, Dr. Read will be concerned mainly with two types of activities — the conduct of the NDC grants-in-aid nutrition research program, and the interpretation of research findings of interest to the dairy industry. Interpretation of research by NDC applies to more than findings from NDC-sponsored nutrition research projects. Its scope includes contact with research investigators and the study and application of information on dairy foods from the entire field of nutrition and nutrition research conducted annually through grants of millions of dollars from both private and governmental sources.

### VIRGINIA ASSOCIATION MAKES CHANGES

The Virginia Association of Milk and Food Sanitarians recently adopted a new Constitution and Bylaws. Two new features were included, a name change and, by individual preference a choice of affiliated sections.

The new name is the Virginia Association of Sanitarians. Then, to recognize individual preference of members, Article I, Section 7 and 8 read as follows:

#### Section 7.

There may be organized within this Association separate sections, each with its own chairman, for the purpose of affiliating with National or International Sanitarians Associations. Each section shall be governed by the Constitution and Bylaws of this Association.

#### Section 8.

Each affiliated paid-up member of the Virginia Association of Sanitarians in good standing, shall receive at no extra cost, the regular issues of the Official Publication of the International Association or the National Association of Sanitarians and such other publications as the Executive Board may direct for the year in which his dues are paid.

This interesting development would presume to promote unity of purpose in environmental sanitation, maintain one state-wide organization, yet give members a choice of individual affiliation.



## MICHIGAN STATE RECEIVES CONTRACT FOR RESEARCH IN SOLAR HEATING AND DRYING

Scientific techniques in the use of solar heating for drying farm products will be the subject of further extensive research at Michigan State University during 1960-61. The research will be carried out under a grant from the Committee of Galvanized Sheet Producers of American Iron and Steel Institute and the American Zinc Institute.

The object of the investigation at Michigan State will be to extend and refine existing knowledge as to how galvanized steel sheet roofing on farm buildings can be used more effectively to capture and utilize solar heat.

Specific points to be explored will be determination of the best methods of utilizing galvanized steel roofing, optimum depths of interior air space, and the rate of air flow necessary to provide most efficient drying results.

Supervision of the research contract will be under the direction of Professor F. H. Buelow, Department of Agricultural Engineering at Michigan State.

In announcing the grant, the Committee noted that much is already known about the effectiveness of the use of black-painted galvanized steel roofing in the heating and drying of stored grain.

Research already conducted, under the auspices of the Committee and individual steel companies, has shown that solar heat, when captured by the galvanized steel roofing, can reduce the drying time of crops during sunny weather by up to 50 percent over drying with unheated air.

Interim reports on the results of the research will be made periodically, the Committee said, and the complete findings will be made available to the public when the project is concluded.

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## PROTEIN DEFICIENCIES MAJOR PROBLEM FOR GROWING WORLD

A shortage of protein is one of the great health problems facing the peoples of Asia, Africa, and Latin America. Inadequate protein consumption constitutes a major killer — particularly among the youngest age groups — and, among those not overtly stricken, drains the productive efficiency upon which the survival and vitality of the new nations depends.

According to *Nutrition Reviews*, the authoritative journal of the Nutrition Foundation, the situation is becoming increasingly critical. There are, for example, 40 to 50 million additional people each year to compete for the food supplies of this planet.

Although the "employment of improved methods

of agricultural technology, increased irrigation and drainage, selection of crops to produce a greater yield per acre, and the eradication of plant disease and pests will lead to greater production of foodstuffs," *Nutrition Reviews* points out, "there is doubt whether such methods can meet the increased demand for food."

The gravest scarcity is, the journal explains, and will probably continue to be, in the realm of protein. "The foodstuffs that are easiest to produce, yield large amounts of calories but supply inadequate amounts of protein." "Moreover," the journal adds, "when foodstuffs are limited in supply, the use of animals for converting plant protein into animal protein is too inefficient."

Even though beefsteak diets may be a long way off for the peoples of these nations, nutritional science is, however, trying to find immediate means to provide sufficient high quality protein.

One of the most promising approaches in several years of research has been developed by the Institute of Nutrition of Central America and Panama (INCAP). Working under grants from the United Nations, the Rockefeller Foundation, the Williams-Waterman Fund, the Nutrition Foundation and the Kellogg Foundation, the Central American research body, headquartered in Guatemala City, has developed a high protein food from locally available — and cheap — grain products.

A blend of corn meal, sorghum flour, cottonseed flour, leaf meal or vitamin A and 3% yeast, "Incaparina" has a promising protein score, 67%.

Another possibility, recently reported at Cornell University is based on the prospect of using synthetic amino acids — the "building blocks" of protein.

