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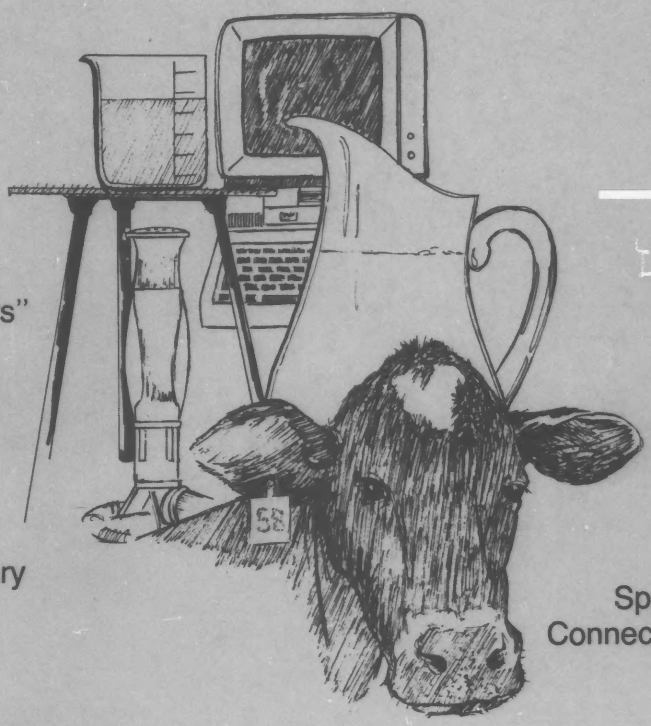

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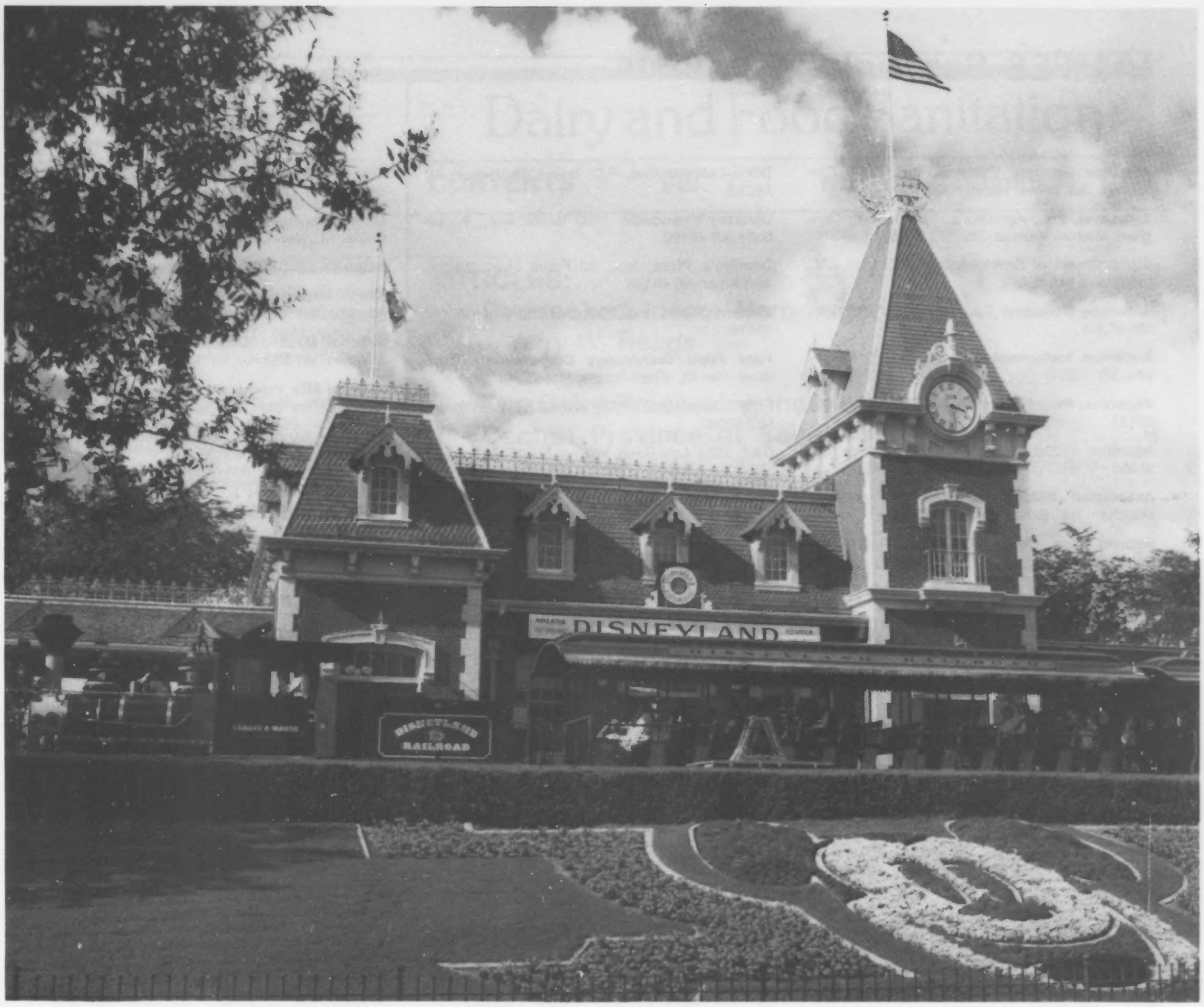

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Dairy and Food Sanitation

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Overlooked Insect Harborages

JERRY W. HEAPS, R.P.E.

As sanitation personnel are cleaning a facility the areas that are most visible normally receive frequent and adequate cleaning to prevent a build up of potential food sources and breeding areas for insects. However, there are many areas that personnel may see and pass by many times a day thinking nothing of the possibility of these sites to breed insects. Ten such "everyday" sites that can be insect harborages have been chosen and some of the more common insects that could be living there and lead to an infestation and/or sanitation problem in your plant are indicated. Hopefully, after reading about these areas that do not receive regular inspections or sanitation you will become more aware of other similar locations throughout your plant.

(1) Drains

Sink or floor drains that are frequently used or, more likely, drains that are only occasionally used could be pest harborages. Examples would be drains in bathrooms and employee shower facilities, cafeterias, or equipment cleaning rooms. Constant awareness and maintenance of any drain is important so food particles, soap and/or hair accumulations, algae-like sludge, stagnant water and other similar debris do not build up. Insects in the order Diptera (true flies) can breed in this type of material if it is allowed to accumulate. Fruit flies, phorid flies and psychodid flies (commonly called drain flies or owlet flies) are common ones that may be found. Cockroaches, especially the American and the oriental, are fond of the warm, moist habitat offered by floor drains.

Sometimes drain cleaning liquids or powders do not remove sludge and debris build up on the drain sides or inner lip area around the trap. A brisk brushing of these places with a stiff bristled brush will adequately remove this material so it can be flushed away.

Any drain in a facility that is not used should be plugged or sealed to prevent its use as a breeding site for insects. Be careful not to allow any cleaning mops, rags or sponges to sit around damp and begin to "sour" as fruit flies can breed in these areas.

(2) Vending Machines

Fruit flies like to breed in the sweet syrup concentration used to make soda beverages in vending machines. These concentrates may spill over inside the machine as it is being filled or around the beverage dispensing area or overflow drain. If not thoroughly cleaned along with the trash containers nearby, a fruit fly population may explode in a few weeks. If the vending machines dispense cans, do not allow the cans to accumulate in the trash containers because fruit flies can also breed in the beverage residue that often remains in a so called "empty" can.

German and brown-banded roaches also like the warm motor area and light fixtures found in some vending machines plus the many cracks and crevices found throughout its interior section. There are approved residual insecticides or insecticide dusts like boric acid with which these areas can be treated.

(3) Pallets

Pallets can be a sanitarian's nightmare. Insects can hitchhike into a plant on them or stored product insects can breed in food dust that can accumulate in their many cracks and crevices as they sit in a plant. Cockroaches and their egg cases which look like brown kidney beans in size and shape could also enter a facility on pallets. Depending on the roach species involved these egg cases could be glued to the pallet or freely laid in a crevice. Egg cases are protective and have many eggs clustered within them. Insecticides cannot penetrate egg cases but fumigants, excess heat (150°F for 1/2 hour) or subfreezing temperatures (0°F for 3-4 days) can effectively kill them.

Pallets should be thoroughly inspected and regularly cleaned or treated with a residual insecticide if they are going to be in the plant for a long period of time. Throughout the plant, pallets should be periodically raised and cleaned underneath so insects cannot breed in the food dust accumulations there.

(4) Overhead Areas

Machinery tops or ledges on structural beams can easily accumulate flour or food product dust and can be an

excellent area in which flour beetles or sawtoothed grain beetles may be found. If possible, these locations should be inspected and cleaned at least once a month to break up the insects breeding cycle that could be completed in four weeks under ideal conditions. Vacuuming is the preferred cleaning method versus using compressed air because insects or their eggs are not blown to other locations.

(5) Portable Equipment

Examples in this category would be scales, air compressors, electrical or hydraulic lifts, and storage carts for tools or electrical supplies. Check elevators, too. If flour dust is allowed to accumulate in these places, flour beetles can begin to breed. Any crack and crevice area should be sealed with caulk or similar material to prevent debris from accumulating in them. Also, cockroaches would like to live in any protective crevice. They need food, water, warmth and a protective habitat like a crack or crevice in order to survive. Any of these vital environmental factors that can be eliminated will stress the cockroach population and make control efforts more effective.

(6) Garbage Dumpsters or Storage Areas

Most of us are quite aware of how these areas can breed and attract flies. In the summer, a fly can complete its life cycle within 10 to 14 days. Fly larvae or maggots can often be seen crawling in garbage material left open for a few days. Cockroaches love to feed in garbage disposal areas or the "chutes" where garbage may be dumped. Any garbage disposal area or container should be thoroughly cleaned and emptied at least once a week. Cracks in the floor of a room used for garbage collection or storage should be sealed to prevent food debris and liquid from accumulating in them; thus allowing insects to breed there. Garbage dumpsters or cans should be kept tightly covered to prevent insect attraction to them. Plastic garbage bags help to prevent leakage and keep the interior of garbage cans clean. Metal dumpsters should be scraped clean after they have been emptied and then treated with a residual insecticide.

(7) Electrical Boxes

Electrical boxes should be inspected at least once a month. Check for food or flour dust accumulations that can be used by stored product insects for breeding. Cockroaches can also live in these areas. The perimeter of electrical boxes where they meet a wall should be sealed with caulk. A small piece of a No-Pest-Strip can be placed inside electrical boxes to aid in pest control. Follow label directions. The active ingredient in these strips is DDVP (Vapona) and insects are killed by a build up of fumes given off by the strip. The less air circulation in the areas where the strip is located, the more effective it is because the fumes get a chance to accumulate. Every three or four months the piece of strip needs to be replaced.

(8) Railroad Track Depressions

Areas adjacent to railroad tracks can deteriorate over a period of time. If food-type raw materials in railcars are brought inside the plant to be unloaded, debris can accumulate in these hollow depression areas or cracks and crevices around them. If not regularly vacuumed out, stored product insects like saw-toothed grain beetles and flour beetles can breed there. Beetles in the family Dermestidae can also live on this debris and other pieces of dead insects that may accumulate over a period of time.

(9) Storage Cabinets, Drawers or Lockers

Storage cabinets, drawers or lockers should be kept clean and free of flour or food debris. Flour beetles can easily breed in the cracks and crevices of these locations if their food is present.

Employee locker rooms and the lockers can be cockroach harborages. Employees should not store any food in their lockers and eat only in designated areas of the plant. Any locker or storage cabinet should be raised up from the floor so that cleaning and inspection underneath is possible. If they do sit directly on the floor, make sure they are sealed around the perimeter with caulk.

(10) Paper or Cardboard Pallets

Flour beetles can breed in or under pallets of paper material if flour dust accumulates there. Cockroaches would also like the cracks and crevices available in such a pallet. If possible, paper products should not be stored close to windows because they may become wet from water leaking through. Insects called psocids or minute brown fungus beetles in the family Lathridiidae are insects that can breed on damp paper products feeding on microscopic mold and fungi that may be growing.

Dairy and Food Sanitation, Vol. 7, No. 1, Pages 6-13 (January 1987)

The Dairy Processing Industry in the Central Province of Saudi Arabia

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INTRODUCTION

The dairy industry in the Kingdom of Saudi Arabia is a rapidly growing food industry striving to attain self sufficiency, a national goal. Growth has been extensive and the quality of dairy farms and dairy processing operations has improved.

Dairy products manufactured in the central province of Saudi Arabia can be categorized into four main groups, fermented products, white cheese, fluid milk and ice cream. Fermented products are exclusively yogurt. They consist of plain liquid yogurt known as "laban" or "Rob"; plain set yogurt known as "Zabadi"; a concentrated product of plain yogurt known as "labneh"; and flavored set yogurt. White cheeses constitute a separate group from fermented products since they are devoid of starter culture. Fluid milk is plain and pasteurized or sterilized (to increase shelf life). Sterilized milk may be plain or flavored.

This study investigated production, processing and quality aspects of dairy products manufactured in the central province of Saudi Arabia.

MATERIALS AND METHODS

This study was conducted between December 1981 and May 1982 and covered all operational processing plants in the central province. Information concerning production figures and manufacturing practices were obtained through inspection and direct contact with the plant management.

Analytical data were obtained from six representative samples of each product per processing plant (total of 14 plants). The samples were collected randomly from the production line (yogurt, cheese and processed milk), the cold storage tank (raw milk) or the deep-freeze storage facilities (ice cream). Upon collection, the samples were transported under refrigerated conditions in insulated ice boxes (4-6°C) containing ice packs, except for ice cream where the ice packs were replaced with dry ice for more effective cooling. Samples were stored at 4-6°C except for ice cream which was stored at -35°C and analyzed within 24 hours of collection.

The physicochemical tests applied on all samples included fat, protein, ash and total solids (TS). In addition, raw milk was tested for lactose and milk solids-not fat (MSNF); ice cream for total sugars; yogurt products for lactose, pH and titratable acidity (TA), and processed milk for pH, TA, phosphatase (ph-ase), hydrolytic rancidity (ADV), specific gravity and refractive index (R.I.).

Protein was analyzed by Kjel-Foss Automatic (Foss Electric). Total solids, total sugars, ash and TA were determined according to the methods of the Association of Official Analytical Chemists (AOAC) (1). Solids-not-fat were obtained by difference (TS-fat). The pH was measured on a digital pH meter (Orion Model 701 A). Lactose was determined gravimetrically (1) and the lactometer method was used to determine specific gravity (7). Refractive index was measured in a temperature compensated Abbe Refractometer (American Optical, Model 10450). Phosphatase was determined by the Scharer modified ph-ase test (Applied Research Institute) and hydrolytic rancidity was measured by determining the acid degree value (ADV) of the product (11).

Microbiological analyses of samples included *Salmonella, Shigella, Staphylococcus aureus, Clostridium perfringens* and *Bacillus cereus*. In addition, yogurt prod-

ucts were tested for coliform and mold & yeast; raw milk and ice cream for coliform and standard plate count (SPC) and processed milk for coliform, SPC and antibiotics.

The standard plate count, coliform, mold & yeast and antibiotics were determined according to the Standard Methods for the Examination of Dairy Products (6). *Salmonella* and *Shigella* were detected according to AOAC methods and confirmed by biochemical and serological tests (1). The procedures of the Bacteriological Analytical Manual of the Food and Drug Administration (3) were used for detection of *S. aureus* and *B. cereus*. Shahidi Ferguson Perfringens (SFP) agar base (Difco) was used for *C. perfringens*.

RESULTS AND DISCUSSION

Production aspects

All dairy processing plants in the central province manufacture yogurt in one form or another. Plain liquid yogurt and plain set yogurt are produced by most of the plants, labneh is limited to a few and flavored yogurt to one plant. Pasteurized milk is produced by half the number of operating plants and sterilized milk is produced by one plant. Ice cream manufacture is limited to almost one-third of the existing plants.

The annual production of the four main groups of processed dairy products is shown in Table 1. Yogurt products are predominant and constitute 82.5% of the total processed dairy products, followed by milk (16.0%), cheese (0.8%) and ice cream (0.7%). Plain liquid yogurt dominates the yogurt market and constitutes 87.4% of the total yogurt production.

Fluid milk, the second major dairy product, is made of sterilized (UHT) and pasteurized milk. Sterilized milk constitutes 69% of the total processed milk and is made from powder milk. Pasteurized milk is made of fresh milk and constitutes about one-third (31%) of the processed fluid milk.

Production figures of individual products as percentage of total processed dairy products indicate the following sequence: plain liquid yogurt (72.1%), sterilized milk (11.0%), plain set yogurt (8.2%), pasteurized milk (5.0%), labneh (2.0%), cheese (0.8%), ice cream (0.7%) and flavored yogurt (.02%).

TABLE 1. *Annual production of dairy products in the central province of Saudi Arabia.*

Name of Product	Quantity of Production (metric tons)
Yogurt	69,971
Milk	13,567
Cheese	719
Ice Cream	588
TOTAL	84,845

Raw material

Three types of milk, reconstituted, recombined and fresh, are used in the manufacture of dairy products at the central province. Reconstituted milk is prepared by reconstitution of whole or skim milk powder with water. Recombined milk is made by a recombination process of skim milk powder, melted butter or butter oil, stabilizer and emulsifier with water. Fresh milk is obtained from predominantly imported cows. Reconstituted milk is used primarily in small size operations and recombined and fresh milk is usually limited to large size plants.

Yogurt products are made of reconstituted, recombined or fresh milk (9). About 52% of plain liquid yogurt is made of fresh milk and 48% is made of powder milk. Plain set yogurt, flavored yogurt and cheese are almost exclusively made of powder milk. Pasteurized milk is made of fresh milk and UHT milk is made of recombined milk. Ice cream is predominantly made of recombined milk with butter oil as the sole source of butter fat in the mix.

Manufacturing practices

The usual steps in yogurt manufacture are applied. They include heat treatment of milk, cooling to incubation temperature, addition of culture, incubation, cooling of yogurt, filling and storage.

The three common types of heat treatment applied on milk include batch pasteurization, high temperature short time (HTST) and ultra high temperature (UHT) treatment. HTST treatment is predominant; however, the temperature-time applied varies between 73-95°C and 15 seconds to 5 minutes.

Cooling of milk to inoculation temperatures of 42-45°C is the usual practice; however, a few plants use temperatures ranging between 21-32°C. Commercial freeze dried cultures are used in yogurt preparation. The majority of plants use Dri-Vac lactic cultures (Chr. Hansens Lab, Denmark) consisting of various strains of *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. One plant, however, utilized commercial freeze dried cultures of various strains of *Streptococcus lactis, Streptococcus cremoris* and *Lactobacillus citrovorum*. Freeze dried cultures are propagated into mother, intermediate and bulk cultures. Bulk cultures are usually added to milk at 1-3% level before incubation.

