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# *Dairy and Food Sanitation*

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*A Publication for Sanitarians and Fieldmen*

- Maintenance and Measurement of Product Temperature in Food Service
- Sanitation in the Processing and Packaging of Raw Cider
- A New Method of Hydrogen Peroxide Application "Nebulization"



*A Publication of the International  
Association of Milk, Food and  
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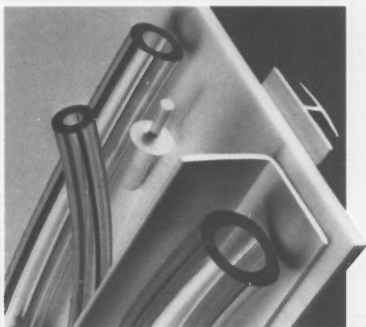
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# A NEW METHOD OF HYDROGEN PEROXIDE APPLICATION "NEBULIZATION"

**SAI FARAHIK**

*Aseptic Research Lab  
Ex-Cell-O Corporation*

*Presented at  
Sixty Eighth Annual Meeting  
International Association of  
Milk, Food and Environmental Sanitarians  
Spokane, Washington  
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By definition, aseptic packaging is the packaging of sterile product under sterile environment in a sterile package. To achieve sterility of the package, packaging material or packaging container, various methods and techniques have been used. In the past, none of these were sufficiently effective to develop a thoroughly sterile package.

A perfect sterilant for this concept should be easily applied, part of an on line operation, and residue-free after application. It must perform the highest kill rate in the shortest possible time and should not cause toxicity to the user or damage to the environment. It should also be inexpensive to use.

One of the most nearly perfect substances used by the industry is hydrogen peroxide. It can be used readily with the system and is easily removed after application, breaking down into harmless water and oxygen molecules. It becomes a highly effective bactericide and sporicide when used with other elements such as heat.

We have recently completed at Ex-Cell-O Corporation Aseptic Research Lab a new method of sterilizing bottom formed cartons using hydrogen peroxide. This method

totally covers the inside of the carton and has been proven to be more effective than the spray system. The hydrogen peroxide residue is readily broken down and dissipated using pressurized heated air, leaving no trace of peroxide inside the package. It can be incorporated with high speed machines and the output can be controlled accordingly. This system is called "mechanical nebulization".

The mechanical nebulizer operates on the Babington principle, which is, the formation of fog by rupturing a thin film of hydrogen peroxide forming on a sphere by a pressurized air stream. This concept operates without the use of electronic components or vibrating parts. The step-by-step operation of the system is as follows:

1. Liquid from the reservoir is pumped to the manifold reservoir from which it is poured over the hollow sphere.
2. A thin layer or film of hydrogen peroxide is formed over the sphere.
3. Compressed air is introduced into the hollow sphere and exits through a small orifice at high speed velocity.
4. The air shatters the liquid film,

forming a dispersion of fine liquid particles.

5. These particles are reduced to ultrafine aerosol as they are forcefully propelled against a plastic impactor.
6. The excess liquid drains to the chamber where it can be recirculated to the upper reservoir through a bubble pump.
7. The generated fog is transferred to the carton through a tube. The flow of fog can be enhanced by a back pressure of air about 3-6 PSI introduced in the back end of the nebulizing chamber.

The mechanical nebulizer system consists of the following components:

1. A plastic tank which holds the daily required amount of hydrogen peroxide. (This reservoir can be made out of glass, but due to handling of parts and danger of breakage, polyethylene is recommended.)
2. Two tygon tubes connected to the plastic tank. One will deliver the liquid down to the main reservoir, and the other keeps the air balance in the tank. This two tube system is part of a level control system for the mechanical nebulizer. (One must make sure the two tubes are functioning properly;

- otherwise, the reservoir will collapse or flow will be intermittent.)
- Level control which works on the "chicken feeder" concept.
  - The main reservoir which contains the principle components for the system and calibrated amount of peroxide.
  - The manifold which is inside the main reservoir containing the spheres from which the fog is generated.
  - Transfer tubing which is inclined leaving the main reservoir and is then bent to introduce the fog inside the carton. The inclination

is required to return large droplets to the main reservoir and only the fine fog is introduced into the carton.

- A pair of parallel electric eyes through which the flow rate of hydrogen peroxide fog is monitored. The analog output for the flow rate is read off a micrometer.

#### *Evaluation of the System*

A completed prototype unit has been evaluated in the Lab to determine the efficacy of the mechanical nebulizer.

rate (cc/min) was calculated from the collected data.

To substantiate the reliability of these data and determine the optimum flow rate required to produce satisfactory coverage of carton interior, the Aseptic Research Lab developed a test to study this criteria, using a fluorescent dye solution.<sup>1</sup>

The dye solution was nebulized into various carton sizes at various primary (20-60 PSI) and secondary (0-6 PSI) air pressure settings. After the solution dried the samples were inspected with a U.V. light to determine the dye distribution. The

Machine Speed Carton Per Min.	Carton Size		Primary Pressure (PSI)	Secondary Pressure (PSI)
	U.S.	Metric		
45	1/2 pt.	250 ml.	35	3
	Pint	500 ml.	40	3
	Quart	Liter	50	6
60	1/2 pt.	250 ml.	35	6
	Pint	500 ml.	40	6
	Quart	Liter	50	6

<sup>1</sup>Fluorescent dye solution: 1 gram #122 invisible blue, luminescent pigment, 2 ml. aerosol OT wetting agent (75% solution), 100 ml. reagent alcohol, 3 liter distilled water. Dissolve the pigment and wetting agent in alcohol. Mix the solution with three liters of water.

<sup>2</sup>Vanadium pentoxide solution: 1 gram vanadium pentoxide powder, 100 ml. 6% sulfuric acid. Mix and heat slowly until all the powder is dissolved. Add 5-10 drops to sample.

#### *1. Flow Rate Test*

Several tests were conducted to determine the amount of peroxide nebulized into the carton at various primary and secondary air pressure settings. The initial evaluations were based on readings from the calibrated plastic reservoir. These readings were made every hour and the flow

following table summarizes the results of the test.

The dye distribution not only indicated the distribution of hydrogen peroxide mist after being nebulized into the carton, but also the size of the mist particles adhering to the carton walls.

## 2. Microbiological Evaluation

To determine the microbiological kill rate of the mechanical nebulizer, precontaminated blanks were formed and sterilized with hydrogen peroxide mist from the nebulizer. The interior of the carton blanks were sprayed (seeded) with *B. Subtilis* spore suspension using a chromatography sprayer (atomizer) for even distribution and uniform thickness. After drying, the blanks were then formed on the prototype machine and sterilized. Random samples without peroxide treatment were used as controls to determine the total spore counts before sterilization. To prevent the peroxide mist from escaping from the nebulized carton during the coalescing period, the carton top was covered with a stainless steel plate for the next three indexing stations. The open cartons were then exposed to hot air with velocity to synergize and dissipate the hydrogen peroxide mist in the carton. The temperature of the hot air was adjusted from 450°-600°F, to

make sure all cartons were peroxide free.

The hydrogen peroxide residue in representative samples was checked using vanadium pentoxide solution<sup>2</sup> before the study started. Also, the rinse water was checked after the plates were made to make sure the sterilized cartons did not contain peroxide residue. Oxidase was not used in this study to eliminate peroxide residues because it was learned in previous experiments that oxidase contributed contaminants to the samples, changing the results of the test.

The collected cartons were evaluated as follows:

A section of the outside surface of the carton was sterilized with alcohol and flame. Immediately, 100 cc of sterile distilled water was injected into each carton. The carton was shaken a number of times to rinse the bacterial cells off the carton walls into the rinse solution. The outside of

the carton was sterilized again and the carton was punctured with a sterile puncture. 5cc of rinse water was removed through this hole with a sterile pipette. Three one ml. samples were pour plated with nutrient agar. The prepared plates were incubated at 33°C. for three days, then enumerated for viable cells. The following table summarizes the results.

Several studies have shown that peroxide is more effective as a bactericidal and sporocidal reagent when it is heated. The manner in which it is heated is very important so that the peroxide is not broken down before it can be effective, as was probably the case in Trial #5.

To improve the kill rate using heat, an experiment was conducted in the Aseptic Research Lab whereby the carton was heated before hydrogen peroxide mist was introduced into it. The results were about 101 higher. This technique not only improved the kill rate but also reduced the peroxide residue considerably.

Trial	Control (Initial Counts)	Counts After Treatment	% Kill Rate
1	190	0	100
2	1 to $6.2 \times 10^7$	Less than 10	99.99
3	$8.0 \times 10^5$	10	99.99
4	$1.3-1.5 \times 10^8$	$2.4 \times 10^6$	98
5*	$1.0-1.8 \times 10^7$	$3 \times 10^6$	80

\* The fifth trial was conducted by heating the carrier tube 300°-375° F. to reduce condensation.

# Proper Pesticide Applications in Food Establishments

RICHARD W. GILLESPIE

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**"All pesticides shipped in interstate commerce must be registered with the EPA. Before registration, the manufacturer is required to prove the product under use would be effective and would not injure humans, crops, livestock, wildlife or damage the environment. The manufacturer must also prove that directed use would not result in illegal residues on food or feed."**

*The great benefits of pesticide use can easily outweigh the negative effects, especially when proper application practices are used. This is particularly important in food handling establishments. Some pesticides may be used only by certified applicators. Others are for general use. Pesticides are available in a number of different forms: liquid, dry, granule, bait and fumigant. They may be dispensed through aerosol containers which have nozzles for specified uses. Application is made to general, spot, or crack and crevice areas. Rodenticides may be dispensed through multiple or single dose anticoagulants.*

Pesticides may be called two-sided chemicals: they have benefitted man by saving millions of lives through the control of insects and rodents; they have endangered man by their toxic nature.

The result is an increased emphasis on proper pesticide application procedures. This has spawned a number of federal regulations establishing application standards. One arm of government which oversees these standards is the Environmental Protection Agency (EPA).

The EPA has the authority to administer the Federal Environmental Pesticide Control Act (FEPCA) of 1972, which establishes tolerance levels on food and feed. The FEPCA recognizes pesticides to be beneficial and necessary, and also

shows health risks to man and animal have grown with increased pesticide usage.

All pesticides shipped in interstate commerce must be registered with the EPA. Before registration, the manufacturer is required to prove the product under use would be effective and would not injure humans, crops, livestock, wildlife or damage the environment. The manufacturer must also prove that directed use would not result in illegal residues on food or feed.

A pesticide registration can be cancelled if it is determined the directed use of the pesticide poses a serious hazard to man or the environment. A suspension of a pesticide can stop interstate shipments immediately, but can only be initiated when the product presents an imminent hazard.

The pesticide label itself is a legal document. It should display the brand, trade and product name, active and inactive ingredients, use directions and warnings. The EPA registration number, establishment number, name of the manufacturer and net weight of the product should also be displayed.

Restricted pesticides can only be used by applicators who are certified by the individual states. General use pesticides can be used by all, but users must follow the instructions on the label.



Most states are actively involved in getting pest control operators (PCO) certified. Certification generally encompasses a minimum of seven hours classroom training covering the law, methods, techniques and safety.

Pesticide or formulas are dispensed by several methods. Aerosols are contact sprays which adhere to

and kill flying insects, usually in a mist form. Aerosol cans are (1) small low-pressure disposable dispensers used by the average householder; (2) larger, high-pressure, refillable aerosol dispensers used on public health programs and by pest control operators; and (3) ultra-low-volume aerosol generators.

Particle size is varied by increasing or decreasing the air velocity in the discharge nozzle, utilizing fine or coarse spray nozzles or using light or heavy spray oils. Aerosol sprays have no lasting protection and are good only for exposed pests. Aerosols are considered a general treatment method, generally not approved or recommended in food operations.

Liquid formulas include residual sprays applied to cracks, crevices and walls to kill insects that rest or walk on the treated surfaces. Liquid insecticides are adaptable to many kinds of equipment.

The dry form of a pesticide can be used for crack and crevice treatment, and is recommended for treating

around electrical outlets. Application requires more skill and care than liquids in food operations.

Pesticides in granule form can be crystallized or mixed with sand or similar material. There is no drift factor and they are therefore designed more for outdoor use.

Bait formulas are combinations of food with a pesticide. Fumigants are volatile chemicals that must reach the pests in gas form to be effective. There are four different types: General fumigation (buildings and their contents); spot fumigation (machinery, bulk commodities); tarpaulin or chamber fumigation and vehicle or in-transit fumigations (trucks, railway cars).

Fumigation should only be carried out by certified applicators.

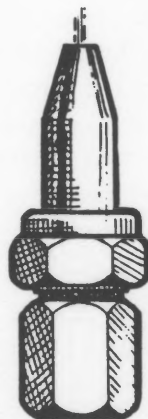
In 1973 the EPA published a policy statement on insecticides and how to apply them in food establishments. It defined the status of every insecticide that could be used in food areas of these establishments.



Needle-Nozzle - (Solid Stream) Used for crack and crevice treatment to control cockroaches, ants.



Wide Angle Cone Nozzle - Used for spot treatment on walls, ceilings and vegetation.



Solid Stream Nozzle - Used to apply a stream of insecticide to an opening, a container or for larvaciding.

The EPA also published definitions of important terms used in the policy statement. Food is defined as articles used for food or drink for man or other animals, chewing gum, and articles used for components of any food.

The food handling establishment is an area or place other than a private residence in which food is held, processed, prepared, and served.

A food area includes areas for receiving, serving, storage, packaging and preparing food. A non-food area includes garbage rooms, lavatories, entries and vestibules, offices, locker rooms, machine rooms, boiler rooms, garages and mop closets.

Residual application of pesticides in food establishments may vary greatly. General applications are to broad expanses of surfaces such as walls, floors, and ceilings. These are permitted only in non-food areas.

Spot applications are to limited areas where insects will likely be but where it will not be in contact with food or utensils. These areas may be floors, walls, ceilings or undersides of equipment.

Until recently, this application could be used only in non-food areas, but the EPA has permitted spot treatment in food areas with certain insecticides. The label on the insecticide container should indicate whether spot treatment is permitted in food areas.

Crack and crevice applications involve applying small amounts of insecticides into cracks and crevices where insects hide, or through which they may enter a building. This is the method of choice for applying insecticides in food operations. The treatment includes the use of sprays, dusts or baits.

A special nozzle -- giving a fine pin stream -- is used to get the insecticide into the cracks and crevices. Most crack and crevice treatment will be made using liquid formulations.

Proper treatment is finished when few placements are made and a minimum of insecticide is applied at each placement. No insecticide should be on a visible surface.

Needle nozzle applications should be placed directly into the crack or crevice, if possible - the closer to the crack and crevice the better. Insecticide sprayed onto an exposed surface should be mopped up.

Nozzles are designed so that the insecticide can be applied in whatever pattern the operator desires. The primary function of the nozzle is to obtain uniform distribution of insecticides, whether the material is deposited on a surface, on water, or is dispersed into the air.

Three common patterns used by public health workers are the solid stream, flat-spray, and hollow-solid cone.

There are literally hundreds of cracks and crevices scattered throughout a food handling establishment. Some of the more common hiding places for pests are: floor-wall junctions, expansion joints, floor drains, electrical conduits, drop ceilings and switch boxes.

A number of insecticides are especially appropriate for crack and crevice treatments. Borax and boric acid powders, carbamates, diazinon and baygon are among the more successful.

Rodenticides must be handled with particular care. All baits should be placed in locked bait stations in food areas. No restricted pesticides should be used -- and the bait sta-

tions should be numbered to be sure all have been retrieved after 48 hours. Pesticide powders for tracking and liquid baits should not be used in food operations.

Multiple dose anticoagulants include coumarin derivatives and indandiones. Rats must consume the bait each day for at least a two-week period. It should be left out a month for mice.

Single dose rodenticides include Red Squill, zinc phosphide, Mr. Rat Guard and strychnine. Do not use single-dose rodenticides near foods. The same acute toxicant should not be used more than twice a year in the same locality.

Whatever pesticide is used in food handling establishments, it must be applied with extreme caution and care. Improper use may endanger the lives of humans and animals because of the toxicity of the product. For specific pesticide application information, contact the state or local EPA, or other appropriate government agency.

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When autos, trucks and all-weather roads became practicable in the early twenties, competition became so severe that she quit the packet business and became an excursion boat.

Make a sentimental journey on the fair lady ... see the beautiful Ohio River and learn of the historic beginning of Louisville's riverfront.

The steam will turn the paddlewheel; the whistle will blow; and, the calliope will sound like a symphony while you cruise upstream with a view of the Kentucky and Indiana shores.

People who say it only happens in the movies have never met our Belle. In fact there's nothin' like our Belle.

The cruise on the Belle of Louisville  
is just one of the attractions of the  
69th Annual Meeting of IAMFES.

Don't Miss Out  
See page 145 and  
make your reservations TODAY . . .

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## SANITATION IN THE PROCESSING AND PACKAGING OF RAW CIDER

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**JOHN G. NORRIS**

*Apple cider has been manufactured in Missouri and a number of other states for many years. It is a safe guess that the general sanitation, equipment and processing practices used in making apple cider leaves something to be desired regardless of what state it is made in, and could present a possible health hazard. The Missouri Division of Health has received numerous reports of contaminated cider being consumed. In an effort to provide essential consumer protection, I have been instrumental in developing procedures and criteria for the manufacturers of raw cider and for those from the Division of Health who inspect raw cider processing plants.*

### **Buildings and Premises**

Any building or portion of a building used in the manufacture of cider should not be used for a nonfood purpose. The bottling operation should be performed in an enclosed room. As a service to the industry, the Missouri Division of Health provides for the review of plans for new construction and structural changes.

Floors of rooms used for cider processing should be impervious to water, easily cleanable and smooth, and kept in good repair. Walls and ceilings should be of hard, sound materials with smooth, easily cleanable surfaces and should be kept clean. Surfaces that require painting should be painted frequently with light-colored paint.

All processing and storage rooms should be adequately lighted to insure sanitary operation and cleanliness. All rooms should be well ventilated--forced-air ventilation if necessary. Screens or other suitable equipment must be provided and used to eliminate flies from the preparation area. Necessary vermin- and rodent-control measures must be taken.

If the water supply is private, it must meet construction requirements and sanitary quality standards of the state. Running water under pressure from an approved source should be easily accessible to all parts of the plant. Adequate provisions for quickly carrying off

and disposing of wastewater, sewage and solid waste should be provided in a manner approved by the responsible state agency.

