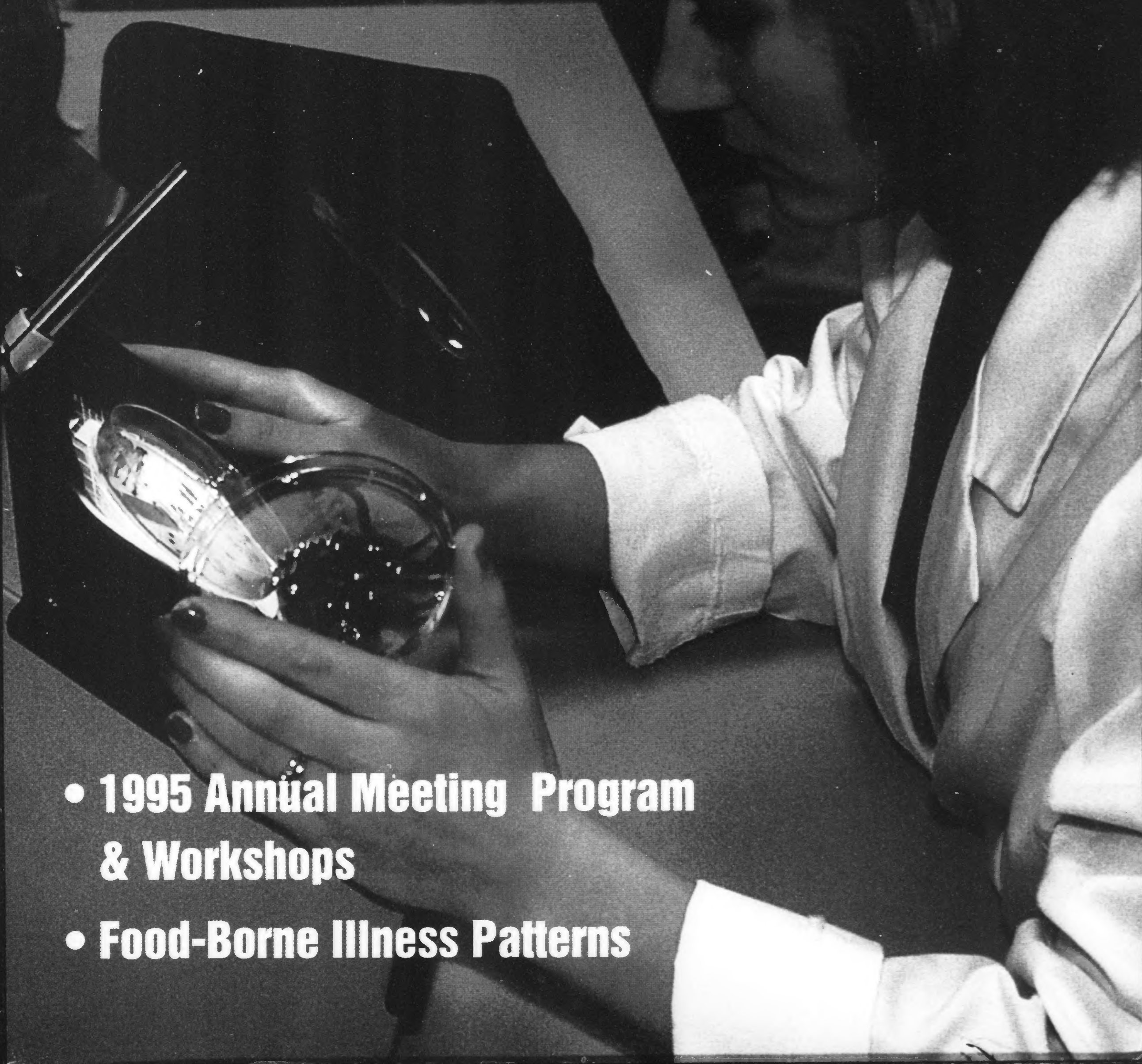
ISSN: 1043-3546

6200 Aurora Avenue•Suite 200W
Des Moines, Iowa•USA•50322

DAIRY, FOOD AND ENVIRONMENTAL Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC.

MAY 1995



- 1995 Annual Meeting Program & Workshops
- Food-Borne Illness Patterns

DFES
5/95

MEMBERS

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

Invite a Colleague
To Join The Association

You, as a member of **IAMFES**, can contribute to the success of the Association and the professional advancement of your colleagues by inviting them to become a part of **IAMFES**. On your behalf we would be happy to send a colleague a membership kit, including complimentary copies of *Dairy, Food and Environmental Sanitation* and the *Journal of Food Protection,* and an invitation to join **IAMFES**. Just fill in the following information and **Mail or FAX to (515) 276-8655**. (Please Print)

Name ______________________ Title ____________

Company ______________________________

Address ______________________________

City ____________________ State/Prov. ____________

Country ________________ Zip/Postal Code ____________

Phone Number ______________________________

Your Name ________________ Your Phone ____________

First
Class
Postage
Required

INDUSTRY GOVERNMENT
IAMFES
EDUCATION RESEARCH

INTERNATIONAL ASSOCIATION OF MILK, FOOD
AND ENVIRONMENTAL SANITARIANS, INC.
6200 Aurora Avenue, Suite 200 W
Des Moines, Iowa 50322-2838

ABOUT THE COVER. . .
Photo courtesy of Northland Laboratories, Inc., 1044 Parkview Road, Green Bay, WI 54304. Picture shows Liza Cook, Certified Lab Technician, reading an aerobic plate count on a milk sample.

DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC.

ARTICLES

ASSOCIATION NEWS

DEPARTMENTS

EXTRAS

DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC

Dairy, Food and Environmental Sanitation (ISSN-1043-3546) is published monthly beginning with the January number by the International Association of Milk, Food and Environmental Sanitarians, Inc. executive offices at 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2838, USA. Each volume comprises 12 numbers. Printed by Heuss Printing, Inc., 911 N. Second Street, Ames, IA 50010, USA. Second Class Postage paid at Des Moines, IA 50318 and additional entry offices.

Postmaster: Send address changes to **Dairy, Food and Environmental Sanitation,** 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2838, USA.

Manuscripts: Correspondence regarding manuscripts and other reading materials should be addressed to Editor, IAMFES, 6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2838; 515-276-3344.

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

Orders for Reprints: All orders should be sent to DAIRY, FOOD AND ENVIRONMENTAL SANITATION, IAMFES, Inc., 6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2838. 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 Steven K. Halstead, IAMFES, 6200 Aurora Ave., Suite 200W, Des Moines IA 50322-2838.

Subscription Rates: $120.00 per year. Single copies $10.00 each. No cancellations accepted.

Sustaining Membership: A sustaining membership in IAMFES is available to companies at a rate of $450 per year. For more information, contact IAMFES, 6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2838; 515-276-3344.

Membership Dues: Membership in the Association is available to individuals only. Dues are $60 per year and include a subscription to **Dairy, Food and Environmental Sanitation.** Dues including both **Dairy, Food and Environmental Sanitation** and **Journal of Food Protection** are $90.00. Student membership is $30.00 per year, with verification of student status, and includes **Dairy, Food and Environmental Sanitation** or **Journal of Food Protection.** Student membership with both journals is $45. No cancellations accepted.

Postage: Canada and foreign add $22.50 per journal subscription. U.S. FUNDS ONLY – ON U.S. BANK. Single copies add $7.00.

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., 6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2838; 515-276-3344.

Reprint Permission: Questions regarding permission to reprint any portion of **Dairy, Food and Environmental Sanitation** should be addressed to: Editor, IAMFES, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2838, or fax to 515-276-8655.

DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

"The mission of IAMFES is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply."

Sustaining**Members**

3M Microbiology Products, 3M Center, Bldg. 275, St. Paul, MN 55144-1000; (612) 733-9558

A & B Process Systems, 528 North Street, Stratford, WI 54484; (715) 687-4332

ABC Research, 3437 S.W. 24th Avenue, Gainesville, FL 32607; (904) 372-0436

ABELL Pest Control, 246 Attwell Drive, Etobicoke, ON M9W 5B4; (416) 675-6060

Accurate Metering Systems, Inc., 1651 Wilkening Road, Schaumburg, IL 60173; (708) 882-0690

Alfa-Laval Agri, Inc., 11100 North Congress Avenue, Kansas City, MO 64153; (816) 891-1528

AMPCO Pumps Co., 4000 W. Burnham St, Milwaukee, WI 53215; (414) 643-1852

APV Crepaco, 9525 W. Bryn Mawr Ave., Rosemont, IL 60018; (708) 678-4300

Atkins Technical, Inc., 3401 S.W. 40th Blvd., Gainesville, FL 32608; (904) 378-5555

Babson Bros. Co., 1880 Country Farm Drive, Naperville, IL 60563; (708) 369-8100

Becton Dickinson Microbiology Systems, Inc., PO Box 243, Cockeysville, MD 21030; (410) 584-7188

Bentley Instruments, Inc., 4004 Peavey Road, Chaska, MN 55318; (612) 448-7600

BioControl Systems, Inc., 19805 N. Creek Parkway, Bothell, WA 98011; (206) 487-2055

Biolog, Inc., 3938 Trustway, Hayward, CA 94545; (510) 785-2585

bioMérieux Vitek, Inc., 595 Anglum Drive, Hazelwood, MO 63042-2395; (800) 638-4835

Bioscience International, Inc., 11607 Magruder Lane, Rockville, MD 20852-4365; (301) 230-0072

Borden, Inc., 180 E. Broad Street, Columbus, OH 43215; (614) 225-4000

Capitol Vial, Inc., PO Box 446, Fultonville, NY 12072; (518) 853-3377

Charm Sciences, Inc., 36 Franklin Street, Malden, MA 02148; (617) 322-1523

Chem Station International, 3201 Encrete Lane, Dayton, OH 45439; (513) 294-8265

Custom Control Products, Inc., 1300 N. Memorial Drive, Racine, WI 53404; (414) 637-9225

Dairy and Food Labs, Inc., 3401 Crow Canyon Road, Suite 110, San Ramon, CA 94583-1307; (510) 830-0350

Dairy Quality Control Institute, 5205 Quincy Street, St. Paul, MN 55112-1400; (612) 785-0484

Darigold, Inc., 635 Elliott Ave., PO Box 79007, W. Seattle, WA 98119; (206) 286-6772

Dean Foods, 1126 Kilburn Avenue, Rockford, IL 61101; (815) 962-0647

Decagon Devices, PO Box 835, Pullman, WA 99163; (509) 332-2756

Difco Laboratories, Inc., PO Box 331058, Detroit, MI 48232; (313) 462-8478

Diversey Corp., 12025 Tech Center Drive, Livonia, MI 48150-2122; (313) 458-5000

DonLevy & Associates, Inc., 1551 E. 89th Ave., Merrillville, IN 46410; (219) 736-0472

DuPont, PO Box 80357, Wilmington, DE 19880; (302) 695-2262

Dynal, Inc., 5 Delaware Drive, Lake Success, NY 11042; (516) 326-3270

Eastern Crown, Inc., PO Box 850, Vernon, NY 13476; (315) 829-3505

Educational Foundation of the National Restaurant Assn., 250 S. Wacker Drive, Suite 1400, Chicago, IL 60606-3834; (800) 765-2122

Electrol Specialties Company, 441 Clark Street, South Beloit, IL 61080; (815) 389-2291

Evergreen Packaging, Division of International Paper, 2400 6th Street, S.W., Cedar Rapids, IA 52406; (319) 399-3236

F & H Food Equipment Co., PO Box 3985, Springfield, MO 65808; (417) 881-6114

Alex C. Fergusson, Inc., Spring Mill Drive, Frazer, PA 19355; (610) 647-3300

Foss Food Technology Corporation, 10355 W. 70th Street, Eden Prairie, MN 55344; (612) 941-8870

FRM Chem, Inc., PO Box 207, Washington, MO 63090; (314) 583-4360

H. B. Fuller Co., 3900 Jackson Street, N.E., Minneapolis, MN 55421; (612) 782-1755

G&H Products Corp., 7600 57th Avenue, Kenosha, WI 53142; (414) 694-1010

Gardex Chemicals, Ltd., 246 Attwell Drive, Etobicoke, ON M9W 5B4; (800) 563-4273

General Mills Restaurants, Inc., PO Box 593330, Orlando, FL 32859-3330; (407) 245-5330

GENE-TRAK Systems, 31 New York Avenue, Framingham, MA 01701; (508) 872-3113

Gist-brocades Dairy Ingredients Group, N93 W14560 Whittaker Way, Menomonee Falls, WI 53051; (800) 423-7906

