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NOTICE TO MEMBERS
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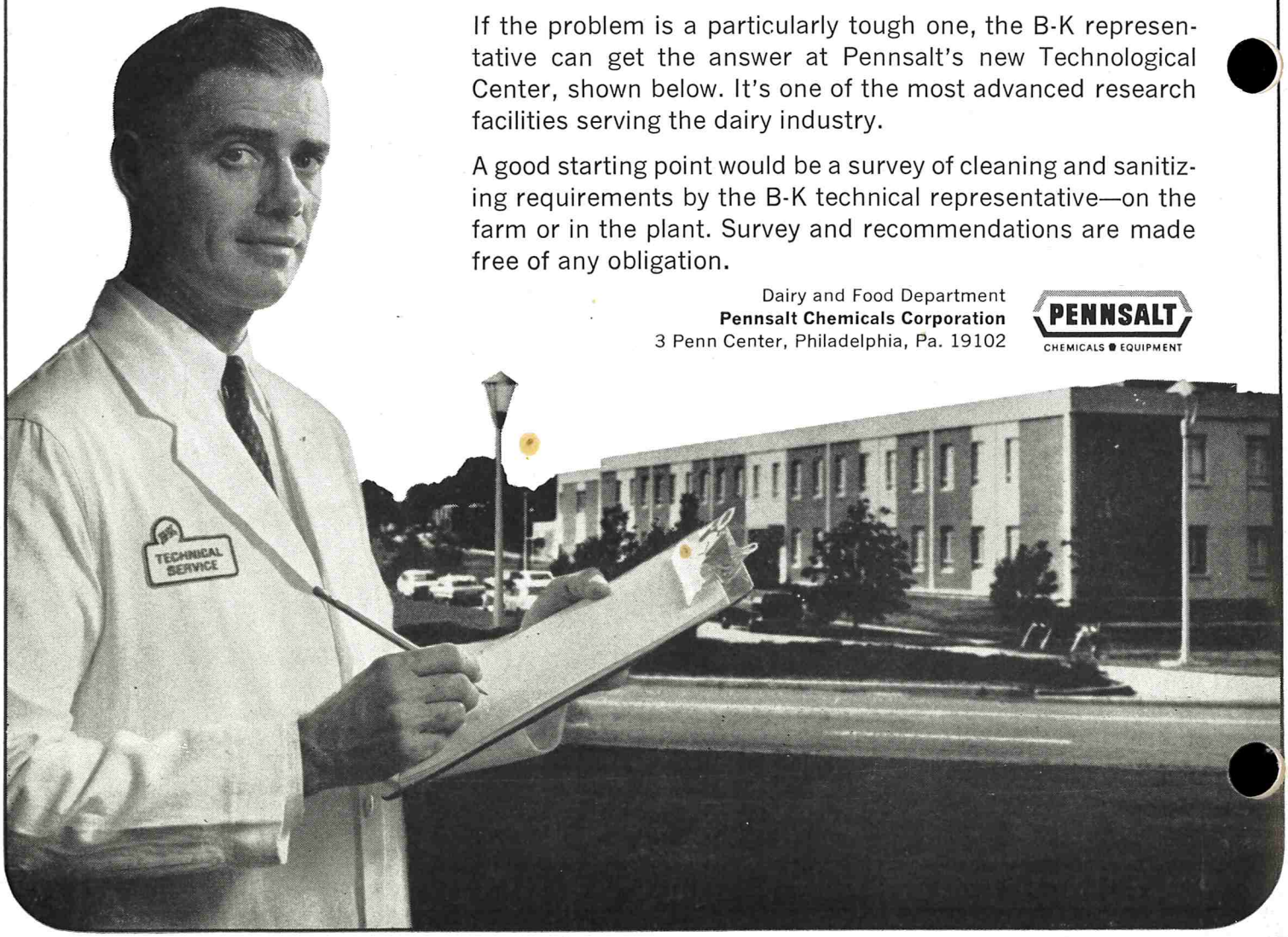

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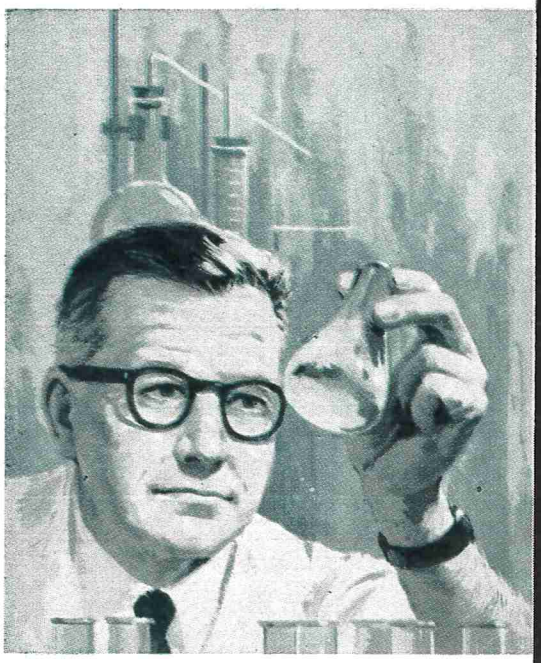

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EFFECTIVE TESTING PROCEDURES FOR EVALUATING PLANT SANITATION[1]

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Summary

Continuing problems with post-pasteurization contamination of milk and cream have stimulated dairy plants to undertake intensive programs to improve sanitation practices. Sources of contamination such as air, water, containers, fillers, pumps, joints, valves, cleaners and sanitizers have received more attention by the more progressive plants. Basic steps have been found to be necessary for improved keeping quality. These are a standardized reference test such as the Moseley 5 days at 45 F test, application of trouble shooting procedures, and application of additional sanitary measures. Comparisons using the Moseley keeping quality test and CVT test showed little correlation between them. A newly designed sampler has provided means of monitoring sanitary conditions and product keeping quality. It is a 3/8-inch drilled hole with a rubber insert clamped in by a stainless steel clamp. The sampler has withstood any pressure applied to it internally under normal dairy processing and can be permanently located in any pipe line system.

Product filling equipment is still the main contributor of contamination. It was found that manual cleaning instead of CIP cleaning was a necessity in equipment that had many product sealing joints. These areas particularly vulnerable due to heavy lubricants often used. Spraying filling areas with sanitizers during processing is essential. Plant conditions change every hour during production, therefore, adjustments in procedures to avoid contamination must be exercised. Cursory examination of plants to evaluate sanitation is insufficient. The best criterion still is the bacteriological and flavor condition of the product at the consumer level.

In the last few years there has been a growing awareness in dairy processing plants that procedures formerly used to measure plant sanitation are outdated and ineffective. This usually results in continuing consumer complaints of premature spoilage in purchased dairy products. Dairies plagued by such experiences should realize that their present procedures are not yielding them the best results publicity-wise and dollar-wise. The best criterion for determining the efficacy of plant sanitation is still the bacteriological and flavor condition of their product after an extended shelf exposure in the market or home. The effort that individual plants make in initiating improvements in their sanitation programs is directly reflected in the length of time their products will remain in top condition in any given market area.

Certain factors formerly taken for granted by many operators are becoming vastly important, especially to the more progressive plants. These include air, water, containers, fillers, pumps, joints, valves, cleaning and sanitation procedures and perhaps, the most important, plant personnel. The more progressive dairies are not accomplishing these gains by accident. Their gains have occurred in a stepwise fashion with noticeable increases in product shelf life.

Future trends of the industry towards centralized processing, less frequent processing and delivery, and greater hauling distances will by necessity demand that all products have good shelf life characteristics. Those dairies that are now on intensified programs that provide these characteristics are enjoying considerable economic gains in processing, distributing and marketing. Some have been successful in acheiving a 14-day shelf life at 45 F while others have maintained consistently low counts and good flavors after 7 days at 45 F.

This paper presents data instrumental in establishing programs that have been successful in a number of dairy plants throughout the country. It has been shown that these concepts are not out of reach for any plant and can be adopted with very little expenditure and added man-hours. The necessity for continual development of new ideas that will improve existing methods for evaluating post-pasteurization sanitation will also be stressed.

Basic Steps

Information obtained from a number of plants on improved sanitation programs have indicated that a number of basic steps are required in order to have a successful keeping quality program. Evaluation of plant sanitation also can be derived from the information provided by employing these basic steps:

1. A standardized reference test such as the Moseley 5 days at 45 F test. This test provides for greater information relating to the bacterial condition of the marketable product than either the coliform test,

[1]Presented at the 53rd Annual Meeting of the International Association of Milk, Food, and Environmental Sanitarians, Inc., August 15-18, 1966, at Minneapolis, Minnesota.

TABLE 1. PLATE COUNTS OF STORED SAMPLES SHOWING EFFECTS OF INCREASED STORAGE PERIOD

Product	Number of days storage at 45 F		
	5 days	6 days	7 days
Skim	<3,000	4,000	850,000
2%	<3,000	<3,000	6,000
Homo	190,000	4,200,000	26,000,000
Stand	<3,000	<3,000	<3,000
H.H.	4,000	520,000	7,600,000
Whip	530,000	6,500,000	TNTC

TABLE 2. COMPARATIVE DATA ON POOR KEEPING QUALITY MILK USING CVT TEST AND 7 DAYS STORAGE AT 45 F TEST

	Plate counts			
	CVT fresh	Flavor	After 7 days storage at 45 F	Flavor
2%	13	OK	3,400,000	sl. stale
Homo 3.8%	9	OK	6,000,000	putrid
Homo 3.25%	1	OK	4,100,000	OK
Homo 3.8%	19	OK	2,500,000	sl. stale
Homo 5%	1	OK	4,200,000	sl. fruity
H & H	4	OK	780,000	OK

TABLE 3. COMPARATIVE DATA ON POOR KEEPING QUALITY MILK USING CVT TEST AFTER 18 HR STORAGE AND 7 DAYS STORAGE AT 45 F TEST

	Plate counts			
	CVT after 18 hr at room temp.	Flavor	After 7 days storage at 45 F	Flavor
Trim	6	OK	TNC	bitter
2%	30	OK	460,000	OK
Homo 5%	180	OK	250,000	OK
Homo 3.8%	240	OK	TNC	stale
Homo 5%	4	OK	100,000	OK
Homo 3.25%	20	OK	910,000	OK

psychrophilic, or standard plate count of fresh products. Storage of pasteurized samples at 45 F simulates temperatures that products will actually be subjected to in the market or home.

2. Apply trouble shooting procedures designed to pinpoint the areas where contamination of the product occurs. Aids that may be utilized in this procedure are special sampling devices, black light, a strong flashlight, daily plant control charts (time, temperature, pressure) and the use of visual and organoleptic tests.

3. Provision of additional measures of sanitation referred to as the "Fine Points of Sanitation." These measures may be in the form of new and modified equipment or as procedures that are to be executed before as well as during production.

STANDARDIZED LABORATORY REFERENCE TESTS

The Moseley Keeping Quality Test *(1)* has been used successfully by many dairy plants for a number of years. This test directly reflects the sanitation program exercised by the plant. In the laboratory only the storage samples held at 45 F are run. This is in lieu of plating fresh pasteurized samples for coliform, total plate count and fresh psychrophilic counts. Dependance on bacterial analysis of freshly processed products for evaluation of plant sanitation has long been shown to be of little value. Laboratory personnel can utilize the time gained by this procedure in spot checking in questionable areas in the plant that may be contributing contamination.

The Moseley test can be made more sensitive by extending the storage time beyond 5 days. This is illustrated by counts on samples stored for 7 days at 45 F. Table 1 shows counts of products held 5, 6 and 7 days. It is apparent from the data that in some cases satisfactory counts in 5 days do not predict the condition of the product in 7 days. This occurs because of the rapid rate of growth of organisms involved at 45 F. The number of days before this pronounced increase is noted depends primarily upon the degree of contamination and the types of organisms. The significance of this contamination becomes more and more apparent as the days of the test are extended.

In recent years there has been considerable interest in developing a rapid test for predicting keeping quality. One test familiarly known as the CVT test employs a special agar medium containing crystal violet and triphenyltetrazolium chloride. The crystal violet selectively inhibits growth of gram-positive organisms, but allows growth of organism most commonly found in poor keeping quality pasteurized products, namely, gram-negative organisms. These gram-negative organisms are dyed red from adsorption of triphenyltetrazolium chloride. CVT plates containing greater than 100 colonies suggest poor keeping quality. The next two tables (Tables 2 & 3) show comparative data on poor keeping quality milk using the CVT test and the 7-day at 45 F test. The first table (Table 2) shows representative data which are typical of 90 random samples of pasteurized prod-

ucts having high counts and/or poor flavor. These samples were plated when fresh on CVT media. One can readily see that the CVT test failed to provide accurate prediction of shelf life. Out of the 90 samples plated, only 15% showed correlation between CVT test and standard plate counts of milk stored 7 days at 45 F. The next table (Table 3) shows CVT counts on products plated after holding 18 hours at room temperature. It is apparent that this modification of the CVT test did not sufficiently improve its accuracy. Results suggest that inhibitors in CVT medium actually depress considerable numbers of bacteria that develop in milk at 45 F. The CVT test may serve as a useful tool for dairies with excessive post-pasteurization sanitation contamination. However, it is doubtful that accurate information can be derived from the CVT test for dairies having good control of post-pasteurization contamination.

IMPROVED TROUBLE SHOOTING PROCEDURES AND DAILY ROUTINE PLANT CONTROLS

Significant gains have been made in improving daily routine controls and trouble shooting procedures. As indicated earlier, little value is obtained from analysis of fresh pasteurized products. Unfortunately, many plants still use this as an index of their plant sanitation programs. When these plants are in trouble, indicated most probably by customer complaints, great effort is expended in disassembling equipment, laboratory testing and cleaning lines, joints, valves, tanks and other post-pasteurization equipment. Present day concepts of plants on adequate sanitation programs are to obtain as much information as possible using selected laboratory and plant tests. When trouble does occur, initiation of procedures to pinpoint the area of contamination are exercised. For example, sampling of all pasteurized products from specific designated areas such as at HTST units, surge tanks, coolers and filling machines. These samples are marked with information pertaining to HTST processing unit, lines used, surge, storage and weigh tanks, filler or packaging unit, processing times and sequences where applicable. All samples are then stored at 45 F from 7 to 14 days, then plated for total count and flavored. Equally important are plant tests such as flavoring before filling or packaging, daily determinations for adequate strengths of all cleaning and sanitizing solutions. Precise plant records are kept of CIP and processing temperature and pressure recorders, also routine inspection dates of all equipment with notations of conditions and any replacements or changes made.

The following tables illustrate the value of this approach. Table 4 points out critical areas in a filling machine determined by selective sampling and plating after 7 days at 45 F. Table 5 is a typical plant report of ice cream mix. Samples are routinely taken from storage tank, weigh tank (where blended mixes are standardized) and finally from can or carton. The sales 6% and 4% are blended from the 0% and 12%. Note that the 6% sales was contaminated by a dirty can. It was also interesting to note that the TNC count of 12% freeze held in T-8 was traced to inadequate cleaning of the tank. This was verified by the CIP temperature-pressure chart indicating a malfunction. The next table (Table 6) shows plate counts of cottage cheese showing filling and blending areas as sources of contamination. Selective sampling of the product during processing and packaging and holding for 14 days revealed several interesting facts. First, there was enough contamination from the dressing and dry curd to cause deterioration in 14 days at 45 F. Secondly, the filling equipment and handling techniques contributed additional contamination to cause the product to deteriorate in considerably shorter time at 45 F. Third, the condensate and drippings alone without being in contact with the product contained organism that could grow to large numbers in 14 days at 45 F.

TABLE 4. PLATE COUNTS OF STORED SAMPLES SHOWING SPECIFIC AREAS OF CONTAMINATION AT FILLER

Product	Plate counts after storage 7 days at 45 F				
	Above bowl	At filler bowl	At manifold	At slide spigot	In carton
Homo	<3,000	<3,000	<3,000	<3,000	<3,000
Skim	<3,000	<3,000	<3,000	78,000	320,000
H.H.	<3,000	18,000	24,000	180,000	240,000
Whip	<3,000	<3,000	<3,000	2,300,000	2,600,000
M.V.	<3,000	90,000	90,000	160,000	280,000

TABLE 5. TYPICAL PLANT REPORT SHOWING PLATE COUNTS OF ICE CREAM MIX STORED 7 DAYS AT 45 F

Product	Storage Tank no.	Storage tank	Weigh tank	Can
0% sales	T-13	<3,000	—	—
12% sales	T-14	<3,000	5,000	4,000
6% sales	—	—	<3,000	2,900,000
4% sales	—	—	<3,000	<3,000
Choc Shake	T-5	<3,000	<3,000	7,000
12% Freeze	T-8	TNC	—	—
4% Freeze	T-4	<3,000	—	—

TABLE 6. PLATE COUNTS OF STORED COTTAGE CHEESE SAMPLES SHOWING FILLING AND BLENDING AREAS AS SOURCES OF CONTAMINATION

	Number storage days at 45 F				
	Fresh	6 days	8 days	10 days	14 days
Dry curd vat	4,800	3,900	4,900	4,000	4,000
C.C. blender	2,900	2,800	58,000	110,000	TNC
Dressing (BL)	300	500	3,100	58,000	4,000,000
Pt. cottage	11,000	97,000	1,600,000	14,000,000	TNC
Qt. cottage	140,000	290,000	1,800,000	24,000,000	TNC
M.T. carton	5				
Drippings	<300	<300	3,000	58,000	4,000,000

TABLE 7. COMPARATIVE PLATE COUNTS OF STORED SAMPLES FROM ROTARY (R) VS. PISTON (P) TYPE PURE PAK FILLERS

Product		Number days storage at 45 F			
		7 days	9 days	12 days	14 days
2%	½ gal (R)	<3,000	<3,000	4,000	10,000
Homo 3.55	½ gal (R)	<3,000	<3,000	3,000	12,000
Homo 3.25	gal (R)	<3,000	<3,000	<3,000	8,000
Homo 3.8	qt (P)	<3,000	3,000	140,000	2,900,000
H & H	pt (P)	780,000	3,100,000	14,000,000	TNC
Whip	½ pt (P)	9,000	11,000	290,000	TNC

These drippings obviously find their way into the product adding additional contamination.