Intensive work is now being done to synthesize two of the most important amino acids, lysine and methionine. If this can be accomplished at a sufficiently low cost, the synthetics might be blended with locally available grains — rice, wheat, corn and sorghum — to create important new food supplies for the nations now short of protein.

On another tack, N. W. Pirie, writing in the British medical publication, *Lancet*, tells of a technique of extracting protein from leaves.

It works this way: fresh green leaves are pulped and the juice is extracted from the mass. The juice is then heated, coagulating the protein.

After a number of filtering steps, the protein is finally formed into cakes. Although a deep green, thanks to the chlorophyll still present, the cakes have proved to be a good source of protein, being on a par with fish meal.



### NEW LEASE PLAN FOR STAINLESS STEEL MILK DISPENSER CANS ANNOUNCED

A new plan for leasing its stainless steel milk dispenser cans has been initiated by John Wood Company's Superior Metalware Division.

Under this new plan it is possible for dairies to rent stainless steel milk dispenser cans for as low as 2.2 cents a day. This provides dairies with an economical means of dispensing milk under the most sanitary conditions.

Complete information on the plan will be available at Superior's Dairy Industry Supply Association exhibit booth, C425, at Chicago's International Amphitheatre, October 31st through November 5th.

Superior Dispenser Cans are made in stainless steel models to fit all types of dispensing units. The new lease plan enables dairy plant operators to select the units they want and install them without large initial outlay. Costs are pro-rated over the term of the lease.



**IOSAN** is a patented germicidal cleaner that kills streptococcus, pseudomonas, E. Coli, staphylococcus and other organisms that cause and spread Mastitis. Its "Tamed-Iodine" killing power has been substantiated by laboratory tests that meet hospital standards. Iosan provides safe, low cost protection when washing udders and dipping teats.

**"Tattles" on milkstone.** Iosan quickly cleans and sanitizes bulk tanks and other equipment. It "tattles" on hard-to-remove or overlooked accumulations of milkstone with a tell-tale yellowish-brown stain that is easy to remove. Reduces bacteria counts to consistent lows, leaves equipment sparkling clean.

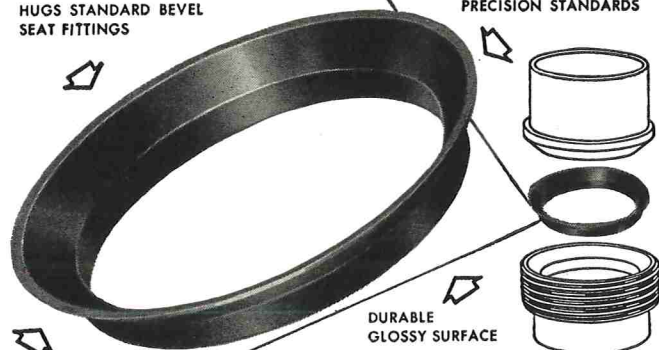
**Two-in-one product.** Iosan saves time and labor by replacing two or more single-action products. Also reduces hot water bills because it is used in tap or lukewarm water. For a free demonstration contact your regular supplier or Lazarus Laboratories Inc., Div. West Chemical Products Inc., 42-16 West St., Long Island City 1, N. Y.

**Tamed Iodine**  
GERMICIDAL CLEANER

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"FORM-FIT" WIDE FLANGE  
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|---|-------------------------------|
| Tight joints, no leaks, no shrinkage        | Time-saving, easy to assemble |
| Sanitary, unaffected by heat or fats        | Self-centering                |
| Non-porous, no seams or crevices            | No sticking to fittings       |
| Odorless, polished surfaces, easily cleaned | Eliminate line blocks         |
| Withstand sterilization                     | Help overcome line vibrations |
|   | Long life, use over and over  |

Available for 1", 1½", 2", 2½" and 3" fittings.  
Packed 100 to the box. Order through your dairy supply house.

**THE HAYNES MANUFACTURING CO.**  
4180 Lorain Avenue • Cleveland 13, Ohio

The Only Approved  
Method of Applying a  
Sanitary Lubricant to Food  
Processing Equipment

**HAYNES**  
*Lubri-Film*  
SPRAY



**A SANITARY PLASTIC TYPE  
SOLID FILM LUBRICANT**

FORMULATED FROM U.S.P. LIQUID PETROLATUM  
AND OTHER APPROVED INGREDIENTS  
(Laboratory Controlled)

**SANITARY • NON-TOXIC  
ODORLESS • TASTELESS**

PHARMACEUTICALLY ACCEPTABLE

CONTAINS NO ANIMAL OR VEGETABLE FATS.  
ABSOLUTELY NEUTRAL. WILL NOT TURN RANCID  
—CONTAMINATE OR TAINT WHEN IN CONTACT  
WITH FOOD PRODUCTS.