Toilet facilities must be provided, complying with city plumbing codes or recommended state standards. Toilet rooms should not open directly into any room or area employed for bottling cider. All toilet room doors should be self-closing. Toilet rooms should be kept clean and in good repair and be well ventilated. Adequate and convenient handwashing facilities should be provided including hot and cold running water, soap and approved sanitary towels. No employee should resume work after using the toilet room without first washing his hands.

### **Machinery and Equipment**

Juice operations should have equipment that is easily cleanable, including vats, covers, mixing and storage tanks, pipelines, fillers and other apparatus. Utensils and equipment with cadmium, zinc or lead as a part of the metal are prohibited. Only solder of low-lead content should be used for joining. If 18-8 stainless steel is feasible, it should be encouraged for product contact surfaces.

### **Processing Methods and Operations**

The apples used in making cider must be clean and free of rotten, moldy or decomposed spots. This requires an organized grading system by the processor. If apples with rotten spots are used, adequate facilities for removing those spots must be provided. Raw apples should be washed or polished to remove accumulations of dust, dirt and other foreign materials. The use of a chlorine rinse (50 ppm) further protects the finished product.

Adequate facilities must be provided for proper cleaning of all containers, utensils and equipment used in the processing or bottling of raw apple cider. All pipelines, apparatus and containers employed in the manufacturing process should be thoroughly cleaned, washed and sanitized after each day's use--or more often

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*Mr. Norris is chief of Food Processing and Drug Control for the Missouri Division of Health, Jefferson City.*

if necessary to maintain them in a clean and sanitary manner. For sanitizing, use hot water with chlorine or other equally effective sanitizing agents recognized by the inspection authority. All glass containers in which cider is sold or dispensed should be washed, rinsed and sanitized immediately before filling and must be free of pathogenic bacteria. Refrigerate all filled containers.

All waste, broken bottles, discarded containers and other refuse must be promptly and properly disposed of. All garbage and other trash must be stored in covered receptacles or in some other sanitary manner to prevent fly breeding or other nuisances. The surroundings of all processing areas should be kept clean and free of litter or garbage. No production operations can be conducted in any room used for domestic purposes. Soiled linens, aprons and coats must be kept in covered containers for this purpose. Birds, cats, dogs, and other animals are not permitted in the processing area.

#### Personnel

All employees engaged in the preparation or packaging of cider should be clean, wear clean clothing and be neat in appearance. Spitting and the use of tobacco in any form in the processing area or in the area of the bottling and filling operation is prohibited.

It is the employer's responsibility to see that no employee has a contagious or infectious disease while engaged in handling products or in preparing, processing or packaging cider or in its storage or sale.

#### Laboratory Examination

Samples of cider should be submitted to an approved laboratory for examination for filth, bacteria, fecal coliform, yeast and mold. Products containing filth or pathogenic bacteria are in violation of the state food and drug laws. Products containing yeast and mold in excess of the amount normally encountered when good processing practices and techniques are followed would also violate the food and drug laws. All containers used for bottling must be clean and sanitary at the time of filling.

When microbiological problems develop in the processing, swab samples and in-line samples should be taken before and after each operation to identify conditions contributing to the buildup of organisms. Such conditions must be corrected. Swab tests should be made in conformance with standard methods procedures.

If rotten, moldy or partially decomposed materials are used in the preparation of cider or if cider is processed under unsanitary conditions, it is considered adulterated under state law. Embargo or other appropriate action must be taken when adulterated cider is found.

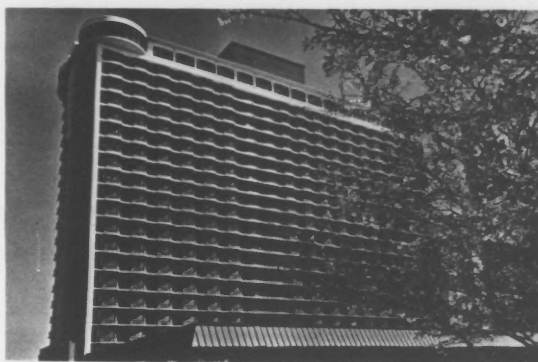
In the laboratory analysis of cider, resampling is required if these tolerance levels or standards are exceeded: aerobic plate count--1,500,000 per ml; yeast and mold--100,000 per ml; fecal coliform--negligible; and fecal strep--250 per ml.

If raw apple cider is processed, packaged and refrigerated according to these criteria and if laboratory results are satisfactory, a more wholesome product can be offered for sale. Such cider has a shelf life similar to that of milk--10-14 days.



# Louisville in '82!

Welcome to Louisville, "Derby City, USA". We invite you to attend the 69th Annual Meeting of IAMFES, August 22-26, 1982 at the Galt House, Louisville, KY. During the meeting a variety of events are planned, ranging from a cheese & wine reception to a cruise on the Belle of Louisville (a paddle-powered, triple decked, stern-wheeler). Music and an outstanding buffet will also be a part of this cruise. Spouses' entertainment will also be a big attraction at the '82 meeting. See you there!



## 1982 IAMFES ANNUAL MEETING

Advance Registration Form for the 69th Annual Meeting, Aug. 22-26, Louisville, KY.

Mail to:

Joe Schureck, Registration Chairman  
Milk Control Branch  
Health Services Building  
275 East Main Street  
Frankfort, Kentucky 40621

Please check where applicable:

Affiliate Delegate	<input type="checkbox"/>	Speaker	<input type="checkbox"/>
Past President	<input type="checkbox"/>	Affiliate Member	<input type="checkbox"/>
Executive Board	<input type="checkbox"/>	IAMFES Member	<input type="checkbox"/>
30 yr. IAMFES	<input type="checkbox"/>	50 yr. IAMFES	<input type="checkbox"/>
Member	<input type="checkbox"/>	Member	<input type="checkbox"/>
Non Member	<input type="checkbox"/>		

Make checks payable to IAMFES Meeting Fund

Advance register and save — refundable (prior to June 30) if you don't attend

	ADVANCE REGISTRATION FEE (prior to July 1)			REGISTRATION FEE AT DOOR			
	* Member	Spouse of Member	Student	• Member	Spouse of Member	Student	Non Member
Registration	\$20.00	\$10.00	no chg.	\$25.00	\$12.00	no chg.	\$30.00
Banquet & Cocktail Hr.	15.00	15.00	\$15.00	17.00	17.00	17.00	17.00
Cruise- Belle of Louisville (entertainment & dinner)	12.00	12.00	12.00	15.00	15.00	15.00	15.00
<b>Total</b>	<b>\$47.00</b>	<b>\$37.00</b>	<b>\$27.00</b>	<b>\$57.00</b>	<b>\$44.00</b>	<b>\$32.00</b>	<b>\$62.00</b>

Name (Member) \_\_\_\_\_

Children's First Names and Ages \_\_\_\_\_

Employer \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Means of Transportation \_\_\_\_\_

GALT HOUSE  
Fourth & River Rd.  
Louisville, KY 40202  
Telephone 502-589-5200

Arrival Date \_\_\_\_\_

Arrival Time \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

Arrangements have been made for a flat rate of \$42.00 per room with a maximum of 4 people to the room. These rooms will have 2 double beds.

Reservations must be received by July 15, 1982.

Departure Date \_\_\_\_\_

Means of Transportation \_\_\_\_\_

Name \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

Mail directly to Galt House, Fourth and River Rd.,  
Louisville, KY 40202

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## Maintenance and Measurement of Product Temperature in Food Service

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D. L. LANCASTER

*Director of Training  
National Sanitation Foundation*

*The major causes of foodborne disease outbreaks are (1) improper refrigeration (2) failure to cook or heat foods thoroughly (3) infected food workers (4) preparation of foods too far in advance (5) adding raw ingredients to food. The biggest problem is improper heating or refrigeration practices, numbering some 58 percent of bacterial outbreaks in the last decade. Refrigeration acts to retard microbial growth, oxidation and enzyme action. This involves the use of well-calibrated thermometers, freezers, and other applicable devices. The effective use of the principles suggested by the Food Service Sanitation Manual for cooling, freezing, thawing, heating and reheating go a long way toward inhibiting foodborne bacterial infection.*

More than a hundred years ago, pioneer women took their fresh-churned butter or new milk and carefully placed it by the cool water of a nearby creek. In much the same way, modern consumers rush home from the grocery store in order to put away eggs, ice cream and other perishables in the refrigerator.

Both practices follow the principle of using low product temperatures to retard microbial growth, oxidation and enzyme action. This, most importantly, prevents an outbreak of foodborne diseases.

The modern consumer has available a number of devices to control

refrigeration temperatures all of which are a bit more sophisticated than the pioneer's nearby creek.

Refrigeration equipment varies from the conventional front opening reach-ins, to large walk-in units. Other common types are beverage coolers, display refrigerators, multiple-temperature refrigerators and the under-counter variety.

Bacterial infection from poor refrigeration is not an obscure problem. Of 388 bacterial outbreaks studied (1961-1970), failure to refrigerate properly was implicated in 58 percent.

Inadequate control of food temperature is the most common factor contributing to outbreaks of foodborne disease. The temperature "danger zone" for food is 45 to 140 degrees F. The region of maximum danger in this zone is from 80 to 115 degrees F. since these temperatures are most ideal for bacterial growth.

To minimize this problem, the temperature of potentially hazardous foods (any food which consists in whole or part of milk, eggs, meat, poultry or fish, in a form capable of supporting rapid growth of infectious microorganisms) must be: (1) kept outside the danger zone when the food is stored, and (2) quickly passed through the danger zone when the food is heated or cooled.

Control of the length of time food is in the temperature danger zone is extremely important in preventing foodborne illness, but this time-temperature factor is seldom the sole

cause of an outbreak. Other factors typically include preparing foods far in advance of planned service, infected persons touching foods (poor personal hygiene), inadequate cleaning and sanitizing of kitchen equipment, using contaminated raw ingredients, and obtaining foods from unsafe sources.

The potential hazard of contamination resulting from many of these factors can be virtually eliminated by proper control of the time-temperature factor.

The time-temperature factor is a direct result of heat transfer, or the way heat moves either in a substance or between substances. For instance, the outside of a large piece of meat may be cooked while its center is still raw. The center of a large pot of stew will still be warm six to eight hours after it has been placed in a walk-in box.

Food placed in a cool location does not immediately become cool, and food being heated is not instantly hot. All heating and cooling processes, including baking, thawing, cooling, and reheating, involve heat transfer.

There are several factors which influence the rate of heat transfer or heat exchange through food products.

Heat moves through a relatively dry, or somewhat firm or solid material at a slower rate than it moves through a more fluid material, all other factors being the same. The nature or consistency of the product

accordingly influences the heat exchange rate when the product is heated or cooled.

As the distance heat must travel either into (heating) or out of (cooling) a food product increases, the amount of time required for a comparable heat exchange also increases. This time increase, often called the "geometry factor", is roughly the square of that distance.

For example, consider two roasts, one twice the size of the other. One might think that the larger one would take twice as long to heat up or cool down as the smaller one. This is not the case. In fact, the larger one would take 2 squared ( $2^2$ ) or 4 times as long to heat or cool the same amount.

One three times the size of the first would require ( $3^2$ ) or 9 times as long for comparable heating or cooling, and one one-half the size would only require ( $1/2^2$ ) or 1/4 the amount of time required by the original.

The temperature differential, or the difference between the initial temperature of the food product and that of the heating or cooling source, also influences the rate of heat transfer.

For example, food at 45°F may be heated in a 350°F oven until it

reaches a temperature of 150°F. Then, the food at 150°F may be placed in a 40°F to 45°F walk-in box to cool to 45°F.

The heating and cooling rates will differ sharply. In fact, to cool the food at the same rate at which it was heated, the temperature of the walk-in box would have to be about -240°F.

There are three general time-related categories for equipment used to process, hold, or store potentially hazardous food in food service operations. These categories are short-term, intermediate-term, and long-term.

Short-term equipment typically holds or stores food for the duration of one meal run or one meal service. Some short-term holding or storage devices are refrigerated display cases, steam tables or bainmaries, and heat lamps.

Most short-term devices do not have the thermal capacity to heat or cool food rapidly, but are designed to hold food at the desired temperature once the food has been heated or cooled to that temperature using some other device.

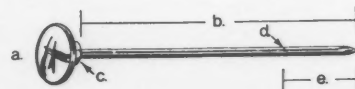
Intermediate-term devices generally hold food products for from one to seven days. Conventional

reach-in and walk-in refrigerators and storage freezers provide intermediate-term storage. No hot storage devices are used for intermediate-term storage.

Long-term devices preserve potentially hazardous food for from a week to several months. The most common long-term storage devices in food service establishments are reach-in and walk-in storage freezers.

Most conventional holding freezers are designed to receive food products at or near 0°F for storage. They are not normally capable of freezing large quantities of warm or hot food products satisfactorily. Therefore, to freeze either large quantities of food, or food in a warm or hot state, the use of quick chill or blast freezing units may be needed.

Product thermometers -- in the form of metal stem-type numerically scaled indicating thermometers -- are used to attain and maintain internal cooking, holding or refrigeration temperatures in potentially hazardous foods.



- a. Dial face diameter minimum of one (1) inch with 2°F increments. Range 0° - 220°F is satisfactory for most applications. More specific ranges may be desirable in some instances.
- b. For most evaluations a minimum stem length of five inches. In some cases a longer stem length may be indicated.
- c. Instruments are available with a "calibration nut" immediately behind the dial to assist in adjusting the indicating needle during calibration.
- d. The staking dimple or mark is significant not as an immersion line, but that the thermometer should always be immersed at least 1/2 inch beyond the dimple.
- e. In practice, the temperature registering on the dial is approximate, it is an average of temperatures being sensed between the dimple and immediately behind the tip.

Sanitizing the instrument is the first step in properly measuring product temperatures. This may be done by following an acceptable "wash, rinse, then sanitize" procedure, or use of isopropyl alcohol swabs, making sure the alcohol evaporates before use.

Next take the temperature in the thermal center of the product. The thermal center may not coincide with the geometric center. Several readings may be required to determine where the hot or cold spots are.

Allow two (2) minutes for the thermometer to stabilize in the product prior to recording a reading. The bimetal thermometers react in an asymptotic fashion. That is, it takes some period of time for them to register near 100% of span of temperatures. Also the instrument will react at different rates depending on the media.

Then, record the reading or take appropriate action. Also provide a thorough clear water rinse between food products. A complete cleaning and sanitization is recommended.

For field calibration of the thermometer at required temperatures, use a total immersion mercury laboratory thermometer with a known accuracy or certification. After proper stabilization time, record the error at particular temperature points. Do the same for all pertinent calibration points.

Whether using well-calibrated thermometers, freezers or other equipment, the use of basic refrigeration devices to protect foods has been

in effect for hundreds of years. But the practice has been improved over the last few decades making it more convenient and effective than ever. Continued efforts in this area will make foodborne disease outbreaks less likely -- or deadly, when they do occur.

#### -- Guidelines --

The Food Service Sanitation Manual provides guidelines for control of the time-temperature factor in potentially hazardous foods under storage and holding conditions:

- Cooling -- Rapidly cool food to an internal temperature of 45 degrees F or below. Foods of large volume should be rapidly cooled, utilizing such methods as shallow pans, agitation, quick chilling, or water circulation so that the cooling period does not exceed four hours. Foods to be transported should be prechilled and held at a temperature of 45 degrees F or below.

- Freezing -- Frozen food should be kept frozen and stored at a temperature of 0 degrees F or below.

- Thawing -- Foods should be thawed:

- in refrigerated units at a temperature not to exceed 45 degrees F.
- under potable running water of a temperature of 70 degrees F or below.
- in a microwave oven only when the food will be immediately transferred to conventional cooking facilities or when the entire process takes place in the microwave.

• Heating -- The internal temperature of foods requiring hot storage should be 140 degrees F or above except during necessary periods of preparation. Food to be transported should be held at a temperature of 140 degrees F or above.

• Reheating -- Foods that have been cooked and then refrigerated should be reheated rapidly to 165 degrees F or higher. Steam tables, warmers, and similar hot food holding facilities are prohibited for rapid reheating. It is vital to point out that temperatures within storage units do not always give a true reflection of the product temperature.

• Refrigerated storage -- Each mechanically refrigerated facility storing food should be provided with an indicating thermometer, located to measure the air temperature in the warmest part of the facility and to be easily readable.

• Hot storage -- Each hot food facility storing food should be provided with an indicating thermometer, located to measure the air temperature in the coolest part of the facility and to be easily readable. It is impractical to install thermometers on equipment, a product thermometer must be available and used to check internal food temperature.

The manual generally outlines the necessary equipment and procedures for monitoring the temperature of potentially hazardous food in the hot or cold storage environment.

• Product thermometer specifications -- Metal stem-type numerically scaled indicating thermometers should be provided and used to assure the attainment and maintenance of proper internal cooking, holding or refrigeration temperatures of all such foods.

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## An Abbreviated IAMFES History of the Seventies

C. K. JOHNS

*Stittsville, Ont. and Bonita Springs, Fl.*

Earl O. Wright retired from his position at Iowa State University to become Executive Secretary and Managing Editor of IAMFES, effective January 1, 1974. He had served as Executive Secretary during the previous year while "Red" had had the most to do with the Journal. When publication of the Journal had moved to Ames, Iowa, Earl assumed complete responsibility as Managing Editor on January 1, 1975.

Earl was born and reared on a farm near Bloomington, Wis., and later graduated from Bloomington High School. In 1941 he received his B.S. degree in Agriculture from the University of Wisconsin-Platteville. Following graduation he taught vocational agriculture and general science in high school. He then served in the U.S. Army for 3½ years during World War II. On his return he became County Extension Director for Lincoln and Clark counties in Wisconsin. Later he enrolled at the University of Wisconsin-Madison and in 1954 received his M.S. degree in Dairy and Food Industries (now Food Science). While there Earl also served as Extension Specialist and Instructor in the Department of Dairy and Food Industries.

In 1954 Earl joined the staff of Iowa State University in Ames, serving there until December 31, 1973 when he resigned as Professor of Food Technology Extension. He was responsible for initiating the bacteriological testing program for manufacturing grade milk. He was also instrumental in setting minimum standards for such milk in the state.