REFINEMENTS IN SAMPLING DEVICE

In-line sampling devices have been used in pinpointing trouble areas *(1)*. These devices were designed to aseptically withdraw samples of milk or other fluid milk products repeatedly without disruption of plant processing. The newest version of the sampler requires a 3/8-inch hole drilled into a pipe line at any given location. A soft rubber insert is placed into the drilled hole then clamped into place with a stainless steel clamp. (Figure 1).

The 3/8-inch diameter hole can be drilled into any standard stainless steel pipe line or fittings. The hole should preferably be drilled close to a pipe opening to facilitate grinding and polishing of hole. The drilled hole should be smooth with no cutting edges. If the hole is in a line cleaned by a CIP system, it must be positioned so as to be completely immersed when circulating. On elbows, the hole is generally positioned on the outer curvature. It is of some advantage to have the sampling port in standard fittings instead of in welded lines. This provides

Figure 1. New sampler consisting of a 3/8-inch drilled hole with a soft rubber insert secured into place with stainless steel clamp. Sample taken with syringe.

greater flexibility by being able to replace standard fittings with an identical fitting having a sampling port built in.

The rubber insert is a conventional serum cap available by ordering a S-94 Stopper 87-Red from T. C. Wheaton Co., Millville, New Jersey. These inserts are autoclavable and will withstand acid and alkaline detergents, chlorine, or other suitable sanitizers. Inserts are changed during cleanup after one day's sampling. If inserts have not been punctured, they may remain in position for periods up to three weeks. If exterior soiling occurs due to leaky lines dripping on sampler, the sampler should be disassembled and cleaned every day. The exterior seating surfaces (outer portion of pipe surrounding hole) must be cleaned and sanitized prior to installing inserts. Inserts and clamps are immersed in 200 ppm chlorine solution before being placed into position.

The clamp that holds the rubber insert in position is an all stainless steel hose clamp with a wing nut clasp. A variety of sizes are manufactured by Marman Products, Tri-Clover and Gates Rubber. These are available through most dairy equipment supply houses. Midway between clamp opening, a centered 1/4-inch hole is drilled. This hole must be smaller than the drilled hole in the pipe, but must be larger than center ridge of rubber insert. The smaller hole in the clamp provides a shoulder for support of the rubber insert.

The following precautions must be exercised in the final assembly:

1. Make sure sanitized rubber insert is pushed up snug into drilled hole.
2. Place sanitized clamp over rubber insert so that hole in clamp is centered over center ridge of insert.
3. Tighten clamp firmly over rubber insert so that entire surface of rubber insert lays flat on surface of pipe. Do not tighten to cause mashing or stretching of rubber insert. Shaping of clamp may be necessary so that even pressure can be applied over entire rubber insert.

Samples are taken using sterile hypodermic needles fitted with an attached tube or syringe. On the positive pressure side of a line, either of the above will work; on negative pressure side, only a syringe with a hypodermic needle will work. A 1-inch to 1½-inch, 21-gauge needle is the maximum size that can be used to insure self-sealing of rubber insert. The rubber insert is sanitized with alcohol or 200 ppm chlorine solution just prior to sampling. This can be applied by wiping or spraying. The needle is inserted into the mid stream of pipe with the bevel of needle facing upstream. Approximately ten repeated samplings can be taken though the rubber insert. On repeated samplings, try not to puncture through the same hole. Repeated punctures through the same hole will result in leaks. It is also a good practice to sanitize immediately after sampling.

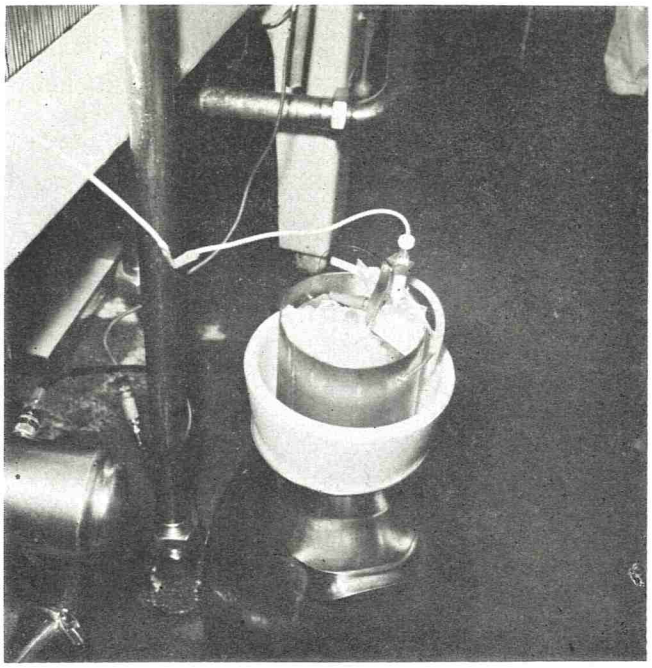

Figure 2. Continuous sampling arrangement consisting of sterile disposable hypodermic needle attached to plastic hose and connected to sterile plastic sampling bag. Sample is refrigerated in receptacle containing cold wall plate using dry or wet ice.

Sterile disposable plastic hypodermic syringes may be purchased from Pharmaseal Laboratories, Glendale, California. (Order Stylex Syringes Cat. No. 7373). These syringes may also be available through a local medical supply house. Different volume syringes are available.

This sampler has withstood any pressures applied to it internally under normal dairy processing. It can be placed in any location as a permanent installation. Swab tests have indicated that the sampler can be cleaned in place, yet will withstand cleaning in a circulating parts washer. Inserts have been left in place for periods of three weeks without any noticeable deterioration.

A special adaptation can be made to sample continuously into a refrigerated receptacle by using special techniques (Figure 2). This new innovation will permit monitoring of any given location. Tests are now being conducted to use this system in sampling raw milk to HTST units taken from a number of raw holding tanks. Sampling of strategic areas from permanently installed samplers has saved considerable time and effort in pinpointing areas contributing contamination. One dairy plant has samplers installed permanently at the outlet of two HTST units, at the outlet of pasteurized surge tanks and above the bowl of each filling machine. Plants that

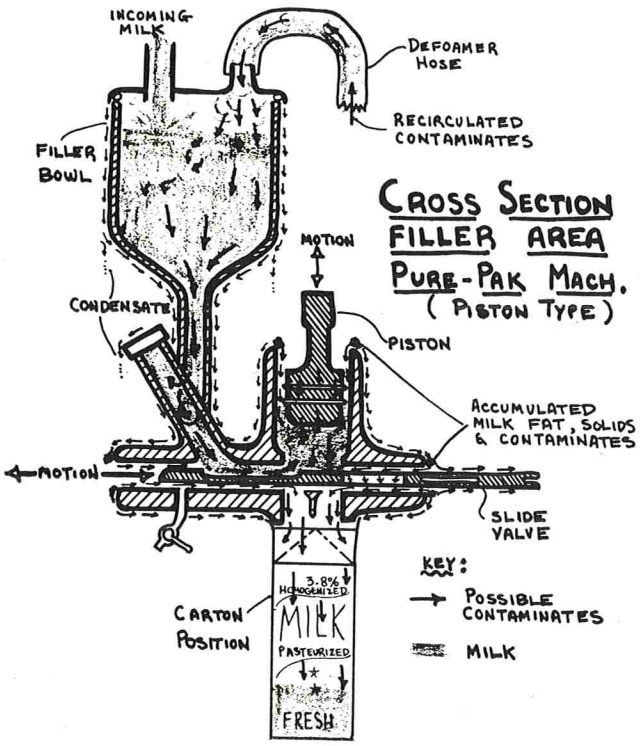

Figure 3. Cross section diagram of filling area of piston type Pure-Pak filling machine showing routes that contaminants gain entrance to product.

have considerable post-pasteurization equipment such as pumps, coolers, vacuumizers and clarifiers should seriously consider if these units are doing more harm than good in contributing contamination to your final product. This can be determined by incorporating sampling equipment described above.

FINE POINTS OF SANITATION

Suggestions to dairies for improving sanitary conditions of post-pasteurization equipment *(1)* have been helpful in providing improved sanitation with subsequent increases in shelf life of their products. With knowledge of how to increase and maintain certain levels of improved sanitation, more and more information has been accumulated that will contribute to a better understanding of the problem. This information generally falls into two categories, equipment development and new sanitation procedures.

Constant updating and improvements of processing, cleaning, sanitizing and assembly procedures have introduced new equipment and modifications of existing equipment. Often this equipment has been redesigned by individual dairies to meet the need of their sanitation programs. While other equipment such as new filling machines have been designed with sanitation in mind. To illustrate the superiority of these newly designed fillers, the next table (Table 7) compares counts of stored samples from the rotary type vs. the piston type Pure-Pak filling machines. These results indicate the rotary type to be more sanitary than the piston type. Some of the reasons for this superiority are:

1. Internal gravity filling.
2. Individual shielding of cartons.
3. No vacuum defoaming.

These features are completely lacking in piston type fillers and can best be illustrated by comparing Figures 3 and 4. In the piston type machine the open cartons travel directly under the filling area where they receive an aliquot of product and possibly contamination that may have accumulated from the filler bowl on down. The open exposure to external conditions of the piston and slide valves which sometimes are metal to metal fittings makes prevention of direct contamination extremely difficult. Regardless of the size of carton being filled, they all pass under the four cylinders which may be dripping potential contaminants. The vacuum defoamer which is usually connected as a return to the filler bowl completes the cycle by returning product, which may contain contaminants back to the fresh product reservoir. The half-gallon Pure-Pak machine by contrast is a rotary type with individual filling heads.

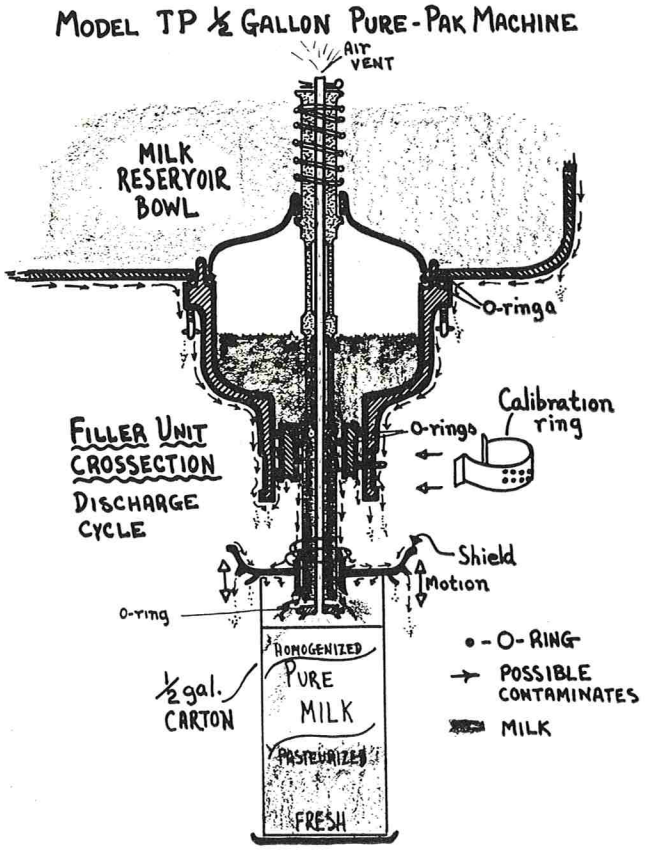

Figure 4. Cross section of a filling head of rotary type Pure-Pak machine illustrating improved sanitary construction. Routes of potential contaminants are also shown. Most contaminants being shunted off from carton by protective shield.

Each carton will contact only one head and will be influenced by this filling head alone. Condensate containing air and soil contaminants still gather on the cold surfaces of both types of machines, however, a shield protects the individual cartons from direct contamination on the rotary type filler. Although direct external contamination is minimized, product is still vulnerable to internal contamination.

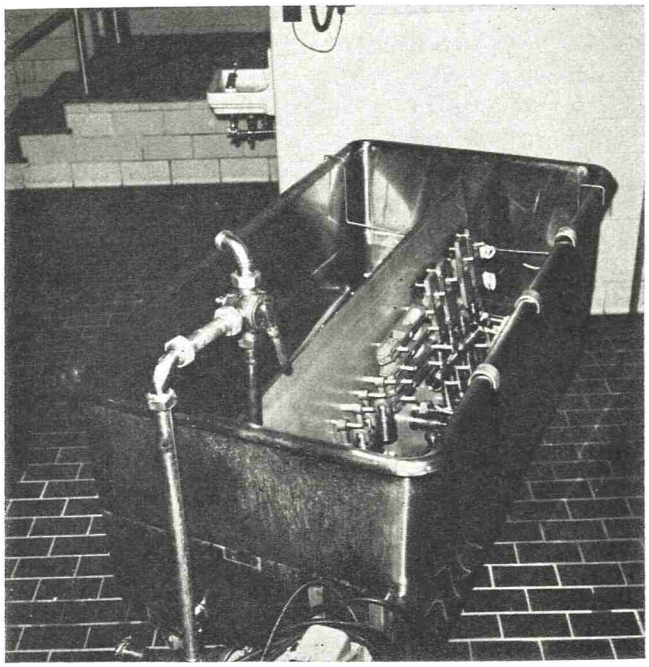

Figure 5. Newly designed circulating tank with top rolled edge facing outward containing special rack fitted with polyethylene protected hangers for parts.

This is especially true if all soil is not removed in cleaning milk contact surfaces within the filling head. Seals either by O-ring or gasket are particularly critical. As indicated earlier trace contamination by soil, milk solids or fat become increasingly significant as sanitation programs are refined. Selection of types of organism having differing growth rates at 45 F also becomes apparent. This oftentimes accounts for the variability observed in shelf life storage of product processed on the same day, on the same filling machine — even at the same time period of filling.

Other equipment or equipment modifications that have aided sanitation improvements are:

1. Newly designed circulating tanks for parts (Figure 5). These rectangular tanks have conventional circulating lines with a centrifugal pump but differ in having a top rolled edge facing outward and contain special racks for parts. This rack designed primarily for filler parts contains individual hangers for each part with polyethylene protectors to prevent scratches or burrs by metal to metal contact. These tanks perform a dual function — for cleaning and for use as a sanitizing tank when assembling.

2. Assembly jig (Figure 6) to assist the operator in handling heavy and complex units such as a filling head. This facilitates the operator in assemblying the units in a sanitary fashion and minimizes hand contamination. They are very simple devices constructed entirely of stainless steel and made portable by casters. Hangers for O-rings and small parts are conveniently located for easy accessibility by operator. The entire jig is sanitized prior to use and can be sprayed with sanitizer during assembly.

3. Flushing pipe lines (Figure 7) has been helpful. These are connected directly to fillers so that product can be purged through the system into a separate flush tank. This eliminates manual drainage of fillers and prevents excessive spillage and dripping of milk products in an area that should be entirely free of organic material.

4. Modification of pipe lines to include more welded and clamp type connections. Eventual elimination of sanitary thread joints where possible is advisable especially in lines that are circulated with hot and cold solutions. Loose sanitary thread joints due to expansion and contraction and vibration become likely trouble areas.

5. Sanitizer proportioning equipment located in key areas where on-the-spot sanitizing is necessary in such areas as fillers and other post-pasteurization handling equipment. This equipment must be 100% efficient in providing desired germicidal levels of sanitizers at all times.

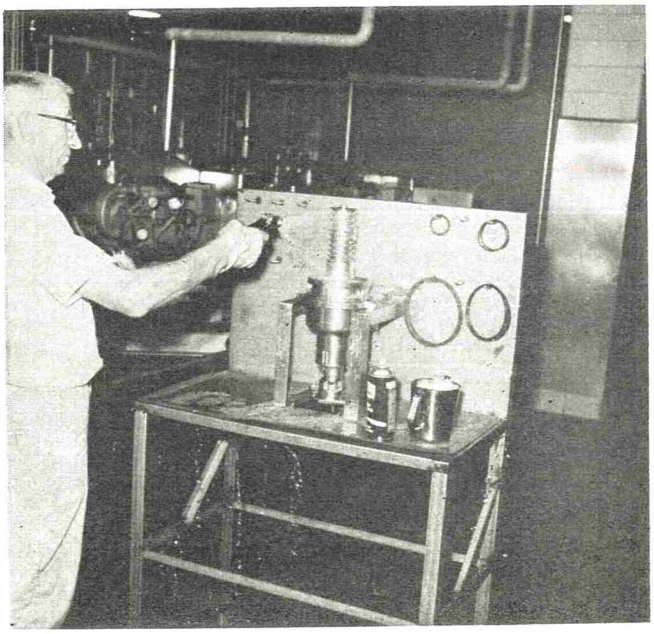

Figure 6. All stainless steel assembly jig for disassembly and sanitary assembly of heavy filling heads of rotary type Pure-Pak filling machine.