Incubation is carried out either in vats (plain liquid yogurt) or in retail packages (plain set yogurt). Incubation time varies between 3-5 hours at 42-45°C or 8-18 hours at 21-32°C. During processing of plain liquid yogurt, incubation is interrupted at pH 4.8. At this pH, breaking of curd starts with gentle agitation and simultaneous cooling. Cooling of the product is done either by vat (slow cooling) or plate cooling (fast cooling). At temperatures not exceeding 10°C, the product is ready to be filled in retail containers and immediately refrigerated. In contrast, the plain set yogurt has uninterrupted incubation in retail

packages followed by refrigeration. The final pH of both products is about 4.3 ± 0.2. In flavored yogurt, sugar, artificial flavor and color are added to milk, otherwise the manufacturing process is similar to plain set yogurt. Except for the UHT processed yogurt, all yogurt in the central province have active lactic culture in the ready-to-eat form.

Labneh is a concentration of plain yogurt. Traditionally, it is prepared by straining plain yogurt by hanging or pressing for several hours in cheesecloth bags. The product is removed from the bags after proper semisolid consistency is achieved, blended to remove possible lumps and produce a homogenious texture (like sour cream) and finally filled into retail tubs and refrigerated. This method is still being used in all dairy plants in the central province except in one plant where centrifugal force is used to achieve the proper textural consistency of the product.

White cheese may be classified as unripened soft cheese which does not contain a starter culture. The processing of this cheese is crude and far from standardization. The product is characterized by high moisture content (56%), high pH (6.3) and poor hygienic standards applied in its manufacturing practices.

Processing of this cheese involves the addition of rennet to milk heated to 35-45°C. The milk is left undisturbed for a period of 30 minutes to 2 hours. The coagulum is broken by hand or by any suitable tool (knife). The curd is strained after whey separation and pressed in cheesecloth (30 x 30 cm). The amount and time of pressure applied are variable. The curd blocks (15 x 10 x 5 cm) are dipped in salt solution (6-12%) for a period not exceeding 16 hours. Salting can also be done directly on milk or on the fresh curd before pressing. The former practice is followed by filtration of the milk before rennetting. The final salt concentration of the fresh product varies between 1-3%.

Modern technology and well-equipped plants are used in the manufacture of processed fluid milk. Raw milk from the milking parlor is pumped into the processing plant. Cooling of the raw milk is done in bulk or plate coolers. On the average, raw milk is processed within 24 hours of milking. When powder milk is used, a recombination process is carried out whereby melted butter or butter oil is fed into a liquid phase made of skim powder, stabilizer, and water to yield the final recombination of constituents prior to heat treatment.

Heat treatment of milk involves the three most commonly practiced methods, vat pasteurization, HTST pasteurization, and UHT treatment. The HTST method is predominant in manufacturing of pasteurized fluid milk. Only one plant uses the batch pasteurization method. UHT treatment is used by one plant in the manufacture of sterilized recombined milk. A wide range of temperature-time application is used in plants with the HTST method. The range varies between 72-94°C and 3 to 30 s for temperature and holding time. There seems to be a tendency for overheating the product in both batch and HTST systems.

After homogenization and pasteurization, the product is filled in Pure-Pack cartons or in form-and-fill plastic containers and refrigerated (4-8°C). Fast delivery and quick retail distribution are practiced because pasteurized milk cannot be sold after 3 days of manufacture according to legal requirements set by the Saudi Arabian Standard Organization (8). Standardization of pasteurized milk is lacking in most of the plants visited. The fat of the product is subject to fluctuations which may adversely affect consumer acceptability, but was never below 3% in all processed milk examined.

Ice cream processing includes the basic steps of blending the ingredients in preparation for the mix, pasteurization, homogenization, cooling, aging, freezing, whipping and hardening.

Various ingredients are used in the basic mix such as cream, butter oil, fresh or powder milk (skim or whole), water, sweeteners, stabilizers and emulsifiers. A multiple variety of natural and artificial flavors and colors are added before or after freezing of the mix.

Pasteurization of the mix is done by vat or HTST methods. The temperature applied range between 75-85°C for 15-30 minutes. Homogenization is usually done in single stage homogenizers and at pressures not less than 105 kg/cm^2 (1500 psi). After pasteurization and homogenization, the mix is cooled to 5-8°C and left undisturbed for aging between 2-24 hours. Freezing and whipping are done in batch or continuous freezer to produce ice cream with an overrun between 80 to 100%. The ice cream is stored in hardening rooms to a minimum temperature of -25°C before distribution.

Quality aspects

The physiocochemical analysis of cultured dairy products is shown in Table 2. White cheese was included under cultured dairy products only for convenience of grouping the data. Flavored yogurt as manufactured by one plant only was excluded from this table and consisted of 2.45% fat, 3.20% protein, 5.35% lactose, 0.90% ash, 21.84% TS, 4.10 pH and 1.02% titratable acidity. The variability in the physical and chemical composition of the product was least for plain liquid yogurt and most for the local white cheese. Titratable acidity and pH for plain liquid yogurt and plain set yogurt were very similar; however, labneh expectedly indicated higher acidity levels. The relatively low acidity of the local white cheese (pH 6.32) is expected since the product is unripened and lacking a starter culture.

The composition of both raw and processed fluid milk is shown in Tables 3 and 4. The average content of fat and solids-not-fat in raw milk were 3.09 and 8.51% (Table 3). These averages, in addition to other reported parameters in both raw and processed fluid milk, fall within the normal range of acceptable milk (5, 6, 7). However, in relation to hydrolytic rancidity, the ADV were on the higher end of the spectrum reported for acceptable milk (6, 11).

The chemical analysis of ice cream is shown in Table

5. Maximum compositional variations were obtained for proteins. Variation in total sugar was also obtained but to a lesser extent. Fat, ash and total solids showed minimal variations. El-Erian and Al-Shaikhli (2) reported higher protein values (average 5.13%) for ice cream; however, their fat (average 9.67%) and total solids (average 36.53%) were comparable to the results of this study.

The microbiological analysis of cultured dairy products for the individual processing plants is shown in Tables 6-9. The results in general indicated that coliforms, *S. aureus, B. cereus* and yeasts were the main contaminants of these products. *Salmonella* and *Shigella* were not detected and *C. perfringens* was present in small numbers. Plain liquid yogurt was the least contaminated product. Flavored set yogurt showed contamination with *B. cereus,* which could be attributed to additives. The major contaminants of labneh were yeasts. White cheese showed considerable contamination with coliform, yeast, *S. aureus* and *B. cereus*. The large number of these organisms in the product is indicative of poor sanitation, and improper handling and storage.

The bacteriological analyses of raw and processed milk are shown in Tables 9 and 10. Coliform, *Salmonella* and *S. aureus* were among the major contaminants of raw milk of which *Salmonella* deserves serious considerations. Pasteurized milk was of high microbiological quality and free from detectable antibiotics.

The bacteriological quality of ice cream is shown in Table 12. Since standards of identity for ice cream are not yet available in the Kingdom, the ICMSF (4) was used for assessment of the microbiological quality of the product. Except for one product, the standard plate count did not exceed the maximum limit suggested by ICMSF (2.5×10^5 counts/g). The coliform count conformed to the minimum suggested level (10^2 counts/g) except for one product. *Salmonella* and *Shigella* were not detected. *S. aureus* was found in marginal quantities except for one plant (more than 100 counts/g). *C. perfringens* was detected in few samples and in small numbers (less than 100 counts/g). Also, *B. cereus* was present in all the samples but in small quantities with the exception of two products with counts approaching 60,000/g.

TABLE 2. *Physicochemical analysis of cultured dairy products in the central province of Saudi Arabia.*

	Plain liquid yogurt			Plain set yogurt			Labneh			Local white cheese		
	Mean	Range	S.D.	Mean	Range	S.D.	Mean	Range	S.D.	Mean	Range	S.D.
Fat (%)	2.78	2.15-3.44	0.3463	2.81	1.88-3.65	0.7360	8.14	3.50-11.45	3.3522	16.89	14.40-21.04	2.9116
Fat (% of dry matter)	----	----	----	----	----	----	----	----	----	38.42	33.32-43.91	4.6141
Proteins (%)	2.99	2.52-3.53	0.3033	4.72	3.53-5.96	1.1620	10.43	8.79-12.35	1.4708	18.95	17.00-24.40	3.6366
Lactose (%)	4.43	3.53-4.95	0.4117	5.53	4.26-6.34	0.8911	4.91	3.67-5.63	0.8537	4.97	2.93-4.42	2.2231
Ash (%)	0.69	0.62-0.78	0.0461	0.95	0.77-1.06	0.1304	1.07	0.94-1.28	0.1459	4.30	3.44-5.12	0.7672
T.S. (%)	10.88	8.83-11.48	0.8515	13.89	11.08-15.89	2.2188	24.61	20.43-29.57	3.7733	44.17	40.92-47.91	3.5628
MSNF (%)	8.09	6.68-8.88	0.6550	11.08	8.07-12.73	2.0951	16.47	15.40-18.12	1.3062	----	----	----
pH	4.29	4.15-4.59	0.1460	4.29	4.15-4.58	0.1934	4.01	3.92-4.15	0.0988	6.32	6.11-6.59	0.2008
Titratable acidity (%)	0.84	0.71-1.01	0.0922	0.86	0.71-0.94	0.1086	1.05	0.92-1.24	0.1349	0.10	0.05-0.14	0.3696

TABLE 3. *Composition of raw milk in the central province of Saudi Arabia.*

Plant code	Fat (%)	Protein (%)	Ash (%)	Lactose (%)	TS[a] (%)	MSNF[b] (%)
A	3.00	3.22	0.75	4.84	11.65	8.65
B	3.00	3.32	0.74	4.96	12.01	9.01
C	3.43	3.02	0.70	4.46	11.66	8.23
H	3.00	3.33	0.75	4.55	11.89	8.89
I	2.60	2.95	0.71	4.59	10.87	8.27
J	3.51	3.50	0.74	4.14	12.41	8.90
K	3.35	3.25	0.74	4.67	12.16	8.81
D[c]	3.30	3.30	0.75	4.56	12.17	8.87
L[c]	3.01	2.18	0.63	4.04	10.39	7.38
M[c]	3.02	3.15	0.71	4.62	12.02	9.00
N[c]	2.75	2.59	0.62	4.01	10.31	7.56
Mean	3.09	3.07	0.71	4.49	11.59	8.51
Range	2.60-3.51	2.18-3.50	0.62-0.75	4.01-4.96	10.31-12.41	7.38-9.01
S.D.	0.282	0.383	0.040	0.311	0.734	0.578

[a]TS, Total Solids.
[b]MSNF, Milk Solids-Not-Fat.
[c]Plants D, L, M and N do not process raw milk into pasteurized fluid milk.

TABLE 4. *Physicochemical analysis of processed fluid milk in the central province of Saudi Arabia.*

Plant code	Fat (%)	Protein (%)	Ash (%)	Lactose (%)	TS (%)	MSNF (%)	pH	TA (%)	Ph-ase	ADV	RI	Specific gravity
A	3.00	3.25	0.74	4.66	11.49	8.49	6.55	0.13	Neg	1.07	1.3472	1.0327
B	3.00	3.23	0.73	4.85	11.87	8.87	6.57	0.15	Neg	1.32	1.3496	1.0338
C	3.75	3.25	0.72	4.48	12.53	8.78	6.52	0.16	Neg	0.84	1.3484	1.0328
G[a]	3.55	3.47	0.75	4.62	12.38	8.83	6.59	0.13	Neg	1.42	1.3519	1.0319
H	3.00	3.46	0.76	4.56	11.95	8.95	6.69	0.13	Neg	1.02	1.3520	1.0338
I	3.27	3.06	0.70	4.47	11.52	8.25	6.61	0.14	Neg	0.68	1.3500	1.0314
J	3.08	3.35	0.69	4.34	11.73	8.65	6.62	0.13	Neg	0.57	1.3475	1.0328
K	3.30	3.37	0.72	4.51	12.03	8.73	6.61	0.14	Neg	0.72	1.3477	1.0323
Mean	3.24	3.30	0.73	4.56	11.94	8.69	6.59	0.14	---	0.95	1.3493	1.0327
Range	3.00-3.75	3.06-3.47	0.69-0.76	4.34-4.85	11.49-12.53	8.25-8.95	6.52-6.69	0.13-0.15	---	0.57-1.42	1.3472-1.3520	1 0314-1.0338
S.D.	0.284	0.135	0.025	0.153	0.374	0.228	0.052	0.011	---	0.307	0.00260	0.00084

[a]Sterilized recombined milk.

TABLE 5. *Chemical analysis of ice cream in the central province of Saudi Arabia.*

Plant	Flavor	Fat (%)	Protein (%)	Ash (%)	Total sugars (%)	Total Solids (%)
A	Vanilla	9.3	3.53	0.94	16.63	34.68
	Strawberry	10.13	3.41	0.72	21.79	36.23
B[a]	Vanilla	10.81	4.11	0.81	19.94	36.10
	Strawberry	10.45	3.80	0.86	19.47	37.24
	Chocolate	10.41	3.78	0.94	16.35	34.10
	Pistachio	10.37	4.01	0.88	19.46	38.71
	Apricot	10.21	3.82	0.81	20.14	34.20
	R. Ripple	10.32	3.21	0.70	20.35	40.25
C	Vanilla	10.77	5.21	0.98	21.73	38.63
	Chocolate	10.70	5.71	1.08	19.94	39.39
	Mean	10.35	4.06	0.87	19.58	36.95
	Range	9.30-10.81	3.21-5.71	0.70-1.08	16.63-21.79	34.10-40.25
	S.D.	0.434	0.794	0.118	1.821	2.234

[a]Recombined milk is used.

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TABLE 6. *Microbiological analysis of plain liquid yogurt in the central province of Saudi Arabia (counts/ml).*

Plant code	Coliform	Mold	Yeast	Salmonella	Shigella	S. aureus	C. perfringens	B. cereus
A	<10	<10	65	ND[a]	ND	<10	<10	<10
B	<10	<10	<10	ND	ND	<10	<10	<10
C	<10	<10	<10	ND	ND	<10	<10	<10
D	<10	<10	<10	ND	ND	<10	<10	<10
E	<10	<10	<10	ND	ND	<10	<10	<10
G[b]	<10	<10	<10	ND	ND	<10	<10	<10
J	500,000	35	30	ND	ND	30	<10	200
K (fresh)	<10	<10	<10	ND	ND	15	<10	<10
K (powder)	<10	<10	<10	ND	ND	<10	<10	<10
L	<10	<10	<10	ND	ND	<10	<10	<10
M	<10	<10	<10	ND	ND	<10	<10	<10
N	1,400	<10	<10	ND	ND	100	<10	<10

[a]ND = Not detected.
[b]Sterilized product.

TABLE 7. *Microbiological analysis of plain set yogurt in the central province of Saudi Arabia (counts/ml).*

Plant code	Coliform	Mold	Yeast	Salmonella	Shigella	S. aureus	C. perfringens	B. cereus
F	<10	<10	700	ND[a]	ND	10	<10	<10
G	<10	<10	35	ND	ND	<10	<10	2100
G[b]	<10	<10	10	ND	ND	<10	<10	8600
H	<10	<10	<10	ND	ND	<10	<10	<10
I	12600	<10	<10	ND	ND	<10	<10	<10
K[c]	---	---	---	---	---	---	---	---

[a]ND = Not detected.
[b]Flavored yoghurt.
[c]Yoghurt samples not available at time of visit.

TABLE 8. *Microbiological analysis of labneh in the central province of Saudi Arabia (counts/g).*

Plant code	Coliforms	Mold	Yeast	Salmonella	Shigella	S. aureus	C. perfringens	B. cereus
B	<10	4,000	187,000	ND[a]	ND	<10	<10	15
F	<10	10	10,000	ND	ND	<10	<10	<10
G	<10	<10	65	ND	ND	<10	<10	<10
H	650	10	14,000	ND	ND	20	<10	<10

[a]ND = Not detected.

TABLE 9. *Microbiological analysis of local white cheese in the central province of Saudi Arabia (counts/g).*

Plant code	Coliform	Mold	Yeast	Salmonella	Shigella	S. aureus	C. perfringens	B. cereus
F	500	<10	250	ND[a]	ND	6,600	<10	200
G	<10	<10	<10	ND	ND	4,200	<10	45
H	32×10^6	10	33,000	ND	ND	4.9×10^6	30	1,000
I	8.1×10^6	250	10,000	ND	ND	4.0×10^4	50	5,000

[a]ND = Not detected.

TABLE 10. *Bacteriological analysis of raw milk in the central province of Saudi Arabia (counts/ml).*

Plant code	SPC	Coliform	Salmonella	Shigella	S. aureus	C. perfringens	B. cereus
A	3,400	20	+	ND[a]	450	<10	<10
B	58,000	500	ND	ND	30	<10	600
C	40,000	2,600	ND	ND	90	<10	<10
H	83,000	12,500	ND	ND	150	<10	1700
I	10,000	1,500	+	ND	480	10	<10
J	550,000	37,000	ND	ND	235	470	365
K	57,000	4,400	+	ND	800	15	<10
D[b]	120,000	2,600	ND	ND	50	<10	<10
L[b]	169,000	1,300	+	ND	2000	<10	1200
M[b]	190,000	3,000	+	ND	3000	10	<10
N[b]	5,200	190	+	ND	500	<10	<10

[a]ND = Not detected.
[b]Plants D, L, M and N do not process raw milk into pasteurized fluid milk.

TABLE 11. *Bacteriological analysis of processed fluid milk in the central province of Saudi Arabia (counts/ml).*

Plant code	SPC	Coliform	Salmonella	Shigella	S. aureus	C. perfringens	B. cereus	Antibiotic
A	1500	<10	ND[a]	ND	<10	<10	<10	ND
B	2000	<10	ND	ND	<10	<10	<10	ND
C	600	30	ND	ND	<10	<10	<10	ND
G[b]	<10	<10	ND	ND	<10	<10	<10	ND
H	350	<10	ND	ND	<10	<10	65	ND
I	4000	<10	ND	ND	20	<10	<10	ND
J	7600	<10	ND	ND	<10	<10	<10	ND
K	500	10	ND	ND	<10	<10	<10	ND

[a]ND = Not detected.
[b]Sterilized recombined milk.

TABLE 12. *Bacteriological analysis of ice cream in the central province of Saudi Arabia (counts/g).*

Plant	Flavor	SPC	Coliform	Salmonella	Shigella	*S. aureus*	*C. perfringens*	*B. cereus*
A	Vanilla	5,000	40	ND	ND	<10	<10	30
	Strawberry	124,000	4,800	ND	ND	<10	<10	30
B[a]	Vanilla	10,000	<10	ND	ND	30	<10	10
	Strawberry	64,000	<10	ND	ND	<10	<10	70
	Chocolate	64,000	<10	ND	ND	135	<10	20
	Pistachio	2,500	<10	ND	ND	180	<10	20
	Apricot	6,700	<10	ND	ND	<10	<10	5
	R. Ripple	1,000	<10	ND	ND	<10	10	75
C	Vanilla	400,000	<10	ND	ND	600	15	60,000
	Chocolate	1,500,000	<10	ND	ND	600	90	58,000

[a]Recombined milk is used.