Hess & Clark, Inc./KenAg, 7th & Orange Street, Ashland, OH 44805; (800) 992-3594

IBA, Inc., 27 Providence Road, Millbury, MA 01527; (508) 865-6911

Idetek, Inc., 1245 Reamwood Ave., Sunnyvale, CA 94089; (408) 745-0544

IDEXX Laboratories, Inc., 1 Idexx Drive, Westbrook, ME 04092; (800) 321-0207

Integrated BioSolutions, Inc., 4270 U.S. Route One, Monmouth Junction, NJ 08852; (908) 274-1778

International Dairy Foods Association, 888 16th Street, N.W., Washington, DC 20006; (202) 737-4332

Klenzade Division, Ecolab, Inc., Ecolab Center North, St. Paul, MN 55102; (612) 293-2233

Land O'Lakes, Inc., PO Box 116, Minneapolis, MN 55440-0116; (612) 481-2870

Maryland & Virginia Milk Producers Assn., Inc., 1985 Isaac Newton Square South, Reston, VA 22090; (703) 742-6800

Metz Sales, Inc., 522 W. First Street, Williamsburg, PA 16693; (814) 832-2907

Michelson Laboratories, Inc., 6280 Chalet Drive, Commerce, CA 90040; (310) 928-0553

Mid America Dairymen, Inc., 3253 E. Chestnut Expressway, Springfield, MO 65802-2584; (417) 865-7100

Nasco International, 901 Janesville Avenue, Fort Atkinson, WI 53538; (414) 563-2446

National Mastitis Council, 1840 Wilson Boulevard, Suite 400, Arlington, VA 22201; (703) 243-8268

Nelson-Jameson, Inc., 2400 E. Fifth Street, PO Box 647, Marshfield, WI 54449-0647; (715) 387-1151

NESTLE USA, Inc., 800 N. Brand Blvd., Glendale, CA 91203; (818) 549-5799

Northland Laboratories, 2415 Western Avenue, PO Box 160, Manitowoc, WI 54221-0160; (414) 682-7998

Norton Performance Plastics Corp., PO Box 3660, Akron, OH 44309-3660; (216) 798-9240

Organon Teknika, 100 Akzo Avenue, Durham, NC 27712; (919) 620-2000

Pall Ultrafine Corp., 2200 Northern Boulevard, East Hills, NY 11548; (516) 484-5400

Penn State University, University Creamery, 12 Borland Laboratory, University Park, PA 16802; (814) 865-7535

Pfizer Animal Health, 812 Springdale Dr., Exton, PA 19341; (610) 363-3140

PRISM, 8300 Executive Center Drive, Miami, FL 33166-4680; (305) 592-6312

R-Tech, PO Box 116, Minneapolis, MN 55440-0116; (800) 328-9687

Ralston Analytical Laboratories, 2RS Checkerboard Square, St. Louis, MO 63164; (314) 982-1680

REMEL, L.P., 12076 Santa Fe Dr., Lenexa, KS 66215; (800) 255-6730

Rio Linda Chemical Company, 410 N. 10th Street, Sacramento, CA 95814; (916) 443-4939

Ross Laboratories, 625 Cleveland Avenue, Columbus, OH 43215; (614) 227-3333

Seiberling Associates, Inc., 94 North High Street, Suite 350, Dublin, OH 43017-1100; (614) 764-5854

Silliker Laboratories Group, Inc., 900 Maple Road, Homewood, IL 60430; (708) 957-7878

Sparta Brush Co., Inc., PO Box 317, Sparta, WI 54656; (608) 269-2151

The Sterilex Corporation, 10315 S. Dolfield Rd., Suite B, Owings Mills, MD 21117; (410) 581-8860

Tekmar Co., PO Box 429576, Cincinnati, OH 45242-9576; (513) 247-7000

Unipath Co., Oxoid Division, PO Box 691, Ogdensburg, NY 13669; (800) 567-8378

Viatran Corporation, 300 Industrial Drive, Grand Island, NY 14072; (716) 773-1700

VICAM, 313 Pleasant Street, Watertown, MA 02172; (617) 926-7045

Walker Stainless Equipment Co., 618 State Street, New Lisbon, WI 53950; (608)562-3151

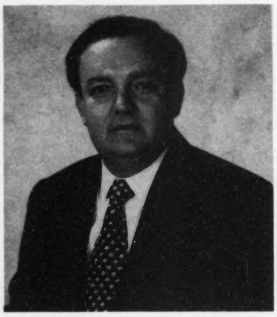
Weber Scientific, 2732 Kuser Road, Hamilton, NJ 08691-9430; (609) 584-7677

World Dryer Corp., 5700 McDermott Dr., Berkeley, IL 60163; (708) 449-6950

Zep Manufacturing Co., 1310 Seaboard Industrial Blvd., Atlanta, GA 30318; (404) 352-1680

THOUGHTS

FROM THE PRESIDENT



By C. DEE CLINGMAN,
IAMFES President

> "Nothing can be sliced so thin that there will be only one side."

When I was growing up my mother always told me that "as you go through life you must always seek out the other side of the story." Whether it is your child telling you the story of "how" the window got broken, or an employee explaining "why" the error occurred, or the government informing the public about a controversial event – there **will** be another side to the story. Somewhere between the two extreme viewpoints will be the "truth" or actual happenings. Your job is to find that point.

During the past year I have tried to stimulate the readers of my President's Column with viewpoints that make you think – what does this mean? One member wrote to me regarding my comment that Fidel Castro should not be considered a "great" leader and that Abraham Lincoln might be a more appropriate reference. Who is to say? It would depend upon who you talked to – Castro's followers may have a different opinion than his opponents. In Abraham Lincoln's situation it may depend upon which side of the Mason-Dixon line you obtained your opinion. Diversity – it is in all that we do and in all walks of life. It is global. But diversity builds strength, understanding, and knowledge by recognizing it as an opportunity, not a problem with society.

It is absolutely essential that each one of us reach out to grasp the other side of the story. By knowing the extremes we are better equipped to focus in on the "truth" somewhere in between. One of the best ways to do this is to attend the upcoming IAMFES Annual Meeting in Pittsburgh. This year's meeting will present diverse viewpoints on many food safety issues. Tremendous food science research will be presented and opinions and viewpoints based upon that science will be expounded upon. It will be a great opportunity for all of our members to gain new knowledge. Attending the IAMFES Annual Meeting also provides precious moments of dialogue among and between fellow professionals. Networking is often the best way to get the "other side of the story."

Please plan to make the IAMFES Annual Meeting part of your professional development program this year. Learning new food safety science is critical to the future of the world. Remember "science" changes. Christopher Columbus' predecessors thought the world was flat based upon the "science" of the time. Wow, how far we've come.

See you in Pittsburgh!

On My MIND...

By STEVEN K. HALSTEAD, CAE
IAMFES Executive Manager

"It's always amazing to me how the busiest, most qualified are the ones most willing to give to the association."

One thing that all of our affiliates have in common is that they all hold meetings each year. In most cases these meetings consist of a short business meeting where next year's officers are elected and some kind of educational programming. My experience has been that this educational programming is excellent. Sometimes it covers the broad range of interests as diverse as our membership; in other cases, it is aimed at a single topic.

Whatever the case, there is always the problem of where to come up with good speakers. For as long as I have been with IAMFES, the Executive Board has sought ways of providing help given our limited resources.

Until recently, IAMFES sent staff members to affiliate meetings. Budget restraints have put an end to that – temporarily I hope. Although it didn't cost the affiliate much of anything to have us at their meeting, they, quite frankly, didn't get much either. We could talk about what was happening in the association and could make an appeal for membership and support, but we couldn't teach the members much of anything that would help them in their day to day work.

At the March meeting, the Executive Board approved a policy which I think will help the affiliates a great deal. Here's how it will work: An affiliate identifies a member of the Executive Board who they would like to have speak at their meeting. The affiliate contacts the officer to see if the officer is available on the dates in question. If the officer is available, the affiliate determines whether or not the officer's employer is willing to provide travel funds. If not, the officer contacts IAMFES for help. If the affiliate agrees to provide the officer with half of his/her transportation costs and all of the lodging, IAMFES will pick up the other half of the transportation and all of the meal expenses.

We see this as a "win-win" situation for both groups. The affiliate gets outstanding speakers and IAMFES gets exposure to our members.

The affiliates will now have access to some of the most qualified food protection experts in the world. (It's always amazing to me how the busiest, most qualified are the ones most willing to give to the association.) The affiliate will also be getting the advantage of having a speaker who is very knowledgeable about the association and very capable of soliciting membership and support. The policy will be discussed at the Affiliate Council meeting in Pittsburgh and funds have been set aside in next year's budget. The question remains – will the affiliates take advantage of this opportunity? Only time will tell.

Dairy, Food and Environmental Sanitation, Vol. 15, No. 5, Pages 292-300

A Food Classification Scheme to Summarize Epidemiological Patterns of Food-borne Illness

A. M. Fraser,[1] C. A. Sawyer,[1] S. A. Andrews,[1] J. P. Youatt,[2] and P. Kirkwood[3]
[1]Department of Food Science and Human Nutrition, and [2]Department of Family and Child Ecology, and [3]Michigan Department of Public Health

The primary purpose of summarizing epidemiological patterns of food-borne illness is to prevent further illness. To prevent further illness, associated factors must be identified so preventive measures can be developed and implemented. To be effective, epidemiological data needs to be summarized and translated into a format easily used by health professionals.

In the U.S., epidemiological patterns of food-borne illness are summarized using the Centers for Disease Control (CDC) surveillance system (1). The CDC system classifies food vehicles into 16 categories (Table 1). These 16 food categories are used to periodically summarize outbreaks and cases of food-borne illness in the U.S. (2).

In the CDC summary of U.S. food-borne illness between 1973 and 1987, foods represented by the food-vehicle category "other" accounted for 33% (n = 1,219) of reported outbreaks and 45% (n = 74, 359) of reported cases (2). The CDC defines "other" as foods that do not fit into any other classification.

The New York State Department of Health (NYS) developed a food-vehicle classification system to expand the CDC category "other" (4). The NYS system places food into two categories: the general food category, which classes implicated food vehicles by the method of preparation and the ingredient food category, which lists the ingredients determined to have introduced the agent and/or that categorize the vehicle.

The purpose of the present project was to expand the CDC food-vehicle categories into food groups based on microbiological, chemical, and physical risks contributing to food-borne illness. The basis of the proposed scheme was to provide greater specificity and ease in categorizing food implicated in food-borne illness outbreaks.

The proposed scheme groups foods into categories which have similar (but not identical) characteristics such as pH, processing, and water activity (Table 2). Expansion of the CDC system should facilitate a higher degree of specificity, especially for foods that have been coded as "other"; 33% of reported cases in the U.S. between 1973 and 1987 were coded by the CDC as "other"(1).

METHODS

Development of the Proposed Food-scheme Categories

The proposed food scheme contains 17 food categories (Table 2). Of the proposed food-scheme categories, 14 contain subcategories. Categories 2, 16 and 17 (eggs, physical, and unknown) do not have subcategories.

Table 3 contains the definitions and examples for each category of the proposed food scheme. Definitions were based on published sources (16). Examples of foods are included with each definition to increase clarity of the definition and to reduce coding error. For example, the definitions and examples of two categories, "chicken" and "salads prepared with one or more cooked ingredients" are:

Chicken

Definition: chicken alone

Example: chicken, fried chicken, baked chicken, Cornish hen, chicken patty, chicken nuggets

Salads prepared with one or more cooked ingredients

Definition: one or more ingredients are cooked prior to combining with raw ingredients and then served cold; usually includes one or more potentially hazardous ingredients;

Example: egg salad, chicken salad, turkey salad, potato salad, pasta salad, rice salads

Thirteen (13) of the major vehicle categories (categories 1 to 13 in Tables 2 and 3) were based on foods with a similar degree of microbiological risk. Microbiological risk was defined as intrinsic and processing factors of food that affect the growth of microorganisms (5). Intrinsic parameters include the pH, moisture content, and nutrient content of the food. Processing factors were defined by handling methods, such as heat treatment. Foods included within a category do not have identical intrinsic and processing factors. The rationale behind the proposed category definitions was that they be broad enough to be easy to use but limited enough to have a high degree of specificity.

TABLE 1. CDC Classification System: Number and percent of food in suspected food-borne illnesses as reported to the Michigan Department of Public Health (January 1, 1992 to December 31, 1992).

Vehicle Category	Outbreak n	Outbreak %[a]	Cases n	Cases %[a]
Bakery products	2	<1	43	2
Beef	19	3	51	2
Chicken	74	11	169	7
Chinese foods	35	5	64	3
Dairy products	8	1	13	<1
Eggs	9	1	15	<1
Finfish	22	3	54	2
Fruits and vegetables	4	<1	39	2
Ice cream	7	1	12	<1
Mexican food	64	10	185	8
Mushrooms	1	<1	2	<1
Nondairy beverages	1	<1	1	<1
Pork	13	2	69	3
Shellfish	21	3	34	1
Turkey	1	<1	1	<1
Other	372	57	1634	68
TOTAL	653	100	2386	100

[a]Totals might be greater than 100% due to rounding.