*Lubri-Film*

- should be used to lubricate
- ▶ Separator Bowl Threads
  - ▶ Pure-Pak Slides & Pistons
  - ▶ Pump & Freezer Rotary Seals
  - ▶ Homogenizer Pistons
  - ▶ Sanitary Plug Valves
  - ▶ Valves, Pistons & Slides of Ice Cream, Cottage Cheese, Sour Cream and Paper Bottle Fillers, Stainless Steel Threads and Mating S. S. Surfaces
  - ▶ and for all other Sanitary Machine Parts which are cleaned daily.

Haynes *Lubri-Film* Sanitary Spray Lubricant is entirely new and different. Designed especially for applications where a heavy duty sanitary lubricant is required.

*Lubri-Film* is a high polymer lubricant and contains no soap, metals, solid petrolatum, silicones nor toxic additives.

Provides a clinging protective coating for vital metal parts such as slides, bearings and other lubricated surfaces despite moisture.

PACKED 6 — 16 OZ. CANS PER CARTON.

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over **60** years' experience

in the preparation of Difco products assures

UNIFORMITY                  STABILITY                  ECONOMY

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*Complete Stocks                  Fast Service*

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*Descriptive literature available on request*

**DIFCO LABORATORIES**

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### USE OF LACTOSE REFUSED

The State Department of Agriculture has refused the petition of Foremost Dairies, Inc., to add lactose to milk or milk products sold in Oregon.

This decision followed a public hearing and a study of briefs submitted after the hearing by the petitioner.

Lactose, the chief source of which is cheese whey, is considered a sugar.

In denying the request, the department says it can find no evidence to support the several claims which Foremost Dairies made in its petition.

The dairy concern argued that Lactose acts as a flavor booster; that it restores true milk flavor to skim or not-fat milks that it extends and maintains even color dispersion; that it does away with vitamin after-taste of fortified milks; and that it will restore the flavor balance of natural buttermilk.

In the department's formal decision, W. E. Upshaw, its hearing officer in this matter, stated that permission to add sugar, salt, spices or flavorings to milk or milk products should be backed up with, *positive proof of the need and benefits of such ingredients.*

The order points out that no other distributor, no producer or no Oregon milk organization has made any demand upon the department as to the need for addition of lactose to milk sold or used in Oregon.

The petitioner's claims, the department order stated, *may or may not be true . . . before we open Pandora's box by authorizing additional ingredients . . . we must have complete and positive evidence and proof. If statements of petitioner are correct . . . it will find organizations in Oregon and in other states available, cooperative and very willing to help test them out,* the department's statement concluded.

### CORNELL CONFERENCE PLANNED

A one-day conference for milk industry representatives to consider the problem of pesticides in relation to milk production and processing is scheduled at Cornell University on Tuesday, November 22. It will be held in Stocking Hall.

Professors James C. White of the dairy industry department and John G. Matthyse of the entomology department are in charge of the program and arrangements.



Speakers will include officials from the federal government's department of health, education, and welfare; from the U. S. Public Health Service; the New York State Department of Agriculture and Markets; and specialists from the State College of Agriculture at Cornell.

Expected to attend are dairy industry leaders and members of control agencies in health and agricultural departments in New York and nearby states.

Program details will be announced later, reports and recommendations on the use of pesticides will be included.

More information on the conference may be had from Professor James C. White, Stocking Hall, Cornell University, Ithaca, N. Y.

### DAIRY FIELDMEN'S AND DAIRY PLANT OPERATOR'S CONFERENCES TO BE HELD AT PURDUE

The 1960 Dairy Fieldmen's and Dairy Plant Operator's Conferences are to be held at Purdue University on November 15 and 16, respectively. The conferences are sponsored jointly by the Dairy Department and the Indiana Dairy Products Association.

Dr. F. N. Andrews, Head of the Dairy Department at Purdue, has announced a Fieldmen's program which includes discussions on mastitis and the Q-Fever problem, methods of forage preservation, herbicide and pesticide residues, dairy farm building arrangements, and the role of dairy fieldmen in dairy plant quality and public relations programs.

The Dairy Plant Operator's Conference will include papers on testing and accounting for incoming receipts and finished products, results of a study of the types of records plants need for product accounting, quality control measures for dairy plants and recent developments in milk filtering practices.

