ISSN:0273-2866
Box 701
Ames, Iowa 50010

October 1987
Vol. 7, No. 10
Pages 497-560
$6.00

Dairy and Food Sanitation®

A Publication of the International Association of Milk, Food and Environmental Sanitarians, Inc.

When It Comes to Stylish Sushi, It's Safer to Be Square

From Tainted Feed to Mother's Milk

IAMFES Award Nominations Due

Solid Waste Solutions Debated at FPI Conference

AACC to Hold 72nd Annual Meeting in Nashville, Tennessee

Standard Methods Revisions Begun

Call for Research Papers for the 1988 Annual Meeting in Tampa, Florida. See the blue abstract pages inside. Also, use the abstract forms if you are entering the Developing Scientist Competition.

Pasteur would have loved it!

Announcing the new Lumenite Microprocessor Based Pasteurization Testing System. Its computer brain tabulates test results and prints them out!

MODEL MTC-2000 CONTROLLER— with digital readout to 1/100 second.

Lumenite's new Milk Pasteurization Testing Kit measures short time pasteurization periods to 1/100 of a second accuracy. Featuring solid state electronics and 10 turn digital calibration controls, the microprocessor based system tabulates and prints results on the attached printer. The operator merely presses the tabulate button, and the MTC-2000 control prints the individual test times, the mean average, the median average, the maximum difference between tests, and more!

Call or write today for complete information on the system specified by hundreds of health departments and dairy processors across the country.

LUMENITE ELECTRONIC CO.

2331 North 17th Avenue, Franklin Park, Illinois 60131

Phone (312) 455-1450 or **1-800-323-8510**

Please circle No. 200 on your Reader Service Card

IAMFES

Announcement
Developing Scientist Awards

(Supported by Sustaining Members)

Awards

Five (5) awards will be presented: 1st place, $500 and a plaque; 2nd place, $200 and a certificate; 3rd place, $100 and a certificate; 4th place, $50 and a certificate; 5th place, $50 and a certificate.

Purpose

1. To encourage graduate students to present their original research at the IAMFES annual meeting.
2. To foster professionalism in graduate students through contact with peers and professional members of IAMFES.
3. To encourage participation by graduate students in IAMFES and the annual meeting.

Who Is Eligible

Graduate students enrolled in M.S. or Ph.D. programs at accredited universities or colleges whose research deals with problems related to environmental, food and/or dairy sanitation, protection and safety. Candidates cannot have graduated more than one (1) year prior to the deadline for submitting abstracts.

Criteria

1. A short abstract of the paper must be submitted to the IAMFES office by January 1 of each year. (Use the blue abstract forms from the October issue, if possible.)
2. The author must indicate on the abstract form the desire to be considered for the competition.
3. The paper and the student must be recommended and approved for the competition by the major professor or department head.
4. The paper must represent original research done by the student and must be presented by the student.
5. An extended abstract form will be sent to all who enter the competition, and must be completed and returned by the deadline date on that form.
6. Each student may enter only one (1) paper in the competition.
7. Papers are to be presented as oral papers and should be approximately fifteen (15) minutes in length with an additional five (5) minutes allowed for questions, for a total of twenty (20) minutes.
8. The use of slides or other visual aids is encouraged.
9. The papers will be judged by an independent panel of judges.
10. Awards will be presented at the annual IAMFES Awards Banquet.

Publishers of the *Journal of Food Protection* and *Dairy and Food Sanitation*

International Association of Milk, Food and Environmental Sanitarians Inc.

P.O. Box 701 - 502 E. Lincoln Way - Ames, Iowa 50010 - (515) 232-6699 - 1-800-525-5223 (outside of Iowa)

IAMFES Sustaining Members

Accurate Metering Systems, Inc., 1705 Carmen Dr., Elk Grove Vlg, IL 60007

Alex C. Fergusson Co., Spring Mill Drive, Frazer, PA 19355

Alfa-Laval, Inc., Agri-Group, 11100 North Congress Avenue, Kansas City, MO 64153

Alpha Chemical Services, Inc., P.O. Box 431, Stoughton, MA 02072

Anderson Chemical Co., Box 1041, Litchfield, MN 55355

Anderson Instrument Co., Inc., RD 1, Fultonville, NY 12072

Angenics, Inc., 100 Inman St., Cambridge, MA 02139

Aquafine, 25230 W. Ave. Stanford, Valencia, CA 91355

Associated Milk Producers, Inc., 830 N. Meacham Rd., Schaumburg, IL 60195

Babson Bros. Co., 2100 S. York Road, Oak Brook, IL 60521

Bactomatic, Inc., 719 Alexander Rd., P.O. Box 3103, Princeton, NJ 08540

BBL Microbiology Systems, P.O. Box 243, Cockeysville, MD 21030

Belmonte Park Laboratories, 1415 Salem Ave., Dayton, OH 45406

Bio Control Systems Inc., 21414 68 Ave. S., Kent, WA 98032

Borden, Inc., Dairy & Services Div., 16855 Northchase, Houston, TX 77060

Canada Packers, 5100 Timbelea Blvd., Mississauga, Ontario L4W 2S5 Canada

Capital Vial Corp., P.O. Box 611, Fonda, NY 12068

Cesco/Q-Controls, 93 Utility Court, Rohnert Park, CA 94928

Chem Bio Laboratories, 5723 West Fullerton Ave., Chicago, IL 60639

Chemland, Inc., Turlock, CA, Memphis, TN

Cherry Burrell Corp., 2400 6th St., SW, Cedar Rapids, IA 52406

Dairy & Food Labs Modesto, Inc., 1581 Cummins Dr., Suite 155, Modesto, CA 95351

Dairy Quality Control Inst., 2353 No. Rice St., St. Paul, MN 55113

Dairymen, Inc., 10140 Linn Station Road, Louisville, KY 40223

Darigold, 635 Elliott Ave. W., Seattle, WA 98109

Dean Foods, 1126 Kilburn Ave., Rockford, IL 61101

Difco Laborstories, P.O. Box 1058, Detroit, MI 48232

Diversey/Wyandotte, 1532 Biddle Ave., Wyandotte, MI 48192

Domino's Pizza, Inc., 30 Frank Lloyd Wright, Ann Arbor, MI 48198

Eastern Crown, Inc., P.O. Box 216, Vernon, NY 13476

Educational Testing Services, 225 Langhorne-Lardley Rd., Laughorn, PA 19047

Environmental Test Systems, Inc., P.O. Box 4659, Elkhart,IN 46514

Foss Food Technology Corporation, 10355 West 70th St., Eden Prairie, MN 55344

FRM Chem, Inc., P.O. Box 207, Washington, MO 63090

GAF, 1361 Alps Road, Wayne, NJ 07470

GENE-TRAK Systems, 31 New York Ave., Framingham, MA 01701

Gerber Products Co., 445 State St., Fremont, MI 49412

Gibco Laboratories, Inc., 231 Sutton St., No. Andover, MA 01845

Gist-Brocades USA, P.O. Box 241068, Charlotte, NC 28224

Henkel Corp., 300 Brookside Ave., Ambler, PA 19002

H. B. Fuller Co., Monarch Chemicals Div., 3900 Jackson St. NE, Minneapolis, MN 55421

Hurricorp/Alco, 1800 Industrial Blvd., Norman, OK 73070

IBA Inc., 27 Providence Rd., Millbury, MA 01527

Intersystems, Inc., 13330 "I" St., Omaha, NE 68137

Kendall Co., One Federal St., Boston, MA 02101

Kienzade Division, Economics Laboratory, Inc., 3050 Metro Drive, Suite 208, Bloomington, MN 55420

Maryland & Virginia Milk Prod. Assn., Inc., P.O. Box 9154 Rosslyn Station, Arlington, VA 22209

Medallion Labs, 9000 Plymouth Ave., Minneapolis, MN 55427

Metz Sales, Inc., 522 West First St., Williamsburg, PA 16693

Michelson Labs, 4555 Produce Plaza, Los Angeles, CA 90058

Mid America Dairymen, Inc., P.O. Box 1837 SSS, 800 W. Tampa, Springfield, MO 65805

Milk Marketing, Inc., P.O. Box 36050, Strongsville, OH 44136

Minnesota Valley Testing Laboratories, 326 Center St., New Ulm, MN 56073

Nalge Co., P.O. Box 365, Rochester, NY 14602

Nasco International, 901 Janesville Ave., Fort Atkinson, WI 53538

National Mastitis Council, 1840 Wilson Blvd., Arlington, VA 22201

National Milk Producers Federation, 1840 Wilson Blvd., Arlington, VA 22201

National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106

Norton Co., P.O. Box 350, Akron, OH 44309

Oregon Digital Systems Inc., 885 N.W. Grant Ave., Corrallis, OR 97330

Oxoid USA, Inc., 9017 Red Branch Rd., Columbia, MD 21045

Penicillin Assays, Inc., 36 Franklin St., Malden, MA 02148

Petrolane, 607 S. Blvd., Baraboo, WI 53913

The Pillsbury Company, 311 Second St., S.E., Minneapolis, MN 55414

Rexham Machinery Group, 5501 N. Washington Blvd., Sarasota, FL 34243

Ross Laboratories, 625 Cleveland Ave., Columbus, OH 43216

Seiberling Associates, Inc., 11415 Main St., Roscoe, IL 61073

Silliker Labs, 1304 Halsted St., Chicago Heights, IL 60411

SmithKline Animal Health Products, P.O. Box 2650, West Chester, PA 19380

Sparta Brush Co. Inc., P.O. Box 317, Sparta, WI 54656

Spectronix Ltd., P.O. Box 2556, Castro Valley, CA 94546

Stainless Fabrication, Inc., 429 N. Belcrest, Springfield, MO 65802

Tekmar Co., 10 Knollcrest Dr., Cincinnati, OH 45222

The Stearns Tech. Textile Co., 100 Williams St., Cincinnati, OH 45215

Thermaco, Inc., P.O. Box 2548, Asheboro, NC 27204-2548

3M/Medical-Surgical Div., 225-5S-01, 3M Center, St. Paul, MN 55144-1000

Trap-Ease, Inc., 3122 S. Maple St., Santa Ana, CA 92707

Universal Milking Machine Div., Universal Coops, Inc., Dairy Equipment Dept., P.O. Box 460, Minneapolis, MN 55440

Walker Stainless Equipment Co., 601 State St., New Lisbon, WI 53950

West Agro Inc., 11100 N. Congress Ave., Kansas City, MO 64153

Dairy and Food Sanitation (ISSN:0273-2866) is published monthly by the International Association of Milk, Food and Environmental Sanitarians, Inc., executive offices at PO Box 701, 502 E. Lincoln Way, Ames, IA 50010. Printed by Heuss Printing, Inc., 911 Second St., Ames, IA 50010. **Second-class postage paid at Ames, IA. Postmaster: Send address changes to IAMFES, 502 E. Lincoln Way, Ames, IA 50010-0701.**

Manuscripts: Correspondence regarding manuscripts and other reading material should be addressed to Kathy Hathaway, PO Box 701, Ames, IA 50010-0701. 515-232-6699.

"Instructions to Contributors" can be obtained from the editor.

Orders for Reprints: All orders should be sent to IAMFES, Inc., PO Box 701, Ames, IA 50010-0701. Note: Single copies of reprints are not available from this address; address reprint requests to principal author.

Business Matters: Correspondence regarding business matters should be addressed to Kathy R. Hathaway, IAMFES, PO Box 701, Ames, IA 50010-0701.

Subscription Rates: $75.00 per volume, one volume per year, January through December. Single copies $6.00 each. No cancellations accepted.

Sustaining Membership: A sustaining membership in IAMFES is available to companies at a rate of $375 per year, which includes $100 credit toward an ad in the "annual meeting issue" of the Journal, the July issue. For more information, contact IAMFES, PO Box 701, Ames, IA 50010-0701, 515-232-6699.

Membership Dues: Membership in the Association is available to individuals only. Direct dues are $33 per year and include a subscription to **Dairy and Food Sanitation.** Direct dues and the **Journal of Food Protection** are $58.00 Affiliate and International Membership include both journals for $58, plus affiliate dues. Student membership is $17.00 per year, with verification of student status, and includes Dairy and Food Sanitation. No cancellation accepted.

Claims: Notice of failure to receive copies must be reported within 30 days domestic, 90 days foreign. All correspondence regarding changes of address and dues must be sent to IAMFES, Inc., PO Box 701, Ames, IA 50010-0701, 515-232-6699.

Dairy and Food Sanitation

CONTENTS VOL. 7 No. 10 OCTOBER, 1987

Dairy and Food Sanitation, Vol. 7, No. 10, Pages 500-501 (October 1987)

Give 'em Air

Thomas L. Schwarz
Assistant Director for Program Development
Retail Food Protection Branch
Center for Food Safety and Applied Nutrition
U.S. Food and Drug Administration

In today's supermarket, a customer can buy mushrooms in many forms - fresh (bulk or plastic-wrapped), canned (metal cans or glass jars), frozen (paperboard cartons), or dried (bulk or cellophane packages). There are several varieties available, representing many countries' production. Some of these mushrooms, because of the way they are packaged, have the potential to cause serious illness.

Nearly every year, someone dies from eating improperly processed home-canned mushrooms. Occasionally, even commercially canned mushrooms have been "underprocessed", as evidenced by the costly product recalls which made headlines in the early seventies. The danger, of course, is from the ever present spores of *Clostridium botulinum*, the bacteria that causes botulism. These spores may not be inactivated unless canning is done properly. If these spores survive processing and end up in an anaerobic environment (with no free oxygen), such as in a can, they will germinate, grow and produce their deadly toxin.

The United States Food and Drug Administration (FDA) has established regulations for manufacturers to follow when processing mushrooms or other low acid foods in hermetically sealed containers. These regulations were spurred by the extensive mushroom recalls and by several outbreaks of botulism associated with other commercially canned food, notably vichyssoise soup. Industry compliance with these thermal processing requirements or those related to acidified foods (marinated mushrooms) means that today's commercially canned and bottled mushrooms should be safe foods.

Because mushrooms in anaerobic environments had a history of developing botulinum toxin, researchers at the Food Research Institute (FRI) of the University of Wisconsin decided in the early seventies to see if fresh mushrooms overwrapped with plastic film posed a potential problem; i.e. was there sufficient oxygen in the package so that *C. botulinum* could not grow and produce toxin. Such tests were important since packaged mushrooms were becoming a common item in the produce section of retail food stores.

In their experiments, FRI scientists inoculated fresh mushrooms with spores of *C. botulinum*, placed the mushrooms on paperboard trays and covered them with polyvinyl chloride (PVC) stretch film. This simulated the procedures used by mushroom packers and some retail food stores. Within three to four days, when the mushrooms were held at 20°C (68°F), they developed botulinum toxin. These mushrooms appeared edible and smelled normal, but were actually deadly. (It should be noted that, if the overwrapped mushrooms were held at refrigeration temperature, 4°C (39°F), no toxin was produced). Subsequent experiments found that one or two air holes in the overwrap prevented toxin development. Extensive work by the FDA found that packages with a one-eighth inch air hole sometimes became toxic. However, two one-eighth inch holes seemed to allow sufficient oxygen to enter so that *C. botulinum* did not grow and produce toxin.

To alleviate the potential problem with overwrapped mushrooms, FDA met in both 1975 and 1976 with the producers and packagers of fresh mushrooms. The available data were shared and a verbal agreement was reached. The industry agreed to offer for sale only packages of mushrooms with two or more air holes. FDA promised it would not then seek mandatory packaging regulation requiring such holes.

For the late seventies and early eighties, this "jawboned" agreement seemed to work. In 1986, however, several state regulatory agencies alerted FDA that mushrooms packages without air holes were again appearing in the marketplace. Immediately FDA approached mushroom industry through its trade association, the American Mushroom Institute. This group, through its newsletter, again informed its members about the need for air holes in the overwrap. It appears that the "slippage" may have been due to many new companies entering the lucrative mushroom supply business. Whatever the cause, it

seems that the problem is again under control.

The retail food store industry also has a part to play in the "big picture". The following are three steps which FDA recommends to retail food store operators to assure consumer safety:

- establish a product specification that packaged mushrooms must be ventilated;
- do not accept shipments that do not comply with this specification;

and

- do not put fresh mushrooms in airtight bags or containers.

These three simple steps, along with FDA's action with the producers should provide consumers of packaged fresh mushrooms with adequate protection from *C. botulinum*. Food store liability will be lessened. In short, when fresh mushrooms get enough air, consumers and food store operators can breathe easier, too.

References

1. Sugiyama, H. and Yang, K.H. (1976). Growth Potential of *Clostridium botulinum* in Fresh Mushrooms Packaged in Semipermeable Plastic Film, Appl. Microbiol. *30*, 964-969.
2. Kautter, D.A., et.al. (1978). Evaluation of the Botulism Hazard in Fresh Mushrooms Wrapped in Commercial Polyvinylchloride Film, J. Food Protect. *41*, 120-121.
3. Sugiyama, H. and Rutledge, K.S. (1978). Failure of *Clostridium botulinum* to Grow in Fresh Mushrooms Packaged in Plastic Film Overwraps With Holes, J. Food Protect. *41*, 348-350.

Dairy and Food Sanitation, Vol. 7, No. 10, Pages 502-503 (October 1987)

When It Comes to Stylish Sushi, It's Safer to Be Square

by Evelyn Zamula

(Member of FDA's Public Affairs Staff)
Reprinted from February 1987/FDA Consumer

A humorous Charles Lamb essay that was required reading in high school years ago attempted to explain how ancient man learned to prefer cooked meat to raw. Lamb tells how a boy liked to play with fire burned down his family's house, along with a litter of pigs that lived with them. When he touched the pigs to see if any of them had survived, he scorched his fingers and then licked them to cool them. To his surprise, his fingers tasted good. The word got around and thereafter houses in the village regularly burned down with pigs in them because everybody agreed that pigs tasted better cooked than raw.

Today, things have changed.

Upscale restaurants, meaning those that charge a lot and serve food a few notches above the local greasy spoon, have started a new trend - raw or undercooked protein foods. A menu may feature that old raw-meat lover's standby, steak tartare, a mixture of finely ground beef and spices, or carpaccio, a dish of transparent slices of raw beef dressed with olive oil and lemon juice. Underdone poultry, represented by thin slices of rare duck breast from which the blood still oozes or briefly cooked goose liver, may also be offered for the diner's delight.

The latest pet of gourmet chefs is fish so lightly broiled or sautéed that it's still translucent in the middle and often barely warm.

Consumers have been well-educated to the dangers of eating undercooked pork, and may be aware that they run a slight risk of tapeworm in eating raw or rare beef, or *salmonella* from poultry that is not thoroughly cooked or properly handled. However, raw or underdone fish may also pose some dangers.

Fish are a valuable source of nutrients, but sometimes they contain parasites that can cause illness. Hundreds of cases of parasitical diseases due to eating raw fish have been reported over the years in Japan, where sushi (strips of raw fish that have been rolled in cold cooked rice and seaweed) is a national dish. Outbreaks have also occurred in the Netherlands - the Dutch are fond of raw or lightly marinated herring known as green herring.

Except for the occasional Jewish or Scandinavian-born housewife who ingested a parasite while tasting raw gefilte fish or fish balls for seasoning, these diseases used to be almost unknown in the United States because most Americans ate fish well-cooked. But the growing popularity of undercooked fish or raw fish dishes such as sushi, sashimi, lomi lomi, ceviche, and the like has resulted in a growing number of cases of disease attributable to fish parasites.

Some of the common parasites that cause infection in humans are several species of fish tapeworm *(Diphyllobothrium)*. Many cases are seen in Japan, Scandinavia and eastern Canada, and some have been reported from the Great Lakes region (where freshwater fish may carry the parasite) and Alaska. But a few years ago epidemiologists with the U.S. Centers for Disease Control were alerted to an unusual outbreak of tapeworm disease in our Pacific states by a surge in requests for niclosamide, a drug that kills the worm in the body, available only from CDC at that time. Requests for the drug from California, Washington, Oregon, Alaska and Hawaii jumped from 17 in 1979 to 59 in 1980, while requests from the other 45 states rose only from 157 to 166. (Doctors can now prescribe the drug, so the exact incidence of fish tapeworm disease in recent years is unknown.)

To track down the source of infection, health officials telephoned 39 of those afflicted to find out what they had been eating. In 82 percent of the cases the offender was salmon, a popular ingredient in sushi. Rockfish, marketed as Pacific red snapper, was also implicated. Most of the afflicted said they had eaten fish raw, but a few said it had been pickled, smoked or cooked. In some cases, symptoms showed up almost immediately; in other cases, they appeared months after the fish was eaten.

Infection with the tapeworm, which can sometimes grow to be yards long, may cause abdominal cramps, diarrhea, nausea, fatigue and weight loss. Some people develop a vitamin B_{12} deficiency, because the tapeworm selectively absorbs this vitamin from the human host's intestine. But most people have few symptoms or none at all; they realize they're infected only when they pass the whole worm or segments of it in their stool.

There is no danger of tapeworm infection from properly canned or frozen fish. Cooking fresh fish until all parts of the fish have reached a temperature of 145 degrees Fahrenheit for at least five minutes, or freezing it at minus 4 degrees Fahrenheit for 72 hours will also kill the tapeworm. The usual methods of brining, which involves packing fish in layers of salt for at least three weeks, is also effective. Hot smoking, a process that in effect cooks the fish while it is being smoked, kills the parasite, but cold smoking, which uses no heat, won't.

Commercially prepared lox (smoked salmon) from the United States and Canada is both brined and smoked (with the exception of gravlax and belly lox) and poses no danger. But ceviche can be hazardous, because the lime juice used in the marinade doesn't kill the tapeworm.

FDA monitors salmon fishing and marketing practices in Alaska, which provides three-quarters of the salmon sold in this country. Normally the fish is canned or frozen, but an unusually good run of salmon in 1980 strained the facilities of salmon processors, so more salmon was shipped fresh to American markets. Those who ate it raw or undercooked ran a greater risk than usual of parasitic disease because the salmon were heavily infected with tapeworm that year. To determine whether salmon continued to be a health risk to American consumers, FDA began sampling fish sold in retail markets. In 1981, FDA sampled fresh sockeye salmon in Seattle and found no evidence of tapeworm, but lots of potentially infectious roundworms.

Eating raw or undercooked fish infected with roundworm larvae can result in anisakiasis - a disease more serious than tapeworm infection. Many species of fish carry these parasites, but, fortunately, most roundworms are found within a fish's internal organs. However, some are occasionally present in the flesh of most kinds of fish. In some fish, such as Pacific salmon, Atlantic cod and American Plaice, the flesh is *usually* infected. Proper treatment of the fish - as soon as it is caught - is critical. If freshly caught fish are refrigerated before their internal organs are removed, roundworms may migrate into the edible portions, increasing the risk of infection to the consumer. The worms (belonging to or related to the genus *Anisakis*) are light beige or white and about an inch or so long. They are sometimes so noticeable that they can be picked out of the flesh. Other times they are hard to see because they may be tightly coiled into a helix just one-quarter inch long or in a loose spiral. Or they may closely resemble tiny muscle fibers.

People who have tapeworm infections can be cured by drugs, but those who've picked up a roundworm are not so lucky. Currently, no drug is available for anisakiasis. In some cases the worm is ingested and then passed out of the body, causing few or no symptoms. In other instances the unfortunate person who swallows a roundworm is almost immediately aware that something is amiss. The roundworm is equipped with a boring tooth, and what it likes to bore into is the wall of the stomach or intestine. Severe, sporadic stomach pain, nausea and vomiting may show up as early as one hour after eating infected raw fish. If anisakiasis is suspected and the worm is not coughed up or vomited out, the doctor can look into the stomach with an endoscope (a medical device that consists of a tube and an optical system for observing the inside of the body cavity) and remove the roundworm with forceps. But sometimes the worm can't be removed by endoscopy, because it has burrowed into the stomach or intestinal wall, where is remains until it eventually dies. In the process, the worm provokes an allergic response by the body and sometimes produces damage out of all proportion to it size. Individuals with acute gastric anisakiasis may experience symptoms that resemble those of ulcers, Crohn's disease, inflammation of the stomach, or stomach cancer. Surgery is often necessary to see what's causing the problem and to remove the lesions resulting from the infection.

Again, most reports of roundworm infections come from the Netherlands and Japan, where herring, mackerel and horse mackerel are the chief carriers. The first documented case in the United States occurred in 1972 in a Swedish-born housewife who routinely prepared salted herring and salmon for her family and sampled the fish in the process. Severe abdonimal pain led her to seek medical advice. Surgery revealed that the roundworm had penetrated the tissues around the colon and had stimulated the formation of a granuloma (tumor) that had surrounded the worm and probably killed it.

Few U.S. cases have been reported since then, but 12 Americans were infected in 1985, most of them from the Pacific states. More fish are infected, and thus more humans as well, on the West Coast than the East, because the primary hosts for the roundworm are marine mammals commonly found in the Pacific, such as seals, porpoises, sea lions and whales. (Ironically, recent efforts to protect these species may increase the incidence of fish roundworm.) The parasite matures and reproduces in the primary hosts. Humans interrupt the parasite's life cycle by eating fish, the intermediate hosts for the roundworm. Fish acquire the parasite by eating small fish or tiny shellfish that carry the worm larvae.

The *Anisakis* worm is a tough customer. It can live 51 days in vinegar and six days in a 10 percent solution of formalin, a mixture of formaldehyde and alcohol. Thorough cooking until the internal temperature of the fish reaches 145 degree Fahrenheit, however, will kill the parasite.

The size of the fish determines how long it must be cooked. This means disregarding the old rules for cook-

con't. on p. 505

Dairy and Food Sanitation, Vol. 7, No. 10, Pages 504-505 (October 1987)

From Tainted Feed to Mothers' Milk

A Pesticide's Devastating Journey Through the Food Chain

by Dixie Farley
(A Member of FDA's Public Affairs Staff)
Reprinted from March 1987/FDA Consumer

Times became difficult last year for many people in and around Van Buren, Ark., when dairy herds on nearly 200 farms were quarantined. Farmers watched their livelihood literally go down the drain as they were forced to dump milk by the thousands of gallons. Milk and milk products were recalled from eight states, and samples were analyzed. Even nursing mothers were advised to have their milk tested.

The problem was a pesticide called heptachlor. It had contaminated cattle feed produced in Van Buren and, from there, had traveled up the food chain to the milk.

Heptachlor causes cancer in animals, may cause cancer in humans, and, in fact, is of sufficient health concern that it's banned from all uses except killing termites. In breast milk, heptachlor poses a special risk because the body absorbs it rapidly and can store it in fatty tissue for a year or more. Breast milk, like cow's milk, is rich in fat, so it becomes a major route for elimination of heptachlor from the mother's body. A baby fed heptachlor-contaminated breast milk could, in fact, have heptachlor levels greater than the mother.

FDA's New Orleans laboratory discovered heptachlor in seed and feed samples collected during an inspection of feed facilities in Van Buren during January and February 1986. Two Van Buren firms were involved: J.E.W., Inc., bought seed and grain to make a fuel-grade alcohol called gasohol and then sold the mash byproduct to Valley Feeds, Inc., which, in turn, sold it as an animal feed to farmers in Arkansas, Missouri and Oklahoma. Heptachlor was in the seed J.E.W. bought, and it was carried through to the finished feed.

FDA had identified a serious problem. But how widespread was it? To find out, FDA investigators and scientists from New Orleans, Dallas, Kansas City, Los Angeles, Minneapolis, Buffalo, Seattle, and Atlanta - with cooperation from state and local government agencies - collected and analyzed samples from all milk and milk products produced within 150 miles of Van Buren, more than 1,400 samples in all. Eventually, the output of the quarantined herds was recalled from outlets in Arkansas, Kansas, Louisiana, Mississippi, Missouri, Oklahoma, Tennessee and Texas.