For example, using the proposed scheme, a food item such as pickled cauliflower would be classified under category 13.3, pickled vegetable, while raw cauliflower would be categorized as 13.2, raw vegetables (Tables 2 and 3). This differentiation in categorization of vegetables products would allow for the identification of a food and its potential to support the growth of microorganisms. The growth of microorganisms on pickled vegetables would be less likely than on raw cauliflower due to the high acid environment of pickled vegetables. Microbial growth on raw cauliflower would most likely be due to the introduction of bacteria naturally present on its surface into its interior and subsequent improper handling and/or refrigeration. Alternatively, if pickled cauliflower became contaminated with lead due to storage in a lead-soldered can, it would be placed into category 15 of the proposed scheme, chemical (Tables 2 and 3).

The proposed food scheme also includes water as a vehicle category (Tables 2 and 3, category 14). The CDC uses a separate surveillance systems for waterborne illnesses and food-borne illnesses. With the addition of waterborne illness, the proposed food scheme would conveniently classify all consumed items implicated in an outbreak into one summary. If raw cauliflower was rinsed in water contaminated by microorganisms, the cauliflower and the water would both be classified as vehicles of illnesses.

Categories 15 and 16 are chemical and physical contamination (Tables 2 and 3). Usually food contaminated by chemical and physical elements do not have common intrinsic parameters–pH, water activity, or nutrient content–that contribute to their contamination by chemical or physical elements. Therefore, if a chemical or physical element is identified as the cause of the reported food-borne illness, it is important to classify the implicated food vehicle separately. Contamination and subsequent illness is usually not the result of intrinsic parameters but rather of special circumstances that have led to contamination of the food.

Category 17 of the proposed food scheme (Table 2) has been defined as unknown or food not reported. Reported outbreaks of food-borne illness in which a food vehicle was not reported need to be separated from outbreaks which have a related food vehicle.

Data

The Michigan Department of Public Health (MDPH) provided the data set used to evaluate the specificity of the proposed food scheme. Specificity was defined as the ability to group a food into a defined category. This data set included both confirmed outbreaks and suspected incidents of food-borne illness reported to the MDPH during 1992. All reported data was used for the evaluation.

Data Analysis

The number and percentage of incidents and cases were calculated for the major categories and subcategories of the food scheme and the 17 vehicle categories of the CDC classification system (Tables 2 and 3). Subsequent comparisons were made between the two classification systems to determine specificity.

TABLE 2. Proposed food scheme: Number and percent of foods in suspected food-borne illnesses as reported to the Michigan Department of Health (January 1, 1992 to December 31, 1992).

Code	Vehicle Category	Outbreak n	Outbreak %[a]	Cases n	Cases %[a]
1	Dairy				
	1.1 Cheese	0	0	0	0
	1.2 Cream/cream desserts	2	<1	2	<1
	1.3 Ice cream/ice cream desserts	7	<1	12	<1
	1.4 Milk	2	<1	12	<1
	1.5 Butter	0	0	0	0
	1.6 Other dairy	4	<1	9	<1
2	Eggs	9	1	15	<1
3	Fruit				
	3.1 Fruit juice	1	<1	11	<1
	3.2 Fruit salad	1	<1	1	<1
	3.3 Raw fruit	1	<1	1	<1
4	Legumes, nuts and seeds				
	4.1 Legumes	0	0	0	0
	4.2 Nuts and seeds	0	0	0	0
5	Meat				
	5.1 Beef	19	3	51	2
	5.2 Chicken	74	11	169	7
	5.3 Hotdogs, lunch meat, and sausage	28	4	103	4
	5.4 Lamb	2	<1	9	<1
	5.5 Pork	13	2	69	3
	5.6 Turkey	1	<1	1	<1
	5.7 Wild game	2	<1	9	<1
6	Mixed dishes				
	6.1 Casserole	3	<1	9	<1
	6.2 Chinese/Japanese foods	35	5	64	3
	6.3 Italian foods	13	2	21	<1
	6.4 Mexican foods	64	10	185	8
	6.5 Pizza	46	7	186	8
	6.6 Sandwich	100	15	313	13
	6.7 Soup	15	2	30	1
	6.8 Stew	0	0	0	0
	6.9 Other mixed dishes	18	3	54	2
7	Mushrooms				
	7.1 Domestic	1	<1	2	<1
	7.2 Wild	0	0	0	0
8	Other				
	8.1 Nondairy beverages	1	<1	1	<1
	8.2 Carbonated beverages	0	0	0	0
	8.3 Snacks/candy	2	<1	6	<1
	8.4 Condiments	3	<1	26	1
	8.5 Desserts	3	<1	7	<1
9	Salads				
	9.1 Salads with raw ingredients	53	8	380	16
	9.2 Salads with one or more cooked ingredients	26	4	40	2
10	Salad dressings				
	10.1 Commercial	0	0	0	0
	10.2 Fresh	1	<1	-	-

(Continued)

RESULTS AND DISCUSSION

In Table 1, foods reported to the MDPH were categorized into the 16 CDC food-vehicle categories. The CDC category "other" accounted for 57% (n = 372) of outbreaks and 68% (n = 1,634) of cases during 1992. Chicken and Mexican foods, the next two most commonly reported CDC categories, accounted for 11% (n = 74) and 10% (n = 64) of outbreaks and 7% (n = 169) and 8% (n = 185) of cases, respectively.

In Table 2 the 1992 MDPH data is categorized using the proposed food scheme. The proposed food scheme did not include an "other" category. All foods were classified into a specific food category.

Using the food scheme, sandwiches (category 6.6 in Tables 2 and 3) accounted for 15% (n = 100) of the overall reported outbreaks in Michigan. Salads with raw ingredients (category 9.1 in Table 2) accounted for 8% (n = 53) of overall outbreaks. If the CDC vehicle classification had been used to summarize this data, these foods would have been reported as "other (category 8 in Table 1). Further, if the CDC classification had been used, food contaminated by chemical or physical agents would also have been classified as "other." The proposed food scheme groups these foods separately.

Outbreaks where no food vehicle was reported would also be classified as "other" if the CDC vehicle classification were used. When using the proposed food scheme, incidents with unknown food vehicles (category 17 in Tables 2 and 3) would be categorized separately. Unknown foods accounted for only 5% (n = 31) of outbreaks and 16% (n = 379) of cases in Michigan in 1992 (Table 2).

CONCLUSION

The proposed food scheme (Tables 2 and 3) more specifically categorized foods from suspected food-borne illnesses in Michigan in 1992 than did the CDC vehicle-classification system (Table 1). All foods reported to the MDPH were grouped into a specific category. With a foodborne illness summary that has a higher degree of specificity, health professionals can evaluate food and food handling practices to determine if attention and subsequent education is properly focused. A food scheme which categorizes all foods into categories should enhance the ability of public-health officials to prevent future illness incidents.

REFERENCES

1. Bean, N. H., and P. M. Griffin. 1990. Foodborne disease outbreaks in the United States, 1973-1987: pathogens, vehicles, and trends. J. Food Prot. 53:804-817.
2. Centers for Disease Control. 1990. Foodborne disease outbreaks, 5-year summary, 1983-1987. CDC Surveillance Summaries. Morbid. Mortal. Weekly Rep. 39(No. SS-1):15-57.
3. International Association of Milk, Food and Environmental Sanitarians. 1990. Procedures to Investigate Waterborne Illness. IAMFES, Des Moines, IA.
4. Guzewich, Jack. 1991. Personal communication.
5. Jay, J. M., 1992. Modern Food Microbiology. Van Nostrand Reinhold, New York. p. 38-59.
6. Ockerman, H. W. 1978. Source book for food scientists. The AVI Publishing Company, Inc., Westport, CT.

TABLE 2. *Continued*

Code	Vehicle Category	Outbreak n	Outbreak %[a]	Cases n	Cases %[a]
11	Seafood				
	11.1 Finfish	22	3	54	2
	11.2 Shucked shellfish	1	<1	1	<1
	11.3 Shellfish, other	20	3	33	1
12	Starchy foods				
	12.1 Bakery	2	<1	43	2
	12.2 Cereal	0	0	0	0
	12.3 Cooked rices	8	1	38	2
	12.4 Patataes	3	<1	5	<1
13	Vegetables				
	13.1 Vegetable juice	0	0	0	0
	13.2 Raw vegetables	1	<1	26	1
	13.3 Pickled vegetables	0	0	0	0
14	Water				
	14.1 Liquid	1	<1	2	<1
	14.2 Ice	0	0	0	0
15	Chemical				
	15.1 Heavy metals	0	0	0	0
	15.2 Caustic	4	<1	7	<1
	15.3 Organic	0	0	0	0
	15.4 Other	0	0	0	0
16	Physical	8	1	8[b]	<1
17	Unknawn	31	5	379	16
	TOTAL	6563	100	2386	100

[a]Totals might be greater than 100% due to rounding.

TABLE 3. Proposed food scheme: definitions and examples of each category and subcategory.

1. DAIRY PRODUCTS

1.1 Cheese

Definition: consolidated curd of milk ripened by fermentation.

Example: cheese, American cheese, Brie, Mexican-style cheese, unpasteurized goat cheese, cottage cheese, cream cheese

1.2 Cream/cream desserts

Definition: yellow-tinged part of whole milk that is rich in butterfat and gradually rises to the top of the milk; includes any product where the predominant ingredient is cream.
NOTE: does not include nondairy coffee creamers.

Example: coffee creamer, whipped cream, cream-filled pastries, half-and-half

1.3 Ice cream/ice cream desserts

Definition: sweetened, flavored, frozen dessert containing cream.

Example: chocolate ice cream, vanilla bar, drumstick, milk shake, sherbet, soft-serve ice cream

1.4 Milk

Definition: fluid secreted by the mammary glands of cows, goats, etc.

Example: milk, chocolate milk, skim milk, raw milk

TABLE 3. ***Continued***

1.5 Butter
Definition: solid emulsion of fat globules, air, and water made by churning milk/cream and used as a food.
Example: butter, whipped butter

1.6 Other dairy products
Definition: dairy products that are not included in the five categories listed.
Example: yogurt, frozen yogurt, dip, sour cream

2. EGGS
Definition: egg(s) alone or as the predominant ingredient in a mixed dish; includes eggs from birds, e.g., chicken, quail, duck, as well as from reptiles, e.g., turtle.
NOTE: does not include egg salad.
Example: boiled eggs, scrambled eggs, omelet

3. FRUIT
Definition: ripened ovary of a seed plant, usually sweet, with a higher acid content than vegetables.
Example: apple, apple sauce, cantaloupe, peaches, raisins, strawberries, watermelon

3.1 Fruit juice
Definition: 100% juice obtained from raw fruit.
NOTE: This does not include juice drinks which contain other ingredients.
Example: orange juice, apple juice, pineapple-orange juice, grape juice

3.2 Fruit salad
Definition: a cold dish of raw fruits or as the predominant ingredient in a mixed dish.
Example: fruit cocktail, Waldorf salad

3.3 Raw fruit
Definition: ripened ovary of a seed plant, usually sweet with a higher acid content than vegetables.
NOTE: Tomato is included under vegetable.
Example: apple, orange, banana, mango

4. LEGUMES, NUTS, AND SEEDS
Definition: legumes are a group of plants whose fruits consist of seed-bearing pods; nuts are a fruit with a hard or leathery shell that contains a single edible kernel, which is enclosed in a soft inner skin; seeds are pods within the fruit. Legumes, nuts, and seeds alone or as the predominant ingredient in a dish.
Example: chick peas, lentils, peanuts, soybeans, sunflower seeds, almonds, Brazil nuts, coconuts, pecans, beans, peanut butter, refried beans

4.1 Legumes
Definition: a group of plants whose fruits consist of seed-bearing pods.
Example: chickpeas, lentils, peanuts, soybeans, garbanzo beans, peanut butter, baked beans, tofu

4.2 Nuts and seeds
Definition: a fruit with a hard or leathery shell that contains a single edible kernel, which is enclosed in a soft inner skin; seeds are pods within the fruit.
Example: almonds, sunflower seeds, pumpkin seeds, pecans, walnuts, coconuts, Brazil nuts

5. MEAT
Definition: roasted, baked, etc. solid pieces of meat/poultry.
Example: roast beef, whole turkey, broiler chickens, baked ham, gyro meat, stuffed chicken breasts, turkey roll, venison, lamb chops

5.1 Beef
Definition: beef alone.
Example: ground beef, steak, veal, rolled roast

TABLE 3. *Continued*

5.2 Chicken
Definition: chicken olone.
Example: chicken, fried chicken, baked chicken, Cornish hen, chicken patty, chicken nuggets

5.3 Hot dogs, lunch meat, and sausage
Definition: processed meat and paultry products.
Example: bocon, hom, pork sausage, salami

5.4 Lamb
Definition: lomb olone.
Exomple: lamb chops

5.5 Pork
Definition: pork alone.
NOTE: This does not include processed meots mode from pork, such os hom, sousoge, etc.
Example: ribs, pork, pork chops, BBQ pork

5.6 Turkey
Definition: turkey alone.
Exomple: turkey, turkey loof, ground turkey

5.7 Wild game
Definition: wild animals, including mammals and birds.
NOTE: This includes domestically raised game.
Example: bear, beaver, boar, buffalo, moose, seal, venison, olligotor, whale, pheasant, duck, rabbit, squirrel, roccoon

6. MIXED DISHES
Definition: foods thot ore a combination of ingredients thot require extensive food handling.
Example: casserole, Chinese/Joponese cuisine, Italian cuisine, Mexican cuisine, pizza, sandwich, soup, stew

6.1 Casserole
Definition: food preporotion steps sometimes involve combining of several ingredients prior to cooking the food.
Exomple: tuna noodle casserole, broccoli cheese casserole

6.2 Chinese/Japanese food
Definition: food typical of Chinese/Japanese cuisine.
Example: chop suey, beef chow mein, egg drop soup, fried rice, sukiyaki

6.3 Italian foods
Definition: food typical of Itolion cuisine.
Exomple: lasagna, spaghetti, manicotti;
NOTE: does not include pizza.