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"Management By Menu"

An updated second edition of "Management by Menu", the trailblazing educational course which identifies the menu as the central management tool to control each area of a foodservice operation, is being published by the National Institute for the Foodservice Industry.

Written by Lendal H. Kotschevar, Distinguished Visiting Professor, Florida International University, Miami, Florida, NIFI's new edition of "Management by Menu" provides foodservice operators and students with a focal point from which decisions can be made regarding menu planning, pricing, cost control, analysis, and merchandising.

By starting with menu planning and working through implementation of the menu (purchase, production, and service), the text presents in logical progression how the menu can be used in every phase of the foodservice operation. The book ends with a look at how computers have entered the foodservice operation and a guide to developing a financial plan for commercial operation.

"Management by Menu" is a practical text - with many illustrations of menus - that acknowledges the menu as a merchandising medium as well as a planning tool. There is comment and background on truth-in-menu regulations.

Both textbook and course are available for use in college, homestudy and industry training programs. To order, contact the Department of Educational Programs, the National Institute for the Foodservice Industry, 20 N. Wacker Drive, Suite 2620, Chicago, Illinois 60606. The retail textbook price is $28.95. The price of the course is $37.50 in group programs and $98.50 when taken through independent study.

Engineering Firm Specializing in Cross-Connection Control Opens Two New Offices

Stuart F. Asay & Associates Inc., one of the few engineering firms in the country specializing in cross-connection control, has announced the opening of two branch offices, according to Stuart F. Asay, president.

"These offices will handle consulting for municipalities, water suppliers and private industry in the establishment of cross-connection control programs," explains Asay. "We will also provide training for those interested in becoming certified backflow prevention device technicians in the areas."

Asay & Associates also assists in the establishment of ordinances, rules and regulations, and conducts plumbing inspections. The firm does designs for the installation of backflow prevention devices and assists with public awareness programs regarding cross-connection control as well. Emergency response plans for backflow conditions are also available.

In line with decreasing cross-connection hazards, Asay & Associates publishes *Backflow Prevention*, a monthly magazine. Backflow prevention standards, problems, new technologies and an open forum of ideas related to cross-connection control are among the focuses of *Backflow Prevention*.

The new locations for Asay & Associates are: P.O. Box 24603, Lexington, KY 40524-4603. Telephone: 606-273-4364. And P.O. Box 297, Laurel, MD 20707. Telephone: 301-636-5734. The Colorado office also has a new address: 11166 North Huron St. #29, Northglenn, CO 80234. Telephone: 303-451-0978.

Dairy Foods Key Component of Dietary Recommendations For Women

Dairy foods are a prominent component of the recently announced dietary recommendations for women from the American Dietetic Association (ADA).

The recommendations are the first to unify and simplify various nutritional recommendations made by different health organizations and are designed for women who want to reduce their risk for osteoporosis, cancer, obesity, premenstrual stress and heart disease and for those who simply desire a routinely nutritious, healthful diet.

"We share ADA's desire to promote a single well-balanced, sensible diet for American women based on current scientific knowledge," said Elwood W. Speckmann, NDC president, "and we were delighted to play a consulting role on these precedent-setting recommendations. They certainly are in step with the food variety and reliance on basic food groups NDC promotes as healthful."

The American Dietetic Association recommendations comprise 14 guidelines. Dairy foods are integral to several, including:

- Eat a daily variety of foods from all major food groups, including three-to-four servings of lowfat dairy foods.
- Include three-to-four daily servings of calcium-rich foods by consuming lowfat milk, yogurt and cheese; including the use of milk in cooking and eating foods like broccoli, sardines with bones, canned salmon with bones and collard greens.
- Rely on foods for necessary nutrients (such as calcium), using vitamin and mineral supplements only under specific circumstances.

Other recommendations are:

Maintain healthy body weight.

- Exercise regularly.
- Limit total fat to one-third of daily calories.
- Eat one-half of daily calories from carbohydrates, selecting complex carbohydrates such as beans and pastas.
- Eat a variety of fiber-rich foods.
- Include plenty of iron-rich foods, making daily selections from such foods as lean meats, leafy green vegetables and enriched or whole grain breads and cereals.
- Limit intake of sodium.
- If you drink, limit alcohol to one-to-two drinks daily.
- Avoid smoking.
- If you have questions on the adequacy of your diet, consult a registered dietitian.
- Adjust diet, exercise and other health considerations to correspond with your own identified risk factors, such as heredity, lifestyle and environment.

Regional Mini-Clinic Instructors

Instructors at the recent regional mini-clinic sponsored by the American Cultured Dairy Products Institute included (L to R): Earl Connolly, Brotech, Inc.; Clinton Washam, Carlin Foods Corp.; Dr. Charles White and Prof. Ed Custer, Mississippi State University; Bill Born, Dean Foods Co.; Fran Lavicky, Nordica International; Dr. Ron Richter, Texas A & M University. (Not pictured: Dr. John Bruhn, University of California; Dr. C. Bronson Lane, Dairy and Food Nutrition Council of Florida).

The 2-1/2 day training school, held in St. Louis, was attended by 30 representatives from dairy processing plants throughout the country. The educational endeavor featured presentations on the basics of cultured dairy foods manufacture and quality control and included a tour of Pevely Dairy.

CIA Releases New Sanitation Programs

The Culinary Learning Resources Department of The Culinary Institute of America recently announced the availability of a new package of teaching materials on the subject of sanitation for foodservice workers.

For the first time, the series of instructional videotapes has been built around a comprehensive text/workbook. Presented in a practical, three-ring binder are 90 pages of researched information about foodborne illnesses and how to avoid them. Illustrations are included and each section concludes with a review quiz for self-testing.

Supporting the comprehensive information given in the book are three light-hearted videotapes about an earthly apprentice chef being observed by "sanitarians-in-the-sky." They applaud his good habits and cringe at his occasional lapses. These programs not only add humor to an intensely serious subject but help to reinforce the major points.

Culinary Learning Resources programs are described in a catalog which may be purchased for $15. For more information, please write the Culinary Institute of America, Hyde Park, NY 12538; or call 914-452-9600, ext. 1278.

Milk From Sunflower Seeds

Supermarkets soon may be selling milk made from a natural resource slightly smaller than a cow. The milk is made from sunflower seeds, and the developer is seeking American companies interested in technology-transfer licensing and eventual U.S. marketing of the product.

Sumitomo Chemical Co., Ltd., a leading Japanese chemical company, developed the world's first process to convert the seeds to milk. Patent applications have been filed in 19 countries, including the U.S.

The seeds contain a variety of nutrients, including linoleic acid, vitamin E, amino acids and minerals. The conversion of this healthy food snack into a beverage will interest health-conscious people worldwide, according to Sumitomo.

Ezaki Glico Company, a leading Japanese confectioner, developed the technology that resulted in the milk's distinct flavor. Made by steadily emulsifying the seeds, the beverage is best served chilled.

It is "very tasty," said Dr. C. E. Stauffer, technical foods consultant, National Sunflower Association (Bismark, ND). In the organization's publication, The Sunflower, he said it is better than

any soybean milk substitute he has tried. In addition to the health-conscious market, Dr. Stauffer sees a large U.S. market for young children who can't drink cow's milk.

For years, sunflower seeds have been a health food snack credited with protecting the body from arterial sclerosis, high blood pressure and heart disease. Reportedly, they retard the aging process by improving skin condition, boosting stamina and fighting obesity.

Not satisfied with just milk, Sumitomo is studying the use of sunflower seeds to develop soup, pudding and ice cream. Sumitomo also has developed an immobilized lactose dissolving enzyme that could have dairy industry possibilities.

For more information, contact: Sumitomo Chemical America, 345 Park Avenue, New York, NY 10154.

Meals From Machines Usually Safe

Food from a vending machine may not be a gourmet treat, but it is usually safe.

Food safety expert Marilyn Haggard says stews, soups, lasagna and other canned foods are safe to eat even at room temperature, unless the cans are rusted, dented or bulging.

"If the can is damaged, don't even taste the food," cautions the Texas A&M University Agricultural Extension Service specialist.

When canned entrees come out of the vending machine hot, the machine is working properly, she says.

"Cold foods, such a ham salad, egg or tuna sandwiches, should be cold to be safe," Haggard remarks. "This means the temperature inside the machine must be 40 degrees Farenheit or below."

The specialist suggests checking the "use-by" date for freshness too. If a sandwish has an off-odor or mold, throw it away.

Some vending machines contain sealed in retort packages, she notes. These packages act like light-weight, flexible cans and need no refrigeration.

Like cans, retort packages have a shelf life of 2 to 5 years, as long as the pouch is intact. But if the pouch is bulging or leaking, don't taste the food, Haggard warns.

When a vending machine isn't working properly, post a note for fellow employees and call the vending company, the specialist advises. If the company doesn't respond, call the health department and report the problem.

"Although food poisoning is not life-threatening for most people, it can be very unpleasant," Haggard says.

Filtration Engineering, Inc., Distributor to Cheese and Dairy Industries

Syneco Systems, Inc., a manufacturer and marketer of biological and environmental products and systems, today announced the appointment of Filtration Engineering, Inc., of New Hope, MN, as sole distributor of its biological products to the cheese and dairy industries on a nationwide basis.

Filtration Engineering will be responsible for marketing and sales of the ULTRA-PLUS℠ SB 7000 water treatment bacteria system within the dairy processing industry. The product, which is USDA authorized and is harmless to the environment, is used in waste water treatment at cheese and dairy plants to help reduce surcharges for water problems.

ULTRA-PLUS SB 7000 helps reduce H_2S odor problems, BOD and TSS through a naturally-occurring process called bioaugmentation when it is added to the waste stream. This system gives better, more efficient control of most water treatment operations without the need for mechanical assistance.

According to Dennis W. Van Dover, president of Syneco Systems, "Filtration Engineering was selected to market this product line on account of its demonstrated knowledge, expertise and reputation for technical achievement in the cheese and dairy fields."

New Product News

The products included herein are not necessarily endorsed by Dairy and Food Sanitation.

Practical Insulated Jacket

• A lightweight, hip length, insulated jacket manufactured by RefrigiWear, Inc. combines warmth and total freedom of movement when climbing, bending and kneeling in cold environments.

The rugged, long-wearing jacket is constructed of "Iron Tuff" 420/420 denier super RefrigiNyl wind-tight nylon duct outer fabric and insulated with 10 ounces of polyester fiberfill. Features include a storm seal cover, insulated knit collar, sturdy rivet reinforced stress points and an elasticized back to provide draft-free comfort. Combined with optional pants and hood, the jacket provides the foundation for a practical cold-fighting outfit.

Available in green, style 57 or blue, style 58 in S/M/L/XL/XXL and XXXL from RefrigiWear, Inc., 71 Inip Drive, Inwood, NY 11696. Telephone: 516-239-7022.

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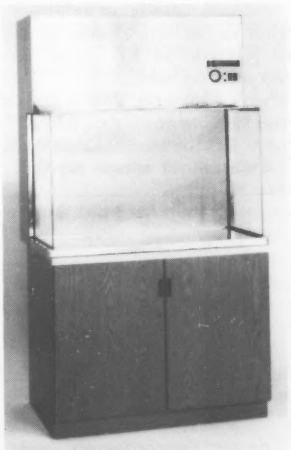

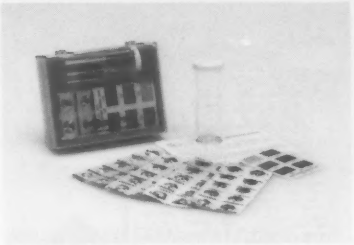

Unique Home Water Monitor Test System

• Now get the facts about the quality of your tap water - with AQUA CHECK. This water test system involves a simple test tablet procedure that reveals the ppm concentration of selected chemicals in a given water sample. Each tablet added to a measured volume of a water sample produces a color change indicative of a test factor. The complete AQUA CHECK test kit includes tablets for determining four major properties of water, a test vial with the appropriate volume mark, a printed color chart for comparing test results and enough tablets for 40 tests.

For more information, contact: ENVIRO-CHEMICAL SCIENCES, P.O. Box 2734, Santa Clara, CA 95055. Telephone: 408-246-8310.

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Sterile Flow Station

• The STERILE FLOW STATION is a stainless steel Horizontal Laminar Flow Hood. This is the only Clean Air Work Station that features an all stainless steel construction (the industry standard is particle board/Formica or painted metal).

The STERILE FLOW STATION incorporates a combination of other unique features to insure convenient and efficient operation and servicing: 1) The SPILLguard Edge provides protection for the HEPA (High Efficiency, Particulate, Air) filter. 2) The prefilter is replaceable in seconds without tools. 3) The HEPA filter is accessible from the side of the hood to allow for replacement without moving the unit. 4) The filter diffuser is easily removable for spills.

The STERILE FLOW STATION is available in 3, 4 and 6 foot widths. The unit features welded, straight up-and-down construction. The HEPA filtration system is certified to be 99.99% effective for particles 0.3 microns in size and meets or exceeds Federal Standard 209b for class 100 air flow. Standard features include: variable speed motor control, Minihelic gauge, diffuser for supply filter and dual fluorescent lights.

Descriptive literature and technical information is available, free of charge, from: Educational Materials Dept., the Germfree Laboratories, Inc., 7435 N.W. 41st Street, Miami, FL 33166. Telephone: 305-592-1780, telex: 515138.

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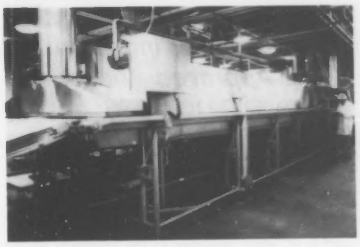

"Home-Cooked" Browning Possible With MPO® Cooking System

• An entirely new concept in cooking prepared foods is now available from Heat and Control, Inc. - the High-Yield MPO® Cooking System with "The Finishing Touch (Radiant Broiling System)", to process value-added products to a "home-cooked" appearance and taste. This system replaces labor-intensive individual portion cooking with higher production rates and the well-known, moist-heat cooking results from the MPO® System (patents applied for). Most of all, it offers the taste, appearance and moisture retention so important to the low-calorie gourmet entrees which are so much in demand.

The MPO® Cooking System has already established the standard for cooking meat, fish, poultry and vegetables. This new system includes the same quality features as other MPO® Systems - energy savings, ease of installation and operation, the fact that no stack pollution controls are required, simple clean-up, low maintenance requirements, and **"around the belt" airflow** for optional heat circulation. By adding "The Finishing Touch", Heat and Control can provide a complete system to produce almost any cooked product with the desirable "pan-cooked" or "braised" look so popular with consumers today, and especially important for microwaveable products.

For more information, contact: Heat and Control, Inc. at our world headquarters at 800-227-5980 in the USA (or 415-871-9234 in California and Nevada), or write us at 225 Shaw Road, South San Francisco, CA 94080, USA.

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Factory Mutual Research Approves Hydratect® and Hydrastep® for Inclusion in its "Approved Annual"

• PROTECTIVE SYSTEMS, announces that Factory Mutual Research has tested and approved the HYDRATECT® water detection system and the HYDRASTEP® water level gauge for inclusion in the "Approved Annual," which is made available to the members of the Factory Mutual Insurance Group. Factory Mutual Research, an independent testing laboratory which is certified by the Occupational Safety and Health Administration, rigorously tests the capability of equipment to control and minimize losses and to reduce hazards, both to personnel and equipment.

HYDRATECT is applicable as single sensors in steam line drains and as arrays in feedwater heater or deaerator level gauges. The HYDRATECT monitoring system discriminates between the resistivities of steam and water by sampling with two electrodes, each of which is connected independently to an electronic discriminator system. With two discrete detector-discriminator routes, the system is both fail-safe and fail-operative; additionally, the system is self-validating and it annunciates hardware failures. The system operates at temperatures of up to 1000°F, and pressures of up to 3000 PSI, and is unaffected by feedwater chemistry. The HYDRATECT requires no setting adjustments, no calibration, no routine maintenance and is entirely self-proving.

Like HYDRATECT, HYDRASTEP electronically discriminates between the resistivities of steam and water, eliminating the need for glass gauges with their attendant maintenance problems. HYDRASTEP's electrodes are guaranteed for 5,000 hours, and lifetimes of 15,000 hours are not uncommon; therefore, boiler down time is greatly reduced, as compared to glass gauges. The HYDRASTEP system is engineered for increased reliability; HYDRASTEP gauges have operated for more than ten million cumulative hours without full indication loss. Additionally, with two self-validating circuits (with two separate power supplies), routine testing is unnecessary, contributing further to HYDRASTEP's reliability. The display of status information is highly visible and unambiguous, either on the on-drum LED display, or on the optional remote display panel directly connected to the HYDRASTEP unit. The system will warn of high or low water levels at specified levels, and will activate an action trip if alarm levels are exceeded.

For more information, contact: PROTECTIVE SYSTEMS, Solartron Transducers, Division of Solartron Electronics Inc., 11321 Richmond Avenue, M-102, Dept. 311, Houston, TX 77082-2615. Telephone: 713-558-2587.

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Post Your Right-to-Know Information "Up Front"

• Idesco has created "check-list" signs and tags that make it easy to implement your Hazard Communication Program. Their Hazard Alert signs and tags are printed with the various hazards encountered in industry. For each of your processes, you simply check-off the hazards that prevail; and then check-off your instructions for Personal Protection, Area Protection, etc. As a final touch, this sign and tag system provides a capability for laminating in heavy-duty polyester to assure tags and signs will remain legible, tamper-proof and looking-new.

Many other formats are available in the Q-SIGN AND Q-TAG Systems to help you communicate with the "front lines" - accident prevention, fire-fighting, emergency telephone numbers, bulletins, operating instructions, valve numbering, lubrication systems, etc. Truly a turn-key system, Idesco supplies all materials and equipment.

For more information, contact: IDESCO Corp., 37 W. 26th Street, New York, NY 10010. From NY State phone 212-889-2530 or from elsewhere toll-free 800-336-1383.

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Microbial Air Sampler from Biotest

• The Biotest RCS Air Sampler is a handheld instrument for determining the number of microorganisms per volume of air. It is light weight (2.5 lbs.), requires no vacuum source, and operates on 4 alkaline "D" cell batteries. A plastic strip containing microbiological culture media is inserted into an open-ended drum containing an impeller fan blade. As the impeller spins, a known volume of air is drawn into the drum and the microorganisms are impacted onto the agar surface. After the sample period, the strip is removed and placed into an incubator. The colonies are then counted to determine the number of microorganisms per cubic foot of air.

For technical literature and brochure, contact: BIOTEST DIAGNOSTICS CORP., 6 Daniel Road E., Fairfield, NJ 07006. Telephone: 800-631-1150 or 201-575-4500.

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All Stainless Steel Sanitary Bag Filters

• Recent development of felt filtering elements capable of retaining particles down to 8-micron size (absolute) have made the use of more economical bag-type filters possible in the food and drug processes. All-stainless steel sanitary service bag filters are now being offered by Rosedale Products, Inc. They have housing that are USDA, 3A sanitary approved, with sanitary connection fittings for 1, 1-1/2 & 2-in. pipe, and are rated for 200-psi pressure. Quick-release covers have Neoprene or Teflon gaskets.