On the recommendation of FDA, a U.S. attorney in Arkansas obtained a consent decree under which J.E.W. and Valley Feeds agreed to stop selling contaminated mash and feed. The investigations led to the involvement of the U.S. Department of Agriculture, the Environmental Protection Agency, the FBI, Congress, and even Presiden Reagan. And in November 1986, Jack E. White, Brownie C. McBride, Jerry L. Finley, and Henry R. White of the Van Buren firms were indicted by a federal grand jury. The 52 counts in the indictment included not only violations of the Federal Food, Drug, and Cosmetic Act but also charges of fraud, racketeering, and other illegal acts. (Not all defendants were charged with all 52 counts.)

FDA's involvement actually began in 1984, when the agency's Nashville district office notified the New Orleans office that a Mississippi firm was sending J.E.W. a load of corn contaminated with aflatoxin, a cancer-causing poison produced by mold growing on grain. Aflatoxin can't be entirely avoided or eliminated from grain, but FDA can take enforcement actions if the aflatoxin level is at or above 20 parts per billion. Grain contaminated with that much aflatoxin can't be used for food or feed and, even if it's used to make gasohol, any mash produced during the processing also must be free from excessive aflatoxin before being used for feed. FDA's Nashville office had been monitoring the corn in Mississippi. Now it was New Orleans' turn.

So, FDA paid follow-up visits to J.E.W. and Valley Feeds and collected a number of samples for laboratory analysis. Excessive aflatoxin was found in the corn, in the gasohol mash, and in the finished feed made from

the mash. The firms were notified of the findings in February 1985.

Excessive aflatoxin was again found in samples collected by FDA in visits later that year. In November 1985, the agency wrote a second time to the firms, telling them of the contamination.

Then, during FDA's January-February 1986 follow-up inspection, the investigator noticed that pink seeds were mixed with the grain used to make the gasohol. Seed grain is dyed an unnatural color, such as pink, if it has been treated with a pesticide to signal that it should not be used as feed.

Analysis of samples taken then revealed heptachlor as well as aflatoxin. One sample of finished feed, in fact, contained a heptachlor level that was a thousand times greater than FDA's action level. Samples of milk taken from cows that ate feed produced by the firms also were found to contain substantial amounts of heptachlor and aflatoxin.

Action levels for pesticides like heptachlor are recommended by EPA and adopted and enforced by FDA. In animal feed, the aciton level for heptachlor is 0.03 parts per million; in milk fat, 0.1 parts per million. Action levels for other chemical contaminants, such as mold toxins like aflatoxin, are determined and established by FDA. The action level for aflatoxin in most feed and food is 20 parts per billion; in milk it's only 0.5 parts per billion.

After the heptachlor was identified, federal, state and local officials went to work to protect the public from the consequences.

Local health departments quarantined suspect dairy herds. The states embargoed milk from the quarantined cows until tests showed it to be safe. FDA and state officials monitored food-processing plants to see whether heptachlor showed up in the dairy-based products. Products were held until analysis was completed.

Investigators from the U.S. Centers for Disease Control in Atlanta collected urine and blood samples from families on farms with contaminated animals and then tested the samples for pesticide and aflatoxin residues.

USDA tested random samples of meat as well as samples of meat suspected of being contaminated. The suspected carcasses were held from sale until tests were completed. FDA alerted its field offices to be on the lookout for anyone trying to market meat and byproducts from carcasses of contaminated cattle.

In March, a task force representing FDA, USDA and EPA was set up to find ways to solve the myriad problems growing out of the contamination. The task force visited farmers wih quarantined herds and recommended that the farmers receive financial assistance. The Farmer's Home Administration soon began providing loans to the stricken farmers.

President Reagan asked Congress to approve funds to compensate the farmers for their losses. On July 2, the president signed legislation that set aside $8 million to repay the farmers for destroyed milk.

Because of the special heptachlor risk for breast-feeding babies, Arkansas provided free breast-milk testing through the University of Arkansas for Medical Sciences in Little Rock. Nearly a thousand nursing mothers took advantage of the offer, with hundreds more samples analyzed by private laboratories. Most of the samples were found to contain fairly low levels of heptachlor. There were no reports of acute heptachlor poisoning.

Still, the mothers were understandably worried about the risk of cancer for their infants. To help allay their fears, the director of the testing program develped an estimated cancer risk assessment. "A child that's born and grows up in the United States," he said, " has a lifetime cancer risk of about one in 20. At the typical levels we found in the breast-milk samples, the lifetime *additional* risk for cancer for a child would be in the range of one per 1,000 to one per 10,000. That's a very small additional risk."

The university is leading a heptachlor study in collaboration with FDA's National Center for Toxicological Research in Jefferson, Ark. " We would like to translate our experience into something that might help others who have to deal with problems like this in the future," said the study's spokesperson.

E. Zamula, *con't. from p. 503*

ing fish, which were to bake it for 10 minutes at 450°F for each inch of thickness, because that's not long enough. Thirteen minutes per inch at 450 F is safer. Frying, baking or broiling fish until it flakes with a fork still goes; never mind what gourmet magazines say about the joys of raw or undercooked fish. Freezing fish at minus 4 degrees Fahrenheit for three to five days will also prevent illness.

Tom Deardorff, Ph.D., parasitologist with FDA's Fishery Research Branch at Dauphin Island, Alabama, says "Thorough cooking or adequate freezing are good preventive measures against anisakiasis and other fish-borne parasitic diseases, but these practices are not always followed and are difficult to enforce. I believe the best way to prevent these diseases is by making people aware that there are health risks in eating raw or undercooked seafoods. When consumers know the risks, as they know the risks of eating raw pork or beef, they can weigh the potential consequences."

The relatively small number of reported cases of fish tapeworm and roundworm infection in the United States does not constitute a major public health problem. But the situation could change as more people develop a taste for raw or undercooked seafood or are persuaded to eat it that way because it's fashionable. In this case, it pays to be out of style.

Listeria
Salmonella
Campylobacter

Those aren't pleasant words for anyone in the food industry. And it's no secret, concern for the control of these airborne contaminants is extremely high these days.

At King, we've invested decades working with many of the nation's leading food processing and handling companies to pioneer improved HVAC systems which inhibit, prohibit and capture biological contaminants:

We inhibit their growth two ways:

- Through precise humidity and temperature control.
- Through equipment designs which lend themselves to effective, efficient sanitation procedures.

We prohibit their introduction and growth with two further techniques. First we use blowers, returns and diffusers which deliver airflow volumes and patterns that eliminate the spectre of uncontrolled infiltration and dead air spaces. Secondly, our specially designed systems dramaitically reduce the number of "high potential" collecting and growing surfaces found in conventional air handling equipment.

Finally, King equipment employs stratigically placed filtration systems that capture yeast, molds, bacteria and other airborne contaminants down to 0.3 microns.

If you feel it is time to review your own air quality standards, please feel free to call us. We have an excellent booklet which outlines the practical points you should address in the control of airborne contaminants.

Even if you simply want to discuss your current situation with one of our food plant specialists, we'll be happy to take your call. Later, if you feel it's appropriate, we'll forward you complete technical literature on King's specially designed environmental control HVAC systems for food plants.

The King Company Air Handling Division;
PO Box 287; Owatonna, MN 55060;
FAX 507/451-3786; Telex: 29-0944;
Phone 507/451-3770.

King
OF OWATONNA

Design & support for industry since 1904. Refrigeration, HVAC, National Heaters, Custom Coils, and Air Curtains.

News and Events

Nominations for 1988 IAMFES Awards Now Due

Awards nominations are due for the 1988 IAMFES Awards. The success of the IAMFES Awards Program depends on organizations which generously and regularly fund the program, but also on you, for nominating persons you know who are worthy of the awards.

Contact Roy Ginn, Dairy Quality Control Inst., 2353 N. Rice St., Room 110, St. Paul, MN. 55113 with information on your nominees. Present Executive Board members are not eligible for the 1988 awards.

The awards are as follows:

*Sanitarian's Award. This is a $1000 award and plaque presented to any Sanitarian for outstanding professional contributions during the past seven years.

*Harold Barnum Industry Award. This $500 award and plaque will go to an industry representative in 1988. It is presented for service to food safety and sanitation.

*Educator Award. This $1000 award and plaque will be presented to an educator. It is presented to a person who has shown outstanding service to food safety and sanitation.

*Citation Award. This plaque will be presented to an IAMFES member for dedicated service to the Association in helping fulfill its objectives.

*Shogren Award. This $100 award and certificate will go to the affiliate organization with the best state or regional program and participation in IAMFES.

*Honorary Life Membership. A plaque is presented to a member who has shown long and extensive service to IAMFES.

*Certificate of Merit. This is presented to members who are active within their state and international group.

Solid Waste Solutions Debated at FPI Conference

Washington, DC, August 3, 1987--Manufacturers of disposables for foodservice and packaging, their raw material suppliers, and foodservice operators met in Washington, DC, recently to discuss methods of solid waste disposal. The conference, "Foodservice and Packaging Disposables and the Environmental Crisis," was sponsored by the Foodservice & Packaging Institute (FPI).

The Foodservice and Packaging Institute supports waste-to-energy incineration after recycables have been removed as the best way of disposing of municipal solid waste containing single service products. The high BTU values of paper and plastic disposables make these items important components of the incineration process. The generation of steam and electricity, or a combination of both, through incineration, allows the energy of disposable products to be recaptured and reused.

Public Health Advantages of Single Service

"The contribution of single use products to public health outweighs the possible disadvantages deriving from urban solid waste and litter," said Charlie Felix, public health consultant to FPI. Disposables contribute much to sanitation levels in foodservice facilities, especially in those with inadequate dishwashing facilities. Felix referred to two microbiological studies which showed disposble utensils to be more sanitary than permanentware at point of use.

Industry Challenged to Develop Solid Waste Figures

"Your visibility is more than your real share of the problem," said Bill Franklin of Franklin Associates. Franklin, who has directed many significant studies of solid waste in the U.S., challenged the disposables industry to develop accurate figures regarding its contribution to solid waste. He also urged the audience to become an active part of the solution to the country's garbage crisis in order to protect the industry's future.

Panelists Offer Different Views

Vermont Representative Curt McCormack opened a debate about ways to dispose of solid waste. He is sponsor of H.B. 196, which requires Vermont's secretary to recommend every two years ways to reduce nonrecyclable and nonbiodegradable materials in the waste stream. McCormack supported a reduction in the amount of packaging as a means of addressing the nation's garbage crisis.

Ruth Lampi, executive director of the Environmental Task Force, suggested that industry engineers work with environmentalists to find ways to reduce weight, volume, and total amount of packaging.

David Gatton of the National Resource Recovery Association, a non-profit organization sponsored by the U.S. Conference of Mayors, pointed out that recycling is only one part of a solid waste management program. "If you're responsible for the disposal of garbage, you tend to come to the issue

with a little broader perspective," he observed. "It is important not to promote one option at the expense of another."

Gatton said that a comprehensive, long-term waste system will involve landfill, waste-to-energy incineration, recycling, and perhaps other options as well.

Panelists discussing litter prevention and cleanup stressed the need to public education and creative programs. Mary Wiard, chief of the Division of Litter Prevention and Recycling of the State of Ohio, emphasized that trash disposal and recycling programs must be convenient, visible, and easy. Gere McCall, executive coordinator of Arlingtonians for a Clean Environment, described such a program in Paris, France, where recycling receptacles are placed along streets, within easy reach of pedestrians.

Bill Fisher, legislative advisor for Southland Corporation, spoke of his company's active participation in Keep America Beautiful. Southland is parent company for 7-Eleven convenience stores. Keep America Beautiful is a non-profit organization founded in 1953 to prevent littering and encourage voluntary recycling through community participation and education.

Copies of speeches by Senators Stafford and Chafee, Bill Franklin, and Gere McCall are available from the Foodservice & Packaging Institute. Copies are $10.00 each or $25.00 for all four for non-members, free of charge to members. Checks should be sent with order to K. Harsel, Foodservice & Packaging Institute, 1025 Connecticut Ave., N.W., Suite 513, Washington, D.C. 20036. Telephone: 202-347-0020.

Scientist's Review Finds Gaps in Knowledge on Fat/Cholesterol Role

Rosemont, IL, June 25, 1987 -- Expert scientists recently reviewed the scientific evidence on the relationship of dietary fat and cholesterol to heart disease and cancer in the same populations at the request of National Dairy Council (NDC).

Important gaps exist in scientific knowledge about the subject, according to the study which was conducted by the Life Sciences Research Office (LSRO), Federation of American Societies for Experimental Biology. The federation performs scientific assessments on biomedical issues for various federal agencies and other organizations.

The expert panel convened by LSRO reported that the evidence linking high blood cholesterol to atherosclerosis and coronary heart disease is "widely accepted as definitive." The panel suggested that public health measures to reduce blood cholesterol levels be considered. However, these experts also noted that not all researchers are in agreement on the relationship between diet and heart disease. As an example, the panel pointed out that scientists are still debating the strength of evidence that supports a recommendation limiting dietary fat to 30 percent of total calories.

The role of dietary fat and cholesterol with regard to cancer is less well established, the expert panel concluded. A majority of the panel members agreed that available data on human populations provide insufficient evidence to support public health recommendations for reducing dietary fat and cholesterol as a means of preventing cancer.

The expert panel also identified areas that require additional research to improve the understanding of dietary fats and cholesterol and their relationship to human disease. They recommended that further research should be conducted before more definitive conclusions can be drawn.

More information regarding the report can be obtained by writing: Nutrition Research Division, National Dairy Council, 6300 N. River Road, Rosemont, IL 60018.

National Dairy Council conducts a comprehensive nutrition research and nutrition education program as a division of United Dairy Industry Association. UDIA represents 95 percent of the U.S. dairy farmers and 85 percent of domestically marketed milk.

AACC to Hold 72nd Annual Meeting in Nashville, Tennessee

St. Paul, MN--The American Association of Cereal Chemists (AACC) has announced details for the 72nd AACC Annual Meeting, scheduled for November 1-5, 1987, at the Opryland Hotel, in Nashville, Tennessee.

This year's Technical Program is taking shape under the direction of Chairman Dr. Eugene Wisakowsky. Symposia are planned on the following topics--Sugars and Dietary Fiber in Cereal Products; Calcium; Grain Grades in Cereal and Oilseed Marketing; Amaranth; A New Grain for the Cereal Chemist; NMR: Theory and Application in Foods; Biotechnology: What Can It Do, What Do We Want?; and Starch and Its Interaction with Food Ingredients. Symposia are also planned in the areas of Milling and Baking, and Rheology.

Technical Sessions are planned in 10 areas including NIR/Imaging, Analytical, Baking, Grains, Nutrition, Starch, Processing and Cooking, Wheat, Rice, and Rheology, and this year's Poster Sessions have been expanded to include presentations from 50 different researchers.

The 1987 technical program will also include a new feature--a "mini-short course" entitled *Flavors: Their Relationship to Product Development*. The course is being planned by Drs. Elwood Caldwell and Richard Williams.

The Social Program for this year's meeting will include a welcome reception, opening session and breakfast, golf and tennis tournaments, and a fun run. A variety of spouse activities and tours are also planned.

Materials are now available for companies wishing to exhibit products or services at the meeting. Table Top Display hours will be Monday, November 2, from 3:00 p.m. to 5:15 p.m., and Tuesday, November 3, from 10:00 a.m. to 12:15 p.m., and 3:00 p.m. to 5:15 p.m. The popular New Products Sessions will be expanded this year to include more presentations.

Advance registration materials for the 1987 meeting will be mailed in June to all AACC members. Nonmembers may request meeting registration materials by contacting AACC, 3340 Pilot Knob Road, St. Paul, MN 55121, U.S.A.; phone 612-454-7250; telex 6502439657 (via Western Union International). Answerback: 6502439657 MCI UW.

The American Association of Cereal Chemists is an international scientific organization of more than 3,400 members. The Association was founded in 1915 to establish standarized methods of analysis in cereal laboratories, and to encourage research within the cereal processing industries.

Standard Methods Revision Begun

Organization of the Technical Committee, Liason Representative Chapter Chairs, and Chapter Committees is virtually complete for preparation of the 16th edition of Standard Methods for the Examination of Dairy Products.

Revision is sponsored by the American Public Health Association. Members of the Technical Committee are Ron Case, Roy Ginn, Jim Messer, Gary Richardson, Mike Wehr, and Tim Peeler. The Editor and Committee Chair is Bob Marshall. APHA Project Director is Howard Bodily.

The Technical Committee invites comment and suggestions regarding content of the 16th edition. Send them to R.T. Marshall, 122 Eckles Hall, University of Missouri, Columbia, MO 65211.

Busta Heads Department at University of Minnesota

Francis F. Busta is the new Head of the Department of Food Science and Nutrition at the University of Minnesota, St. Paul effective July 1, 1987.

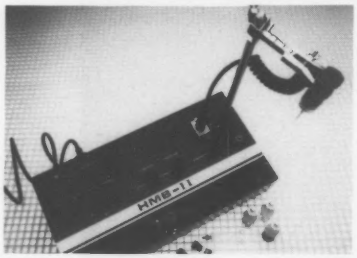
A native of Montgomery, Minnesota, Dr. Busta received his B.A. degree in Bacteriology and his M.S. degree in Dairy Industries from the University of Minnesota. His Ph.D. was granted by the University of Illinois in Food Science with an emphasis on Microbiology and Biochemistry. Prior to his previous appointment as Professor and Chairman of the Food Science and Human Nutrition Department at the University of Florida, Gainesville in 1984, he was Professor of Food Microbiology in the Department of Food Science and Nutrition at the University of Minnesota. From 1963-1967 he served as a faculty member at North Carolina State University, Raleigh.

His research interests include the study of environmental stress on microorganisms, the influence of food systems on growth and survival of microorganisms, thermal processing, general microbiological aspects and quality management of food processing. Recognized as a national and international authority in Food Microbiology, Dr. Busta has been a visiting researcher at several international institutions and has lectured extensively abroad. He has authored and published more than 100 scientific articles, 13 chapters in books, and holds two U.S. patents.

The Department of Food Science and Nutrition has 34 faculty members involved in research, teaching and Extension. Graduate programs in Food Science and in Nutrition are offered in addition to undergraduate programs in Food Science, Nutrition and Dietetics and Consumer Food Science. There are about 100 graduate students and 200 undergraduate students associated with the department.

New Product News

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



Biotech's HMB II Microbial Activity Testing Device

• The HMB II is a biochemical testing device that determines microbial activity in fluids, solids and powders, as well as on surfaces. Testing procedures take only 15 minutes making the device ideal for use as an early warning system or as a primary testing tool. The HMB II does not require extensive training and is versatile, portable and efficient. Using disposable test kits, it is less expensive to operate on an individual test basis, faster and more accurate than traditional growth study methods. BIOTECH INTERNATIONAL, INC., 10800 Financial Centre Parkway, Suite 345, Little Rock, AR 72211. Telephone: 501-225-5302.

Please circle No. 249
on your Reader Service Card

MCLAS® Technologies Offers No-Cost Protocol Development Program

• Las Vegas, June 17, 1987 - MCLAS Technologies is the first biotechnology company to offer a *No-Cost Protocol Development Program* for its Salmonella testing system. The Lumi-Phage™ Testing System® provides results after 18 hours. MCLAS' *No-Cost Protocol Development Program* is a key element in the company's commitment to provide a full support system for its customers.

"We are a customer defined company and our customers want products and services that answer their specific needs, not technology they have to experiment with to make work," said Forrest Seale, president of MCLAS. "If the existing protocols do not meet our customers' needs, we will custom design, at no additional cost, a protocol for those products. This is our investment in our customers to show how firmly we stand behind the Lumi-Phage™ Testing System."

Beyond the *No-Cost Protocol Development Program*, MCLAS offers technical services support for its customers. This includes on-site training, and a toll-free number (1-800-527-3196, Ext. 99), available with experienced personnel ready to answer questions or provide additional information.

The MCLAS Lumi-Phage™ Testing System is based upon the science of chemiluminescence. The Lumi-Phage™ Testing System is the first application of MCLAS' proprietary chemiluminescence technology. The company plans to introduce a family of pathogen testing products in the near future.

For more information, contact: Jim Duffy, MCLAS, 18585 Sigma Road, San Antonio, TX 78258. Telephone: 512-491-0757.

Please circle No. 250
on your Reader Service Card

Liquid Level Measurement System With CIP Sanitary Flange

• SENSOTEC presents the LL-T LIQUID LEVEL MEASUREMENT SYSTEM with a clean-in-place (CIP) sanitary flange. This flush diaphragm, strain gage type liquid level sensor can be equipped with virtually any tube length.

SENSOTEC's MODEL LL-T utilizes a quick disconnect CIP fitting which allows for easy installation or removal of the transmitter where sanitary or other frequent cleaning requirements are required, as in the food industry. The standard CIP fitting on the LL-T is for a 2 1/2" tube diameter, however other CIP fittings can be used.

LL-T electronics include zero and span adjustments, built-in shunt calibration, and encasements in explosion-proof housing. Power requirements are 26-32VDC with 4-20ma output via a three-wire configuration. An optional two-wire unit with a 4-20ma output and 0-5VDC output is also available.

Pressure ranges span from 30" to 100" H20 with a diaphragm tube diameter of 2.25" or 125" H20 thru 1000 psi with a 1.5" diaphragm tube diameter. Standard operating temperatures are 0 degrees to 325 degrees F with an optional range to 425 degrees F. Compensated temperature range spans from 60 degrees to 160 degrees F. An all-welded, stainless steel, flush diaphragm construction ensures optimal performance and a .25% F.S. accuracy in rugged, industrial applications. An optional .15% F.S. accuracy is also available. For more information, contact: Bob Fisher, Manager of Marketing, SENSOTEC, Inc., 1200 Chesapeake Ave., Columbus, OH 43212. Telephone: 614-486-7723.

Please circle No. 251
on your Reader Service Card

Coved Corner Stainless Steel Sinks Available from Marlo...N. S. F. Approved

• Hawthorne, New Jersey-Marlo Manufacturing Company, Inc. announces the availability of their complete line of N. S. F. approved coved corner stainless steel sinks.

Constructed of heavy gauge stainless steel with both vertical and horizontal corners coved on 1/2" radius with intersections spherical and polished, all sinks have a 10" high overall splash including a 2" return wall at a 45 degree angle with a 1" sanitary flange. Sinks are mounted on galvanized tubular legs with internal white metal adjustable bullet feet. Legs are fastened to stainless steel funnel gussets that are welded to sink bottom.

Available in single, double and triple compartment models, each compartment is provided with a basket waste outlet. All models may be obtained with integral drainboards on one or both sides. Sinks are 34" working height with depths of 14" or 16" in sizes from 18" to 90".

Marlo also offers a complete line of sink and drainboard accessories.

Marlo's versatile stainless steel sinks are ideal for use in kitchens, bars-lounges, take-out food establishments, drive-ins, bakeries, packing plants, nursing homes, hospitals, canning plants, meat/food processing plants, and many other. For further information and catalog write: Marlo Manufacturing Co., Inc., 140 Fifth Ave., Hawthorne, NJ 07506.

Please circle No. 252
on your Reader Service Card

Labconco Introduces a Protector-48 Fiberglas Hood Exclusively for the International Market

• Labconco Corporation, Kansas City, Mo., introduces the International Proteycor-48 Fiberglass Hood, available with the same short lead time as their standard Protector Hoods.

The International Protector Hood offers popular features most frequently requested by customers abroad. Its custom design includes: remotely-controlled cold water gooseneck service fixture, remotely-controlled fixture for other service and integral exhaust motor/blower. The international hood is available for 115-volt 60 Hz or 230-volt 50 Hz operation to meet overseas electrical requirements.

Labconco's International 4-foot hood is equipped with the same fiberglass liner, fluorescent lighting and epoxy coated steel exterior as standard Protector Hoods.

Labconco fume hoods are available through major laboratory dealers worldwide. For a free copy of their catalog featuring the international fume hood and a list of their international dealers, call Labconco at 1-800-821-5525 or Telex 4-2568.

Please circle No. 253
on your Reader Service Card

Cart Safety and Inspection Program Will Benefit Processors and Grocers

• A Cart Safety and Instruction Manual has been developed at the request of many processors and grocers. Free copies of the manual are available from Cannon Equipment Company, a manufacturer of distribution and display carts.

Processors and grocers can use copies of the cart safety manual to enhance their employee safety programs. Giving the manual to employees will lessen the risk of claims resulting from the improper handling of carts.

The safety manual covers folding and rigid carts used for handling plants, ice, meat, by-products, beverages, milk, ice cream, frozen foods, baked goods, deli items, eggs, produce and bottle returns. Photographs and pictograms illustrate common sense rules of thumb and safe handling practices. The manual is printed in both Spanish and English, and many copies are UV coated for use and reference in refrigerated areas.

For free copes of the manual and details of safety program construction call or write Cannon Equipment Company, 324 W. Washington, Cannon Falls, MN 55009. Telephone: 1-800-533-2071 or 1-507-263-4231.

Please circle No. 254
on your Reader Service Card

Operates HTST Controllers for 12 Hours Under End-Use Conditions Before Shipping

• The Anderson Instrument Company has long had a policy of maximizing the accuracy and reliability it builds into its indicating, recording and control instrumentation. In keeping with this policy the company has introduced an innovative procedure to its quality assurance program. Now, every HTST controller, after first being calibrated against instrumentation traceable to NBS, is tested for 12 hours under simulated end-use operating conditions before being shipped to the dairy or food processor.

Accompanying the controller is a Two-Year Warranty certificate and an HTST Verification Record -- initialed by the quality assurance technician who administered the test -- which spells out the results of test parameters. These include startup and shutdown times, operating temperatures, and output-air pressure at five different temperatures between 158°F and 170 °F. In addition to these functions, the HTST controller is also checked for temperature and diversion-setpoint accuracies, proportional band operation, event-pen trip and chart-driven accuracy. Each unit is cycled between 158°F and 170 °F at least 44 times.

For more information, contact: Anderson Instrument Company, Inc., R.D. 1, Fultonville, NY 12072. Telephone: 518-922-5315.

Please circle No. 255
on your Reader Service Card

New ESD Glove™ Reduces Component Damage

• Utilizing a unique new fabric, the ESD Glove by Colonial Glove and Garment, Inc., is a reusable, touch-sensitive glove that provides electronic components with superior protection from the human hand. The hand carries harmful static electricity and waste materials that cause many millions of dollars worth of damage in industry each year.

Colonial's ESD Glove is knit with premium, extra-dense polyester fabric containing carbonized fiber. The usual static-dissipator glove is woven with nylon, providing a less-effective, less-durable shield.

In use, the ESD Glove provides exceptional static dissipation, resists pass-through of skin flakes and other harmful material, and gives full protection from perspiration, skin oils, and salts. Very comfortable to wear, the ESD Glove will not deteriorate from acids and can be laundered repeatedly without losing its original static dissipation properties. This makes it cost-effective in comparison with disposable gloves.

For further information on the new ESD Glove, contact: Colonial Glove and Garment, Inc., 1800 Ocean Ave., Ronkonkoma, NY 11779. Telephone: 516-588-6900.

Please circle No. 241
on your Reader Service Card

BBL Microbiology Systems Introduces New Breakpoint Susceptibility and Identification System for Testing Urinary Isolates

• BBL Microbiology Systems, a division of Becton Dickinson and Company, announces development of a new system for susceptibility and/or identification testing. The product is called the BBL® SenSIR™ System. The first **SenSIR** panels available test for rapidly growing aerobic and facultatively anaerobic bacteria from urine specimens.

The BBL® SenSIR™ System features five panels formulated to identify microorganisms or provide either susceptibility readings or readings of susceptible, moderately susceptable, and resistant by using one or two concentrations of antimicrobics commonly used to treat urinary tract infections.