6.4 Mexican foods
Definition: combination foods typical of Mexican cuisine.
Example: burrito, enchiladas, tacos, tostada, Mexican rice, nachos and cheese, refried beans, Spanish rice, tamales

6.5 Pizza
Definition: an apen-faced pie that consists of a layer of pasta daugh, or yeast dough, spread with spiced tomato paste, and topped with mozzorello cheese and often other ingredients.
Example: cheese pizza, pepperoni pizzo, vegetarian pizza

6.6 Sandwich
Definition: ingredients are assembled and served between two slices of bread or other baked good ond served hot or cold.
NOTE: includes hamburger but not hot dog.
Example: bacon-lettuce-tomato sandwich, toasted cheese sandwich, Monte Cristo sandwich, pita pocket, homburgers, hot dogs, sloppy joes

TABLE 3. *Continued*

6.7 Soup

Definition: cooking meat, fish, or vegetables and the like in such fluids as water or milk where the liquid part is predominant over the solid portion.

Example: chicken noodle, cream of broccoli, vegetable soup, borscht

6.8 Stew

Definition: cooking meat, fish, or vegetables and the like in water or milk where the solid food takes priority over the liquid portion.

Example: beef stew, venison stew

6.9 Other mixed foods

Definition: combination foods requiring extensive food handling that are not included in the categories listed.

Example: macaroni and cheese, meat loaf, meat balls, creamed dried beef, chili, microwave meals, goulash, pot pie

7. MUSHROOMS

Definition: any edible fungus.

Example: mushrooms, wild mushrooms, russula mushroom, lepiota jesseran

7.1 Domestic

Definition: any edible fungus grown under controlled conditions.

Example: gray cap mushrooms

7.2 Wild

Definition: any edible fungus grown in the wild.

Example: morelles, truffles

8. OTHER

Definition: foods that do not fit into any of the specific classifications.

Example: nondairy and carbonated beverages, snacks, candy, condiments, and desserts

8.1 Nondairy, non-carbonated beverages

Definition: sweetened or unsweetened beverages.

Example: Kool-Aid®, coffee, tea, snowcones, slush, cocoa, alcoholic beverages, drink box

8.2 Carbonated beverages

Definition: sweetened bubbly beverage.

Example: Coke, Pepsi, soda pop, tonic water

8.3 Snacks/candy

Definition: unsweetened and sweetened foods.

Example: popsicles, pretzels, crackers, chips, popcorn, turtles, graham crackers, fruit snacks, sour balls, gum, marshmallows

8.4 Condiments

Definition: any substance often aromatic, added to the food at the table in the function of flavor enhancer.

Example: catsup, sugar, syrup, mustard, jam, jelly, apple butter, honey, gravy, malt vinegar, lemon juice

8.5 Desserts

Definition: sweetened combination food that is not specific to any other vehicle category.

Example: caramel apple, Jello, pudding, Twinkies, Pop-Tarts, nutty bars

9. SALADS

Definition: usually cold ingredients mixed together and served with mayonnaise or other dressing.

Example: cole slaw, chef salad, Jello salad, macaroni salad, pasta salad, salad bar, tossed garden salad, three-bean salad

(Continued)

TABLE 3. *Continued*

9.1 Salads with raw ingredients

Definition: ingredients are generally not cooked and are served cold; usually do not contain a potentially hazardous ingredient except possibly the dressing.
NOTE: dressing should be coded separately.

Example: green salads, cole slaw

9.2 Salads prepared with one or more cooked ingredients

Definition: one or more ingredients are cooked prior to combining with raw ingredients and then served cold; usually include one or more potentially hazardous ingredients.

10. SALAD DRESSINGS

10.1 Commercial

Definition: dressing processed and hermetically sealed in a food-manufacturing facility.

Example: Seven Seas blue cheese dressing, Kraft mayonnaise

10.2 Fresh

Definition: dressing prepared on-site in the home or in a food service establishment.

Example: homemade mayonnaise, dressing prepared from a package, pesto

11. SEAFOOD

Definition: aquatic animals, excluding mammals.

Example: cod, shrimp, lobster, clams, tuna

11.1 Finfish

Definition: aquatic animal with fins.

Example: bluefish, tuna steak, fresh tuna, stuffed flounder, fried catfish, salmon croquette, pink salmon, lox, fillet of sole, sardines canned salmon

11.2 Shucked shellfish

Definition: aquatic animal whose external covering consists of a shell which is usually removed.

Example: raw clams, steamed clams, raw oysters, steamed mussels

11.3 Shellfish, other

Definition: aquatic animal whose external covering consists of a shell.

Example: shrimp, lobster, scallops, crayfish, prawns

12. STARCHY FOODS

Definition: foods derived from the seeds, roots, or stems of plants that are predominantly composed of carbohydrates that can be commercially extracted.

Example: boiled rice, steamed rice, wheat, oats, barley, sweet potatoes, potatoes

12.1 Bakery

Definition: baked products usually with flour as the main ingredient; exceptions are pies where fruit may be the main ingredient.

Example: bagels, biscuits, bread, breadsticks, brownies, cake, cookies, pie (apple, cream), cupcakes, eclairs, French toast, fry bread, muffins, pancakes, rolls, strudel, toast, waffle, sweet breads.

12.2 Cereal

Definition: grain product commonly consumed for breakfast.

Example: cold cereal, oatmeal, Cheerios, grits, gruel, cream of wheat, puffed rice cereal

12.3 Cooked rice

Definition: rice alone.

Example: steamed rice, boiled rice, wild rice

12.4 Potatoes

Definition: potatoes alone.
NOTE: does not include scalloped potatoes, potato salad, German-style potato salad

Example: French fries, potato sweet potato

12.5 Other

Definition: starchy foods that do not fit into the above categories.

Example: barley, linguine, butter noodles, bread pudding, stuffing

TABLE 3. *Continued*

13. VEGETABLES

Definition: an herbaceous plant cultivated for food.
Example: asparagus, beans, peppers, corn, cucumbers, egg plant, lettuce, carrots, onions, okra, olives, peas, pickles, raw vegetables, spinach, zucchini

13.1 Vegetable juice

Definition: juice obtained from raw vegetables.
Example: carrot juice, V-8, celery juice

13.2 Raw vegetables

Definition: vegetables that are served alone, hot or cold.
Example: carrot sticks, peas, corn, tomatoes

13.3 Pickled vegetables

Definition: any vegetable that has been immersed in a spiced vinegar or brine solution for varying lengths of time with the objective of both preserving and flavoring.
Example: olives, pickles, pickled cauliflower, salsa

14. WATER

Definition: water meant for human consumption.
Example: water, ice
NOTE: The Centers for Disease Control (CDC) in collaboration with the Environmental Protection Agency tabulate data on waterborne disease separately from those for food-borne disease outbreaks. A waterborne disease outbreak is defined as illness occurring after consumption of water intended for human consumption.

14.1 Liquid

Definition: water in the liquid form meant for human consumption.
Example: tap water, spring water, bottled water

14.2 Ice

Definition: frozen water meant for human consumption.
Example: ice cubes, crushed ice
NOTE: does not include slushes.

15. CHEMICAL

Definition: the accidental introduction of chemicals into foods that is not related to food-preparation practices.
Example: Sanitizer in soup, lead in acidic foods

15.1 Heavy metals (copper, lead)

Definition: the accidental introduction of lead, cadmium, copper into food.
Example: copper contamination of cherry topping

15.2 Caustic

Definition: the accidental introduction of a caustic chemical into food.
Example: floor cleaner in soup

15.3 Organic

Definition: the accidental introduction of an organic compound into food.

15.4 Other

16. PHYSICAL

Definition: the accidental introduction of physical elements into foods that is not related to traditional food-preparation practices.
Example: worm in food, wire in steak

17. UNKNOWN

Definition: causal foods not reported.

Dairy, Food and Environmental Sanitation, Vol. 15, No. 5, Pages 301-308

A Scientific Basis for Regulations on Pathogenic Microorganisms in Foods

Summory of o Workshop held in Moy 1993; Orgonized by ILSI Europe Scientific Committee on Microbiology

FOREWORD

This publication is a distillation of the workshop entitled *A Scientific Basis for Regulations on Pathogenic Microorganisms in Foods*, convened by ILSI Europe in May 1993. The workshop addressed important issues related to the quantitative risk assessment of microbiological hazards, the application of dose-response data, and the concept of Minimal Infective Dose (MID) to the regulator process. There is a need for more sophisticated approaches to replace the unrealistic principle of zero tolerance that underlies many food laws. However, variation in host susceptibility, complex effects of the food vehicle, and the dynamics of growth and survival of microorganisms make it difficult to apply quantitative techniques to the assessment of microbiological hazards. More and better quantitative data are needed in order to establish a sound scientific basis for the regulation of pathogenic microorganisms in foods.

–Paulus M. Verschuren, Scientific Director

ILSI Europe
Av. E. Mounier 83 box 6
1200 Belgium
Telephone: 32/2-771-0014
Fax: 32/2-762-0066

Background

Food laws have traditionally been based on the principle that all pathogenic microorganisms should be absent from all foods. However, this concept of zero tolerance does not reflect reality. Experience over the last 30 years has clearly shown that the complete elimination of pathogenic microorganisms from the food supply is not achievable. Thus, new approaches are needed in order to establish scientifically sound regulations on pathogenic microorganisms in foods.

Scientifically valid regulations are important to international trade as well as food safety. Certainly, imported foods may be rejected for food safety reasons, but internationally accepted standards should ensure that the basis for such rejection is scientific rather than political.

The idea of permitting the presence of some pathogens in certain food is implicitly acknowledged by some current European food laws, regulations, and recommendations. For example, in its advisory codes and mandatory standards, the Codex Alimentarius Commission (an international advisory body) states that products should/shall be free from microorganisms in an amount that may represent a hazard to health. Similarly, Dutch legislation states that foods must be free from pathogenic microorganisms "of such type and in such amounts that danger to general health can result." Such statements implicitly demand quantitative risk assessment.

The Challenge of Microbiological Risk Assessment

The process of quantitative risk assessment has been applied successfully to chemical hazards in food, water, and the general environment. However, few attempts have been made to apply similar techniques to the risks posed by microbiological agents in food. There are many reasons for this, but one principal concern is that microbiological risk assessment involves many complexities that do not apply to risk assessment for chemicals. Examples of issues unique to microbiological hazards are listed in Table 1.

One obvious, yet crucial, consideration is that unlike microorganisms, chemicals neither grow nor die. The concentration of a chemical contaminant cannot be increased and is rarely decreased by storage, handling, or preparation of foods. In contrast, the level of a microbial contamination in foods can change dramatically over time. The number of microorganisms present in a product at the time of sampling for microbiological analysis may have little relation to the number of organisms present at the time of consumption.

The effects of cooking are another important consideration. Few chemical hazards are destroyed by cooking temperatures, and in general, the chemical safety of foods does not depend on correct cooking procedures. In contrast, cooking plays a key role in microbiological food

TABLE 1. Factors that Complicate Microbiological Risk Assessment

Changes in numbers of microorganisms during storage, handling, and preparation for consumption, including effects of cooking
Role of the consumer
Heterogeneous distribution of microorganisms within a food
Person-to-person transmission
Ability of a single agent to cause a wide variety of disease syndromes
Principal concerns are short-term rather than long-term effects, but some illnesses may have long-term sequelae
Host effects
Food vehicle effects

safety. Most foods of animal origin are cooked before they are eaten, and microbiological agents in these foods generally cause illness only if cooking or subsequent handling procedures are inadequate. These factors make illness related to microbiological agents more difficult to predict than illness due to chemical agents.