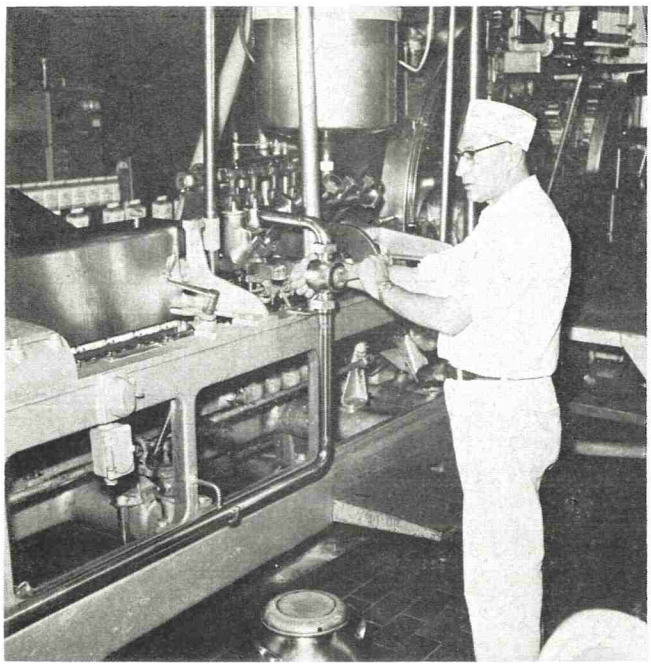

Figure 7. Flushing pipe line on piston type Pure-Pak machine used in purging filling area and to minimize hand contamination during manual drainage of filling units.

6. Solution sampling cocks should be provided on all CIP systems. These should be positioned to sample wash solutions after usage. Sampling periods oftentimes can be programmed into automatic controls of CIP systems. An aliquot of the solution desired can then be withdrawn into a receptacle automatically.

Areas that continue to contribute contamination are various types of filling devices for fluid milk or fluid milk products, core type valves, sanitary thread joints, pipe manifolds, dead end lines, dirty hoses, and air bleeding valves on lines. Procedures for control of these trouble areas will differ from plant to plant. The most essential thing that must be stressed is that these areas must be cleaned to be void of soil, sanitized during assembly, sanitized just prior to use and during usage. Measures to sanitize during production must be developed to suit individual plants. Special consideration must be given to fillers and pumps. These should be assembled just prior to use. The best method is full immersion of parts in a slightly acidified (pH5) bath followed by addition of an appropriate sanitizer. Hypochlorites have been used successfully. If properly administered and controlled for strength, no detrimental effects due to corrosion are apparent. Excessive contact time and misuse of strength are often the reason for corrosion by this sanitizer. Other sanitizers on the market such as iodophors have been used effectively for on-the-spot sanitization.

Flushing off filling areas of all types of fillers with sanitizing solution is still an important step in maintaining sanitary control of condensate and accumulated milk solids during production. It has been shown that this procedure is an absolute necessity to maintain sanitary control of some types of filling machines. Periodic timed spraying has been incorporated by many dairies. Every 30 minutes or when there is a product change-over has been the time set for executing this procedure. Some beverage manufacturers have observed that atmospheric contamination around the filler is extremely significant. They have installed atomizers that spray mists of sanitizers continuously above the filling area of filling machines as a control measure.

Variation in storage counts from fillers cleaned by CIP have revealed improper cleaning of internal parts. Areas most vulnerable are milk contact seals. Many dairies still resort to manual cleaning with complete disassembly of all parts daily. Circulating tubs with built in racks and assembly jigs have facilitated cleaning and sanitizing of these machines. The time and cost are slightly greater using this technique, but the consistently excellent results obtained far offset the additional cost. New filling machines designed for cleaning by CIP insure exposure of all milk seals to cleaning solutions and have produced satisfactory results. One of the main deterents to effective cleaning of filling machines has been the excessive use of heavy lubricants that are hard to remove. These lubricants mix with milk solids and offer an excellent place for carrying over contaminants. The only satisfactory control has been manual removal by wiping of lubricants prior to washing. Washing in circulating tanks having rolled edges outward tend to float off these fats in the wash. Tanks that are rolled inward tend to trap the fat and redeposit it on the clean parts. Use of detergents high in wetting agents have also aided removal of this type of soil.

OTHER ASPECTS IN EVALUATING PLANT SANITATION

Ideally, plants should minimize the amount of equipment that post-pasteurized products must flow through to the final container. These may be complex networks of lines, tanks, valves, clarifiers, separators and plate coolers. If too much flexibility in product handling is designed into the plant, a proportionate increase in potential problem areas will develop. Oftentimes, substantial gains are made with increased flexibility. If this is justified, then utmost precaution in cleaning, sanitizing and plant control (time, temperature, pressure) must be maintained before and during production. Again, it must be emphasized that there is no longer gross visable soiling occurring in most modern processing

plants. It is trace contamination that we are seeking. Plant conditions are changing every hour during production, and it behooves one not to be satisfied that conditions will remain satisfactory after the beginning of the day. Cursory examination of plants to evaluate sanitation is fallacious. A more indicative and meaningful criterion should be the bacteriological and flavor condition of the product as it is offered for sale to the consuming public.

The importance of post-pasteurization contamination may have a deeper meaning from a public health standpoint. The route by which pathogenic and psychrophilic spoilage organisms gain entrance to some food products is the same. This is best exemplified by recent outbreaks of staphylococcus and salmonella food poisoning in processed foods. So let us not sell ourselves short on plant sanitation.

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WATER PROTECTION HIGH ON LEGISLATIVE AGENDAS

More than 700 measures touching on water supplies and pollution control are now being considered by legislatures of the 44 states now in session, according to Commerce Clearing House of Chicago, Illinois. These measures deal with flood control zones, pollution control schedules, water pollution taxes, water authorities, sanitary and sefer facility financing, state water control compacts, soil erosion and siltation and refuse in waters.

The bills also touch on industrial pollution, watershed controls, tax incentives and exemptions, wildlife preservation, land and water recreational resources, irrigation districts, water quality standards, water and sewage research, local water regulation, water drainage, water districts and environmental pollution problems, among other things, said CCH, publishers of WATER CONTROL NEWS. Connecticut presently tops the list of water-related proposals with no less than 76, while New York is considering 62 measures and Oregon and California are studying 46 and 45 bills, respectively.

Also, the legislatures of Illinois, Indiana, Maryland, Minnesota, Texas, Washington and West Virginia each have at least twenty separate measures touching on some aspect of water that are under study. While the total includes some duplicate measures introduced in both houses in some of the legislatures and similar or almost identical bills offered by two or more members, it also suggests water law proposals are high in 1967 state legislative agendas.

EXPANDING NATIONAL PROGRAM ON SOLID WASTES CONTROL

Four more States have joined a national program for planning attacks on solid waste pollution, according to Leo Weaver, Chief of the Solid Wastes Program in the Public Health Service's National Center for Urban and Industrial Health.

The States—Maryland, Massachusetts, Tennessee, and Texas—received grants for up to 50 percent of the cost of statewide surveys and planning to eliminate solid waste disposal practices that create health hazards and destroy natural beauty. This brings to 25 the number of States developing solid waste management plans with support from the Public Health Service.

"A major objective of this statewide planning is to develop comprehensive solid waste management systems that are responsive to regional disposal needs," Mr. Weaver said. "We are seeking to reverse a nationwide tendency to leave responsibility forw aste disposal with communities unable, usually because they are too small, to handle the job except in ways which endanger health and cause scenic blight."

Already participating in solid waste pollution control planning are California, Colorado, Connecticut, Georgia, Hawaii, Idaho, Kentucky, Louisiana, Maine, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Washington, West Virginia, and Virginia.

COMPARISON OF PLATE LOOP AND AGAR PLATE METHODS FOR BACTERIOLOGICAL EXAMINATION OF MANUFACTURING GRADE RAW MILK[1] [2]

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SUMMARY

Plate loop counts and standard plate counts on each of several manufacturing grade raw milk samples (handled in cans or in farm bulk tanks) have been compared. On the average, the plate loop count (PLC) was lower than the standard plate count (SPC) regardless of the type of handling of milk on the farm, can or bulk tank. Agreement between the SPC and PLC seemed to depend upon the bacterial-count levels present in milk. Statistical analyses indicated significant differences, at 1% level of probability, between the average bacterial count by SPC and PLC methods regardless of count level ($\leq$100,000/ml or $>$100,000/ml) in case of can milk samples. On the other hand, in case of farm bulk tank milk samples, no significant differences, at the 1% level of probability, between the average bacterial count by SPC and PLC methods were obtained, when the counts were equal to or less than 100,000 per ml; when the counts exceeded 100,000 per ml, significant differences were present. Since the bacterial counts of manufacturing grade raw milk samples are likely to exceed 100,000/ml, the data presented in this investigation indicate that, until the bacteriological quality of manufacturing grade milk supplies undergoes substantial improvement, the PLC method does not appear to be a suitable substitute for the SPC method for routine bacteriological examination of such milk supplies.

Viable bacterial counts by agar plate method (SPC) are commonly used for routine bacteriological examination of raw milk supplies. The plate loop method (PLC), which also gives viable bacterial counts, is more rapid and less expensive than the agar plate method. Thompson et al. *(5)*, the originators of the plate loop method, reported close agreement between the bacterial counts by the PLC and SPC methods on raw milk samples using 35 C for plate incubation. Thus, according to "Standard Methods" *(1)* the PLC may be substituted for SPC for routine bacteriological examination of low count ($\leq$200,000/ml) raw milk. With the exception of the work published by the originators of the PLC method *(5)*, no other studies of this nature were found in the literature. Because of the simplicity of the PLC method, the present investigation was undertaken to compare the counts by these two methods and to evaluate the PLC method for bacteriological examination of manufacturing grade raw milk supplies.

EXPERIMENTAL METHODS

Three hundred and sixty-three can milk and 323 farm bulk tank milk samples (manufacturing grade) from 152 and 124 randomly selected individual producers, respectively, were collected in the Minnesota-Wisconsin-Iowa area during the period from February through October 1963. Can milk samples were taken from the weigh-tanks at the processing plants using a chlorinated dipper. The bulk tank milk samples were taken directly from the bulk tanks at the farms using sterile disposable pipettes after the milk was agitated for at least 3-5 minutes. Samples were taken in sterile screw-cap tubes, placed in ice water, and were transported in an ice chest to the laboratory and were stored overnight at 3.3 C. The next day each was mixed well, the foam was allowed to break up, then each sample was plated by the PLC method *(5)* and the SPC method *(1)*. Rather than being flamed between platings, the loop was rinsed by discharging one ml of sterile phosphate buffered dilution water over the shank and the loop. The loop was tested as described by Thompson et al. *(5)* and was found to be free rinsing. The same individual performed both the SPC and PLC methods using the same lot of plate count agar (Difco). Furthermore, this same individual was given instruction in use of the loop by one of the originators of the PLC method. The plates were incubated at 32 C for 48 $\pm$ 3 hours. At the end of the incubation period the colonies on the plates were counted in accordance with "Standard Methods" *(1)*. Logarithms of bacterial counts by the SPC and PLC methods on each producer's milk were placed on IBM cards to facilitate statistical analyses. Of the 363 can milk and 323 farm bulk tank milk samples examined, 231 and 218 samples, respectively, yielded 300 or fewer colonies ($\leq$300,000/ml) on plates prepared by the PLC method. Only samples which yielded 300 or fewer colonies by the PLC method were included in the analyses of the data. Significance of differences between SPC and PLC was tested (analysis of variance, two-way classification with fixed treatments and random blocks, i.e. counts by SPC and PLC methods as treatments and each milk sample as a block) using log bacterial counts, as described by Steel and Torrie *(4)*. Actual computations were performed by the Control Data Corporation 1604 computer using a "UMSTAT-51" program *(3)*.

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[1]Scientific Journal Series Paper No. 6129, Minnesota Agricultural Experiment Station.

[2]This work was supported in past by the United States Department of Agriculture and the Minneapolis-St. Paul Quality Control Laboratory.

[3]Present address: Market Quality Research Service, Field Crop and Animal Products Branch, Plant Industry Station, U. S. Department of Agriculture, Beltsville, Maryland.

TABLE 1. FREQUENCY DISTRIBUTION OF SAMPLES[a] IN BACTERIAL COUNT RANGES BY THE SPC AND PLC METHODS

Bacterial count range	All samples		Can milk		Farm bulk tank milk	
	SPC (%)	PLC (%)	SPC (%)	PLC (%)	SPC (%)	PLC (%)
<30,000	21.1	24.7	15.6	18.2	28.9	31.7
30,000-100,000	34.5	40.1	34.6	42.0	34.4	38.1
>100,000-200,000	16.7	21.8	18.6	26.8	14.7	16.5
>200,000-300,000	4.0	13.4	4.8	13.0	3.2	13.8
>300,000	22.7	–	26.4	–	18.8	–
Average bacterial count	90 T[b]	63 T	110 T	73 T	72 T	54 T

[a]Based on 231 can milk and 218 farm tank milk samples (231 + 218 = 449 all samples).
[b]T = thousand.

RESULTS AND DISCUSSION

Table 1 shows the average bacterial counts and frequency distribution of samples in count ranges by the SPC and PLC methods. The average counts by the PLC method were lower than the corresponding counts by the SPC method regardless of the type of handling of milk on the farm, can or bulk tank. However, the magnitude of difference between the average count by the PLC and SPC methods was higher for can milk samples. The frequency of occurrence of samples in each bacterial count range, from <30,000 - 300,000, was higher with the PLC method than with the SPC method.

In general, as the bacterial count increased, the difference between the percentage of samples falling in each class by the SPC and PLC methods also increased. For example, 22.1% and 24.7% of all samples were in the range of <30,000 by the SPC and PLC methods, respectively, i.e. a difference of 2.6% between the methods. There was a difference of about 9% between the percentages of samples by the SPC and PLC methods in the range of >200,000-300,000. On the other hand, a substantial percentage of samples (about 23) with PLC's ≤300,000/ml had SPC's of >300,000/ml.

Table 2 shows the frequency distribution of samples in bacterial count ranges by the SPC method within each count range of PLC method. A close agreement between SPC and PLC was obtained for milk samples with counts equal to or under 100,000 per ml, while this was not the case for milk exceeding 100,000 per ml.

For example, about 70% of samples with PLC's under 30,000 per ml also had SPC's under 30,000 per ml. On the other hand, only 31% of samples with PLC's over 100,000 per ml but under 200,000 per ml had SPC's in the same range. A large number of clumps is more likely to be found in milk with a high bacterial count than in milk with a low bacterial

TABLE 2. FREQUENCY DISTRIBUTION OF SAMPLES[a] IN BACTERIAL COUNT RANGES BY THE SPC METHOD WITHIN EACH COUNT RANGE OF PLC METHOD

Bacterial count range by PLC method	No.	Distribution of percent samples by SPC method							
		<30T[b]	30-100T	>100-200T	>200-300T	>300-500T	>500T-1M[c]	>1-3M	>3M
All samples									
<30T	111	70.3	26.1	2.7	–	0.9	–	–	–
30-100T	180	10.6	60.0	21.1	0.6	3.3	3.3	0.6	0.6
>100-200T	98	1.0	14.3	30.6	11.2	16.3	19.4	4.1	3.1
>200-300T	60	1.7	6.7	6.7	10.0	20.0	35.0	13.3	6.7
Can milk samples									
<30T	42	66.7	26.2	4.8	–	2.4	–	–	–
30-100T	97	6.2	61.9	21.7	1.0	4.1	4.1	–	1.0
>100-200T	62	1.6	12.9	32.3	12.9	16.1	21.0	1.6	1.6
>200-300T	30	3.3	3.3	–	6.7	20.0	40.0	20.0	6.7
Farm bulk tank milk samples									
<30T	69	72.5	26.1	1.5	–	–	–	–	–
30-100T	83	15.7	57.8	20.5	–	2.4	2.4	1.2	–
>100-200T	36	–	16.7	27.8	8.3	16.7	16.7	8.3	5.6
>200-300T	30	–	10.0	13.3	13.3	20.0	30.0	6.7	6.7

[a]Based on 231 can milk and 218 farm bulk tank milk samples (231 + 218 = 449 all samples).
[b]T = thousand.
[c]M = million.

TABLE 3. TEST OF SIGNIFICANCE OF DIFFERENCE IN LOG. BACTERIAL COUNTS BETWEEN SPC AND PLC PROCEDURES ACCORDING TO THE TYPE OF HANDLING

Bacterial level/ml	Number of samples		F test	
	Can	Bulk	Can milk samples	Bulk tank milk samples
≤100,000 by PLC	139	152	17.05**	3.5ns
>100,000 by PLC	92	66	43.73**	23.18**
≤100,000 by PLC or SPC	150	161	8.48**	1.32ns

**Significant at the 1% level of probability.

nsNon-significant at the 1 and 5% levels of probability.