The **SenSIR™** Uri-NEG ID System can identify 90 to 95% of all organisms from urines with a high degree of correlation with conventional media. Use of **SenSIR** provides a guide for antimicrobic selection with a savings of time and expense over the usual full range of antimicrobic microdilutions. The single concentration susceptibility test uses the concentration to which urinary pathogens are usually considered susceptible, thus saving time and expense.

Inoculation of the test panels is performed by using an exclusive **SenSIR** five-channel incremental pipetter, which precisely injects prepared broth into all system wells with a single fill of the pipette tips.

The **SenSIR™** Uri-III Susceptibility Panel provides susceptibility results for gram-negative isolates. Each panel can test two different isolates. The panel contains a growth control well, two sets of a single concentration of seven antimicrobics, plus two concentrations for sulfisoxazole, for each set. The full list of antimicrobics is: sulfisoxazole, nitrofurantoin, norfloxacin, trimethoprim/sulfamethoxazole, ampicillin, cephalothin, amikacin, and gentamicin.

The **SenSIR™** UriPOS ID Panel provides susceptibility and identification results for gram-positive isolates. The panel features a growth control well, two biochemicals and Beta-Lactamase test, a single concentration of thirteen antimicrobics, and two concentrations for sulfisoxazole. The full list of antimicrobics is: sulfisoxazole, nitrofurantoin, norfloxacin, trimethoprim/sulfamethoxazole, tetracyline, gentamicin, cephalothin, cefazolin, ampicillin, penicillin, oxacillin/2% NaCl, erythromycin, and amoxicillin/clavulanic acid. Biochemical substrates include 6.5% sodium chloride and bile esculin. Novobiocin is included for identification purposes. The **SenSIR™** UriNEG ID Panel provides susceptibility and identification results for gram-negative isolates and identifies 90-95% of all urinary tract isolates. It contains a single concentration of eight antimicrobics and two concentrations for sulfisoxazole, plus fourteen biochemicals. A growth control well is included in which an indole test is performed. The full list of antimicrobics is: amikacin, cephalothin, cefazolin, nitrofurantoin, norfloxacin, gentamicin, ampicillin, trimethoprim/sulfamethoxazole, and sulfisoxazole. Biochemical substrates include: lysine, rhamnose, sucrose, citrate, ornithine, melibiose, esculin, xylose, ONPG(Nit), urea, adonitol, arabinose, sorbitol, and inositol.

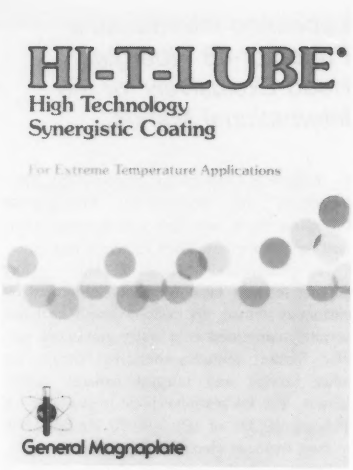
For more information, contact: BBL Microbiology Systems, PO Box 243, Cockeysville, MD 21030. Telephone: 301-771-0100.

Please circle No. 242
on your Reader Service Card

BacTrace® Affinity-Purified to E. coli 0157:H7

• KPL's newest BacTrace® antibody is highly specified for *E. coli* serotype 0157:H7 which is associated with hemorrhagic colitis and other serious disease. The antibody is produced in goat, then affinity purified to minimize cross reactivity to non-0157:H7 *E. coli* as well as other *Enterobacteriaceae*. This antibody demonstrates high sensitivity to *E. coli* serotype 0157:H7 in ELISA systems developed in our laboratory. The product is available either unlabeled or labeled with peroxidase, phosphatase or fluorescein. These antibodies can be used individually or in tandem for rapid detection of *E. coli* 0157:H7 in clinical specimens as well as food, cosmetic and pharmaceutical samples. Technical support in development of ELISA systems will be provided upon request. Bulk production is available for large scale applications. For further information, contact: Kirkegaard & Perry Laboratories, Inc., 2 Cessna Court, Gaithersburg, MD 20879.

Please circle No. 243
on your Reader Service Card



Dry-Lubricating Metal Coatings for Temperature Extremes

• A patented dry-film lubricant Hi-T-Lube®, used in extreme-temperature abrasion and wear applications is described with test data, performance characteristics, federal and industrial specifications, and illustrated jet engine and similar typical high-performance applications in a 4-page product data sheet issued by General Magnaplate Corp., Linden, NJ.

The dry lubricant consists of a patented multi-layer matrix system that is applied to wear surfaces by means of a series of "synergistic" electrodeposited metals and alloys that are permanently bonded to the substrate metal.

Copies of the new product data sheet are available from General Magnaplate Corp., 1331 Route 1, Linden, NJ 07036.

Please circle No. 244
on your Reader Service Card

USE THE READER SERVICE CARD

The Reader Service Card is for you. Use it to get more information about the products and services advertised in this issue.

IAMFES

International Association of Milk, Food and Environmental Sanitarians Committees

Committee and Chairperson

SANITARY PROCEDURES
Dick B. Whitehead
304 Forest Point Drive
Brandon, MS 39042
601-354-6552

FOOD EQUIPMENT SANITARY STANDARDS
Duaine B. Shaw
Food Service Facilities
Division of Food Protection
Dept. of Environmental Resources
P.O. Box 2357
Harrisburg, PA 17120
717-787-9037

BAKING INDUSTRY SANITARY STANDARDS
Martyn Ronge
Martyn Ronge and Associates
2400 Farnsworth Lane
Northbrook, IL 60062
312-272-7626

FOUNDATION
Harry Haverland
FDA Training Facility
Room 8002
Federal Office Bldg.
550 Main St.
Cincinnati, OH 45202
513-851-1810

JOURNAL OF FOOD PROTECTION (publication committee)
Bob Marshall
Dept. of Food Science & Nutrition
Room 101, T-14
University of Missouri
Columbia, MO 65211
314-882-7355

DAIRY AND FOOD SANITATION (publication committee)
Harold Bengsch
Springfield Health Dept.
921 W. Turner
Springfield, MO 65803
417-864-1000

COMMUNICABLE DISEASE
Frank Bryan, Ph.D.
2022 Lavista Circle
Tucker, GA 30084
404-938-8094

BUDGET
Ron Case
Kraft Inc.
Kraft Court
Glenview, IL 60025
312-998-2056

WATER QUALITY AND WASTE DISPOSAL
Robert R. Zall
Dept. of Food Science
Stocking Hall
Cornell University
Ithaca, NY 14853
607-256-3112

FARM METHODS
Steve Sims
Food and Drug Administration
585 Commercial Street
Boston, MA 02109
617-223-5526

SUSTAINING MEMBERSHIP
Ruth Fuqua
Dairymen, Inc.
10140 Linn Station Rd.
Louisville, KY 40223
505-245-0401

NOMINATING
Kirmon Smith
1100 West 49th St.
Texas Dept. of Health
Austin, TX
512-458-7281

AUDIO/VISUAL LIBRARY
Sidney E. Barnard
9 Borland Lab
Penn. St. Univ.
University Park, PA 16802
202-485-0140

MEMBERSHIP
Ruth Fuqua
Dairymen, Inc.
10140 Linn Station Rd.
Louisville, KY 40223
505-245-0401

SCIENTIFIC PROGRAM CONTENT
Zd Zottola
262 Food Science & Nutrition
University of Minnesota
St. Paul, MN 55108
612-376-5303

COUNCIL OF AFFILIATES
Bill Coleman
Minnesota Dept. of Agriculture
90 West Plato Blvd.
St. Paul, MN 55107
612-296-1586

FOOD SERVICE
Bennett Armstrong
P.O. Box 205
Gainesville, VA 22065
703-347-3465

EDUCATION AND TRAINING
Joel Simpson
Dobbs Houses Inc.
5100 Poplar Ave.
Memphis, TN 38137
901-766-3978
Ulfert Esen
United Airlines - Food Service
Laguardia Airport
Flushing, NY 11371

LONG RANGE PLANNING
Michael Wehr
Oregon Dept. of Agric.
635 Capitol St. N.E.
Salem, OR 97310
503-378-3793

RETAIL FOODS
Thomas Schwarz
FDA
200 C Street S.W.
Washington, D.C.
202-485-0140

FDA INTERPRETATIONS

Abstract of Papers Presented at the Seventy-Fourth Annual Meeting of the IAMFES

Anaheim, California, August 2-6, 1987

Abstracts of most papers submitted for presentation at the 74th Annual Meeting of the IAMFES appear on this and the following pages. The complete text of some of the papers will appear in future issues of the *Journal of Food Protection* or *Dairy and Food Sanitation*.

ANTIBIOTICS

A STANDARD "ANTIBIOTIC FREE" MILK

Stanley E. Charm, *Penicillin Assays, 36 Franklin Street, Malden, MA 02148*

"Zero Tolerance" is a common statement in the CFR referring to the tolerance of many antibiotics. What is used for a zero standard and how is it measured? In practice, zero zone with the disc assay is used to identify zero milk. However, such milk may contain significant antibiotic contamination, e.g. 2 ppb penicillin or 10,000 ppb sulfamethazine. It is possible to reduce antibiotic concentrations in milk by passing it through a charcoal column. Knowing the antibiotic equilibrium characteristics between charcoal and milk, it is possible to calculate processing conditions needed to reduce an antibiotic load to any desired level. Milk to be processed is first tested with a modified Charm Test II to determine that it has low or no detectable residues. Milk processed to reduce the antibiotic load by 2 log cycles will have less than 1% of the initial load characterized by the minimum detectable concentrations of the modified Charm Test, e.g. less than 0.003 ppb or 0.01 ppb sulfamethazine. Standard zero milk meeting this criterion is now available. This milk is preserved by a unique high-temperature short-time sterilization process, 155°C for 0.02 s. A comparison of zero standard milk using Charm Test II is made with milk from a cow never exposed to antibiotics.

THE INCIDENCE OF ANTIBIOTICS OTHER THAN PENICILLIN IN PRODUCER RAW AND FINISHED MILK PRODUCTS

H.M. Wehr, N.J. Corristan, M. Park, D. Pederson and S.E. Charm, *Laboratory Services Division, Oregon Department of Agriculture, 635 Capitol Street NE, Salem, OR 97310-0110*

Antibiotics are routinely used in the dairy industry for disease control. Occasional residual levels of antibiotics may inadvertently occur in milk, resulting in both public health and economic concerns. Processors and regulatory agencies alike routinely test producer raw and finished milk products to avoid use of milk containing antibiotic residues. Most routine screening and confirmatory tests are sensitive to beta-lactam antibiotics, particularly penicillin, but are relatively insensitive to other antibiotics. Concern has been expressed by regulatory agency representatives and others regarding possible undetected antibiotic residues in milk. No extensive investigation of this possible problem has been carried out. This report will present results of a survey of over 600 producer raw and finished milk samples analyzed over a 3 month period by the Charm II test (Penicillin Assays, Inc.) for the presence of a spectrum of antibiotics, including tetracyclines, sulfa compounds, beta-lactams and others. The incidence and levels of these compounds will be reported.

DAIRY PRODUCT PROCESSING AND QUALITY

BACTERIAL QUALITY AND FLAVOR OF MILK IN THE NORTHEASTERN UNITED STATES

Sidney E. Barnard and Louise M. Moir, *The Pennsylvania State University, 8 Borland Laboratory, University Park, PA 16802*

All consumer acceptance criteria for milk except flavor have been good in the northeastern United States and continue to improve. Only about 10% of all store purchased milk samples exceeded the Pasteurized Milk Ordinance and most state standards for coliform counts and Standard Plate Counts. Flavor has improved where pro-

grams were conducted to assist processors and farmers. However, almost 24% of samples in Pennsylvania and 38% of a limited number of samples in surrounding states were not acceptable. Over 80% of the poor-tasting samples in Pennsylvania and surrounding states were rancid. Of the regular (whole) milk samples tested for Acid Degree Value, 50% of the Pennsylvania samples and 58% of the samples from other states were above 1.0. Reduction of the rancidity problem seems essential to prevent further declines in regular milk sales.

PROCESSING FLUID MILK

Sidney E. Barnard, Edward D. Glass, Jr., and Ronald A. Matason, *The Pennsylvania State University, Food Science Department, 8 Borland Laboratory, University Park, PA 16802*

This presentation is with a set of 140 slides and 30-min cassette tape on processing of fluid milk. It was prepared to train fluid milk plant employees who receive, process, and package milk and clean equipment. Emphasis is on practical procedure which will eliminate spoilage and prevent food poisoning. Regulations, standards and processing procedures are included. The script was reviewed by 15 persons in industry, state and federal regulatory, and educational institutions. Pictures were taken in seven processing plants by a professional photographer.

ELIMINATING CROSS-CONNECTIONS BETWEEN RAW AND PASTEURIZED PRODUCTS IN DAIRY PLANTS

Roger W. Dickerson, Jr., *Food and Drug Administration, 1090 Tusculum Avenue, Cincinnati, OH 45226*

A method was developed to identify cross-connections between raw and pasteurized products in dairy plants. A flow diagram of the dairy plant is used to identify the pasteurized pumps, storage tanks, fillers or other post-pasteurization processing equipment. An envelope is drawn on the flow diagram around all pasteurized equipment. Only the few pipelines that penetrate the envelope have the potential of a cross-connection. Each pipeline that penetrates the envelope is traced to its origin to determine if it is a cross-connection.

MICROBIOLOGICAL QUALITY OF CANADIAN FROZEN DAIRY PRODUCTS

M.A. Johnston, U.T. Purvis, R. Foster and O. Diep, *Field Operations Directorate, Health Protection Branch, Health and Welfare Canada, Ontario, Canada K1A 0L2*

Surveillance programs initiated over the last 2 years by the Health Protection Branch have shown that the Canadian ice cream industry is having difficulty meeting the coliform standard (10 per g) for ice cream but is not having difficulty meeting the aerobic colony count standard (100,000 per g). Twenty percent of all samples were in violation with the coliform standard. In most instances, coliforms other than *Escherichia coli* were responsible for the violations. The source of these coliforms has not been traced to ingredients added to the mix since the rate of contamination is approximately the same for different varieties of ice cream. There were no *Salmonella*-positive products found during this study. However, one of the 132 samples examined for *Listeria* did contain *Listeria monocytogenes*. *Listeria innocua* was also found in the same ice cream novelty. Inspectors were unable to identify the source of this organism within the plant. To date products from 36 of 131 Canadian manufacturers have been examined for *Listeria*. An assessment of the manufacturing practices within 89 plants indicate that 10 manufacturers must make major improvements in their operations to ensure the safety of their frozen dairy products.

THE IMPACT OF DAIRY PRODUCERS ON PRODUCT/PROCESS RESEARCH AND DEVELOPMENT

Joseph A. O'Donnell, *Dairy Research Foundation, Dairy Center, 6300 N. River Road, Rosemont, IL 60018*

The dairy industry is committed to improving its competitive position in the food marketplace through unprecedented support of product/process research and development. Providing direction to this effort are the priorities identified at the "Research Opportunities for the Dairy Industry" conference. Implementation of these priorities is done through the long existing research grants, fellowships and awards programs as well as the new Dairy Food Research Centers program. Coordination of these activities is accomplished through the Dairy Research Foundation and its Science Advisory Committee. Expectations of the industry are illustrated.

DAIRY REGULATORY CONCERNS

FIELD EVALUATION OF A MODIFIED FARM INSPECTION PROGRAM

Randall Daggs, *Wisconsin Division of Health, Bureau of*

Environmental Health, PO Box 309, 1 W. Wilson, Madison, WI 53701

There has been considerable interest, both recent and past, as to whether two inspections per year are needed on all Grade "A" farms. More efficient use of resources might be obtained in a "modified inspection" program whereby only one inspection a year would be made on a farm demonstrating satisfactory sanitation and quality. Farms less than desirable would be inspected as often as necessary to maintain minimum Grade A standards. Such a modified program was implemented in 1984, involving over 400 Grade A farms in a specific geographic region. A field sanitation survey was conducted at the start of the program, then again 2 years later on the farms. The sanitation compliance rating (SCR) dropped significantly in that time (6.3 points) seemingly independent of farm size, general management practices, and quality. The study supports the present program of at least two inspections per year per farm in order to insure consistent and satisfactory farm sanitation levels.

FDA'S FY 87 AGED HARD CHEESE PATHOGEN SURVEILLANCE SAMPLING PROGRAM-PROGRESS REPORT

Johnnie G. Nichols, *FDA, Washington, D.C. 20204*

The nationwide survey when completed will include 63 samples each of: Cheddar, Colby, Swiss, Edam, brick, and blue cheeses. These cheeses were made from raw milk and aged 60 days in lieu of pasterization. A second survey is covering soft cheese plants, including inspections and sample collections from plants not inspected during fiscal years 1985 and 1986. This survey also includes all plants found to be in violation during fiscal year 1986.

SANITATION AND GOOD MANUFACTURING PRACTICES IN DAIRY PROCESSING PLANTS

Joseph M. Smucker, *Food and Drug Administration, 50 United Nations Plaza, San Francisco, CA 94102*

The milkborne disease incidents in recent years have lead to intensified dairy plant inspections through the FDA's new Milk Safety Initiatives. These intensified inspections have been very valuable in identifying potential sources of product contamination in dairy processing plants. These findings have had a significant impact on the manufacturing and sanitation practices of dairy plant processors. Regulatory personnel inspecting these milk processing plants have also made adjustments in their inspection methods and the standards they apply.

DAIRY TESTING

SELECTION OF BACTERIOLOGICAL TESTS FOR MONITORING THE CLEANING OF MILK PIPELINES

G.F. Senyk, S.M. Kozlowski, and D.K. Bandler, *Institute of Food Science, Stocking Hall, Cornell Univ., Ithaca, NY 14853*

Raw milk samples were collected over time from four model pipeline systems which were previously subjected to different cleaning routines. Routines included: (1) emptying after milking, (2) emptying and rinsing with water, (3) emptying, rinsing and washing, and (4) emptying, rinsing, washing, and sanitizing. Six plating methods were evaluated: standard plate count, psychrotrophic bacterial count, rapid psychrotrophic count, mesophilic plate count, preliminary incubation count, preliminary incubation-violet red bile agar count. Four impedance protocols were also evaluated: total count, psychrotrophic count, mesophilic count, and coliforn count. A Bactomatic R model 123 was used to do the impedance protocols. Counts by plating methods declined and impedance detection times increased with time of milk flowing through the pipeline for the poorest cleaning routines. Impedance protocols provide more rapid monitoring of cleaning of pipelines.

ASSESSMENT OF THE MICROBIAL QUALITY OF DAIRY POWDER USING THE IMPEDANCE TECHNIQUE

N. Tsang, R. Firstenberg-Eden and M. Lamb, *PO Box 3103, Princeton, NJ 08540*

An array of automated tests were developed to rapidly determine dairy powder quality. Using an impedance method for enumerating total count, 10 g of the sample were dissolved in 90 ml of a Detection Medium (DM) and preincubated at 35°C for 4 h. One ml of this sample was then loaded into a well in the test module that was pre-filled with 1 ml of DM. The change in the capacitance signal was monitored (24 h, 35°C). Regression analysis showed high correlation between the impedance method and the standard plate count method. The impedance method for fecal streptococci consisted of dissolving 10 g of the sample in 90 ml of a newly formulated Fecal Streptococci Medium (FSM) and subsequently load-

ing 1 ml of the sample into a well in the test module. The capacitance signal was monitored (24 h, 35°C). Samples with fecal streptococci levels equal to the specification limits (10-100 CFU/g) could be detected by the impedance method within 18 h. A large variety of dairy powders, including dry milk powders, was tested. The FSM effectively inhibited growth and detection of interfering bacteria, including *Bacillus* sp. and Group N *Streptococcus* sp. These two tests, along with other impedance methods, such as the coliform test and the *Escherichia coli* test, provide the industry with a fast, easy and versatile approach in controlling the microbial quality of dairy powders.

FOOD TOPICS

AUTOMATIC GREASE/OILS/FATS REMOVAL UNITS FOR FOOD-PROCESSING FACILITY EFFLUENT TREATMENT APPLICATIONS

W.C. Batten, *Thermaco, Inc., Asheboro, NC*

Automatic grease/oils removal units do the job that no one wants to do manually. As unemployment rates decline, federal funds for sewer projects/repairs vanish, landfill dumping restrictions increase, and commercial areas continue to develop, use of automatic grease/oils removal units will increase. Sewer utility surcharges and use restrictions, coupled with already high costs of servicing large in-ground grease traps will necessitate greater usage of automatic grease/oils removal units, particularly in densely populated business districts and on sites where septic tanks or small wastewater treatment plants are utilized. Environmentally, the removed products are suitable for sale to existing recycling companies (rendering companies), leading to reduced amounts of grease/fats/oils being dumped in landfills. The bulk of the organic loading mass (food solids and fats/oils) can be physically removed yielding numerous benefits including: Significant reductions in food-processing facility effluent B.O.D., suspended-solids, and grease/oils levels. This means the facility may realize significant reductions in *sewage* treatment assessments/costs. Elimination of drain stoppages caused by grease/oils/fats and food solids build-ups. As a consequence, this reduces the possibility of facility-maintenance personnel utilizing powerful (and in many cases environmentally illegal) drain clearing chemicals. Improved facility sanitation as a consequence of fewer waste drain line stoppages. An automatic grease/oils removal unit is designed to: (1) separate free-floating grease/oils/fats constituents from a wastewater flow and (2) automatically "skim-out" the separated grease/oils/fats at *least* once every 24 hrs into a separate container for recycling or disposal. Many products have undergone a transformation from manually operated designs to automatic designs during the last 100 years. Examples of this are water pumps and washing machines. The day has arrived, and the technology has been perfected whereby wastewater grease/oils may be separated, skimmed-off, and transported automatically without human intervention.

CLEAN ROOM CONCEPTS FOR THE FOOD INDUSTRY

R.M. Darrah, *Safeway Stores, Inc., Dairy & Meat Division*

Clean Room concepts have long been recognized in the electronics business. Particulate air filtration down to 99.9% at .03 microns has been a realty for many years. Originally μm to keep microscopic particles out of sensitive circuitry while allowing an operator access to the material being protected, these techniques have been adapted to food processing applications in only the past few years. These concepts and practices are still used in only very limited applications, while it is abundantly clear greater protection is needed for our food supplies.

Use of Laminar air flow can help to keep bacterial aerosols away from critical points in food filling and packaging machinery and other critical areas.

THE RELATIONSHIP OF SANITATION KNOWLEDGE TO PROFITS IN MEAT DEPARTMENTS OF A RETAIL SUPERMARKET CHAIN

R.B. Gravani, T.R. Dockerty, E.W. McLaughlin and B.B. Edmiston, *Institute of Food Science, Stocking Hall, Cornell University, Ithaca, NY 14853*

This study was undertaken to determine the relationship between employee sanitation knowledge and meat department profitability in retail stores. A 25-item questionnaire, composed of technical and attitudinal questions, was administered to 612 meat department employees of 51 stores within a major supermarket chain. The average score for all employees was 77.1, with managers achieving the highest average (82.2), followed by non-managers (76.3) and the sanitation worker (69.8). Test scores within each job classification rose as experience level increased. Employees who showed a greater technical knowledge of sanitation, as indicated by higher scores, seemed to understand the link between sanitaiton and profitability as reflected in attitudinal responses. No significant correlation could be found between a managers and subordinates score. When meat department profitability data were compared with questionnaire results, a positive relationship between profit and the degree in which specified sanitation procedures are followed was observed.

IMPORTANCE OF STATISTICAL QUALITY CONTROL IN FOOD PROCESSING

C. Kloos, *Beatrice/Hunt-Wesson, Inc., 1645 West Valencia Drive, Fullerton, CA 92633*

Food products have traditionally been thought of as commodities requiring relatively small amounts of manufacturing and marketing. However, as customers became more sophisticated and demanded higher levels of quality, nutrition and safety for their food dollar, manufacturers have had to improve the ways they handled and processed foods. Losses in market share to foreign competitors have also made management rethink their approach to controlling quality. Dr. W. Edwards Deming, the man credited with helping bring Japanese industry back to its feet, has developed a unique management theory and approach to improving product quality and productivity. The 14 points of Deming's Management Theory will be reviewed as well as some simple graphical techniques which can be used for controlling processes to improve product quality. As pressures for safety and profits mount, companies must reexamine the factors such as quality which affect sales and productivity which affect costs.

APPLICATION OF TIME-TEMPERATURE INDICATORS IN FOOD INVENTORY MANAGEMENT

R. Paul Singh and John Henry Wells, *Department of Agricultural Engineering, University of California, Davis, CA 95616*

Time and temperature play a major role in causing quality related changes in foods during storage and handling. Abusive temperature exposures often lead to quality deterioration. It is desirable to know the actual temperature history of a food product as it moves through the food chain. Some commerically available time-temperature indicators offer an opportunity to determine this information in quantitative terms. Recent research has focused on correlating the indicator response with changes in quality attributes of stores products that were subjected to a variety of time-temperature exposures. Studies have shown that these indicators can be effectively used in determining the type of temperature exposure a product receives during storage and handling. A potential application of this approach is to use a time-temperature based inventory management system. Such a sysem is based on the remaining shelf life of a food product rather than the conventional First-In-First-Out system which assumes that product is always held at recommended constant temperatures.

THE COST OF REGULATORY COURT ACTION AND LEGAL SUITS TO THE FOOD INDUSTRY

Ewen C.D. Todd, *Bureau of Microbial Hazards, Health Protection Branch, Tunney's Pasture, Ottawa, Ontario, KlA 0L2*

Problems in food processing of foodservice that lead to spoilage, illness or contamination by pathogens or extraneous matter can be costly in terms of legal settlements to the companies involved. Although industry and public health officials have been aware of these risks, the extent and types of costs involved are not usually publicized. This paper gives examples of seizures, fines and settlements. The type of amounts given may depend on severity and length of illness and also whether or not the settlement is determined by Workers' Compensation Board, court or out-of-court action. In court cases, these settlements represent an average of about two thirds of the total costs, the other amounts being for legal and court expenses. Because some of these awards are becoming prohibitively high for industries, insurance companies and the taxpayer, there are government moves to limit these to $100,000 and prevent excessive legal fees. The opposition to this will probably be strong enough to prevent any rapid change to the settlement system, and legal action will remain an important component in the economy of the food industry.

FOOD SAFETY TOPICS

UPDATE ON EMERGING PATHOGENS IN FOODS

Michael P. Doyle, University of Wisconsin, Food Research Institute, 1925 Willow Drive, Madison, WI 53706

Recent attention of regulatory agencies and much of the food industry largely has been focused on the association of *Listeria monocytogenes* with foods. However, of equal or perhaps greater importance are certain other bacterial pathogens that have within the past decade become organisms of concern because of their recognized presence in foods. *Campylobacter jejuni* is now known in the United States . *Yersinia enterocoliticais* responsible for distressing appendicitis-like symptoms which often lead to unnecessary appendectomies. *Escherichia coli* 0157:H7 produces hemorrhagic colitis (bloody diarrhea) and hemolytic uremic syndrome (a principal cause of kidney failure in children) which result in severe morbidity and sometimes mortality. *Vibrio cholerae* may produce severe diarrhea and dehydration which can be life-threatening. *Vibrio vulnificus,* an unusually virulent marine bacterium associated with seafoods, is often fatal for individuals with high serum iron levels. It is important for food manufacturers to identify means of controlling these organisms in potentially contaminated foods and consider the survival and growth characteristics of such pathogens when developing new products.