The importance of the consumer in assuring microbiological food safety cannot be overstressed. This is very different from the situation with chemical hazards, where ultimate control lies in the hands of the farmer and food processor. In general, consumers cannot create chemical hazards by undercooking foods, allowing cross contamination to occur, or storing food at incorrect temperatures or for excessive periods of time. In contrast, many cases of microbiological food-borne illness result from these forms of mishandling in the home or food service establishment.

Another way to look at the extent of the difficulty of assessing microbiological risk is to use the Hazard Analysis Critical Control Point (HACCP) concept–an advanced, sophisticated system for identifying and controlling hazards in foods. The HACCP system relies on the identification and close monitoring of the specific steps in the production of a food product that are crucial to its safety. These key steps are called Critical Control Points. For chemical hazards, all of the Critical Control Points occur on the farm or in the processing plant. In contrast, for microbiological hazards in many foods, particularly animal products sold in the raw state (e.g., meat, eggs, seafood), correct preparation in the home is the ultimate Critical Control Point. As this is done by the consumer, it is extremely difficult–if not impossible–to monitor this control point adequately. There is an urgent need for better education of consumers on safe food handling practices.

The distribution of microbiological agents within a food product may be very different from that of chemical agents. In most instances, it is reasonable to assume that chemical agents are distributed in a homogenous, uniform way. In contrast, for microorganisms, such factors as surface contamination and colony formation may lead to non-uniform distribution patterns.

Person-to-person transmission is important for microorganisms but not for chemicals. Secondary spread is an important factor in some types of microbiological food-borne diseases. For some enteric viruses, secondary spread rates as high as 90% have been reported. Infected persons can also contribute to the spread of an outbreak in another way: if they handle or serve food, they may contaminate it, thus spreading infection to others.

Further complicating the picture is the ability of some microbiological agents to cause a wide range of disease syndromes. For example, *Escherichia coli* O157 can cause a spectrum of illnesses ranging from mild diarrhea to severe bloody diarrhea to the potentially fatal hemolytic uremic syndrome (a complication involving anemia, central nervous systems symptoms, and kidney failure).

Chemical risk assessment focuses mostly on long-term effects that may result from repeated exposure to a toxic agent. For example, much research effort is devoted to determining whether long-term exposure to a chemical will lead to an increased risk of cancer. For microbiological hazards, the situation is very different, involving short-term effects that usually result from a single exposure to the disease-causing agent. Some food-borne diseases, however, can have long-term sequelae. For example, in some individuals, reactive arthritis can occur after an infection with *Salmonella*, *Yersinia enterocolitica*, and other food-borne disease-causing bacteria.

Host Factors

Characteristics of the human host play a far greater role in determining the effects of exposure to microbiological agents than they do for chemical agents. The most important host factors are listed in Table 2. It is important to emphasize that host factors may be more important in determining the severity or *outcome* of an infection that in determining the *likelihood* of infection. Members of high-risk groups may develop symptomatic infections or severe, potentially fatal complications while less vulnerable individuals develop inapparent, asymptomatic infections or become only mildly ill after exposure to the same agent.

Age is one of the most important host factors. For many food-borne pathogens, the risk of severe illness is far greater for very young or very old persons than for healthy young or middle-aged adults. The death rate from food-borne infections is ten times higher in nursing homes for the aged than in other settings. In disease outbreaks caused by *E. coli* O157, fatalities occur almost exclusively in

TABLE 2. Host Factors that Influence Susceptibility to Microbiological Food-borne Disease

Age
Pregnancy
Nutritional Status (including alcohol intake, intake of colostrum in newborns)
Concurrent or recent infections
Immunological status
Physiological factors (e.g., gastric acidity, gastric emptying, gut flora)
Use of medication
Stress

young children and elderly persons. One probable food-borne infection–infant botulism–occurs only in the very young. (Toxins produced by *Clostridium botulinum* can cause illness in persons of any age, but only infants actually become infected with the organisms.) Another pathogen, *Listeria monocytogenes*, is a particularly serious threat to newborns.

Pregnancy is an important host factor, especially for infections with *L. monocytogenes*, which can cause death of the fetus. Indeed, the relationship of listeriosis to pregnancy is one of the best documented examples of the effect of a host factor on food-borne disease.

Other factors influencing host susceptibility to food-borne infections include nutritional status, concurrent or recent infections, immunological status, physiological factors, use of medications (e.g., antibiotics that may change the gut flora, corticosteroids), and stress. Many of these factors are thought to exert their influence through the immune system, and some are more relevant to some diseases than to others.

Host factors may account for the differences in susceptibility to food-borne diseases in various parts of the world. For example, well nourished European or North American groups may be more resistant to a microorganism than undernourished groups in a developing country. On the other hand, for some organisms such as *Campylobacter* and enterotoxigenic *E. coli*, adults in developing countries may have greater resistance than Westerners do because they were exposed to the organism in early childhood and have developed immunity to it.

Effects of the Food Vehicle

A wide variety of factors in foods may influence the amount of a microorganism needed to cause infection or disease (see Table 3). Important factors include fat content, iron content, buffering, stresses (e.g., heat, acidity, cold), background flora, preservatives, physical state of the food (liquid or solid), circumstances of ingestion (e.g., time spent in the stomach), storage history, and storage temperature.

For example, a large number of studies have shown that the presence of fat in a food is protective to *Salmonella*, because it permits the bacteria to survive transit through the stomach. Some pathogens, such as *Yersinia* and *Aeromonas*, may be especially affected by storage temperature. Refrigeration prevents the growth of some pathogens, such as *Campylobacter*, but allows for slow growth of others, including *Yersinia* and *Listeria*. Ethnic differences in food choices and food preparation practices may also influence risk.

The Concept of Minimal Infective Dose (MID)

Attempts at quantification of microbiological risks have often made use of a concept called Minimal Infective Dose, abbreviated MID. The MID is an estimate of the smallest number of microorganisms that can cause an infection. The idea of MID may seem simple, but its determination is not. MID is influenced by all of the host and food vehicle factors described in Table 2, and it may vary greatly for different strains of a microbial species. It may be necessary to establish separate MIDs for different population groups and different food vehicles or to make provisions for special groups or unusual products by "safety factors" determined by rule of thumb. In addition, there is uncertainty about how MID should be defined because there is uncertainty about the most useful definition of the term "infection."

In 1990, as a follow-up to a 1989 workshop on MID, the International Life Sciences Institute–ILSI Europe sent a questionnaire to 160 experts in clinical microbiology, food microbiology, and epidemiology, asking for their views on the MID concept. Only 45 of the scientists answered the questionnaire–a disappointing response. Nevertheless, the answers and comments provided by this limited group raised some important issues. (The ILSI Europe questionnaire and its responses are described in detail in the Appendix.)

When asked, "Based on your experience do you think that the MID concept is useful?" 22 (49%) of the scientists responded yes, and 10 (22%) said no. Even among those who gave a negative response, there was agreement that if such a concept could be realized, it would be of the utmost importance in food microbiology. However, some of the experts believed that the concept would be difficult to realize because of the large number of factors involved and the potential for individual differences.

In answer to a question about their definition of the term "infection," the experts were almost evenly divided between two choices. Eighteen (40%) defined infection as symptomatic disease only, while 21 (47%)

TABLE 3. Factors in Foods Which May Influence Minimal Infective Dose
Fat content
Iron content
Stresses (e.g., heat, acidity, cold)
Background flora
Preservatives
Physical state (i.e., liquid vs. solid)
Circumstances of ingestion
Buffering
Storage history and storage temperature

defined infection as including both symptomatic disease and the asymptomatic carrier state. Clearly, there remains substantial disagreement on how best to incorporated the phenomenon of inapparent infection into the MID concept.

The MID concept can be of practical value only if there are sufficient quantitative data available to serve as a basis for dose estimates. Unfortunately, the amount of quantitative data currently available is extremely limited, and the quality of much of the available data is poor. This problem was emphasized by the respondents to the ILSI Europe questionnaire. It was also the dominant theme of the discussions at the 1993 workshop that served as the basis for this booklet. Time after time, during their considerations of a wide variety of issues, the scientists participating in the workshop returned to the problem of insufficient available data. Regardless of whether the MID concept is put into effect or whether alternative ideas are used, there is an urgent need for more and better data to use as the basis for scientifically sound quantification of microbiological hazards in foods.

For certain food-borne infections, there is some information available on the relationship between the numbers of microorganisms ingested and the human response. Examples include *Salmonella* spp., *Salmonella typhi*, *Campylobacter*, *Vibrio parahaemolyticus*, infant botulism, and *E. coli*.[1] However, much more information is needed on these and other pathogens. This information may come from epidemiological studies and investigations of disease outbreaks, from tests conducted in human volunteers, and–to a very limited extent–from animal experiments.

The Role of Animal Models

Much of the information used in chemical risk assessment is derived from studies conducted in experimental animals. In contrast, animal models are of very limited value in microbiological risk assessment. There is a great deal of variability among humans in susceptibility to microbial infection; even greater differences can be expected between experimental animals and man. Since the type of animal chosen influences the dose-response relationship, extrapolation to humans would be extremely difficult. In addition, animal experiments are usually carried out by tube-feeding, using pure cultures of microorganisms; this technique does not take account of the effects of the food vehicle.

Animal models are useful in some aspects of the study of microbiological food-borne diseases. For example, they can be used to investigate the components of the pathogenic mechanisms of the disease process and the virulence mechanisms of the organisms. However, for quantitative risk assessment, data derived from animal studies are a last resort, to be used only if no there information is available.

Human Volunteer Studies

If animal studies cannot be used to determine scientifically sound MIDs, then the necessary data must come from investigations in humans. One important type of investigation is volunteer studies in which known doses of microorganisms are administered to human subjects. These studies are of value in quantitative risk assessment, but they have important limitations.

The main problem with human volunteer studies is that, for reasons of safety, they are almost always conducted with healthy, young adults, usually men. These are not the individuals who are most susceptible to food-borne pathogens. The MID in healthy volunteers may be much higher than that of very young, very old, or immunocompromised individuals.

The value of volunteer studies is also limited by the variation among microbial strains and the effects of food vehicles. For example, volunteer studies of *Salmonella* have suggested that a relatively large dose–at least 1 million cells – is needed to cause illness. However, investigations of disease outbreaks indicate that illness may result from as few as 10 to 100 *Salmonella* cells per gram of certain food product.

[1] *Considerable amounts of dose-response data are also available for food-borne intoxications, including those caused by toxins produced by* Staphylococcus aureus *and* Clostridium botulinum. *However, these intoxications are beyond the scope of the workshop upon which this document is based, and they will not be discussed further.*

Epidemiological Studies and Outbreak Investigations

For a full understanding of the quantitative relationship between exposure to microorganisms and human responses, finding from volunteer studies must be considered in conjunction with epidemiological data. Epidemiology is the study of the causes and distribution of disease in human populations. Epidemiological studies of food-borne diseases may include prospective investigations (in which a group of people are followed over time to see who becomes ill and to determine the factors associated with illness); retrospective studies (in which persons who became ill are compared with those who remained healthy, to see how they may differ); and investigations of outbreaks of food-borne diseases.

Epidemiological studies have made crucial contributions to the understanding of how outbreaks of food-borne disease occur and how they can be prevented. For example, in 1992, extensive epidemiological investigations in France revealed a major nationwide outbreak of listeriosis and associated the illness with consumption of a particular food product–pork tongue in aspic. In 1993, U.S. epidemiologists traced a large outbreak of *E. coli* 0157 infection to the consumption of undercooked ground beef patties sold by a chain of restaurants, and authorities were able to limit the spread of the outbreak by recalling large quantities of the contaminated meat. The quality of these investigations was excellent, and the information they generated will be of great value in the prevention of future disease outbreaks. Unfortunately, however, even in these investigations, most of the data generated were qualitative rather than quantitative in nature.

Epidemiological studies have the great advantage of relevance. Unlike volunteer studies, they involve all types of people, including those in high-risk groups, and they involve real food vehicles rather than pure cultures of microorganisms. On the other hand, the numbers of microorganisms ingested by individuals who became ill in actual disease outbreaks can only be estimated; in human volunteer studies, the number can be established with great precision.

Data from outbreaks of food-borne disease can provide information on the numbers of microorganisms that caused disease in a particular situation, but they do not provide information on the minimal or threshold dose necessary to cause disease. Concerns have been expressed about the possibility that MIDs may be inferred from types of epidemiological data that are illsuited to this purpose. Epidemiological data can be used to determine probabilities of infection, but the accuracy of the estimates is highly dependent on the quality of the data. Unfortunately, the quality of much existing data is poor, and, as a result, current attempts at quantification are subject to large ranges of error.