TABLE 4. AGREEMENT AND DISAGREEMENT BETWEEN THE SPC AND PLC METHODS IN GRADING MANUFACTURING GRADE RAW MILK SAMPLES[a]

Standard[b]	Unsatisfactory by SPC		Classification by PLC[c]			
			Unsatisfactory		Satisfactory	
	(No.)	(%)	(No.)	(%)	(No.)	(%)
100,000	195	43.4	138	70.8	57	29.2
200,000	120	26.7	51	42.5	69	57.5
	Unsatisfactory by PLC		Classification by SPC[d]			
			Unsatisfactory		Satisfactory	
	(No.)	(%)	(No.)	(%)	(No.)	(%)
100,000	158	35.2	138	87.3	20	12.7
200,000	60	13.4	51	85.0	9	15.0

[a]Based on 449 samples.

[b]Samples which exceeded the standard indicated were considered unsatisfactory.

[c]of samples unsatisfactory by SPC

[d]of samples unsatisfactory by PLC

count. It is likely that the shaking in the preparation of dilutions for SPC procedure tends to break up clumps and to give higher SPC's.

Table 3 shows the results of a test of significance of difference in counts between SPC and PLC procedures for can milk and for farm bulk tank milk. Differences between counts by SPC and PLC for low (under 100,000 per ml) as well as for high (over 100,000 per ml) count milk were statistically significant (1% level) for milk handled in cans. Differences between the counts were statistically significant for high count milk handled in farm bulk tanks, while differences between counts were not statistically significant (5% level) for low count milk handled in farm bulk tanks. For milk samples with a bacterial count equal to and under 100,000 per ml by either SPC or PLC methods, differences were significant between counts by SPC and PLC for can milk samples, while differences between counting methods were not significant (5% level) for farm bulk tank samples.

Assuming that the differences between SPC's and PLC's were due to the breakage of bacterial clumps, then the reason for significant differences in case of can milk samples and not in case of farm bulk tank milk samples, when the counts were ≤100,000/ml, might be explained on the basis of the possible differences in the bacterial flora of these supplies. The bacterial flora of can milk samples might be expected to be predominantly micrococci and streptococci (enterococci as well as lactic streptococci). Psychrophilic bacteria might be expected to predominate in farm bulk tank milk supplies. The micrococci exist largely as irregular masses of bacteria while the streptococci exist as short or long chains. The psychrophilic bacteria tend to be in singles, pairs, and clumps *(2)*. However, the clumps of micrococci or chains of streptococci may contain more individual cells within each clump or chain than would be the case with the psychrophilic bacteria. Therefore, when clumps break, more individual cells may arise from the clumps of micrococci or streptococci than from the clumps of psychrophilic bacteria. However, no evidence supporting this hypothesis is presented in the present study.

Table 4 shows the application of SPC and PLC methods for grading of manufacturing grade raw milk samples. If a standard of 100,000/ml is used for both methods, about 43% of the samples were unsatisfactory by SPC and only about 35% by PLC, i.e. a difference of 8% between the methods. Of the samples unsatisfactory by the SPC, about 71% of these were also unsatisfactory by the PLC. In other words, about 29% of the samples unsatisfactory by the SPC were classified as satisfactory by the PLC. The reverse relationship shows that only about 13% of the samples unsatisfactory by the PLC were classified as satisfactory by the SPC. On the other hand, when a standard of 200,000/ml was used, the disagreement between the two methods in terms of the percentages of samples unsatisfactory by one method that were classified as satisfactory and vice versa was greater. For example, about 58% of samples unsatisfactory by SPC were classified as satisfactory by the PLC, whereas, only about 15% of samples unsatisfactory by PLC were classified as satisfactory by SPC at 200,000/ml standard. Thus, it would appear likely that if the same standard is used for both methods, PLC, would upgrade a considerable percentage of samples that might be unsatisfactory by the SPC.

ACKNOWLEDGMENT

The authors express appreciation to Mr. Charles K. Mitchell for his technical assistance.

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FOOD PLANT WASTE DISPOSAL*

Waste disposal is becoming a prime factor in choosing the location for a food processing plant. This has not always been true. Once waste disposal was a simple matter of discharging plant effluent into a stream or narby land area. Older plants, originally located away from populated areas, are now often surrounded by industrial manufacturing of all kinds and, in some instances, densely populated residential districts. Many municipal waste treatment plants are already overloaded by this rapid population and industrial growth and cannot provide adequate protection to downstream water users.

According to the Federal Water Pollution Control Administration, the two principal sources of industrial pollution of rivers in the Pacific Northwest are paper and pulp mills and food processing plants. There are over 900 food plants in this area processing meat, dairy products, fruits, vegetables, potatoes, beet sugar, grain, and marine products. Most of these plants are in the Snake, Yakima, Walla Walla, and Willamette River Basins.

Wastes from food plants are high in dissolved organic materials which combine with and use up the dissolved oxygen of the receiving stream. In addition to organic matter, some plants have relatively large amounts of salt brines and alkalis in their wastes which cannot be returned to a stream or earth strata.

There are other pollution problems closely associated with the growing of food. In areas of high animal concentrations, it is necessary to process or contain in some manner the excreta to prevent contamination of irrigation and underground waters. Feed lots, dairies, and large chicken ranches are now considered a possible source of stream pollution during heavy rains. Recently one state passed a regulation that the location of new feed lots after a certain date must be first approved by the State Water Pollution Board.

In 1966, the U. S. Department of Interior established the Pacific Northwest Water Laboratory on the campus of Oregon State University to continue the fight against water pollution. When fully staffed, it will have a complement of 150 scientific and professional people composed of engineers, chemists, biologists, bacteriologists, hydrologists, soil scientists, oceanographers, mathematicians, and geologists. The program is divided into three broad areas of endeavor: research, technical services, and training. The laboratory will help combat water pollution in the Pacific Northwest and also furnish assistance in solving water quality problems of California, Nevada, and Hawaii.

The solution to waste disposal becomes more complex as the food plant becomes larger and more diversified. Stricter State and Federal regulations are on the way. Several years ago, officers and members of the National Canners Association recognized the need for more knowledge on waste treatment. The NCA Laboratory at Berkeley, California has studied composting techniques as a means of utilizing processing wastes. The possibility of changing processing techniques to modify plant effluent is also under consideration at this laboratory. Other organizations and far sighted individuals have been seeking answers to disposal and water pollution problems for some time. For those processors who have not included waste treatment in their long range planning, it may be too late.

*From *Food Processing Review*, March 15, 1967, published by the Food Technology Department, Oregon State University, Corvallis.

PUBLIC HEALTH ASPECTS OF ROTISSERIES IN MARKETS

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About a dozen years ago when the operation of rotisseries in markets was proposed to the Health Department, our Food Sanitation Advisory Committee brought together market operators, members of the meat-cutters union, representatives of the food service industry and equipment manufacturers to develop public health standards. Among the specific requirements developed were:

1. A separate work area and a work table not used for any raw meat or fish products shall be provided for the handling of cooked meats.
2. A separate storage cabinet shall be provided for keeping spits and supplies in a sanitary condition.
3. The following special facilities shall be provided for storing of barbecued meats:
   a. Barbecued meats to be sold "hot" shall be stored in a unit which automatically maintains temperatures above 140 F.
   b. Barbecued meat that is to be sold "cold" shall be stored in a portion of a refrigerator where it does not come in contact with, and is not subject to dripping or contamination from raw meat.

In the ensuing dozen years a number of suspected food-poisoning and food illness outbreaks have been attributed to products from these rotisseries. Perhaps cases of salmonellosis have been caused by this type of product without being reported to the Health Department. Within the past two years, in Los Angeles County, 17 outbreaks or single cases from these products were reported. Nine were attributed to chicken, four to spareribs, one to turkey, and three to barbecued pork. Three of the outbreaks appeared to have been from staphylococcus toxin, with laboratory data indicating millions of the *Staphylococcus aureus* in the food samples. Symptoms, onset time, and in some cases positive cultures of the same organism, in both food and stools, indicated that five outbreaks were caused by salmonellae and two were from *Clostridium perfringens*. In the other cases, not sufficient confirmatory evidence was obtained to conclusively indicate the specific cause.

The USPHS weekly report from the Communicable Disease Center for July, 1966, reported an outbreak in Spokane involving 24 different family groups, barbecued chicken from a market, inadequate cooking temperatures, 100 to 110 F holding temperatures, and *Salmonella typhyimurum* isolated from over 30 individuals. The report stated that the City Health Department temporarily suspended all barbecue operations at markets throughout the city.

A survey of cooking, holding and marketing practices in Los Angeles County indicated that better controls were needed to assure that all products are "pasteurized" during cooking and that operating practices and existing equipment failed to hold products at required temperatures. Among the problems observed were the following:

1. Attempts were being made to heat cold products in a "warming oven". These units should not be labelled "warming ovens" since they are most ineffective for warming. They should be considered hot-holding devices. In other words they are capable, when properly designed, operated and maintained, of maintaining foods warm but are incapable of warming cold products to appropriate temperatures within a reasonable period of time.
2. Wrapped products were commonly placed in warming devices or refrigerators. The insulation effects of the wrapping resulted in excessively long "incubation periods."
3. Units designed for heating with infra-red lights were modified by substituting incandescent bulbs which were relatively ineffective for the intended purpose.
4. Units intended for heating by radiation from below were rendered ineffective by covering the radiating surface with aluminum foil which is an excellent reflector and therefore an insulator.
5. Devices were frequently overloaded with stacked products. This was particularly objectionable in open units designed for heating by radiation.
6. Some units were without adequate thermostatic temperature control, without thermometers for indicating the appropriate setting, and without instruction to the operator on setting the thermostat.
7. On some units designed for circulating heat throughout an enclosed cabinet, the shelves were completely covered with aluminum foil or other material so as to block circulation.
8. Products left over at the end of the day were sometimes left in the warming ovens which were turned off, or were left in the wrappers and placed in the refrigerator over night where cooling times were excessively long.
9. In the morning products that had been refriger-

TABLE 1. EFFECT OF PLIOFILM VS. ALUMINUM FOIL WRAPPING ON TEMPERATURE OF FOODS REHEATED IN MODEL A—OPEN UNIT

	10:20 a.m.	11:00 a.m.	12:00 noon	12:30 p.m.
Pliofilm	45	102	133	142
Aluminum Foil	45	60	78	90

TABLE 2. TEMPERATURE REDUCTION IN FOODS COOLED IN WRAPPED AND UNWRAPPED CONDITION

	10:30 a.m.	11:00 a.m.	12:00 noon	1:00 p.m.	1:30 p.m.
Chicken No. 1 Unwrapped	140	88	55	40	37
Chicken No. 2 Wrapped in Aluminum Foil	144	118	82	56	54
Chicken No. 3 Wrapped in Card-Board Carton	135	100	70	50	49

TABLE 3. COMPARISON OF TEMPERATURE REDUCTIONS IN FOODS COOLED IN ALUMINUM AND IN PLIOFILM WRAPPING

	3:00 p.m.	3:30 p.m.	4:00 p.m.	4:30 p.m.	5:00 p.m.
Aluminum Foil	140	130	118	100	82
Pliofilm Wrap	138	120	106	85	72

ated or allowed to stand at room temperature over night were placed or left in a warming oven in their wrappers and hours were required to warm up the product.

10. Some operators did not have the food-testing thermometer required by State law and others who had thermometers were not properly using them.

FIELD STUDY

Details of the field study follow. Three open model warmers and one closed model manufactured by three companies were observed during the study.

The Model A—Open Unit has six 250 watt infra-red lamps under a hood approximately two feet above the displayed product. Radiant heating elements are also located beneath the product. The thermostat temperature settings may be adjusted by the operator but the control is unmarked.

The Model B—Open Unit is of similar design to the Model A—Open Unit except that is is provided with regular light bulbs above and has a heating element at each side as well as below. The thermostat can be set by the operator.

The Model C—Open Unit is similar to the Model A and Model B—Open Units but is designed for non-removable infra-red tube lights above and heating elements below.

The Model C—Closed Unit is an enclosed cabinet with a thermostatically controlled electrical heating element and has a number of shelves.

WRAPPING MATERIALS

Various wrapping materials were tested for their effect on reheating a cold cooked product. Chickens wrapped in pliofilm on an aluminum pan and chickens wrapped in aluminum foil were placed in a Model A—Open Unit with the heat control on full (unmarked) and all overhead infra-red bulbs on. The temperature of the chickens was 45 F when placed in the warmer. After two hours and ten minutes the chicken wrapped in pliofilm was 142 F while the chicken wrapped in aluminum foil was only 90 F. Temperatures at various time intervals are shown in Table 1. (Temperature readings in all tables are in degrees Fahrenheit.)

Similar results were observed when cold, pre-cooked chickens were reheated in the Model C—Open and Closed Units.

Three cooked chickens were taken from a warmer at temperatures from 135 to 144 F and placed in a refrigerator with a temperature of 35 F. From one the wrapping was removed, one was wrapped in aluminum foil and the third was in a cardboard carton with a transparent window. After two hours the unwrapped chicken temperature was 45 F while the chicken in the cardboard carton was at 60 F and the one in aluminum foil was at 70 F. After three hours the temperature of the chicken wrapped in aluminum foil was 54 F. Rate of temperature reductions are shown in Table 2.

In another test a chicken at 138 F in pliofilm wrapping cooled somewhat more rapidly but was 72 F after being in a 38 F refrigerator for two hours. (Table 3).

Aluminum foil is too efficient an insulator for use for wrapping foods to be heated or cooled. Wrapping, in general, also seriously retards cooling of products that are warm or hot when refrigerated.

EFFECT OF STACKING

To study the effects on the temperature of stacking two or more layers on the single shelf of a Model C—Open Warming Unit, six chickens at 162 to 171 F were placed in two layers in the warmer. The chickens in the bottom layer were wrapped in aluminum

foil, pliofilm and cardboard carton (transparent window). On the top layer was a chicken wrapped in aluminum foil and two wrapped in pliofilm. The heating element under the unit was turned to the maximum setting of 200 F and all of the three overhead infra-red bulbs were on. The top layer apparently acted as insulation to the bottom layer and after one hour and 45 minutes chickens wrapped in pliofilm on the top layer were 14 to 18 degrees warmer than the chicken in pliofilm on the bottom layer. Chickens in aluminum foil on the top layer were at 137 F while those on the bottom layer were 146 F. Temperature changes are shown in Table 4. The chicken in the cardboard carton removed directly from a heating oven and placed on the bottom layer dropped from 170 to 137 F in one hour and 45 minutes.

Aluminum foil could be considered satisfactory for wrapping chickens after they were heated if they were to be placed in a single layer in an open unit. Pliofilm wrapping appeared to be the best if more than one layer of the product was used in an open unit with infra-red heating bulbs.

TABLE 4. EFFECTS ON TEMPERATURES BY STACKING FOODS IN VARIOUS WRAPPINGS IN MODEL C—OPEN WARMING UNIT

	1:25 p.m.	1:55 p.m.	2:25 p.m.	3:10 p.m.
Bottom Layer				
Pliofilm	171	163	157	148
Aluminum Foil	169	163	153	146
Cardboard Carton	170	154	142	137
Top Layer				
Pliofilm	162	166	168	162
Aluminum Foil	162	151	144	137
Pliofilm	163	170	165	166

SUBSTITUTION FOR INFRA-RED HEAT LAMPS

Many markets with warming units designed for infra-red heat lamps replace them with ordinary light bulbs so observations were made to determine the effect this practice. In a Model A—Open Unit, two of the six overhead 250W infra-red lamps were replaced with two 150W ordinary incandescent bulbs. The four infra-red bulbs on either side of the replacement bulbs were left on. The thermostat for the heating element under the product was set to maximum temperature. The temperature of the product under the infra-red bulbs and under ordinary bulbs was recorded hourly.

After four hours the temperature of the product had reached its maximum, and chicken under infra-red bulbs was 22 degrees warmer than those under the ordinary bulbs. Replacing infra-red bulbs with ordinary bulbs does significantly reduce the heating effect.

TABLE 5. EFFECT ON TEMPERATURE OF FOODS WARMED IN MODEL C—OPEN UNIT WITH BOTTOM HEATING ELEMENT COVERED WITH ALUMINUM COIL

	10:30 a.m.	11:30 a.m.	12:30 p.m.	1:30 p.m.
Chicken No. 1 in transparent wrapping with aluminum foil on heat element	144	138	138	138
Chicken No. 2 in transparent wrapping with no aluminum foil on heat element	141	158	158	158

USE OF ALUMINUM FOIL OVER HEATING ELEMENTS

The effect of covering the bottom and racks of warming units with aluminum foil was studied and two Model B—Open Units were used. The raised metal plate in the bottom of one of the units was covered with foil while the other was not. Each unit had been pre-heated for over one hour with the thermostat set at 350 F, at which time the setting was reduced to 275 F. The temperatures of chickens when placed in the warmers were 141 to 144 F and subsequent temperatures were recorded over a three-hour period as shown in Table 5, the temperature of the chickens in the unit where foil was used on the heating elements dropped six degrees in one hour. Chickens in the unit with no foil covering the bottom heating plate rose 17 degrees in temperature and then remained constant for the balance of the three hour test period.