Earl spent much time in training fieldmen and food plant personnel in proper laboratory methods; he advised plants on selection of equipment, processing problems, product development and quality control. He also prepared a monthly newsletter for the dairy and food industries in Iowa and wrote a monthly column that appeared in Hoard's Dairyman for 8½ years. He also published scientific articles in the Journal of Milk and Food Technology and elsewhere and prepared numerous bulletins, circulars and leaflets that were published by Iowa State University.

Earl has served on committees of IAMFES and also on its Executive Board, having now completed his term of office as President. He has also been active in the American Dairy Science Association, serving on several committees and as Chairman of the Business and Industry Section. He has served on the Executive Board of the National Conference on Interstate Milk Shipments

and as Secretary-Treasurer for the 3-A Sanitary Standard Symbol Administrative Council. He is a member of Gamma Sigma Delta and Epsilon Sigma Chi, and is listed in Who's Who in the Midwest and in American Men and Women of Science. His alma mater, University of Wisconsin-Platteville, has honored him with the DISTINGUISHED ALUMNUS AWARD.

Earl's wide background in the food and dairy industries, his familiarity with the science of food and dairy hygiene, and his organizational and administrative experience have made him eminently qualified to fill the vacancy created when H. L. "Red" Thomasson retired.

The CITATION AWARD for 1974 was given to John C. Schilling, who graduated from the University of Missouri-Rolla in 1943 with a B.S. degree in Chemical Engineering. He then joined the St. Louis Health Division, where he has served as Public Health Engineer (Community Sanitation and Rat Control), Dairy Plant Supervisor in the Milk Control Section, and Chief, Milk Control Section. In 1974 he was Assistant Health Commissioner in the Bureau of Environmental Health Services of the St. Louis Health Division. John is a member of IAMFES, the Missouri Association of Milk, Food and Environmental Sanitarians, the Missouri Public Health Association, the Missouri Mastitis Council and the National Conference on Interstate Milk Shipments. He is on the IAMFES Committee on Sanitary Procedures and was Chairman of the Local Arrangements Committee when the Annual Meeting of the IAMFES was held in St. Louis. In addition, he served as Chairman of the Sanitation Section of the Missouri Public Health Association and as a Director of the Missouri Mastitis Council. He was also Vice-Chairman of the National Conference on Interstate Milk Shipments, and served on the group's Executive Board.

The SANITARIAN'S AWARD for 1974 was presented to Clarence K. Luchterhand. Born on a farm near Clinton, Wis., he attended the University of Wisconsin-Madison from 1933 to 1935, and again in 1937 for the dairy short course. He also enrolled for short courses at the University of Michigan and Michigan State College. His financial situation during the Great Depression forced Clarence to leave the university for employment with the Carnation Co. where he remained until 1942, when he became an inspector for the Wisconsin

Department of Agriculture. In 1944 he moved to the Wisconsin State Board of Health as a milk sanitarian. In 1951 he was named Chief, Section on Milk Certification, which now is the Wisconsin Department of Health and Social Services. Clarence has devoted the major part of his professional career to promoting the dairy program in Wisconsin and to working for the removal of trade barriers so that milk could move freely without costly duplication of inspection.

At the 1974 Annual Meeting, two outstanding members who had recently retired were presented with HONORARY LIFE MEMBERSHIPS in recognition of their distinguished services - H. L. Thomasson and K. G. Weckel. "Red's" accomplishments have already been recorded. Ken Weckel, a native of Canton, Ohio, attended the University of Wisconsin-Madison, majoring in Dairy Industry and receiving the B.S., M.S., and Ph.D. in 1931 to 1935. His ability was rewarded with an Assistant Professorship in 1935, Associate Professor in 1941 and Professor in 1945. He has shown a long and continuing interest in IAMFES and was president in 1951. He was also president of the Wisconsin Association of Milk and Food Sanitarians in 1945 and 1947. He served on numerous committees of IAMFES and has been a member of the Editorial Board of the Journal since 1945.

A record of his achievements and appointments includes (a) secretary of the Wisconsin Dairy Technology Society for many years, (b) consultant to the Wisconsin Alumni Research Foundation since 1936, (c) Chairman of the National Conference on Interstate Milk Shipments, 1953-1955, (d) Chairman, first National Mastitis Conference, 1961, (e) member, Food Technology Sub-Committee of the National Research Council, (f) Consultant to the Public Health Service Sanitary Engineering Center, 1957-1960, (g) member of the Gross Committee of the Public Health Service, 1961, and (h) Chairman, Wisconsin Section of the Institute of Food Technologists, 1960. He was also a member of the Grade A Milk Ordinance Advisory Council, Refrigeration Research Foundation, National Confectioners Education and Research Foundation, and the Wisconsin Food Advisory Council. He held memberships in Alpha Zeta, Phi Sigma, Sigma XI, IAMFES, American Dairy Science Association, Institute of Food Technologists, American Chemical Society and the American Candy Technologists. He was highly regarded by all who knew him.

The 1974 UNIVERSITY-INDUSTRY AWARD was given to Professor Richard P. March. Dick obtained his B.S. in Dairy Industry from the University of Massachusetts in 1944 and served in the U.S. Marine Corps from 1944 to 1946. He obtained his M.S. at Cornell in 1948. He was on the staff at Cornell as an instructor in Dairy Science in 1947 and was Assistant Professor in 1950, Associate Professor in 1955 and

professor in 1965. He was a member of the International Association of Milk and Food Sanitarians, Secretary of the New York State Association of Milk and Food Sanitation in New York State in the Central New York section of the Institute of Food Technologists, the Finger Lakes Sanitarians Association, the Connecticut Milk and Food Sanitarians Association and the National Mastitis Council. He had important assignments as resident consultant to study the impact of the National Sanitarians Act, and was secretary of the Cornell Food Science Department Planning Committee, 1956-62, and Chairman, 1963-64, of the Council of Affiliates. He also served on a number of state and national committees. Awards received include the DR. PAUL B. BROOKS MEMORIAL AWARD, and EMMETT R. GAUHM AWARD (both of these from the New York State Association of Milk and Food Sanitarians), a citation from the New York State Association of County agricultural agents, and a College of Agriculture travel award. His professional achievements are legion, including co-operation with the Health Department in New York State to provide training in sanitation to dairy plant fieldmen, efforts resulting in eliminating differences in regions, covering producers, professors and distributors of milk and milk products in the north-eastern states. He was the author of more than 100 bulletins and other publications.

In 1975 the Annual Meeting was held in Toronto, Ontario, with Parnell J. Skulborstad presiding. In his presidential address he stressed the need for IAMFES to provide leadership for those in the food industry, and advocated a study to determine the future direction of the Association. He also mentioned that the membership committee chaired by Harold Heiskell had added 513 new members during the past year.

At the Awards Banquet, the CITATION AWARD went to Dr. A. Richard Brazis. Dick, a native of Connecticut, graduated from Norwich University in Northfield, Vt., in 1949, later winning his M.S. and Ph.D. degrees from the University of Missouri in 1951 and 1954 respectively. He was an Assistant Instructor in the Dairy Husbandry Department there between 1952 and 1954. During World War II he served in a tank company in the First Cavalry Division of the U.S. Army. Back in civilian life Dick returned to Norwich University for his B.S. degree. During his last two years at the University of Missouri he was commissioned into the inactive reserve of the Commissioned Corps, U.S. Public Health Service. On attaining his doctorate he was placed on active duty with the U.S. Public Health Service Commission Corps. He served as a microbiologist with the Water Supply and Pollution Control Program at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio from 1954 to 1959, when he was transferred to the Milk Sanitation Research Unit in the Milk and Food Research Section at the same Center.

From 1959 to 1965 he conducted research and in addition assisted in the PHS program for approval of State and territorial laboratories, as well as standardization and certification of State and territorial laboratory survey programs. After 1966 he was actively engaged in coordination of FDA-State-District Milk and Food Laboratory Approval Programs, becoming Chief, Laboratory Development Section, Division of Microbiology, FDA.

Dr. Brazis is a registered microbiologist of the American Board of Microbiology. He received the COMMENDATION MEDAL from the Public Health Service for exemplary performance of duty in 1963. He was Chairman, Applied Laboratory Methods Committee of IAMFES, has served as Chairman, Sub-Committee on Screening Tests of the National Mastitis Council, has served as member of the Standard Methods Subcommittee on Coliform Bacteria, American Public Health Association, and was a member of the National Mastitis Council Research Committee. In addition to membership in several other honorary or professional societies, he has participated in several committees working on the procedures for examination of milk and food. During his tenure as Chairman of the Applied Laboratory Methods Committee, the committee was particularly active, studying analytical problems as they relate to microbiological analyses of milk and milk products. These studies resulted in several papers published in the Journal.

The SANITARIAN'S AWARD went to Samuel C. Rich, Program Manager and Sanitarian Milk Specialist Supervisor in the Environmental Health Division of Mecklenburg County Health Department, North Carolina. He received the Sanitarian's Award in part for his efforts to insure safe food and food service establishments and a safe milk supply in Mecklenburg County.

Sam had devoted his entire professional career of over 40 years to milk and food hygiene. During that time he held the following positions: 1934-1937, sanitarian, Beauford County Health Department Washington, N.C.; 1937-1941, district sanitarian, North Carolina State Board of Health, Raleigh; 1941, field representative for Coble Dairy Producers, Lexington, N.C.; 1941-1945, U.S. Army Sanitary Corps Medical Department; 1946-1975, with Mecklenburg County Health Department. As Program Manager for the Consumer Services Section of the Mecklenburg County Health Department, he was responsible for organizing the Section and making it work. He provided professional and technical supervision for milk quality control and sanitation, food, lodging and institutional sanitation, rodent control, solid waste and vector control, recreational sanitation, public water supply, on-premises waste disposal and water supply, soil science consultation, and pesticide and hazardous chemical control. He prepared local codes for

all of the programs just recorded, and was instrumental in getting them adopted.

Sam has been particularly active in milk sanitation. He implemented several programs that were coordinated with and became lead programs in state-wide inter-agency cooperative efforts. These programs included (a) elimination of pesticides from the milk supply, (b) developing a training program for newly employed milk sanitarians and newly appointed milk sanitation supervisors, (c) evaluating newly developed equipment and procedures for milk sanitation and on the basis of such results providing guidance to agencies in other counties and to the State, and (d) prevention and control of abnormal milk.

In the program to control abnormal milk, Sam enlisted the aid of North Carolina State University to make somatic cell counts on bulk tank milk. He established the first regression equation for converting results of the Wisconsin Mastitis Test to valid estimates of numbers of somatic cells. He also promoted educational efforts by fieldmen, sanitarians and university personnel so that concerned persons were informed of the importance of somatic cells in milk and how excessive numbers could be controlled.

Sam served on the executive committee of the Interstate Milk Shipments Conference, and on program planning committees for the local Dairy Technology Society and for the annual Fieldmen's and Sanitarian's Conference. Because of the success of his programs and his willingness to help others, Sam Rich earned unofficial status as 'counselor and advisor' to sanitarians and other health officials throughout North Carolina.

In 1975 the EDUCATOR-INDUSTRY AWARD went to Dr. Kenneth G. Weckel, Emeritus Professor of Food Science, University of Wisconsin-Madison. A full account of Ken's background and career was published on p. 585 of Volume 37 of the Journal, when Ken was awarded an Honorary Life Membership in 1974.

The SHOGREN AWARD for the affiliate with the most outstanding program went to the Associated Illinois Milk, Food and Environmental Sanitarians. Mr. Robert A. Cole, Secretary, accepted the award.

It is interesting that both men nominated for Secretary-Treasurer were from Canada, both had been born in Manitoba, and both had received their B.S. degree from the University of Manitoba.

An HONORARY LIFE MEMBERSHIP was awarded to Arthur E. Parker. He was Chief of the Milk Sanitation Section of the Multnomah County (City of Portland) Health Department at the time of his retirement. Before he became involved in regulatory control of the milk supply, Art held various positions in different segments of the dairy industry. He also served in the U.S. Navy, where he gained experience in vessel boiler operations.

Art had been a long-time member of IAMFES, and had served with distinction on the Dairy Farm Methods

Committee. He co-authored "Methods for Production of High Quality Raw Milk", published by IAMFES in 1972. Art also served for several years as the representative of IAMFES to the National Mastitis Council. Following retirement, Art continued to provide the Association with his insights and expertise in the field of milk sanitation.

Art had also been active in the Oregon Association of Milk, Food and Environmental Sanitarians. He was a charter member of the affiliate, and also served on its Board of Directors and as its President, Vice-President and representative to the IAMFES Affiliate Council. His meritorious work was also recognized by the folks in Oregon in COMMENDATION AWARDS from the Mayor of Portland and from Multnomah County.

In 1976 the Annual Meeting was held at Arlington Heights, Ill., with Harold E. Thompson, Jr., presiding. In his presidential address, he mentioned action taken by the Executive Board to strengthen contacts with members and affiliates through the appointment of Barbara Lee as Assistant Executive Secretary and Associate Editor of the Journal. He also mentioned a new affiliate, the National Association of Fieldmen, and that a special session would be devoted to the dairy fieldmen. He also reported that a much-needed change in the name of the Journal was to be made, dropping the inappropriate title of Journal of Milk and Food Technology, to be replaced by the more suitable title, Journal of Food Protection. The continuing difficulty in obtaining 'grass roots' articles for the Journal was still a cause for concern. A constitutional change was also made by which the Secretary-Treasurer became a full-fledged member of the Executive Board. He mentioned also that William Kempa of Ontario will be the new Secretary-Treasurer.

At the Awards Banquet, the SANITARIAN'S AWARD went to Melvin W. Jefferson. A great deal of the steady, pioneering leadership that gained national recognition for Virginia's dairy regulatory program was provided by Jefferson. A graduate of Virginia Tech with a B.S. in Dairy Science, he had been with the Virginia Department of Agriculture since 1942. During this period he worked to eliminate duplication and promote reciprocity within the state's regulatory agencies. In 1969 his work on the Virginia Mastitis Prevention and Control Committee contributed to the addition of mastitis milk control to the state regulatory program. In that same year, under his leadership, a state-wide program requiring all tank truck operators to collect and handle bacteriological samples became effective.

Since 1969, his hard work and dedication aided in the implementation of subsequent regulatory improvements, among which were (1) the power to adopt regulations pertaining to fluid milk, milk products and ice cream was given to the Virginia Board of Agriculture which, under his guidance, developed regulations for fluid milk and milk products that paralleled those of the U.S. Public Health Service, making it possible for Virginia to

participate fully in the National Conference of Interstate Milk Shippers, (2) development of regulations concerning ice cream and frozen desserts which followed federal standards, (3) establishment of reciprocal agreements with Virginia's neighboring states and with Pennsylvania, and (4) re-organization of the Bureau of Dairy Services, after which he was promoted to Director, Division of Markets in the Virginia Department of Agriculture.

Jefferson has been active in many food and dairy related organizations. He chaired the IAMFES Farm Methods Committee, and then served on the 3-A Sanitary Standards and Sanitary Procedures Committees. In addition to chairing the National Labeling Committee, he is a member of the Board of Directors and the Executive Committee of the National Mastitis Council, a member of Council I of the National Conference of Interstate Milk Shippers, the advisory board of the Department of Dairy Science, Virginia Polytechnic Institute and of the Virginia State Dairymen's Association Committee on Component Pricing of Milk. He has served as President of the Dairy Division of the National Association of State Departments of Agriculture. He was twice President of the Southern States Division of NASDA and has served as President of the Virginia Association of Sanitarians.

The 1976 CITATION AWARD was given to James A. Meany, Chief Sanitary Officer, Chicago Board of Health. A life-long resident of Chicago, he graduated from Loyola University in 1933. In 1938 he became a dairy inspector with the Chicago Board of Health, subsequently rising to supervising dairy inspector, county unit inspector and chief dairy inspector. In 1970 he was appointed Chief Sanitary Officer, where he is responsible for all inspectional activities of the Chicago Board of Health.

A registered sanitarian, he was a leader in programs to assure safe water supplies for farms holding Board of Health permits. He also assumed leadership in a program to analyze the problem of "abnormal milk", which was a forerunner of the mastitis program. He was instrumental in achieving success for Chicago's milk inspection, rodent control and lead poisoning control programs. Under his leadership, a group of city, state and federal health officials joined with representatives of the academic community, labor, food service and consumer organizations to formulate Chicago's modern and comprehensive restaurant code. He was also engaged in co-ordinating an education-surveillance program to deal with the problem of St. Louis encephalitis in Chicago and surrounding areas.

The EDUCATOR-INDUSTRY AWARD went to Burdet H. Heinemann, Vice-President for Research and Product Development of Mid-America Dairymen, Inc. Born in St. Louis, he grew up in Kansas City, Mo., graduating in 1937 from Iowa State College of Agricul-



ture (now Iowa State University) with a B.S. degree in bacteriology. In 1936 he joined the Producer Creamery, a predecessor of Mid-America Dairymen, as a laboratory specialist. He was subsequently appointed Technical Director of Research and Product Development of Mid-American Dairymen, and in 1967 promoted to Vice-President for R & D.

Heinemann's research has encompassed a wide range of topics pertaining to the dairy and food industries. Packaging of butter, 80% cream and cottage cheese in polyethylene-lined containers, now quite common, was developed under his supervision. Other research projects included the use of nisin in milk, standardization of the Babcock test for milk and development of ultra-pasteurization and packaging of milk and milk products. He published many research papers and commercial production monographs.

He belongs to numerous honorary and professional societies, including the American Dairy Science, the American Dry Milk Institute, the American Public Health Association, the Milk Industry Foundation and the National Milk Producers Federation. He has served on important committees, including the National Research Council and the Executive Board of the National Conference of Interstate Milk Shippers, and was a long-time member of the National Mastitis Council, where he served as president in 1975.

The SHOGREN AWARD for 1976 went to the Wisconsin Association of Milk and Food Sanitarians for the most outstanding program of an affiliate. This included close cooperation with the University of Wisconsin at Eau Claire and the Wisconsin Environmental Health Association in developing an educational program for undergraduates, and work with the University of Wisconsin to establish continuing education courses for Association sanitarians.

An HONORARY LIFE MEMBERSHIP was granted A. Bender Luce of Washington for his many activities with IAMFES. In 1972 he received the CITATION AWARD; a full account of his career appeared at that time.