To increase the usefulness of epidemiological data for quantitative risk assessment, it is important that disease outbreaks be investigated as soon as possible after they occur. Food samples should be collected and examined promptly, using quantitative methods of analysis. Efforts should be made to determine the amounts of the implicated food consumed by infected individuals. More information on the prevalence of pathogens in raw materials and foods for sale from the food surveillance should be made available to the scientific community, and efforts should be made to improve the reporting of cases of food-borne disease.

Application of MID or Alternate Concepts to the Regulatory Process

The MID concept has not yet been incorporated to a significant extent into European food laws or international agreements. The current sampling schemes developed by the Codex Alimentarius Commission and the International Commission on Microbiological Specifications for Foods (ICMSF) make use of MIDs only in a very limited way. The MID concept would be of greater value in regulatory activities if better quantitative data were available. However, MIDs for the various pathogens, if they are to be useful, should be developed for a wide range of foods as well as a variety of population subgroups.

Some of the concepts in current use are valuable. For example, the ICMSF microbiological sampling scheme, which calls for different types of sampling plans depending on the degree of health hazard posed by a particular organism, is a useful tool that needs to be updated and extended. On the other hand, some current concepts need improvement. Many current microbiological standards are based more on technical attainability than on scientific reasoning.

Better quantitative data are needed if sound regulations are to be established. Once actual numbers are available for use in the regulatory process, the consequences of the establishment of quantitative criteria can be evaluated through surveillance systems. Suitable mathematical models should be established to evaluate quantitative approaches. The technique of predictive modelling may be appropriate, if its limitations are taken into account. A valid MID or other quantitative approach could be used to help adjust processing conditions to reduce safety risks to an acceptable level or to meet the needs of a particular target population.

Some scientists prefer concepts other than the MID. For example, the use of the concept of "acceptable level" or "no-effect level" has been suggested. The concept of "acceptable level" might be applied to microbiological parameters which are not directly related to disease, such as indicator organisms. Indicator organisms are microorganisms which are not pathogenic in themselves but which are associated with contamination or poor sanitation. Their presence in a product at higher than expected levels suggests the possibility of a health hazard but does not prove that a hazard exists. Coliforms are an example of an indicator organism.

As a further alternative to the MID concept, some scientists prefer an approach based on probabilities. These experts assume that it is possible for a single organism to cause infection or disease but acknowledge that for most pathogens, such an event is very unlikely. Dose-response data are used to determine the probability that an infection will result from exposure to a particular dose of a microorganism. Of course, even with an approach based on probabilities, the effects of host factors, food vehicle factors, strain variation, and the complex dynamics of the growth and survival of microorganisms cannot be avoided.

Priorities for Future Research

Regardless of whether they endorse the MID concept or prefer an alternative approach to quantification of microbiological hazards, all experts in the consultation agree that there is an urgent need for more and better quantitative data to serve as a basis for regulations on the microbiological safety of foods. Whatever alternative is adopted for regulatory purposes, it must afford a valid basis for food processing safety and international trade agreements.

Although additional investigations are needed in all areas, the most concentrated research efforts should focus on species known to cause food-borne disease outbreaks, foods known to carry these pathogens, species causing severe disease, emerging pathogens, and novel foods. Findings from new studies should be collected and evaluated, in conjunction with existing data, and used to produce dose-response curves. Such an approach to risk assessment would establish valuable criteria to assess a process in relation to food safety and to evaluate products for purposes of international trade.

GLOSSARY

Carrier: A person who harbors a microorganism and can transmit it to others, but who does not show symptoms of the disease caused by that organism (see inapparent infection).

Cross-contamination: Contamination of one food from another. For example, pathogenic microorganisms from raw poultry might contaminate salad vegetables if the same utensils were used to prepare both foods.

Enteric: Intestinal.

Epidemiology: The study of the causes and distribution of disease in human(?) populations.

Handling: Anything that happens to food between the time of harvest or slaughter and the time of consumption.

Hazard: Potential to cause harm.

High-Risk Group: A segment of the population that has an increased susceptibility to a microorganism or other potential hazard.

Host: The living organism in which a microorganism multiplies. In the context of this report, the term "host" almost always refers to a human host.

Immunocompromised: Having an impairment of the immune system that weakens the body's ability to fight disease. An individual may be immunocompromised because of coexisting disease, under-nutrition, use of certain medications, or other factors.

Inapparent Infection: An infection that does not produce symptoms of disease (see Carrier).

Infection: A condition in which a microorganism establishes itself and multiplies within the body. Infection may or may not result in symptoms of disease. Many common food-borne diseases, including those caused by *Salmonella*, *Listeria*, and *Campylobacter*, are infections.

Intoxication: An illness caused by a toxic substance. Some food-borne diseases are caused by toxins produced by microorganisms, rather than by the organisms themselves. Preformed toxin in foods can cause illness even if no viable microorganisms are present. Examples of this type of food-borne illness include botulism (except the infant type) and staphylococcal food poisoning.

Irradiation: Treatment of food with ionizing radiation (e.g., gamma rays) in order to destroy pathogens and/or extend shelf life.

Minimal Infective Dose (MID): The smallest dose of a microorganism that can cause an infection.

Pathogenic: Capable of causing disease.

Risk: Estimate of the likely occurrence of a hazard.

Risk Assessment: The process of identifying and characterizing hazards and determining the risk of illness.

Secondary Spread: Transmission of a disease from one infected individual to another.

Vehicle: The substance (i.e., food or water) in which a microbial agent is transmitted to the consumer.

Virulence: The ability of a microorganism to cause disease, and the severity of the disease. Different strains of a microbial species may vary in virulence.

APPENDIX

Summary Report on Answers to the ILSI Europe Questionnaire on Minimal Infective Dose (MID)

In February 1989, the Working Group on Food Microbiology of the International Life Sciences Institute—ILSI Europe organized a workshop in Brussels to discuss the concept of Minimal Infective Dose (MID) in food microbiology. Fourteen well-known experts from various countries attended the meeting, where the discussion focused on the problems of food-borne diseases, especially with regard to infective doses.

It is well known that in food-borne disease outbreaks, not all exposed consumers develop symptoms of an infection or intoxication. Predisposing factors such as age, immunological status, concurrent diseases, and most probably the number of causative organisms or the amount of toxin are important in determining the response to a pathogenic agent. It is also well known that certain bacterial types need more organisms to cause disease than others do. There may even be differences within a single species due to strain variation and virulence factors. The nature of the food vehicle is another recognized factor which influences the outcome of exposure to food-borne pathogens.

All of these factors were discussed during the 1989 workshop, and the participants concluded that only limited data are available and that quantitative data are especially scarce in the scientific literature. The participants suggested that ILSI Europe should send a questionnaire on MID and related issues to experts from around the world.

In mid-1990, ILSI Europe sent a questionnaire to 160 experts in the fields of clinical microbiology, food microbiology, and epidemiology. Only 45 (28%) responses were received, with the following results.

Question 1: Which of the following corresponds most closely to your definition of "infection?"

A. Symptomatic disease

B. Asymptomatic carrier

C. Both

Answers:
A: 18 (40%)

B: 0

C: 21 (47%)

Question 2: Evaluate the importance of the following factors in determining the mid level of a specific pathogen for a particular individual (1 = very important, 5 = not important).

Answers:
A: Age
1 = 20 (44%) 2 = 16 (36%)
3 = 5 (11%)

B: Predisposing disease
1 = 18 (40%) 2 = 15 (33%)
3 = 5 (11%)

C: Immunosuppression
1 = 27 (61%) 2 = 6 (13%)
3 = 3 (7%)

D: Food category
1 = 5 (11%) 2 = 13 (29%)
3 = 12 (27%)

Question 3: Is it possible to establish maximum levels for particular pathogens which may be present in foods at the moment of consumption and which can be ingested without causing infection?

Answers:
Yes = 9 (20%)
No = 14 (31%)
Perhaps, maybe = 3 (7%)

Comments on this question ranged from "absurd" and "utopic" to "yes, with further studies (volunteers)."

Questions 4: (For respondents who answered affirmatively to question 3): If such levels can be defined, which levels would you apply to the following pathogens under the specified conditions (X can be per gram, X per 10 grams, etc.) The pathogens were *Salmonella*, *Shigella*, enterotoxigenic *E. coli*, verotoxigenic *E. coli*, *Campylobacter jejuni*, *Listeria monocytogenes*, *Vibrio parahaemolyticus*, and *Yersinia enterocolitica*. The specified conditions were fatty, watery, and dry food.

Answers: From the 12 respondents who gave affirmative or indefinite answers to question 3, 11 answered this question. However, most of the responses consisted of remarks such as "we have no correct data," "impossible to evaluate," or "not much experience."

Question 5: Which food categories other than those mentioned (fatty, watery, and dry food) should be considered?

Answers: Wide range of responses. Fish and seafood as well as acid foods were mentioned several times.

Question 6: Even if you were unable to answer some of the questions, we still need your help in collecting data which would be useful in determining MIDs for specific pathogens. If you are aware of such data please describe:

6A: Data from food-borne outbreaks.

6B: Human challenge data.

Answers: Only eight respondents provided data, all of which has been described in the literature and is well known.

Question 7: Based on your experience do you think that the MID concept is useful? Please explain your response.

Answers:
Yes = 22 (49%)
No = 10 (22%)

Comments ranged from very negative to carefully positive with remarks such as "utopic," "doubtful, if ever possible," "limited value–individual factors significant," "only guidelines–if possible at all," "too many factors involved," "need for more research–volunteers," "useful, but difficult to realize," "for some pathogens certainly useful." Several of those answering no and thus doubting the realization of the MID concept nevertheless underlined the wish to have such a concept.

DISCUSSION

The response to the questionnaire was disappointing and considerably weakens its significance.

The answers to question 1 are quite clear and underline the common difference of opinion on this subject. The answers to question 2 were as expected. Immunosuppression is increasingly regarded as an important factor. Age is a key factor in the Western world, with its high average life expectancy. Underlying diseases are a critical factor in the developing world.

There was a wide range of answers to question 3. Approximately one-third of the experts did not believe that maximum safe levels for a particular pathogen in foods could be established. However, 20% believed that this could be realized. This latter group emphasized the need for further studies with emphasis on volunteer experimentation.

In response to question 4, only a small number of the experts tried to provide data, mainly in limited fields of their own interest. This question clearly underlines the need for more reliable data from food-borne disease outbreaks.

Answers to question 5 were very varied, probably reflecting the regions where the experts lived. Those living in countries with large coastal areas emphasized the importance of fish and other seafood.

The responses to question 6 confirm the opinions of the 1989 and 1993 workshop participants that reliable data with regard to MID are very scarce in world literature. Question 7 indicates that about half of the experts believe that the MID concept may be useful. Even those who do not believe that the MID concept could be realized nevertheless emphasized that such a concept would be of the utmost importance in food microbiology.

In summary, the results of this questionnaire make it clear that discussion of the MID concept should continue and that outlines for future studies should be developed. The responses also draw attention to necessity for reliable epidemiological investigations of food-borne disease outbreaks in order to obtain quantitative data which would be valuable for future analysis of the significance of pathogens in food.

REFERENCES

1. Gerber, C. P., Haas, C. N., 1988. Assessment of risk associated with enteric viruses in contaminated drinking water. ASTM Special Technical Publication 976:489-494.
2. Glass, R. I., Lew, J. F., Gangarosa, R. E., LeBaron, C. W., Ho, M-S. 1991. Estimates in morbidity and mortality rates for diarrhoeal diseases in American children. J. Pediatrics 118: 27-33.
3. Glynn, J. R., Bradley, D. J. 1992. The relationship between infecting dose and severity of disease in reported outbreaks of *Salmonella* infections. Epidemiol. Infect. 109:371-388.
4. Haas, C. N. 1983. Estimation of risk due to low doses of microorganisms: a comparison of alternative methodologies. Am. J. Epidemiol. 118(4):573-582.
5. Hudson, C. B. 1991. Risk assessment and risk management: key factors in food safety decision making. Food Australia 43(9)S10-S12.
6. ICMSF. 1971. Sampling for microbiological analysis: principles and specific applications. Microorganisms in Foods Book 2 (2nd ed.– 1988), University of Toronto Press, Toronto.
7. Macler, B. A., Regli, S. 1993. Use of microbial risk assessment in setting U.S. drinking water standards. Int. J. Food Microbiol. 18:245-256.
8. Mossell, D. A. A., Struyk, C. B. 1993. Workshop on risk assessment of human exposure to pathogenic microorganisms. Int. J. Food Microbiol. 18:239-244.
9. Rose, J. B., Gerba, C. P. 1991. Use of risk assessment for development of microbial standards. Wat. Sci. Tech. 24(2):29-34.

Dairy, Food and Environmental Sanitation, Vol. 15, No. 5, Pages 309-310

European Community Focuses on Sanitary Standards

—Tom Gilmore, 3-A Secretary/Technical Director, Dairy & Food Industries Supply Association, McLean, VA

Why is the United States involved in European standards developing organizations? The 19 countries in the European Economic Area (EEA) comprise a market of 380 million people and the machinery sector account for 8% of their gross domestic product.