Temperature readings were taken in an enclosed Model C warming unit to learn of the effect of covering shelves with aluminum foil. Temperatures were taken first with the shelves covered with foil and then with the foil removed. With or without foil, the temperature of the product on the top shelves was slightly lower. Covering shelves of closed unit with foil had little effect when foil did not restrict air circulation in unit. However, when the foil extended over the shelves to the sides in a manner to

TABLE 6. OPERATING PRACTICES IN HANDLING LEFT-OVERS

	Yes	No
Left-overs Refrigerated	33	2[a]
Placed Back in Warmer	23	12
Heated in Oven Before Placing in Warmer	11	24[b]

[a]Of the two not refrigerating left-overs, one placed them back in the warmer the next day after keeping them overnight in the meat cutting room and the other stated that they were thrown away the next day.

[b]Of the 24 not reheating left-overs in the oven, 12 placed the product back into the warmer for heating without first reheating in the oven for consumer "hot" sales, seven sold the product refrigerated, three made it into salad or sandwiches, while two said they threw it away or gave it away.

restrict air circulation, there was a more significant lowering of the temperature. In one such unit the product temperature was 120 F at the top and 150 F at the bottom.

ATTITUDES AND PRACTICES IN HANDLING LEFT-OVERS

Thirty five establishments using food warmers were surveyed to obtain the attitudes and practices of operators in handling left-overs. In addition, the opinions of equipment manufacturers and distributors were obtained.

In practice the majority of operators place left-over products in refrigerators overnight and place them back in the food warmer the following day (Table 6). Of these about one half (11) reheated the product in an oven to quickly raise the temperature. The others (12) move the product directly to the warmer from the refrigerator. Opinions as to the quality of the product, after reheating in the oven, were generally favorable. Some operators who were not reheating were adamant in their mistaken opinion that such "re-cooking" would dry out the product to be unsalable.

Manufacturers' recommendations are to reheat in the cooking unit for 15 to 20 minutes at approximately 350 F. Tests made during the survey showed this procedure will raise the temperature of the product from 34 F to 140 F.

Most of the operators who pre-heat left-overs in the oven remove the wrappers before refrigerating. Others leave the product wrapped and take it directly from the refrigerator to the warmer and vice-versa, thereby having two long periods at improper temperatures.

From observation, reheating for 15-20 minutes in the oven will bring the internal temperature of the product to 140 F or more and will not adversely affect the salability. From discussions with operators and distributors plus limited observations, excessive drying is due to keeping the product in the cooking unit too long or holding the packaged product at too high a temperature for too long a period.

Results of this study on attitudes and practices have been reviewed by the Los Angeles County Food Sanitation Advisory Committee and Health Officer's Rules were drafted to assure that cooked foods are kept at temperatures which prevent development of food poisoning bacteria. The study and instructions for the sanitary operation of commercial food warming equipment have been publicized to market operators through publication in trade journals.

OPERATING RULES AND REGULATIONS

In consultation with the Food Sanitation Advisory Committee, the following rules and regulations for the operation of rotisseries and handling of products were developed and subsequently adopted by the Los Angeles County Health Officer:

Temperature Control Procedures.

1. Rotisseried meats and poultry to be sold "hot" shall be stored in a unit which maintains the product at a temperature of 140 F or above.

2. An accurate "stick-in type" food testing thermometer shall be kept readily available in the market and used regularly.

3. Previously cooked meat or poultry which has subsequently been refrigerated or allowed to cool shall be pre-heated in cooking equipment to a temperature of 140 F before being placed in a warm food display or holding unit.

4. Prior to reheating or cooling the cooked meat or poultry, wrapping or packaging which would retard such process shall be removed.

5. Cooked meats and poultry shall be placed in the hot food holding device immediately after cooking. In display units not entirely enclosed, food shall be displayed in single layers unless it has been demonstrated the unit can maintain more than one layer of products at 140 F or above.

6. The thermostatic control shall be so set and the hot food holding unit so maintained that foods are maintained at 140 F or above.

7. Infra-red heat lamps shall not be replaced with ordinary light bulbs unless it has been demonstrated that the unit maintains foods at a holding temperature of 140 F or above with other than infra-red bulbs.

8. In either enclosed or open hot food holding units the heating plate or shelves shall not be covered with aluminum foil unless tests have shown that the unit maintains the food at a holding temperature of 140 F or above when such areas are covered. Shelf covering shall not extend to the sides of the unit when this prevents circulation of air to interfere with maintenance of proper temperatures.

Operational Rules.

1. The person in charge of the establishment shall make sure that employees properly operate the equipment and handle products as required herein.

2. Employees shall wash their hands before handling

cooked foods.

3. Raw meats, fish and poultry shall not be placed on the same work surface as prepared foods. A separate work area and a work table shall be provided and used for handling cooked product.

4. Separate utensils shall be used in handling raw and cooked food or these shall be washed and sanitized before use on prepared products.

5. A separate storage cabinet shall be provided for utensils, spits and supplies.

6. Cooked foods intended to be stored below 140 F shall be placed in a refrigerator at a temperature of 50 F or below when the internal temperature of the food reaches 120 F.

7. Prepared foods shall be protected from contact with raw meat.

EDUCATIONAL PROGRAM

The rules and regulations and results of the study were utilized in developing a pamphlet which is being used by the sanitarian in on-the-job instructions at all markets where rotisseries are operated. A copy of the pamphlet entitled "Instructions for Sanitary Operation of Commercial Food Warming Equipment" is available from the Bureau of Environmental Sanitation, Los Angeles County Health Department, 220 N. Broadway, Los Angeles, California 90012.

This same information, together with an explanatory article, appeared in the Grocer's Journal which goes to practically all the markets in the area.

The instructions and advice concerning equipment and its operation have been furnished to all distributors of rotisserie devices. They will include pertinent Department rules in their instructions issued in connection with sale and servicing of their units.

SUMMARY AND CONCLUSIONS

Operation of rotisseries in markets has undoubtedly produced an appreciable number of cases and outbreaks of food-borne illness. As with most such outbreaks the causes are:

1. Inadequate cooking to destroy pathogens naturally present in the meat or introduced during processing.

2. Products subject to contamination, subsequent to the heat processing, are wrapped and then handled in such a way as to be kept at incubating temperatures for long periods of time.

3. Devices for keeping products hot are altered or improperly used and do not adequately perform their intended functions.

4. Attempts to refrigerate and heat wrapped products are ineffective and result in the product being held at incubating temperature for long periods.

Correction will necessitate more attention on the part of the Sanitarian and more education of the equipment dealers, market owners, and employees. Adequate equipment, constant supervision by management and on-the-job instruction for employees are essential factors in a control program.

PUBLICATIONS OF INTEREST

Editorial Note: Listed below are books, pamphlets and reprints on a variety of subjects considered to be of interests. Requests for material should be addressed to the source indicated. Note cost of books and certain items.

Cat. No. A 88.6:C 42—List of Chemical Compounds Authorized for Use Under USDA Poultry, Meat, etc. Inspection Programs. Rev. 1966. 45c.

Cat. No. FS 2.2:Sh 4/4—National Register of Shellfish Production Areas. 1966. 15c.

Cat. No. FS 16.2:W 29/2—Focus on Clean Water, An Action Program for Community Organizations. Rev. 1966. 15c.

Cat. No. A 1.75:307—Rain Traps for Intercepting and Storing Water for Livestock. 1966. 10c.

Cat. No. FS 2.6/2: P 26/2—Procedures for Testing Pasteurization Equipment. 1966. 25c.

Cat. No. FS 2.36/2:966—Public Health Service Film Catalog 1966. $1.00.

Cat. No. FS 2.6/2:B 96—Handbook on Sanitation of Buses, 1966. 15c.

Cat. No. Y 4.Sci 2:89-2/S – Environmental Pollution, A Challenge to Science and Technology. 1966. 20c.

Cat. No. FS 2.6/2:M 59/3—Fabrication of Single Service Containers and Closures for Milk and Milk Products, A Guide for Sanitation Standards. 1966. 15c.

pH Guide. A quick, non-technical introduction to pH. Bull. 92-1, Beckman Instruments, Inc., 2500 Harbor Blvd., Fullerton, Calif. 92634.

Pasteurizer-Sterilizer Equipment. Bull. No. D-1-400. St. Regis Paper Co., CP Div., 1243 W. Washington Blvd., Chicago, Ill. 60607.

Ultra-violet Air Conditioning. Manual describing forced-air Heating and cooling units. American Ultraviolet Co., 30 Commerce St., Chatham, N. J. 07928.

EPOXY SURFACING AND COATING OF CONCRETE AREAS

JOHN CARAMANIAN

Commercial Chemical Co.
1021 Summer Street,
Cincinnati, Ohio

A properly formulated epoxy compound constitutes the best protective surfacing for concrete floors, new or old, for three very important reasons. Due to its molecular structure, it has the strongest adhesive strength of any product available today. After it has hardened it is extremely tough. It is so hard that it is difficult to machine on a metal turning lathe, so abrasion-resistant it will outlast steel on hard coal chutes. A third reason, important to the brewery industry, is its exceptional resistance to destructive chemical solutions and solids.

Another advantage that may be mentioned is its versatility. It will adhere to almost anything and can be given a wide range of finishes, from rough non-skid to a glass-like washable surface.

An epoxy surfacer is composed of a combination of epoxy resins and hardeners mixed with aggregates such as silica sand, granite chips, silica flour and other inert materials. The aggregates are used as fillers, adding to the bulk and making the surfacer economically feasible.

While the protective value of epoxy coating on concrete brewery floors has been well established for its long lasting ability to withstand water, acids and caustic solutions, some failures still occur. A large percentage of these are due to inadequate preparation of the concrete prior to application. Step-by-step procedures if followed, will assure long lasting epoxy protection, eliminating frequent and costly repair of concrete.

All deposits of dirt, asphalt, oils or greases must be removed before the final surface preparation. Mechanical means are best suited for this purpose, such as power grinder, sander or wire brush, aided by the use of grease cutting detergents, if necessary.

The surface of new concrete is always weak, even on good high strength concrete. The vibration and troweling movement made when placing the concrete encourages the lighter components, such as surplus Portland Cement and water, to rise to the surface. When this sets it is called "latence". It gives new concrete a typical and, unfortunately, appealing smooth appearance.

Latence is present to a depth of 0.05 inches or more and is almost universally extremely weak in its bond to the body of the concrete. Unless it is removed it will limit the performance and perhaps cause the failure of anything applied to its surface. This latence may well be present in old concrete floors as well as new floors. Removal can be accomplished by etching with strong acid followed by neutralizing with ammonia and thorough rinsing.

Application of Epoxy Surfacer

In applying an apoxy surface, pre-measured amounts of epoxy and hardener are mixed thoroughly and aggregate (normally 2½ times bulk of epoxy) is added. Surfacing compound should not be applied in temperatures under 50 F. The mixed batch is dumped on the prepared surface and troweled to a desired thickness of 1/8 to 1/4 inch.

It is preferable to complete the entire floor but the epoxy material will bond together even after one section has completely set. A minimum set time of eight hours and a maximum of twelve hours before use is recommended, after which the surface may be washed with strong solutions or subjected to heavy weights. Damaged sections can be repaired at any time by patching without treating an entire area.

Epoxy Surfacer vs. Epoxy Coating

There may be some confusion between epoxy surfacers and epoxy coatings as protection for concrete floors. The primary difference is in the thickness and in the amount of protection provided. As outlined previously, an epoxy surfacer requires an aggregate of some kind to make it economical and give it body. It provides a covering surface of 1/8 to 1/4 inch overall (with even more thickness in deep holes and cracks). A finished surface of this kind will withstand heavy industrial weight and traffic as well as destructive chemical solutions and solids.

An epoxy coating normally is no more than 20 mils thick (20 thousandths of an inch) and has no aggregate filler. It will do an excellent job of protecting a concrete floor against erosion by water and chemicals. It is suitable for pedestrian traffic but not for heavy industrial traffic, impact and wear. It will not cover and hide holes, cracks and other sizable defects. (Holes may be filled with concrete, using an epoxy compound to bond them in.) It is good for laboratories, certain areas of dairies, animal hospitals and pens and so forth. It is the ideal protector and sealant for concrete block and may be pigmented for a wide variety of color finishes.

Epoxy coating may be applied by spraying, brushing, or roller coating and should be applied in a uniform thickness by whichever method is chosen. It should not be applied when floor temperature is below 50 F. For maximum results the liquid epoxy should be applied in a series of three coats, allowing not more than 24 hours to elapse between applications.

If a non-skid surface is desired as well, it may be easily obtained by broadcasting white silica sand, "sand blast grade" over the entire surface of wet coating during the application of the second coat. The sand should be applied freely, and the excess swept off when dry prior to the application of the third coat. The third coat should then be applied in the same manner as above.

ADDITIONAL PUBLICATIONS RECOMMENDED BY DAIRY FARM METHODS SUBCOMMITTEE

Some 200 pamphlets, brochures, bulletins and reprints published by various university and state extension services, departments of health and agriculture, and suppliers to the dairy industry have been reviewed by the Subcommittee on Education of the IAMFES Committee on Dairy Farm Methods. A number of these publications have been selected as being of interest to sanitarians and fieldmen and of value as educational and reference material.

It was the recommendation of the Subcommittee that this selected material be abstracted for publication in the *Journal* and this is the fifth in the series of abstracts. In the following abstracts the source of the material is indicated as well as the date of publication where available.

MASTITIS AND THE KANSAS MASTITIS CONTROL PROGRAM

This is a twelve page mimeograph release by the Kansas State University Extension Service and is designed to be a summary of facts and important points of concern in the control and elimination of mastitis. Pointing out that mastitis is the largest single economic loss to Kansas dairymen, cooperation is urged by all state agencies, county organizations and producing farmers. Suggestions are made for improved herd maintenance, milking practices and a comprehensive testing and eradication program. The mimeograph is well organized in material and supplies ample information for the producer and others involved in mastitis control.

A section on laboratory and therapeutic procedures undertakes to spell out the respective responsibilities of the herd owner and the practicing veterinarian in the detection of abnormal milk, testing and laboratory procedures, treatment and herd management to eliminate mastitis. Examples of C.M.T.-Production charts are included in the mimeograph.

RELATIVE IMPORTANCE OF PERSISTENCE, TRANSFER, AND MILKING MACHINE TECHNIQUE TO ANTIBIOTIC RESIDUE CONTAMINATION OF MILK

Originally published in the *Journal of the American Veterinary Medical Association*, Vol. 141, No. 2, July 15, 1962, this article is available as a six page reprint summarizing the results of a year-long study of the persistance of antibiotics in milk from treated cows. One of the purposes of the study was to determine the reasons for the presence of antibiotic residues in fluid milk supplies. In view of special emphasis on the labeling and use of antibiotic preparations, the relative importance of various conditions responsible for antibiotic residues was also evaluated. The article is technical in character and contains a number of tables developed from the test data to illustrate certain factors discussed in the text.

THE INSTALLATION, OPERATION, AND CLEANING OF FARM MILK PIPELINE SYSTEMS

This is a report of the Farm Practices Committee of the New York State Association of Milk Sanitarians and is reprinted from the 1959 Annual Report of the association. Recommendations are set forth for the installation of rigid pipelines including size, slope, risers, gaskets, hangers and brackets, filters and other factors. An accepted automatic cleaning system is outlined. Some uses for nonrigid transparent plastic tubing is discussed and physical factors are set forth for judging acceptability of such tubing.

Accompanying the report are two subsequent releases by interdepartmental committees for specific studies. The first covers pipeline milkers and in itemized form gives general principles of operation, design, installation, maintenance and inspection. The second study covers acceptability of C.I.P. com-

ponent parts for pipeline milkers and the report likewise is in an itemized form. Parts covered include piping, valves, inlet ports, receivers and weigh jars, probes, traps, filters and pumps.

SUSCEPTIBALITY OF MILK FROM VARIOUS DAIRY BREEDS TO HOMOGENIZATION-INDUCED RANCIDITY

This is a reprint of an article appearing in the Michigan Agricultural Experiment Station *Quarterly Bulletin*, Vol. 32, No. 3, February, 1950, and although the study was made some 17 years ago the Subcommittee feels that the information is still timely and of value.

The article reviews sources of complaints and circumstances relating to rancidity and reports on results from studies of samples of milk from individual cows of six common breeds. Factors considered in the experiment were the influence of breed, the percentage of fat, the size of fat globules, initial titratable acidity and temperature. All samples were homogenized to ascertain their susceptibility to undergo lipolysis upon homogenization.

Interpretations of the tests indicated that milk from all breeds were equally susceptable to rancidity and that low fat milk is as capable of homogenization-induced rancidity as high fat milk. Similarly milk having low initial titratable acidity becomes rancid upon homogenization as readily as milk with high initial titratable acidity. Storage of the milk at 40 F for 24 hours prior to homogenization has no appreciable effect upon homogenization-induced lipolysis.