PACKAGED ICE: A GROWING FOOD PROTECTION PROBLEM

Charles W. Felix, Charles Felix Associates, PO Box 1581, Leesburg, VA 22075

A food safety problem that has surfaced in the past 10 years with the extraordinary growth of foodservice in convenience stores is the contamination of ice made, served, and sold on the premises. In the back rooms of counless gas stations, package stores, and convenience outlets in the U.S., ice making machines account for an ice industry of considerable magnitude that is generally unregulated and frequently unsanitary. A survey of the 50 states indicates that health officials often either do not inspect these ice making operations or, being unfamiliar with the critical control points in ice manufacture, neglect to check on the sanitary quality of the ice made, served and/or packaged, and sold on the premises. A search of the literature reveals that ice is indeed a food and capable of supporting survival and growth of pathogenic organisms. There is also documented evidence that contaminated ice can cause illness in consumers. A model for packaged ice has been developed by the Packaged Ice Association for the instruction of inspectors and operators alike. These quideines are presented in the context of the health hazards repesented by unregulated packaged ice.

IMPROVING THE EFFICIENCY OF THE BOT-ELISA TEST

C.N. Huhtanen, *Eastern Regional Research Center, 600 East Mermaid Lane, Philadelphia, PA 19118*

The enzyme-linked immunosorbent assay for *Clostridium botulinum* toxin (BOT-ELISA) is generally done at 37°C for 90 min for each step. This requires a full working day excluding the first step of coating the micro-titer plates, which is done at 4°C for 18 h or more. The purpose of the research reported here was to determine if the assay could be improved by increasing the incubation temperature of the various steps. Observations were also made on the effect of micro-titer plate washing methods and plate source on the efficiency of the BOT-ELISA test. The results indicated that in general the reaction times were substantially decreased by incubating at 45°C. There was a decrease in optical density at 55°C, indicating that this temperature either destroyed the toxin or exceeded the optimum for the alkaline phosphatase used in the test. No differences in sensitivity were observed among plates obtained from three different sources. Evaluation of washing methods indicated that three washes instead of five were adequate.

DETECTION OF SPECIFIC MICROORGANISMS OR TOXINS BY BIOSENSORS

N. Robert Ward and Philip J. Lozier, BioControl Systems, Inc., 21414 68th Ave S., Kent, WA 98032

The basic elements of a biosensor include: (i) a biologically active component that responds to specific conditions or chemicals in its environment to generate a signal and (ii) an electronic device for recognition and interpretation of the signal (the 'sensor' or 'transducer'). Biosensors can detect specific microorganisms or toxins through the coupling of antigen-antibody reactions or nucleic acid hybridization reactions to a sensor. Direct immunosensors have been constructed by binding an antibody directly to a sensor surface or to a membrane that is placed onto the sensor surface. The reaction of an antigen with the antibody on the immunosensor results in generation of a signal that is processed by the sensor. These direct immunosensors generally have low sensitivity and throughput and are frequently fouled by extraneous materials in the sample being tested. Immunosensors that are constructed with the sensor away from the antigen-antibody reaction avoid these problems. In most instances, immunosensors of this type utilize an enzyme labelled antigen or antibody. After formation of the antigen-antibody complex, substrate is added and the product of the enzyme reaction is detected by a remote sensor. Use of a remote sensor also seems to be a promising approach for hybridization assays. As with the remote immunosensor, hybridization reaction employing an enzyme label would be conducted apart from the sensor. Formation of the hybridization duplexes would be indicated by the appearance of an enzyme-catalyzed product after addition of substrate. The types of the biosensors for detection of specific toxins and microorganisms will range from small hand-held devices to large multi-sample analyzers.

HOME FOOD HANDLING

THE MICROBIOLOGY OF SLOW-COOKED, STUFFED TURKEY

K.F. Eckner, E.A. Zottola and R.B. Gravani, *Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, MN 55108*

Recently a recipe for stuffing and slow-cooking a turkey overnight appeared in a national magazine. Questions arose concerning the microbiological safety of the recipe and the cooking times stated. The stuffing was prepared according to the recipe and then inoculated with *Staphylococcus aureus, Salmonella typhimurium* and *Clostridium perfringens* at 10^5 organisms per ml. Four turkeys were prepared for cooking and were stuffed. Thermocouples were inserted into various parts of the turkey and the stuffing to record temperatures attained during roasting. The turkeys were roasted until the center of the stuffing reached 165°F. After cooking, the stuffing was aseptically removed, incubated in 12 L of 0.1% peptone broth and plated onto appropriate diagnostic media. No salmonellae or staphylococci were isolated from the stuffing, but *Clostridium perfringens* was present after

roasting. The results indicated that pathogenic bacteria could survive if the published procedure for minimum prescribed cooking time was used.

USE OF MICROWAVE OVENS FOR IN-HOME PASTEURIZATION OF MILK

Kathleen M. Knutson and Elmer H. Marth, *Department of Food Science, 1605 Linden Drive, University of Wisconsin, Madison, WI 53706*

Microwave ovens present in many homes offer a convenient means to pasteurize milk on farms where raw milk is otherwise available to consumers. Methods were developed to pasteurize milk in microwave ovens. The heat-resistance of *Streptococcus faecalis* was determined to be greater than that of *Coxiella burnetii*, and so *S. faecalis* served as the test organism and was inoculated into raw milk. The procedure for a 700-W microwave oven involved heating 604.8 g (2/3 quart) of inoculated raw milk for 4.5 min, and for a 550-W microwave oven, heating 453.6 g (1/2 quart) for 5.0 min in 1-quart glass canning jars. Initial temperatures of milk were 7°C, and final temperatures ranged from 66 to 71°C. After heating, milk was vigorously shaken and then cooled overnight at 5°C. Milks were plated on APT agar with 0.4% added sodium azide and on Bile Esculin Azide agar. Microwave-heating as described reduced the population of *S. faecalis* by 2.9-5.1 orders of magnitude. This is equivalent to or greater than reducing *C. burnetii* to undetectable levels from an initial concentration of 10^5 infectious guinea pig doses per 2 ml of milk, which is the basis for the currently acceptable pasteurization process for milk.

LISTERIA AND LISTERIOSIS

ANTIMICROBIAL EFFECT OF CHLORINE ON *LISTERIA MONOCYTOGENES* IN PHOSPHATE BUFFER AND BRUSSELS SPROUTS

R.E. Brackett, *Department of Food Science and Technology, University of Georgia, Experiment, GA 30212*

The antimicrobial effect of reagent grade sodium hypochlorite (SH) and household bleach (HB) on 2 strains of *Listeria monocytogenes* (Scott A and LCDC 81-861, both serotype 4a) was determined. After 24 h of growth in tryptic soy broth, cells were centrifuged, and the pellets resuspended in potassium phosphate buffer (pH 7.0). Three-ml portions of the cell suspensions were then added to 27 ml of phosphate buffer containing about 0, 5, 10, 50, 100, or 200 ppm free residual chlorine. Cells were exposed to the chlorine for 15, 60, 120 and 300 s, at which time the chlorine was neutralized with 0.01 *M* sodium thiosulfate. Populations of surviving cells were determined by plating samples of the neutralized solution on tryptic soy agar and incubating plates for 48 h at 30°C before counting. Chlorine concentrations less than 50 ppm showed no antimicrobial effect but exposure to 50 ppm or greater chlorine resulted in no viable cells being recovered. Results for both SH and HB were similar. Dipping Brussels sprouts containing about 5 $\log_{10}$ colony forming units (CFU) *L. monocytogenes*/g into a 200 ppm chlorine solution for 10 sec reduced viable cells recovered on McBrides agar by about 2 $\log_{10}$ CFU/g.

HEAT RESISTANCE OF LISTERIA MONOCYTOGENES IN ARTIFICIALLY-INOCULATED AND NATURALLY-CONTAMINATED RAW MILK

Jeffrey M. Farber, Gregory W. Sanders, Douglas B. Emmons and Robin C. McKellar, *Bureau of Microbial Hazards, Health Protection Branch, Tunney's Pasture, Ottawa, Ontario K1A 0L2 and Food Research Center, Central Experimental Farm, Agriculture Canada, Ottawa, Ontario K1A 0C6*

The outbreak of listeriosis in Massachusetts in 1983, in which the incriminating vehicle was pasteurized whole or 2% milk, has prompted investigators to question whether or not *Listeria monocytogenes* can actually survive pasteurization. The objective of this study was to examine the heat resistance of *Listeria* in artificially-inoculated and naturally-contaminated raw milk. In initial studies, *Listeria monocytogenes* (mixture of 10 strains; 10^4 organisms/ml) was inoculated into 1200 L of raw, whole milk. Temperatures ranging from 72 to 60°C (16 s) were examined using a Junior Paraflow, APV-Crepaco regenerative plate unit. It was demonstrated that the organism could survive temperatures up to 67.5°C, but could not survive pasteurization. In the next phase of our study, milk naturally-contaminated with *L. monocytogenes* was used. Postive bulk-tank samples in the Ottawa area, led to a farm containing a cow secreting *L. monocytogenes* in its milk. The cow's milk was pooled for 2-3 d and then run through the pasteurizer. Preliminary results indicate that *L. monocytogenes* will not survive proper pasteurization treatment in naturally-contaminated raw milk.

ATTACHMENT OF LISTERIA MONOCYTOGENES AND YERSINIA ENTEROCOLITICA TO STAINLESS STEEL AT VARIOUS TEMPERATURES AND pH VALUES

P.J. Herald* and E.A. Zottola, *Department of Food Science and Nutrition, 1334 Eckles Avenue, University of Minnesota, St. Paul, MN 55108*

This study was undertaken to investigate the adherence of recently emerging pathogens, *Listeria monocytogenes* isolate Jalisco Cheese and *Yersinia enterocolitica*, to stainless steel at temperatures and pH values between their upper and lower growth ranges. *L. monocytogenes* was grown to pH 5, 7, and 8 at 10, 21, and 35°C, and identical temperatures were used for growth of *Y. enterocolitica* in TSB at pH 6, 8, and 9.5. A stainless steel chip was in each culture vial. The incubation periods were 18-24 hr for 21 and 35°C and 36-48 h for 10°C to obtain approximately the same cell population as determined by growth curves. Attachment was also investigated in a dynamic growth environment and at various times during growth at optimum pH and temperature. Following the incubation period, the stainless steel chips were fixed for scanning electron microscopy (SEM). Both pathogens attached to the stainless steel at the pH values and temperatures studied; however, the numbers of microcolonies and cells with attachment material were greater at lower temperatures and increased with incubation time. The presence of these microorganisms in food processing plants could pose a health hazard and makes the cleaning and sanitation of the plant and equipment very significant.

FOOD SAFETY RESEARCH AND EDUCATIONAL PRIORITIES FOR THE DAIRY INDUSTRY

Alan R. Huggins, Dairy Research Foundation, 6300 River Road, Rosemont, IL

During the Summer of 1986, Dairy Research Foundation (DRF) accelerated its program to initiate directed research that would provide new information on the emerging foodborne pathogen, *Listeria monocytogenes (Lm)*. Symposia and workshops were sponsored by DRF to generate questions, answers and to determine the critical issues. In the Fall of 1986, DRF held a special 2-d meeting with research experts representing academia, dairy and food industries, FDA, CDC, USDA and state officials to assess the status of research by different groups on *Lm* and to identify priorities for new research, which were then published as a call for proposals. Eight new projects were initiated from this program to address the following four priorities: (1) Determination of Infectious Dose in Animal Models; (2) Development of Improved Detection Methods; (3) Control in the Dairy/Food Processing Environment and (4) Behavior in Dairy Products. These eight new projects, and five ongoing projects represent over one million dollars of research funding, provided by the U.S. dairy industry through a coordinated program, committed to understanding and preventing the potential occurrence of *L. monocytogenes* in food products. Finding of these projects are in progress.

SURVIVAL OF *LISTERIA MONOCYTOGENES* IN SIMULATED MILK COOLING SYSTEMS

R.K. Lindenthal and E.A. Zottola, *Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, MN 55108*

Survival of *Listeria monocytogenes* under conditions normally found in milk cooling systems was studied. Sterile solutions of 0.1 and 0.01 peptone, 0.1% and 0.01% NFDM, 30% glycol, and 30% glycol with 0.01% NFDM were inoculated with 6000 organisms per ml of *L. monocytogenes* var. Scott A. These were placed in a circulating water bath at 4°C. Growth was not observed after 3 weeks and initial populations declined. The temperature was then increased to 7°C. Initially, samples were taken every 2-3 d, then weekly, when it was observed that the population stabilized. After 30 d, there were greater than 10^6 organisms per ml in both concentrations of peptone and NFDM. Growth was greater in NFDM than peptone and at the higher concentrations of each. There was little growth in the 30% glycol with 0.01% NFDM broth and no survival in the 30% glycol solution. Existence of *L. monocytogenes* may pose a hazard in milk cooling systems, especially in sweet water systems that might contain a small amount of milk, and less of a threat in glycol systems.

HUMAN LISTERIOSIS TRANSMITTED BY FOOD IN A GENERAL MEDICAL-MICROBIOLOGICAL PERSPECTIVE

D.A.A. Mossel[1], P. van Netten[2] and I. Perales[3], [1]Chair of Medical Food & Water Microbiology, The Netherlands Government University of Utrecht, P.O. Box 80175, 3508 TB Utrecht, The Netherlands, [2]Netherlands Government, Food Inspection Service, and [3]Government Health Directorate Bilbao, Spain.

Listeriosis transmitted by food is rarely observed in man in The Netherlands and its surrounding countries. Data obtained in the US prompted new investigations. A highly selective-diagnostic medium was developed allowing the recovery of the target organism, also in sublethally injured condition, from heavily contaminated food specimens. These included poultry, considered an important source of infection in N.W. Europe. The basal medium was that of Beerens-Ralovich, relying on the use of acriflavine and nalidixic acid, but with 0.25%

phenylethanol added and made elective by the use aesculin and a ferrous salt. Incubation in a microaerobic atmosphere restricted growth on this medium to *Listeria monocytogenes* and group D streptococci. Solid medium repair in the presence of catalase was found to be required for quantitative recovery of very severely stressed population components. *L. monocytogenes* was not found to occur to any extent (1 cfu/ml) in raw milk originating from healthy udders and clarified before being processed for safety. The organism shows no unusual heat resistance (i.e. not resulting in at least 7 D at 72°C); data earlier obtained pointing to the opposite have been collected by a technique fraught with experimental risk. *L. monocytogenes* has a generation time at 4°C of about 30h, exceeding that of true psychrotrophs. Longitudinally integrated good manufacturing and distribution practices of validated safety assurance value will completely manage any risk of transmission of listeriosis by food. However, the introduction of refrigerated processed food of extended durability ("repfed") requires particular attention; risk analysis in this area are in progress and their results will be presented.

SURVIVAL OF LISTERIA MONOCYTOGENES IN COLD-PACK CHEESE FOOD DURING REFRIGERATED STORAGE

Elliot T. Ryser and Elmer H. Marth, *Department of Food Science, 1605 Linden Drive, University of Wisconsin, Madison, WI 53706*

The ability of *Listeria monocytogenes* to persist in cold-pack cheese food was examined. Duplicate batches of cheese food were made according to three different formulations; inoculated to contain 5×10^2 *L. monocytogenes* (strains Scott A, V7, California or Ohio) CFU/g and stored at 4°C. *L. monocytogenes* was enumerated by surface-plating appropriate dilutions made in Tryptose Broth (TB) at 21°C and TB containing 2% (w/v) sodium citrate (TBC) at 45°C on McBride Listeria Agar (MLA). Selected TB and TBC dilutions were stored at 4°C and plated on MLA after 2 weeks. Representative colonies were biochemically confirmed. *Listeria* counts decreased 0.23 to 0.73 order of magnitude after 28 d in cheese food without preservatives. In 14-d-old cheese containing 0.30% sorbic acid or sodium propionate, *Listeria* counts decreased 0.04 to 0.21 and 0.08 to 0.52 order of magnitude, respectively. Similar *Listeria* counts were obtained using both TB and TBC. After 2 weeks, the percentage of false-negatives for cold-enriched TB and TBC samples was 20.4% (28 of 137) and 5.7% (8 of 141), respectively.

BEHAVIOR OF LISTERIA MONOCYTOGENES IN SKIM MILK DURING FERMENTATION BY LACTIC STARTER CULTURES

Michelle M. Schaack and Elmer H. Marth, *Department of Food Science, 1605 Linden Drive, University of Wisconsin, Madison, WI 53706*

Behavior of *Listeria monocytogenes* in sterile skim milk inoculated with various lactic acid bacteria was investigated. Flasks containing autoclaved skim milk were inoculated with approximately 1×10^3 *L. monocytogenes* strain V7 cells/ml of milk. A lactic culture (*Streptococcus cremoris* or *Streptococcus lactis*) was added to the skim milk at levels of 5.0, 1.0, 0.5, 0.25 or 0.1%. Flasks of milk were incubated at 21 or 30°C for 15 h, followed by refrigeration at 4°C. Samples were plated in duplicate on McBride Listeria Agar and on Plate Count Agar. Plates were incubated at 30°C for 48 h. Results using a 1.0% inoculum of *S. lactis* and incubated at 21°C showed that *L. monocytogenes* increased in number by an average of .36 log, but control samples showed an average increase of 1.92 log, thus inhibition of *Listeria* was 1.56 log (final pH 5.20). Results with other levels of *S. lactis* and incubation at 21°C showed inhibition of 1.49 log at 0.5% (pH 5.20), 0.97 log at 0.25% (pH 5.63) and 0.88 log (pH 6.03) at 0.1%. Using *S. cremoris* and incubation at 21°C, *Listeria* was inhibited by 1.93 log at 5.0% inoculum (pH 4.61), 1.79 log at 1.0% (pH 4.76), 1.14 log at 0.5% (pH 5.72) and 0.32 log at 0.1% (pH 6.22). At 30°C, *S. cremoris* inhibited growth of *Listeria* by 3.99 log at 5.0% (pH 4.38), 3.90 log at 1.0% (pH 4.46), 2.88 log at 0.5% (pH 4.53), and 2.56 log at 0.1% (pH 4.53). *L. monocytogenes* also survived refrigerated storage after 6 weeks at pH 4.81.

SURVIVAL OF LISTERIA MONOCYTOGENES DURING THE MANUFACTURE AND RIPENING OF COLBY CHEESE

Ahmed E. Yousef and Elmer H. Marth, *Department of Food Science and the Food Research Institute, University of Wisconsin, Madison, WI 53706*

Colby cheese was made from pasteurized whole milk inoculated with *Listeria monocytogenes* (strain V7 or California). The number of *L. monocytogenes* was monitored during manufacture and ripening of the cheese. Ten-g samples of curd or cheese were mixed with 90 ml of warm (40°C) 2% citrate solution and blended for 2 min. One-tenth ml of the emulsified sample (or its 1:10 dilution) was spread on McBride Listeria Agar. Plates were incubated 48 h at 35°C in an atmosphere of 5% O_2: 10% CO_2: 85% N_2. Colonies of *L. monocytogenes* were counted and selected colonies were confirmed biochemically. At the time of hooping, curd contained ca. 10 times the number of *L. monocytogenes* that was in inoculated milk. Most *Listeria* cells were in curd and only a few in whey. Batches of cheese that contained strain V7 were ripened for 4 months at ca. 4°C. Number

of *Listeria* in these cheeses remained almost constant for 1 month, then gradually decreased. Survival of the California strain in cheese was similar except numbers of this strain decreased more rapidly than those of V7.

MOLDS AND MYCOTOXINS

THE OCCURRENCE AND SIGNIFICANCE OF MOLDS AND MOLD GROWTH IN FOODS

Lloyd B. Bullerman, *Department of Food Science and Technology, University of Nebraska-Lincoln, 134 Filley Hall, East Campus, Lincoln, NE 68583-0919*

Molds and mold growth on foods are continuing problems in food microbiology and food safety, which demand constant attention and efforts to control. Mold growth in food affects the safety and quality of the food, but does not always mean that the food must automatically be discarded. Guidelines have been developed which can be used to do risk analyses and determine if a food exhibiting mold growth must be discarded, or if the mold can safely be removed and the remainder of the food salvaged. A number of environmental factors affect mold growth. Control of these factors can lead to prevention and control of mold growth in foods. This paper discusses the factors that must be controlled to prevent mold growth in foods, and the basis for guidelines used to determine when a food can be safely trimmed of mold growth and when it should be discarded.

EFFECTS OF COMPETITIVE MOLDS ON GROWTH AND AFLATOXIN PRODUCTION BY *ASPERGILLUS FLAVUS* AND *ASPERGILLUS PARASITICUS*

Lloyd B. Bullerman and Shi-Jenq Lee, *Department of Food Science and Technology, University of Nebraska-Lincoln, 134 Filley Hall, East Campus, Lincoln, NE 68583-0919*

The effect of selected competing molds on growth and aflatoxin production by *Aspergillus flavus* and *Aspergillus parasiticus* was studied by using a dialysis membrane to physically separate the molds grown side by side in yeast extract sucrose broth. Growth of the competing molds reduced aflatoxin production. The reduction was more than simple competition for nutrients which often results in reduced growth. Sorbate treatment affected the mold interaction, depending on the relative sensitivities of the molds to sorbate. Fungal interaction was studied on the surface of corn meal agar and corn kernels by inoculating spore mixtures of molds in various ratios. The result of interaction was observed as the inhibition of sporulation of the aflatoxin-producing mold by the selected competing mold at the inoculation site, or the front or leading edge of the colony. *A. flavus* was more competitive on damaged corn kernels with 18%moisture than on undamaged kernels with 26% moisture.

MOLDS INVOLVED IN THE DEVELOPMENT OF "BLUE-EYE" DISEASE OF STORED POPCORN

Martha J. Lindell and Dr. L. B. Bullerman, *Dept. of Food Science & Technology, University of Nebraska-Lincoln, 134 Filley Hall, East Campus, Lincoln, NE 68583-0919*

"Blue-eye" is a condition in which members of the maize family are invaded by blue or green mold(s). The mold(s) are located between the germ and seed coat of the kernel causing a visible blue spot or streak over the germ area. The objective of this research was to identify the mold(s) causing the condition in popcorn and to assess the effect of water activity (a_w) on the molds present, and the development of blue-eye. Surface sanitized kernels were placed directly on the surface of two agar media, one of which had salt added to lower the a_w. The purpose of this was to determine if a_w would have an effect on the type of molds which developed and were isolated. Kernels plated on media without salt yielded predominantly several blue-green *Penicillium* species and one type of green *Aspergillus*. More molds were isolated from kernels plated on media which contained salt than on media without salt (77.2% outgrowth vs. 54.4% outgrowth, respectively). The results confirm that blue-eye condition is strongly associated with the presence of blue-green *Penicillium* species. The green *Aspergillus* species were more predominant at the lower water activities. At low water activities, the predominant molds appeared to be ascosporic aspergilli most likely members of the *Aspergillus glaucus* series. This may suggest that the *A. glaucus* molds develop first, followed by the blue-green penicillia which ultimately take over and predominate.

PACKAGING OF FOOD

ASSESSING THE MICROBIOLOGICAL SAFETY OF MODIFIED ATMOSPHERIC PACKAGING: SPOILAGE VS PATHOGENICITY

J.H. Hotchkiss, *Institute of Food Science, Department of Food Science, Cornell University, Ithaca, NY 14853*

There is an increased commercial interest in refrigerated foods. This stems from a consumer perception of freshness and from packaging technologies which increase refrigerated shelf life. Shelf life is extended up to 400% through packaging in gas atmospheres that have been modified from air. The microbial consequences of shelf life extension are not fully understood and no consensus has been reached on the safety of such packaging technologies. There is no standard methodology for assessing hazards from these products. At least four experimental approaches have been taken: (1) simple inoculation studies, (2) comparative studies of toxigenesis and organoleptic spoilage, (3) comparisons of relative probability of toxigenesis, and (4) comparative studies of the growth of spoilage and pathogenic organisms under abusive conditions. Each method will be discussed and the advantages and disadvantages presented. The relationship between spoilage and pathogenesis will be discussed using examples from the literature. The concept of a safety index for assessing safety will be presented.

CURRENT STATUS OF TAMPER EVIDENT FEATURES AVAILABLE FOR PACKAGED FOODS

J.H. Hotchkiss and R.B. Gravani, *Institute of Food Science, Department of Food Science, Cornell University, Ithaca, NY 14853*

In 1982 several deaths resulted from ingestion of cyanide-laced over-the-counter (OTC) drugs. The OTC drug industry in cooperation with the federal regulatory agencies quickly adopted packaging technologies intended to minimize the risks from malicious tampering. The food industry did not respond in a similar manner. Deaths occurred 3 years later as a result of ingesting tampered foods. The food industry has since begun to adopt tamper-evident packaging technologies. This presentation will define the problem in terms of risks to consumers and to food manufacturers resulting from malicious tampering. A ranking of the vulnerability of different product categories based on field surveys will be given. The characteristics of the ideal tamper-indicating package will be discussed and the advantages and disadvantages of recent packaging technologies examined. Some not yet available packaging ideas which are intended to make product tampering more difficult will be presented.

SALMONELLA

MICROBIOLOGICAL CONTAMINATION OF SWEET WATER AND GLYCOL COOLING SYSTEMS USED IN THE HTST PASTEURIZER

A.A. Airoldi, R.K. Lindenthal and E.A. Zottola, *Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, MN 55108*

Refrigerated water and water/glycol mixtures used in HTST pasteurizers have been suggested as potential sources of spoilage and pathogenic bacteria in milk. This study was carried out to determine the incidence of potentially pathogenic bacteria in these cooling systems. Sweet water and glycol coolants from 17 fluid milk plants were sampled to determine the presence of salmonellae and other gram negative enteric organisms. A modified most probable number (MPN) technique was performed using 333 ml of coolant in lactose broth. Samples were incubated for 48 h at 37°C. Those showing growth at 24 h were used to inoculate classic selective enrichment, differential and biochemical confirmation media for salmonellae. After 48 h samples positive for growth and gas were used to inoculate brilliant green bile for confirmation and enumeration of coliforms. The population of organisms that grew at 37°C varied greatly from plant to plant. MPN values from <2.1 to> 1680/ml were found. No salmonellae were identified. When present, coliforms were usually at low levels. Two plants had MPN values for coliforms greater than 20/ml. This study suggests that coolant used in a HTST may serve as a reservoir for bacterial contamination of pasteurized milk.

IMPROVED SELECTIVE PLATING MEDIUM FOR DETECTION OF SALMONELLAE FROM FRESH AND CURED POULTRY SAMPLES

J.S. Bailey, J.Y. Chiu, N.A. Cox and R.W. Johnston, *USDA, Agricultural Research Service, RRC, PO Box 5677, Athens, GA 30613*

A new modified lysine iron agar medium (MLIA/USDA) was developed and evaluated against brilliant green sulfa agar (BGS) and xylose lysine desoxycholate agar with novobiocin (XLDN) for the selective differentiation of salmonellae from fresh and cured poultry. Fifty samples of mechanically deboned turkey, mechanically deboned cured chicken meat, and rinse samples of fresh chicken carcasses were either direct-enriched in selenite cystine broth at 35°C or preenriched in lactose broth with 0.6% tergitol and 35°C and then enriched in TT broth at 43°C or selenite brilliant green at 43°C. Overall, significantly (P = .05) more salmonellae were recovered with MLIA/USDA than with BGS or XLDN. When the poultry products were enriched in TT broth at 43°C and then streaked onto MLIA/USDA plates, 75% of isolates from cured meat and 95% of isolates from turkey and fresh chicken were confirmed to be salmonellae. By using the TT (43)-MLIA/USDA procedure, fewer isolates would have to be picked from the selective plates to ensure confirmation of salmonellae. The medium can be stored for at least 3 weeks at 4°C without loss of selective differential properties.