The filter bags are of multi-layer polyester felt, encased in spun-bonded nylon (to prevent any migration of bag material). They carry nominal ratings of 1, 10, or 12-micron retention. Other bag materials and micron retention ratings are available. The bags are supported within stainless steel baskets perforated to provide 50% open area. A patented feature seals the tops of the bags against the ID of the housing.

For more information contact Nils N. Rosaen, Rosedale Prod. Inc., P.O. Box 1085, Ann Arbor, MI 48106. Telephone 313-665-8201.

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Ozone Generation

• Capital Controls announces an exclusive agreement to manufacture, assemble and sell ozone disinfection systems, under technological license of Schmidding-Werke, West Germany.

Concurrently, Capital Controls also announces the availability of the SORBOZON® ozone process. In this process, ozone is produced from oxygen, separated, and recycled, thereby dramatically improving efficiency and lowering operating costs.

Several types of ozone systems are available with generators utilizing air or oxygen, and capacities ranging from 1 pound per day (15 grams per hour) to 800 pounds per day (15,000 grams per hour).

For more information, write or call: Capital Controls Company, Inc., P.O. Box 211, Colmar, PA 18915-9990, 800-523-2553, in PA 800-242-7590, from outside the U.S., call 215-822-2901.

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Eastman® IsoPlus® Nutritional Supplement

• Eastman® IsoPlus® Nutritional Supplement, a new feed additive for dairy cows that has been shown to increase milk production by more than 1,000 pounds over the course of a cow's lactation, is now available to Iowa's 8,000 commercial dairy farms.

"IsoPlus will give Iowa dairymen the opportunity to produce more milk from their present herds, or to cull cows and still maintain their current production," according to Sandy Knefel, Telemarketer for the Eastman Chemicals Division of Eastman Kodak Company.

"Independent university research and on-farm feeding trials have consistently shown that when fed to Holstein cows at a rate of 3 ounces per head per day, IsoPlus increased milk production by an average of 1,000 pounds more milk over the cow's lactation," says Knefel.

"IsoPlus has been tested in a variety of typical dairy rations including forage sources of corn silage, alfalfa hay and alfalfa haylage," reports Knefel. "It also has been tested with a variety of grain and protein sources including corn, soybean meal, brewers grain, urea and high-bypass protein sources."

"IsoPlus is safe," adds Knefel. "There are no side effects, milk residues or changes in milk composition. In fact, IsoPlus has been fed to dairy cows at 10 times the recommended amount with no adverse health effects."

Dr. John Rogers, senior animal nutritionist with Eastman, explains "IsoPlus is a combination of calcium salts of four volatile fatty acids found naturally in the cow's rumen. These acids act as nutrients for fiber digesting microorganisms to increase milk production in dairy cows."

Dr. Rogers continues, "Cows should be started on IsoPlus at 1.5 ounces per cow per day two weeks prior to calving, then fed the full rate of 3 ounces from freshening through the first 225 days in milk. We recommend prepartum feeding for two reasons. First, it gets the cows used to the taste of IsoPlus. And second, it allows time for the bacterial population in the rumen to change and grow due to the inclusion of IsoPlus in the ration."

For more information contact Val Reisig, Eastman Chemicals Div., 212-930-7937.

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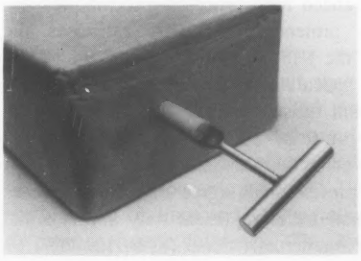

New Test Detects Aflatoxin Poison in Milk

• A simple and accurate test for aflatoxin has been introduced by Cambridge Naremco. The aflatest 10 provides an inexpensive, on-the-spot method to check milk for aflatoxin contamination.

Aflatest 10 eliminates the high cost and time delay of previous testing procedures. The new test is simple, safe, and economical. No special skills or training is required to perform the test which provides accurate results in less than 10 minutes.

The aflatest 10 system is a state-of-the-art development from the field of biotechnology. The test was researched and patented by scientists from Harvard, MIT, and Boston University.

The test system includes a starter kit with all necessary equipment from quantitative testing, including a fluorometer which provides digital readout of the p.p.b. aflatoxin level. The disposable test components, each good for one test, are available in economical cartons of twenty-five.

For more information on the new aflatest 10 system or the problems of aflatoxin, contact Cambridge Naremco, P.O. Box 1572 SSS, Springfield, MO 65805. Telephone: 1-800-641-7515.

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Walker's Cheese And Butter Tryer

• Walker Stainless Equipment Co. now offers a Stainless Steel Cheese and Butter Tryer. The sampler is made of all #304 stainless steel and polished to a #4 Dairy finish. Heavy duty 16 gauge cutting tube easily cuts and pulls a representative core sample from cheese or butter products. Two sizes are available, 10" model has a knife-edge tip; 5-1/2" model features full-length knife-edge.

For more information, contact: Doug Duray, Walker Stainless Equipment Co. Inc., 618 State Street, New Lisbon, WI 53950. Telephone: 608-562-3151.

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CHROM/SLIK™ - A Composite Coating

• CHROM/SLIK™ surface coating combines chromium and Teflon to provide the best features of both materials for rolls and equipment of all sizes and shapes. Impervious chromium is electroplated to a textured base, then Teflon is applied and the surface polished to the required finish.

Advantages of CHROM/SLIK include: non-stick surface for quick release and easy cleaning; tough and durable for a long, trouble-free life; regular, even surface provides smooth, transferable finish; transfers heat evenly; and high operating temperature.

For more information contact Chromium Industries, Inc., 4645 West Chicago Ave., Chicago, IL 60651. 312-287-3716.

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Low Temperature Portable Thermometers

• New full color Telatemp catalog describes two precision portable low temperature thermometers. The Telatemp transit thermometer is an economical 1°C accuracy time/temperature chart recorder that provides permanent documentation of temperature sensitive products while in the warehouse or in transit. It records elapsed time vs. temperature from -20°F to 130°F for quality assurance.

The Telatemp Personal Thermometer™ comes with a supplied clip-on holster and is a "Go Anywhere" portable digital thermistor thermometer. It has a sharp tip stainless steel penetration probe to conveniently, quickly and accurately measure internal and immersion temperatures. For more information, contact: Telatemp Corp., P.O. Box 5160, Fullerton, CA 92635. Telephone toll free: 1-800-321-5160, except CA: 714-879-2901.

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Free "Magnetic Ideas" Booklet

• Illustrated brochure describes over 70 different Eriez Magnetic equipment applications that have produced impressive results for their users. Ideas such as dozens of ways ferrous contaminants can be automatically removed to protect machinery and improve product purity...which types of vibratory equipment best move and meter dry bulk materials...and how to use magnets to lift and convey.

For more information and a free copy of "MAGNETIC IDEAS," contact: Eriez Magnetics, Asbury Road at Airport, Erie, PA 16514. Telephone: 1-800-628-1200, Extension 616.

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Food Science Facts
For The Sanitarian

Dr. Robert B. Gravani
Cornell University
Ithaca, NY

The Causes and Costs of Foodborne Disease

Most Americans naturally assume that the foods we eat are safe and wholesome. We subconsciously take for granted the fact that the foods we purchase, prepare and eat at home and in places outside the home are free from adulterants and can be safely eaten without fear of illness or harm.

U.S. consumers place a tremendous amount of trust and confidence in all of the people who are responsible for providing these foods and in those who are charged with protecting public health. This trust comes from the knowledge that U.S. food laws are among the most comprehensive in the world. It also comes from the fact that the U.S. food industry has knowledgeable, competent and trained professionals involved in the complex system of bringing food from farms to our tables. Most people feel comfortable knowing that the U.S. food supply is, by far, the safest in the world.

Sometimes, however, problems do occur. In 1985, several large foodborne outbreaks received national attention. The following are some examples of outbreaks recently covered by the media.

- A milk-borne outbreak involved more than 16,000 confirmed cases of salmonellosis in northern Illinois and surrounding states (1).
- A botulism outbreak from dried, salted whitefish caused the death of two people in New York (2).
- A listeriosis outbreak in southern California from Mexican-style cheese involved 86 people and caused 29 deaths (3).
- A turkey associated outbreak of salmonellosis involved 351 children and staff at a Georgia elementary school (4).
- A hepatitis A outbreak involved at least 15 people in an upstate New York community. Over 9,000 people were given immune globulin shots to prevent further outbreaks of the viral hepatitis (5).
- A staphylococcal outbreak associated with ice cream affected over 90 people in Pennsylvania and Virginia (6).

These foodborne outbreaks highlight the importance of food safety and remind us that problems can occur when foods are improperly produced, processed, transported, distributed, stored and/or prepared.

This issue of Food Science Facts will highlight the importance of food safety; discuss the prevalence and economic impact of foodborne illness in the U.S.; and detail the foods, causative factors and sequence of events involved in outbreaks.

The Prevalence of Foodborne Disease

In the U.S., there are normally about 400-500 foodborne disease outbreaks reported annually. These outbreaks usually involve 10,000-20,000 people and cause untold suffering, discomfort, debilitation and in some cases, even death (7). The actual incidence of outbreaks is thought to be far greater than the figures actually reported. In a study of bacterial, viral and parasitic outbreaks, the ratio of the estimated cases to initially reported cases was 25:1 (8). Based on this ratio and a thorough knowledge of the foodborne surveillance system, it has been estimated that the cases of food and water-borne illness in the U.S. is 1.4 to 3.4 million per year (8).

The USDA acknowledges that more than 2 million cases of bacterial food poisoning occur in the U.S. each year in spite of advanced food processing techniques (9). A Canadian food protection specialist estimates the number of cases in the U.S. to be around 5 million (10). Other researchers speculate that diarrheal diseases of foodborne origin (and subsequent person-to-person transfer) accounted for at least 24 million and perhaps as many as 81 million or more cases per year (11).

Food protection professionals agree that the outbreaks reported to health authorities represent only a very small percentage of those that actually occur (8, 9, 10, 11).

Economic Impact

The economic impact of foodborne disease in the U.S. is staggering. When economic losses associated with 17 foodborne outbreaks mainly from the U.S. and Canada were analyzed, costs ranged from $16,690 to over $1 million (12). Loss of business and law suits were the major factors in the costs, but loss of income for the victims and infected food handlers was also considerable (12).

It has been estimated that the cost of foodborne disease in the U.S. is from $1 billion to $10 billion annually (10). This figure includes the direct medical costs, lost wages and productivity, investigational costs, and industry losses through embargo, voluntary destruction and recall of the products involved. If one assumes that there are 5 million cases each year, the average cost per case would range from $200 to $2,000 (10).

A detailed accounting of the expenses involved in a "typical" foodborne outbreak is shown in Table 1 (12). An outbreak of salmonellosis from food eaten in a Minnesota restaurant in 1973 caused 126 persons to become ill. The illness lasted 5 days, with 50 patients consulting physicians and 11 being hospitalized. Wage earners accounted for 94 of the 126 ill persons.

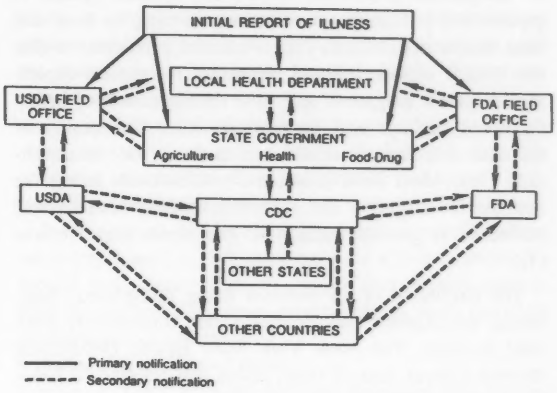
Table 1. Expenses involved in a single salmonellosis outbreak. (Adapted from 12.)

	Expenses	Percent
Medical costs (physicians and hospitalization)	$ 6,387	11.2
Lost earnings (victims & food service workers)	$ 36,416	63.4
Lost business to restaurant (for 2 years following the outbreak)	$ 10,000	17.4
Investigational costs (wages, expenses & lab costs)	$ 4,620	8.1
Total cost	$ 57,423	100.1
Cost per case	$ 456	

Disease Surveillance

Foodborne disease surveillance in the U.S. is a complex system that involves local, state and federal regulatory agencies. (See Figure 1.) The purpose of the surveillance system is to reduce the occurrence of foodborne illness (13, 14). This is accomplished through the: 1) investigation of suspected outbreaks, 2) interpretation of investigational findings and 3) dissemination of information to prevent future outbreaks. The investigational results often indicate the major causative factors in outbreaks and aid in the prevention of future outbreaks (14).

Figure 1. The foodborne disease surveillance system in the U.S. (15).



The process begins when an afflicted person or medical professional notifies the local health department about a suspected foodborne illness. The health department sanitarian then begins a preliminary investigation to determine whether the illness is compatible with a foodborne outbreak. If the illness was transmitted by food, then a full scale investigation is begun. Depending on the size, scope and severity of the outbreak, state and federal agencies may be notified to assist in the investigation. All of the information gathered during the investigation is then transmitted to the Centers for Disease Control (CDC) in Atlanta, Georgia. CDC is responsible for maintaining records and reporting foodborne illness in the U.S. (14).

This surveillance system involves many people and organizations including the afflicted persons, medical and health professionals, state and federal regulatory officials and food industry personnel. How well the system works depends on the interest, knowledge, dedication and commitment of all these individuals (14).

The statistics that are reported to CDC are only a fraction of the actual figures because of breakdowns in the surveillance process (15, 16, 17). These occur when:

- those afflicted do not seek medical assistance;
- the common food source is not obvious, and the outbreak goes undetected even if the afflicted person(s) seek(s) medical assistance;
- the foodborne disease is misdiagnosed as another illness with similar symptoms;
- physicians do not report the illness to local health authorities;
- investigations of the incidents are not conducted properly; and
- reports of findings are not communicated to appropriate individuals and agencies.

Large outbreaks involving serious illness, hospitalization or deaths are more likely to come to the attention

of health authorities than mild cases of illness following a family meal (14).

The present foodborne disease surveillance system is passive and voluntary and relies on reporting by local and state health departments (16). Potential problems, within the system include delayed reporting, incomplete reporting, incorrect diagnoses and slow dissemination of investigational findings and summarized data. The quality of the data collected is variable and at times may be unreliable (16). Most food protection professionals recognize that the investigation and reporting of foodborne disease outbreaks is grossly inadequate and needs improvement (7).

The likelihood of an outbreak being recognized, diagnosed, investigated and reported varies considerably from state to state. The New York State Health Department devotes a great deal of time, effort and training to foodborne disease surveillance. Since the state encourages its county units to investigate and report all illnesses transmitted by foods, New York often has higher outbreak statistics than other states. These higher figures don't necessarily mean that New York has more foodborne illnesses; they're just investigated more thoroughly and reported more accurately by health department sanitarians.

Outbreaks and Cases

Foodborne disease is defined as an incident in which, 1) two or more persons experience a similar gastrointestinal illness after ingestion of a common food, and 2) epidemiologic analysis implicates the food as the source of illness. There are two exceptions to this definition: a single case of either botulism or chemical poisoning is considered an outbreak (14).

Outbreaks are usually divided into two categories (14):

1) Laboratory confirmed – outbreaks in which laboratory evidence of a specific agent is obtained.
2) Undetermined agent – outbreaks in which epidemiologic evidence implicates a food source, but adequate laboratory confirmation is not obtained.

For the period 1972-1978, a total of 2,889 outbreaks of foodborne disease involving 94,595 people were reported to CDC (18). A causative agent could be confirmed in only 38% (1,097) of these outbreaks. Figure 2 illustrates these data.

When the information from the confirmed outbreaks from this time period was analyzed, the causative agents were determined and are listed in Table 2 (18).

In the outbreaks where the agent was identified, bacteria caused the overwhelming majority of cases (91%). It is well documented that the importance of microbiological hazards (particularly bacteria) exceeds those of other health hazards associated with foods (18).

Food Involved

A wide variety of foods have been incriminated in foodborne illnesses as shown in Table 3 (15). Red meats, poultry, fish and shellfish, ethnic foods, particularly Chinese and Mexican foods, and meat and vegetable salads are often implicated in foodborne outbreaks. Surveillance data from 1968-1977 indicate that meat and poultry and products made from them were vehicles in over 50% of the reported outbreaks of foodborne disease (19). Fish, mollusks, marine crustaceans and marine mammals were implicated as vehicles in approximately 11% of the outbreaks reported during 1970-1978 (20).

Most foods that allow the growth of pathogenic organisms have several common characteristics (15, 17).

Figure 2. Foodborne disease outbreaks and cases reported to the Centers forDisease Control from 1972-1978 (18).

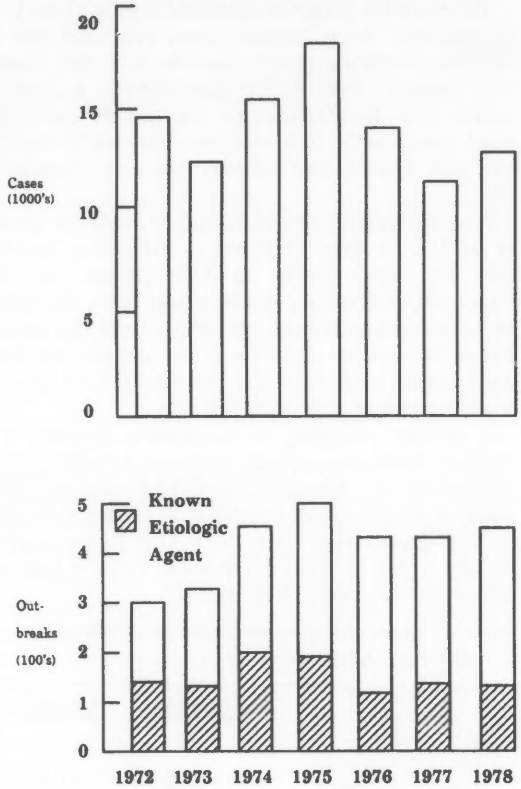


Table 2. Foodborne disease outbreaks and cases reported to the Centers for Disease Control by known causative agent from 1972-1978. (Adapted from 18.)

	Outbreaks		Cases	
Causative Agent	Number	Percent	Number	Percent
Bacterial	725	66.3	36,659	90.9
Chemical	257	23.5	1,739	4.3
Parasitic	85	7.8	467	1.1
Viral	30	2.7	1,426	3.5
Total	1,097	100.3	40,291	99.8

Table 3. Foods incriminated in foodborne disease outbreaks during 1973-1976. (Adapted from 15.)

Foods	Outbreaks Number	Percent
Meat & poultry	397	23.4
Seafood	158	9.3
Ethnic foods (Chinese & Mexican foods)	95	5.6
Salads (meat & vegetable)	76	4.5
Dairy products	51	3.0
Fruits & vegetables	46	2.7
Baked foods	44	2.6
Mushrooms	25	1.5
Other	263	15.5
Unknown	543	32.0
Total	1,698	100.1

They usually:

- provide a sufficient quantity and variety of nutrients;
- have a water activity (Aw) (water available for microbial growth) above 0.85;
- have a pH greater than 4.6;
- possess the proper oxygen requirements; and
- are stored at temperatures in the growth range of disease causing organisms for enough time to allow them to grow.