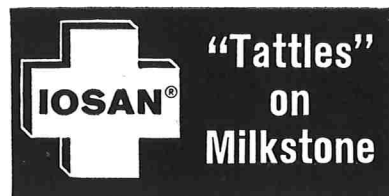
For further information concerning these conferences, contact Mr. H. F. Ford, Dairy Department, Purdue University.

### PROJECT HOPE TO BRING KNOWLEDGE AND HELP TO SOUTHEAST ASIA

*Project HOPE is a privately sponsored program to share this country's modern medical knowledge and skills with the newly developing countries.*

*HOPE will send a floating medical training center to Southeast Asia during its first year of operation. The SS HOPE was formerly a Navy hospital ship, and is being loaned by the U. S. government. It will carry the most modern medical equipment and supplies, and training aids. The ship, formerly the USS*

Continued on Page 327



**IOSAN** is a patented germicidal cleaner that "tattles" on hard-to-remove or overlooked accumulations of milkstone with a tell-tale yellowish-brown stain that is easy to remove. It quickly cleans and sanitizes bulk tanks and other equipment. Reduces bacteria counts to consistent lows, leaves equipment sparkling clean.

**Kills Mastitis Organisms.** Iosan kills streptococcus, pseudomonas, E. Coli, staphylococcus and other organisms that cause and spread Mastitis. Its "Tamed-Iodine" killing power has been substantiated by laboratory tests that meet hospital standards. Iosan provides safe, low cost protection when washing udders and dipping teats.

**Two-in-one product.** Iosan saves time and labor by replacing two or more single-action products. Also reduces hot water bills because it is used in tap or lukewarm water. For a free demonstration contact your regular supplier or Lazarus Laboratories Inc., Div. West Chemical Products Inc., 42-16 West St., Long Island City 1, N. Y.

**Tamed Iodine®**  
GERMICIDAL CLEANER

THE ONLY Approved  
SANITARY METHOD OF APPLYING  
A U. S. P. LUBRICANT  
TO DAIRY & FOOD  
PROCESSING EQUIPMENT

*Haynes  
Spray*

**U. S. P. LIQUID PETROLATUM SPRAY**

U.S.P. UNITED STATES PHARMACEUTICAL STANDARDS

CONTAINS NO ANIMAL OR VEGETABLE FATS. ABSOLUTELY NEUTRAL. WILL NOT TURN RANCID—CONTAMINATE OR TAINT WHEN IN CONTACT WITH FOOD PRODUCTS.

**SANITARY—PURE**

**ODORLESS—TASTELESS**

**NON-TOXIC**



This Fine  
Mist-like

**HAYNES-SPRAY**

should be used to lubricate:

SANITARY VALVES  
HOMOGENIZER PISTONS — RINGS  
SANITARY SEALS & PARTS  
CAPPER SLIDES & PARTS  
POSITIVE PUMP PARTS  
GLASS & PAPER FILLING  
MACHINE PARTS  
and for ALL OTHER SANITARY  
MACHINE PARTS which are  
cleaned daily.

**The Modern HAYNES-SPRAY Method of Lubrication  
Conforms with the Milk Ordinance and Code  
Recommended by the U. S. Public Health Service**

The Haynes-Spray eliminates the danger of contamination which is possible by old fashioned lubricating methods. Spreading lubricants by the use of the finger method may entirely destroy previous bactericidal treatment of equipment.

PACKED 6-12 oz. CANS PER CARTON

SHIPPING WEIGHT—7 LBS.

**THE HAYNES MANUFACTURING CO.**  
4180 Lorain Avenue • Cleveland 13, Ohio



# Classified Ads

## FOR SALE

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

## SANITARIAN OPPORTUNITIES

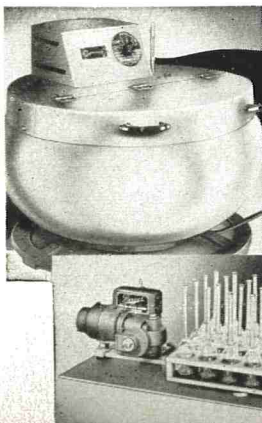
Several Sanitarian positions are now open in the Philadelphia Department of Public Health due to program expansion and recent promotions. Starting salary \$5347. Blue Cross, Blue Shield, life insurance and other liberal fringe benefits. Arrangements can be made to take the written examination in the area where you live. For further information, contact: Miss Joyce Tocks, Personnel Officer, Public Health Services, 500 South Broad Street, Philadelphia 46, Penna.

## POSITION AVAILABLE

Beautiful mountainous area, good schools and Jr. College. Abundant recreational opportunities. Range \$400-\$455 mo. Public Health Sanitation eligible for registration. Write: Arthur L. Warner, M.D., M.P.H. Director, San Juan Basin Health Unit, P. O. Box 140, Durango, Colorado.