RAPID DETECTION OF *SALMONELLA* IN FOODS USING THE GENE-TRAK ASSAY IN CONJUNCTION WITH A MODIFIED ENRICHMENT PROCEDURE

R.H. Deibel, R.J. Siakel, C. Kowalewski and M.A. Mozola, *Chem Bio Consultants and Laboratories, 5723 West Fullerton Avenue, Chicago, IL 60639 and GENE-TRAK Systems, 31 New York Avenue, Framingham, MA 01701*

The recent development of rapid methods for *Salmonella* analysis, such as the GENE-TRAK DNA hybridization method, has reduced the time required for *Salmonella* testing to approximately 44-48 h. In an attempt to reduce analysis time still further, a modified enrichment procedure for *Salmonella* was evaluated in conjunction with the GENE-TRAK assay. The modified enrichment procedure employs a 7 h preenrichment in a minimal glucose-salts medium followed by two successive transfers to an M broth-novobiocin enrichment medium for incubations of 13 and 6 h. The final enrichment broth is then tested directly in the GENE-TRAK assay (4 h), resulting in a total analysis time of about 30 h. One hundred thirty eight samples, comprised of inoculated and uninoculated foods, were analyzed by both the BAM/AOAC conventional culture procedure and the modified enrichment/GENE-TRAK method. Thirty one samples were positive by BAM/AOAC. Forty two samples were positive by the GENE-TRAK assay following modified enrichment, of which 32 were confirmed by isolation of *Salmonella* from the culture media. These preliminary results indicate that the modified enrichment procedure has potential for use in conjunction with the GENE-TRAK *Salmonella* assay to reduce total analysis time to approximately 30 h.

WATER QUALITY

BOTTLED WATER QUALITY

Robert B. Kelsey, *Arrowhead Drinking Water Co., 1566 E. Washington Blvd., Los Angeles, CA 90021*

Today's bottled water consumer is more demanding of quality than in the past. The preferred taste of bottled water over most tap water has been the main driving force in the growth of the bottled water industry. Today, however, the consumer is more educated. A constant barrage of reports in the news media has raised consumers' concerns about the quality of their tap water. Bottled water quality has also been challenged since analytical techniques can now meaure contaminants at levels below 1 ppb. The bottled water industry must provide the consumer with water that not only tastes good, but also is free of harmful microbial and chemical contaminants. The International Bottled Water Association (IBWA) is working closely with it's membership to maximize bottled water quality.

WATER FOR SOUTHERN CALIFORNIA

W.G. Kervahn, *The Metropolitan Water District of Southern California, 1111 Sunset Blvd., Los Angeles, CA 90012*

In December 1985, Metropolitan's entitlement to Colorado River water was severely reduced. "Water for Southern California", a 35mm slide presentation describes Southern California's current souces of water, anticipated impact of the entitlement reduction and several courses of action.

OVERVIEW OF CONTAMINANTS DISTRIBUTION IN SOUTHERN CALIFORNIA COASTAL WATERS

Jack W. Anderson, *Southern California Coastal Water Research Project, 646 West Pacific Coast Highway, Long Beach, CA 90806*

The Southern California Coastal Water Research Project Authority (SCCWRP) is a public agency created in 1969 through a joint powers agreement between five local government agencies (City of Los Angeles, County Sanitation District of Los Angeles County, County Sanitation of District of Orange County, City of San Diego, Ventura Regional Sanitation District). These "sponsors" recognized a responsibility to conduct extensive scientific research into effects of municipal wastewater discharge on southern California coastal waters, and realized the necessity of participating on a broad-based regional level. SCCWRP's main objectives are to provide information to various agencies on the effects of ocean discharge and non-point source inputs on the coastal waters and, ultimately, develop predictive models that will determine future impacts on the marine environment. Recent projects of interest to participants of this meeting include a survey of containment levels in sediments of nearshore southern California analyses of local fish tissues for concentrations of priority pollutants and new approaches for monitoring coastal waters. Results of these investigations will be summarized.

THE CITY OF PASADENA'S APPROACH TO VOLATILE ORGANIC CHEMICAL (VOC) CONTAMINATION IN GROUND WATER

Thomas K. Underbrink, *City of Pasadena, Water & Power Department, 100 N. Garfield Avenue, Pasadena, CA 91109-7215*

In early 1980 volatile organic chemical (VOCs) were discovered in the groundwater of various groundwater basins in the State of California. The City of Pasadena was one of those affected. Some water purveyors were able to blend different water sources to assure that water served at all times met or exceeded all state or federal standards. Pasadena was one of those able to utilize such a blending program. Realizing that the problem was a long term one, Pasadena made a commitment to explore the most appropriate method of treatment for this water. Pasadena discontinued using its affected wells about two years ago (although being able to meet all the standards by blending), until a full scale treatment process was in place. This presentation describes the process of selecting the type of treatment which will be used.

MONITORING FOR ORGANIC CHEMICAL CONTAMINATION IN PUBLIC WATER SYSTEMS IN CALIFORNIA

Harvey F. Collins, and David Storm, *Department of Health Services, PO Box 942732, Sacramento, CA 94234-7320*

In 1984 the California State Department of Health Services (DHS) embarked on a program to investigate organic chemical contamination of public drinking water systems which utilize groundwater. During 1984 and 1985, the DHS completed the sampling of 817 large water systems. In 1986 a 3 year effort to evaluate approximately 5,000 small water systems was begun. Of the 2,947 large water system wells sampled, 538 (18.3%) showed contamination; 165 (5.6%) exceeded one or more of the State's health-based "action levels". So far, 1814 wells in 1712 small systems have been sampled. Approximately 150 of the small system wells (8.3%) showed contamination; 33 (1.8%) exceeded state action levels. Wells which exceeded action levels either have been shut down or are being subjected to remedial actions. Most of the 35 different chemicals detected so far are volatile chlorinated industrial solvents such as tetrachloroethene, chloroform, and trichloroethene. Only six different pesticides have been found.

NOTICE TO AUTHORS

Dr. Elmer H. Marth, who has served as Editor of the *Journal of Food Protection* for 20 years, will "retire" from that position at the end of 1987. The new Editor will be Dr. Lloyd B. Bullerman. Consequently, after January 1, 1988 manuscripts to be considered for publication in the *Journal of Food Protection* should be sent to:

Dr. Lloyd B. Bullerman
Editor, *Journal of Food Protection*
Department of Food Science and Technology
Lincoln, Nebraska 68583, U.S.A.

Seventy-Fifth Annual Meeting of IAMFES

Tampa, Florida
July 31-August 4, 1988

Instructions to Prepare Abstracts of Contributed Papers

Procedure

1. Use the printed Abstract form that appears on the other side of this page. Complete the form using a typewriter equipped with a reasonably dark ribbon.
2. Type in the title, capitalize the first letter of the first word and of any proper nouns.
3. List authors and institution(s). Capitalize first letters and initials. Indicate with an asterisk the author who will present the paper. Give complete mailing address of the author who will present the paper.
4. Check the proper box to indicate if the paper will be presented by a graduate student and is to be entered in The Developing Scientist Award Competition.
5. Type the abstract *double-spaced*, in the space provided on the abstract form.
6. **Mail *two* copies of the abstract before January 15, 1988 to:**

   Kathy R. Hathaway
   Executive Manager, IAMFES
   P.O. Box 701
   Ames, Iowa 50010

7. Enclose *two* self-addressed standard post cards. One will be used to acknowledge receipt of the abstract and the other to notify the speaker about the scheduling of the paper. Two cards must be included with *each* abstract that is submitted.

Content of the Abstract

The abstract should describe briefly: (*a*) the problem that was studied, (*b*) methods used in the study, (*c*) essential results obtained, and (*d*) conclusions. Statements such as "results will be discussed" should not appear in a abstract.

Oral Presentations

Papers will be scheduled so a speaker has a maximum of 15 minutes, including discussion. Hence the actual presentation should be no more than 11-13 minutes so that time for discussion will be available. Projectors for 2 × 2 inch slides will be available. If the speaker needs other projection equipment, Kathy R. Hathaway (address given earlier) should be contacted as soon as possible.

Subject Matter for Papers

Papers should report results of applied research in such areas as: food, dairy, and environmental sanitation and hygiene; foodborne disease hazards; food and dairy microbiology; food and dairy engineering; food and dairy chemistry; food additives; food and dairy technology; food service and food administration; food and dairy fermentations; quality control; mastitis; environmental health; waste disposal, pollution, and water quality.

Developing Scientist Award Competition

Open to graduate students enrolled in M.S. or Ph.D. programs at accredited universities or colleges who will present their own original research. Candidates cannot have graduated more than one year prior to deadline for submission of abstracts. Form must be signed by the student's major professor or department head signifying approval. An extended abstract form will be required later.

Additional Abstract Forms

Extra copies of the abstract forms may be obtained from Kathy R. Hathaway (address given earlier).

Membership in IAMFES

Membership in IAMFES is NOT necessary for presenting a paper at the annual meeting.

(OVER)

Annual Meeting

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

ABSTRACT FORM

Title _____

_____

Authors _____

_____

Institution and Address _____

_____

Developing Scientist Award Competition ☐ Yes ☐ No (Please check appropriate box)

Major Professor/Department Head approval (signature & date) _____

Please type abstract, double-spaced, in the space provided above.

Seventy-Fifth Annual Meeting of IAMFES

Tampa, Florida
July 31-August 4, 1988

Instructions to Prepare Abstracts of Contributed Papers

Procedure

1. Use the printed Abstract form that appears on the other side of this page. Complete the form using a typewriter equipped with a reasonably dark ribbon.
2. Type in the title, capitalize the first letter of the first word and of any proper nouns.
3. List authors and institution(s). Capitalize first letters and initials. Indicate with an asterisk the author who will present the paper. Give complete mailing address of the author who will present the paper.
4. Check the proper box to indicate if the paper will be presented by a graduate student and is to be entered in The Developing Scientist Award Competition.
5. Type the abstract *double-spaced*, in the space provided on the abstract form.
6. **Mail *two* copies of the abstract before January 15, 1988 to:**

   Kathy R. Hathaway
   Executive Manager, IAMFES
   P.O. Box 701
   Ames, Iowa 50010
7. Enclose *two* self-addressed standard post cards. One will be used to acknowledge receipt of the abstract and the other to notify the speaker about the scheduling of the paper. Two cards must be included with *each* abstract that is submitted.

Content of the Abstract

The abstract should describe briefly: (*a*) the problem that was studied, (*b*) methods used in the study, (*c*) essential results obtained, and (*d*) conclusions. Statements such as "results will be discussed" should not appear in a abstract.

Oral Presentations

Papers will be scheduled so a speaker has a maximum of 15 minutes, including discussion. Hence the actual presentation should be no more than 11-13 minutes so that time for discussion will be available. Projectors for 2 × 2 inch slides will be available. If the speaker needs other projection equipment, Kathy R. Hathaway (address given earlier) should be contacted as soon as possible.

Subject Matter for Papers

Papers should report results of applied research in such areas as: food, dairy, and environmental sanitation and hygiene; foodborne disease hazards; food and dairy microbiology; food and dairy engineering; food and dairy chemistry; food additives; food and dairy technology; food service and food administration; food and dairy fermentations; quality control; mastitis; environmental health; waste disposal, pollution, and water quality.

Developing Scientist Award Competition

Open to graduate students enrolled in M.S. or Ph.D. programs at accredited universities or colleges who will present their own original research. Candidates cannot have graduated more than one year prior to deadline for submission of abstracts. Form must be signed by the student's major professor or department head signifying approval. An extended abstract form will be required later.

Additional Abstract Forms

Extra copies of the abstract forms may be obtained from Kathy R. Hathaway (address given earlier).

Membership in IAMFES

Membership in IAMFES is NOT necessary for presenting a paper at the annual meeting.

(OVER)

Annual Meeting

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

ABSTRACT FORM

Title _____

_____

Authors _____

_____

Institution and Address _____

_____

Developing Scientist Award Competition ☐ Yes ☐ No (Please check appropriate box)

Major Professor/Department Head approval (signature & date) _____

Please type abstract, double-spaced, in the space provided above.

Food and Environmental Hazards to Health

Foodborne Manual

The 4th Edition of "Procedures to Investigate Foodborne Illness" has been released by the International Association of Milk, Food, and Environmental Sanitarians. "The new edition has been greatly revised and expanded and will be of interest to individuals engaged in investigating outbreaks of foodborne illness, as well as others concerned with epidemiology and food safety," says Dr. Frank Bryan, chairman of the IAMFES committee who worked on the update.

The procedures described in the manual include the following : a) handling alerts and complaints; b) interviewing ill persons and those at risk; c) developing a case definition; d) collection and shipping samples and specimens; e) conducting hazard analysis of operations in question; f) tracing sources of contamination; g) identifying factors responsible for contamination with toxic substances or microorganisms, for their survival, or for multiplication of pathogens; h) reporting outbreaks.

Field investigation details have been expanded to include hazard analysis techniques. Collecting economic impact data is also covered. Various forms are provided to aid in the investigation and the listing of illnesses attributed to foods has been expanded and brought up to date. The cost of the booklet is $3.50 per copy, with discounts available for quantity orders. For more information write or call IAMFES, PO Box 701, Ames, IA 50010. Toll free telephone: 1-800-525-5223.
E.N.D./ Spring 1987

Cost of Gastro-Intestinal Disease

FDA is taking a sharp pencil to estimates of the cost of intestinal infectious diseases in the U.S. and the bottom line is astonishing. In a study entitled "Incidence of Acute Episodes of Intestinal Infectious Diseases and Costs of Medical and Lost Productivity" to be released soon, FDA scientists Wallace Garthright, Douglas Archer, and John Kvenberg estimate that "intestinal infectious diseases cause about 99 million acute cases of vomiting and/or diarrhea per year in the United States," half of them involving more than a full day of restricted activity. Not counting the cost of death pain, and suffering and the losses sustained by food service establishments for judgements, legal expenses, etc., the cost of gastrointestinal diseases in the U.S. adds up to an estimated $23 billion per year, mostly in lost productivity. For the 8.2 million victims who seek medical care, out-of-pocket costs are estimated to be $560 million for the quarter million who are hospitalized; $690 million for those who see their doctors.

Mourners Felled by Pasta Poisoning

A funeral is distressful under the best of conditions. But for those who attended one such sad event in Middletown, N.J., last June, the distress was intensified by the buffet following the funeral. About half of the 40 mourners became violently ill, suffering nausea, fever, headache and diarrhea - all signs of food poisoning, specifically salmonellosis, and, indeed, that's what it was.

FDA's New York district office learned of the outbreak on June 5 from the New Jersey State Health Department. State officials reported that the foods most likely to have caused the illnesses were pasta products manufactured by Rotanelli Foods, Inc., New Rochelle, N.Y.

Hard on the heels of the report of the outbreak came word of another. The Rockland County (New York) health department reported that 15 people became ill after attending a party. Again the illness looked very much like salmonellosis, and the suspect foods had been produced by Rotanelli Foods. In both cases, all the victims soon recovered.

FDA's investigation was conducted jointly with the U.S. Department of Agriculture, the New York State Department of Agriculture and Markets, and the New Jersey health department. Both raw materials and finished products were collected at Rotanelli Foods. Analysis by FDA's New York regional laboratory found that six of 22 samples of finished products (including lasagna, manicotti, and stuffed shells) were contaminated with Salmonella bacteria.

In a meeting with FDA's New York district staff, officials from Rotanelli Foods agreed to a nationwide recall of their products. The products, worth between $2 million and $3 million were recalled and destroyed under government supervision.

The officials also agreed that the firm would shut down and not resume manufacturing without the approval of FDA or the New York State Department of Agriculture and Markets. Under the agreement, when the firm resumed manufacturing, it was audited by FDA and the state.

New York district investigators also checked out some of Rotanelli's customers. One customer, Riviera Ravioli Inc., Bronx, N.Y., produced similar products - also had a similar problem. Samples of cheese ravioli and black pepper were contaminated with Salmonella bacteria. The firm destroyed the contaminated black pepper and, at FDA's request, recalled and destroyed the ravioli. Riviera also signed an agreement similar to Rotanelli's, stating that it would shut down until the Salmonella problem was solved. Both firms have resumed operations and are being closely watched by FDA and the New York State Department of Agriculture and Markets.FDA Consumer/ March 1987.

Outbreak of Nonbacterial Gastroenteritis In A Local, National And Foreign Group - Quebec

In early May 1986, 3 different groups consumed meals at a large hotel in the Montreal region: 1) high school

students from New Jersey (9-12 May), 2) delegates to a Boy Scouts of Canada Association council meeting (5-10 May), and 3) representatives from a Montreal heating equipment company attending a sales meeting (12 May). A gastrointestinal illness occurred among participants of all 3 groups with 24 to 48 hours of food consumption at the hotel.

Three different public health authorities were involved in the outbreak investigation: the New Jersey State Department of Health (New Jersey high school students), the laboratory Center for Disease Control (Boy Scouts of Canada Association group), and the lakeshore General Hospital Department of Community Health (Montreal Company group, foodhandlers, kitchen inspection and food preparation techniques). The *Bureau of regional des maladies infectieuses* of the *Regroupement des DSC du Montreal metropolitain* supervised and coordinated the investigation.

For the New Jersey group (NJ), a case was defined as a participant who had experienced diarrhea or vomiting between 10 and 13 May. The symptoms included in the case definition for the Boy Scouts of Canada Association (SC) and for the Montreal Company (MC) were diarrhea or vomiting or any 2 of the following: loss of appetite, nausea or abdominal cramps occurring within 4 days of consumption of food at the hotel.

Participants were interviewed concerning illness and foods consumed. The number from each group interviewed was as follows: 49 of 66 (NJ), 78 of 86 (SC), and 23 of 23 (MC). The number (and percentage) of these meeting the case definition was as follows: 20 (41%) (NJ), 34 (44%) (SC), and 11 (48%) (MC). Bacterial culture of stools from the NJ group revealed no pathogens; viral studies are pending. There was a total of 12 illnesses among non-participant contacts of cases: 2 in the NJ group, 6 in the SC group, and 4 in the MC group.

The following symptoms were reported most frequently by cases: nausea (68%), diarrhea (61%), and vomiting (58%). The NJ group, composed of a greater number of young participants, showed significantly more vomiting ($p < 10^{-4}$) and nausea ($p = 0.04$). Medical consultation was generally infrequent although somewhat more common in the NJ group 9/20, versus 4/34 (SC) and 0/11 (MC).

The association between illness and consumption of foods was examined. The NJ group was served breakfast only. Fresh orange juice served on 10 May was strongly associated with illness (odds ratio (OR) = 18.4, $p < -6$). For the SC group, orange juice served on 9 May was borderline statistically associated with disease (OR = 2.7, $p = 0.06$); however, consumption of any juice at coffee breaks was significant (OR = 4.8, $p = 0.004$), as was consumption of chicken sandwiches (OR = 6.6, $p = 0.02$). Finally, for the MC group, whose participants were catered lunch and 2 coffee breaks on 12 May, no single food including orange juice was significantly associated with disease; however, the consumption of egg or ham sandwiches or olives was significantly associated with illness (OR = 5.0, $p = 0.004$). Based on the meals implicated, the median incubation periods (in hours) for the 3 groups were as follows: NJ 33, SC 30, and MC 36.

Samples of foods served to these groups were not available. However, culture of 11 foods collected later revealed 2 with high bacterial counts: cooked chicken, 84 x 106 total non-specific bacteria (upper limit: <105), 490 total coliforms (upper limit: <2) and <100 coagulase-positive *Staphylococci* (within acceptable limits); and orange juice which showed more than 2 total coliforms (upper limit: <2), and <100 coagulase-positive *Staphylococci* in 3 samples. No *Salmonella* was found in foods sampled.

Evaluation of food preparation techniques revealed the following: open sandwiches were made by hand and consisted of half a buttered roll garnished with lettuce, meat (e.g. chicken or ham) and topped with a raw vegetable (a tomato or cucumber slice) or olive. Sandwiches were made in the morning and refrigerated until served. Fresh orange juice was made using an electric juice presser. Each half orange was held by hand in the center while the juice was extracted. An experienced employee can press about 10 crates of oranges in one hour so that juice is normally refrigerated within 1 1/2 hours of being pressed.

Investigation of foodhandlers revealed an employee who had prepared the incriminated foods (raw vegetables and orange juice) and who had experienced fever and myalgia for 3 days beginning on 9 May. In spite of his illness, this employee continued to work, preparing the raw vegetables used in the preparation of sandwiches and the salad platter. Moreover, during the weekend of 12 May, because of reduced staff, this foodhandler had prepared fresh orange juice.

Stool cultures of foodhandlers for *Staphylococcus, Salmonella, Shigella, Yersinia,* and *Campylobacter* were negative. Skin cultures of the hands of 2 of 7 employees were significantly abnormal. In the first one, cultures revealed 13 total bacteria with more than one fecal coliform per cm2 of skin. Normally, no fecal coliforms and very few bacteria should be found. For the second employee, who was the one who had been ill, cultures revealed 92 total bacteria per cm2.

Discussion: An outbreak of gastrointestinal illness occurred among 3 groups who consumed food at a large hotel in the Montreal region in May 1986. No bacterial pathogens were recovered from stool cultures of participants or from foodhandlers. However, the epidemic curves, the high attack rates, the short incubation periods, and the brief duration of illness accompanied by relatively mild symptoms suggest that the outbreak was caused by infection with a Norwalk-like virus. This outbreak meets the epidemiologic criteria defined by Kaplan for non-bacterial gastroenteritis.

The present outbreak investigation provides evidence for a foodborne source. The foods incriminated were prepared by the same foodhandler. The vehicle of transmission was shown to be orange juice, raw vegetables, and

olives. The latter 2 food items are similar to those implicated in previous foodborne outbreaks, whereas orange juice has not been identified before as a vehicle. Orange juice has a high acidic pH (3 to 4); this pH level is not compatible with the survival and growth of bacterial pathogens. However, enteroviruses appear to be more resistant to acidic conditions. The Norwalk agent has been shown not to be inactivated by a pH of 2.7 in volunteer studies by Dolin.

The implicated foodhandler with mild nonspecific symptoms appears to have contaminated the foods involved. Although it is impossible to be certain that this individual did not experience gastrointestinal symptoms as claimed, the possibility that a foodhandler without vomiting or diarrhea could contaminate food during its preparation is of particular concern. This possibility was considered during the investigation of 2 similar foodborne outbreaks described in Britain in 1984 and 1985. Such a possibility may be explained by the fact that a small dose of the agent is infective; experimental evidence suggests that this may be so.

The abnormal bacterial count on swabs of the implicated employee's hands showed improper manipulation and contamination. Although the bacteria found on his fingers were not pathogens, they do indicate improper handwashing technique. Because mild symptoms may not be reported and may not lead to interruption of work, this stresses the importance of adequate handwashing techniques for foodhandlers. The Lakeshore General Hospital Community Health Department recommended that hotel administration reinforce the application of proper handwashing technique

.Can. Dis. Weekly Report 3/7/87.

Connecticut Overwelmed by Salmonella

The Nutmeg State has had more than their share of Salmonella outbreaks since November 1986. A health care center in Windsor had 5 deaths and 27 sick patients from a *S. enteritidis* outbreak in November. Late in January, 7 restaurant patrons from Cromwell had to be hospitalized as a result of food containing *S. Montevideo*. They were part of the 47 patrons that became ill after having meals (prime rib was implicated) at this particular restaurant. The attack rate for the beef was 76% and the prime rib was culture positive.

Early in February, a West Hartford restaurant that serves about 1500 customers a day, had almost 100 people experiencing diarrhea after eating at this very popular spot. *S. Enteritidis* was the culprit. Investigation by the State Department of Health Services revealed that a significant number of the restaurant food handlers were ill or culture positive. Connecticut has a policy of culturing all employees involved in food preparation.

It has been a long standing problem in the food service industry that many workers will not report their illness because they want to work and not to be sent home by the owner or operator. In addition, there's always the possibility of an asymptomatic carrier. This is why Connecticut has chosen the stringent requirement that all food handlers be tested for infections.

They have also taken other measures to minimize the risk of future outbreaks. One requirement would have all food service establishments with walk-in refrigerators install shallow shelves to assure rapid cooling of potentially hazardous foods. Another measure is providing the industry with a list of consultants that could train their staff rather than the Health Dept. doing all the training. Training has been a high priority in their retail food protection program for several years.

These 3 Connecticut salmonella outbreaks reflect the five-fold increase in *Salmonella enteritidis* experienced by the Northeast states in the last 10 years as reported by the Centers for Disease Control (CDC). All other Salmonella sterotypes in this region have increased only 1.7-fold. The reasons for the increase are being investigated, but are not yet understood.

NYSMFS Newsletter 3/87.

New Members

Arizona

Larry Garten
Indian Hlth. Services
Phoenix

California

John C. Bruhn
Univ. of California
Davis

Daniel D. Conolly
Drexer's
Oakland

Gary F. Frazier
San Diego

Gary Gray
Calif. Almond Growers
Exchange
Sacramento

Winifred Kovac
Vons Grocery Co.
El Monte

Manider Sandhu
Dreyers
City of Commerce

Michael F. Schnars
USAF
San Francisco

Bart T. Sepulveda
Dole Packaged Foods
Technical Ctr.
San Jose

Edgar R. Smith
US Army
San Diego

Richard Stueve
Alta Dena Dairy
Sierra Madre

Paula M. Tanner
San Diego Co. Hlth. Dept.
El Cajon

Ming Chang Wu
JAC Creative Foods
Los Angeles

Connecticut

William J. Bova
Bio-Engineering Group Ltd.
New Haven

Florida

Edith Garrett
South Bay Growers
South Bay

Illinois

Rebecca A. Harris
Lake Engineering Inc.
Barrington

Mark Kaspar
Skokie

Catherine Templeton
Nutra Sweet
Niles

Indiana

James E. Gordon
American Maize-Products Co.
Hammond

Iowa

Dr. Henry Stahr
Spectrochrom ISU
Ames

Maine

Beverly Hubbard
Dept. of Agriculture
Augusta

Maryland

Donald P. Gertzman
McCormick & Company
Hunt Valley

Donna E. Williams
USAF
Oxon Hill

Michigan

Chihoung Chen
Student
East Lansing

Dave Bechtel
Chef Pierre
Traverse City

Debra L. VandeBunte
Ottawa Co. Hlth. Dept.
Holland

Mississippi

Dee Berry
Bryan Foods
West Point

Missouri

Jim Erlinger
Erlinger Sales Co.
Chesterfield

New Jersey

Karen D. Huether
Nabisco
East Hanover

Jim Yoss
Parsippany

New York

Robert E. Colvin
Gene-Trak Systems
Staten Island

George C. Fisher
Conde Dairy Equipment
Sherrill

William I. Hill
Empire Cheese Inc.
Cuba

Richard V. Lechowich
General Foods Corp.
Tarrytown

Vernon Sisson
United Dairy Machinery Corp.
Buffalo

Frank Szematowicz
Agway, Inc.
Ithaca

North Carolina

Thomas L. Johnson
M.B. Newell Co., Inc.
Greensboro

North Dakota

Melvin Fischer
Dept of Fire & Inspections
Bismarck

Ohio

Douglas Henry
Warren Rupp-Houdaille, Inc.
Mansfield

Robert Terrell
Kahn's & Co.
Cincinnati

Pennsylvania

Paul Nichols
V.F. Weaver, Inc.
New Holland

Lori A. Ocker
Knouse Foods, Inc.
Biglerville

Tennessee

Dr. Phllip K. Lee
Bishop Baking Co.
Cleveland

Texas

Tom Blake
Borden, Inc.
Houston

Eleanor R. Cabilan
Alpine Frozen Delights, Inc.
Grand Prairie

Carlos F. Madero
Quik-to-Fix Food Products
Garland

Jennifer Shields
Houston

Susan Tanner
Americana Foods, Inc.
Dallas

Utah

Jodene Figgner
Meadowgold
Salt Lake City

Virginia

James B. Lewandowski
Waynesboro

John J. Pascale
Bedford

Wisconsin

Brian Eggebrecht
Welcome Dairy, Inc.
Colby

Sue Fickau
Old Wisconsin Cheese Co., Inc.
Platteville

John McDowell
Roundy's Inc.
Hales Corners

George H. Nelson
UW-Stout
Menomonie

Jamie B. Nuding
Real Veal, Inc.
Ixonia

Vincent L. Zehren
Schreiber Foods, Inc.
Green Bay

Canada

Laura Chow
Vancouver, British Columbia

David A. Hughes
N.B. Milk Marketing Board
Sussex, New Brunswick

Connie Humphrey
Baxter Foods, Ltd.
Saint John, New Brunswick

KAMFES Member Receives National Award

The David Klee family, Foster, Kentucky recently were selected for the "Great American Family Award".