For the first time the IAMFES awarded the SAMUEL J. CRUMBINE CONSUMER PROTECTION AWARD. This award is named for the Kansas State Health Officer who, in 1909, first banned common drinking cups from public facilities. The Single Service Institute, which established the award in 1954, is the national trade association of manufacturers of single-use food service and packaging products. In presenting this award to Region VI of the New Mexico Environmental Improvement Agency, Charles W. Felix, Director, Environment, Health and Communications of the Single Service Institute pointed out that this year was the first time a state agency had been eligible to compete for the Crumbine Award, which formerly had been limited to local government agencies. The winner was selected both for

its structure as an across-the-board environmental health institution and its success in establishing management and budgetary systems enabling it to fulfill its broad responsibilities. John E. Guinn, Regional Manager of the Agency, accepted the award on behalf of his agency.

The 1977 Annual Meeting was held at Sioux City, Iowa, with Henry V. Atherton presiding. In his presidential address Henry mentioned that through careful management of the Association's resources, and despite the increased costs of publication and postage of the Journal, they had been able to continue with the same dues structure for another year. Credit was given for the valuable assistance of the Budget Committee, headed by Past-President Skulborstad. It was also the first year that income had been received from Sustaining Memberships. Due thanks were extended to Ken Harrington and those who worked with him to develop such a program and then make it work. He mentioned the change in the title of the Journal to the Journal of Food Protection, which had been widely accepted. And with sadness he reported the passing of Dr. Ken Weckel, who had rendered incalculable services to IAMFES. In addition to being a Past President, Ken had been a long-time member of the Journal Management Committee and of the Editorial Board. Membership had shown a moderate increase in all categories, and two new Affiliates, the Texas Association of Milk, Food and Environmental Protection and the North Texas Association of Milk, Food and Environmental Sanitarians had been welcomed into the family. Barbara Lee, the first Assistant Secretary and Associate Editor of the Journal, having resigned, her position had been filled by David Rogers, who had an excellent background in biology and in journalism, and who would continue to develop the programs started by Ms. Lee. Working relationships with the National Environmental Health Association had improved, and he hoped both associations would continue to explore areas of mutual interest and concern.

At the Awards Banquet, the Awards Committee, chaired by P. J. Skulborstad, reported that the two nominations for the CITATION AWARD arrived too late for ample consideration. There was excellent nomination response to all other awards. Outside of a photograph showing Skulborstad presenting the SHOGREN AWARD to Past President O. M. Osten as representative of the Minnesota Sanitarian's Association, the writer found no mention of who received the other awards in the write-up of the meeting; too bad these were omitted.

The 1978 meeting, held in Kansas City, was dedicated to the memory of H. L. "Red" Thomasson, former Executive Secretary and a Past President of IAMFES. In his Presidential Address, David D. Fry remarked that "The organization had had many resourceful and imaginative presidents, but we remember more often the paving stones they've laid down than we do the individual's personality. For instance, H. L. Thomasson



was an outstanding president, but even he will be remembered most for the things he accomplished: the setting up of an operating office, creation of the position of Executive Secretary, and developing of the Journal, to name a few". We've seen the National Mastitis Council, the 3-A Standards and other committees being born; we've seen some die. We witnessed the creation of a "Procedures to Investigate Foodborne Illnesses." We were now operating on a budget, have sustaining members and have set up a foundation. We've survived and grown in a move from Shelbyville, Ind. to Ames, Iowa, and have met in a number of cities. We will survive jointures, dual meetings, mergers and all the rest. He also reported that the Journal of Food Protection had continued to grow both in size and stature under the very capable direction of the Editor, Elmer Marth, the Editorial Board and the Journal Management Committee. He also reported that Mrs. Janice Richards had been appointed Assistant Executive Secretary and Managing Editor, David Rogers having resigned.

At the meeting of the Affiliate Council, E. O. Wright spoke for the Awards Committee, saying that a full slate of candidates for awards had been received. Unfortunately, the only mention of the winners in the Report of the Annual Meeting is a picture of David Fry accepting the SHOGREN AWARD from Past President P. J. Skulborstad for the Florida Affiliate.

The 66th Annual Meeting of the IAMFES was held in Orlando, Fla., with Howard Hutchings of Pierre, S. Dakota, in the chair. In his presidential address he stressed the need for *professionalism* and *communications* as challenges for the future. He reported membership up a little, but inflation resulted in a deficit despite the dues being raised effective July 1. The sustaining membership program, organized a few years ago, had begun to shape up, with over 20 sustaining members. Another great plus was completion of the "Procedures to Investigate Waterborne Disease Outbreaks." Above all else, he felt that negotiations with National Environmental Health Association (NEHA) had proceeded to the point that agreement had been reached on the formation of a permanent joint committee. This would not be aiming at jointure or merger but instead would explore ways of mutual cooperation and of working together whenever possible. If at some future date a merger comes, it will be because of a natural process of growing and sharing ideas together. On the subject of communication, he felt there was a need to better communicate with members. There must be a method to increase the flow of information from the Affiliate Council, from the affiliate members, the state groups or city groups to the individual sanitarian and back to the Executive Board. He suggested the Chairman of the Affiliate Council be made a member of the Executive Board. If he could attend Executive Board meetings and be involved at the decision-making level, this might increase the flow of

information from individual members to the Executive Board. He closed with the challenge that we need to promote, seek solutions and share these in a way that we can collectively better serve mankind. We need to establish this organization as a prominent pool of total food protection knowledge that is available to everyone at any time.

At the Awards Banquet, Dr. Bailus Walker, Jr., Director of the Environmental Health Administration for the District of Columbia, was named "SANITARIAN OF THE YEAR", and received the \$1,000 award in recognition of outstanding contributions he was made to the health and welfare of his community. Previously Director of Health and Welfare for Newark, N.J., and before that Deputy Health Commissioner for Environmental Health in Cleveland, Ohio, Dr. Walker had held his present position since 1972. Among his first steps in reorganizing and revitalizing the D.C. program was to ask the D.C. council to amend the food code to provide a stronger legal basis for food protection as well as to require training and certification of food service personnel. The D.C. program was one of the nation's first mandatory training and certification programs. It has since served as a model for other communities.

In addition to work with food service establishments, Dr. Walker pioneered in developing and applying environmental health and epidemiological methods to the study of physical, chemical and biological hazards in U.S. jails and prisons. An environmental health consultant to the U.S. Department of Justice in the early 1970's, he began a comprehensive study of environmental conditions in correctional institutions. These studies provided the basis for organized environmental health programs for such institutions and directly influenced improvements which reduce the chance of disease transmission and injury in these institutions. This research also led to the drafting of U.S. legislation to protect the rights of pre-trial and post-trial detainees in jails and prisons.

Among the developments which had taken place in the D.C. food sanitation program while under Dr. Walker's direction were amendments of general food regulations, including open dating of products, health examinations of employees after illness, weighted inspection forms, four rather than two inspections per restaurant per year, display of inspection results in sub-standard establishments, and identification of fat content of ground meat. A Certificate of Merit program was established to motivate and reward the food industry and to inform the public of which establishments consistently maintain a superior level of cleanliness.

Dr. Walker's education began in Springfield, TN, where he was born and grew up. In 1954 he received a B.S. in biology from Kentucky State University. Following four years' service with the Air Force Medical Service Corps, he worked as a research associate with the Bureau

of Environmental Health in Washington. He completed his Master's degree in Environmental Health at the University of Michigan and worked as a public health sanitarian, first in Philadelphia, then in Detroit and surrounding areas. Next, he taught at the College of Medicine, Howard University, while beginning studies in environmental hygiene at John Hopkins University. He completed additional studies in water supply and pollution control at the University of Kansas while working part-time as a research assistant in the Environmental Health Research Laboratory. In 1966 he became research fellow and Director of the Environmental Research Laboratories for the School of Public Health at the University of Minnesota, where he completed his Ph.D. Following public health service in Ohio and New Jersey, he assumed his present position.

Throughout other commitments, he has served as a consultant to a number of public health agencies and continued teaching at Howard University, George Washington University, and Meharry Medical College of Nashville. He has contributed numerous articles to professional journals and served as a consultant to a number of public and professional organizations. The recipient of many awards, he has been honored with the ROBERT W. BROWNING PRIZE for disease prevention, the OUTSTANDING SERVICE AWARD of the American Civil Liberties Union, SPECIAL ACHIEVEMENT AWARD of the American Correctional Food Service Association, OUTSTANDING SERVICE COMMENDATION of the U.S. Environmental Protection Agency, EDITOR'S AWARD for outstanding contributions to the JOURNAL OF ENVIRONMENTAL HEALTH, SPECIAL COMMENDATION of the U.S. Department of Justice, MOST DISTINGUISHED ALUMNI AWARD of Kentucky State University, and DISTINGUISHED ENVIRONMENTAL HEALTH SCIENTIST AWARD of the National Environmental Health Association.

Dr. Joseph E. Edmondson, Professor of Food Science and Nutrition at the University of Missouri, Columbia, MO, received the 1979 IAMFES EDUCATOR AWARD for his outstanding academic contributions to the field of food safety and sanitation. A nationally recognized authority in food sanitation, quality and microbiology, he has taught at least ten different college courses during his career. He has also taught extension courses related to food processing and sanitation throughout the state. Since he began a course for bulk milk handlers in 1954, more than 1200 persons had attended the course by 1975.

The organizer and director of the area program in sanitary science at the University of Missouri, he has directed a number of Master's degree candidates in that program. He also helped organize the microbiology program there. He has served as director of graduate studies for his department from 1962 to 1967, then

served as director of undergraduate studies in food science and nutrition. He served as Chairman of the Dairy Department and Chairman of the Department of Food Science and Nutrition until 1969. He has served on a number of university committees and the Missouri Council for Agriculture. As an advisor, he works with 30 to 40 undergraduate students each year, and carries a heavy advisement load in the sanitary sciences graduate program.

The achievements of this year's EDUCATION AWARD recipient include being a member of the Missouri Affiliate for over 25 years, serving as secretary, and since 1957 as program chairman. In 1977-78 he worked on a committee to rewrite the constitution and bylaws of the new state organization, the Missouri Milk, Food and Environmental Health Association. He was also the first president of this group, which merged the local affiliates of IAMFES and of NEHA. He served IAMFES as program coordinator for the 1978 Annual Meeting in Kansas City, MO. He has also served other sanitation-related organizations, including the Interstate Milk Shipper's Conference, Missouri Public Health Association, Institute of Food Technologists, and the American Dairy Science Association. He is also frequently a source of counsel for persons in his community needing public health and food sanitation advice.

The National Future Farmers of America (FFA) selected Dr. Edmondson as superintendent of their milk and dairy foods quality contest. He annually organizes and supervises the contest, which involves over 100 high school students nationwide. Among previous rewards he has won are the American Dairy Association's COW BELL AWARD, Honorary American Farmer, awarded by the FFA, and recognition for outstanding work with the 1975 Food Technology Conference of the St. Louis Institute of Food Technologists.

In 1979 the CITATION AWARD went to Past President Harold E. Thompson, Jr. A native of Massachusetts, "Tommy" graduated from the University of Maine in 1941 with a B.S. degree in Dairy Technology. After a year's work as assistant superintendent of production in an ice cream plant he served four years as an officer in the Army Medical Corps. In 1945 he joined the Virginia State Department of Health as a county sanitarian, conducting programs in all phases of environmental health. The following year he became assistant state milk sanitarian with the Virginia State Department of Health, with responsibility for implementation of a state-wide milk sanitation program. He was then commissioned by the U.S. Public Health Service and became a regional milk and food consultant in Boston. He served in New York and Washington, D.C. until attending the University of Minnesota, where in 1959 he obtained his Master of Public Health degree. He then transferred to the Kansas City regional office, where he remained until he became Chief, Milk Sanitation Program of the Public

Health Service. In 1970 the PHS presented its COM-MENDATION MEDAL to him for continued high quality work, noteworthy technical and professional contributions to the science and administration of public health. He has actively promoted milk and food sanitation as a member of IAMFES, as well as through serving on the Board of Directors of the National Mastitis Council, the Executive Committee of the National Conference on Interstate Milk Shipments, the Steering Committee of the 3-A Sanitary Standards Committee, and the Joint FAO/WHO Committee of Governmental Experts on the Code and Principles Concerning Milk and Milk Products.

In recognition of his long service to IAMFES, on his retirement as Director, Division of Microbiology, Bureau of Foods, Food and Drug Administration, a LIFE MEMBERSHIP AWARD went to Dr. Joseph C. Olson, Jr. He has served the Association in many capacities, including that of Editor of the *Journal* from 1954-67, when it was known as the *Journal of Milk and Food Technology*. He had been a member of IAMFES and of the Minnesota Affiliate for 31 years, having served the latter group as Secretary-Treasurer from 1947-54, and as President in 1965.

In his final position with FDA, Joe managed the research and operation of the Division of Microbiology of the Bureau of Foods. He served a special assignment from July 1976 to January 1979 as Deputy Assistant to the Director, Bureau of Foods, for International Programs. This position took him around the world to meetings as a member of such groups as the International Commission on Microbiological Specifications for Food (ICMFS), Conference on Sanitary Quality and Microbiological Safety of Fishery Products, U.S.-Japan Joint Panel on Toxic Microorganisms, International Standards Coorganization and Conference on Global Impacts of Applied Microbiology, among others.

Co-author of the college text-book *Dairy Microbiology*, Joe has also written over 100 journal papers, technical bulletins and pamphlets. He helped write, co-author and edit several ICMFS books. In addition to the IAMFES he is a member of the Institute of Food Technologists, American Dairy Science Association, American Society for Microbiology and the American Academy of Microbiology.

Originally from Roeburt, OR, Dr. Olson received B.S., M.S. and Ph.D. degrees from the University of Minnesota. His Ph.D. thesis dealt with the heat resistance of coliform bacteria in milk. From 1939 to 1967, he advanced at this alma mater from Instructor in the Department of Dairy Husbandry to Professor in Food Science and Industry and Professor of Microbiology. He taught introductory courses in General Microbiology, Dairy and Food Microbiology, and a course in Milk Regulatory Control for senior veterinary students. His research emphasized microbiological aspects of

production, processing, distribution and public health safety of milk and milk products.

Among other awards Dr. Olson received the IAMFES CITATION AWARD and the ACHIEVEMENT AWARD of the Minnesota Sanitarian's Association. He is also a member of Gamma Sigma Delta, Sigma XI and a charter member of the American Academy for Microbiology.

The SHOGREN AWARD for 1979 went to the New York Association of Milk and Food Sanitarians. This affiliate had averaged almost 750 members, including 79 sustaining members, during the last five years. Attendance at their Annual Conference runs about 400 members, with 70 or more attending their spring meeting. They produce and distribute an eight-page newsletter five times a year. Among Committee activities the Laboratory Practices Committee holds a day-long workshop each year for laboratory personnel. They were judged to be the top Affiliate for 1979.

And this brings us to the close of the 'Seventy's'. Big changes have been made, a number of outstanding members have passed on, but the results of their efforts, along with those of members still with us, continue to remind us of our debt to them. May the IAMFES continue to provide service to its members and to mankind in general.

C. K. Johns



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## AFFILIATE NEWSLETTER . . .

This page has been devoted to YOU, the IAMFES affiliates. Your input is needed on whether you feel this page should be a regular feature to serve as a communication source between the state and international office. Please respond.

**MEMBERSHIP FORM** ... a universal membership form was created for everyone to use to obtain new members for both state and international. We'd like to hear from you. We've had some comments on it so far, and with your help, we'll end up with a form that works the best for everyone.

**STATE TIDBITS** ... remember to send in your state tidbits, as far as what is going on within your state, date of your annual meeting, etc. for publication.

**CRUISE** ... You won't want to miss the cruise on the Belle of Louisville during the IAMFES 69th Annual Meeting, August 22-26, 1982 in Louisville, KY. Fill out the reservation form provided within this issue TODAY! See you there!

**IAMFES CONTEST** ... as announced in last month's issue, GET TWO IN '82 could prove to be worth your while. \$75 cash will be awarded to the winner. Check inside this issue for details.

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Edison failed ten thousand times before he perfected the modern electric lamp. The average man would have quit at the first failure. That's why there are so many "average" men and only one Edison.

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### WINNERS VS. LOSERS

**THE WINNER:** Is always a part of the answer.  
**THE LOSER:** Is always a part of the problem.

**THE WINNER:** Always has a problem.  
**THE LOSER:** Always has an excuse.

**THE WINNER:** Says "Let me do it for you."  
**THE LOSER:** Says "That's not my job."

**THE WINNER:** Sees an answer for every problem.  
**THE LOSER:** Sees a problem in every answer.

**THE WINNER:** Sees a green near every sand trap.  
**THE LOSER:** Sees two or three sand traps near every green.

**THE WINNER:** Says "It may be difficult, but it is possible."  
**THE LOSER:** Says "It may be possible but it is too difficult."

**BE A WINNER**



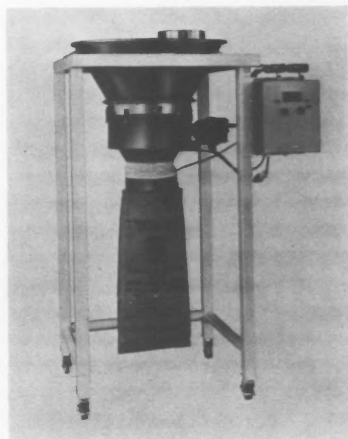
## New Product News

•A new open-mouth bag filling system for powdered food products that meets 3A Sanitary Standards and USDA Approvals has been announced by Black Products Company.

The Model 981 Sani-Bagger™ provides concise, simultaneous filling and weighing of powdered food products. The combination of an exclusive flow control and ultra-sensitive electronic weighing assures totally consistent bag results and eliminates over filling and product giveaway.

The entire system can be disassembled for complete cleaning and sanitizing in five minutes. Each system is caster-mounted for portability. An adjustable assembly accommodates various bag sizes and weights. The inlet surge hopper is made to order to meet specific size requirements.

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•Kernco Instruments Co. introduces refractometers manufactured by Bellingham and Stanley. They are world renowned and are available to cover the measurement of sugar, starch, water in honey, wine determination and refractive index.

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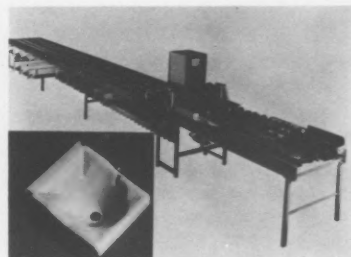


•Complete pneumatic conveying systems for handling such materials as milk powder and pharmaceuticals are now available from Chicago Conveyor Corporation.