LETTER STUFFERS FOR A MASTITIS CONTROL PROGRAM

These six short statements concerning various aspects of mastitis control were prepared as mailing pieces cooperatively by Kansas State University and the Dairy Institute of Kansas. The message conveyed by each stuffer is brief and to the point and subjects covered are as follows: Diagnosis of Mastitis; Importance of Proper Operation and Care of Milking Machines; Preventing Udder Injuries Leading to Mastitis; Mastitis Treatment; Prevention of Mastitis by Sound Management; and a final admonition to all good producers to work for quality milk production. On the reverse side of each mailing piece are eleven rules for mastitis prevention.

LIPASE: A REVIEW

A reprint from the *Journal of Dairy Science*, July, 1954, this 14 page brochure by a staff member of the Cornell Department of Dairy Industry is considered by the Subcommittee still to be good reference material on rancidity problems in spite of the date of publication.

The brochure opens with a comprehensive discussion of rancidity and recognized causes and remedial measures. Methods used to study lipase and procedures for measuring changes in milk fat are given. Various publications on lipase in milk and milk products are reviewed and some of the effects of lipolysis are discussed.

Some 85 papers and publications on rancidity and lipase, reviewed by the author, are listed as references.

STUDIES OF THE STREPTOCOCCUS AGALACTIAE FORM OF MASTITIS IN DAIRY CATTLE

Another bulletin highly recommended for reference reading by field men is this study on mastitis prepared by staff members of the New York State Veterinary College, Cornell University and originally published in the *Journal* of the American Veterinary Medical Association, December, 1963. The studies were based on data obtained from examination of a great number of cows and of milk samples cultured in the course of herd surveys by the New York State Mastitis Control Program. Of the herds studied some 23% were found to have been infected with *Streptococcus Agalactiae.*

The article deals with the use of antibiotics in treatment for the infection with recommendations for treatment by practicing veterinarians. One study was undertaken to determine the rate of reinfection of cows after a single treatment without modification of sanitary practices and other studies on specific problems are summarized. The article concludes with an outline for a practical program for eradication in dairy herds.

A STUDY OF WELDED LINES FOR PROCESSING MILK

Originally published in the *Journal of Milk and Food Technology* in March, 1960, this article is available in the form of an eight page reprint. The study was made by representatives of the Department of Dairying, Oklahoma State University at Stillwater.

The purpose of the study was the determination of the sanitary aspects of using welded lines in the processing of milk. The criteria used included visual examination, swab tests, rinse tests and standard coliform counts on the milk at various stages of the processing. The results indicated that the use of welded lines of the type used in this plant in conjunction with an automatic CIP system was satisfactory for processing Grade A milk.

ASSOCIATION AFFAIRS

DR. MILTON R. FISHER
PAST PRESIDENT IAMFES, INC.

Dr. Milton R. Fisher, 67 years old, Past President of IAMFES, Inc. passed away March 13 at St. Mary's Hospital, St. Louis, Mo. Dr. Fisher was a victim of leukemia.

"Milt" as head of the milk control division of St. Louis, City Health Department since 1935 was one of the best known milk sanitarians in the U. S. He was known as one of the most progressive, courageous and dedicated persons in the profession. His contribution to the public's health and to industry was immeasurable.

He was president of IAMFES during 1949-50. A long time member, always loyal and active in the Association, "Milt" served on the Committee on Sanitary Procedures from its beginning in 1944 until his death. He received the IAMFES Citation Award in 1958 and the Missouri Association outstanding sanitarian award in 1959. IAMFES again honored him at the Annual Meeting in Minneapolis last year by making him an honorary life member.

"Milts" passing will be mourned by all his IAMFES friends, and his sage counsel greatly missed but his contribution was impressive and will be long lasting.

Originally from Paducah, Kentucky, funeral services and burial was in Paducah, March 16. Survivors are his wife Peal, a son Robert C. and three grandchildren.

FLORIDA ASSOCIATION LOCAL ARRANGEMENT COMMITTEE FOR IAMFES ANNUAL MEETING FINALIZES PLANS

The Local Arrangements Committee of the Florida Association of Milk and Food Sanitarians under the chairmanship of Norman Tobey, Tampa, Florida, met with H. L. Thomasson, IAMFES, Executive Secretary, Friday, April 7 in Miami Beach to complete local plans for the IAMFES annual meeting, August 14-17, at the Americana Hotel.

Almost one hundred per cent of the members of the committee attended. An unusally fine program has been developed for the ladies, the high light of which is a boat trip to the world famous Aquarium near Miami. A boat trip on Thursday afternoon at the close of the meeting is planned for everyone as well as special entertainment at the Banquet and a Cheese Cupboard on Tuesday, August 15. The program is to be published in the May issue and reservation cards will be enclosed with the Journal. Further information will be included with the Journal in the next few issues prior to the meeting.

NOTICE

All IAMFES members are urged to consider submitting nominations for the annual $1,000 Sanitarians Award. We also invite suggestions for the Citation Award from any individual or affiliate. Submit your nominations and supporting evidence as soon as possible to:

H. L. Thomasson, Executive-Secretary
International Association Milk, Food & Environmental Sanitarians, Inc.
P. O. Box 437
Shelbyville, Indiana 46176

The deadline is June 1, 1967
Nomination papers & information on the rules and procedures are available from the Executive-Secretary or from:

W. C. Lawton, Sr., Chairman
Committee on Recognition and Awards
2424 Territorial Road
St. Paul, Minn. 55114

WESLEY KROTZ HONORED AS ONTARIO SANITARIAN OF THE YEAR

Wesley Krotz (center) is congratulated by Commissioner Baker and Ontario Dairy Princess Dolly Ann Edmunds.

At its 9th Annual Meeting at Etobicoke, Ontario, on January 25, 1967, the Ontario Milk Sanitarians Association nominated Wesley Krotz, manager of the Millbank Cheese and Butter Company, as Sanitarian of the Year for 1967. The award presentation was made by J. L. Baker, Ontario Dairy Commissioner.

In reading the citation Commissioner Baker stated that "Wes" Krotz could also be termed "Sanitarian Over the Years" as his activities in sanitation dated back to his apprenticeship in cheesemaking. Because of his interest in competition for quality product awards at province and national shows he recognized early the importance of sanitation in production of milk and cream. Throughout his career he has encouraged a better class of milk production at the farm level and has emphasized his interests at the plant level by insisting on top quality equipment and operation. Mr. Krotz holds 40 First Class Cheesemaker certificates and 28 First Class Buttermaker certificates.

Furthermore, according to Commissioner Baker, the 1967 Sanitarian of the Year has long been active in dairy industry associations, including the Ontario Milk Sanitarians Association. He has served as president as well as secretary of a number of Ontario organizations.

The one-day program at the annual meeting provided for discussions on topics such as laboratory control and guidance for quality production, employee education and plant inspection procedures. The program closed with the usual problem clinic. Election of officers took place at the annual business meeting and the following are the association officers for 1967: F. S. Whitlock, President; Raymond Bowles, Vice-President; J. W. Raithby, Treasurer; and T. Dickison, Secretary; Herman Cauthers is Past President and the Directors are Gordon Harkness, J. F. Jewson, A. N. Myhr, Fred R. Roughley and John D. Wishart.

REPORT OF THE COMMITTEE ON COMMUNICABLE DISEASES AFFECTING MAN—1966

Under the able direction of Stanley L. Hendricks, D.V.M., retired chairman of this Committee, the brochure entitled, "Procedure for the Investigation of Foodborne Disease Outbreaks," was brought up-to-date and approved for printing. On behalf of Dr. Hendricks, I wish to thank the members of this Committee and the many others who rendered valuable assistance in revising and reviewing this material.

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REPORT OF THE COMMITTEE ON FOOD EQUIPMENT SANITARY STANDARDS—1966

The IAMFES Committee on Food Equipment Sanitary Standards, known hereafter as the Committee, is charged with the responsibility of cooperating with other interested organizations and industries in the formulation of sanitary standards and educational materials for the fabrication, installation, and operation of food equipment and to present to the membership those standards and educational materials which the Committee recommends be endorsed by the Association.

The purpose of this cooperative program is to aid industry in improving the design, construction and installation of equipment so that it will lead to easy cleaning and proper functioning when placed into service in food establishments. It is the Committee's further purpose to cooperate with industry in the preparation of standards or guidelines which public health agencies will accept, thereby securing uniformity in the manufacture and nationwide acceptance of such equipment.

The following report will outline the Committee's activities during the past year in working with two health and industry organizations (National Sanitation Foundation's Joint Committee on Food Equipment Standards and the National Automatic Merchandising Association's Automatic Merchan-

dising Health-Industry Council) and progress in meeting its purposes and objectives. It is expected these organizations will be the two groups that the Committee will work with during the coming year.

NATIONAL SANITATION FOUNDATION (NSF)

The Committee was represented at the 1966 meeting of the National Sanitation Foundation's Joint Committee on Food Equipment Standards where appropriate action was taken on several proposals and prior to the meeting reviewed and submitted comments on each draft of these proposals. Since the meeting the Committee has also reviewed and submitted comments on proposed changes to existing standards and criteria and the development of new ones.

Policies and Procedures for the NSF Joint Committee

The NSF Joint Committee on Food Equipment Standards believing it would function better and more efficiently under a set of written policies and procedures developed such and recommended to the National Sanitation Foundation that such written procedural guidelines be adopted. With some minor modification, the Foundation adopted the proposed set of written policies and procedures for the Joint Committee; and prior to its approval at the 1963 Joint Committee Meeting, this Committee reviewed the proposal and offered comments to the Foundation.

Since adoption of these written policies and procedures, the Executive Committee on the NSF Council of Public Health Consultants reviewed these policies and procedures and proposed several significant changes to this procedural document which were presented to the Joint Committee at its 1966 Meeting. According to the NSF staff, the purpose of the Executive Committee's action was to formalize the role of the NSF Joint Committee and that of NSF Standard Task Committees. It generally was the feeling of the Public Health and Liaison Representatives on the Joint Committee that certain of these changes were unacceptable to them, as they seemed to limit or de-emphasize the work of the Joint Committee; and, therefore, the Joint Committee made several counter proposals. These recommendations are being forwarded by the Foundation to the Executive Committee.

Proposed Standard for Kitchen Exhaust Ventilation Systems

The Joint Committee reviewed the proposed NSF Standard relating to Commercial Kitchen Exhaust Ventilation Systems and recommended that it be referred to a NSF Standards Task Committee for further review and development, prior to submitting it to the Joint Committee members and their affiliated organizations for further review and comment. The Joint Committee was fortunate to have the opportunity of discussing technical standards development matters with industry experts throughout the meeting, and some of the representatives of this industry seemed to be particularly outstanding. They quickly caused the Joint Committee to recognize that this proposal was not ready for further review at this time.

Proposed Standard for Bulk Milk Dispensers

This Standard for Bulk Milk Dispensers is being developed, according to the NSF staff, with the full knowledge and cooperation of the 3-A Symbol Council. Its development being in keeping with the long established agreement between the Foundation and the 3-A Council that milk equipment cleaned and sanitized at the dairy plant is within the scope of the 3-A; while equipment cleaned and sanitized in the food establishment is within the purview of the National Sanitation Foundation. The Standard was reviewed on a preliminary basis by the Joint Committee and has subsequently been redrafted by the Foundation's staff, and transmitted for final review to members of the Joint Committee. This Committee has recently submitted a few additional suggestions to further improve the proposal.

Proposed Standard for Food and Drink Dispensers

This proposed Standard for Food and Drink Dispensers is being developed at the direction of the Joint Committee in order to provide necessary requirements for such manually-operated dispensing equipment as differentiated from coin-operated vending equipment. Following a preliminary review at the Joint Committee Meeting, the proposed Standard has been revised and the Committee is presently studying and preparing comments on the new draft.

Standard No. 4—Commercial Cooking and Warming Equipment

A proposed revision of Standard No. 4 had been prepared by the NSF Industry Task Committee in cooperation with the Foundation staff. However, limitation of time prevented a complete review of the proposed revision by the Joint Committee, but the review was in sufficient detail to realize that it was not ready for distribution to this and other committees. Therefore, it was referred to a Standards Task Committee for further review and development. It is anticipated that the Committee members will have an opportunity to review another draft of the proposal before the end of this year.

Standard No. 7—Commercial Refrigerators and Storage Freezers

At the request of the Refrigeration Industry Advisory Committee, the Joint Committee and the Foundation extended the effective date from January 1, 1966 to July 1, 1966 for compliance with the following provision: "All joints and seams in the food zone shall be filled and finished to conform with Item 3.01" of Standard No. 7. During the 1966 meeting, the Advisory Committee presented a report to the Joint Committee on the technical and economic aspects of the problems of complying with this provision as well as the results of a study on cleanability of said joints and seams conducted by the Foundation. It was evident during the presentation that a few companies have been properly filling and smoothing joints and seams in their equipment for the past several years and they felt that it was unwise to further extend the effective date. Nevertheless, the Joint Committee concluded that there was sufficient basis for further study of the problem and took action to extend the effective date till July 1, 1969. Further, the Joint Committee requested the establishment of a Special Committee to study the practicability and feasibility as well as the implications of this requirement. This Special Committee is to also study and recommend a general protocol for cleanability evaluations as related to food service equipment.

Basic Criteria C-1—Food Vending Machines

The Joint Committee amended the NSF Basic Criteria C-1, relating to Food and Beverage Vending Machines, to reflect the current temperature recommendations of the Public Health Service for storing and displaying potentially hazardous food at safe temperatures, namely, 45 F or below, or 140 F or above.

A complete review with preparation of necessary revisions to Criteria C-1 relating to Food and Beverage Vending Machines was also requested by the Joint Committee; and it further recommended that such review, if at all possible, be done in cooperation with the National Automatic Merchan-

dising Association. Due to recent changes in the PHS Ordinance and Code for Food and Beverage Vending Machines and the necessity of these two organizations conducting uniform evaluations of machines, it is deemed urgent that this recommendation for revision of C-1 be implemented as soon as possible and that the construction and performance requirements of the NSF and NAMA be made uniform.

Standard No. 3—Commercial Spray-Type Dishwashing Machines

The Joint Committee in the interest of reducing the chance for human error in commercial dishwashing operations recommended during the 1965 meeting the appointment of a Special Public Health and Industry Task Committee to study the problems of developing more definitive requirements for automatic controls relating to the general automation of commercial spray-type dishwashing machines.

Based upon a report received from this Task Committee, the Joint Committee acted to require effective on July 1, 1967, automatic thermostats on all wash and pumped rinse tanks in commercial spray-type dishwashing machines and recommended that the following be incorporated in Standard No. 3:

"THERMOSTATIC CONTROL: An automatic thermostatic control, having a maximum differential of 15 F., shall be provided in the wash and pump rinse tanks of all commercial spray-type dishwashing machines relying on heat sanitization of dishes. The thermostatic control(s) shall be so located as to assure maintenance of the wash and/or pump rinse water at the required minimum temperature."

Now, steps should be taken to require a device that will make the dishwashing machine inoperative unless the dish has been sanitized.

Standard No. 2—Food Service Equipment

The Joint Committee after reviewing comments from the affiliated organizations adopted the following addition to Item 4.421 of Standard No. 2 relating to Wheeled Self-Leveling Utensil Storage Systems: "Wheeled self-leveling utensil storage systems designed for the transportation and for storage of multi-use utensils shall be enclosed on the bottom and all sides to a height of not less than 18 inches above the floor. The enclosed space shall be readily accessible for cleaning."

The Joint Committee also received a verbal progress report from the Committee, appointed following the 1965 meeting, on its study to determine the cleanability and durability of certain cutting boards and wood top tables. It is anticipated that this Committee will have an opportunity to review a copy of the final report of this study during the latter part of 1966.

Portable Equipment

This Committee twice reviewed and submitted comments on a proposal to define the term "portable" as used in contexts of the various NSF Standards and Criteria relating to food equipment. It was evident throughout this review that, while it would be very helpful to the NSF in its evaluations to have this term defined, it was somewhat questionable that a piece of equipment complying with the proposed definition could be easily moved by one person. Nevertheless, the Joint Committee felt this was a step toward more definitiveness and, therefore, adopted the following specification to be reflected in all NSF Food Equipment Standards where applicable:

"PORTABLE: The unit shall be small enough and light enough to be easily moved by one person and shall comply with the following:

(1) Not exceed 75 pounds in weight and have no dimension in excess of three feet in any one plane.

(2) Have no utility connection; OR have a connection that can be easily disconnected without tools; OR have a flexible utility connection of sufficient length to permit the unit to be moved for cleaning."

Future Projects

The Joint Committee after receiving a preliminary report from the Foundation on high pressure laminates generally agreed that definite specifications for high pressure laminates were needed and, therefore, requested the Foundation to contact the high pressure laminate industry and explore with this industry and public health and user groups the development of specifications, a standard, or requirements for high pressure laminates for use in food service equipment.

The Foundation reported also that it had received a number of requests from the users, public agencies, and industry for definitive specifications for wall, ceiling, and floor materials as used in the food preparation areas. The Joint Committee discussed in general the feasibility and practicability of developing specifications for such materials and recommended that this matter be explored in more detail during the coming year.