Places Where Foods are Mishandled

Foods can be mishandled at any point in the food chain, but mishandling problems frequently occur in food service establishments and homes. Table 4 summarizes the foodborne outbreak data from 1972-1976 in these three general categories (17).

Food service establishments and homes are often involved in outbreaks because unsafe food preparation techniques are inadvertantly practiced (17). In many cases, untrained, unaware or indifferent individuals are given the responsibility of preparing food without any knowledge of safe food preparation procedures. The low incidence of outbreaks related to food processing plants reflects the controlled nature of most manufacturing processes. Foods are subjected to carefully calculated time-temperature combinations to destroy pathogenic microorganisms and reduce the risk of foodborne illness (17).

Table 4. Foodborne disease outbreaks attributed to foods mishandled in three classes of establishments, 1972-1976. (Adapted from 17.)

	Outbreaks Number	Percent
Food service establishments	826	41.3
Homes	334	16.7
Food processing plants	68	3.4
Unknown/Unspecified	771	38.6
TOTAL	1,999	100.0

Factors Contributing to Outbreaks

Before discussing the specific diseases transmitted by foods, it is important to review the many factors that usually contribute to outbreaks (21). These factors vary with the place where foods are handled. Table 5 provides some very significant data on food service establishments, homes and food processing plants. These statistics were obtained from public health surveillance data that contained information about contributory factors.

Food Service Establishments

In the period 1973-1976, food service establishments were implicated in 235 outbreaks in which contributory factors were listed (21). The major factors that contributed to outbreaks in these establishments were (in order of frequency of occurrence):

- inadequate cooling of foods;
- lapse of a day or more between preparing and serving foods;
- insufficient high temperature during hot storage of foods;
- infected person having touched foods which were not subsequently heat-processed; and
- inadequate time or temperature or both, during reheating of previously cooked foods.

Homes

The major factors involved in the outbreaks in family households during the same period were as follows (in order of frequency of occurrence) (21):

Table 5. The most important factors contributing to the occurrence of foodborne outbreaks in places where food was mishandled (21).

Contributing factor	Rank and Percent 1973-1976 Food service (235 outbreaks)	Homes (122 outbreaks)	Food processing (32 outbreaks)	Total* (427 outbreaks)	1961-1976 Total (1,152 outbreaks)
Improper cooling	1 (63)	1 (30)	3 (16)	1 (46)	1 (46)
Lapse of day or more between preparing and serving	2 (29)	5 (11)	(all)	2 (20)	2 (21)
Infected person	4 (26)	6 (8)	5 (9)	3 (18)	3 (20)
Inadequate thermal process, canning, or cooking	9 (5)	3 (21)	1 (25)	6 (11)	4 (16)
Improper hot storage	3 (27)	7 (6)		4 (16)	5 (16)
Inadequate reheating	5 (25)	9 (5)		5 (16)	6 (12)
Ingesting contaminated raw food or ingredient	11 (2)	2 (22)	1 (25)	7 (11)	7 (11)
Cross contamination	8 (6)	12 (2)		11 (4)	8 (7)
Inadequate cleaning of equipment	6 (9)	13 (1)		8 (6)	9 (7)
Obtaining foods from unsafe sources	13 (1)	5 (11)	6 (6)	11 (4)	10 (5)
Using leftovers	7 (7)	10 (4)		9 (5)	11 (4)
Toxic species mistaken for edible varieties		4 (13)		11 (4)	
Faulty fermentations		7 (6)	3 (16)	16 (2)	
Incidental additives				15 (2)	
Intentional additives	11 (2)				

*Includes other outbreaks which do not fall in the other three classes.

- inadequate cooling;
- ingesting contaminated raw food or ingredient;
- inadequate time or temperature, or both, during canning or cooking;
- mistaking toxic species of mushrooms or other plants for edible varieties;
- obtaining foods from unsafe sources; and
- lapse of a day or more between preparing and serving of foods.

Food Processing Plants

The major factors contributing to the occurrence of outbreaks related to foods mishandled in food processing plants included (21):

- contaminated raw ingredients;
- inadequate heat processing;
- inadequate cooling; and
- faulty fermentations.

Sequence of Events in an Outbreak

When studying the patterns and causes of foodborne diseases, epidemiologists have identified a sequence of events that must occur before people will become ill (17, 22). Figure 3 illustrates the sequence of events needed for the major causative agents of foodborne outbreaks.

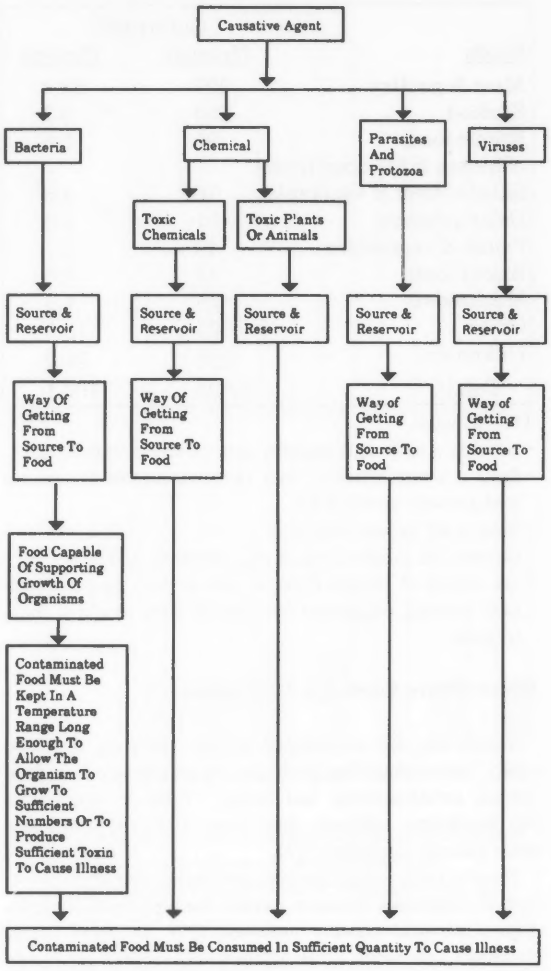
To provide a better understanding of exactly how a bacterial foodborne outbreak can occur, the following reviews an actual incident that occurred on an international jetliner (23, 24).

On February 2, 1975, the passengers aboard an airliner flying from Tokyo to Copenhagen were served a breakfast consisting of a cheese omelette, ham slice, yogurt, roll and butter. About 2.5 hours after the meal, 196 passengers and 1 crew member developed a gastrointestinal illness characterized by nausea, vomiting, diarrhea and abdominal cramps.

What caused the outbreak to occur? The sequence of events shown in Figure 3 can be traced to show how this international outbreak occurred.

1) Causative agent – bacteria.
   Staphylococcus aureus was the organism responsible for this outbreak.
2) Source and reservoir of the organism.
   The bacteria were present in an infected wound on the finger of a cook who prepared the meal.
3) Way of getting from the source to the food.
   The cook handled the ham slices and placed them on the omlettes as the meal was being prepared and packed for the flight. *S. aureus* was transferred from the infected wound to the ham.
4) Food capable of supporting growth of microorganisms.
   S. aureus is capable of growing in proteinaceous foods in a wide variety of conditions (15). It can grow in a pH range of 4.0 - 9.8, at water activities in the range of 0.83 - 1.00 and at relatively high salt concentrations (15). In cured meats, like ham, several other types of bacteria are killed in the curing process and due to the low Aw of the product, the growth of others is inhibited. Since there is less competition from other organisms, *S. aureus* can grow well in this food (15).
5) Contaminated food must be kept in a temperature range long enough to allow the organism to grow to sufficient numbers or to produce sufficient toxin to cause illness.
   During meal preparation of the omelettes and ham, the food was stored at room temperature for 6 hours. Following preparation, the breakfast entrees were placed in a holding room for 14.5 hours. The temperature in this room was 50°F. The meals were then loaded onto the plane and stored at room temperature for 5.5 hours until they were heated in the galley oven prior to serving.
   The ham was held at temperatures of 50°F - 70°F for about 26 hours. This was sufficient time to allow the growth of *S. aureus* and the production of heat stable

Figure 3. Sequence of events needed for a foodborne disease outbreak to occur.



toxin. Heating the meals on the plane did not destroy the toxin.

6) Contaminated food must be consumed in sufficient quantity to cause illness.

About 2.5 hours after eating the food, 197 people consumed the ham in sufficient quantity to develop the classic symptoms of a *S. aureus* intoxication.

Although this particular case took place on a jetliner, a large number of similar incidents have taken place in homes, schools, restaurants, institutions and at church dinners, picnics and many other affairs. It is obvious that the infected food service worker began the sequence of events that caused the problem. Attention to safe food preparation techniques could have easily prevented this outbreak from occurring. When correct procedures are used, the hazardous sequence of events described above does not occur and foodborne illness is prevented. This is why millions of meals are safely served every day.

In the next issue of Food Science Facts, a classification of the major foodborne diseases will be provided and their causes and prevention reviewed in detail.

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EPIDEMIC OF ACUTE GASTROENTERITIS AT A TERTIARY-CARE HOSPITAL - ONTARIO

During the last 10 years, the Norwalk virus has emerged as an important cause of epidemic viral gastroenteritis, a disease that occurs in family or community-wide outbreaks affecting predominantly school-age children, adults and family contacts. Progress in understanding the biology, epidemiology, and immunology of Norwalk virus has been slow because the virus is small in size, difficult to visualize, and is shed in relatively low titres in feces. To date, it has not been cultivated in any cell or organ culture system to permit the subsequent production of illness in laboratory animals, including primates.

On 14 November 1985, the infection control nurse at a Toronto tertiary-care hospital was notified that many health-care personnel had developed acute gastroenteritis. A preliminary surveillance of all hospital staff and patients carried out the following day revealed that there were several hundred additional cases and that the disease had affected most areas of the hospital. Because of the magnitude of the outbreak, a decision was made to close the hospital to all admissions and emergency room visits as of 1800 hours on 15 November. The case definition was as follows: vomiting, and/or diarrhea (i.e.watery or 2 or more stools per day).

The results of the investigation suggested that the outbreak period occurred between 1 and 22 November. The first reported in-patient case occurred on 11 November. The epidemic curve was compatible with person-to-person transmission of the virus. Neither environmental studies nor staff case-control studies were able to implicate food, water or ice as a source. A total of 673 hospital employees fitted the case definition for an attack rate of 25%. By department, attack rates were highest among staff in the emergency room (ER) (70%), respiratory therapy (69%), and the department of medicine (64%). There were 109 cases among hospitalized patients for an attack rate of 20%. The highest attack rates were on the medical floors.

Illness was characterized by fatigue, nausea, diarrhea, abdominal cramps, headache, myalgia, and vomiting. Illness was generally benign; the median duration of symptoms was 24 to 48 hours. Stool specimens from thirty cases were negative for *Salmonella, Yersinia, Campylobacter,* and toxogenic *Escherichia coli*. Electron microscopic examination revealed 27 nm virus-like particles in 4 of 17 stool specimens.

In response to a press release on 19 November, over 200 individuals in the community telephoned the hospital to report that they had visited during the outbreak and subsequently developed vomiting and/or diarrhea. Of those people who were called by investigators, 102 satisfied the case definition. Forty-seven percent of the persons had visited the ER. Of those 102 people, 35 (34%) who had visited on 11 and 23 November became ill. The attack rate was higher among patients who had stayed longer than 3 hours (52%) than among those whose visits had been briefer (20%). Development of the disease was not associated with touching staff, using the washroom, consuming food, drinking water or smoking.

In order to determine the attack rate during the same time period in a different area of the hospital, 41 randomly selected patients, who had been seen in the family practice unit were contacted. The attack rate here was 3 of 41 (7%). In addition, 18 randomly selected patients who had been seen in the ER on 8 November were interviewed and it was found that none of this group had become ill.

In summary, an outbreak of over 700 cases of acute gastroenteritis occurred among staff and patients at a tertiary-care hospital during the period 1 to 22 November. Apparently, the ER had served as a common source of infection for several days. The virus was probably spread by fomites and possibly via aerosols in the ER and then transmitted by person-to-person contact throughout the rest of the hospital.

Can. Dis. Weekly Report 2-8-86.

CRYPTOSPORIDIUM IN TWO DAY-CARE CENTRES IN CALGARY, ALBERTA

Since 1976, *Cryptosporidium,* a protozoan parasite with a complex life cycle, has increasingly been recognized as a cause of diarrheal illness of the malabsorptive type in humans, particularly immunocompromised/immunosuppressed individuals. Clinical illness in the immunocompetent is thought to be mild and self-limiting, but in the immunocompromised may be more severe with dehydration, malnutrition, and occasionally contributing indirectly to death.

The sexual cycle of *Cryptosporidium* produces a resistant oocyst which is infective orally and can be transmitted to humans through fecal contamination from animal sources, such as calves with diarrhea. Special laboratory techniques, necessary for the identification of the oocysts, are not yet routinely performed by all diagnostic laboratories.

Epidemiological and clinical knowledge about human cryptosporidiosis has increased recently with reports of the disease associated with AIDS patients. In addition, some travelers returning with diarrheal illness from developing countries have been stool-positive for *Cryptosporidium* oocysts. Recent evidence indicates that the organism may be common in immunologically normal children and that it might be a cause of sporadic outbreaks of diarrhea in day-care centres.

The following is a summary of outbreaks of diarrheal illness, considered to be caused by *Cryptosporidium*, in 2 day-care centres in Calgary.

In April 1985, 24 of 66 attendees (36.4%) at one day-care centre were found symptomatic with diarrhea (3 had profuse diarrhea and were obviously very ill). Nineteen of the 24 (79.2%) were infants less than 2 years of age (all in diapers) who were located upstairs in the building (total number of infants here was 29); 3 of 10 staff members in this area were also symptomatic with diarrhea. The remaining 5 symptomatic attendees (20.8%), ranging from 2-6 years, were located downstairs (total number of attendees here was 37) and 2 of 7 staff members in this area also complained of diarrhea. A case was defined as any person with diarrhea (liquid, frequent stool) more than 3 times per day.

Staff and the visiting nurse had noted an increase in the number of children with diarrhea in mid-March and, in retrospect, the staff indicated that 4 attendees had experienced intermittent, and at times, 'severe diarrhea' dating back to the fall of 1984.

Early management of the outbreak followed a standard protocol including searching for any irregularities or deficiencies in the environment and hygienic practices. Stool specimens were obtained initially from all symptomatic children and staff and submitted to the Southern Alberta Provincial Laboratory for culturing and examination for ova and parasites. While waiting for the results, control measures concentrating on a thorough cleaning of the centre, better handling and management of children with diarrhea, separation of symptomatic children and staff from those asymptomatic, and improved food handling techniques were recommended. The centre remained open but no new admissions were allowed.

By 18 April, stools from 2 children had been reported positive for *Giardia lamblia* and 6 others, positive for *Cryptosporidium* oocysts. An information letter was prepared and distributed to the children's parents and to staff. Parents of *all* children at the centre, together with staff and all family and household contacts were interviewed and asked to submit one stool specimen. All those who were found positive for *Cryptosporidium* were asked to continue submitting stool specimens every 3 days until 2 weeks after symptoms disappeared. Stool specimens from guinea pigs and budgerigars kept as pets at the centre and from any household pets were requested for parasite examination.

Compliance by staff, parents and household contacts to submit stool specimens was poor. The investigation terminated on 23 May when there were apparently no further cases of diarrhea at the centre. Of those with diarrhea, 68.4% in the upstairs area and 40% in the downstairs area were stool-positive for *Cryptosporidium* oocysts. *Cryptosporidium* oocysts were isolated from the stools of 55.1% of all cases with diarrhea; *G. lamblia* cysts were found in 20.7% of the stools. One attendee was positive for both agents and had apparently been ill intermittently "for months". In 7 cases (4 attendees and 3 staff), no parasite or etiologic agent was found.

The epidemic curve shows a cluster of cases between 31 March and 23 April, possibly indicting a period of common source spread, especially in the upstairs area. However, person-to-person intermittent transmission must also be considered because 2 attendees had been repeatedly symptomatic since October 1984 and one staff member since March 1985. Investigation revealed several deficiencies at the centre including an inadequate number of sinks, poor hygienic practices, and crowding, which could have contributed to both a common source spread and environmental contamination resulting in person-to-person transmission.

The mean age of attendees with diarrhea and a positive stool for *Cryptosporidium* was 19 months, range 8-36 mos.; for symptomatic attendees with a positive stool for *G. lamblia*, the mean age was 27 mos., range 9-54 mos.

The most common symptom in those children who were stool-positive for *Cryptosporidium* was profuse watery diarrhea (88.2%). Moreover, about 1/3 of these children also had a hacking non-productive dry cough, and in some cases, particularly those with long-term intermittent diarrhea, the cough had been persistent for months. This association for cryptosporidial diarrhea and cough in children has been previously reported. Such an association was not reported in those children with diarrhea and a stool positive for *G. lamblia*.

Stool samples from the budgerigar and guinea pigs cages at the centre were negative for *Cryptosporidium* oocysts. Unfortunately, no stool specimens were submitted from any other pets. However, the number of attendees who were stool-positive for *Cryptosporidium* and had pets (including dogs, cats and birds) in their homes was significantly greater than those who were either *G. lamblia* positive or negative for any pathogen.

An attempt to determine the duration of cyst excretion and the potential for spread was not very successful. However, 12 attendees with diarrhea originally positive for *Cryptosporidium*, had negative stools after an average of 24.6 days. The potential for future spread both internally and externally probably still exists if strict hygiene practices are not followed.

The second outbreak occurred in another centre in early May 1985 and there was no apparent link between the 2 facilities. Investigation again revealed a breakdown in general cleanliness, hygiene, diaper changing procedures, and management of children with diarrhea. The centre's operator elected to close the facility for an extended 4-day week-end, during which time the centre was cleaned by a commercial company. All children were home for 4.5 days, and the outbreak rapidly ended after a 1-week period.

Twenty-six of the 50 attendees (51%) at this centre had diarrhea; 14 of these (53.8%) had *Cryptosporidium* oocysts in their stools. Two attendees were positive for *G. lamblia*. No other bacterial, viral or parasitic organisms were found.

Comments: Limited data are available on the prevalence of cryptosporidiosis in Canada. The prevalence rates (based on stool samples submitted to the provincial laboratories) in Manitoba and Newfoundland were reported to be 1.06% and 1.14% respectively. *Cryptosporidium* was identified in 0.63% of diarrheic stools in British Columbia and the occurrence was related to 3 factors: patient age (especially < 6 yr.), time of year (summer), and geographic location (may be endemic foci).

Surveys in animals have suggested that the parasite is common, and more likely in young animals. The investigation in the first outbreak reported here suggested that pets in the home may be a source of *Cryptosporidium* in the Calgary area.

The principal mode of transmission is fecal-oral. Deficient hygiene practices in day-care centres especially with regards to handling diapered children with diarrhea can lead to the spread of infection in such settings.

None of the children in these 2 outbreaks were sufficiently ill to warrant treatment beyond support measures used in the management of diarrhea.