High efficiency filters and smooth easily cleanable surfaces throughout without ledges or crevices make these systems broadly applicable to sanitary applications. All components are specially designed for this service and have passed 3A inspection without difficulty.

For further information, contact: Chicago Conveyor Corporation, 330 LaLonde Avenue, Addison, IL 60101, 312-543-6300.

•The Durand-Wayland Microsizer weighs and sorts fruits and vegetables at speeds up to 3200 pieces per minute, transporting them in cups made of CELCON® acetal copolymer, a thermoplastic engineering resin supplied by Celanese Plastics & Specialties Company. The tough plastic resists frictional wear caused by high speed travel over aluminum rails better than other materials, and is not affected by oils or greases used to lubricate metal parts. For more information contact: A. R. Massi, 26 Main St., Chatham, NY 07928, 201-635-2600.



•Hygicult® is a range of slide culture products developed for the rapid, reliable and economic detection and monitoring of microbial growth.

A plastic slide is covered on both sides with the desired growth medium and enclosed in a sterile vial. Sampling may be accomplished by pressing the slide against solid foods or surfaces, swabbing with sterile cotton or by dipping directly into a liquid. The inoculated slide is then fastened back into its vial and incubated for the required time.

The results are then compared to a colony density chart supplied.

Fast, reliable, easy-to-read results are provided at minimum cost without special training or technical skills.

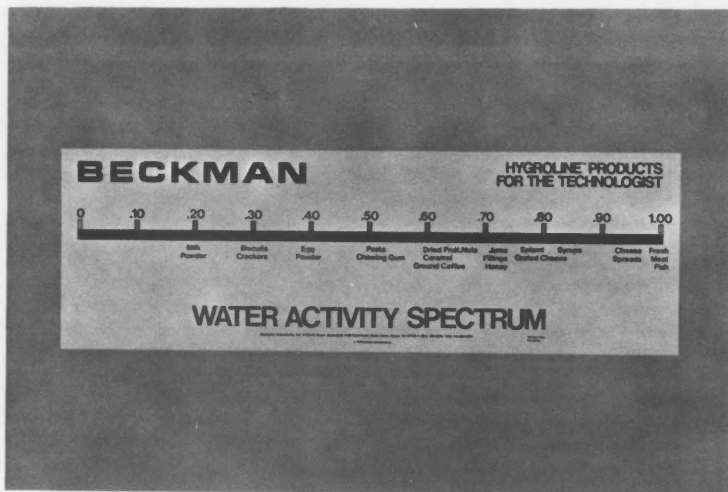
For further information or samples, please write to: Technical Products Division of MCE, P.O. Box 161, Chester, NJ 07930.



•A multi-colored wall chart showing the Water Activity Spectrum of common food products that can be measured with Beckman's Hygroline™ Instrumentation is available from Beckman Instruments, Inc., Cedar Grove Operations. The Hygroline product line consists of instrumentation for the measurement and control of water activity and air relative humidity.

The graphics provide visual association of the water activity values expected for meats, cheeses, syrups, dried fruits and other types of foods. The names of various food groups are positioned on the chart so that estimated water activity values or ranges are immediately evident. Also, color bands highlight other water activity related properties such as regions of possible biological activity.

To obtain a free copy of the Beckman Hygroline Water Activity Spectrum, write to Beckman Instruments, Inc., Cedar Grove Operations, 89 Commerce Rd., Cedar Grove, N.J. 07009-9990.

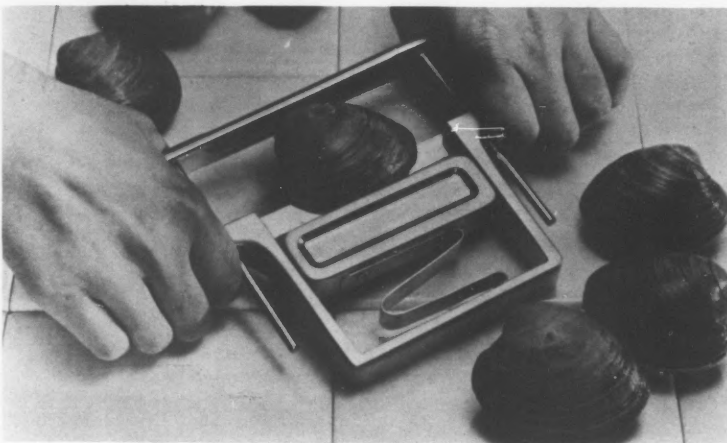


•CLAM-A-LOT, Inc., of Oceanside, Ca., introduces a new clam opener called Clam-A-Lot. It will be a welcome utensil at any restaurant which serves clams. The manufacturer claims it greatly reduces labor in opening clams and is completely safe to operate.

Clam-A-Lot works quite simply. When the clam is inserted in the device it is locked into place. To open the clam, the operator squeezes the handles firmly. Since Clam-A-Lot operates only by squeezing both handles, there is no chance of the operator getting his fingers caught under the blade.

The blade pops the clamshell open in seconds, cutting only the muscle, not the meat. Even if the clam has been disturbed and has clammed up, the device will still work. The manufacturer believes that any restaurant serving clams should enjoy a substantial saving on labor using Clam-A-Lot.

For further information contact: CLAM-A-LOT, Inc., 392 Via El Centro, Oceanside, California, 92054. (714) 747-0144.



## Poultry and Egg Outlook for '82

About the only bright spot for poultry and egg producers in 1981 was international trade, and that should continue during 1982, especially for broilers.

"High feed costs were the major cause of low profit and negative returns in 1981," explains Dr. David Mellor, poultry marketing specialist with the Texas Agricultural Extension Service, Texas A&M University System. "Though producers can expect lower feed costs in 1982, other prices are expected to rise."

But the total cost picture should be more favorable in 1982 than in 1981, he adds.

Broiler prices may be slightly better in 1982, says Mellor, but any increase in prices will be due to lower supplies of competitive meats, such as pork and beef, and a general expanding economy stimulated by tax cuts.

"The extreme heat during the summer of 1980 reduced broiler supplies, hatchery supply flocks and feed supplies, which in turn increased costs," he says.

Egg production is not expected to vary much in 1982 and is likely to be about the same as 1981 or show a small decline. Per capita consumption will probably decline again this year as it has the past several years, notes Mellor.

Cartoned eggs will possibly be a little higher in 1982. This, coupled with lower feed costs, should make 1982 a little more profitable than 1981.

"Turkey prices were severely depressed during the 1981 holiday season because the stock of frozen turkeys was at a record high," Mellor says. "If these stocks continue into 1982 -- even with decreasing feed costs -- unfavorable returns are likely."

## Fumaric Acid Approved

The U.S. Department of Agriculture will allow food producers to use fumaric acid to speed both the curing time and color development of processed meat and poultry products.

Fumaric acid is not new to the food industry, according to Donald L. Houston, administrator of USDA's Food Safety and Inspection Service. It already is approved by the Food and Drug Administration to prevent refrigerated dough from spoiling, to keep vegetables fresh and to control the acid content of wine. It occurs naturally in many plants and is produced commercially from glucose.

Houston said fumaric acid allows meat and poultry processors to use higher cooking temperatures, which results in shorter cooking times.

Consumers will benefit from this change since fumaric acid is less costly than other substances that hasten curing, such as citric acid, according to Houston.

## Fast Foods—Good Source of Nutrients

Meals eaten at fast food restaurants can make a real contribution to good nutrition. According to a report released today by the American Council on Science and Health (ACSH), fast food's potential nutritional contribution to the diet is limited only by the variety of menu items available.

Dr. Elizabeth M. Whelan, executive director of SCSH, said: "Many people think that fast foods are distinctly different from other foods in nutritional value. In fact, it is only the speed and style of service, not the food itself, which distinguishes fast food restaurants from others."

The items served in fast food restaurants are good sources of many nutrients, including protein, most of the B-complex vitamins, calcium and iron. Vitamin A, some minerals, and dietary fiber are found in smaller quantities simply because of the limited menus of these restaurants rarely include foods that are rich sources of these nutrients. ACSH recommends that meals eaten at fast-service restaurants be incorporated into a varied diet that includes many other food choices.

The ACSH report warns that individuals who must restrict their calorie or sodium intake need to be aware of the nutritional composition of fast food menu items in order to make appropriate choices. Armed with this information, a weight watcher can choose a low-calorie meal at almost any fast food restaurant. People on sodium-restricted diets have more of a problem. Some fast food menu items are simply too high in sodium to incorporate into their diets.

ACSH Associate Director Dr. David Roll said: "Many fast food chains are beginning to offer a broader selection of menu items. Since variety is important for good nutrition, this is a step in the right direction. The addition of salads to some menus is especially valuable, since salads can provide vitamins A and C dietary fiber, which may otherwise be in short supply in a fast food meal."

The ACSH report includes detailed nutritional information about typical items from hamburger, chicken, seafood, and pizza restaurant chains, and lists addresses where consumers can write to obtain more extensive information about the nutritional composition of menu items at particular restaurants.

The American Council on Science and Health (ACSH) is a nonprofit, independent educational association promoting scientifically balanced evaluations of food, chemicals, the environment, and human health. ACSH maintains offices in New York, New Jersey, and Washington, D.C.

Copies of the report *Fast Food and the American Diet* can be obtained from the American Council on Science and Health, 47 Maple St., Summit, NJ 07901, 201-277-0024.

## FOOD FORECAST STUDY

How the United States will move food from processors to consumers during the 1980s and 1990s is being forecast by researchers at Battelle's Columbus Division.

The 10-month study is being sponsored by firms connected with various components of the food industry including food packaging, processing, equipment manufacture, retailing, banking, and the import/export sectors.

According to Battelle's William A. Gordon, who heads the study team, these issues include innovative processing, preserving, and packaging technologies; improving materials handling techniques; evolving electronics capabilities; and changing transportation infrastructures and equipment. The factors should cause changes in the way food is processed, packaged, transported, refrigerated, and sold.

Researchers initially are analyzing trends in food manufacturing and distribution, including changes in market shares and profit margins; the proliferation of convenience and specialty stores; the introduction of expansive new cash-and-carries; and the impact these and other factors have on retailers, wholesalers, and processors. Also being analyzed are generic versus private and branded labelling, warehouse automation, and new modes of electronic communication.

Battelle then will project the business environment to 2000, Gordon said. Projections will encompass major changes anticipated in the technical and physical environment as well as consumer and population characteristics.

"Of particular importance," he said, "will be the impacts of new packaging technologies. Battelle will examine new packaging materials and processes such as aseptic packaging and retort pouches, and analyze their

effects on traditional packaging materials and high-volume food products."

Also, researchers will analyze the demand for product unitization and the increasing use of plastics and combinations of materials in food packaging. They then will predict the effect of these and other developments on corrugated, glass, and other widely used packaging materials.

Modified atmosphere packaging and other technologies for extending the shelf life of perishable items also will be examined.

"New packaging systems could significantly alter the basic supermarket concept," Gordon said. "For instance, retail-sized cuts of meats could be prepared exclusively at packing houses, thereby eliminating the need for personnel and preparation equipment in supermarket meat departments. Also spraying fruits with a coating of sugars and esters of fatty acids could significantly extend fruit shelf-life and modify the importance of a basic criteria--produce quality--by which consumers evaluate supermarkets."

With this information, Battelle will identify the requirements for food distribution for the next two decades and will analyze the technical and economic feasibility of alternative food distribution systems.

Finally, the researchers will draw conclusions on how these systems may impact food manufacturers, distributors, and retailers. These conclusions should help sponsoring firms in identifying important innovations, trends, structural changes, and technologies that could be critical for their long-range planning.

For more information contact: William A. Gordon, Battelle's Columbus Division, 505 King Avenue, Columbus, Ohio 43201, 614-424-4464.

### *Energy-Saving Egg Storage*

Oiling shell eggs can be an effective, energy-saving alternative to refrigeration, especially for short storage periods.

This finding is based on a farm trial comparing refrigeration and oiling of eggs to preserve interior egg quality, reports Dr. David B. Mellor, poultry marketing specialist with the Texas Agricultural Extension Service, Texas A&M University System.

Eggs were either not oiled, normally oiled or intensely oiled (oiled twice with a commercial aerosol spray) in the study conducted under hot summer conditions.

Some eggs were refrigerated immediately after lay, some were held at room temperature, others were held at outside temperature (98 degrees F. daytime and 73 degrees F. nighttime) for a day and then refrigerated, and some were held at outside temperature continuously for seven days.

Results showed intensely oiled eggs as the most desirable group, normally oiled eggs as intermediate, and non-oiled eggs at least favorable, notes Mellor.

Non-oiled eggs held at outside temperature and then refrigerated compared favorably with intensely oiled eggs stored at outside temperature for a week. Both groups graded low AA.

Intensely oiled eggs held at outside temperatures, when broken, had more thin spreading whites than non-oiled, refrigerated eggs, adds the specialist.

Eggs oiled immediately after lay graded the highest. According to Mellor, other studies have shown that for eggs stored 14 days, the best results were obtained from eggs oiled the day of lay, then washed, sanitized and reoiled three days later. Washing eggs before oiling, especially when oiled the day of lay, reduced benefits as wash water penetrated shell pores.

## New Appointments

The Sanitation Education Department at the American Institute of Baking has announced the appointment of two new field sanitarians, Edward J. Verkuilen and David A. Paquette, effective January, 1982.

With the addition of these two men, the number of field sanitarians presently employed by AIB now totals 14.

Before coming to AIB, Verkuilen worked with the Department of Environmental Health at the University of Wisconsin-Madison. Verkuilen's primary responsibilities will be to inspect bakeries, warehouses, etc., in the Kentucky, Ohio and Indiana area.

For the past three years, Paquette has worked for Frito-Lay as a Sanitation Manager. He has also served as Director of Public Health of West University Place, Texas and Inspector for the Texas Health Department. His territory for AIB includes Los Angeles and Southern California, Phoenix and New Mexico.

## Rice elected to Secretary of MIF

Ronald R. Rice, Vice President Dairy Foods Division of The Kroger Company, Cincinnati, Ohio, has been recently elected secretary of the Milk Industry Foundation. The election took place during MIF's annual convention in Atlanta.

The national trade association represents processors of fluid milk and milk products located in the United States, Canada, and a number of other countries.

Rice joined The Kroger Company in 1957 and has served as Dairy Foods Division Vice President since 1974.

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## Can You Taste the Difference?

Forty-six people participated in the "Can You Taste The Difference?" taste panel at the 1981 convention of dairy associations in Des Moines.

The good news for the dairy industry is that 43 (94%) of the panel participants correctly identified the shredded cheddar cheese from the imitation. They agreed that the imitation cheese didn't have a very pleasing flavor and had an obvious aftertaste.

All the panelists except one could taste the difference between low fat milk and -- a low fat (coconut oil), whey, non-fat milk and caseinate-based powder that was reconstituted for this taste test.

Also, more fairly good news for the dairy industry was that 34 people (74%) correctly distinguished between the real and imitation sour creams.

Now for the bad news -- dairy people had some difficulty correctly identifying which spread was butter, margarine or a margarine-butter blend. Twenty-five (54%) correctly identified butter, twenty-one (46%) correctly identified margarine and 20 (44%) correctly identified the margarine-butter blend. Fourteen people thought the margarine was butter and 8 thought the blend was butter.

Dessert topping also presented some difficulties for taste panel participants. Twenty-six (57%) correctly identified the real whipping cream. Fourteen thought that Cool Whip, an imitation dessert topping, was the real thing while only 6 thought that Dover Farm's real and imitation blend was real whipping cream.

So both good and bad news surrounded this taste test. The good news was that some of the imitation products aren't yet up to the taste level of real dairy foods. However, products like dessert toppings and spreads presented identification problems for the dairy people.

Keep in mind too that the price of dairy foods also presents a big problem for many consumers. So with dairy foods at record high prices -- as are most other items we purchase -- this is prime time for food processors to develop products resembling dairy foods and market them at lower prices.

Obviously the dairy industry has their marketing and processing work cut out for them -- continuing to produce and market excellent-flavored dairy foods at a competitive price. Maybe the dairy industry could better serve their own cause by developing blends.

Bill LaGrange  
Dairy Industry Report



## Nutritional Value of Milk at its By-Products

Put a little milk-processing "jargon" into your collection of shopping skills, and you'll stand a better chance of getting the nutrients you want for the price you pay -- without extra calories, says a food and nutrition specialist.

Modern processing techniques protect nutritive value of milk and its by-products, but different items vary in actual content of total nutrients, says Mary K. Sweeten, Home Economics staff, Texas Agricultural Extension Service, The Texas A&M University System.

Pasteurization destroys harmful bacteria in milk by partial sterilization, but it also dissolves small amounts of water-soluble vitamin C and thiamine, she explains.

Of course, a big risk is involved without pasteurization, such as in cases of drinking raw milk even though it is certified for a low bacterial count, the specialist says. Certain pathogenic (disease causing) bacteria which cause tuberculosis or other febrile-related diseases may be harbored in raw milk, she adds.

Protect milk, too, from direct sunlight, since riboflavin, an important sugar in the vitamin-B complex, is destroyed by light rays, Sweeten says.

Low-calorie milks, such as skim milk, non-fat or low-fat milk with no butterfat or cream also lack vitamin A, the specialist says.

True these are lower in calories -- an eight-ounce glass of whole milk has 170 calories, while the same amount of skim milk has only 80 calories.

So, "trading off" certain nutrients to get the low-calorie benefit may be worth it if you're trying to maintain a 1200-calorie diet, but be aware of the nutrient sacrifice, the specialist says.

On the other hand, if you want both features -- fewer calories and your nutrients, too -- there are some low-calorie milks that have been fortified with vitamin A and D. Shop for these to get maximum nutrients and few calories, Sweeten suggests.

Non-fat dry milk processing doesn't involve any big nutritive changes, the specialist says. Most of the protein, lactose, minerals and vitamins are retained when fresh milk is processed into non-fat dry milk.

Cheese, however, is another story. When cheese is processed, some water-soluble nutrients, such as lactose, B vitamins, proteins and minerals are lost, Sweeten says.

Finally, one sure way to know which products have the most nutrients for the money is shopping carefully and comparing labels and nutritional information, the specialist adds.