Conformance with European Union (CE) or International Organization for Standardization (ISO) standards are necessary before a company can export to EEA countries. The 3-A Sanitary Standards program has a 50-year history of protecting public health through a voluntary consensus standards program for the hygienic design applied to food and dairy processing machinery. Further, until recently it was the only program of its kind in the world.

Now there are several European standards organizations developing hygienic standards. As the 3-A Secretary, I and other key members of the 3-A Sanitary Standards are assuming active roles in the several European standards organizations with the ultimate goal of harmonizing standards efforts or, at a minimum to achieve equivalent results. 3-A is uniquely positioned to lead Europe and the U.S. into a new age of hygienic standards development.

The European Hygienic Equipment Design Group (EHEDG) is a group of equipment fabricators, research laboratories, food processors and others whose overall objective is to prepare publications on the minimum requirements for hygienic and aseptic equipment, principles of hygienic and aseptic design and on methods to test whether equipment fulfills these minimum requirements. EHEDG feels existing standards are flawed and may endanger microbiological safety of processed foods and are not good starting points for their activity.

Their group is organized as a main committee and ten subgroups. The 3-A Sanitary Standards Steering Committee is a member of the EHEDG main committee and has been represented at three of its meetings in the past year. The chair of the EHEDG, H.L.M. Lelielveld of Unilever Research Laboratorium Vlaardingen, is also a member of the 3-A Steering Committee.

The two groups are sharing information and the 3-A Steering Committee and the DFISA Technical Committee have commented on several tentative EHEDG papers. Four EHEDG papers on test methods to insure bacterial tightness, clean-in-place effectiveness, aseptic process conditions, and HTST conditions will be considered for adoption by the 3-A Sanitary Standards Committee an will eventually be referenced in appropriate 3-A standards or practices.

"The larger purpose...is to usher in and nurture an atmosphere of mutual trust and combined effort that goes beyond individual organizations."

Another objective of EHEDG is to provide standardization organizations with specialists views on hygienic aspects of equipment design. EHEDG committee members indeed hold membership on CEN/TC 153 on safety and hygienic aspects of machinery and, one of its members is the secretary to ISO/TC 199 WG2 on machinery hygiene.

The 3-A Steering Committee has agreed to a joint EHEDG/3-A project to use the 3-A Model Standards as the basis for an "A-level" hygienic document to provide general sanitary criteria for all food equipment. A committee to provide the expertise to mold the 3-A model into a general document has been set and its first meeting scheduled. Its goal is to achieve a harmonized document that could serve as the basis for CENTC/153 and ISO/TC 199 WG2, and an expanded 3-A Sanitary Standards program to include food equipment other than dairy equipment. It is here where prospective, rather than retrospective, harmonization can and must be realized. This will be no easy task.

Consensus within the 3-A program is difficult at best. Harmonization of the United States approach to sanitary equipment design with the European approach probably will be even more difficult. The logic of international harmonization goes beyond harmonized documents. The larger purpose is to foster a harmony of attitudes and minds. It is to usher in and nurture and atmosphere of mutual trust and the combined effort that goes beyond individual organizations.

A second group that 3-A has been active with on the standards front is the International Dairy Federation (IDF). The IDF is an independent, non-profit association which aims to promote scientific, technical and economic progress in the international dairy field and at the same time guard against any standards from becoming trade barriers. The IDF was established in Brussels in 1903 and is still headquartered there and has 37 member countries including the U.S.A. DFISA is a member of the United States National Committee of IDF.

The work of these two standards groups is ongoing and will continue for some time. It is vital to DFISA capital goods members that we be involved with EHEDG and IDF to prevent sanitary standards from becoming trade barriers for U.S. companies that wish to export equipment to Europe.

On the global level in addition to IDF there is the International Organization for Standardization (ISO). DFISA is a member of a Capital Goods Standards Coalition (CGSC), which sponsors the technical advisory group (TAG), recognized by the American National Standards Institute (ANSI) as the official U.S. representative to ISO/TC 199. The purpose of CGSC-TAG is to create a vehicle for U.S. companies to become involved in international standards for machinery, particularly those being written or proposed by ISO and the Committee on European Norms (CEN). Up to now most of the TAG activity has been on developing its program of work and on safety standards coming from CEN/TC 114 and ISO/TC 199.

At the February plenary meeting of ISO/TC 199 a working group 2 for writing hygienic standards for food equipment was authorized. The US-TAG has submitted five names for delegates to ISO/TC 199 WG2. John Holah of Campden Food and Drink Associates is the secretary to ISO/TC 199 WG2, and will call its first meeting. We are hopeful that eventually the EHEDG work and that of CEN/TC 153, relating to hygienic food equipment design, will all be elevated to ISO/TC 199 WG2.

EHEDG, CEN/TC 153 and ISO/TC 199 WG2 are all tied together via common members and in the case of EHEDG and ISO/TC 199 WG2 a common secretariat. We must therefore be involved as much as human and economic resources allow with these groups. GATT is silent on standards as trade barriers.

DEPARTMENT OF AGRICULTURE

Food Safety and Inspection Service

9 CFR Parts 308, 310, 318, 320, 325, 326, 327, and 381

[Docket No. 93-016P]

RIN 0583-AB69

Pathogen Reduction; Hazard Analysis and Critical Control Point (HACCP) Systems

Agency: Food Safety and Inspection Service, USDA.

Action: Proposed rule.

Summary: The Food Safety and Inspection Service (FSIS) is proposing requirements applicable to all FSIS-inspected meat and poultry establishments that are designed to reduce the occurrence and numbers of microorganisms in meat and poultry products and to reduce the incidence of food-borne illness associated with the consumption of those products. The proposals would (1) clarify the responsibility of establishment management to ensure compliance with sanitation requirements; (2) require at least one antimicrobial treatment during the slaughter process prior to chilling of the carcass; (3) establish enforceable requirements for prompt chilling of carcasses and parts; (4) establish interim targets for pathogen reduction and mandate daily microbial testing in slaughter establishments to determine whether targets are being met or remedial measures are necessary; and (5) require that all meat and poultry establishments develop, adopt, and implement a system of preventive controls designed to improve the safety of their products, known as HACCP (Hazard Analysis Critical Control Points). FSIS is also announcing its intent to initiate rule-making jointly with the Food and Drug Administration (FDA) to establish Federal standards for the safe handling of food during transportation, distribution, and storage of the products prior to delivery to retail stores, as well as further efforts to encourage adoption and enforcement by States of consistent, science-based standards to ensure food safety at the retail level. These proposals and initiatives are part of a comprehensive strategy to improve the safety of meat and poultry products when they are delivered to the consumer.

Dates: Comments must be received on or before June 5, 1995.

Addresses: Submit written comments in triplicate to Diane Moore, Docket Clerk, Room 3171 South Building, Food Safety and Inspection Service, U.S. Department of Agriculture, Washington, DC 20250. Oral comments, as permitted under the Poultry Products Inspection Act, should be directed to the appropriate person listed under "For further information contact."

For further information contact: (1) GENERAL: Dr. Judith A. Segal, Director, Policy Evaluation, and Planning Staff, (202) 720-7773; (2) SANITATION: Dr. Isabel Arrington, Staff Officer, Inspection Management Program, Inspection Operations, (202) 720-7905; (3) ANTIMICROBIAL TREATMENTS: Dr. William O. James, II, Director, Slaughter Inspection Standards and Procedures Division, Science and Technology, (202) 720-3219; (4) TEMPERATURE CONTROLS: Carl S. Custer, Staff Officer, Processed Products Inspection Division, Science and Technology, (202) 501-7321; (5) MICROBIAL TESTING: Dr. Richard A. Carnevale, Assistant Deputy Administrator Scientific Support, Science and Technology, (202) 205-0657; (6) HACCP: Dr. Dorothy Stringfellow, Director, HACCP Office, Science and Technology, (202) 690-2087; (7) TRANSPORTATION AND RETAIL: Patrick J. Clerkin, Director, Evaluation and Enforcement Division, Compliance Program, Regulatory Programs, (202) 254-2537, Food Safety and Inspection Service, U.S. Department of Agriculture, Washington, DC 20250.

Obtaining copies of this document: Paper or diskette copies of this document may be ordered from the National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. Orders must reference NTIS accession number PB95-166021 for a paper copy and PB95-502217 for the diskette version. For telephone orders or further information on placing an order, call NTIS at (703) 487-4650 for regular service or (800) 533-NTIS for rush service. To access this document electronically for ordering and downloading via FedWorld, dial (703) 321-8020 with a modem or Telnet fedworld.gov. For technical assistance to access FedWorld, call (703) 487-4608.

Supplementary information:

Table of Contents

I. Background

Purpose of This Document

The mission of the Food Safety and Inspection Service (FSIS) is to ensure that meat and poultry products are safe, wholesome, and accurately labeled. Current FSIS regulatory requirements and inspection procedures contribute much to the achievement of these goals, but there is a critical gap in the FSIS program. The current program does not directly target pathogenic microorganisms, which frequently contaminate otherwise wholesome carcasses. It also does not make meat and poultry establishments legally responsible for taking systematic, preventive measures to reduce or eliminate the presence of pathogenic microorganisms in meat and poultry products. This gap in the FSIS program has important public health implications because a significant portion of the cases of illness in the United States is associated with the consumption of meat and poultry products that are contaminated with pathogenic microorganisms.

To protect public health and reduce the risk of illness, FSIS proposes to fill the gap in its current system by requiring new measures that will target and reduce the presence of pathogenic microorganisms in meat and poultry products. FSIS is also beginning a fundamental shift in the paradigm governing its inspection program. FSIS will begin to build the principle of prevention into its inspection program by requiring all meat and poultry establishments to adopt the Hazard Analysis Critical Control Point (HACCP) approach to reducing safe meat and poultry products. FSIS will also take steps to encourage preventive measures on the farm, require preventive controls during transportation, and support State-based HACCP controls at retail.

The purpose of this document is to initiate the rule-making required to bring about these changes in the FSIS program. This document will also explain these changes in the context of a broad and long-term strategy to improve the safety of meat and poultry products. The safety of any food product can be affected–positively or negatively–at virtually every step in the process of producing the agricultural commodity on the farm, converting the agricultural commodity into a food product through slaughter and other processing, distributing the product to the consumer, and preparing the product for consumption. While this document focuses on changes that are needed within FSIS-inspected establishments, these changes are part of a broader food safety strategy. This strategy addresses each step in the process and takes a long-term approach to building a comprehensive food safety system that works effectively to protect consumers by preventing food safety problems.

To place the regulatory program in context, this document will first describe the origins and history of the FSIS program, the problem of foodborne illness in the United States, and FSIS's food safety objectives and proposed strategy for achieving them.

Origins and History of the FSIS Program

The following historical account briefly describes the purposes and operation of the inspection program from its late-nineteenth century inception through the current efforts to improve the program.

1890-1945

Federal meat inspection legislation dates from 1890, when countries in Europe raised questions about the safety of American beef. Congress gave the U.S. Department of Agriculture (USDA) responsibility for ensuring that exports would meet European requirements and, in 1891, for conducting ante- and postmortem inspection of livestock slaughtered for meat intended for distribution in the United States.

In 1906, the graphic picture of insanitary conditions in meat-packing establishments described in Upton Sinclair's novel *The Jungle* outraged the U.S. public. Congress responded by passing the Federal Meat Inspection Act (FMIA), one of the first Federal consumer protection measures. It established sanitary standards for slaughter and processing establishments, and mandated antemortem inspection of animals (cattle, hogs, sheep, and goats) and postmortem inspection of every carcass.

It also required the continuous presence of Government inspectors in all establishments that manufactured meat products for commerce. Because the program depended heavily on veterinary skills, it was implemented by USDA's Bureau of Animal Industry which, during that first year, oversaw the inspection of nearly 50 million animals.

The companion Food and Drug Act of 1906 was implemented by a different section of USDA, the Bureau of Chemistry. It covered the safety of all food products except meat and poultry, but it did not require continuous inspection. The Food and Drug Administration (FDA), which now implements the law, was formed in USDA in 1930 and transferred to the Public Health Service in 1940. Meat inspection, which primarily focused on carcass inspection by veterinarians, remained in USDA.

The meat inspection program that developed early in this century used organoleptic methods, based on sight, touch, and smell. The major public health concerns of the time were the potential for transmission of diseases from sick animals to humans and the lack of sanitary conditions for animal slaughter and production of processed products. The purpose of carcass inspection was to keep meat from diseased animals out of the food supply. Federal inspectors under the supervision of veterinarians checked every live animal and every carcass for signs of disease. They also watched for insanitary practices and the use of dangerous preservatives.