NATIONAL AUTOMATIC MERCHANDISING ASSOCIATION (NAMA)

The National Automatic Merchandising Association's Automatic Merchandising Health-Industry Council (AMHIC) held its tenth annual meeting during October 1965, and this Association and other public health organizations and the affected industries were represented and participated in AMHIC'S deliberations. The afternoon of the first day was reserved for the public health representatives and was used by them to discuss public health objectives and policies to be followed in their work with the entire membership of AMHIC. The next morning was reserved for these representatives to examine the public health aspects of the vending machines in Exhibit Hall prior to meeting with the other members of the Council. This was a valuable experience for the Association's representative and enabled the public health members to coordinate and clarify their views on the work of AMHIC during the remainder of the meeting.

Evaluation Manual

The Automatic Merchandising Health-Industry Council (AMHIC) at its 1965 meeting reviewed all proposed amendments to the NAMA Vending Machine Evaluation Manual. Most of these amendments were necessitated by the 1965 Recommendations of the Public Health Service as contained in its Sanitation Ordinance and Code for the Vending of Foods and Beverages. The Council at its 1964 meeting felt that due to the many technological and operational changes in the vending industry, as now evident by the many major changes in the PHS Ordinance and Code, that the Subcommittee on Revision of the Evaluation Manual should be a continuing committee.

Since the 1965 AMHIC meeting, the NAMA staff redrafted the revision of the Manual and submitted copies to the members of the Council and their affiliated organizations for review and comment. Comments from this Committee and others were then compiled and recently submitted to all interested parties for consideration and further comment. Upon the completion of this review, the list of recommendations will be forwarded by the NAMA staff to the Subcommitee on Manual Revision for study and possible incorporation in the next draft of the Manual which should be in the hands of the Committee before the end of this year.

The members of the Council also discussed problems of having two national agencies developing guidelines for the

evaluation of vending machines on an independent basis and the advantages of having uniform machine design and construction standards adopted by both the National Automatic Merchandising Association and the National Sanitation Foundation. Recently, this Committee received information that the NSF and NAMA were making plans to work together in the development of uniform standards for the design and construction of vending machines. Such plans are significantly important to public health and industry, and these two national organizations should be congratulated for their willingness to cooperate in this venture.

Check List for Use in Evaluating Vending Machines

The Subcommittee on Revision of the Check List reported that it, in cooperation with the NAMA staff, reviewed two drafts containing comments from this and other committees; and the second draft represented all of the important changes suggested by members of AMHIC during the year plus those necessitated by the recent revision of the PHS Ordinance and Code. It was the consensus of the Council that any changes in the Manual should be properly reflected in the Check List. It was further reported that the NAMA Evaluation Agencies had found the Check List to be workable and very useful in the evaluation of machines. A final draft of the Check List is contingent upon the completion of the Manual, but it should be available for review by the Committee in the near future.

Amendment of NAMA Machine Evaluation Program Policies

The NAMA staff reviewed the following proposed changes and additions to the Machine Evaluation Program Policies for: amending various administrative procedures, establishing policies for re-evaluation of approved (certified) machines, requiring annual reporting by manufacturers of certified machines, and establishing an approval program for machine reconditioning companies.

It was the consensus of the Council that all machine models for which "Letters of Compliance" had been issued by NAMA to the manufacturer and which machines were still in production 18 or 30 months, depending upon the type of machines, after the original approval date should be re-evaluated to determine if they were in compliance. The Council also approved the policy setting up the mechanics for NAMA to receive a report from a designated official agent of each manufacturer as to what certified machines required re-evaluation.

There was also extensive discussion of the proposed policy on the evaluation of reconditioned machines and the approval of machine reconditioning companies, and it was the general consensus of the Council that a full-fledged approval program was premature, pending a better knowledge of reconditioners, their procedures and other aspects of this growing portion of the vending machine industry. In order to develop plans for working with the reconditioners and developing a positive program that would assure the buyers of these products of receiving machines in compliance with the Evaluation Manual, a Subcommittee was established to explore this matter in depth and to recommend to the Council appropriate steps to be taken.

Current Research Studies

The Council received two preliminary reports on current research projects being carried on by two well known institutions of higher learning—Clemson College and Ohio State University. The report on the Clemson study involving hot and cold food machines indicated good machine performance in heating and cooling but revealed marked temperature differentials on various shelves and positions in most machines. It was also reported that the complete study will soon be published in the Journal of Milk and Food Technology. The Ohio State study is also concerned with the basic behavior of typical hot and cold food vending machines but has also included a study of sandwich composition and wrapping as they are related to heat transmission, internal temperatures and bacterial survival.

Future Projects

AMHIC is also making plans to analyze the industry's food labeling problems and recommends steps establishing labeling practices consistent with good packaging public health practices; develop appropriate educational material for dissemination to the vending industry, public health agencies and the general public; and develop requirements for automatic ice makers. In order to implement these projects as well as others discussed previously in this report, assignments were given to special subcommittees to explore and to submit a report of their findings and recommendations on or before the 1966 meeting of AMHIC. It is anticipated that these reports will be made available to this Committee for review and comment before the end of 1966.

Recognition of a Charter Member of AMHIC

AMHIC adopted a resolution acknowledging the distinguished contributions made to vending and public health by its first Co-Chairman, the late Mr. Arthur J. Nolan, and recommending that the NAMA Board of Directors consider the establishment of an Arthur J. Nolan Award to individuals who have made notable contributions toward the goals of the NAMA Public Health Programs. This Committee has received word from the NAMA staff that the NAMA Board of Directors has established such an Award with a recommendation that candidates for it be submitted through AMHIC and has already contacted members of AMHIC for a list of candidates for the first Award to be given at the 1966 NAMA meeting.

At the 1965 meeting of AMHIC, the Chairman of the IAMFES Food Equipment Committee was re-elected Co-Chairman of AMHIC to represent the public health group.

RECOMMENDATIONS:

1. The Association reaffirm its support of the National Sanitation Foundation and the National Automatic Merchandising Association and continue to work with these two organizations in developing acceptable standards and educational materials for the food industry and public health.

2. The Association urge all sanitarians to obtain a complete set of the National Sanitation Foundation's Food Equipment Standards and Criteria and a copy of the National Automatic Merchandising Association-Automatic Merchandising Health-Industry Council's Vending Machine Evaluation Manual; to evaluate each piece of food equipment and vending machine in the field to determine compliance with the applicable sanitation guidelines, and to let the appropriate agency know of any manufacturer, installer, or operator failing to comply with these guidelines.

3. The Association urge all sanitarians and regulatory agencies to support the work of the Association's Committee and subscribe, by law or administrative policy, to the Standards, Criteria, and Evaluation Manual for food equipment and vending machines.

This report of the Committee on Food Equipment Sanitary Standards respectfully submitted by:

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Lloyd W. Regier (International Association)
Garnett DeHart (Georgia Association)
A. T. Rhoads (International Association)
Carl Henderson (International Association)
Jerome Schoenberger (New York Association)
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Eaton E. Smith (Connecticut Association)
Wayne H. Palsma (South Dakota Association)
Harold Wainess (Illinois Association)

REPORT OF THE COMMITTEE ON BAKING INDUSTRY EQUIPMENT—1966

The committee has had two meetings with the Baking Industry Sanitation Standard Committee since our 1965 report.

At the Fall meeting, October 26, 1965, a basic criteria was adopted by BISSC. This basic criteria spells out in detail—definitions and principles of design that have been accepted and appoved by BISSC. Using these basic criteria, task committee members can excerpt pertinent sections relevant to their standards.

Manufacturers when drawing plans for new equipment can use the basic criteria with assurance that any equipment manufactured to comply with or exceed the basic criteria requirements will comply with BISSC Standards. Sanitarians can use the basic criteria in applying minimum requirements when formulating standards or when revising existing standards. The committee believes the revision of existing Standards should be given high priority in future BISSC planning.

At the Spring meeting in March 1966, BISSC announced that active certification of equipment had commenced January 1, 1966. The BISSC symbol will be placed on equipment whose manufacturers have complied with the requirements of the Office of Certification. The symbol will be dated and will show the standard number under which the equipment is certified. Thus, BISSC joins other groups such as the 3A in certifying equipment. The committee urges all sanitarians to acquaint themselves with BISSC standards. Through the cooperation of the baking industry a complete set of all published bakery standards may be obtained by writing to: Raymond Walter, Executive Secretary, BISSC, 521 Fifth Avenue, New York 17, N. Y., or to any member of this committee.

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James Barringer, 1703 Oneida Street, Joliet, Illinois.

Maxwell Wilcomb, Professor of Sanitary Science, University of Oklahoma, Norman, Oklahoma.

Paul Rankin, Department of County Health Administration, Mississippi State Board of Health, Jackson, Mississippi.

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NEWS AND EVENTS

USE OF ANTIBIOTICS BY VETERINARIANS[1]

Some research results indicate that antibiotics, when fed to food-producing animals, are potentially harmful to humans consuming meat, milk, or eggs from treated animals. Because of this possible danger, FDA formed a committee to study the veterinary medical and nonmedical uses of antibiotics, with respect to their safety and effectiveness. According to the committee's report, these antibiotics might be harmful to humans in the following ways:

1. Antibiotic residues are retained in these products. Some individuals who are sensitive to antibiotics may consume these contaminated products and suffer adverse reactions.

2. Some strains of micro-organisms may become resistant to a specific antibiotic. Then humans or animals ill from these resistant organisms might not respond to treatment with the antibiotic or related antibiotics.

Based on the committee's report and other information, FDA has asked sponsors of drugs containing any antibiotic intended for use in food-producing animals to submit data showing whether such antibiotics are present as residues in the meat, milk, and eggs from treated animals. If the data are not submitted within the specified period, FDA may take action to withdraw approval for continued marketing of these antibiotics for use in food-producing animals. Any unwarranted residues may result in stricter controls.

Antibiotics Affected

This study will evaluate the safety to consumers of meat, milk, and eggs from animals treated with any of the following antibiotics: bacitracin, chlortetracycline, erythromycin, hygromycin-B, neomycin, novobiocin, nystatin, oleandomycin, oxytetracycline, penicillin, polymyxin-B, streptomycin, tylosin, and any derivatives of these antibiotics. Sponsors of chloramphenicol, lincomycin and tyrothricin will also submit data concerning safety and effectiveness for animals, even though the drugs are not being used in food-producing animals.

In addition to their veterinary medical use, two of these antibiotics (chlortetracycline and oxytetracycline) have been used to a limited extent for food preservation purposes in uncooked poultry and fish.

Veterinarians' Responsibilities

Veterinarians are concerned about the possible restrictions on use of these antibiotics. Therefore, they should observe the following precautions when using or recommending antibiotics for poultry and livestock:

1. Curtail any indiscriminate use of antibiotic drugs by using or recommending them only when necessary.

2. Know their clients' feeding practices, particularly when the individual is already using antibiotic-containing feeds, to lessen the chance of intakes greater than the prescribed amounts.

3. Stress that certain antibiotics or medicated feeds must be withdrawn for a specified period of time before slaughter, or before a product from treated animals or poultry is used for food.

4. Instruct their clients that certain antibiotics are to be fed only to designated species, and some antibiotics are not to be fed to laying hens or lactating dairy cows.

5. Tell their clients the latest information on the safe use of antibiotic drugs.

Copies of the committee's report are available from the Division of Industry Education, Bureau of Education and Voluntary Compliance, Food and Drug Administration, Washington, D. C. 20204.

[1]From FDA Fact Sheet, December, 1966, published by the Food and Drug Administration, U. S. Dept. of Health, Education and Welfare, Washington, D. C.

OUR STRUGGLE AGAINST PESTS

The U. S. Department of Agriculture, Office of Information, has recently released a highly interesting 24-page booklet (PA No. 772) entitled "Our Struggle Against Pests." Written essentially for the consumer, it is a concise discussion with some semi-technical background on such common pests as insects, plant and animal disease organisms, weeds and commercially unwanted plants and various factors affecting human welfare. It outlines the activities and programs of control being carried on by various federal agencies.

Discussing insect pests, the booklet points out that the actual number of species sharing our globe is not known, although estimates range from three to ten million. Every year thousands of new species are discovered. Some can live in nearly boiling

water, others at freezing temperatures and one variety makes its home in corks of cyanide bottles. Some 10,000 species alone are known to be damaging to crops, forests and livestock and modern agriculture would be impossible without methods developed for control.

In general, plant diseases are caused by bacteria, fungi and viruses and nearly every species of useful plant is subject to several types of diseases. Some plants may develop resistance but nearly all must be treated by modern chemicals to survive in commercial production.

Much the same is true of livestock, poultry and wild-life. All are subject to diseases which, if not controlled, would destroy countless numbers. Because of local outbreaks and flare-ups, national and international control measures must be comparable to defense against biological warfare.

The battle against pest-carried diseases which afflict humans has been much more successful, particularly in the United States. Malaria, yellow fever and typhus are rare in the U. S. today but, nevertheless, vigilance and protective measures cannot be relaxed.

Defining weeds as "plants growing where they are not wanted," the USDA booklet emphasizes that weed control is becoming an ever-greater factor in our economy and well-being. Not only do weeds harm desirable plants by taking their food, water, light and space, but they also harbor insects and other pests, clog farm ponds, recreational lakes and streams, irrigation and drainage ditches and even adversely affect impounded drinking water supplies. Weeds also may impair the health of humans.

DEVELOPMENT OF PESTICIDES

For the first time in world history, according to the USDA story, the war against pests took a more favorable and positive turn in the early 1940's. Prior efforts in using salt and brimstone (sulphur) in ancient times, Paris green by early American settlers, copper sulphate and "hand-to-hand" methods of ditching and moving crops to new fields had little permanent benefit.

The turning point in the 1940's was the development and use of new types of chemical "pesticides," a term applied to a variety of chemical compounds. It included insecticides, herbicides, nematocides, fungicides and rodenticides. The chlorinated hydrocarbons were among the early successful compounds and DDT was one of the best known. Many other chemical groups were developed such as the organic phosphorous compounds and in 1966 there were some 69,000 different kinds of pesticide formulations registered with the USDA after thorough tests of their safety and effectiveness.

Chemical pesticides, of course, are poisons and this is why they are effective for the purpose intended. Like many modern drugs they are dangerous if carelessly or improperly used, the USDA booklet points out. Some pesticides are known to leave a lasting residue which may move in water, air and food into the bodies of animals, including man.

This is of serious concern to scientists and others interested in human welfare. Every possible precaution is taken to insure that pesticides do not harm human beings or adversely affect plants or living creatures contributing to the support of human life.

Chemical pesticides are powerful substances that serve man in many ways and have grown to be essential in providing an abundant and wholesome supply of food and in controlling and eradicating diseases and pests. It is the responsibility of the Department of Agriculture, along with other federal, state and community agencies, educational institutions and private industry through regulation, direct control, education and research, to secure the effective use of pesticides with minimum hazard.

FEDERAL AGENCY PROGRAMS

The USDA booklet relates that the Federal government through Congressional action has long been engaged in a program of insuring that food is wholesome and safe to eat and contains no chemical residues or substances in quantities known to be harmful. By the Food, Drug and Cosmetics Act of 1938 and amendments, the Food and Drug Administration branch of the Department of Health, Education and Welfare is charged with the responsibility for the safety of foods containing pesticide residue. FDA sets predetermined safe limits on amounts of residue remaining on crops shipped across state lines and establishes allowable "tolerances." Among other control activities a program of monitoring is maintained whereby in a typical year more than 30,000 samples of raw agriculture products are examined.

The Federal Insecticide, Fungicide and Rodenticide Act of 1947 assigns the responsibility for pesticide control to the Department of Agriculture. Under the law every chemical pesticide shipped in interstate commerce must be registered with USDA. Registration is based on rigid tests for safety to humans, crops, livestock and wildlife and registration applications are now also reviewed by DHEW, USDA and the Department of the Interior.

USDA regulates the labeling of the compound which includes the registration number assigned, a cautionary or warning statement when needed, and

approved directions for use or other wording based on factual data supplied by the manufacturer. USDA also maintains a system of monitoring and testing of products on the market.

The Public Health Service of DHEW likewise is engaged in a nationwide program to evaluate both long and short term effects, if any, of pesticide substances in the human body. Research is conducted to determine possible relationships between pesticide exposure and human illness. PHS also has the responsibility to record and investigate illnesses or deaths believed to be related to pesticide usage. It also has the responsibility for studying ways of controlling insects, rodents and pests that endanger public health.

Finally, the Department of the Interior, is engaged in obtaining an accurate measure of pesticide hazards to wildlife. Scientists in the Fish and Wildlife Service study the effect of pesticides and residues on fish and wildlife such as the use of pesticides to control "rough" fish in lakes and streams.

The Future of Pest Control

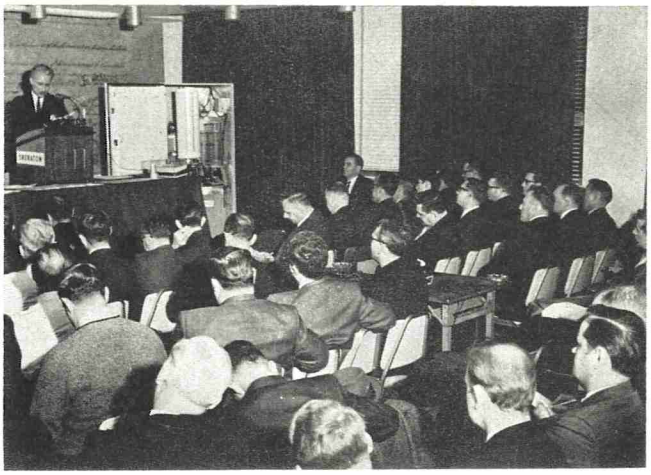
Recognizing the "built-in" hazards of certain chemical pesticides, research is aimed at the development of safer compounds which leave little or no residue and which can be used in safer applications. Some new compounds are effective in extremely small quantities and methods of application to a restricted target area have been improved, according to the booklet.