## Flys . . . Possibly Damaging to the Dairy Industry

Most people would agree flies are a nuisance, not to mention disease carriers.

But could it be possible they're responsible for more damage to the dairy industry each year than simply taking the "contented" out of contented cows?

University of Maryland agricultural research scientists think so.

And they've set out to substantiate their hypothesis that the *Musca autumnalis* -- or common "face fly" -- so interferes with the normal grazing patterns of dairy cattle that nearly \$70 million in damages and a 25 percent loss in milk production are suffered annually by the U.S. dairy industry.

"These figures represent the highest estimated loss value for any insect species associated with dairy cattle," says Dr. Allen L. Steinhauer, professor and chairman of the university's Department of Entomology.

The face fly is so named because it gathers around the face and thorax of dairy and beef cattle -- usually peaking during the summer months of June, July and August -- and has been associated with such irritations to the animal as "pink eye."

Previous research studies of the problem show conflicting results, according to Dr. Edward T. Schmidtman of the USDA Agricultural Research Service Livestock Insect Laboratory, who, with

collaborator Dr. Steinhauer, is conducting probably the only research of its kind in the U.S.

The research, conducted for the Maryland Agricultural Experiment Station and the Livestock Insect Laboratory, is important for several reasons, says Dr. Steinhauer.

"More than 50 percent of agricultural profits in the Northeast United States come from the sale of dairy products," he said.

"Until it is established whether or not face fly feeding contributes to decreased milk yield," says Dr. Steinhauer, "the time, money and energy costs expended by dairymen to control the pest cannot be justified on a rational basis."

To date, the research team has discovered face fly pest intensity is reflected in significantly reduced grazing time for dairy cattle, according to Dr. Schmidtman.

"We've found grazing time to be reduced by about 55 minutes per animal per day," he said.

Cattle tend to counteract face fly feeding by undergoing a behavioral pattern called "bunching," which is what the name implies: Cattle group together for mutual protection from the pests, with one cow's switching tail keeping the flies away from another.

Researchers now believe this natural form of protective behavior may also be responsible for reduced grazing time.



# Calendar

April 13-15---FLORIDA AFFILIATE MEETING, University of Florida, Gainesville, FL.

April 21-23---57th ANNUAL MEETING of the American Dry Milk Institute and the 11th Annual Meeting of the Whey Products Institute will be held jointly at the Chicago Marriott O'Hare Hotel, 8535 West Higgins Road (at O'Hare Airport), Chicago, IL.

April 21-23---SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION 34TH ANNUAL EDUCATION CONFERENCE, South Dakota State University, Brookings, SD. Contact: Cathy Meyer, R.S., P.O. Box 903, Mitchell, SD 57301.

April 22-23---PACIFIC NORTHWEST FOOD SCIENCE AND TECHNOLOGY CONFERENCE. "Electronic Control in the Food Industry--Microprocessors to Computers." Tyee Inn, Olympia, Washington. Contact: Jean Canfield, WSU Conference Assistant, 4525 Libby Rd., NE, Olympia, WA 98506, 206-754-6870.

April 22-23---SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION ANNUAL MEETING. SDSU, Brookings, SD. For more information contact: Ron Stangeland, SDSU, Brookings, SD.

April 26-29---UCD/FDA BETTER PROCESS CONTROL SCHOOL. University of California. Contact: R. C. Pearl, Department of Food Science & Technology, University of California, Davis, California 95616.

April 26-30---INCREASING PRODUCTIVITY THROUGH TRAINING, Manhattan, KS. Contact Donna Mosburg at 913-537-4750 or write: Donna Mosburg, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

Apr. 26-30, 1982---MICROANALYTICAL SANITATION SERIES III (Advanced Qualitative Interpretive), Melbourne, FL. Course sponsored by American Association of Cereal Chemists, 3340 Pilot Knob Road, St. Paul, MN 55121.

April 27---IAMFES SPRING SEMINAR, Elgin, IL at the Blue Moon Restaurant. Registration begins at 8:30 a.m. For more information contact: Robert Crombie, 521 Cowles Ave., Joliet, IL 60435. 815-726-1683.

April 28---SOUTHERN CALIFORNIA FOOD PROCESSORS SANITATION WORKSHOP. Presented by the University of California Cooperative Extension with assistance from industry trade associations and food industry personnel. Inn at the Park, Anaheim, California. For more information contact Paulette De Jong, Food Science and Technology, University of California, Davis, CA 95616, 916-752-1478.

May 12-13---FOOD MICROBIOLOGY UPDATE. University of California, Davis, CA. Topics covered include sampling, new trends and methods for detection, enumeration, and identification of microorganisms, microbial aspects of food processing methods, pathogens, and the significance of microorganisms in food. Contact Paulette De Jong, Food Science and Technology, University of California, Davis, CA 95616. (916) 752-1478.

May 22-26---NATIONAL RESTAURANT ASSOCIATIONS 63rd ANNUAL SHOW, Chicago's McCormick Place. For more information contact: Susanne Martin, 312-644-5800, at Sheila King Public Relations, or Jeffrey Prince, 800-424-5156, at the NRA Washington, D.C. office.

May 30-June 3---1982 CIFST 25th SILVER ANNIVERSARY CONFERENCE, Queen Elizabeth Hotel, Montreal, Canada. For more information contact: Jim Wells CIFST Conference, PO Box 273, Macdonald College, Ste. Anne de Bellevue, Quebec, Canada, H9X 1C0.

June through August---GORDON RESEARCH CONFERENCES, "Frontiers of Science", New Hampshire. Contact: Dr. Alexander M. Cruickshank, Director, Gordon Research Conferences, Pastore Chemical Laboratory, University of Rhode Island, Kingston, Rhode Island 02881, 401-783-4011 or 401-783-3372.

June 6-9---INTERNATIONAL FROZEN FOOD TRADE FAIR, Grosvenor House, London, England. For more information contact: Sharon Evans, Eagle Exhibition Consultants Ltd. 129-141 High St., Epping, Essex CM 16 4AG.

June 12-16---85th ANNUAL CONFERENCE OF THE ASSOCIATION OF FOOD AND DRUG OFFICIALS. Hyannis Regency, Hyannis, MA, Cape Cod, hosted by the New England Food and Drug Officials Association. Contact: Eaton E. Smith, 23 Bevin Boulevard, East Hampton, CT 06424.

June 19-23---ANNUAL EDUCATIONAL CONFERENCE OF THE NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION. New Orleans, Louisiana. Contact: Larry Krone, NEHA, 1200 Lincoln Street, Suite 704, Denver, Colorado 80203.

June 21-25---75th AIR POLLUTION CONTROL ASSOCIATION MEETING. New Orleans, Louisiana. Contact: APCA, P.O. Box 2861, Pittsburg, PA. 15230.

June 22-25---IFT "FOOD EXPO," Las Vegas, NV. Contact: Dan E. Weber, Director of Marketing/Administration, IFT, 221 N. LaSalle St., Chicago, IL 60601.

July 20-24---HOSPITAL, INSTITUTION, AND EDUCATIONAL FOOD SERVICE SOCIETY (HIEFSS) is announcing the relocation of its 1982 Annual Meeting. The 22nd Annual Meeting and Exposition is at Stouffer's Inn On The Square in Cleveland, Ohio. This is a change in date, city and hotel. For more information contact: Carolyn Isch, 4410 West Roosevelt Road, Hillside, IL 60162, 312-449-2770.

Aug. 22-26---IAMFES ANNUAL MEETING. Galt House, Louisville, KY. Contact: Earl Wright, IAMFES, PO Box 701, Ames, IA 50010, 515-232-6699.

Sept. 15-17---20th YANKEE CONFERENCE ON ENVIRONMENTAL HEALTH. Cromwell, Connecticut. Contact: Leon F. Vinci, P.O. Box 1300, Middletown, CT. 06457.

September 24---1982 FOCUS ON FOOD SCIENCE SYMPOSIUM IV. Kansas State University, Manhattan, KS. For more information contact: F. E. Cunningham.

October 7-10---1982 NATIONAL CONVENTION-EXHIBIT of Vending and Food-service Management, The Rivergate, New Orleans. (Expected Attendance, 7,000). Contact: Walter Reed, National Automatic Merchandising Association, 7 South Dearborn Street, Chicago, Illinois 60603, 312-346-0370.

Oct. 12-13---SYMPOSIUM ON PESTICIDE APPLICATIONS AND FORMULATION SYSTEMS, Drawbridge Motor Inn, Fort Mitchell, KY. For more information contact: ASTEM Publications Division 1916 Race St., Philadelphia, PA 19103, 215-299-5414.

Oct. 13-14---NEBRASKA DAIRY INDUSTRIES ASSOCIATION 28th ANNUAL CONVENTION. Regency West Motel, 1680 and Pacific Street, Omaha, NE. Contact: R. A. Evans, Executive Secretary, 134 Filley Hall, East Campus, University of Nebraska, Lincoln, NE 68583.

August 6-11, 1983---IAMFES ANNUAL MEETING, Stouffers, St. Louis, MO.

August 3-9, 1984---IAMFES ANNUAL MEETING, Edmonton, Alberta, CN.

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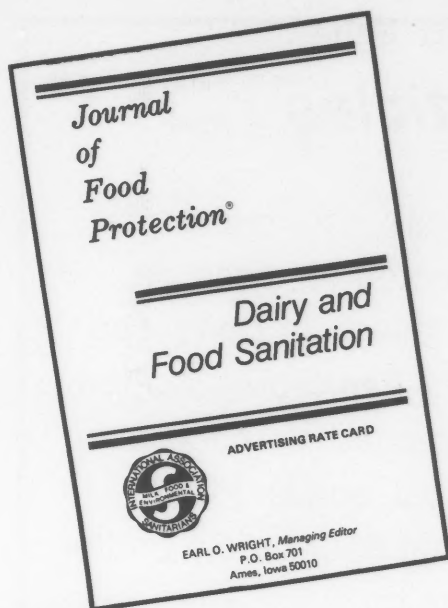
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### CIRCULATION INFORMATION

#### Major Responsibilities

Milk and Food Quality Control	49.20%
General Sanitation	18.50
Laboratory	15.20
Teaching, Research	9.70
Industry (other than quality control)	7.40
	<u>100.00%</u>

The circulation of the *Journal* is international and averages 4000 copies per month.

## *Errata*

### Holders of 3-A Symbol Council

Authorizations on February 15, 1982, published in the February 1982 Dairy and Food Sanitation.

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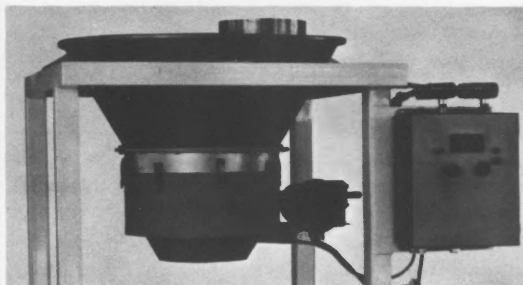
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## JFP Abstracts

*Abstracts of papers in the April A Journal of Food Protection*

**Depletion of Sorbate from Different Media During Growth of *Penicillium* Species**, Maria L. Finol, Elmer H. Marth and Robert C. Lindsay, Department of Food Science and the Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

*J. Food Prot.* 45:398-404

*Penicillium cyclopium*, *Penicillium roqueforti*, *Penicillium viridicatum*, *Penicillium puberulum*, *Penicillium cyclopium* (atypical strain), *Penicillium crustosum* and *Penicillium lanoso-viride* were isolated from spoiled cheese. These molds grew and depleted sorbate from media when the chemical was present initially at a concentration of up to 3,000, 10,000, 6,000, 12,000, 12,000, 7,000 and 3,000 ppm, respectively. A combination of paper chromatography and spectrophotometry was used to determine amounts of residual sorbate. Seventy-one to 100% of sorbate present initially was depleted from media by the various molds during 4-20 days of incubation at 21°C and 22-48 days at 4°C. The substrate influenced growth of mold and depletion of sorbate, but uniform behavior was not observed for all the *Penicillium* species studied. For example, presence of 3,000 ppm of sorbate plus 1% casein in the medium inhibited *P. cyclopium* and *P. lanoso-viride* but not the other five species. Concentration of sorbate (3,000 - 9,000 ppm) plus temperature (4, 12, 21°C) were important for inhibitory action of the preservative on *P. cyclopium*, *P. viridicatum*, *P. crustosum* and *P. lanoso-viride* but not *P. puberulum*, *P. cyclopium* (atypical strain) which grew at 4°C and depleted sorbate when the initial concentration was up to 9,000 ppm and *P. roqueforti* which grew at up to 6,000 ppm at the same temperature.

**Efficacy of Microwave Cooking for Devitalizing Trichinae in Pork Roasts and Chops**, W. J. Zimmermann and Pamela J. Beach, Veterinary Medical Research Institute, Iowa State University, Ames, Iowa 50011

*J. Food Prot.* 45:405-409

Pork roasts and chops containing *Trichinella spiralis* larvae were cooked in six household-type microwave ovens representing five brands. Cooking procedures were generally those recommended by the oven manufacturers or the National Pork Producers Council. Infective trichinae remained after cooking in 9 of 51 products. Positive products included: 5 of 28 roasts cooked following complete recommendations, including standing time; 2 of 8 roasts cooked with recommended time and power, but without standing time; and 1 of 12 roasts using modified procedures. Viable trichinae also were present in one of three groups of pork chops.

**Hazard Analyses of Fried, Boiled and Steamed Cantonese-Style Foods**, Frank L. Bryan, Charles A. Bartleson, Mitsuto Sugi, Lloyd Miyashiro and Steven Tsutsumi, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control; Washington State Department of Health and Social Services; and Hawaii State Department of Health

*J. Food Prot.* 45:410-421

Time-temperature exposures to which each stage of the preparation of a variety of fried, boiled or steamed Cantonese-style foods were subjected were evaluated at six restaurants. Samples of these foods were examined to determine their water activity, to detect the presence of *Bacillus cereus* and to count the number of mesophilic aerobic microorganisms. Temperatures of foods that were attained during cooking were usually high enough to cause rapid destruction of vegetative pathogenic foodborne bacteria. Food temperatures usually increased after cooking ended to provide additional lethal effect to any surviving vegetative microorganisms. During hot-holding in steam tables, the temperatures of the foods were such that multiplication of pathogenic foodborne bacteria would be unlikely and would cause additional lethal effect to vegetative forms of these organisms. Foods that were held in hot-air warmers, however, did not always reach sufficiently high temperatures to prevent multiplication of these organisms. Cooked foods were sometimes held at room temperature long enough to permit multiplication of bacteria that might have been present. This was confirmed by the finding of large numbers of mesophilic aerobic microorganisms in samples of such foods. Time-temperature control measures for cooked Cantonese-style foods include: (a) serve these items immediately after cooking or hold them at 55 C (131 F) or higher until served, refrigerated or reheated; (b) cool in layers not exceeding 9 cm (3.5 in) in walk-in refrigerators; and (c) thoroughly reheat cooked, chilled foods or foods left at room temperature to at least 74 C (165 F).

**Hazard Analyses of Char siu and Roast Pork in Chinese Restaurants and Markets**, Frank L. Bryan, Charles A. Bartleson, Mitsuto Sugi, Beatrice Sakai, Lloyd Miyashiro, Steven Tsutsumi and Clifford Chun, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Washington State Department of Social and Health Services, and Hawaii State Department of Health

*J. Food Prot.* 45:422-429

Evaluations of time-temperature exposure of each stage of the preparation of *char siu* (marinated roast pork) were made at six Chinese restaurants and a market. These evaluations were also made of roast pork at the market. Samples of these products at the various stages of preparation and swabs of equipment surfaces that the pork touched during preparation were tested for *Clostridium perfringens*, *Salmonella* and *Staphylococcus aureus*. The water activity of other samples was also determined. Temperatures attained at the geometric center of these pork products during roasting in ovens or after cooking ceased were such that vegetative pathogenic foodborne bacteria should have been killed, if present. The cooked products were often displayed in warming cabinets or window counters at which time their temperatures were within a range that would permit rapid bacterial growth for several hours. Reheating of leftover pork was inadequate to destroy pathogenic microorganisms that grew or toxins that were produced during storage. The water activity of *char siu* was frequently at a level that would increase the bacterial lag phase and slow the rate of growth of pathogenic bacteria from



optimum. A few samples of *char siu* were contaminated by low numbers of *C. perfringens* and a sample of raw and roast pork with *S. aureus*. There were opportunities for contamination of cooked pork products during preparation, particularly at the market. Critical control points for these operations--handling after cooking, hot-holding, cooling and reheating--are given along with measures for controlling and monitoring these points.

**Time-Temperature Survey of Hawaiian-Style Foods**, L. Bryan, Harold Matsuura, Mitsuto Sugi, Larry Spiro, Irving Fukunaga and Beatrice Sakai, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Atlanta, Georgia 30333 and Hawaii State Department of Health, Honolulu, Hawaii 96801

*J. Food Prot.* 45:430-434

Time-temperature exposures of each stage of the preparation of *kalua pig*, *lauau*, *pipikaulua* beef, and *taro* leaves in coconut milk were evaluated at two Hawaiian-style restaurants. The temperatures attained at the geometric center of these foods during cooking were such that vegetative pathogenic foodborne bacteria (but not spores) would have been killed, had such organisms been present. Hot-holding and reheating procedures included no obvious hazards. Leftovers refrigerated in one establishment, cooled slowly; leftovers in the other establishment were kept at room temperature overnight. Procedures are recommended to minimize the chances of the foods becoming contaminated after cooking, to cool the foods more rapidly and to reheat leftovers thoroughly.

**Differentiation and Enumeration of Somatic Cells in Goat Milk**, A. M. Dulin, M. J. Paape and W. P. Wergin, U.S. Department of Agriculture, Agricultural Research Service, Beltsville, Maryland 20705

*J. Food Prot.* 45:435-439

Non-leukocytic cell-like particles commonly observed in goat milk were examined ultrastructurally and cytochemically. Transmission electron microscopy indicated that these particles were generally membrane-bound and anucleate. They contained granular material in the dilated cisternae of the endoplasmic reticulum and homogeneous electron translucent inclusions that resembled lipid. Histochemical and fluorescent staining indicated that the particles contained large amounts of protein, some lipid, but no deoxyribonucleic acid. Several methods routinely used for estimating somatic cell counts in cow milk were compared to determine which one would give accurate estimates of somatic cell counts in goat milk. No significant difference was found ( $P > .05$ ) among methods which specifically measure deoxyribonucleic acid. These included Membrane Filter-DNA, direct microscopic somatic cell counts using Pylonin Y-methyl green stain, and Fossomatic cell counts. Results of the Wisconsin Mastitis Test did not differ significantly from Fossomatic cell counts. Because Coulter electronic counts and direct microscopic somatic cell counts using Levowitz-Weber stain could not differentiate between the cell-like particles and the actual leukocytes, these methods resulted in elevated cell counts that were highly variable. Results indicate that only those counting methods that are specific for deoxyribonucleic acid can distinguish cell-like particles from somatic cells, and thereby give reliable estimates of somatic cell numbers in goat milk.