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**Consistently Accurate!**  
**GARVER**  
 Milk & Cream Testing Equipment

Faulty testing equipment can turn profit into loss—fast. Insure now against inaccuracy with this efficient Garver combination.

1. Garver "Super" Babcock Tester. Speed controlled and speed indicated for extreme accuracy.
2. Garver "ovate action" Test Bottle Shaker. Thoroughly integrates test ingredients—saves time—eliminates dangerous, haphazard hand twirling.

Write today for catalog.  
**THE GARVER MANUFACTURING CO.**  
 Dept. JM, Union City, Ind.

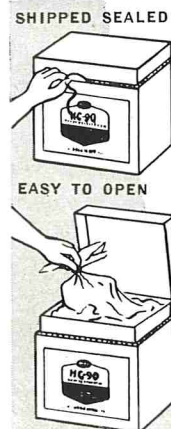
"Babcock Tester Manufacturers for Four Decades"

**Now!**  
**KLENZADE DETERGENTS IN**  
*Revolutionary*  
**KLENZ-PAK**  
**AT NO INCREASE IN COST**



**KLENZ-PAK PROTECTS**  
**CHLORINATED PRODUCTS**

**MAINTAINS QUALITY — PREVENTS CAKING**



Easy handling 50 lb. unit. Inner polyethylene liner can quickly and repeatedly be air-sealed. Protects contents to the last ounce. Sealed against dampness and water seepage. Hinge type cover keeps out dust. Another example of Klenzade progress . . . to give the very finest in sanitation service and products — first.

Ask Your **KLENZADE** Representative

**KLENZADE PRODUCTS, INC.**  
 Systematized Sanitation All Over the Nation  
**BELOIT, WISCONSIN**



Continued from Page 325

CONSOLATION, is a 15,000-ton vessel, with 230 beds. It was constructed during World War II.

*The permanent medical staff of the SS HOPE will include 15 physicians, two dentists, 25 nurses and 30 auxiliary personnel. Volunteer teams of up to 35 physicians will be flown to the ship on a rotating basis for tours of four months. The medical staff will include top specialists in the key fields of medicine. More than 1,500 medical people have applied for assignments on the SS HOPE.*

*HOPE is essentially a teaching program, although necessarily there will be treatment involved. American members of the medical staff will be assigned to work in small teams with their local counterparts. This will enable the American staffers to pass along modern techniques and the latest medical knowledge under working conditions.*

*Part of the medical staff will work on shipboard, part will form mobile, inland teams. They'll work with physicians, surgeons, dentists, health officers, sanitation officials, nurses, midwives, technicians.*

Training will also be conducted through classroom lectures and discussions, movies and film strips.

*Teaching is stressed because this will enable HOPE to have a more enduring effect on local health conditions than would attempts at widespread treatment. There are too many millions in need of treatment for a relatively small project to have broad impact in actually curing diseases. Concentration on training will enable HOPE to help upgrade the local medical people in their ability to diagnose and treat. Then these people will in turn be able to teach others. HOPE's impact will grow and spread.*

*The SS HOPE will visit only those countries that extend invitations. Indonesia is the first stop. The ship will remain there for about six months. Viet Nam will be next, for a four-month stay before its return to the United States. Invitations have also been received from Korea, Okinawa and Pakistan. The ship left for Indonesia on September 23.*

HOPE's program will be geared to the specific needs of the countries visited. Activities will be worked out in advance with local doctors. This will enable HOPE to concentrate on the most serious and pressing problems of each country.

*It will cost about \$3.5 million for one year's operation of the SS HOPE. The money is coming from private contributions — from business and industry, labor unions, other private groups and individual contributions. Contributions are tax deductible. The government's only role is loan of the hospital ship.*

Chairman of HOPE's Board of Directors is L. F. McCollum, President of Continental Oil Co. Ernest R. Brech, Director of the Finance Committee of

Ford Motor Company, heads HOPE's Business and Industry Committee, which has charge of corporate fund raising. Some of the most noted men in American business are heading committees for individual industries.

*Support for Project HOPE is widespread. It has been endorsed by the American Medical Association, the American Dental Association, and many other medical associations. It has the personal backing of President Eisenhower, who made the decision to lend the hospital ship.*

The American President Lines will operate the SS HOPE at cost. Drug and pharmaceutical companies of the U. S. will supply the drugs and medicines needed. The American petroleum industry will give the fuel needed for the ship. The Pure-Pak Division of Ex-Cell-O Corporation is underwriting a major motion picture project to raise funds for HOPE.