This is a prestigious White House award presented by the American Family Society, Washington, DC.

The Klee family was selected along with five other families nation wide from over 1800 nominees.

They were honored at the White House, July 26-27, 1987 with a welcome by Dr. Norman V. Peale and a banquet hosted by Mrs. Reagan.

David presently serves as a Director of the Kentucky Association of Milk, Food and Enviromental Sanitarians and is employed by the Department of Health Services, Milk Control Branch.

Affiliate Calendar

1987

October 20-22, IOWA ASSOCIATION OF MILK, FOOD & ENVIRONMENTAL SANITARIANS will hold it's annual meeting at the Ramada Inn, Waterloo, IA. For more information contact: Dale Cooper. 319-927-3212.

November 3-5, NORTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION will hold its annual meeting at the Seven Seas Motor Inn, Mandan, ND. For more information contact: Robert Hennes, 701-224-2382.

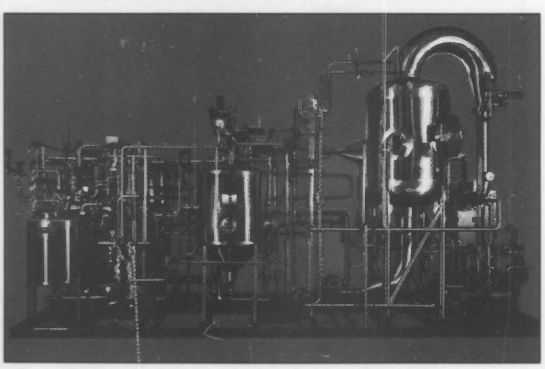
1988

March 1-2, VIRGINIA ASSOCIATION OF SANITARIANS AND DAIRY FIELDMAN'S ANNUAL MEETING AND DAIRY INDUSTRY WORKSHOP will be held at Virginia Polytechnic Institute and State University, Blacksburg, VA. For more information, contact: W. J. Farley, Rt. 1, box 247, Staunton, VA 24401.

The flavor of the future is fresh

and with a DASI System that's what you deliver...

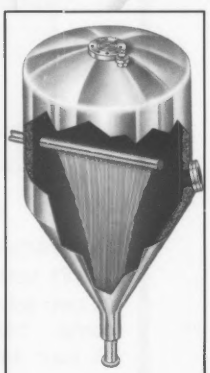
The DASI System helps you capture a bigger share of the market with FRESH flavor. UHT products will claim about 60 percent of tomorrow's dairy market according to industry projections. By offering UHT milk products with fresh "real milk" taste, you will quickly gain loyal customers. You will also build more business because you can satisfy the fast food chains, restaurants and the institutional caterers.



Consumers across the country agree. UHT milk processed by a DASI System has the freshest taste available. And this fresh flavor is locked in for long term storage. So you can serve a larger market area too —offering customers the storage advantages of UHT milk with super fresh flavor while improving your own warehousing and distribution efficiency.

Unique sterilization process

The fully automatic, computer controlled DASI System can sterilize virtually every type of milk product. Its Free Falling Film technique makes sure that the flavor keeps its freshness.



Cut-away showing the Free Falling Film in the DASI Sterilizer.

Product falls in a thin, laminar film through a pressurized atmosphere of culinary steam, rising to sterilization temperature in 1/3 of a second. The

Please circle No. 131 on your Reader Service Card

for more sales, more profits and a bigger market.

product never comes in contact with hot metal surfaces, so there is no change to the particle structure, no cooking or burning. Just fresh taste.

No health hazards

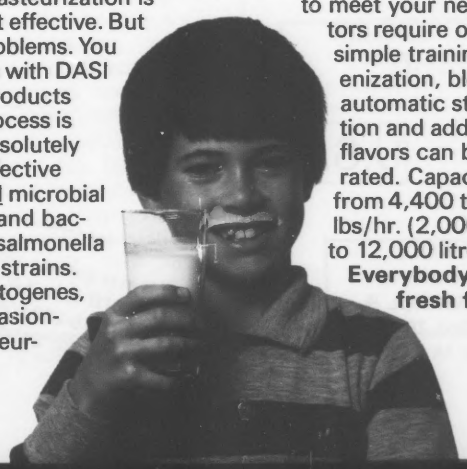
Conventional pasteurization is over 99 percent effective. But there can be problems. You have no worries with DASI System UHT products because the process is proved to be absolutely 100 percent effective at destroying <u>all</u> microbial contamination and bacteria, including salmonella and its typhoid strains. Listeria monocytogenes, which may occasionally survive pasteurization, is also destroyed.

This reassuring quality is good for sales—and for your peace of mind.

Versatile, easy to install

The commercially proven DASI System is supplied as a packaged, skid-mounted system configured to meet your need. Operators require only brief, simple training. Homogenization, blending, automatic standardization and addition of flavors can be incorporated. Capacities range from 4,400 to 26,400 lbs/hr. (2,000 litres/ hr. to 12,000 litres/ hr.).

Everybody enjoys the fresh flavor!



A small dairy on the U.S. eastern seaboard invested in a DASI System three years ago. Customers soon increased purchases and business expanded. Within months, the dairy became the first supplier of UHT milk to a major quick service restaurant chain. The dairy's products are now sold in seven States and in markets as far away as the Caribbean. The key to success: <u>fresh flavor</u> in a product that offers more than 35 day extended shelf life.

Seize your share of tomorrow's milk market now. Call or write for more information.

TCI-Superior

A MUELLER COMPANY

6500 Northwest Drive
Mississauga, Ontario
Canada L4V 1K4
Telephone: (416) 677-9000
Telex: 06-968814 Fax: 677-4988

611 Sugar Creek Road
Delavan, Wisconsin
U.S.A. 53115
Telephone: (414) 728-8267
Fax: 1-414-728-4320

DASI Industries Inc. owns all patent rights to the Free Falling Film system in the U.S.A., Canada and major world markets. TCI-Superior is the sole licensed manufacturer.

Business Exchange

Equipment / Supplies

STERILE SAMPLE VIALS

LEAK PROOF
IMS APPROVED
FOOD GRADE MATERIAL
50 ML SIZE

For Samples Call or Write:

Lincoln Suppliers
Box 546
Owatonna, MN 55060
(507) 451-7410

CIRCLE READER SERVICE NO. 301

1 — 5000 gal. cold wall tank
1-gal. all S.S. filler and capper
2 — 6000 gal. milk storage tanks
2 — 600 gal. processing vats
2 — 1000 gal. pressure wall vats
1 — 6000 gal. cold wall tank
1 — 10,000 gal. rectangular cold wall tank
1 — 8000 lb. ammonia ice builder - like new
1 — 6000 gal. storage tank

Midwest Food Supply Co.

504 Clay St., Waterloo, IA 50704
(319) 234-5554

CIRCLE READER SERVICE NO. 292

SELECT used machinery

DAIRY EQUIPMENT NEEDED

M & E will purchase your used equipment, either complete plants or individual items

We are THE Liquidators
and
We Come With CASH
Call Don Rieschel

MACHINERY & EQUIPMENT CO.
PO BOX 7632-W SAN FRANCISCO, CA 94120
TOLL FREE: National 800-227-4544
California 800-792-2975
Local & International 415-467-3400
Telex 340-212

CIRCLE READER SERVICE NO. 300

BENTLEY INSTRUMENTS, INC.

Milk Testing Equipment

New and rebuilt milk analyzing equipment for fat, protein, lactose and solids testing. Installation, training, parts and service available.

Call for more information
(612) 448-7600
Bentley Instruments, Inc.
P.O. Box 150
Chaska, MN 55318

CIRCLE READER SERVICE NO. 330

Tired Of Brine Contamination Complaints?

Let us overhaul your ice cream stick novelty moulds
Call Carl for gram & vitaline mould overhauling
Top Quality Workmanship

AMERICAN MOULD SERVICE

6701 Eilerson St. Clinton, MD 20735
(301) 868-1273 Carl Hornbeak

CIRCLE READER SERVICE NO. 304

HOMOGENIZERS FOR SALE

Manton Gaulin 200E.
Manton Gaulin 300E.
Manton Gaulin K6, 500 GPH.
Manton Gaulin KF24, 750/1500 GPH w/ ball valves.
Manton Gaulin CGD-K, 1000 GPH w/ ball valves, 5000 # head.
Manton Gaulin DJF40, 4000 GPH w/ stainless steel cabinet.

EISCHEN ENTERPRISES INC.
P.O. Box 6136
Fresno, CA 93703
(209) 251-6038

CIRCLE READER SERVICE NO. 313

DISTRIBUTORS WANTED:
Unique opportunity to take charge of the future today. Hi-Tech Chemical Research has developed the MEGA CONCENTRATE, 8 to 10 times more active than standard concentrates. 5-gallon pail is equivalent to 55-gallon drum and 16 ounce bottle equals 1 gallon; dilutions as much as 1 part MEGA CONCENTRATE to 1000 parts water. COBRA, MAX, THUNDER, FX-400, BULLDOG, CONVOY and more. Save $$$, space, handling, freight. Write: **Despo Chemicals International, Inc.**, 395 Front St., Perth Amboy, NJ 08861, or call (201) 826-0100.

CIRCLE READER SERVICE NO. 302

Attention:

BREDDO HIGH SPEED BLENDERS

Available in All Sizes From:
25 gallons through 300 gallons

CHOOSE FROM
Complete Inventory Including
Single Wall or Jacketed Units

Contact: **BREDDO LIKWIFIERS**
18th & Kansas
Kansas City, KS 66105
800-255-4092

CIRCLE READER SERVICE NO. 286

Equipment / Supplies

HERITAGE
Stainless Steel Processing Equipment

SELECT ITEMS- IN STOCK

S.S. Storage tanks to 10,000 gal.
S.S. processing vats
Gaulin Homogenizers
Sanitary Centrifugal pumps
Sanitary Rotary pumps

HERITAGE EQUIPMENT COMPANY
3200 Valleyview Drive
Columbus, Ohio 43204 (614)276-0187
Surrounding States Wats 1-800-282-7961
Ohio Only 1-800-282-2997

CIRCLE READER SERVICE NO. 334

2 — 4,000 cold wall tanks
3 — 4,000 gal. tanks with s.s. headings
— MC75 homogenizer
— **CB & CP & York** Heat Exchangers
2 — 600 gal. Kettles with agitation
1 — 500 gal, Kettle and smaller
— **CB** G60 Filler
— Haskon Fillers; 340, 540, 740
— Fittings up to 4". Air valves, valves & pumps

CARMEL EQUIPMENT
246 Beacon Ave.
Jersey City, NJ 07306
(201) 656-4030

CIRCLE READER SERVICE NO. 309

FLOOR REPAIR

High performance Epoxy Patch and Resurfacers provide cleanable, anti-fungal heavy duty wear surfaces. Low temperature cures. Can be applied by in-house maintenance personnel. USDA approved.

For more information contact Sandy at NATIONAL POLYMERS, INC. at (800) 831-5600 in PA (800) 831-5601.

CIRCLE READER SERVICE NO. 327

HOT DATE CODERS

- Air Driven.
- Brands sealed cartons after the combiner.

JOHNSON BRANDERS, INC.
(513) 553-4524

CIRCLE READER SERVICE NO. 256

Services / Products

GOSSELIN & BLANCHET
Butter-Making Equipment. New and used. Sales. Service. Parts. **B & J REPAIR SERVICE • 4818 N. Bailey Rd. • Coral, MI 49332 • (616) 354-6629.**

CIRCLE READER SERVICE NO. 316

Employee Training Materials
for Food Plants

- GMP booklets, slides & videos. Tapes in English & Spanish
- Sanitation booklets and slides

LJB, INC.
Associated with L.J. Bianco & Associates
Food Quality Control & Assurance Consultants
850 Huckleberry Lane
Northbrook, IL 60062
312-272-4944
35 Years Food Operation Experience

CIRCLE READER SERVICE NO. 297

C.I.S.
CONTROL INSTRUMENT SERVICES, INC.

Complete instrument services including repair, rebuilding, calibration and general retrofitting **AT YOUR PLANT OR OURS.**

Parts stocked for Taylor, Anderson, Ametek and Partlow. Distributors of Anderson, Graphic Controls, and Bristol Babcock.

Parts stocked for most leading lines of instruments for the food and dairy industry. Orders shipped same day as received.

JOHN BENEDICT
CONTROL INSTRUMENT SERVICES, INC.
3607 Ventura Drive • Lakeland, FL 33803 **813-644-9838**

CIRCLE READER SERVICE NO. 303

LAB QUALITY & SAFETY FIRST

MICROTABS & PRESERVO® LIQUID: *Patented* preservatives for laboratory milk samples-nonsensitizing to skin.

GLOCOUNT TABLETS: Quick dissolving fluorescent dye for cell counting instruments. *Eliminates inhalation and potential skin contact.*

MILK CALIBRATION STANDARDS: Component samples to *increase accuracy* of infrared instruments.

SOMATIC CELL STANDARDS: Reference samples for calibration and *control of cell counting* instruments and DMSCC's.

D&F Control Systems, Inc.
1750 Folsom Street
San Francisco, CA 94103
(415) 863-3031

CIRCLE READER SERVICE NO. 336

Services / Products

Equipment Engineering

Call 1-800-952-6859 extension CG for more information
Telex 27-6125 EQPMT ENG

Remanufactured Centrifuges

Parts Service Repair

CIRCLE READER SERVICE NO. 285

Consulting Services

WARD DUEL, R.S., M.P.H.

Compliance Consultant
JAILS AND PRISONS

4907 West St.
McHenry, IL 60050
Phone (312) 497-3970

Areas of Expertise:
Living Environments
Food Service
Fire and Safety

CIRCLE READER SERVICE NO. 328

George K. Morris, Ph.D.
Consulting Microbiologist

consulting in clinical microbiology, food microbiology, enteric diseases, food safety and epidemiology.

4016 Dover Avenue
Alpharetta, Ga. 30201
Tel. (404) 442-0880

CIRCLE READER SERVICE NO. 325

FULL SERVICE LAB

- analytical chemistry
- microbiology
- stability studies
- toxicology
- animal bioassays
- nutrition labeling

nutrition international
725 Cranbury Road
East Brunswick, NJ 08816
201-545-1700

CIRCLE READER SERVICE NO. 337

DR. R. H. ELLINGER & ASSOCIATES, LTD.
Consultants to Food Industry — Domestic — International

Research & Development
- *Consumer Products*
- *Foodservice Products*
- *New Formulations*
- *Product Improvement*
- *Consumer Testing*
- *Experience in:*
  - *—frozen foods*
  - *—bakery products*
  - *—prepared mixes*
  - *—dairy products*
  - *—sauces & dressings*

R. H. Ellinger, Ph.D
(312) 272-6376

Regulatory Compliance
- *Legal Assistance Available*
  - *—through Associate*
  - *—expert food law attorney*
- *Labeling Compliance*
- *Food Safety Regulations*
- *Product Recalls/Seizures*
- *Adverse Inspections*
- *Port-of-entry Detentions*
- *Regulatory Negotiations*
  - *—FDA, USDA, US. Customs*
  - *—State, Local agencies*

Quality Assurance
- *USDA Approval*
- *QA Audits*
- *Statistical QC*
- *Computerized QC Data*
- *Expert Court Witness*
- *Approved Procedures for:*
  - *—HACCP*
  - *—GMP/plant/warehouse*
  - *—consumer complaints*
  - *—sanitation*
  - *—pest control*

3946 Dundee Road
Northbrook, IL 60062

CIRCLE READER SERVICE NO. 299

Flooring

Grouting of Floors

Epoxy high acid resistant re-grouting of quarry tile and brick floors. Also tile replacement where required, with special fast set epoxy — also fiberglass walls and floors installed.

M&W Protective Coating Co.
912 Nunn Ave. • Rice Lake, WI 54868
Ph. (715) 234-7894

CIRCLE READER SERVICE NO. 294

Employment Opportunities

ATTENTION: DAIRY PROFESSIONALS

Dunhill of Southeast Fort Worth, Inc. has over 40 job openings in all areas of the dairy profession. Company paid fees, relocation and interview expenses. You may qualify. Examples:

REFRIGERATION SUPERVISORS	$25-40K
SANITATION SUPERVISORS	$25-35K
ICE CREAM Q.C. MANAGER	$30-34K
MAINTENANCE SUPERVISORS	$25-40K
PRODUCT DEVELOPMENT	$30-40K
PROJECT ENGINEERS-B.S. DEGREE	$30-50K
DIRECTOR Q.C. FLUID & I.C.	$35-40K
REGIONAL SALES MANAGERS	$30-35K
PRODUCTION SUPERVISORS	$25-30K
VAULT SHIPPING SUPERVISORS	$25-32K
TRAFFIC MANAGER	$30-40K
PRODUCTION NOVELTIES I.C.	$25-40K
CHIEF ENGINEERS-ALL AREAS	$30-45K
PLANT CONTROLLERS	$28-47K

Send resume in confidence to:

Mr. Dana S. Oliver, President

The National Personnel System

Dunhill

PERSONNEL SERVICE OF SOUTHEAST FT. WORTH, INC

P.O. Box 6397
Fort Worth, Texas 76115-0397
or call 817/926-7284

CIRCLE READER SERVICE NO. 290

Employment Opportunities

IAMFES Manuals

JFP Abstracts

Abstracts of papers in the October 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.

Sensitivity of Foodborne Bacteria (Spoilage and Pathogenic) to a Methoanol-Acetone Extract of Milk Fermented by *Streptococcus thermohilus*, A. Sikes and T. Hilton, Department of Food Science and Animal Industries, Alabama A&M University, P.O. Box 264, Normal, Alabama 35762

J. Food Prot. 50:812-814

Effects of an inhibitory methanol-acetone (MA) extract of *Streptococcus thermophilus*-fermented milk was tested on growth of *Salmonella enteritidis*, two strains of *Staphylococcus aureus* (types A and E), two strains of *Clostridium perfringens* (types A and C) and *Pseudomonas fluorescens*. Each organism was tested at three levels of the extract, e.g., 250, 500 and 1000 ppm. Results indicated that the degree of sensitivity among the test organisms varied. *C. perfringens* (C) was the most sensitive, with a mean % inhibition (average % inhibition over the three MA extract concentrations) of 73.3, while *S. enteritidis* was the least sensitive (mean % inhibition = 51.8) to the extract. The differences between the mean % inhibition of *P. fluorescens* (65.4), *S. aureus* (A) (64.8), and *C. perfringens* (A) (62.2) were not significant ($P>0.05$); however, the sensitivity of these three organisms to the extract was significantly less ($P<0.05$) than *C. perfringens* (C) but significantly greater ($P<0.05$) than *S. aureus* (E) and *S. enteritidis*.

Millipore Filtration and Use of RV Medium for Isolation of *Salmonella* from Preenrichment Broths, R. B. Truscott and Anna M. Lammerding, Agriculture Canadda, Animal Pathology Laboratory, 110 Stone Road W., Guelph, Ontario N1G 3W4, Canada

J. Food Prot. 50:815-819

A filtration procedure for isolation of *Salmonella* from preenrichment broth is described. Five ml of broth are passed through a Millipore AP15 pre-filter above a .45 μm Millipore filter. The filter is transferred to 25 ml of Rappaport-Vassiliadis broth and incubated at 42°C. Of 76 naturally and 55 artificially contaminated meat and poultry samples, 102 were positive for *Salmonella*. Of these, 99 were isolated using the filtration technique, 93% of which were obtained following a 6-h incubation period. Isolations from tetrathionate brilliant green and selenite cystine broth were 93 and 84, respectively.

Growth and Aflatoxin Production by *Aspergillus parasiticus* NRRL 2999 in the Presence of Potassium Benzoate or Potassium Sorbate and at Different Initial pH Values, Gulam Rusul and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 50:820-825

Experiments were done to determine how different concentrations of potassium benzoate or potassium sorbate in a glucose-yeast extract-salts medium with an initial pH value of 3.5, 4.5 or 5.5 affected growth and aflatoxin production by *Aspergillus parasiticus* NRRL 2999. The pH of the medium, weight of mycelium and amount of aflatoxin produced were determined after 3 and 7 d of incubation. Aflatoxin was determined using reversed-phase high-performance liquid chromatography. Maximum concentrations of potassium sorbate and potassium benzoate that permitted growth were 0.2% and 0.4%, respectively, in a medium with an initial pH of 5.5. When the initial pH was 4.5, the maximum concentrations of potassium sorbate and potassium benzoate that permitted growth were 0.05% and 0.10%, respectively, but there was an extended lag phase. Increasing concentrations of potassium benzoate or potassium sorbate decreased amounts of aflatoxin B_1 and G_1 produced after 3 d in a medium with initial pH values of 5.5 or 4.5. Cultures growing in the medium containing 0.1, 0.15 or 0.20% potassium benzoate or potassium sorbate and with an initial pH of 5.5 were somewhat inhibited at 3 d of incubation, which was characterized by a slow decrease in pH, low mycelium dry weight and small amounts of accumulated aflatoxins. After 7 d these cultures overcame the initial inhibition and produced substantial amounts of aflatoxins and mycelium. This was also true for cultures growing in a medium with an initial pH of 4.5 and containing potassium benzoate or potassium sorbate. By decreasing the initial pH of the medium from 5.5 to 4.5, amounts of potassium benzoate or potassium sorbate required to achieve inhibition decreased by a factor of 10.

Production of Deoxynivalenol and Zearalenone by Isolates of *Fusarium graminearum* Schw., S. E. Megalla, G. A. Bennett, J. J. Ellis and O. L. Shotwell, Northern Regional Research Center, Agricultural Research Service, U.S. Department of Agriculture, Peoria, Illinois 61604

J. Food Prot. 50:826-828

Production of deoxynivalenol (DON) on rice, corn, wheat, and barley grains by *Fusarium graminearum* Schw. NRRL 5883 was investigated. Highest yields (91.9-202 ppm) were obtained on rice; yields on the other substrates were: corn (34.1-84.5 ppm), wheat (3.6-24.4 ppm), and barley (0-6.6 ppm).

Fusarium isolates (49) from corn inoculated in the field with strains of *F. graminearum,* collected from corn plants infected with stalk rot, were tested for DON production on corn. Twenty of these were also tested for zearalenone production. One isolate produced more than 200 ppm DON, 13 produced 20-50 ppm, 17 produced 10-20 ppm, and the rest produced less than 10 ppm. All 20 isolates tested produced zearalenone; 18 produced higher levels of zearalenone (15.4-369 ppm) than of DON. The other 2 isolates formed essentially the same levels of zearalenone and DON—37 and 30 ppm, and 15 and 16 ppm, respectively.

Occurrence of Enteropathogenic *Escherichia coli* Serotypes in Butter, F. M. Abbar and M. Tahir Mohamed, Department of Biology, College of Science, University of Mosul, Mosul, Iraq

J. Food Prot. 50:829-831

A total of 30 samples of butter analysed during the course of the investigation showed that fecal coliforms were absent from only 13.3% of samples. One hundred forty colonies of fecal coliforms were biochemically characterized with the following types obtained (*Escherichia* sp. 41.4%, *Enterobacter* sp. 25.7%, *Citrobacter* sp. 20%, *Klebsiella* sp. 10%). Five different serotypes, namely 0 125 K70(2), 0 142K86(1), 0 127K63(1), 0 114 K90(2), 0 111 K58(1) were detected in 7 of 58 *Escherichia coli* isolates and 51 strains were untypable. Three strains produced heat stable (ST) enterotoxin and belonged to the enteropathogenic serotype. The antibiotic resistance patterns of coliform strains are presented.

Enterotoxigenic *Excherichia coli* Isolated from Foods in São Paulo, Brazil, Bernadette D. G. M. Franco, Beatrice C. Guth and Luiz R. Trabulis, Departamento de alimentos e Nutricão Experimental, Faculdade de Ciências Farmacêuticas, Universidade de são Paulo, Caixa Postal 30786, CEP 01051, São Paulo, Brazil and Departamento de Microbiologia, Imunologia e Parasitologia, Escola Paulista de Medicina, Caixa Postal 20342, São Paulo, SP, Brazil

J. Food Prot. 50:832-834

Incidence of enterotoxigenic *Escherichia coli* (ETEC) in foods usually consumed in the city of São Paulo, Brazil was determined. Raw and cooked foods of animal and vegetable origin were investigated. Enterotoxigenic strains were found in approximately 3.5% of food samples contaminated with *E. coli*. There was a great predominance of ETEC strains producing only LT enterotoxin. None of the isolated strains produced LT and ST simultaneously. Several serotypes were involved, and none of them was positive for colonization factors CFA-I and CFA-II. One ETEC showed resistance to some antibiotics but most were sensitive to the ones tested.

Heat Resistance of Vegetative Cells and Asci of Two *Zygosaccharomyces* Yeasts in Broths at Different Water Activity Values, Marco F. G. Jermini and Wilheml Schmidt-Lorenz, Food Microbiology Laboratory, Department of Food Science, Swiss Federal Institute of Technology (ETH), CH-8092 Zürich, Switzerland

J. Food Prot. 50:835-841

The heat resistance of vegetative cells and asci of two osmotolerant yeasts *(Zygosaccharomyces rouxii* and *Z. bailii)* was investigated in two different broths of a_W 0.963 and 0.858, respectively. The highest heat resistance was observed with asci of *Z. bailii* LMZ 108, showing a decimal reduction time (D-value) at 60°C and a_W 0.858 of 14.9 min. Asci of *Z. rouxii* LMZ 100 were less heat resistant ($D_{60°C}$-value at a_W 0.858 = 3.5 min). The heat resistance (D-values) of asci at a_w 0.963 proved to be 20- to 50-fold and 5- to 8-fold higher than the D-values of the corresponding vegetative cells of *Z. rouxii* and *Z. bailii,* respectively. However, the lower the a_W of the heating broth, the smaller the differences between heat resistance of asci and that of vegetative cells. Morever, different preparations of the same cell material were found to lead to different heat resistances.

Antibotulinal Effectiveness of Nisin in Pasteurized Process Cheese Spreads, Eileen B. Somers and Steve L. Taylor, Food Research Institute and the Department of Food Science, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 50:842-848

Pasteurized process cheese spreads were prepared at moisture levels ranging from 52 to 57% with added sodium chloride at levels from 0 to 2.0%, with disodium phosphate levels ranging from 1.4 to 2.5%, and with nisin levels of 0 to 250 ppm. *Clostridium botulinum* spores were added at a level of approximately 1000 spores per gram of cheese spread except for control batches and one experiment where the spore levels were varied (10-1000 spores/g). The cheese spreads were incubated at 30°C for up to 48 weeks. Nisin is an effective antibotulinal agent in pasteurized process cheese spreads. Addition of nisin allows formulation of pasteurized process cheese spreads with reduced sodium levels (addition of 1.4% disodium phosphate

and no added sodium chloride) or slightly higher moisture levels (55-57%) by comparison to typical commercial pasteurized process cheese spreads. Higher levels of nisin (100 and 250 ppm) were required to prevent outgrowth of botulinal spores in cheese spreads with highest moisture levels or most greatly reduced sodium levels. However, in a cheese spread of 52% moisture prepared with 2.5% disodium phosphate but no added sodium chloride, a nisin level of 12.5 ppm was able to prevent completely outgrowth and toxin production by *C. botulinum*.