**Storage Characteristics of Finfish Fillets (*Archosargus probatocephalus*) Packaged in Modified Gas Atmospheres Containing Carbon Dioxide**, M. Lannelongue, M. O. Hanna, G. Finne, R. Nickelson, II, and C. Vanderzant, Seafood Technology Section, Department of Animal Science, Texas A&M University, College Station, Texas 77843

*J. Food Prot.* 45:440-444

Sheepshead (*Archosargus probatocephalus*) fillets were stored in air and in modified gas atmospheres consisting of: 100% CO<sub>2</sub>, 80% CO<sub>2</sub>:20% O<sub>2</sub>, 60% CO<sub>2</sub>:40% O<sub>2</sub>, 30% CO<sub>2</sub>:60% O<sub>2</sub>, 20% CO<sub>2</sub>:80% O<sub>2</sub>, 40% CO<sub>2</sub>:60% N<sub>2</sub> and 44% CO<sub>2</sub>:36% O<sub>2</sub>:20% N<sub>2</sub>. At regular intervals during refrigerated storage, numbers and types of microorganisms and total volatile nitrogen (TVN) were determined. Increases in aerobic plate counts of fish fillets held in air and in 20% CO<sub>2</sub>:80% O<sub>2</sub> were greater than those for fillets stored in the other gas atmospheres. The most effective combinations of gas for limiting bacterial growth were 100% CO<sub>2</sub> and 40% CO<sub>2</sub>:60% N<sub>2</sub>. Total volatile nitrogen values of samples stored in air and in 20% CO<sub>2</sub>:80% O<sub>2</sub> increased similarly to those of fish held on ice. At higher CO<sub>2</sub> concentrations, however, increases in TVN were slow and the rate of TVN production appeared inversely proportional to CO<sub>2</sub> tension.

**Hazard Analyses of Duck in Chinese Restaurants**, Frank L. Bryan, Mitsuto Sugi, Lloyd Miyashiro, Steven Tsutsumi and Charles A. Bartleson, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control; Hawaii State Department of Health; and Washington Department of Health and Social Services

*J. Food Prot.* 45:445-449

Time-temperature exposures and water activity values were measured during the preparation and storage of Chinese-style duck products. Frozen ducks were usually thawed at room temperature and remained at room temperature for several hours thereafter. During cooking or during the post-oven temperature rise period, the temperatures at the geometric centers of the ducks exceeded 94 C (201 F). Cooked ducks were subjected to cross-contamination when they were chopped or cut up on cutting boards. Cooked ducks were held for several hours at bacteria-incubating temperatures while they were on display in cabinets or on counters. Leftover cooked ducks cooled rather rapidly during refrigerated storage. When they were reheated, their internal temperatures did not rise to levels lethal to vegetative pathogenic bacteria. Water activity values of cooked duck ranged from 0.87 to 0.99. Critical control points of the operations were the cutting and chopping of cooked ducks, storage of ducks during display for sale and reheating leftover ducks. Recommendations for control are: (1) to hold cooked ducks at 55 C (131 F) or above, (2) cool unsold cooked ducks rapidly, (3) reheat leftover ducks to internal temperatures of 71-74 C (160-165 F), and (4) minimize opportunities of contamination from equipment surfaces and workers' hands.

**Identification and Determination of Four  $\beta$ -Lactam Antibiotics in Milk**, Doris V. Herbst, National Center for Antibiotics Analysis, Food and Drug Administration, Washington, DC 20204

*J. Food Prot.* 45:450-451

A coordinated three-phase method was developed to determine residues of penicillin G, ampicillin, cephalixin and cloxacillin, the four  $\beta$ -lactam antibiotics most frequently used in mastitis preparations, in milk. An agar well diffusion technique in bioassay trays with *Bacillus stearothermophilus* as the test organism was used for preliminary screening. Positive samples were subjected to thin-layer chromatography followed by bioautography, and the residues were identified. An agar well diffusion method with standard levels of the specific  $\beta$ -lactam antibiotics was used for quantitation.

**Antioxidant Activity Increase in Heating Oilseed Protein Ingredients with Glucose**, Ki Soon Rhee and Khee Choon Rhee, Department of Animal Science, Texas Agricultural Experiment Station and Food Protein Research and Development Center, Texas Engineering Experiment Station, Texas A&M University, College Station, Texas 77843

*J. Food Prot.* 45:452-454

Protein ingredients prepared from glandless cottonseed, peanut and soybean show varying degrees of antioxidative effectiveness in model systems and in food systems. This paper presents data showing that nonenzymatic browning between oilseed protein ingredients and a reducing sugar can enhance the antioxidant value of oilseed ingredients. Defatted flours and protein isolates of the oilseeds were mixed with glucose in a ratio of 1:1 by weight and heated at 100 C for 2 and 6 h. Antioxidant activity of ethanolic extracts of the mixtures was determined against autoxidation of safflower oil. Antioxidant activity of the mixtures increased with heating time, as did the extent of nonenzymatic browning. The rate of increase in antioxidant activity was greater for mixtures having lower endogenous (0 h) antioxidant activity.

**Outbreak of Histamine Poisoning Associated with Consumption of Swiss Cheese**, Steve L. Taylor, Thomas J. Keefe, Ernest S. Windham and James F. Howell, Food Research Institute, Departments of Food Microbiology and Toxicology and Food Science, University of Wisconsin-Madison, Madison, Wisconsin 53706, Department of Pathology, Brooke Army Medical Center, Ft. Sam Houston, Texas 78234 and USAF Hospital Elmendorf, Elmendorf AFB, Alaska 99506

*J. Food Prot.* 45:455-457

On 24 March 1980, an outbreak of suspected food-borne illness involving six individuals occurred on the USS Benjamin Franklin. Nausea and vomiting occurred within 30 min to 1 h following consumption of a common meal comprised of a salad made from lettuce, sliced ham and sliced Swiss cheese. Symptoms persisted for approximately one hour. No evidence of pathogenic bacteria or staphylococcal enterotoxins was found on analysis of the salad components. However, histamine analysis of the Swiss cheese revealed an average histamine level for three subsamples of 187 mg/100 g, a level sufficient to implicate histamine as the causative agent of this outbreak.

**Repair of Heat-Injured *Staphylococcus aureus* 196 E on Food Substrates and Additives and at Different Temperatures**, Samuel A. Palumbo and James L. Smith, U.S. Department of Agriculture, Eastern Regional Research

Center, 600 East Mermaid Lane, Philadelphia, Pennsylvania 19118

*J. Food Prot.* 45:458-461

Repair of heat-injured *Staphylococcus aureus* 196E was studied on a newly developed agar medium containing 25% ground beef. The cells were heat-injured at 50 C in 0.1 M potassium phosphate buffer (pH 7.2). After being heated, the cells were surface plated on: Tryptic soy agar (TSA); TSA + 7% NaCl (TSAS); ground beef agar (GBA) with and without various additions; and meat/food agar. Repair is defined as the number of organisms growing on GBA, GBA + addition, or meat/food agar that is greater than the number growing on TSAS by at least one log cycle. The following additives incorporated into GBA permitted repair of heat-injured *S. aureus*: nitrite (up to 400 ppm), ascorbate (up to 500 ppm), lactic acid (down to pH 5.5), liquid smoke preparations, and water activity-lowering substances including glycerol (10%), NaCl (2.5%), KCl (5%) and sucrose (30%). Cells regained salt tolerance on TSA when incubated at temperatures from 20 to 45 C, but not at 16 or 50 C. Repair was most rapid at 35 C. When ground beef was replaced in the plating medium, repair occurred on frankfurter and chili beef soup agars, but not on pepperoni and Lebanon bologna agars. Repair of heat-injured *S. aureus* can take place on meat-foods, in the presence of various meat additives, and at temperatures from 20 to 45 C.

**Microbiological Safety and Stability of Chewing Tobacco**, A. J. Peiser, D. E. Nocella and R. J. H. Gray, Department of Food Science and Human Nutrition, University of Delaware, Newark, Delaware 19711

*J. Food Prot.* 45:462-465

Eight brands of smokeless tobacco, including 4 scrap, 2 plug, and 2 snuff varieties were examined. Their ability to support microbial growth over a 14-day period at 30°C was determined. The pH of the products ranged from 4.8 to 8.5 and water activity from 0.48 to 0.81. The bacterial level was  $1.0 \times 10^4$  to  $1.9 \times 10^6$ , depending on the variety sampled. These levels varied little over the storage period. Use of inoculated samples demonstrated that chewing tobacco provided an unfavorable growth environment for either *Penicillium expansum* or *Aspergillus flavus*. Levels decreased from an initial  $10^5$ /g to  $10^2$ /g of tobacco. These data indicate that chewing tobacco, as marketed, is a microbiologically stable product.

**Differences and Similarities Among Proteolytic and Non-proteolytic Strains of *Clostridium botulinum* Types A, B, E and F: A Review**, Richard K. Lynt, Donald A. Kautter and Haim M. Solomon, Division of Microbiology, Food and Drug Administration, Washington, DC 20204

*J. Food Prot.* 45:466-474

Cultures of *Clostridium botulinum* types A, B, E and F, which are responsible for human botulism, fall into two groups with different characteristics unrelated to toxin type. These groups differ primarily with respect to proteolysis, but also have different somatic and spore antigens and DNA; the heat resistance of their spores, their growth at low temperatures and their salt tolerance also differ. All known type A strains are proteolytic and all type E strains are nonproteolytic, but types B and F have some proteolytic and some nonproteolytic strains.

Although proteolytic strains can activate their own toxins, nonproteolytic strains cannot do so and therefore require trypsinization for maximum toxicity. Proteolytic strains are unable to grow at temperatures below 10 C, but have relatively high salt tolerance and spores of high heat resistance. Nonproteolytic strains can grow at 3.3 C and have a lower salt tolerance; their spores have a much lower heat resistance than those of proteolytic strains.

**Principles of Food Dehydration**, Do Sup Chung and D. I. Chang, Department of Agricultural Engineering, Kansas State University, Manhattan, Kansas 66506

*J. Food Prot.* 45:475-478

The basic principles involved in the food dehydration are reviewed. Major emphasis is placed on types of water held in foods, heat of vaporization of water in food product, equilibrium moisture and water activity relationship and dehydration rate mechanism.

**Practical Applications of Food Dehydration: A Review**, F. E. Cunningham, Animal Sciences Department, Kansas State University, Manhattan, Kansas 66506

*J. Food Prot.* 45:479-483

Removal of water from foods is one of the oldest methods of preserving foods. Today nearly all foods can be preserved by a variety of controlled dehydration processes. Many chemical and physical changes can take place during food dehydration and those changes determine the ultimate quality of the dried and rehydrated product. This review concerns some of the more common drying methods, selected drying processes for various foods and a summary of the nutritive value of dehydrated foods.

**Recent Developments in Intermediate Moisture Foods**, L. E. Erickson, Department of Chemical Engineering, Kansas State University, Manhattan, Kansas 66506

*J. Food Prot.* 45:484-491

The science and technology of intermediate moisture foods has advanced during the last 25 years. Developments during this period are reviewed. Knowledge of the relationship of water activity and food degradation has advanced considerably during this period. Many new intermediate moisture foods have been developed. Several methods have been developed to alter the water activity of foods.

**Practical Approaches to Home Food Dehydration**, Peggy Duggan Maggard, Butler County Extension Office, Court-house, El Dorado, Kansas 67042

*J. Food Prot.* 45:492-494

Preserving foods by drying is one of the oldest known methods of food preservation. Until recently, freezing and canning have been the methods most people used to preserve foods at home. During the past 50 years, science and technology developed during World War II led to increased commercial drying of a wide variety of foods. Most of this information has not been readily available to the individual who wants to dry foods at home. Individuals wanting to do home drying, until approximately the last 10 years, could only find bits and pieces of information on how to do it. Hopefully,

this article will help eliminate some of the confusion that occurs because of conflicting information found in the scarce literature that is available on drying foods at home.

**Abstracts of papers in the April B Journal of Food Protection**

**Contribution of Nitrite to the Control of *Clostridium botulinum* in Liver Sausage**, A. H. W. Hauschild, R. Hilsheimer, G. Jarvis and D. P. Raymond, Microbiology Research Division, Health Protection Branch, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario, K1A 0L2, Canada

*J. Food Prot.* 45:500-506

Liver sausage was formulated with different brine and nitrite concentrations, challenged with a mixture of spores of five strains each of *Clostridium botulinum*, types A and B at 10-fold increasing concentrations, temperature-abused at 27°C, and assayed for botulinum toxin after various periods. From the number of toxic sausages and initial spore concentrations, the probability (P) of a single spore to give rise to toxin within a given period of abuse was estimated. At moderate brine concentrations (3.8-4.2% salt), 50 or 100 ppm of nitrite had little or no effect on toxigenesis; the estimated P values for one week at 27°C were from 10<sup>-2</sup> to 10<sup>-4</sup> with 0 and 50 ppm of nitrite, and from 10<sup>-2</sup> to 10<sup>-5</sup> with 100 ppm. With 150 ppm, however, P was consistently <2 × 10<sup>-6</sup>. At a higher brine concentration, an appreciable delay in toxigenesis was also obtained with 50 or 100 ppm of nitrite. Randomly typed extracts from 44 toxic sausages all contained *C. botulinum* type A toxin only. At toxin levels ≥100 mouse MLD/g the sausages had a putrid odor, but sausages with less toxin often appeared organoleptically acceptable. Storage of sausages at 8°C for 6 weeks before incubation at 27°C resulted in nearly complete disappearance of detectable nitrite, but did not diminish the inhibitory effect of the initial nitrite. Increased processing temperature and/or prolonged time of processing reduced the inhibitory effect of nitrite.

**Sensitivity of *Campylobacter jejuni* to Drying**, Michael P. Doyle and Debra J. Roman, Food Research Institute, University of Wisconsin-Madison, 1925 Willow Drive, Madison, Wisconsin 53706

*J. Food Prot.* 45:507-510

Several factors were shown to influence the rate of inactivation of *Campylobacter* sp. when dried on a glass surface. These included strain, temperature and humidity, and medium used to suspend the organism. Of the strains evaluated, all of three isolates of *Campylobacter jejuni* exhibited greater tolerance to drying than did a strain of nalidixic acid resistant, thermophilic *Campylobacter*. Inconsistent results were obtained when organisms were dried and maintained at 25 C. Viable cells from two of four strains having an initial population of >10<sup>7</sup> were not recovered after 24 h in an anhydrous environment at 25 C. Under comparable conditions, drying *C. jejuni* FRI-CF8 in the presence of skim milk at 25 C resulted in a >10<sup>7</sup> log<sub>10</sub> reduction of cells within 1 day in one



instance; a 5 log<sub>10</sub> decline after 7 days in another; and inactivation at an intermediate rate on a third occasion. Rates of death were greatly reduced when cells were dried and held at 4 C. At this temperature and in the presence of skim milk and an anhydrous environment, a 5 log<sub>10</sub> reduction of CF8 occurred after 6 weeks. In all instances, greater survival occurred when organisms were dried in the presence of Brucella broth than in skim milk. When held in environments of different relative humidities (RH), survival was greatest in the presence of 14% or less RH. Results suggest that *C. jejuni* is generally quite sensitive to drying and storage at room temperature, but, at refrigeration temperature and the appropriate humidity, large numbers may survive drying and remain viable for several weeks.

**A Regression Equation for Estimating Solids-Not-Fat From Fat, Protein and Lactose of Fluid Milk**, K. K. Park, W. C. Green and B. W. Rolf, California Department of Food and Agriculture, 1220 N Street, Sacramento, California 95814

*J. Food Prot.* 45:511-512

A regression equation was developed for estimating solids-not-fat from fat, protein and lactose contents in fluid cow's milk. The standard error of estimate was 0.0516%. It was found that the estimate by the equation of Cervinka et al. was low at the high level of solids-not-fat. The developed regression equation gave a more accurate estimate than the equation of Cervinka et al.

**Subpasteurization Heat Treatment to Inactivate Lipase and Control Bacterial Growth in Raw Milk**, G. F. Senyk, R. R. Zall and W. F. Shipe, Department of Food Science, Cornell University, Ithaca, New York 14853

*J. Food Prot.* 45:513-515

Raw milk was heat-treated under subpasteurization and suprapasteurization conditions, cooled and stored for up to 72 h at 4.4 and 6.7°C. Milk lipase activity and bacteria counts were monitored in both unheated and heated milks. Inhibition of milk lipase activity ranged from 42 to 98% for treatments of 57.2°C for 10 sec to 73.9°C for 10 sec, respectively. The logs of Standard Plate Count after 72 h of storage at 6.7°C were 6.56, 4.86, 4.31, 4.00 and 2.82 for unheated and 10-sec heat treatments at 57.2, 65.6, 73.9 and 82.2°C, respectively. Psychrotrophic Bacteria Counts were also lower in the heated milks than in the unheated milk. The logs of Psychrotrophic Bacteria Counts after 72 h of storage at 6.7°C were 6.21, 2.45, 2.27, 1.33 and 1.00 for unheated and 10-sec heat treatments at 57.2, 65.6, 73.9 and 82.2°C, respectively. Heat treatment of raw milk supplies would result in limiting action of the milk lipase system and growth of bacteria.