*The need for HOPE is great. In much of Southeast Asia, there just aren't enough doctors to go around. In Indonesia, for example, there is one doctor for every 71,000 persons. In the U. S., there is a doctor for every 750 persons. With such a shortage, the doctors are so busy they find it difficult to keep up with modern techniques and developments. And they can't get away to Europe or the U. S. for advanced training. Project HOPE will, in effect, bring the medical school to them.*

Poverty, disease, malnutrition are common in Southeast Asia. Millions of people there are caught up in a vicious circle. They have to produce to survive, and unhealthy men cannot produce.

*HOPE's medical staff will benefit too, in new-found knowledge. Information will flow both ways. The experience to be gained in diagnosis and treatment of tropical diseases couldn't be gained anywhere in the U. S.*

*HOPE is an experiment in international cooperation. HOPE's backers believe better understanding among the peoples of the world can be achieved on a personal level, through friendship, sharing knowledge, and helping others to help themselves.*

These people-to-people contacts can help form the basis of a lasting peace.

Project HOPE is headed by Dr. William B. Walsh, Washington, D. C. internist and heart specialist. HOPE is the majority activity of The People-to-People Health Foundation, an outgrowth of President Eisenhower's People-to-People suggestion made in 1956.

HOPE means . . .

HEALTH OPPORTUNITY  
FOR PEOPLE EVERYWHERE.



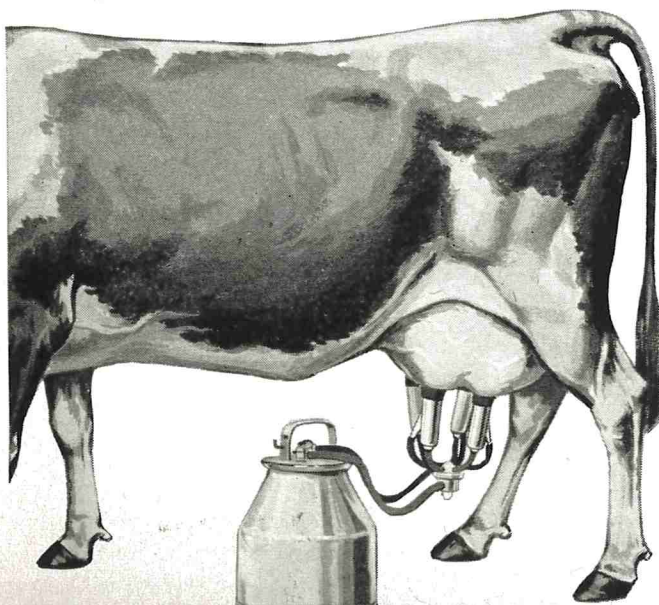
# Milk protection *starts* at the source

Milking utensils, bulk tanks, dairy plant equipment . . . all stay sanitized with Lo-Bax, the chlorine bactericide approved by health authorities. Lo-Bax kills bacteria fast . . . always gives sure sanitation. For your own protection and best-quality milk production, recommend Lo-Bax Special or LoBax-W (with a wetting agent) to your producers. Write for booklet, "How Can I Sanitize My Milk Utensils."

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*bacteria*  
For a low  $\Delta$  count  
at low cost . . . **LOBAX**

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## Objective:

**TO ASSURE FULL VITAMIN POTENCY  
AND FLAVOR STABILITY DURING  
THE SHELF LIFE OF THE MILK**

It is important for all those associated with the milk industry to know about the extremely high quality of Vitex® Vitamin Concentrates. There is perhaps no other industry where health and sanitation standards, where inspection, control and regulation, play such a key role. In consequence, it is well to realize that Vitex concentrates meet or exceed every criterion and are entirely acceptable as a food additive.

Vitex concentrates are processed in a Grade A plant under AAA standards. Every batch of pure vitamin crystals is assayed before processing. And not one batch of the finished product can be released for shipment until the laboratory provides a clean bill of health concerning: total plate count; thermophile count (37° and 55°C) at 10 days; viscosity; physical appearance (fat and solids separation at 10 days at 37°C); final report of vitamin assay.

Vitamin additives offer dairies a profitable means of providing better balanced nutrition. Vitex Vitamin Concentrates are the consumer's best assurance of purity, potency and stability.