Results of the investigation of these 2 outbreaks corroborate previously noted problems in day-care settings, and the importance of high standards and practices of hygiene.

Can. Dis. Weekly Report 2-2-86.

Raw fish (November 1985): A study of 1,000 cases of gastroenteritis associated with eating raw shellfish further illustrates the dangers of this practice. Illness also developed in people who ate steamed clams - more cooking (perhaps four to six minutes) is needed than to simply open the shells. Common symptoms are diarrhea, nausea, abdominal cramps, and vomiting. (New England Journal of Medicine 314:11, 678).

Medical Update April 1986.

Sulfites (September 1985, March 1985): Sulfites are a food preservative that can cause allergic reactions in asthmatics and in other people. These reactions can be fatal. Test strips are now available to help detect the presence of sulfites in food. For more information, write to Sulfitest™, Center Laboratories, 35 Channel Drive, Port Washington, NY 11050, or call 800-645-6335. (In New York, 516-767-1800.)

Medical Update April 1986.

Welcome . . . New IAMFES Members

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California

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Chris Hansen Laboratories
Modesto

Clive Campion
Agri Tek
Del Mar

Keith A Gomes
Adohr Farms
Southgate

Willard Howder
Milk & Dairy Foods Cont
Martinez

Leon Jensen
Milk & Dairy Foods Cont
Oakland

Ken Jones
Shade Foods, Inc
Belmont

Sadie Kendall
Atascadero

Barbara Larson
Dairyman's Creamery
Tulare

E M Matchak
California Cheese Co
San Jose

Frank Morgan
Foss Foods Inc
Covina

Quentin Nelson
Southland Corp
Walnut Creek

Jack Pollock
Milk & Dairy Foods Cont
Manhattan Beach

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Rockview Dairies
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Mexico

Letters to the Editor

Dear Ms. Hathaway:

As you may imagine, the salmonella outbreak in Illinois and the incidence with *listeria* in California caused much concern in Europe too. In addition, we had a case of salmonellosis in Germany this summer, traced back to milk powder. Our department therefore organized a seminar *SALMONELLA* AND *LISTERIA* IN DAIRY INDUSTRY to inform the colleagues in the dairies.

In preparing this seminar it occurred to me that American publications on the matter tend to discuss the subject in a somewhat one-sided way. The reports sound as if raw milk was established to be the only possible source of pathogens. All discussion concentrates on failures in heat treatment, heat resistance of strains and on that legendary "cross connection."

Of course, raw milk once was the major source of pathogens; introduction of pasteurization certainly was a great achievement to take care of these risks. But so far I can see, exactly this has changed the situation. Shouldn't we say that in these days even raw milk isn't any more what it used to be?

As an alternative, I propose post-pasteurization contamination (recontamination) as a most likely mechanism to explain these incidents. Of course, I know that in all cases the actual course of events is not definitely known. Thus, we are left with assumptions. I just wonder why the American colleagues don't even care to dismiss recontamination as an explanation. The main problem seems to be that most people never thought of the possibility that bacteria may persist in an installation for a considerable length of time. As far as clean, smooth surfaces are concerned, I agree that it is most unlikely that any contaminant (including salmonella) could survive usual cleaning procedures. But how about worn out gaskets or partially pluged CIP-nozzels? How about those most sophisticated valves? Has it ever been shown that cleanseability is increasing with sophistication? I know of a few installations which predominantly deliver milk free of recontamination. Most of them, however, consist of a heater, of a short, stainless-steel pipe, of one valve and a filler. Even then once in a while contamination occurs.

As I said before, the idea of persistence seems to create the problem. That matter apparently looks that odd, that nobody even cared to test, how persistent bacteria can be. One exception, of course, is the experiment at Hillfarm Dairy. There, obviously, a specific strain of *salmonella* inhabited the dairy equipment for several months. Do we actually know that such a persistence is unlikely to occur? Who ever tried to find out, whether the pseudomonas found in yesterday's milk, had been present in the line last week too?

Well, there is evidence. Curiously enough, it has been obtained in work with UHT-milk. In cases of insterilities in UHT-operations, we routinely analyze the microflora of contaminated packages. In this work we repeatedly found that a given strain showed up several times in one line. The most stubborn one was a strain of an *N-streptococcus* which bothered a manufacturer for about three weeks. Incidentally, that strep gave up at the very moment, when we detected a valve which within five years never had received any maintenance service.

Sterilization of UHT-lines is much more severe a procedure than cleaning and disinfection of past milk installations. Therefore, if such things can happen in UHT-production, they are the more likely to occur in past milk lines. There are effective methods to control recontamination; thus we feel that this would be a promising approach to minimize the risk. If the milk consistently is free of gramnegatives then the installation probably is not in a critical condition. There should be no "cleaning in part."

Possibly Hillfarm Dairy did very strict tests on contaminants. I actually don't know. There seems to be no way to know anyway, since none of the various reports even would touch that question. That's, after all, the very matter which is startling me. So, I sat down and wrote this letter to the Editor.

Thank you for your attention.

Sincerely yours,

Martin Busse, Ph.D.
Technische Universität München
Bakteriologisches Institut
8050 Freising, Vöttinger Str. 45
Germany

John Collier (l) receives the IAMFES Honorary Life Membership Award from Ward Peterson (r).

C. K. Luchterhand (l) presenting WAMFS Sanitarian of the Year Award to Al Negus (r).

W.A.M.F.S. Meeting Highlights

Approximately one hundred and fifty people attended the Seventh Annual Joint Educational conference co-sponsored by the Wisconsin Association of Milk and Food Sanitarians, the Wisconsin Environmental Health Association, the Wisconsin Association of Dairy Plant Field Representatives and the Wisconsin Dairy Technology Society. The meeting was held September 24 and 25, 1986 at the Valley Inn in Neenah, Wisconsin.

The keynote address was given by Don Konsoer of the Wisconsin Department of Agriculture, Trade and Consumer Protection and Katie Morrison of the Wisconsin Division of Health. The general session speakers were Dr. Tom Evans, Wisconsin Geological and Natural History Survey, discussing Radioactive Waste Disposal and Holly Dowling, Wisconsin Division of Health, reviewing AIDS, its Epidemiology and Impact.

Many interesting topics were presented. Dairy problems were reviewed by Ken Kirby, Consultant and David Hatch of Hatco Corporation. Dr. Michael Pariza, University of Wisconsin, discussed diet and cancer. Environmental issues were discussed by Nelson Fabian of NEHA, Larry Mcdonnell of Wisconsin Division of Health, Dr. Marty Kanarek of the University of Wisconsin, Ed Marshall of Bell Laboratories and Dr. Dean Emanuel of the Marshfield Clinic.

The Awards Luncheon was scheduled for Noon on Thursday, September 25. The Wisconsin Association of Milk and Food Sanitarians presented the Sanitarian of the Year Award to Al Negus of Madison Dairy Supply.

The W.A.M.F.S. Business Meeting was well attended and featured reports by the chairperson of each of the three standing committees (Milk, Food and Administration). Gene Lindauer presented the gavel to the new president, Dale Hachmann. Dale presented the Past President's plaque to Gene.

W.A.M.F.S. Officers for 1986-87 are:

President - Dale Hachmann, Kendall Co., Prairie du Sac

Vice President - Randall Daggs, Wis. Div. of Health, Madison

First Vice President - Ken Kirby, Dairy Consultant, Edgerton

Past President - Gene Lindauer, W.D.A.T.C.P., Green Bay

Secretary-Treasurer - Neil Vassau, W.D.A.T.C.P., Madison

Second Vice President - Candidates are: Ray Cress & P. C. Vasavada

Georgia Association of Food and Environmental Sanitarians Inc. to Hold 1st Annual Meeting

The 1st Annual Meeting of the Georgia Association of Food and Environmental Sanitarians, Inc. will be held Feb. 6, 1987. Registration begins at 8:00 a.m., with the meeting to begin at 10:00 a.m. The meeting will be held at the Chick-Fil-A Co., 5200 Buffington Rd., Atlanta, GA.

One of the topics will feature speakers from Regulatory Agencies and Food Companies on *Listeria*. There will be a plant tour of Eastern Foods at 3:00 p.m.

For more information contact Dr. Paul Gopal at 404-262-2729 or if you are in Athens contact Dr. Joe Frank at 404-542-2453.

1987 IAMFES AWARDS

The International Association of Milk, Food and Environmental Sanitarians is proud of its members and their contributions.

As a member, you are entitled to nominate deserving colleagues for the IAMFES Awards.

You were recently sent a nomination form. Simply check those awards which you would like to nominate a person for and mail the form to the Ames office by March 1, 1987.

The Ames office will then send you a complete form for that particular award(s). Those forms need to be completed and back to the Ames office by April 1, 1987.

1. Previous award winners are not eligible for the same award. Check pages 38 and 39 in this issue for a complete listing of past award winners.

2. Present Executive Board members are not eligible for nomination.

3. Candidates must be current IAMFES members in order to be nominated.

Presentation of these awards will be during the IAMFES Annual Meeting August 2-6, 1987 at the Disneyland Hotel in Anaheim, California during the Annual Awards Banquet.

SEND ALL REQUESTS AND COMPLETED MATERIALS TO:

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IAMFES, Awards
P.O. Box 701
Ames, IA 50010

Questions? Call 800-525-5223, members in Iowa and outside the U.S. call 515-232-6699. 9-4 weekdays.

The following page lists the awards that you may nominate a person for, along with awards that are presented.

Nominate a deserving colleague for these prestigious IAMFES Awards

NOMINATIONS

- **SANITARIANS AWARD**

  $1000 award and plaque

  in recognition of outstanding service to the profession of the Sanitarian.

- **EDUCATOR AWARD**

  $1000 award and plaque

  presented to an educator in recognition of outstanding service in academic contributions to the profession of the Sanitarian.

- **CITATION AWARD**

  plaque

  for many years devotion to the ideals and objectives of the association.

- **HAROLD BARNUM INDUSTRY AWARD**

  $500 award and plaque

  in recognition of outstanding service to the public, IAMFES and the profession of the Sanitarian.

- **HONORARY LIFE MEMBERSHIP**
  plaque and lifetime membership with IAMFES

  for devotion ot the high ideals and principles of IAMFES.

- **SHOGREN AWARD**

  certificate and $100 award

  presented to the affiliate association for service to their members and IAMFES.

- **CERTIFICATE OF MERIT AWARD**

  certificate

  presented to those affiliate members who are active within their state/province affiliate group and IAMFES.

- **MEMBERSHIP ACHIEVEMENT AWARD**

  certificate

  presented yearly to the affiliate with the large increase of IAMFES members.

Past IAMFES Award Winners

EDUCATOR-INDUSTRY AWARD

1973-Dr. Walter A. Krienke
1974-Richard P. March
1975-Dr. K. G. Weckel
1976-Burdet H. Heinemann
1977-Dr. Elmer H. Marth
1978-James B. Smathers
1979-Dr. Joseph Edmondson
1980-James R. Welch
1981-Dr. Francis F. Busta

In 1982 this award was split into the Educator Award and the Harold Barnum Award (for industry)

EDUCATOR AWARD

1982-Floyd Bodyfelt
1983-Dr. John Bruhn
1984-Dr. R. Burt Maxcy
1985-Dr. Lloyd B. Bullerman
1986-Dr. Robert T. Marshall

HAROLD BARNUM AWARD

1982-Howard Ferreira
1983-C. Dee Clingman
1984-Omer Majerus
1985-William L. Arledge
1986-Hugh C. Munns

CITATION AWARD

1951-Dr. J. H. Shrader and William B. Palmer (posthumously)
1952-C. A. Abele
1953-Clarence Weber
1954-Dr. C. K. Johns
1955-Dr. R. G. Ross
1956-Dr. K. G. Weckel
1957-Fred C. Baselt
1958-Milton R. Fisher
1959-John D. Faulkner
1960-Dr. Luther A. Black
1961-Harold S. Adams
1962-Dr. Franklin W. Barber
1963-Dr. Merle P. Baker
1964-W. K. Moseley
1965-H. L. Thomasson
1966-Dr. J. C. Olson, Jr.
1967-William V. Hickey
1968-A. Kelley Saunders
1969-Karl K. Jones
1970-Ivan E. Parkin
1971-Dr. L. Wayne Brown
1972-Ben Luce
1973-Samuel O. Noles
1974-John C. Schilling
1975-Dr. A. R. Brazis
1976-James Meany
1977-None Given
1978-Raymond A. Belknap
1979-Harold E. Thompson, Jr.
1980-Don Raffel
1981-Dr. Henry V. Atherton
1982-None Given
1983-William B. Hasting
1984-Dr. Elmer H. Marth
1985-Dr. Ralston B. Read, Jr.
1986-Cecil E. White

SANITARIANS AWARD

1952-Paul Corash
1953-Dr. E. F. Meyers
1954-Kelley G. Vester
1955-B. G. Tennent
1956-John H. Fritz
1957-Harold J. Barnum
1958-None Given
1959-William Kempa
1960-James C. Barringer
1961-Martin C. Donovan
1962-Larry Gordon
1963-R. L. Cooper
1964-None Given
1965-Harold R. Irvin
1966-Paris B. Boles
1967-Roger L. Stephens
1968-Roy T. Olson
1969-W. R. McLean
1970-None Given
1971-Shelby Johnson
1972-Ambrose P. Bell
1973-None Given
1974-Clarence K. Luchterhand
1975-Samuel C. Rich
1976-M. W. Jefferson
1977-Harold Bengsch
1978-Orlowe Osten
1979-Dr. Bailus Walker, Jr.
1980-John A. Baghott
1981-Paul Pace
1982-Edwin L. Ruppert
1983-None Given
1984-Harold Wainess
1985-Harry Haverland
1986-Jay Boosinger

HONORARY LIFE MEMBERSHIP AWARD

1957-Dr. J. H. Shrader
1958-H. Clifford Goslee
1959-Dr. William H. Price
1960-None Given
1961-Sarah Vance Dugan
1962-None Given
1963-Dr. C. K. Johns and Dr. Harold Macy
1964-C. B. and A. L. Shogren
1965-Fred Basselt and Ivan Parkin
1966-Dr. M. R. Fisher
1967-C. A. Abele and Dr. L. A. Black
1968-Dr. M. P. Baker and Dr. W. C. Frazier
1969-John Faulkner
1970-Harold J. Barnum
1971-William V. Hickey
1972-C. W. Dromgold and E. Wallenfeldt
1973-Fred E. Uetz

and Presidents

1974-H. L. Thomasson and
Dr. K. G. Weckel
1975-A. E. Parker
1976-A. Bender Luce
1977-Harold Heiskell
1978-Karl K. Jones
1979-Dr. Joseph C. Olson, Jr.
1980-Alvin E. Tesdal
1981-Robert M. Parker
1982-None Given
1983-Orlowe Osten
1984-Dr. Paul Elliker
1985-Patrick J. Dolan
Dr. Franklin W. Barber
Clarence K. Luchterhand
1986-John G. Collier

SHOGREN AWARD

1972-Iowa Affiliate
1973-Kentucky Affiliate
1974-Washington Affiliate
1975-Illinois Affiliate
1976-Wisconsin Affiliate
1977-Minnesota Affiliate
1978-None Given
1979-New York Affiliate
1980-Pennsylvania Affiliate
1981-Missouri Affiliate
1982-South Dakota Affiliate
1983-Washington Affiliate
1984-None Given
1985-Pennsylvania Affiliate
1986-None Given

MEMBERSHIP ACHIEVEMENT AWARD

1986-Iowa Affiliate

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1913-C. J. Steffen
1914-C. J. Steffen
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1916-Claude F. Bessio
1917-Wm. H. Price
1918-Alfred W. Lombard
1919-James O. Kelly
1920-Ernest Kelly
1921-C. L. Roadhouse
1922-H. E. Bowman
1923-Geo. E. Belling
1924-J. B. Hollingsworth
1925-T. J. Strauch
1926-G. C. Supples
1927-W. A. Shoults
1928-Ira V. Hiscook
1929-H. R. Estes
1930-R. E. Irwin
1931-A. R. B. Richmond
1932-W. B. Palmer
1933-H. N. Parker
1934-P. F. Krueger
1935-Dr. C. K. Johns
1936-G. W. Grim
1937-J. C. Hardenbergh
1938-A. R. Telland
1939-V. M. Ehlers
1940-P. D. Brooks
1941-L. C. Frank
1942-F. W. Fabian
1943-C. A. Abele
1944-C. A. Abele
1945-R. R. Palmer
1946-R. R. Palmer
1947-R. G. Ross
1948-W. D. Tiedeman
1949-A. W. Fuchs
1950-M. R. Fischer
1951-Dr. K. G. Weckel
1952-H. L. Thomasson
1953-H. J. Barnum
1954-John D. Faulkner
1955-I. E. Parkin
1956-Harold S. Adams
1957-Paul Corash
1958-Harold Robinson
1959-Dr. Franklin Barber
1960-W. V. Hickey
1961-Dr. John Sheuring
1962-Charles E. Walton
1963-Ray Belknap
1964-John H. Fritz
1965-Dr. W. C. Lawton
1966-Fred E. Uetz
1967-Dr. P. R. Elliker
1968-Dr. A. N. Myhr
1969-Samuel O. Noles
1970-Milton E. Held
1971-Dick B. Whitehead
1972-Orlowe M. Osten
1973-Walter F. Wilson
1974-Earl O. Wright
1975-P. J. Skulborstad
1976-H. E. Thompson, Jr.
1977-Dr. H. V. Atherton
1978-David F. Fry
1979-Howard Hutchings
1980-Bill Kempa
1981-William Arledge
1982-Harry Haverland
1983-Dr. Robert Marshall
1984-Dr. A. Richard Brazis
1985-Archie Holliday
1986-Dr. Sidney E. Barnard

Compendium of Methods for the Microbiological Examination of Foods Second Edition, edited by Marvin L. Speck

This book is the second edition of a compendium of methods that has become an important reference for all food microbiologists. The format is basically the same as the first edition, but the length of the book has been increased by over 200 pages. Many of the chapters have been expanded and all have been updated with newer procedures where appropriate. Four new chapters have been added which deal with the topics of Laboratory Quality Control (Chapter 1), Measurement of Water Activity (Chapter 8), *Campylobacter* (Chapter 31) and Bottled Water (Chapter 57). Equipment, media, reagents and stains have been removed from Chapter 2 and placed at the end of the book in Chapter 58. Chapter 2 of the new edition deals with sampling plans, sample collection, etc., the subjects of Chapter 1 in the first edition. The remaining chapters deal with specific methodology such as colony count methods, direct microscopic count, most probable number and methods for specific groups or types of microorganisms, including spoilage organisms, indicator organisms, and pathogens. Methods are also included for specific types of foods and the organisms common to the foods. Individual chapters include background information as well as stepwise procedures. Chapter 58 contains numerous formulae which will permit the analyst to prepare a variety of media and reagents for different methods.

This book should be of value to every type of microbiology laboratory involved in the analysis of foods. If one found the first edition to be a valuable reference, the second edition will be equally as valuable. This book should certainly be a part of the library of any company, agency or laboratory doing microbiological analyses of foods. Academic institutions should also have this book as a part of their library holdings, and it should be a key reference in any course in food microbiology. Finally, this book would also be an excellent and important addition to the personal library of any practicing food microbiologist.