**Effect of Low Temperatures on Growth of Nonproteolytic *Clostridium botulinum* Types B and F and Proteolytic Type G in Crabmeat and Broth**, H. M. Solomon, D. A. Kautzer and R. K. Lynt, Division of Microbiology, Food and Drug Administration, Washington, DC 20204

*J. Food Prot.* 45:516-518

The ability of unheated and heated spores of nonproteolytic *Clostridium botulinum* types B and F, and of the weakly proteolytic type G, to grow and produce toxin in crabmeat and broth at low temperatures was investigated. Sterilized crabmeat or broth was inoculated with 10<sup>3</sup> spores/g or ml and incubated anaerobically at 4, 8, 12 and 26 C for 180 days. Both heated and unheated spores of all three types grew and produced toxin at 26 C in broth and crabmeat. Types B and F grew in broth at 12, 8 and 4 C when unheated but only at 12 and 8 when heated; they did not grow in crabmeat at any of these temperatures, heated or not. Heated and unheated type G grew at 12 C in both broth and crabmeat but not at lower temperatures.

**Prevention of Mold Growth and Toxin Production through Control of Environmental Conditions**, Martin D. Northolt and Lloyd B. Bullerman, Laboratory for Zoonoses and Food Microbiology, National Institute of Public Health, P.O. Box 1, 3720 BA Bilthoven, The Netherlands and Department of Food Science and Technology, Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln, Nebraska 68583

*J. Food Prot.* 45:519-526

Environmental conditions influence mold growth and mycotoxin production. Such things as water activity (a<sub>w</sub>), temperature, pH and atmosphere can strongly affect and profoundly alter patterns of growth and mycotoxin production. Generally, maintenance of low temperatures will prevent aflatoxin production in stored products, whereas other toxins such as penicillic acid, patulin, zearolenone and T-2 toxin may be produced at low temperatures. Toxic *Penicillium* and *Fusarium* species are generally more capable of growth at low temperatures than are toxic species of *Aspergillus*. Temperature interacts with a<sub>w</sub> to influence mold growth and mycotoxin production. Aflatoxin B<sub>1</sub> can be produced at conditions of a<sub>w</sub> and temperature which are close to the minimum a<sub>w</sub> and temperature for growth. On the other hand, patulin, penicillic acid and ochratoxin A are produced within a narrower range of a<sub>w</sub> and temperature, compared with those for growth. In fact, production of patulin and penicillic acid by *Penicillium* species appears to be confined to high a<sub>w</sub> values only. In optimal substrates, the minima of a<sub>w</sub> and temperature for growth and toxin production may be lower than in other substrates. It appears that pH and substrate composition have no great effect on growth of toxic molds, but may have a great influence on toxin production. Presence of CO<sub>2</sub> and O<sub>2</sub> influences mold growth and mycotoxin production. A 20% level of CO<sub>2</sub> in air depresses aflatoxin production and markedly depresses mold growth. Decreasing the O<sub>2</sub> concentration of air to 10% depresses aflatoxin production, but only at O<sub>2</sub> levels of less than 1% are growth and aflatoxin production completely inhibited. With patulin- and sterigmatocystin-producing molds, concentrations of 40% CO<sub>2</sub> depress growth and toxin production, but a level of 90% CO<sub>2</sub> is needed to completely inhibit production of these toxins. Decreasing O<sub>2</sub> concentration to 2% depresses production of patulin and sterigmatocystin but does not affect fungal growth. Only at levels down to 0.2% are growth and toxin production completely inhibited. Controlled atmospheres with increased CO<sub>2</sub> (above 10%) and decreased O<sub>2</sub> (2%) can be used to retard mold growth. Exclusion of O<sub>2</sub> by vacuum packaging in materials with low O<sub>2</sub> permeability will depress or

even prevent aflatoxin production. Presence of other microorganisms may also restrict fungal growth and mycotoxin production. Aflatoxin production by *Aspergillus flavus* in mixed cultures with *Aspergillus niger* is less than in pure culture. Mixtures of fungi growing in grains and nuts in competition with *A. flavus* seem to prevent aflatoxin production. Other organisms including *Rhizopus nigricans*, *Saccharomyces cerevisiae*, *Brevibacterium linens* and some lactic acid bacteria have been shown to reduce growth and aflatoxin production by *Aspergillus parasiticus*. In general, mold growth and mycotoxin production can be prevented by employing various measures based on knowledge of the factors involved. Choice of the measures depends upon the type of product, storage period and available techniques.

**Microbiological Characteristics of Beef Tongues and Livers as Affected by Temperature-Abuse and Packaging Systems**, C. A. Rothenberg, B. W. Berry and J. L. Oblinger, Meat Science Research Laboratory, S&E, ARS, USDA, Beltsville, Maryland 20705, Department of Animal Sciences, University of Maryland, College Park, Maryland, 20742, and Food Science and Human Nutrition Department, University of Florida, Gainesville, Florida 32611

*J. Food Prot.* 45:527-532

Effects of various handling, packaging, temperature-abuse and storage conditions were determined on the microbiological characteristics of beef livers and tongues. These organs were evaluated: (a) initially following slaughter, (b) immediately following the frozen storage period of 2-4 weeks at -29°C and (c) following a simulated shipping-temperature abuse of 24 h at 22-28°C followed by 13 days of storage at -1 ± 0.5°C. Initial counts (log/cm<sup>2</sup>) of coliforms, coagulase-positive *Staphylococcus aureus* and *Clostridium perfringens* ranged from 0.19-1.37. Generally, neither freezing nor temperature-abuse had a significant effect on these microorganisms. Vacuum-packaged beef tongues and livers, generally, had lower bacterial counts than did either naked or polyvinyl chloride film-wrapped products. Generally, it was observed that abusive storage temperatures, in conjunction with the naked and film-wrapped packaging systems, appear to present potential microbial spoilage problems when compared with vacuum packaging.

**Bacterial Content of Raw and Processed Human Milk**, E. N. Agel, B. A. Friend, C. A. Long and K. M. Shahani, Department of Food Service and Technology, University of Nebraska, Lincoln, Nebraska 68583

*J. Food Prot.* 45:533-536

Mature human milk samples were manually expressed into sterile containers and examined for their bacterial content. No other special precautions were taken to ensure asepsis. The total counts of seven individual samples ranged from 1.5 × 10<sup>3</sup> to 1.9 × 10<sup>7</sup> CFU/ml; the counts of pooled samples used for further processing ranged from 4.2 × 10<sup>6</sup> to 5.7 × 10<sup>7</sup> CFU/ml. Freezing had no significant effect on the counts. Although freeze-drying reduced the mean count by one log cycle, the decrease was not significant and the level of contamination was

above the level considered safe for human consumption. Pasteurization at 62.5°C for 30 min reduced the load 4-5 log cycles and the reduction continued during subsequent storage at -25°C. Although heating at 75°C for 15 min reduced the load 6-7 log cycles, the microbial counts tended to increase during subsequent storage at 4°C.

**The Salt Crystal Liquefaction Test - A Simple Method for Testing the Water Activity of Foods**, M. D. Northolt and C. J. Heuvelman, Laboratory for Zoonoses and Food Microbiology, National Institute of Public Health, P.O. Box 1, 3720 BA Bilthoven, The Netherlands

*J. Food Prot.* 45:537-540

A simple method for testing the water activity ( $a_w$ ) of foods has been developed. The test can be used to check the  $a_w$  of products which must comply with required  $a_w$  standards. The test is based on the property of salt crystals to attract water vapor and to liquefy when they are placed in a jar containing a product with an  $a_w$  above the specific  $a_w$  of the salt. By using different salts with appropriate specific  $a_w$  values, the  $a_w$  of products at various  $a_w$  levels can be examined. The specific  $a_w$  values of salts which can be used for the test are: 0.68, 0.76, 0.79, 0.81, 0.86, 0.87, 0.91, 0.94 and 0.98. The sensitivity of the test is less than 0.02  $a_w$  with a reading time of 3-24 h, depending on the type of salt, type of product and temperature. The test using salt crystals with a high specific  $a_w$  is sensitive to a change in temperature and must be performed in a thermostat-controlled cabinet. The test using CuCl<sub>2</sub>·2H<sub>2</sub>O crystals (0.68  $a_w$ ) was evaluated under extreme environmental conditions and it appeared to be most promising for use in field conditions.

**Variability in Cholesterolemic Response of Rats Consuming Skim Milk**, N. L. Keim, J. A. Marlett, C. H. Amundson and L. D. Hagemann, Department of Nutritional Sciences and Department of Food Science, University of Wisconsin-Madison, Madison, Wisconsin 53706

*J. Food Prot.* 45:541-546

The hypocholesterolemic property of skim milk powder (SMP) was investigated using rats in a series of six separate experiments. SMP was incorporated at a level of 25% by weight into stock diets or semipurified diets with casein or soy as the protein source. Ingestion of SMP with casein-based diets for periods of 5 to 12 weeks produced a transient hypocholesterolemia only when diets were introduced within 1 week of weaning. In two different experiments, when weaning rats were fed stock diets with or without SMP for periods of 8 and 16 weeks, SMP ingestion led to a transient decrease in plasma cholesterol (CH) levels in only one experiment. Finally, SMP was not hypocholesterolemic when fed to weaning rats with a soy-based diet for 8 weeks. Together, these results reveal that consumption of SMP does not consistently elicit hypocholesterolemia in rats. We found that to observe significant differences in plasma CH levels between the control and SMP groups, semipurified diets containing SMP had to be fed to rats within the first week of weaning; in addition, the diets had to be free of, or reduced in other components with cholesterol-lowering properties. Finally, the SMP-induced hypocholesterolemia that we observed appeared to facilitate the normal rate of decline in plasma CH levels during the post-weaning period, producing only a transient difference between control and SMP groups.



**Defects of Inshell Walnuts, Pecans and Brazil Nuts**, John S. Gecan, Paris M. Brickey, Jr. and John C. Atkinson, Division of Microbiology and Division of Mathematics, Food and Drug Administration, Washington, DC 20204

*J. Food Prot.* 45:547-548

A survey was done to determine the level of defects in inshell walnuts, pecans and Brazil nuts. The analytical data, which represented inshell nuts at the national retail level, were obtained on 406 samples of Brazil nuts, 386 samples of pecans and 450 samples of walnuts. Defective inshell nuts were classed as insect-infested, moldy, rancid, decomposed, shriveled, blank and dirty. The mean and percentage range of total defects were walnuts 4.0 (0-23.5), pecans 5.7 (0-47.0), and Brazil nuts 5.7 (0-24.1). The percentages of samples of each nut type which contained at least one defect were walnuts 88.0%, pecans 93.5%, and Brazil nuts 97.0%.

**Fate of Aflatoxin M<sub>1</sub> in Cheddar Cheese and in Process Cheese Spread**, Robert E. Brackett and Elmer H. Marth, Department of Food Science and the Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

*J. Food Prot.* 45:549-552

Four batches of stirred-curd Cheddar cheese were prepared, using milk which was naturally contaminated with aflatoxin M<sub>1</sub>. This cheese was analyzed for aflatoxin M<sub>1</sub> content at intervals while the cheese ripened for about 1 year. Levels of aflatoxin M<sub>1</sub> detected in cheese started low, increased and then leveled off for the remainder of the ripening period. This cheese was used to make process cheese spread. The spread appeared to contain as much or more aflatoxin M<sub>1</sub> as the cheese from which it was made. The aflatoxin M<sub>1</sub> content of cheese spread appeared to increase, and then return to near original levels during storage at 7°C. Contaminated Cheddar cheese was treated with heat (90°C for 20 min), emulsifying salt (5% Na<sub>2</sub>HPO<sub>4</sub>) or both to determine the influence of processing conditions on aflatoxin M<sub>1</sub>. Samples treated with emulsifying salt or heat showed an increase in aflatoxin M<sub>1</sub> content but not as much as when samples were treated with both. The apparent increase in aflatoxin M<sub>1</sub> content in natural cheese and in process cheese spread may be associated with greater recovery of toxin by the analytical method as cheese ripens or is treated to make the process cheese spread.

**Fate of Aflatoxin M<sub>1</sub> in Brick and Limburger-like Cheese**, Robert E. Brackett, Rhona S. Applebaum, Dana W. Wiseman and Elmer H. Marth, Department of Food Science and the Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

*J. Food Prot.* 45:553-556

Three batches of brick cheese were prepared, using milk which was naturally contaminated with aflatoxin M<sub>1</sub> (AFM<sub>1</sub>). Cheeses were allowed to ripen with a smear for 2, 3 or 4 weeks, and then were either waxed or wrapped in foil to simulate production of mild brick, aged brick or Limburger-like cheese, respectively. These cheeses were analyzed for AFM<sub>1</sub> at intervals for about 26 weeks. There was an average 1.7-fold enrichment of toxin in the curd over that in milk. Levels of AFM<sub>1</sub> in cheese

started low, appeared to increase at about 4 weeks of age and then dropped to initial levels in cheese ripened with a smear for 3 or 4 weeks. At no time did amounts of AFM<sub>1</sub> drop below initial levels. Toxin concentrations appeared to increase most in the rind of cheeses ripened with a smear for 2 or 3 weeks. When such ripening was for 4 weeks, levels of AFM<sub>1</sub> in the rind decreased, whereas levels in the center of the brick remained constant or increased.

**Inactivation of Aflatoxin M<sub>1</sub> in Milk Using Hydrogen Peroxide and Hydrogen Peroxide plus Riboflavin or Lactoperoxidase**, Rhona S. Applebaum and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

*J. Food Prot.* 45:557-560

Use of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), H<sub>2</sub>O<sub>2</sub> plus riboflavin (Rib.) and H<sub>2</sub>O<sub>2</sub> plus lactoperoxidase (LPO) to inactivate aflatoxin M<sub>1</sub> (AFM<sub>1</sub>) in naturally contaminated raw whole milk was examined. Effectiveness of treatments was evaluated by determining percent of AFM<sub>1</sub> inactivation, using thin-layer chromatography and fluorodensitometry. Inactivation values ranged from 0 to 98%. Maximum inactivation (98%) was obtained using 1% H<sub>2</sub>O<sub>2</sub> plus 0.5 mM Rib. (30°C, 30 min) followed by heating at 63°C for 30 min. Eighty-five percent of measurable AFM<sub>1</sub> was eliminated when 5 units of LPO plus 0.1% H<sub>2</sub>O<sub>2</sub> (4°C for 3 d) were used. Singlet oxygen and/or hypochlorous acid are two reactive species that may be involved in mechanisms responsible for inactivation of AFM<sub>1</sub>.

**Pyruvate as an Indicator of Quality in Grading Nonfat Dry Milk**, R. T. Marshall, Y. H. Lee, B. L. O'Brien and W. A. Moats, Department of Food Science and Nutrition, University of Missouri-Columbia, Columbia, Missouri 65211 and U.S. Department of Agriculture, Science and Education Administration, Agriculture Research, Beltsville, Maryland 20705

*J. Food Prot.* 45:561-565

Samples of skim milk and nonfat dry milk (NDM) made from it were collected, paired and tested for pyruvate concentration, [P], and Direct Microscopic count (DMC). The skim milk was tested for Standard Plate Count (SPC) and Psychrotrophic Plate Count (PPC). The geometric average DMC of skim milk was more than three times higher than that of the paired NDM samples. However, [P] of NDM was not significantly different from that of the skim milk. Although [P] of skim milk was poorly correlated with SPC and PPC,  $r = .31$  and  $.26$ , respectively, it was relatively well correlated with DMC,  $r = .64$ . Data were widely dispersed around the regression line when [P] was  $\leq 4.0$  mg/L. However, [P] increased rapidly when DMCs were  $> 10^6$ /ml. A limit of 10 mg/L of [P] in NDM reconstituted 1:9 was chosen to represent the current U.S. Department of Agriculture Standard for DMC in NDM. This limit failed to classify about 10% of the samples correctly, assuming that each geometric mean DMC was correct. However, the probability that samples meeting the DMC standard would be rejected by the pyruvate test was quite low and the probability was moderate that samples which

would be acceptable by the pyruvate test would be rejected by the DMC. For the latter, 28% of the samples having DMCs of  $\geq 10^7$ /ml contained  $< 10$  mg/L of pyruvate. No sample having  $\geq 10$  mg/L of pyruvate had a DMC of  $\leq 10^7$ /ml. Pyruvate concentration in NDM did not change during storage at 5 or 32°C for 90 days.

**Model for Predicting the pH of Foods Comprising Mixtures of Tomatoes and Low-Acid Ingredients, G. M. Sapers, J. G. Phillips, A. M. Divito and W. M. Brooks, Eastern Regional Research Center, Philadelphia, Pennsylvania 19118**

*J. Food Prot.* 45:566-570

The possibility of predicting the pH of home-canned foods comprising mixtures of tomatoes and low-acid ingredients was investigated. A quadratic model representing multi-component mixtures of tomatoes and nine low-acid ingredients, combined in various proportions, was tested. A 19-term equation for pH prediction, generated from the data, yielded a correlation coefficient of 0.9998 and a standard error of 0.11 pH unit. Tomato acidity was an important determinant of product pH. The equation was validated by comparing the predicted and observed pH of 55 representative products. Good agreement between these pH values was obtained. Criteria for recognition of low-acid products were established.

**Quantitative Assay of Beta-Lactam Residues in Raw Milk Using a Disc Assay Method, R. E. Ginn, R. Case, V. S. Packard and S. Tatini, Dairy Quality Control Institute, Inc., 2353 North Rice Street, St. Paul, Minnesota 55113; Kraft, Inc., Kraft Court, Glenview, Illinois 60025; and Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles, St. Paul, Minnesota 55108**

*J. Food Prot.* 45:571-573

Numerous methods have been developed to determine presence of antibiotics in raw milk. Until recently, major effort had been placed on qualitative considerations, and primarily for detecting presence of penicillin (beta-lactam) residues. Only one method, the *Sarcina lutea* Cylinder Plate (CP) procedure, has been modified to provide for quantitative estimates. The CP method is a rather long, tedious test, requiring considerable technical skill. Need for a simpler, faster quantitative method was apparent. This paper describes a method for making quantitative estimates of beta-lactam residues around a fixed reference standard. The method uses *Bacillus stearothermophilus* in a disc assay test. Quantitative estimates above or below the reference level of antibiotic are computed through a paired-t statistical analysis. The test can be completed within 3 h.

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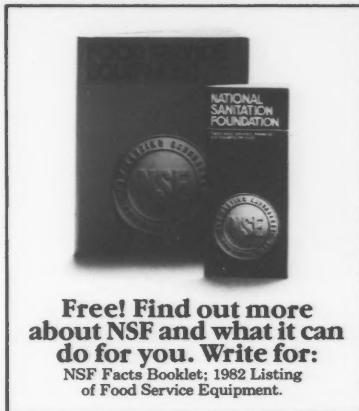
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