Growth Characteristics of *Yersinia enterocolitica* in Pasteurized Skim Milk, Mohammad K. Amin and Frances A. Draughon, University of Tennessee, Department of Food Technology and Science, P.O. Box 1071, Knoxville, Tennessee 37901-1071

J. Food Prot. 50:849-852

Experiments were undertaken to determine the growth characteristics of five strains of *Yersinia enterocolitica* in pasteurized milk at 4°C. Pasteurized milk was inoculated with approximately 10 or 1000 cells/ml of *Y. enterocolitica,* and was incubated at 4°C for 0, 3, 7, 14 and 21 d. Each sample was spread-plated in duplicate on Tryptone Soya Agar, MacConkey Agar and Cefsulodin-Irgasan-Novobiocin (CIN) agar. Plates were incubated at 25°C for 48 h or at 32°C for 24 h and enumerated for total and *Yersinia* plate count. All five strains of *Y. enterocolitica* competed very well with background microflora of pasteurized milk and reached levels of log 5.0 to 7.0/ml after 7 d at 4°C. Level of inoculation had little or no effect on the total number of *Y. enterocolitica* after 14 or 21 d in pasteurized milk at 4°C. Generation times at 4°C were highly strain-dependent.

A *Bacillus thuringiensis* Isolate Found on Grapes Imported from California, Michael J. Bidochka, L. Brent Selinger and George G. Khachatourians, Bioinsecticide Research Laboratory, Department of Applied Microbiology and Food Science, University of Saskatchewan, Saskatoon, Canada S7N 0W0

J. Food Prot. 50:857-858

Samples of fruit and vegetable products were examined for presence of bacteria. A gram-positive, sporogenous, crystalliferous bacterium was isolated from Red Tokay grapes imported from California. This isolate was confirmed to be *Bacillus thuringiensis* var. *kurstaki* based on plasmid profiles resolved by agarose gel electrophoresis. Although this bacterium is exempt from Canadian food regulation, such residue has been previously reported to pose a potential health hazard for humans.

Survival of Selected Indicator and Pathogenic Bacteria in Refrigerated Pizzas, James S. Dickson, Schwan's Sales Enterprises, 115 West College Drive, Marshall, Minnesota 56258

J. Food Prot. 50:859-861

This study was conducted to determine the shelf life of previously frozen pizzas stored at refrigeration temperatures. Pizzas were prepared using meat inoculated with *Escherichia coli, Staphylococcus aureus,* and *Salmonella typhimurium*. The pizzas were frozen, then stored at 3 and 10°C. Samples were analyzed every 2 d for 14 d. Sensory analysis was conducted every day for 8 d using uninoculated product. There was a significant ($P<0.05$) increase in the population of *E. coli* between 8 and 10 d at 10°C. There were no significant ($P>0.05$) differences in the populations of *S. typhimurium* or *S. aureus* with either time or temperature. The sensory shelf life of the pizzas was approximately 5 d at 10°C and 6 d at 3°C. The pizzas were unacceptable after 7 d at either temperature.

Antiviral Substances in Raw Bovine Milk active Against Bovine Rotavirus and Coronavirus, G. Panon, S. Tache and C. Labie, HIDAOA, Ecole Nationale Véterinaire, 31076 Toulouse Cedex, France

J. Food Prot. 50:862-866

After experimental contamination of bovine raw and heat-treated milks with bovine rotavirus and coronavirus strains, we observed a strong viral inhibition only with raw milks, from which virus recovery was $5 \times {}^{-4}\%$. Between 30% and 80% of the virus was recovered from the heat-treated milks, depending on the level of inoculation. The antiviral substance is heat-liable (destroyed within 30 min at 100°C), precipitated by ammonium sulfate and filtrable (0.45 μm Millipore membrane). It also has neutralizing activity on tissue culture.

Oxidation of Cholesterol in Commercially Processed Cow's Milk, Mae Z. Cleveland and Natholyn D. Harris, Department of Nutrition and Food Science, Florida State University, Tallahassee, Florida 32306

J. Food Prot. 50:867-871

Pasteurized whole milk, ultra-high temperature heated milk, canned evaporated milk, skim milk and instant nonfat dry milk

were analyzed for presence of oxidized cholesterol compounds. Effects of heating whole milk and storage of whole milk lipid extracts were also examined. Analytical thin-layer chromatography data indicate that cholesterol in liquid milk was stable during commercial pasteurization, sterilization and evaporation. However, instant non-fat dry milk contained 7-hydroxy-cholesterol. Heating whole milk for 12 h at 85°C did not produce oxysterols, but GC-MS analysis indicate that storage of whole milk lipids may have produced steroidal ketones.

Growth of *Staphylococcus aureus* and Enterotoxin Production in Homemade Mayonnaise Prepared with Different pH Values, Esperanza Gomez-Lucia, Joaquin Goyache, Jose L. Blanco, Jose F. F. Garayzabal, Jose A. Orden and Guillermo Suarez, Departamento de Patologia Animal I (Sanidad Animal), Unidad de Microbiologia, Facultad de Veterinaria, Universidad Complutense, 28040 Madrid, Spain

J. Food Prot. 50:872-875

The ability of *Staphylococcus aureus* to grow and produce enterotoxins in homemade mayonnaise prepared at different pH values was studied. Ten enterotoxigenic strains, producing one or two enterotoxin types (A, B, C, or D) were inoculated into mayonnaise samples with pH adjusted to values ranging between 4.0 and 5.8, and incubated at 37°C for 7 d. Counts were made on days 1, 3, 5, and 7 and extracts were prepared on day 7 to detect enterotoxin by ELISA. An important difference was seen between those samples prepared with pH below or equal to 4.9 and those over or equal to 5.0; in the range of pH between 4.0 and 4.9 the average of staphylococcal population was 100 CFU/g; at pH 5.0 it was 1.6×10^5, and at pH 5.15 and above it was at least 8×10^6 CFU/g. Enterotoxin was detected only at initial pH over 5.15 and when final pH was not less than 4.7. The highest amount of enterotoxin corresponded to 157.8 ng of SEB/100 g of mayonnaise.

Carbohydrate Metabolism by *Streptococcus thermophilus:* A Review, R. W. Hutkins and H. A. Morris, Department of Food Science and Nutrition, University of Minnesota, St. Paul, Minnesota 55108

J. Food Prot. 50:876-884

Despite the widespread use of *Streptococcus thermophilus* as a starter culture in the manufacture of many fermented dairy products, only recently has an understanding of the basic processes regarding carbohydrate metabolism been developed. Although *S. thermophilus* is related to other lactic streptococci by virtue of their common use in dairy fermentations, available information indicates that *S. thermophilus* is serologically, genetically, and physiologically distinct from the Group N, mesophilic streptococci. Carbohydrate metabolism, in particular, occurs by different processes in *S. thermophilus* than in the Group N streptococci *(Streptococcus lactis* and *Streptococcus cremoris).* The latter organisms utilize lactose by a specific phosphoenolpyruvate-dependent phosphotransferase system in which the lactose hydrolysis products, glucose and galactyose-6-phosphate, are concurrently metabolized to lactic acid. In contrast, *S. thermophilus* lacks phosphotransferase activity and instead possesses a lactose permease. After hydrolysis by ß-galactosidase, only glucose is further metabolized and galactose is released into the extracellular medium. Most strains are unable to ferment galactose and are phenotypically galactose-negative. The rapid growth rates of *S. thermophilus* on lactose and slow growth rates on glucose and galactose are likely due to the differences between the lactose and monosaccharide transport activities. Galactose transport by *S. thermophilus* requires an exogenous energy source and is mediated by a galactose permease. Galactose is further metabolized in galactose-positive cells by the enzymes of the Leloir pathway, specifically, galactokinase, galactose-1-phosphate uridyl transferase, and uridine-5-diphospho-glucose-4-epimerase. The latter two enzymes are eonstituitively expressed; however, in galactose-positive cells galactokinase and the galactose permease are induced by galactose in the absence of lactose. The phenotypic differences between galactose-positive and galactose-negative *S. thermophilus* are, in part, due to differences in the galactokinase and galactose permease activities. Galactose released into the medium by lactose-grown, galactose-positive cells can be subsequently metabolized, homofermentatively, to lactic acid. However, the important practical implications of released galactose has produced the need for isolation and development of *S. thermophilus* strains which ferment the lactose components, glucose and galactose, completely and simultaneously.

3-A Accepted Practices for Instantizing Systems for Dry Milk and Dry Milk Products

Number 608-01

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Dry milk and dry milk products instantizing systems specifications heretofore and hereafter developed which so differ in design, material, fabrication or otherwise as not to conform with the following accepted practices, but which, in the fabricator's opinion are equivalent or better, may be submitted for the joint consideration of the IAMFES, USPHS and DIC, at any time.

A

SCOPE

A.1

These 3-A Accepted Practices shall pertain to the sanitary aspects of equipment in instantizing systems for dry milk and dry milk products and include all equipment necessary for instantizing dry milk and dry milk products beginning with the equipment which receives the product to be instantized and terminating at the point the product is discharged to either the packaging system or storage. The instantizing systems include equipment used for moving and cleaning the air, heating and/or cooling air, conveying the product, moistening the product, additional drying of the product, removing the instantized product from the air and cooling the product.

A.2

In order to conform with these 3-A Practices, equipment in instantizing systems shall comply with the following criteria for design, material, fabrication, processing air and moistening medium

B

DEFINITION

B.1

Product: Shall mean dry milk, dry milk products and fluid milk products.

B.2

Instantizing: Shall mean the processes whereby dry milk and dry milk products are moistened, redried and cooled in such a manner to substantially improve its dispersion and reliquifying characteristics.

B.3

Moistening Medium: Shall mean the moisture from steam or water or fluid milk or fluid milk product used to moisten the dry milk or dry milk product during the instantizing process.

B.4

Safe Water: Shall mean water from a supply properly located, protected and operated and shall be of a safe sanitary quality. The water shall meet the standards prescribed in the National Interim Primary Drinking Water Regulations of the Environmental Protection Agency Office of Water Supply -- EPA-570/9-76--3.

B.5

Processsing Air: Shall mean air prepared by filtration which is intended to be used in contact with the product for such purposes as heating, cooling, drying or conveying or will be used for sealing a bearing or similar purposes.

B.6

Air to be Heated and Heated Air: Shall mean processing air to be heated or which has been heated to at least 240 degrees F.

B.7

Air not to be Heated: Shall mean processing air which either will not be heated or will be heated to a temperature less than 240 degrees F.

B.8

Product Contact Surfaces: Shall mean all surfaces which are exposed to the product and surfaces from which liquids and/or solids may drain, drop or be drawn into the product.

B.9

Air Contact Surfaces:

B.9.1

Air contact surfaces, for air to be heated, shall mean all surfaces prior to coming in contact with the product, commencing at the discharge of the final air inlet filter(s) and ending at the first downstream product contact surface.

B.9.2

Air contact surfaces for air not to be heated shall

mean all surfaces prior to coming in contact with the product, commencing at the discharge of the final air filter(s) and ending at the first downstream product contact surface.

B.9.3

Exhaust air contact surfaces shall mean the surfaces of the air ducts, plenum chamber(s), if provided, and appurtenances from the final product contact surface through the exhaust system.

B.10

Non-Product Contact Surfaces: Shall mean all other exposed surfaces.

B.11

Mechanical Cleaning or Mechanically Cleaned: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

C

MATERIALS

C.1

The materials of product contact surfaces of equipment included in the instantizing system for which there are 3-A Sanitary Standards or 3-A Accepted Practices shall comply with the material criteria of the applicable Standards or Accepted Practices.

C.2

All other product contact surfaces shall be of stainless steel of the AISI 300 series[1] or corresponding ACI[2] types (See Appendix, Section G.1), or metal which under conditions of intended use is at least as corrosion-resistant as stainless steel of the foregoing types and is non-toxic and non-absorbent, except that:

C.2.1

Plastic materials may be used for sight and/or light glasses, bearings, bushings, supports, short pieces of transparent tubing for observation purposes, short flexible connectors, scraper blades and sealing applications. These materials shall conform with the applicable provisions of the 3-A Standards for Multiple-Use Plastic Materials, Number 20-13.

C.2.2

Rubber and rubber-like materials may be used for scraper blades, short flexible connectors and sealing applications. These materials shall comply with 3-A Standards for Multiple-Use Rubber and Rubber-Like Materials, Number 18-00.

C.2.3

Cotton, wool, linen, silk or synthetic fibers may be used for filtering and/or screening surfaces or entrainment separators, and for short flexible connectors in dry product areas. These materials shall be non-toxic, relatively insoluble in water, easily cleanable, and shall not impart particulate matter or flavor to the product.

C.2.4

Welded areas and the deposited weld material shall be substantially as corrosion-resistant as the parent material.

C.2.5

Aluminum alloys conforming to the Aluminum Assocation[3] designated 5052 and 6061 may be used as product contact surfaces for dry product in vibrating trays in after-dryers.

C.2.6

Product contact surfaces for dry product in dust collecting equipment shall conform to the applicable provisions of the 3-A Standards for Bag Collectors, Number 40-01.

C.2.7

Heat resistant glass[4] may be used in sight and/or light ports.

C.3

Air contact surfaces for air to be heated, except for those of flexible connectors, heating coils, fans, burners and dampers, shall be of a corrosion-resistant metal that maintains its original surface characteristics under the environment of intended use, or is rendered corrosion-resistant by a coating of corrosion-resistant material other than paint. If the portion of the plenum chamber at the inlet to the instantizing chamber is subject to washing, it shall be made of stainless steel.

C.4

Air contact surfaces for air not to be heated shall meet the material requirements of a product contact surface.

C.5

Filter media for intake air shall consist of one or more of the following: fiber glass with a downstream backing dense enough to prevent fiber glass break off from passing through, cotton flannel, wool flannel, spun metal, activated carbon, activated alumina, non-woven fabric, absorbent cotton fiber, or other suitable materials, which under conditions of intended use, are non-toxic and non-shedding and which do not release toxic volatiles or other contaminanats to the air, or volatiles which may impart any flavor or odor to the product. Chemical bonding materials contained in the media shall be non-toxic, non-volatile and insoluble under all conditions of use. Dispoable media shall not be cleaned and re-used. Note: Electronic air cleaners use electrostatic precipitation principles to collect

---

[1]*The data for this series are contained in the following references: AISI Steel Products Manual, Stainless & Heat Resisting Steels, Dec. 1974 Table 2-1, pp. 16-17. Available from: American Iron & Steel Institute, 1000 16th St., NW, Washington, DC 20036.*

[2]*Steel Founders' Society of America, Cast Metal Federation Bldg., 455 State St., Des Plaines, IL 60016.*

[3]*Aluminum Association, 818 Connecticut Ave., NW, Washington, DC 20006.*

[4]*Glass of a borosilicate type with a coefficient of expansion between 30 degree C and 300 degrees C between 3.0 and 3.5 parts per million per degree celsius.*

particulate matter and therefore are not included in the preceding list of acceptable filter media. This does not preclude their use in instantizing systems upstream from the filter.

C.6

Non-product contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. Non-product contact surfaces shall be relatively non-absorbent, durable and cleanable. Parts removable for cleaning having both product contact and non-product contact surfaces shall not be painted.

D

FABRICATION

D.1

The fabrication criteria of equipment included in the instantizing system for which there are 3-A Sanitary Standards or 3-A Accepted Practices shall be those of the applicable Standards or Accepted Practices.

D.2

All other equipment shall conform to the following fabrication criteria.

D.2.1

All product contact surfaces shall have a finish at least as smooth as a No.4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices in the final fabricated form (See Appendix, Section H). Seam welds shall be smooth and pit free. Where grinding and polishing are required, such areas shall be at least as smooth as a ground finish obtained with 80 grit silicon carbide. Intricate fabricated and/or machined components shall be as smooth as a ground finish obtained with 80 grit silicon carbide, with welds pit free. If stainess steel sheets with a No. 2B finish are used, they shall be selected so as to be free of imperfections such as pits, folds and crevices in the fabricated form. Joints shall be smooth and shall be fabricated in a manner that the product contact surface is self-draining or self-purging. Permanent joints in metallic product contact surfaces shall be continuously welded.

D.2.2

Product contact surfaces shall be easily accessible for thorough cleaning, either when in an assembled position or when removed. Parts that must be removed for cleaning shall be readily removable and easily dismantled, except (1) that high pressure liquid product lines and such parts as fan wheels, air lock valves, fluidizer valves, conveying mechanisms, and similar parts need only be readily accessible for cleaning, and (2) centrifugal atomizers and air dispenser cones need only be removable for cleaning.

D.2.2.1

If no other means of easy access for cleaning is available, panels or doors shall be provided. They shall be constructed in a manner that will prevent the entrance of unfiltered air, and shall use hinges, wing nuts, latches and similar easy opening devices to allow easy access without special tools.

D.2.3

Product contact surfaces intended for regular wet cleaning shall be self-draining or self-purging except for normal clingage, and except where self-draining is not feasible, other drying methods, including air drying, may be used.

D.2.4

Internal angles of 135 degrees or less on product contact surfaces shall have minimum radii of 1/4 inch except:

D.2.4.1

Radii for fillets of welds in product contact surfaces where the thickness of one or both parts joined is 3/16 inch or less shall be not less than 1/8 inch.

D.2.4.2

Where smaller radii are required for essential functional reasons such as those on internal parts of mechanical collectors, collector systems, air lock blades, air distribution devices, atomizing devices, and conveying mechanisms, the radii shall not be less than 1/32 inch.

D.2.5

Lap joints may be used on (1) sloped sidewalls where the angle from the vertical is not less than 15 degrees or more than 45 degrees, and on (2) horizontal seams around the top where the joint is cleaned by mechanical means. At least one of the materials joined shall not exceed .075 inches, 14 gauge in thickness and the resultant weld shall comply with D.2.1.

D.2.6

There shall be no exposed threads or crevices on product contact surfaces except where required for functional and safety reasons such as high pressure liquid product lines, atomizing devices, air distribution devices, fire extinguishing nozzles, fan wheels, air lock valves, fluidizer valves and conveying mechanisms. The parts for which an exception is made that have exposed threads or crevices on product contact surfaces shall be designed to be mechanically cleaned or shall be readily accessible for cleaning.

D.2.7

Flexible connections having product contact surfaces shall have straight sides without corrugations.

D.3

Processing air contact surfaces shall be accessible and readily cleanable. If no other means of easy access for cleaning is available, panels or doors shall be provided. They shall be constructed in a manner that will prevent the entrance of unfiltered air, and shall use external hinges, wing nuts, latches and similar easy opening devices to allow easy access without special tools.

D.4

Processing air contact surfaces for air not to be heated shall have continuous welds, with heat discoloration removed and shall be smooth, snag free, and pit-free. All surfaces shall be designed to be mechanically cleaned or shall be readily accessible for cleaning and inspection.

D.5

The construction of the portions of the instantizing system having air contact surfaces such as sheet metal work, air heating equipment, filtering equipment and exhaust system shall be so constructed as to prevent the entrance of unfiltered air.

D.6

When a fan is installed on the downstream side of the intake air filter, it shall be designed and installed in a manner to preclude entrance of contaminants to processing air.

D.7

Fans of the air foil type shall be constructed with blade cavities sealed.

D.8

Sanitary tubing and fittings shall conform with applicable provisions of the 3-A Standards for Fittings, Number 08-17 rev. and/or 3-A Practices for Cleaning Systems, Number 605-02, except:

D.8.1

Those used in high pressure moistening medium lines.

D.9

Gaskets and Gasket Grooves on Product Contact Surfaces: Gaskets having product contact surfaces shall be removable or permanently bonded to the surface. Any gasket groove or gasket retaining groove, except in the bonded area, shall be no deeper than its width and shall not exceed 1/4 inch in depth or be less than 1/4 inch wide except those for standard O-Rings smaller than 1/4 inch. The minimum radius in a gasket groove or gasket retaining groove, other than those for standard 1/4 inch and smaller O-Rings, shall not be less than 1/8 inch. The minimum radii in grooves for standard 1/4 inch O-Rings shall be not less than 3/32 inch and for standard 1/8 inch O-Rings shall not be less than 1/32 inch. Use of gasket positioning grooves or pins, premolded fitted gaskets or gaskets cut from sheet material is recommended.

D.10

Openings in the top of a dryer for a centrifugal atomizer that is removed for cleaning shall have a permanently installed flange or ring around the opening that extends upward at least 1/2 inch above the opening for the centrifugal atomizer. Openings in product contact surfaces shall be provided with close fitting overlapping covers having a downward flange of at least 3/8 inch, unless the opening is fitted with a permanently attached sanitary fitting conforming to D.8.

D.11

Bar screen and perforated plate may be used for after-dryers and dry product coolers or for screening and shall be easily removable, or shall be readily cleanable in place.

D.12

Mechanical joints shall be dust-tight and splash-proof.

D.13

Non-Product Contact Surfaces: Non-product contact surfaces shall be smooth, free of pockets and crevices, and be readily cleanable and those to be coated shall be effectively prepared for coating.

D.14

The means of support shall provide a clearance between the lowest part of the instantizer and the floor, with the exception of legs, of (1) at least 6 inches when the equipment outlines an area in which any point is less than 36 inches from the nearest edge of the area or (2) a clearance of at least 8 inches when any point is more than 36 inches from the nearest edge.

D.15

Legs, if provided, shall be smooth with rounded ends and have no exposed threads. Legs made of hollow stock shall be sealed.

D.16

Any bearing having a product contact surface shall be of a nonlubricated type. Lubricated type bearings shall be located outside the product area with at least 1 inch clearance between the bearing and any product contact surface to assure (1) that the product does not contact the bearing or lubricant and (2) lubricants and/or product do not build-up between the bearing and any product contact surface. When a shaft passes through a product contact surface, the portion of the opening surrounding the shaft shall be protected to prevent the entrance of contaminants.

D.17

Ductwork of the product contact portion of the instantizing system that is designed to be separated or dismantled for cleaning shall be provided with tight fitting covers to be used when the ductwork is separated or dismantled to prevent fore or back draft and to segregate the dry areas from wet areas during clean-up.

D.18

Ducts shall be designed and fabricated to minimize product accumulation.

D.19

Air pressure seals between product and non-product areas shall be acceptable if the sealant air is applied at the properly designed pressure and if the sealant air is from a source complying with the applicable provisions of the 3-A Accepted Practices for Supplying Air Under Pressure, Number 604-03.

D.20

Belt conveyors shall conform to 3-A Standards for Mechanical Conveyors, Number 41-00.

D.21

Conveyors utilizing air as the conveying medium shall conform to the 3-A Standards for Pneumatic Conveyors, Number 39-00.

E

PROCESSING AIR

E.1

The location and nature of adjacent structures and the variations of wind and weather shall be considered in selecting the location of the outside air intake opening(s). Air quality and source shall be considered when selecting the location of the inside air intake opening(s). Both inside and outside opening(s) shall be so located that they will reasonably insure that the character of the intake air will be suitable for its intended use.

E.2

Outside intake openings shall be suitably protected against the admission of all foreign objects. Openigs shall be provided with louvers which can be closed when processing equipment is not in use. Hoods shall be used over these openings to minimize the intake of rain, snow, dust or other foreign material. Openings shall be equipped with sturdy screens having openings not larger than 1/4 inch in any dimension.

E.3

The air supply system and/or ducting shall be such that all of the air is caused to pass through properly installed air filters before coming in contact with product surfaces of the instantizing system.

E.3.1

Processing air which will be heated before product contact shall be passed through a properly installed and maintained filter(s), selected to have a minimum average efficiency of 90% when tested in accordance with the ASHRAE Synthetic Dust Arrestance Test[5] when operated at its design face velocity.

E.3.2

Processing air which will not be heated before product contact shall be passed through a properly installed and maintained filter(s), selected to have a minimum average efficiency of 85% when tested in accordance with the ASHRAE Atmospheric Dust Spot Method[5] when operated at its design face velocity.

E.4

Processing air exhausted from the processing equipment shall be through stacks or other openings located so as to minimize re-entry of exhausted air or product into process air contact and product contact surface areas, and to minimize accumulation of product on surrounding structures. Except for relatively small air quantities, such as from bin or hppper vents, all air shall be exhausted to the outside atmosphere.

E.5

The instantizing system shall be designed and fabricated so that processing air exhausted from the equipment shall be substantially free of residual product.

E.6

A self closing head shall be installed at the terminal end of all ducts exhausting processing air to the atmosphere outside the building.

F

MOISTENING MEDIUM

F.1

Steam used as a moistening medium shall meet the criteria for culinary steam, as specified in 3-A Accepted Prractices for Producing Steam of Culinary Quality, Number 609-00.

F.2

Water used as a moistening medium, shall be of a safe sanitary quality. (See B.4).

F.3

Liquid milk and liquid milk products used as a moistening medium shall be at least of equal sanitary quality to the product being instantized and shall be pasteurized prior to use. The pasteurization process shall comply with the 3-A Accepted Practices for High-Temperature Short-Term Pasteurizers, Revised, Number 603-05.

APPENDIX

G

PRODUCT CONTACT SURFACE MATERIALS

G.1

Stainless steel conforming to the applicable composition ranges established by AIAI[1] for wrought products, or by ACI[2] for cast products, should be considered in compliance with the requirements of section C.2 herein. Where welding is involved the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C.2 sets forth the chemical ranges and limits of acceptable stainless steels of the 300 series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. These cast grades are covered by ASTM[6] Specifications A-743, A-744, and A-351.

H

PRODUCT CONTACT SURFACE FINISH

H.1

Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets, is considered in compliance with the requirements of subsection D.1 and subsections D.2.1.

[5]The method of making these tests will be found in the following references: Method of Testing Air Cleaning Devces, ASHRAE Standard 52-76. Available from the American Society of Heating, Refrigerating and Air-Conditioning Engineers, 1791 Tulle Circle, NE, Atlanta, GA 30329.

[6]Available from ASTM, 1916 Race St., Philadelphia, PA 19103

I

Experience in the use and operation of instantizing systems has proven certain practices to be satisfactory from a sanitary control and operational standpoint. The following set forth certain recommendations as a guide to control authorities and/or processors.

J

INSULATION

J.1

To assure proper operaton and to prevent condensation, it is recommended that insulating and jacketing techniques be employed on equipment and cold air ducts where necessary.

K

CLEANING

K.1

Equipment should be designed so that it can be inspected for cleanliness by either sight or touch, except in the case of mechanical cleaning and pipelines designed to be cleaned in place.

K.2

Equipment should be cleaned as often as necessary to prevent contamination of product.

K.3

Dry cleaning of normally dry equipment areas should be performed in accordance with need. Too frequent opening of equipment to dry clean may lead to increased contamination of product contact surfaces and should be avoided.

K.4

Cleaning methods employing air under pressure should be used only when vacuum cleaning methods are inadequate.

K.5

While cleaning the instantizing system, air complying with the pressure and source requirements of D.19 should be applied to all air pressure seals provided for in D.19.

K.6

Hand and vacuum cleaner brushes, scoops, scrapers, and any other tools used in the dry cleaning of product and process air contact areas of equipment should not be used on any other surfaces. Such tools should be made of materials that can be cleaned and sanitized and should not have wooden parts nor be of mild steel or other iron products that will rust. They should be maintained in a sanitary manner and stored in clean, separate, labeled lockers or cabinets. Separate brushes, tools, and appliances shoud be provided and should not be used for the cleaning of other surfaces of equipment and processing areas.

K.7

Suitable written cleaning procedures should be established.

K.8

Wet cleaning of rooms should be avoided and done only when necessary.

L

MAINTENANCE

L.1

All equipment should be kept in good repair, free of cracks and corroded surfaces.

L.2

Filters should be maintained and serviced on the basis of the manufacturer's instructions and specific operating history and experience. To prolong filter life, the use of prefilters is suggested. Filter installation should be provided with suitable air pressure gauges to indicate pressure drop as an aid to maintenance.