Lloyd B. Bullerman
University of Nebraska
Lincoln, NE

Crisis Management: Planning for the Inevitable by Steven Fink

Crisis is defined as "a turning point for better or worse." Crisis management, as defined by the author, is planning for a crisis, a turning point, the art of removing much of the risk and uncertainty to allow you to achieve more control over your own destiny. Steven Fink points out that from a business-oriented point of view, a crisis is a situation that runs the risk of (1) escalating in intensity, (2) falling under close media or government scrutiny, (3) interfering with the normal operations of business, (4) jeopardizing the positive public image presently enjoyed by the company or its officers, and (5) damaging a company's bottom line in any way.

"Crisis Management" is the first book to detail the essentials of managing a crisis. The recent crises experienced by the food industry including Salmonella deaths in Chicago, Listeria deaths in the West Coast and glass in baby food make this book essential to food protection and safety officers. Steven Fink uses actual crises drawn from recent headlines, as well as his own crisis. He illustrates how to capitalize on the nature of the crisis and how any individual at any level in the management ladder can strive to create achievement out of adversity. The author does not use any examples from the food industry; although, in the last few years there have been some crises.

The book analyzes the anatomy of a crisis beginning with the early warning signals when many crises can be recognized and prevented. Mr. Fink shows common patterns and aspects of all crises and details how corporate managers can forecast their next crisis and develop critical contingency plans. He shows the readers how businesses should manage communications and decision making during a crisis, including hostile public demands for answers.

"Crisis Management" shows the strategic need for a crisis management plan that is well understood by every company executive. The author states that every executive should have at least two copies, one at the office, one at home.

All crises go through four distinct stages according to the author.

A.[The Pre-crisis stage: "when small warning signs can signal an impending disaster;"B.[The Acute crisis stage: "when crisis has erupted and only swift, sure management can minimize the damage to you and to your company;"C.[The Chronic crisis stage: "sharing the joys of a well managed crisis...but badly managed crisis destroys careers and even entire corporations;"D.[The Crisis Resolution stage: "when business returns to normal, until the next crisis."

Finally, "Crisis Management" takes an analytical and detailed look at four management crises, none of them from the food industry.

This book is essential reading to all those food professionals responsible for food protection, consumer safety and product quality. In addition, this is a must read book for all corporate officers and management personnel who will be involved in every potential crisis. A very timely book that will help food companies prevent catastrophic outcomes of mismanaged crises.

Ricardo J. Alvarez
Pizza Hut, Inc.
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International Association of Milk, Food & Environmental Sanitarians, Inc.

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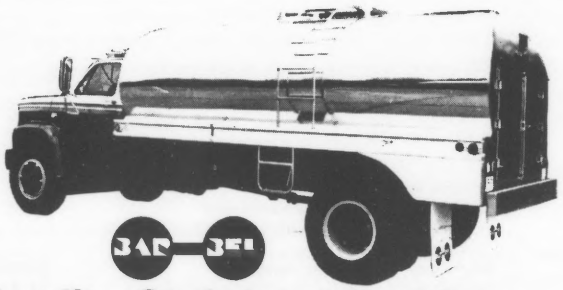

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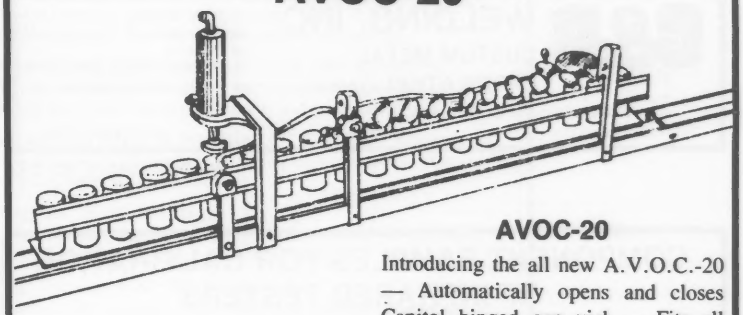

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Abstracts of papers in the January Journal of Food Protection

To receive the* Journal of Food Protection *in its entirety each month call 1-800-525-5223, ext. A or 515-232-6699, ext. A in Iowa.

Comparison of Procedures for Isolating *Listeria monocytogenes* in Soft, Surface-Ripened Cheese, Michael P. Doyle and Jean L. Schoeni, Food Research Institute, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 50:4-6

Ninety samples of soft, surface-ripened cheese from a lot previously identified to contain *Listeria* were assayed for *Listeria monocytogenes* by three procedures. These included: (a) cold enrichment, (b) the Food and Drug Administration enrichment procedure, and (c) the selective enrichment procedure of Doyle and Schoeni (Appl. Environ. Microbiol. 15:1127, 1986). *L. monocytogenes* was isolated from 41 of the 90 cheese samples. The organism was isolated from only 9 of the 41 *L. monocytogenes*-positive samples by more than one procedure. Most isolations (21) were made by the cold enrichment procedure, with 16 and 13 isolations made by the FDA and Doyle-Schoeni procedures, respectively. In most instances, the organism was isolated from a cheese sample by only one procedure.

Behavior of *Listeria monocytogenes* During the Manufacture and Ripening of Cheddar Cheese, Elliot T. Ryser and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 50:7-13

The ability of *Listeria monocytogenes* to survive the Cheddar cheesemaking process and persist during ripening of cheese was examined. Pasteurized whole milk inoculated to contain 5×10^2 cells of *L. monocytogenes* [strain Scott A, V7 or California (CA)]/ml was made into stirred-curd Cheddar cheese in a pilot-plant-sized vat. Cheese was ripened at 6 or 13°C. *Listeria* counts were obtained by surface-plating samples diluted in Tryptose Broth (TB) on McBride Listeria Agar (MLA). Initial TB dilutions were stored at 3°C and plated on MLA after 2, 4, 6 and 8 weeks if the organism was not detected with the original plating on MLA. Selected *Listeria* colonies from each sample were confirmed biochemically. During Cheddar cheese manufacture, *Listeria* counts remained relatively constant at ca. 5×10^2/ml of milk. After pressing the curd overnight, numbers of *L. monocytogenes* increased to about 1×10^3/g. Generally, greatest numbers of *Listeria*, about 5×10^3 cells/g, were detected in cheese after 14 d of ripening. *Listeria* counts for all 3 strains decreased during further ripening and except for strain V7, no appreciable difference in survival occurred in cheese aged at 6 or 13°C. Strains Scott A, CA and V7 survived for as long as 224, 154 and at least 434 d, respectively, in Cheddar cheese of normal composition. Strains V7 and CA were uniformly distributed throughout another set of cheese blocks and numbers of *Listeria* decreased uniformly throughout blocks of cheese during 98 d of storage.

Comparison of Heat Resistance of *Listeria monocytogenes* in Milk as Determined by Two Methods, Catherine W. Donnelly, Elizabeth H. Briggs and L. Scott Donnelly, Department of Animal Science, University of Vermont, Burlington, Vermont 05405

J. Food Prot. 50:14-17

The thermal resistance of 3 strains of *Listeria monocytogenes* was compared using test tube versus sealed tube methods of thermal inactivation. All *L. monocytogenes* strains were rapidly inactivated in milk when survival was measured using sealed tube thermal inactivation methods. Calculated $D_{62°C}$ values ranged between 0.1-0.4 min for the three strains tested. In contrast, total inactivation of *L. monocytogenes* populations using test tube methods of thermal inactivation could not be accomplished within 30 min at 62°C. Extensive tailing of survivor curves was consistently observed. When an initial population of 5×10^6 *L. monocytogenes*/ml was heated at 72, 82, or 92°C, consistent survival of a population of 10^2-10^3 *L. monocytogenes*/ml after 30 min was observed. The results prove that the test tube method for measuring thermal resistance of *L. monocytogenes* is inaccurate. Reports of extraordinary heat resistance based upon this method are correspondingly inaccurate. *L. monocytogenes* cells, dispersed freely in milk, will not survive pasteurization.

Heat Resistance of *Talaromyces flavus* and *Neosartorya fischeri* Isolated from Commercial Fruit Juices, Virginia N. Scott and Dane T. Bernard, The National Food Processors Association, 1410 New York Ave., N.W. Washington, D.C. 20005

J. Food Prot. 50:18-20

The heat resistance of two molds believed to have survived the thermal process applied to two commercial "shelf stable" fruit juices was studied. *Neosartorya fischeri* had a D-value of 1.4 min at 190°F (87.8°C) and a z-value of 10°F (5.6°C). *Talaromyces flavus* had a D-value of 2.2 min at 195°F (90.6°C) and a z-value of 9.5°F (5.2°C). Under certain conditions, both molds possess sufficient heat resistance to survive commercial thermal processes if ascospores are present in sufficient numbers.

Effect of Sucrose, Fructose and Aspartame on Fortificant Iron Solubility in a Wheat Flake Cereal, D. B. Nadeau and F. M. Clydesdale, Department of Food Science and Nutrition, Massachusetts Agricultural Experiment Station, University of Massachusetts, Amherst, Massachusetts 01003

J. Food Prot. 50:21-24

The iron solubilizing effect of three sweeteners (sucrose, fructose and aspartame) in a processed wheat flake cereal fortified with either ferric orthophosphate, hydrogen-reduced or electrolytically-reduced elemental iron was evaluated at various stages during a simulated in vitro gastrointestinal digestion. Added sweetener had little influence on soluble iron over controls, regardless of pH, iron or sweetener source, although effects may have been masked by various cereal components known to complex iron.

Antioxidant Activity of Selected Spices Used in Fermented Meat Sausage, Bushra Al-Jalay, Greg Blank, Barry McConnell and Mohammed Al-Khayat, Department of Food Science, College of Agriculture, University of Baghdad, Abu-Ghraib, Iraq and Department of Food Science, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2

J. Food Prot. 50:25-27

The antioxidant activity of ten spices commonly used in the formulation of a fermented meat sausage (Pastourma) were evaluated using a hemoglobin peroxidation procedure involving safflower oil in a water emulsion (10%). Clove followed by rose petals and allspice exhibited the highest antioxidant index when used in a dry form. In an aqueous-based microbiological broth, cloves again showed the highest antioxidant index followed by black pepper, ginger and rose petals. Generally antioxidant indices were higher in emulsions containing dry spice than in an aqueous based microbiological broth.

Effects of Processing Equipment on Howard Mold and Rot Fragment Counts of Tomato Catsup, Ruth Bandler, Paris M. Brickey, Stanley M. Cichowicz, John S. Gecan and Philip B. Mislivec, Division of Microbiology, Food and Drug Administration, 200 C Street, S.W., Washington, D.C. 20204

J. Food Prot. 50:28-37

Two studies were done to determine the effects of processing equipment on Howard mold and rot fragment counts of tomato catsup. In a pilot plant study in 1980, batches of catsup with known cut-out rot levels were produced and processed through various types of comminution equipment. Urschel and Fitzpatrick mills and homogenizers at 500 to 700 and 1500 to 2000 psi increased mold counts more than twofold over the range of data obtained. Contrary to previous reports, Urschel mills increased rot counts significantly. A nationwide survey was conducted in 1983 to determine if similar effects would be found with well-characterized commercial products. Data were obtained on inline and finished products from 164 lots of catsup produced at 16 plants located across the country. Urschel and Fitzpatrick mills tended to increase mold counts over twofold and caused a slight increase in rot counts. High pressure homogenizers (≥2000 psi) tended to decrease mold counts; low pressure homogenizers (<2000 psi) increased them. Homogenization at any pressure reduced rot counts dramatically. Although mold counts were highest for catsup produced in the eastern United States and lowest for catsup produced in the West, milling and low pressure homogenization were also most prevalent in the East and least prevalent in the West. When the effects of these types of comminution were removed, the difference between regions diminished. Compared with the norm, rainfall levels for the growing regions involved in this survey were fairly typical.

Molds and Tenuazonic Acid in Fresh Tomatoes Used for Catsup Production, Philip B. Mislivec, Verneal R. Bruce, Michael E. Stack and Ruth Bandler, Division of Microbiology and Division of Contaminants Chemistry, Food and Drug Administration, Washington, D.C. 20204

J. Food Prot. 50:38-41

The mold flora was determined for 146 samples of fresh but visibly moldy tomatoes collected from sorting belts in tomato catsup processing plants in California and in Midwestern and Eastern United States. Mold found in 141 of the samples included at least 22 genera, principally *Alternaria, Aspergillus, Cladosporium, Fusarium* and *Penicillium,* and 51 species. The California tomatoes were dominated by *Geotrichum candidum* and species of *Aspergillus* and *Penicillium;* Midwest and East tomatoes were dominated by *Alternaria.* This suggested that the predominant molds in tomatoes may differ, depending on geographical source. Tenuazonic acid (TA), a toxic metabolite of *Alternaria* spp., was found in 73 of the samples at a range of 0.4 to 69.7 (average 4.94) μg/g of moldy tissue; however, *Alternaria* spp. were not found in 35 of the 73 TA-positive samples. It is possible that other molds may produce TA or that the toxin-producing *Alternaria* died off before our sampling.

Influence of Carbon Substrates on Lactic Acid, Cell Mass and Diacetyl-Acetoin Production in *Lactobacillus plantarum,* Thomas J. Montville, Mary Elizabeth Meyer and Amy Han-Ming Hsu, Department of Food Science, New Jersey State Agricultural Experiment Station, Cook College, Rutgers University, New Brunswick, New Jersey 08903

J. Food Prot. 50:42-46

Production of diacetyl-acetoin, lactic acid and cell mass by *L. plantarum* strains ATCC 8014, ATCC 14431, ATCC 4008 and ATCC 8041 were examined in the growth medium of Craig and Snell (J. Bacteriol. 61:283,1951) containing glucose, lactose, citrate or pyruvate as substrates. The yield coefficient, μM lactate produced per mg cell dry weight, averaged 73.4 for glucose-grown cells and 64.9 for lactose-grown cells with no significant inter-strain difference. Strains that produced higher lactic acid concentrations did so because they produced more cell mass. Glucose and lactose reduced diacetyl-acetoin synthesis in all strains except 8041. Diacetyl-acetoin synthesis doubled when strains 14431 and 8014 were grown in medium containing 20 mM citrate, but was not markedly affected in

strains 4008 and 8041. Pyruvate stimulated diacetyl-acetoin synthesis in all four strains 10- to 20-fold. Conversion of pyruvate to diacetyl and acetoin was ≥30% of the theoretical molar yield for strains 8014, 8041 and 14431 grown in the presence of 20 mM pyruvate.

Evaluation of the Microbial Quality of Raw Milk, R. B. Maxcy and R. J. Paul, Department of Food Science and Technology, University of Nebraska-Lincoln, Lincoln, Nebraska 68583-0919 and Mid-America Dairymen, Inc., Omaha, Nebraska

J. Food Prot. 50:47-50

Commercial evaluation of the microbial quality of raw milk presents a major challenge, and new methods are burdened by being compared to imprecise presently used standard methods. Extensive comparisons in commercial and research laboratory environments were made using a method that involved direct enumeration of single cells in comparison to colony forming units. The correlations were from 0.50 to 0.99 depending on treatment of the data. Repetition of all tests on milk from individual farms indicated that inherent variation in quality at the farm, sampling, testing, and evaluating the results showed the extreme inadequacy of the presently established methods of grading raw milk. More frequent tests with appropriate averaging would improve the likelihood of correct decisions on quality grade.

***Salmonella, Campylobacter jejuni,* and *Yersinia enterocolitica* in Raw Milk,** Candace McManus and John M. Lanier, Minneapolis Center for Microbiological Investigations, Minneapolis, Minnesota 55401

J. Food Prot. 50:51-55

Raw milk samples collected from bulk tank trucks of milk suppliers in Wisconsin, Michigan, and Illinois were analyzed for *Salmonella, Campylobacter jejuni,* and *Yersinia enterocolitica. Salmonella* spp. were isolated from 32 (4.7%) of 678 samples, and *C. jejuni* was found in one (0.4%) of 237 samples. Although *Y. enterocolitica* was recovered from 114 (48.1%) of 237 samples, all isolates were environmental, nonvirulent strains.

Effect of a Short Cold Storage on Frequency of Spoilage in Pasteurized (Perishable) Canned Meat Products Subjected to the Incubation Test, S. Kafel and E. Jozwik, The Institute of Food and Nutrition, ul. Powsinska 61/63, 02-903 Warsaw, and Agro-Technical Academy, Faculty of Veterinary Medicine, 10-957 Olsztyn-Kortowo, Poland

J. Food Prot. 50:56-58

Investigations were carried out in 6 meat processing plants in Poland on the effect of a short storage period on the results of the incubation test of various canned pasteurized meat products. From the daily consignments, 1% of the cans was reserved within 1-3 d of production and incubated at 37°C for 3 d. The remaining cans of the consignments were stored at around 8°C. When spoilage resulted in one or more of the incubated cans from any consignment, about 2% of other cans from that consignment were taken, and the incubation test was repeated. These later incubation tests were initiated 7-10 d after the date of production. From among 4,322 cans subjected to first incubation test 980 (22.67%) produced swells but in the repeated incubation carried out on 8,290 cans only 347 (4.18%) became swollen. It is concluded that the bacteria responsible for spoilage of canned pasteurized meat products may disappear or lose their ability to spoil these products during the storage under refrigeration.

Detection of Salmonellae in Foods with an Enzyme Immunometric Assay, G. F. Ibrahim and M. J. Lyons, New South Wales Department of Agriculture, Hawkesbury Agricultural Research Unit, Richmond, N.S.W., 2753, Australia

J. Food Prot. 50:59-61

The efficacy of an enzyme-immunometric assay (EIMA) was investigated against a standard cultural method (SCM) for *Salmonella* detection in 82 food samples. Cultures of the food samples were assayed by EIMA after preenrichment and again after selective enrichment. Testing of preenrichment cultures by EIMA was unreliable as only 7 *Salmonella*-positive samples were detected. However, full agreement between EIMA and SCM was obtained when the selective enrichment cultures were assayed by EIMA, resulting in the identification of 24 *Salmonella*-positive samples.

***Bacillus cereus* Contamination of Seeds and Vegetable Sprouts Grown in a Home Sprouting Kit,** Stanley M. Harmon, Donald A. Kautter and Haim M. Solomon, Division of Microbiology, Food and Drug Administration, Washington, D.C. 20204

J. Food Prot. 50:62-65

Sprouting seeds (alfalfa, mung bean and wheat) were purchased at local health food stores and examined for *Bacillus cereus* by the official AOAC method. Of 98 units collected, 56 (57%) were positive for *B. cereus* at levels ranging from 3 to >500 per g. Population levels of *B. cereus* on sprouts grown from naturally contaminated seeds in a home sprouting kit ranged from a mean of $\log_{10}$ 3.72 for alfalfa to 5.39 for wheat; the $\log_{10}$ mean for mung bean sprouts was 4.52. Washing contaminated sprouts for 10 min with warm tap water as recommended by the manufacturer of the sprouting kits reduced the *B. cereus* count for mung bean sprouts by approximately one log unit but was less effective for wheat sprouts. *B. cereus* populations large enough to cause food poisoning ($>10^5$/g) frequently remained on wheat sprouts even after three wash cycles, and significant numbers of viable *B. cereus* remained on wheat sprouts even after cooking for 20 min.