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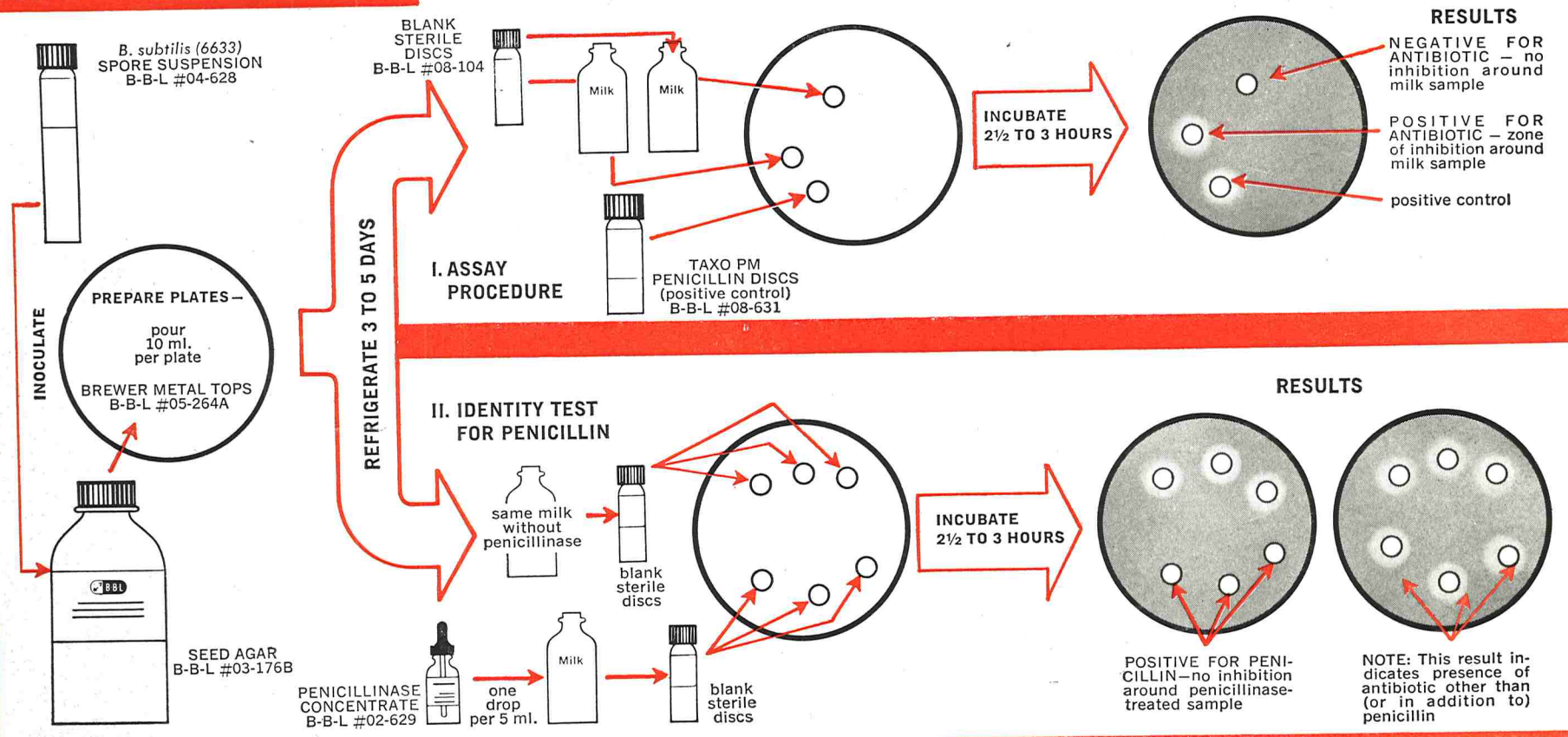
Pioneer Producers of a Complete Line of Vitamin Concentrates for the Dairy Industry





# techniCHART

## DETECTION OF PENICILLIN IN MILK



The presence of antibiotics in milk following mastitis therapy in cows has created serious public health problems and caused technical difficulties within the dairy industry. A rapid, practical laboratory procedure to assist regulatory agencies and the dairy industry in solving these problems was described by Arret and Kirshbaum.\* This procedure employs rapid growth of a sensitive strain of *B. subtilis* for assaying the presence of antibiotics

in milk and for determining its identity with penicillin. Inhibition of growth by the presence of as little as 0.05 unit of penicillin per ml. of milk sample is detectable within 2½ hours. In answer to many requests for information about the availability of B-B-L products for this simplified procedure, the B-B-L Development Laboratory has prepared this TECHNICHART. It graphically illustrates the basic procedure, showing the materials

necessary—all of which are available from B-B-L. A complete brochure with detailed technique and product listing is available upon request.