M

INSTANTIZING PROCESS ROOMS

M.1

The instantizing process rooms should be designed and maintained in such manner as to minimize the introduction and migration of air-borne contamination.

M.1.1

Rooms should be well ventilated, by means of mechanical ventilation if necessary, and free of objectionable odors.

M.1.2

Intakes for mechanical ventilation supply systems should be fitted with suitable filters.

N

PRODUCT HANDLING

N.1

Transfer of product from one container to another should be accomplished with minimum exposure of product and product contact surfaces to the atmosphere and with minimum development of atmospheric dust load.

These practices become effective February 12, 1988, at which time 3-A Accepted Practices for Instantizing Systems for Dry Milk Products, Number 608-00, are rescinded and become null and void.

3-A Sanitary Standards for Plate Type Heat Exchangers For Milk and Milk Products

Number 11-04

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Plate type heat exchanger specifications heretofore and hereafter developed which so differ in design, material, fabrication, or otherwise as not to conform with the following standards, but which, in the fabricator's opinion are equivalent or better, may be submitted for the joint consideration of the IAMFES, USPHS, and DIC at any time.

A

SCOPE

A.1

These standards cover the sanitary aspects of plate type heat exchangers for milk and milk products.

A.2

In order to conform with these 3-A Sanitary Standards, plate type heat exchangers shall comply with the following in design, material and fabrication criteria.

B

DEFINITIONS

B.1

Product: Shall mean milk and milk products.

B.2

Product Contact Surfaces: Shall mean all surfaces that are exposed to the product or from which liquid may drain, drop or be drawn into the product.

B.3

Non-Product Contact Surfaces: Shall mean all other exposed surfaces.

C

MATERIALS

C.1

All product contact surfaces shall be of stainless steel of the AISI 300 series[1] or corresponding ACI[2] types (See Appendix, Section E), or equally corrosion-resistant metal that is non-toxic and non-absorbent, except that:

C.1.1

Rubber and rubber-like materials may be used for gaskets. These materials shall comply with the applicable provisions of the 3-A Standards for Multiple-Use Rubber and Rubber-Like Materials, Number 18-00.

C.1.2

Plastic materials may be used for gaskets. These materials shall comply with applicable provisions of the 3-A Standards for Multiple-Use Plastic Materials, Number 20-13, as amended.

C.1.3

Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformational characteristics when exposed to conditions encountered in the environment of intended use and in cleaning and sanitizing treatment.

C.1.3.1

The final bond and residual adhesive, if used, of bonded rubber-like materials and bonded plastic materials shall be non-toxic.

C.2

All non-product contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. All non-product contact surfaces shall be relatively non-absorbent, durable and cleanable. Parts removable for cleaning having both product contact and non-product contact surfaces shall not be painted.

D

FABRICATION

D.1

All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices in the final fabricated form. (See Appendix, Section F.)

---

[1]*The data for this series are contained in the following reference: AISI Steel Products Manual, Stainless & Heat Resisting Steels, Dec. 1974, Table 2-1 pp. 16-17. Available from: American Iron & Steel Institute, 1000 16th St., NW, Washington, DC 20036.*

[2]*Alloy Casting Institute Div., Steel Founders' Society of America, Cast Metal Federation Bldg., 455 State St., Des Plaines, IL 60016.*

D.2

All product contact surfaces shall be easily accessible for cleaning and inspection, either when in an assembled position or when removed.

D.2.1

Removable parts shall be readily demountable. Heat transfer plates shall be readily removable from the press.

D.2.2

There shall be no more than 8 clamping bolts. Bolts, if used, shall be located in cutouts so as to be easily removable.

D.3

All internal angles of 135 degrees or less on product contact surfaces shall have radii of 1/4 inch except where smaller radii are required for essential functional reasons. In no case shall such radii be less than 1/32 inch.

D.4

There shall be no threads on product contact surfaces.

D.5

Connections in product contact surfaces shall conform to the applicable provisions of the 3-A Standards for Fittings, Number 08-17 Rev.

D.6

Heat transfer plate gaskets shall be continuous and shall be removable or shall be bonded to the transfer plate in such a manner that the bond is continuous and mechanically sound so that in the environment of its intended use the gasket does not separate from the plate.

D.7

A leak detector groove of sufficient width to be readily cleanable and open to the atmosphere at both ends shall be provided to allow the leakage past the gaskets to drain to atmosphere so as to prevent accumulation of product.

D.8

Presses (or frames) shall be provided with legs of sufficient length to give a clearance of at least 4 inches between the lowest part of the press and the floor. Legs shall have rounded ends with no exposed threads. If made of hollow stock they shall be effectively sealed.

D.9

Presses (or frames) shall be so constructed that when opened, plates and/or terminal frames may be separated to provide a space for cleaning and inspection equal to the lesser of the width of one plate or 15 inches.

D.10

Non-product contact surfaces shall be smooth, relatively free of pockets and crevices and be readily cleanable. Surfaces to be coated shall be effectively prepared for coating.

APPENDIX

E

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI[1] for wrought products, or by ACI[2] for cast products, should be considered in compliance with the requirements of Section C.1 herein. Where welding is involved the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C.1 sets forth the chemical ranges and limits of acceptable stainless steel of the 300 series. Cast grades of stainless steel corresponding to types 303, 304, and 316 are designated CF-16F, CF-8, and CF-8M, respectively. These cast grades are covered by ASTM[3] specifications A743, A744 and A351-83.

F

PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide, properly applied on stainless steel sheets is considered in compliance with requirements in D.1 herein.

G

Heat exchanger presses (or frames) should be located at a sufficient distance from walls to permit easy access to the plates.

G.1

There should be unobstructed access to one side of the heat exchanger.

---

[3]*Available from ASTM, 1916 Race St., Philadelphia, PA 19103.*

These practices become effective February 12, 1988, at which time 3-A Sanitary Standarads for Plate Type Heat Exchangers for Milk and Milk Products, Number 11-03, are rescinded and become null and void.

Calendar

1987

October 10-15, 1987 30TH ANNUAL NATIONAL EDUCATIONAL CONFERENCES AND EXPOSITION OF THE ENVIRONMENTAL MANAGEMENT ASSOCIATION AND ITS SUBSIDIARIES, to be held at the Clarion Hotel, St. Louis, MO. For more information, contact: Registrar, 1019 Highland Ave., Largo, FL 33540. 813-586-5710.

October 12-14, BIOTECHNOLOGY PROCESSING ENGINEERING CENTER THIRD ANNUAL SYMPOSIUM, to be held at the Massachusetts Institute of Technology, Cambridge, MA 02139. For more information, contact: Diana Kenney, MIT, Room 20A-207, Cambridge, MA 02139. 617-253-0805.

October 15-16, 8TH ANNUAL FOOD MICROBIOLOGY SYMPOSIUM, "Current Concepts in Foodborne Pathogens and rapid and Automated Methods in Food Microbiology", to be held at the University of Wisconsin-River Falls. For more information, contact: Dr. P.C. Vasavada, Food and Science Dept., Room 250, University of Wisconsin-River Falls, River Falls, WI 54022. 715-425-3150.

October 18-21, CORNELL SYMPOSIUM ON CHEESE BIOTECHNOLOGY AND INTERNATIONAL FOOD DEVELOPMENT, to be held at Cornell University, Ithaca, NY. For more information, contact: Richard A. Ledford, Chairman, Department of Food Science, Cornell University, Ithaca, NY 14853-7201. 607-255-7616.

October 19-21, DESCRIPTIVE ANALYSIS, to be held in Palo Alto, California. Preregistration required. For more information, contact: Herbert Stone, President, Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833 or Telex WUI 6502215776 (access MCI).

October 19-21, BIOTECHNOLOGY PROCESSING ENGINEERING CENTER THIRD ANNUAL SYMPOSIUM, to be held at the Massachusetts Institute of Technology, Cambridge, MA 02139. For more information, contact: Diana Kenney, MIT, Room 20A-207, Cambridge, MA 02139. 617-253-0805.

October 20-22, BASIC PASTEURIZATION COURSE to be held at the South Austin Plaza, Austin, Texas. For more information, contact: Janie Park, TAMFES, PO Box 2363, Cedar Park, TX 78613-2363. 512-458-7281.

October 20-22, AMERICAN CULTURED DAIRY PRODUCTS INSTITUTE CLINIC, to be held in Minneapolis, MN. For more information, contact: Dr. C. Bronson Lane, ACDPI, PO Box 547813, Orlando, FL 32854-7813.

October 27-28, MISSOURI DAIRY FIELDMEN'S AND SANITARIAN'S EDUCATIONAL CONFERENCE, to be held at the Days Inn-University Center, formerly Holiday Inn West, Columbis MO. For more information, contact: R.T. Marshall, Eckles Hall, University of Missouri, Columbia, MO 65211. 314-882-7355.

November, CANADA'S AMFES ANNUAL MEETING, to be held in Edmonton, Alberta. For more information, contact: Jim Eisen. 451-0817.

November 1-5, THE AMERICAN ASSOCIATION OF CEREAL CHEMISTS, 72nd AACC Annual Meeting, at the Opryland Hotel, Nashville, TN. For more information, contact, Raymond J. Tarleton, AACC, 3340 Pilot Knob Road, St. Paul, MN 55212. Telephone: 612-454-7250.

November 3-4, CONTROL OF PATHOGENS IN THE DAIRY PROCESSING ENVIRONMENT, sponsored by the University of Georgia Division of Food Science and Technology. For more information, contact: Dr. Joe Frank, University of Georgia, Department of Food Science, Athens, GA 30602. 404-452-0994.

November 3-5, NORTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION will hold its annual meeting at the Seven Seas Motor Inn, Mandan, ND. For more information contact: Robert Hennes, N.D. State Dept. of Health, State Lab. Dept., Box 5520, Bismarck, ND 58502-5520. 701-224-2382.

November 8-11, DAIRY INSTITUTE OF CALIFORNIA ANNUAL FALL MEETING, to be held at The Lodge, Pebble Beach, CA. For more information, contact: Robert D. Boynton, Suite 718, 1127 - 11th Street, Sacramento, CA 95814.

November 10-12, BASIC PASTEURIZATION COURSE, to be held in Texarkana, Texas. Location to be announced. For more information, contact: Ms. Janie F. Park, TAMFES, P.O. Box 2363, Cedar Park, Texas 78613-2363. 512-458-7281.

November 15-18, SOUTHERN ASSOCIATION OF DAIRY FOOD MFRS., INC. 73RD ANNUAL CONVENTION, to be held at Colonial Williamsburg Foundation, Williamsburg, VA. For more information, contact: John E. Johnson, P.O. Box 10506, Raleigh, NC 27605

November 17-19, INTERNATIONAL CATERERS' SHOW AND CONFERENCE (ICS), to be held at the Merchandise Mart Expo Center, Chicago, IL. For more information, contact: Helen Brett Enterprises, 220 S. State St., Suite 1416, Chicago, IL 60604. 312-922-0966.

November 18, 43RD ANNUAL UNIVERSITY OF MARYLAND DAIRY TECHNOLOGY CONFERENCE, for more information, contact: Dr. James T. Marshall, Department of Animal Sciences, University of Maryland, College Park, MD 20742. 301-454-7843.

TOTAL QUALITY SYSTEM (HACCP) WORKSHOP to be held at the Holiday Inn Southeast, Madison, WI. For more information, contact: Nina Albanese-Kotar, Center for Dairy Research, University of Wisconsin-Madison, 1605 Linden Drive, Madison, WI 53706. 608-262-5970.

November 30-December 3, NATIONAL MILK PRODUCERS FEDERATION ANNUAL MEETING, to be held at the Hyatt Regency, New Orleans, LA. For more information, contact: James C. Barr, 1840 Wilson Blvd., Arlington, VA 22201.

November 30-December 4, THE FIRST LATIN AMERICAN CONGRESS ON FOOD MICROBIOLOGY AND THE I ARGENTINE SYMPOSIUM ON PRESERVATION OF FOODS, to be held in Buenos Aires, Argentina. For more information, contact: Dr. Ricardo Sobol, Secretary General, Bulnes 44 P.B. "B", 1176 Buenos Aires, Argentina. Additional information: Dr. Fernando Quevedo, 525 Twenty Third St., N.W., Washington, D.C. 20037.

December 7-9, MICROBILOOGY AND ENGINEERING OF STERILIZATION PROCESSES, to be held at the University of Minnesota, St. Paul Minnesota Campus. For more information, contact: Dr. William Schafer, Department of Food Science and Nutrition, 1334 Eckles Ave., St. Paul, MN 55108. 612-624-4793.

December 8-11, WORKSHOP IN INSTRUMENT SERVICE AND REPAIR, to be held at the Anderson training facility and dairy processing plant in Fultonville, NY. For more information, contact: Michael D. Cunningham, Anderson Instrument Company, Inc., R.D. #1, Fultonville, NY 12072. Telephone: 518-922-5315.

1988

January 11-20, 38th ANNUAL UNIVERSITY OF MARYLAND ICE CREAM SHORT COURSE, for more information, contact: Dr. James T. Marshall, Department of Animal Sciences, University of Maryland, College Park, MD 3742. 301-454-7843.

January 20-23, FOURTH INDUSTRY-WIDE U.S. DAIRY FORUM, sponsored by the Milk Industry Foundation and International Ice Cream Association. To be held at the Innisbrook in Tarpon Springs, FL. For more information, contact: Joe Dugan, 888 Sixteenth Street, N.W., Washington, DC 20006. 202-296-4250; TELEX 150185.

February 10-11, DEPARTMENT OF FOOD SCIENCE & NUTRITION DAIRY & FOOD INDUSTRY CONFERENCE, to be held at the Fawcett Center for Tomorrow, Ohio State University, Columbus, OH. For more information, contact: John Lindamood, 2121 Fyffe Road, Columbus, OH 43210-1097.

February 12-14, DAIRY PRODUCTS INSTITUTE OF TEXAS ANNUAL CONVENTION, to be held at the Hershey Hotel, Corpus Christi, TX. For more information, contact: Glenn R. Brown, 201 Vaughn Building, Austin, TX 78701.

February 15-17, ABC RESEARCH CORPORATION'S 14TH ANNUAL TECHNICAL SEMINAR will be held at the University Centre Hotel, Gainesville, Florida. Fore more information, please contact Sara Jo Atwell, ABC Research Corporation, 3437 SW 24th Avenue, Gainesville, FL 32607. Telephone: 904-372-0436.

February 21-24, SWEETENER USERS GROUP, INTERNATIONAL SWEETENER COLLOQUIUM, to be held at Innisbrook Resort, Tarpon Springs, FL. For more information, contact: Constance E. Tipton, 888 16th Street, NW, Washington, DC 20006.

March 1-2, VIRGINIA ASSOCIATION OF SANITARIANS AND DAIRY FIELDMAN'S ANNUAL MEETING AND DAIRY INDUSTRY WORKSHOP will be held at Virginia Polytechnic Institute and State University, Blacksburg, VA. For more information, contact: W.J. Farley, Rt. 1, Box 247, Staunton, VA 24401.

March 6-8, OHIO DAIRY PRODUCTS ASSN., INC. ANNUAL CONVENTION, to be held at Dayton Marriott Hotel, Dayton, OH. For more information, contact: Don Buckley, 1429 King Ave., #210, Columbus, OH 43212.

March 6-9, TEXAS PUBLIC HEALTH ASSOCIATION, 63rd Annual Meeting to be held at the Hilon Palacio del Rio in downtown San Antonio. For more information, contact: James O. Allen, Jr., Texas Public Health Association, PO Box 4246, Austin, Texas 78765.

AMERICAN BUTTER INSTITUTE - NATIONAL CHEESE INSTITUTE ANNUAL MEETING, to be held at the Hyatt Regency Washington on Capitol Hill, Washington, DC. For more information, contact: the ABI-NCI, 699 Prince Street, Suite 102, Alexandria, VA 22314. 703-549-2230.

March 13-16, DAIRY & FOOD INDUSTRIES SUPPLY ASSN. ANNUAL CONFERENCE, to be held at Americana Canyon Resort, Palm Springs, CA. For more information, contact: Bruce D'Agostino, 6245 Executive Blvd., Rockville, MD 20852.

March 21-25, DEPARTMENT OF FOOD SCIENCE & NUTRITION, MID-WEST WORKSHOP IN MILK & FOOD SANITATION, to be held at Fawcett Center for Tomorrow, Ohio State University, Columbus, OH. For more information, contact: John Lindamood, 2121 Fyffe Road, Clumbus, OH 43210-1097.

April 10-13, MILK INDUSTRY FOUNDATION, INTERNATIONAL ICE CREAM ASSOCIATION, MARKETING & TRAINING INSTITUTE SPRING BOARD MEETING, to be held at The Ritz Carlton, Laguna Niguel, CA. For more information, contact: John F. Speer, Jr., 888 16th Street, NW, Washington, DC 20006.

38th ANNUAL UNIVERSITY OF MARYLAND ICE CREAM CONFERENCE, for more information, contact: Dr. James T. Marshall, Department of Animal Sciences, University of Maryland, College Park, MD 20742. 301-454-7843.

April 18-21, AMERICAN DAIRY PRODUCTS INSTITUTE ANNUAL MEETING & TECHNICAL CONFERENCE, to be held at Chicago O'Hare Marriott Hotel, Chicago, IL. For more information, contact: Warren S. Clark, Jr. 130 N. Franklin Street, Chicago, IL 60606.

April 20-21, 1988 CENTER FOR DAIRY RESEARCH CONFERENCE (MILKFAT: TRENDS AND UTILIZATION), alternates with Cheese Research and Technology Conference, to be held at the Holiday Inn Southeast, Madison, WI. For more information, contact: Nina Albanese-Kotar, Center for Dairy Research, University of Wisconsin-Madison, 1605 Linden Drive, Madison, WI 53706. 608-262-5970.

May 22-24, GEORGIA DAIRY PRODUCTS ASSOCIATION ANNUAL CONVENTION, to be held at Callaway Gardens, Pine Mountain, GA. For more information, contact: Pat Hamlin, P.O. Box 801, Macon, GA 31208.

July 31-August 4, IAMFES 75th ANNUAL MEETING, to be held at the Hyatt Regency Westshore, Tampa, FL. For more information, contact Kathy R. Hathaway, IAMFES, Inc., PO Box 701, Ames, IA 50010. 800-525-5223, in Iowa 515-232-6699.

September 11-13, NATIONAL DAIRY COUNCIL OF CANADA ANNUAL CONVENTION, to be held at the Winnipeg Convention Centre, Winnipeg, Manitoba. For more information, contact: Pat MacKenzie, 141 Laurier Avenue West, Ottawa, Ontario, Canada K1P-5J3.

September 11-14, SOUTHERN ASSOCIATION OF DAIRY FOOD MANUFACTURERS, INC. 74TH ANNUAL CONVENTION, to be held at the Boca Raton Hotel & Club, Boca Raton, FL. For more information, contact: John E. Johnson, P.O. Box 1050, Raleigh, NC 27605.

September 21-22, UNITED DAIRY INDUSTRY ASSOCIATION ANNUAL MEETING, to be held at the Hyatt Regency Minneapolis, Minneapolis, MN. For more information, contact: Edward A. Peterson, 6300 N. River Road, Rosemont, IL 60018.

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.

October 15-19, MILK INDUSTRY FOUNDATION & INTERNATIONAL ICE CREAM ASSOCIATION ANNUAL CONVENTION & SHOW, to be held at Marriott's Orlando World Center, Orlando, FL. For more information, contact: John F. Speer, Jr., 888 16th Street, NW, Washington, DC 20006.

November 28-December 1, NATIONAL MILK PRODUCERS FEDERATION ANNUAL MEETING, to be held at the Hilton, Anaheim, CA. For more information, contact: James C. Barr, 1840 Wilson Blvd., Arlington, VA 22201.

Products in the categories below—that bear an NSF Mark—have been verified to comply with the NSF Listing or Certification requirements. Products without the Mark should not be regarded as Listed or Certified by NSF. **IF IT'S NOT MARKED—IT'S NOT LISTED OR CERTIFIED.** This is true even if the product is in the current *Listing Book* or *Certification Registry.*

For more information concerning NSF's programs, contact the National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106 USA. Telephone (313) 769-8010; Telex: 753215. FAX: 313-769-0109.

FREE! WRITE FOR:
- Facts about Listing Services
- Facts about Certification Services

Look for the mark!

Food Service

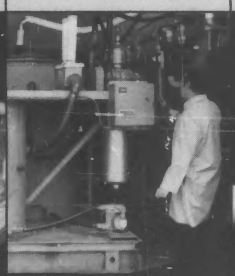
- Dishwashing Machines
- Ranges, Ovens and Broilers
- Ice Makers
- Meat Choppers, Saws
- Food Cutters, Slicers
- Refrigerators, Freezers
- Food, Beverage and Soft Ice Cream Dispensers
- Work Tables, Cabinets, and Shelving

Pool, Spa, Hot Tub Equipment

- Filters
- Pumps
- Skimmers
- Chemical Filters
- Multiport Valves

Water & Wastewater Treatment

- Point-of-Use Drinking Water Treatment Units
- Flexible Membrane Liners
- Onsite Wastewater Treatment Systems
- Extended Aeration Package Plants



Plastics Pipe & Fittings

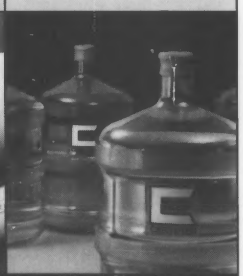
NSF-pw
NSF-wc
NSF-dwv
NSF-tubular
NSF-cw
NSF-sewer
NSF-drain

- Hot & Cold Potable Water
- Drain, Waste & Vent
- Well Casings
- Continuous Waste
- Corrosive Waste
- Sewers

NSF CERTIFIED®

Certification Programs

- Drinking Water Laboratory Accreditation
- Bottled Water
- Plumbing System Components



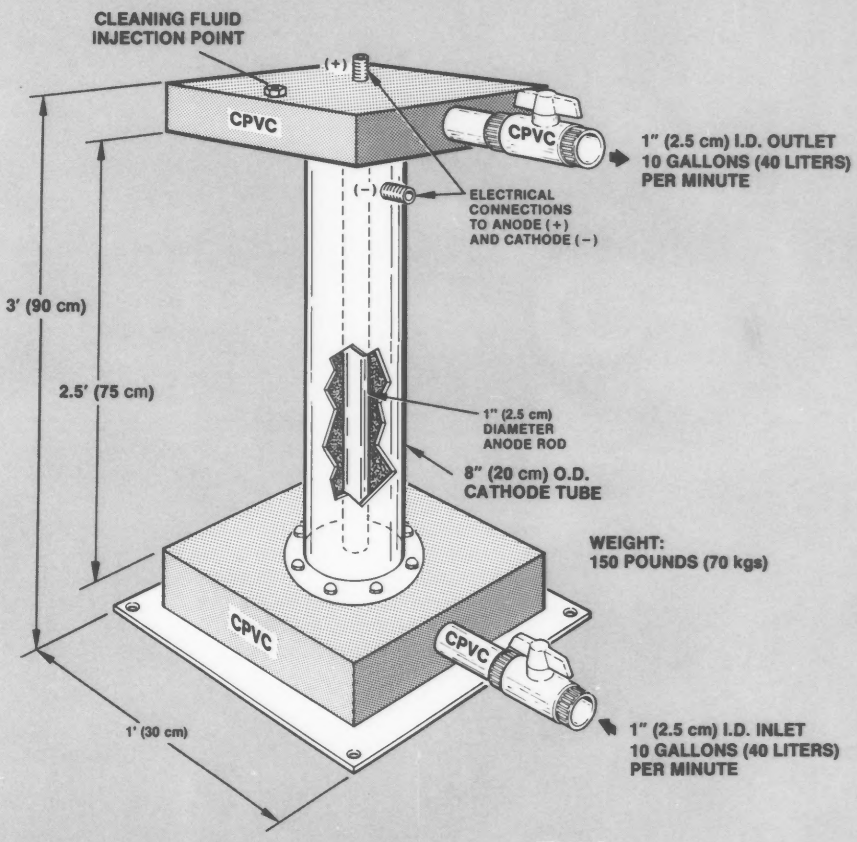
NSF®

NATIONAL SANITATION FOUNDATION

Please circle No. 174 on your Reader Service Card

SEWAGE TREATING CELL
BRINECELL MODEL '130'

This Electrolytic Brinecell Sterilizes and Deodorizes At Least 1.5 Million Gallons (544 M³) of Sewage In 24 Hours For About $20 (U.S.) Per Day In Operating Cost. It Also Destroys and Oxidizes Herbicides and All Related Chemical Pollutants.



HOW IT WORKS
When sewage containing some salt (NaCl) passes through this cell, nascent chlorine, ozone, chlorine dioxide and their respective free radicals are liberated. Working synergistically, these powerful agents oxidize, sterilize and deodorize the sewage rendering it safe and free from herbicides and related chemical pollutants.

HOW TO OPERATE IT
Connect its anode and cathode to a DC power supply capable of carrying a maximum of 50 volts and 100 amperes, about 5 kilowatts. Pump sewage at the rate of about 10 GPM (40 liters per minute). Simultaneously, pump 5 fluid ounces per minute (150 ml per minute) of saturated saline solution. This saline solution is equal to about 1.5 ounces, 40 grams of rock salt per minute.

MINIMUM CONCENTRATION AND CAPACITY PER MINUTE, HOUR, DAY:
If this cell operates at its MINIMUM capacity as stated above, it will generate the equivalent of 2,000 ppm-mg/l of a 10% liquid chlorine concentration or 20,000 ppm-mg/l at its 10 gpm (40 lpm) effluent. This concentration must be diluted 20 times since sewage requires as much as 20 ppm-mg/l of a 10% liquid chlorine residual for proper treatment. Therefore, this cell's effluent will treat; 1,000 gpm (4,000 lpm), 60,000 gph (240,000 lph) or 1,440,000 gallons (544 cubic meters) per 24-hour operation. At 5 oz. (150 ml) per minute of saline, this cell will consume about 1 kilowatt per hour! This cell's concentration and capacity increases as the saturated saline intake increases.

MAXIMUM DAILY OPERATING COST:
If this cell operates at its MAXIMUM capacity which is 50 V DC at 100 amperes, it will consume 50 x 100 = 5,000 watts per hour. Therefore it requires a 5 KVA service. If each KWH cost 6 cents (US), the daily operating cost will be; 5 X 6 X 24 = $7.20 (US). The cost of the salt will be about $10 per day for a grand total of less than $20 per 24-hour operation.

NOTE:
We manufacture and provide the cell only. All sewage facilities have adequate DC power, pumps and experts to operate this simple cell. However, we can manufacture and provide the complete system and can design, manufacture and provide systems to meet customer's requirements. This cell can operate with as high as 30% saturated salt concentrations.

Price: $35,000 (U.S.)

Manufactured in the United States of America by:

BRINECELL® MANUFACTURING CORPORATION

Mailing Address: P.O. Box 27488, Salt Lake City, Utah 84127 U.S.A.

Offices: 375 West 400 North, Salt Lake City, Utah 84103 U.S.A.

Telephone: (801) 532-5600. FAX: 801-595-0964

August 1987

Litho in U.S.A.

If you're concerned about the quality of your products, you should also be concerned about the quality of the test you use to detect antibiotics. That's why Dr. Charm and the people at Penicillin Assays have developed the Charm II Test. The first true antibiotic test available.

With the Charm II Test, you're able to test for just the antibiotics you select. And you can even select the levels at which each will be detected.

The Charm II Test saves time, cuts costs, and helps produce a consistently higher yield of quality products. In fact, it's become an important part of the quality-control process at hundreds of companies.

If you'd like to join them, call or write. And they'll show you how the Charm II Test can improve the quality of your products, too.

Nothing works like a Charm.

Penicillin Assays Inc.

36 Franklin Street, Malden, MA 02148, Tel. (617) 322-1523

Only one man can identify the junkie in this line up.