Low Incidence of *Aeromonas* sp. in Livestock Feces, Norman J. Stern, E. S. Drazek and S. W. Joseph, U.S. Department of Agriculture, Agricultural Research Service, R. B. Russell Agricultural Research Center, P.O. Box 5677, Athens, Georgia 30613 and University of Maryland Department of Microbiology, College Park, Maryland

J. Food Prot. 50:66-69

Pig, beef, sheep and turkey fecal specimens were assayed for recovery of inoculated *Aeromonas* sp. by directly plating the samples on five different agar media. Of these, starch-ampicillin was optimal with respect to selectivity and ability to differentiate from other resident microflora. Generally, the numbers of inoculated *Aeromonas* sp. recovered on starch-ampicillin agar were similar to those recovered on brain heart infusion and blood ampicillin agar media, and were 10^1 to 10^3 greater than the recovery rate on either MacConkey-ampicillin or cefsulodin-irgasan-novobiocin agars. The sensitivity for the direct recovery of *Aeromonas* sp. from inoculated beef feces with naturally contaminating microflora, using streaked starch-ampicillin agar medium, was between 10^2 and 10^3 cells per gram. Using starch-ampicillin agar, the incidence of *Aeromonas* detected from feces of beef, pig, sheep and turkey held at the Beltsville Agricultural Research Center was one of 32, none of 22, none of 24 and three of 21, respectively. Based upon current taxonomic criteria, the isolate from the beef feces had characteristics consistent with both *Aeromonas sobria* and *Aeromonas caviae,* whereas three isolates from turkey feces were identified as *A. caviae* or *Aeromonas hydrophila*. The organism was isolated from five of five packages of ground beef from retail sources. The discrepancy in the consistent presence of the organism in retail meat suggests that many of the food isolates are probably not of fecal origin.

A Review of the Sealworm Problem: Biology, Implications and Solutions, Hannes Hafsteinsson and Syed S. H. Rizvi, Institute of Food Science, Stocking Hall, Cornell University, Ithaca, New York 14853

J. Food Prot. 50:70-84

The life cycle and geographic distribution of the sealworm (*Phocanema decipiens*) are reviewed. Also discussed is the temperature tolerance of the third stage larva as well as its public health implications. It is concluded that there ought to be no public health hazards associated with the sealworm as long as people continue to process seafood properly. Correlation between the increase in the grey seal population and the increase in the rate of sealworm infestation in cod over the last decades as well as possible biological solutions to the problem also are discussed. Rate of infection is similar to Eastern Canadian waters, British waters, of the coast of Norway, and around Iceland. Also reviewed are the current detection methods, their limitations, potential alternative technique as well as the properties of the sealworm involved. Pictures taken, with the Scanning Laser Acoustic Microscope, of sealworm embedded in 2.5- and 4-cm thick cod tissue, are presented.

Calendar

1987

January 12-21, 37TH ANNUAL UNIVERSITY OF MARYLAND ICE CREAM SHORT COURSE, to be held at the Animal Sciences Center, College Park, Maryland. For more information contact: Dr. James T. Marshall, Department of Animal Sciences, University of Maryland, College Park, Maryland 20742. 301-454-7843.

January 12-23, BAKING FOR ALLIED AND NON-PRODUCTION PERSONNEL, Manhattan, Kansas. Contact Registrar at 1-800-633-5137 or write: Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

January 14-17, THE U.S. DAIRY FORUM, to be held at the Bonaventure Hotel in Ft. Lauderdale, FL. For more information contact: Joe Dugan, MIF & IAICM, 888 Sixteenth Street, N.W., Washington, DC 20006. 202-296-4250.

January 19-21, PACKAGING, Manhattan, Kansas. Contact Registrar at 1-800-633-5137 or write Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

January 21-23, PATENT LAW FOR SCIENTISTS & ENGINEERS, New Jersey. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0964. 201-238-1600.

January 22, 37TH ANNUAL UNIVERSITY OF MARYLAND ICE CREAM CONFERENCE, to be held at the Adult Education Center, College Park, Maryland. For more information contact: Dr. James T. Marshall, Department of Animal Sciences, University of Maryland, College Park, Maryland 20742. 301-454-7843.

January 26-28, BAKING PRODUCTION TECHNOLOGY, location to be announced. Contact Registrar at 1-800-633-5137 or write: Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

January 26-28, COOLING TOWER TECHNOLOGY AND WATER TREATMENT, New Jersey. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, NJ 08816-0964. 201-238-1600.

January 26-29, BASIC FOOD PROCESSING SANITATION, Manhattan, Kansas. Contact Registrar at 1-800-633-5137 or write: Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

January 26-29, PRACTICAL COMBUSTION CONTROL & INSTRUMENTATION, New Jersey. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0964. 201-238-1600.

January 26-30, SPECIALIZED COOKIE PRODUCTION FOR THE RETAIL BAKER, Manhattan, Kansas. Contact Ellen Thurlo at 1-800-633-5137 or write: Ellen Thurlo, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

January 27-30, INDUSTRIAL MEMBRANE TECHNOLOGY, East Brunswick, New Jersey. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0964. 201-238-1600.

February 4-5, FOOD PROCESSORS' SANITATION WORKSHOP, to be held at the Holiday Inn, Santa Nella, CA. For more information contact: Kathryn J. Boor, Food Science and Technology, University of California, Davis, CA 95616. 916-752-1478.

February 5-7, FOOD ADDITIVES, THE CHANGING CLIMATE? 1ST INTERNATIONAL CONGRESS, to be held at the Hilton Hotel, Vienna, Austria. For more information contact Secretariat of the Food Additives, The Changing Climate, 1st International Congress, 30 Deane Way, Ruislip, Middlesex HA4 8SX, England.

February 6, 1st ANNUAL MEETING OF THE GEORGIA ASSN. OF FOOD & ENVIRONMENTAL SANITARIANS, to be held at Chick-Fil-A, 5200 Buffington Rd., Atlanta, GA. For more information contact: Dr. Paul Gopal at 404-262-2729.

February 9-12, BAKING TECHNOLOGY, New Jersey. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0257. 201-238-1600.

February 9-13, A SEMINAR IN BAKERY MANAGEMENT, to be held in Manhattan, KS. For more information, contact: Mrs. Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

February 10-11, OREGON DAIRY INDUSTRIES ANNUAL CONFERENCE, to be held at the Red Lion Inn, Springfield, OR 97477. For more information contact: June Daley, Exec. Secretary, Oregon Dairy Industries, 503-754-3131.

February 11-12, DAIRY AND FOOD INDUSTRY CONFERENCE: THE OHIO STATE UNIVERSITY. For information contact John Lindamood, Department of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210-1097.

February 18-20, PATENT LAW FOR SCIENTISTS & ENGINEERS, Denver, Colorado. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0964. 201-238-1600.

February 19, WESTERN NEW YORK IFT SYMPOSIUM, Pest Management and Sanitation, Rochester, NY. For more information contact Donald L. Downing, Cornell University - NYSAES, Geneva, NY 14456. 315-787-2273.

February 23-25, ABC RESEARCH, 13TH ANNUAL TECHNICAL SEMINAR. For more information contact Sara Jo Atwell, ABC Research Corporation, P.O. Box 1557, Gainesville, FL 32602. 904-372-0436.

February 23-25, KAMFES 1987 EDUCATIONAL CONFERENCE, to be held at the Louisville, Kentucky, Executive Inn. For more information contact: Bland Doris, 711 Cottonwood Drive, Bowling Green, KY 42101.

February 23-26, INDUSTRIAL MEMBRANE TECHNOLOGY, Los Angeles, California. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0964. 201-238-1600.

February 24-27, CONTRACTING & CONTRACT MANAGEMENT OF PROCESS PLANTS, Houston, TX. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, NJ 08816-0964. 201-238-1600.

March 2-5, SENSORY EVALUATION, New Jersey. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0257. 201-238-1600.

March 3-4, VIRGINIA ASSOCIATION OF SANITARIANS AND DAIRY FIELDMEN'S ANNUAL MEETING, to be held at Virginia Polytechnic Inst. and State University. For more information contact: W. J. Farley, Rt. 1, P.O. Box 247, Staunton, VA 24401. 703-434-3897.

March 9-11, FOOD TEXTURE TECHNOLOGY, New Jersey. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0257. 201-238-1600.

March 9-11, NUTRITIONAL ASPECTS OF FOOD PROCESSING, New Jersey. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0257. 201-238-1600.

March 10-12, WESTERN NEW YORK IFT SYMPOSIUM, Freezing Technology, Geneva, NY. For more information contact: Donald L. Downing, Cornell University - NYSAES, Geneva, NY 14456. 315-787-2273.

March 15-18, AMERICAN CULTURED DAIRY PRODUCTS INSTITUTE ANNUAL MEETING AND CONFERENCE/CULTURES AND CURDS CLINIC/INTERNATIONAL CULTURED DAIRY PRODUCTS EVALUATION SESSIONS, Nashville, Tennessee. For more information contact: Dr. C. Bronson Lane, ACDPI, P.O. Box 7813, Orlando, Florida 32854. 305-628-1266.

March 18, INDIANA DAIRY INDUSTRY CONFERENCE. For more information contact: James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

March 19-20, MOISTURE MANAGEMENT IN FOOD SYSTEMS, New Jersey. For more information contact: The Center for Professional Advancement, Box H, East Brunswick, New Jersey 08816-0257. 201-238-1600.

March 23-27, MID-WEST WORKSHOP IN

MILK AND FOOD SANITATION, The Ohio State University. For more information contact: John Lindamood, Department of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210-1097.

March 25-27, MICHIGAN ENVIRONMENTAL HEALTH ASSOCIATION ANNUAL MEETING, to be held at the Hilton Hotel, 28th St., Grand Rapids, MI. For more information contact: Ike Volkers, Environmental Health, Michigan Dept. of Health, 3500 N. Logan, Lansing, MI 48909. 517-335-8268.

March 26, WESTERN NEW YORK IFT SYMPOSIUM, Better Process Control School Refresher, Rochester, NY. For more information contact: Donald L. Downing, Cornell University - NYSAES, Geneva, NY 14456. 315-787-2273.

March 31 - April 1, WESTERN FOOD INDUSTRY CONFERENCE, to be held at the University of California, Davis, CA. For more information contact: Robert Pearl, Conference Chairman, 916-752-0980 or Shirley Rexroat, Conference Coordinator, Department of Food Science and Technology, University of California, Davis, CA 95616.

April 6-8, FLORIDA ASSN. OF MILK, FOODS AND ENVIRONMENTAL SANITARIANS, INC. EDUCATIONAL CONFERENCE, to be held at the Gainesville Hilton, Gainesville, FL. For more information contact Dr. Franklin Barber at 904-428-1628.

April 7-8, WESTERN NEW YORK IFT SYMPOSIUM, Wine Industry Workshop, Rochester, NY. For more information contact Donald L. Downing, Cornell University - NYSAES, Geneva, NY 14456. 315-787-2273.

April 22-24, SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION ANNUAL MEETING, to be held in Aberdeen, SD. For more information contact: Stan Iwagoshi, South Dakota Dept. of Health, 1320 S. Minnesota Ave., Suite A, Sioux Falls, SD 57105. 605-335-5037.

April 27-30, AOAC SPRING TRAINING WORKSHOP AND EXPOSITION, to be held at the Skyline Hotel, 101 Lyon Street, Ottawa, Ontario, Canada. For more information contact: Graham MacEachern, Agriculture Canada, Laboratory Service Building 22, Central Experimental Farm, Ottawa, Ontario, Canada K1A-0C5 (613) 994-1991 or James Lawrence, Health & Welfare Canada, Health Protection Branch, Tunneys Pasture, Ottawa, Ontario, Canada K1A-0L2. 613-990-8495.

April 29, FOOD SAFETY AND SANITATION WORKSHOP FOR THE FOOD PROCESSING AND FOOD SERVICE INDUSTRIES, to be held at the Inn at the Park, Anaheim, CA. For more information contact: Kathryn Boor, Food Science and Technology, UCD, Davis, CA 95616. 916-742-1478.

April 29, CORNELL'S INSTITUTE OF FOOD SCIENCE SPRING CONFERENCE, to be held at the White Plains Hotel in White Plains, NY. For more information contact: Dr. John Kinsella, Chairman, Institute of Food Science, Dept. of Food Science, Stocking Hall, Ithaca, NY 14853. 607-255-7616.

May 11-14, WESTERN NEW YORK IFT SYMPOSIUM, Better Process Control School, Rochester, NY. For more information contact: Donald L. Downing, Cornell University - NYSAES, Geneva, NY 11456. 315-787-2273.

May 11-14, PURDUE ASEPTIC PROCESSING AND PACKAGING WORKSHOP. For more information contact: James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

May 17-20, CANADIAN INSTITUTE OF FOOD SCIENCE & TECHNOLOGY ANNUAL MEETING, to be held at the Hamilton Convention Centre, Hamilton, Ontario. Theme: Biotechnology - Challenge for the Food Industry. For more information contact: Dr. V. F. Rasper, Conference Chairman, Department of Food Science, University of Guelph, Guelph, Ontario N1G 2W1. 519-824-4120.

May 18-20, THE PA DAIRY SANITARIANS & LABORATORY DIRECTORS ANNUAL MEETING, to be held at Penn State University, J. O. Keller Convention Center, State College, PA. For more information contact: Audrey Throne, Hershey Choc. Co., 19 E. Chocolate Ave., Hershey, PA 17033. 717-534-4031.

July 10-18, SEVENTH INTERNATIONAL WORKSHOP ON RAPID METHODS AND AUTOMATION IN MICROBIOLOGY, to be held at Kansas State University, Manhattan, KS. For more information contact: Dr. Daniel Y.C. Fung, Director of the workshop. 913-532-5654.

August 2-6, IAMFES 74TH ANNUAL MEETING, to be held at the Disneyland Hotel, Anaheim, California. For more information contact Kathy R. Hathaway, IAMFES, Inc., PO Box 701, Ames, IA 50010. 800-525-5223, In Iowa 515-232-6699.

August 9-14, ANNUAL MEETING OF THE SOCIETY FOR INDUSTRIAL MICROBIOLOGY, to be held at The Hyatt Regency Hotel, Baltimore, Maryland. For more information contact: Mrs. Ann Kulback, SIM, P.O. Box 12534, Arlington, VA 22209. 703-941-5373.

September 1-2, FOOD PROCESSING WASTE CONFERENCE, Radisson Hotel, Atlanta, GA. For more information contact: Edd Valentine or Chuck Ross, Georgia Tech. Research Inst., Economic Development Laboratory, Environmental, Health and Safety Division, Atlanta, GA 30332. 404-894-3412.

September 24-25, SWEETENERS IN FOODS: SENSORY, PROCESSING AND HEALTH ASPECTS, to be held at Kansas State Union, Kansas State University, Manhattan, KS. For more information contact: Dr. Carol Setser or Dr. Karen Penner, Department of Foods and Nutrition, Justin Hall, Kansas State University, Manhattan, KS. 913-532-5508.

October 5-9, 13TH INTERNATIONAL SYMPOSIUM OF THE IUMS-ICFMH & FECS-WPFC, "Toxins in Foodborne Disease" and "Microbiology of Drinking Water," to be held in Halkidiki, Greece. For more information contact: Prof. J. A. Papadakis, Omirou 24, 10672 Athens, Greece.

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October 9-13, AACC ANNUAL MEETING, to be held at the Hotel InterContinental San Diego, in San Diego, California. For more information contact: Raymond J. Tarleton, American Assoc. of Cereal Chemists, 3340 Pilot Knob Road, St. Paul, MN 55121. 612-454-7250.

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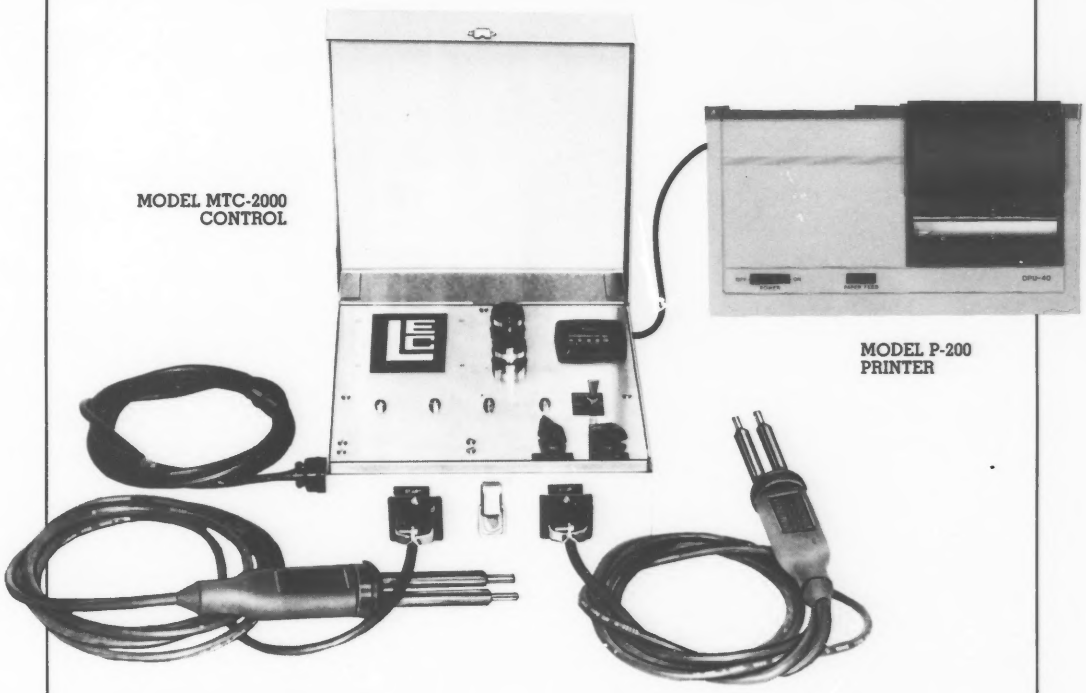

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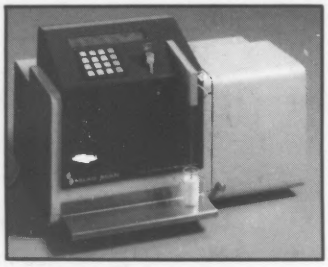

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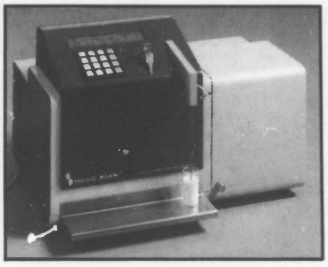

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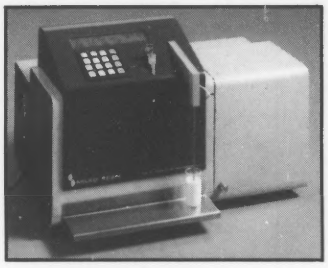

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