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

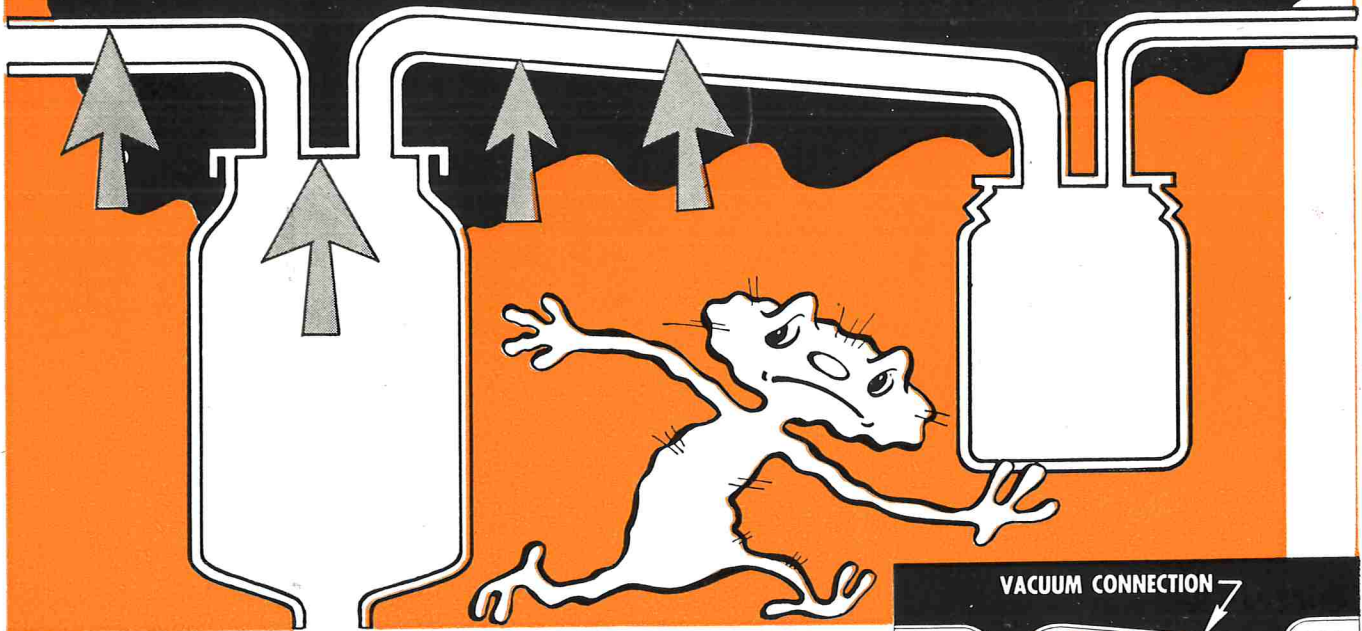
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# **SURGE** CLEANS THIS "ZONE OF CONTAMINATION"



## **SURGE** does a complete job...

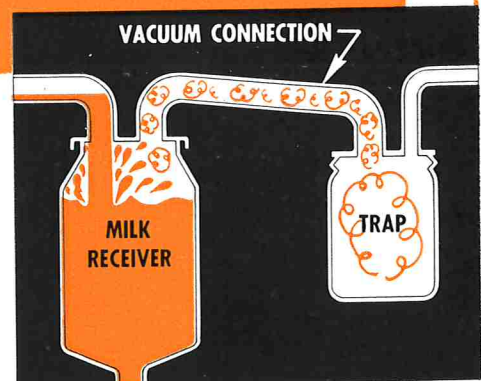
To produce the kind of milk that you would allow your own youngsters to drink, all parts of your Milker Pipe Line must be entirely and completely clean. To splash some water and detergent here and there is not enough . . . it takes such a little dirty spot to provide a breeding place for bacteria.

It is easy to create a great commotion with the water . . . easy to wash the pipe line itself, but this won't hold your count down if you let the receiver pail and trap with the connecting line accumulate contamination. Unwashed spots can quickly become dirty spots . . . they become "zones of contamination." That's why Surge is so very fussy about washing them.

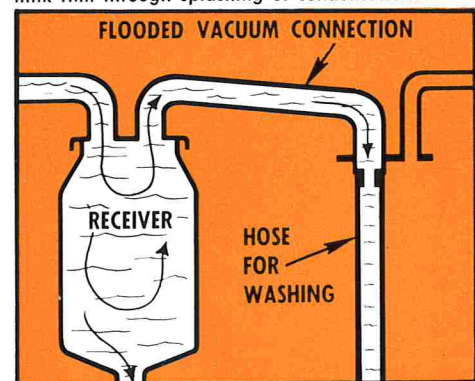
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MILK OR MILK VAPOR touches all inside surfaces of a pipe line system during milking. Top of milk lines, bottom of receiver and dispenser covers . . . even vacuum connections to traps collect some milk film through splashing or condensation.



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