Other non-chemical pesticide methods are under study and some give great promise. Use of parasites, predators and certain diseases of pests provide important ways to control them. Certain bacteria, fungi and viruses are used to control weeds and selected species of beetles have been successful in clearing large areas. Other pest control research deals with insect attractants and lures and the use of lights and sounds. Interference with natural reproductive capabilities is another field being studied thoroughly and successfully.

All federal pest control activities are coordinated by the Federal Committee on Pest Control (FCPC). Each year a variety of pest control proposals are reviewed and judged as to their safety and effectiveness. Individual departmental activities are studied and evaluated.

Many scientists in universities and industrial laboratories also are working to solve problems of pest control and many states and local communities have active programs. The USDA booklet concludes that a combination of all known methods of control and much more research will be required to continue man's endless war against pests.

NAMA HOLDS WORKSHOPS IN PENNSYLVANIA



Dave Hartley addresses NAMA Workshop at Philadelphia.

An audience of more than 460 vending and supplier company representatives participated in recent vending sanitation workshops in three Pennsylvania cities.

The vending operators attended the two-hour sessions which were sponsored by the National Automatic Merchandising Association and the Pennsylvania Automatic Merchandising Council.

Vending sanitation and servicing procedures were explained to vending operators, supervisors, routemen, and shop personnel at the workshops by David E. Hartley, N A M A public health counsel. Other subjects covered at the one-day meetings were servicing and cleaning of the vending machine, housekeeping at the location, personnel health and health habits, and the new Pennsylvania "Vending Sanitation Regulation."

The meetings, which were held in Philadelphia, Pittsburgh and Harrisburg, were conducted by Hartley and Herbert M. Beitel, N A M A Eastern office manager.

3,333,000,000 PEOPLE AND STILL GOING

According to the Population Reference Bureau, an organization which takes stock in such matters, the population of the world last summer passed the three and a third billion mark. And the United Nations estimates that the world population is now growing at a rate of 2% a year.

Last summer's figure was an increase of 65 million people or 180,000 per day over the previous year. Moreover, the Bureau calculates that half the world's present population has been born since the end of World War II. This increment of 1.6 billion approximates the estimated total population of the world in 1900—just an average lifetime ago.

It took a million years for the world population to reach the first billion in 1800, some 166 years ago, and since that time the population has more than tripled. At the present 2% rate of growth the total number of people in the world will have doubled by the end of this century and in a hundred years the increase will be nearly eightfold. In other words, in 2066 the total world population will be 24 billion.

It's going to take an awful lot of sanitarians!

NMC DIRECTORS VOTE TO SUPPORT STUDY OF SCREENING TESTS FOR MASTITIS

In a step aimed at ending some of the confusion surrounding the use of screening tests for the detection of bovine mastitis, the Board of Directors of the National Mastitis Council, Inc., voted unanimously to financially support a project of the NMC Research Committee to compare and evaluate a number of screening tests. This action was taken at the annual meeting of the Council February 15 and 16, 1967, in Chicago.

One of the first objectives of the Research Committee will be to study means for the standardization of the direct microscopic leucocyte count (DMLC) so that this procedure may be more accurately used as a reference test for indirect screening techniques. Although final plans for the study are not yet completed, it is the idea of the committee to compare and standardize methods for a number of other screening tests once the work with the DMLC is completed.

"The challenge of a mastitis control program today lies in the establishment of uniform methods and rules," said Dr. Robert J. Schroeder, president-elect, American Veterinary Medical Association and county veterinarian, Los Angles County, California. Speaking to an audience of 300 representatives of all segments of the dairy industry from 41 states, and Canada, he said, "It seems that the need for uniform methods and rules is universally recognized."

Dr. William G. Merrill of Cornell University reported on mastitis research currently in prograss at the National Institute for Research in Dairying, Reading, England. The English researchers, Merrill stated, have proposed a control system that involves the development and testing of new disinfectant and antibiotic products, and have tested both the products and the control techniques in large, properly controlled field experiments. "There are encouraging prospects that the hygiene milking routine for preventing new infection, and antibiotics for eliminating established infections are likely to have a marked effect on mastitis," Dr. Merrill reported, "when the two methods are applied together."

Those at the meeting heard a complete description of the Ontario mastitis control program by Dr. K. A. McEwen of the Ontario Department of Agriculture and Food. "We are confident that we have a workable approach to the problem of mastitis control," McEwen told the audience. "Our problem will be to adjust to servicing more herds and still achieve the required results."

The California milk quality program is not complicated and it is not expensive, according to Dr. D. E. Jasper, University of California. "Our program depends to a large extent on the good will and intentions of all producers, all processors, all inspectors, and all others who serve the dairy industry. Best of all, it is a program which is working and achieving results," Jasper said.

"Sometimes I wish I had the courage to tell a farmer, who doesn't seem to care, that he doesn't belong in the dairy business," Dr. J. J. Mettler, Jr., a practicing veterinarian of Copake Falls, New York, told his audience. "However, our responsibility to our clients is such that we must help them or we both fail."

A final report of the work of the committee on abnormal milk of the National Conference of Interstate Milk Shipments was made by the chairman, Dr. John B. Herrick, Iowa State University. This report calls for a three phase program aimed at mastitis control and proposes that this program be put into effect in all states.

The first step, to become effective July 30, 1967, provides for setting up a program for using indicator tests conducted in official laboratories for the detection of abnormal milk. The second step, effective July 1, 1968, sets forth an educational program directed to dairy farmers and aimed at reducing leucocyte counts to 1,000,000 or less per ml. of milk. The third step, effective July 1, 1970, provides a penalty clause for non-compliance with leucocyte standards.

At the meeting of the Board of Directors, this proposal was thoroughly discussed and it was voted that the National Mastitis Council withhold approval of the report. This action was taken as a result of objections made by the Research Committee of NMC, and the Committee on Mastitis of the American Veterinary Medical Association, with the concurrence of the American Dairy Science Association liaison committee, to certain segments of the report.

Other actions of the Board of Directors included the approval of an Education Committee request to proceed with the preparation of a new leaflet, written in popular style and covering all aspects of mastitis control, which would be designed for mass distribution to dairy farmers. A Research Committee request to proceed with the preparation of a manual on recommended microbiological procedures for the

diagnosis of bovine mastitis was approved.

Before adjourning the Board of Directors elected new officers to serve the Council until the next annual meeting, which will be held in Chicago on February 15 and 16, 1968. The new officers are Graham T. Coulter of Kraft Foods, Chicago, president; Dr. C. J. Haller, veterinarian of Avon, New York, vice-president; Dr. J. C. Flake of Evaporated Milk Association, Washington, secretary; and M. G. Van Buskirk of Naerville, Illinois, treasurer.

PHS GRANT FOR STUDY OF EGGS AND SALMONELLA DISEASE

A Federal grant of $20,720 to trace how eggs and egg roducts contribute to Salmonella disease in humans has been awarded by the Public Health Service to a team of investigators headed by Dr. Ralph A.Masterson, a veterinary epidemiologist in the Ohio Department of Health, Columbus, Ohio.

The study involves the identification and tracing of salmonellae bacteria found in both raw and finished egg products. Its purpose is to determine frequency and extent of contamination; precise types of the bacteria on or in eggs entering processing plants; flocks from which the eggs originated and how the flocks became infected, and to sample eggs before and after the various processing steps to identify at which step contamination occurred. It is also hoped to determine the extent of contamination and to learn about environmental factors which may be involved on the farm and in plants.

The information will be of value in the control of Salmonella contamination of egg products and will, in turn, be useful in the surveillance of associated outbreaks of disease in humans.

The research project was recommended by the National Advisory Council on Environmental Health. Funding will be administered by the Public Health Service's National Center for Urban and Industrial Health.

DDT TOLERANCES ESTABLISHED FOR MILK AND MILK PRODUCTS

The Government on March 14, 1967, established tolerances for residues of the pesticide DDT in milk and milk products at levels recommended by a scientific advisory committee. The tolerances will permit DDT residues of up to 0.05 parts per million in whole milk and 1.25 parts per million on a milk-fat basis in manufactured dairy products. These maximum residue levels apply to DDT, its chemical degradation products DDD and DDE, or any combination of the three, the Food and Drug Administration said.

Both the advisory committee, which was nominated by the National Academy of Sciences, and FDA scientsits have concluded that these residue levels are safe for man. The approval of tolerances does not alter existing recommendations on the use of DDT, which stipulate that the pesticide is not to be used in or around dairy barns or on forage crops intended for dairy animals. FDA's action reflects the fact that small amounts of DDT are found in milk despite these restrictions.

The California State Departments of Agriculture and Public Health petitioned the FDA in 1965 to set tolerances for DDT, DDD, and DDE. The petitions proposed the same levels established on March 14 for any one of the three chemicals, but suggested permissable residues of twice those levels for any combination of the three. There had been no established tolerance for DDT residues in milk or milk products, but improved analytical methods developed in recent years have shown that residues do exist in most milk samples even in areas where the use of DDT is strictly controlled.

In its report to the FDA last October, the advisory committee concluded that pesticide-free raw milk is a practical impossibility at the present time because of the wide usage of DDT and its chemical stability. "The importance of the continuing use of DDT for the production of food and fiber crops throughout the United States is unquestioned," the committee said. "Thus the establishment of a finite tolerance would be a realistic step and it would recognize and legalize an existing unavoidable situation. It would not constitute approval for additional uses of this insecticide."

The committee also concluded, however, that the higher residue levels requested for combinations of DDT and its degradation products would require additional evidence of safety. The existing prohibition against feeding cows corn forage or apple pomace containing DDT remains in effect despite the tolerance established for residues in milk.

STUDY TASTES AND ODORS IN DRINKING WATER

What makes drinking water taste "good" in one city, and "bad" in another? How may the factors influencing taste and odor be measured and changed? In an effort to find out, the U. S. Public Health Service is supporting two studies, both at the University of California, on the identification of tastes and odors in drinking water.

One study is aimed at providing basic information on specific chemical, physical, and environmental factors which influence the acceptability of water

that people drink. Specific aims include the measurement of the taste interaction of calcium, magnesium, and sodium, in combination with chloride, sulfate, and carbonate; a study of the influence of temperature, oxygen, and carbon dioxide in mineralized and chlorinated waters on sensory responses and on salivary secretion; and application of the results obtained to selected natural domestic waters and to beverages, such as coffee and tea, prepared from these waters.

The second study is concerned with determining the exact source of undesirable tastes and odors of a biological origin. Investigation includes the development of physical and chemical methods of separation and analysis designed to help resolve the nature of compounds which produce taste and odor. The ultimate objective is control to enable upgrading of water quality.

4TH ISA SHORT COURSE ON GAS CHROMATOGRAPHY

Ihe Instrument Society of America (ISA) will sponsor the fourth five-day Short Course on Gas Chromatography for Practicing Chromatographers. Organized and directed by the Society's Analysis Instrumentation Division, the course will be held on the campus of Colorado, from August 7-11, 1967.

Course Coordinator is Dr. C. E. Borchers, Chemistry Department of Northwestern University and Associate Director of ISA's Analysis Instrumentation Division. The course is designed to provide practicing chromatographers, and others having a working knowledge of chromatography, with the opportunity to receive the latest theoretical, operating, and applied techniques. It is keyed for those having responsibilities for process or laboratory instrumentation, and who are concerned with various aspects of gas chromatography.

The course consists of daily lectures plus related discussion sessions guided by the teaching staff, all well-known and currently active authorities in the field, on advanced theoretical topics and general applications of problems in gas chromatography. Subjects to be covered include the historical development of chromatography; theory of retention; peak broadening; the chromatographic system; column types; qualitative and quantitative analysis; chromatographic detection; special techniques; process chromatography; and biomedical chromatography.

Registration will be limited, with preference given to those most closely concerned with gas chromatography who have not attended previous ISA Gas Chromatography Short Courses. Detailed information and/or registration request is available from Dr. C. E. Borchers, ISA Gas Chromatography Short Course Coordinator, Northwestern University, Chemistry Department, Evanston, Illinois 60201.

WORK SMARTER*

"Work smarter—not just harder" is a slogan worth thinking about. It was Emerson who wrote, "There's a way to do it better—find it."

For years tradition has applauded the "hard worker." You know the type. The fellow who keeps his nose to the grindstone is ever ready to work overtime, and takes work home at nights and over the weekend. Maybe some of this is necessary, but sometimes it is not.

If you would rather be "a smart worker" try some frank evaluation of the duties you perform.

Itemize each duty.

Analyze the importance of each of the itemized duties in relationship to all others.

Estimate the amount of time each duty should require if it could be done properly.

Total this estimate of duty time—and compare with the total amount of time you now give it. Could it be improved?

Apply IBM's well known "Think" and ponder over "ways and means" to steramline the over-all duty load, initiate new timing, and squeeze out the waste in time and effort. This is known as simplification and refinement.

Lastly, try most of all to give attention to one thing at a time, and do not permit yourself to stray from basic principles or to scatter your concentration, your energy and your goals.

Some people, possibly environmental practitioners, and health agency administrators, appear to believe that little if anything can be done to improve inspectional and sanitation education patterns and just grind on, imperturbed by the increasing demands of a fast-moving economic business and social world.

Mebee it's not too late! Stop and think about it—it could pay dividends to work "harder" at being "smarter."

*From the Ohio Sanitarian, Spring 1967.

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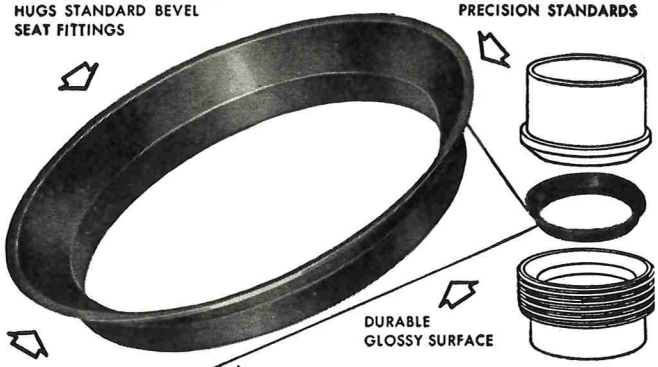

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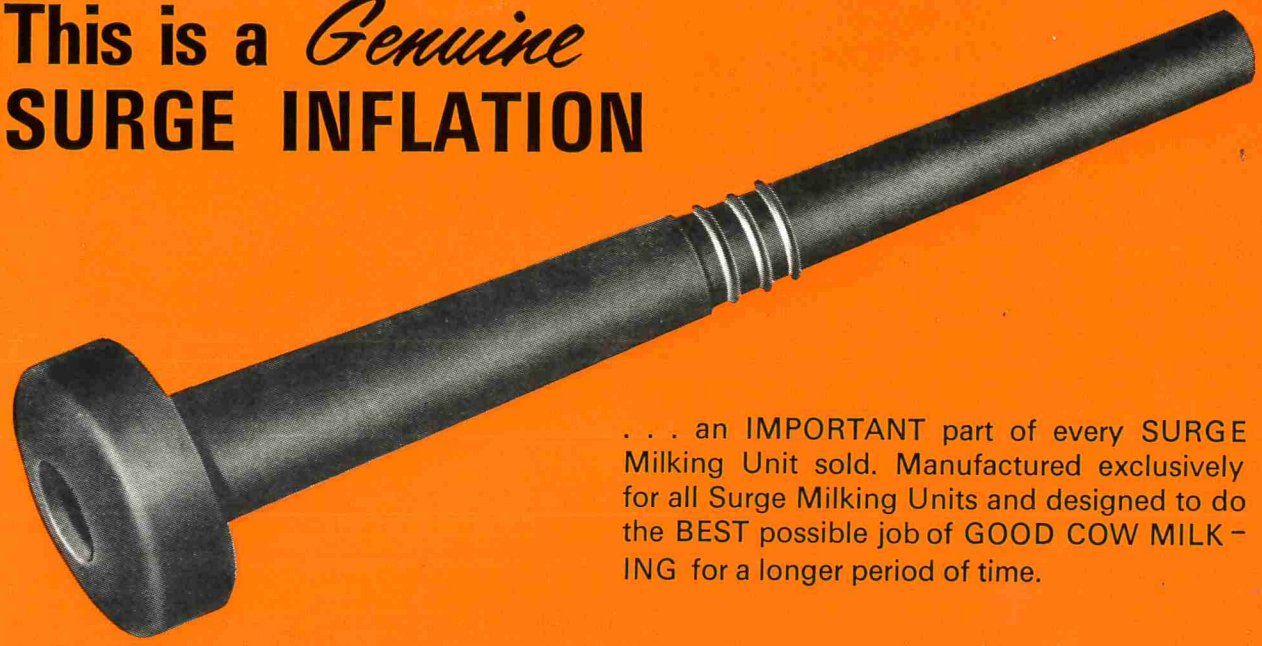

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