In addition to requiring carcass-by-carcass inspection in slaughter establishments, the 1906 meat inspection law provided for continuous USDA inspection of processing operations. Processing, which for the most part consisted of cutting and boning whole carcasses and the production of sausages, ham, and bacon, was usually done in or near the slaughterhouse. Processing was viewed as an extension of slaughter and was conducted by the same FSIS personnel. From the inception of the Program, however, the Agency recognized that, in processing inspection, the inspector focused on the operation of the overall production line, not on each production unit (in contrast to slaughter inspection, where inspectors focused on each carcass).

The FMIA covered all meat and meat products in interstate commerce. It did not cover poultry. At that time, chickens and turkeys were produced mainly on small farms for personal consumption or sale in the immediate area. They were inspected only by the purchaser.

1946-1975

Developments after World War II had a major impact on the meat and poultry industry. New establishments opened, beginning a surge of growth that continued through the 1950's and 1960's. The market for dressed, ready-to-cook poultry expanded rapidly, and both the meat and the poultry industries began turning out many new kinds of processed products. An increasing proportion of the total meat and poultry supply was being processed into hams, sausages, soups, frankfurters, frozen dinners, pizza, and so forth. Between 1946 and 1976, the volume of such products almost quadrupled.

New technology, new ingredients, and specialization added complexity to the once-simple processing industry. Small establishments, many producing solely for intrastate commerce began producing new products outside the slaughterhouse environment. Processing inspection could no longer be managed as an extension of slaughter inspection.

The growth of the processing sector presented the inspection program with major challenges. First, the skills needed by the Agency called increasingly on the disciplines of food technology and microbiology, along with those of veterinary medicine. The Agency began to recruit and develop more people with the specialized skills necessary to design processing inspection systems.

Second, more inspectors were needed to meet the industry's growing production and geographic expansion. A system of "patrol" inspection assignments, with one inspector visiting several processing establishments daily, was devised to fulfill the statutory requirement for continuous inspection in those establishments.

Third, new technologies made it difficult for consumers to check levels of fat, water, and other ingredients used as fillers, increasing the risk of economic adulteration. As a result, USDA inspectors were increasingly called on to protect consumers in this technically complex area. Controlling the use of certain vegetable proteins as ingredients in meat food products, for example, became important, because vegetable proteins can mask the addition of water to a product. The development of equipment to salvage formerly discarded high-protein tissue from bones and fatty tissue made time-temperature requirements necessary to guard against the growth of spoilage organisms. Standards had to be set for the use of these ingredients and the labeling of products containing them.

Meanwhile, better animal husbandry practices had improved animal health and reduced the public health risk from diseased carcasses. The Agency's extensive, statutorily mandated carcass-by-carcass inspection continued, however, with the important objective of eliminating from commerce the unpalatable signs of diseases that could pose a human health risk (such as salmonellosis or cysticercosis), fecal contamination of meat and poultry carcasses, and visible damage (such as bruises). Establishment sanitation also remained in both slaughter and processing facilities.

The Poultry Products Inspection Act (PPIA) of 1957 made inspection mandatory for all poultry products intended for distribution in interstate commerce. It was modeled after the Federal Meat Inspection Act.

The potential for unseen health hazards in the food supply also attracted increasing regulatory attention. In 1962, Rachel Carson's *Silent Spring* raised public awareness of the possible harmful effects of pesticides and other chemical contaminants in food. In 1967, the Agency established the National Residue Program, the Federal Government's principal regulatory mechanism for determining and controlling the presence and level of those chemicals in meat and poultry that may present a public health concern.

Because of the increasing volume and complexity of food production and the potential for various forms of adulteration that consumers could not, by themselves, determine, Congress enacted new legislation during this period to assure the safety and wholesomeness of foods, including meat and poultry products. The 1958 Food Additives Amendment of the Federal Food, Drug, and Cosmetic Act (FFDCA) provided for FDA approval of new food additives and their conditions and levels of use.

The Wholesome Meat Act of 1967 and the Wholesome Poultry Products Act of 1968 amended the basic laws of governing mandatory meat and poultry inspection to assure uniformity in the regulation of products shipped in interstate, intrastate, and foreign commerce. These Acts provide the statutory basis for the current meat and poultry inspection system. Both Acts gave USDA new regulatory authority over allied industries, including renderers, food brokers, animal food manufacturers, freezer storage concerns, transporters, retailers, and other entities. Both Acts incorporated adulteration and misbranding prohibitions tied to important provisions of the FFDCA relating to food and color additives, animal drugs, and pesticide chemicals. Both Acts provided stronger enforcement tools to USDA, including withdrawal or refusal of inspection services, detention, injunctions, and investigations. Both Acts extended Federal standards to intrastate operations, provided for State-Federal cooperative inspection programs, and required that State inspection systems be "at least equal to" the Federal system.

Also, under these Acts, meat and poultry products from foreign countries that are sold in the United States must have been inspected under systems that are equivalent to that of USDA.

1970s—Present: Increasing Demand for Inspection

By the 1970s, the need to focus on "invisible" hazards to public health had raised the ratio of analytical to organoleptic activities and the ratio of out-of-plant to in-plant activities. The bulk of the Agency's resources continued to be allocated, however, to in-plant activities addressing the issues of animal disease and establishment sanitation. During the 1970s, national budget constraints reduced the funds available for inspection throughout the United States. As individual States exercised their right to request that the Agency take over their inspection programs, FSIS had either to eliminate some inspection activities or change the way they were performed, to provide the additional coverage.

The driving force behind FSIS's program changes from the 1970s on was the need to keep up with industry's expansion and its productivity gains, including the incorporation of automation in the slaughter process that increases the rate at which carcasses could move through the slaughter facility (typically referred to as "line speed"). Automation has had a particularly great impact on poultry operations, where inspectors have had to face faster and faster line speeds, which today can be as high as 91 birds per minute.

The industry changed in many ways during this period. The poultry industry became, to a large extent, vertically integrated, with large companies controlling each step of the process from production of birds to slaughter, processing, distribution, and marketing of chicken and turkey products under brand names. The beef and pork industries grew, but generally did not become vertically integrated. Beef cattle and swine continued to be produced by a large number of independent farming businesses. Consolidation occurred in slaughter and processing operations and production increased. Increased production meant more meat and poultry products awaited inspection by FSIS inspectors.

The Agency strained to keep pace with an industry radically different in scale and scope from what it had been in 1906. In September 1976, the Agency hired the management consulting firm of Booz, Allen and Hamilton, Inc., to perform an in-depth study to find less costly ways to inspect meat and poultry that would not reduce the level of consumer protection. The study recommended, among other things, that FSIS:

- Use quality control mechanisms to shift responsibilities from inspectors to the establishment, giving inspectors a verification responsibility.
- Establish microbiological criteria for finished products.
- Explore substitution of air chilling for water chilling of poultry carcasses.
- Require chlorination of chiller water for poultry.
- Expand food safety education for consumers and food handlers.

The study elicited a generally negative response from consumer groups and some members of FSIS's workforce, who interpreted the recommended role changes as an abdication of Agency responsibility. Anticipating higher costs and concomitant price hikes, industry also objected to the recommendations. FSIS decided to pursue only some of the recommendations.

One that it did pursue in processing establishments, the voluntary Total Quality Control (TQC) program, was implemented in 1980. The General Accounting Office (GAO) had recommended a TQC-type program in December 1977, to afford the Agency flexibility to tailor inspection frequency to individual establishment's needs. This program applied a different kind of inspection to establishments that FSIS approved for a self-monitored production control program designed to assure that processed products would meet regulatory requirements. In those establishments, the inspector, instead of personally generating production process information, used establishment production records on the production process, supplemented by in-plant observations, to verify that product was in compliance. In many establishments, TQC reduced the time needed for inspection, but the statutory provision for "continuous" inspection meant that, even under TQC, an inspector had to visit the establishment at least daily.

In 1978, the Agency issued its own report, "A Strengthened Meat and Poultry Inspection Program." Among other things, the report observed that the poultry postmortem system had been designed before both the vertical integration of the poultry industry and the increasing attention to production control, which had helped producers overcome major animal and poultry health problems. With the introduction of high-speed production lines, the traditional inspection system had become "severely stressed," with inspectors "forced to work at speeds well over those at which peak effectiveness is expected." Scientific evidence indicated that with the improvement in animal health, little of the carcass examination performed by inspectors was necessary to protect public health. However, carcass-by-carcass inspection continued to address the wholesomeness and quality aspects of meat and poultry that consumers demanded.

Between 1980 and 1986, the Agency introduced what became known as streamlined inspection systems (SIS) in high-speed poultry slaughter operations. These systems shifted routine tasks that controlled for quality, rather than safety, from inspectors to establishment employees. Since an increasing amount of the poultry (and meat) supply was being produced under brand names, the Agency believed that the establishments would be motivated to protect the reputation of their products by performing systematic quality control for visible, unpalatable defects. Under streamlined inspection, establishment employees, working under FSIS supervision, would perform detection and trimming of carcass defects that affect the "quality," but not the "safety" of the product–functions previously performed by FSIS inspectors. The attempt to streamline carcass inspection by shifting non-public health tasks to the industry was criticized by consumer groups and inspectors, who interpreted the modernization initiative as a pretext for deregulation.

In 1986, Congress granted the Agency the authority to vary the frequency and intensity of inspection in processing establishments on the basis of the risk presented by the particular establishment and process. Again, FSIS's proposal to implement this authority was interpreted by consumer groups as an effort to reduce inspection. They opposed it, as did some Agency employees. Industry members supported the concept but were skeptical about how it would be implemented. For lack of support, the Agency withdrew its proposal, and the legislative authority for it expired in 1992.

Each of the foregoing modernization initiatives aroused the same concerns: Increased line speeds compromised job performance; new procedures had not been adequately or objectively tested; and, generally, streamlined slaughter inspection policies would not protect consumers. While SIS for poultry survived, the controversy blocked FSIS's attempt to extend SIS to cattle. A special review in 1990 by the National Academy of Sciences (NAS) pointed out deficiencies in the current system's handling of microbiological hazards but concluded that a SIS for cattle would be at least as effective as traditional inspection. However, consumers and the Agency's inspection workforce equated SIS for cattle with deregulation–license for industry to increase line speeds at the expense of public health. Congress ordered the Agency to stop the pilot tests then in progress in five cattle operations.

Today, FSIS inspectors perform hundreds of tasks during slaughter and processing operations. Slaughter inspection occurs in two phases: antemortem and postmortem. During antemortem inspection, the inspectors observe all red meat animals at rest and in motion, segregating any abnormal animals they detect before the animals enter the slaughter facility. Based on further examination by a Veterinary Medical Officer (VMO), abnormal animals are either condemned or allowed to enter the slaughter process under special handling.

The large number of chickens and turkeys FSIS inspects (more than 6 billion slaughtered annually) makes antemorten bird-by-bird inspection impracticable, inspectors of VMO's conduct the antemortem inspection of poultry on a flock or lot basis. The poultry are observed while in coops or grouped for slaughter, before or after they are removed from trucks. Abnormal birds are condemned.

Antemortem inspection can detect some diseases, (for example, rabies, listeriosis, and heavy metal toxicosis) through distinct clinical signs that cannot be detected by gross postmortem inspection. Additionally, some types of microbial diseases that can seriously contaminate the slaughter environment, such as abscesses and anthrax, can be detected by antemortem inspection. In those cases, the affected animals are prevented from entering the slaughterhouse.

During the postmortem phase of Federal inspection, the viscera and carcasses of all animals and birds slaughtered are examined by an FSIS inspector on the processing line. Many of the bacteria implicated in cases of food-borne illness live in the intestinal tracts of meat animals and poultry, present no evidence of overt pathologies in the animal, and can be shed in the feces. For this reason, line inspectors require physical removal of visible fecal and ingesta contamination of flesh.

For red meat, inspectors examine the heads, viscera, and carcass at one or more postmortem inspection stations. For poultry, the viscera, carcasses, and, for older poultry, heads are examined at a single postmortem inspection station. To detect abnormalities at these stations, the red meat inspector performs a sequence of observations, palpitations, and incisions of tissues; the poultry inspector, a sequence of observations and palpitations. For both red meat and poultry, visible contaminants (such as feces), damage, and other abnormalities are detected and eliminated to ensure only meat and poultry that appear fit for human consumption "pass" inspection. Only VMOs and VMO supervised inspectors make the final determination.

**Note: Only a portion of this document has been provided. The entire document is 116 pages long. Copies may be obtained through the telephone numbers and addresses included in this brief publication.*

New Members

ALABAMA

Dr. David Kamau
Tuskegee University
Tuskegee Institute, AL 36087

APO

Wayne Dutson
95th Combat Support Hospital
Heidelberg, APO

CALIFORNIA

Dr. R. H. Bennett
UC Coop Ext., Santa Rosa

Les Wood
CDFA/MDFC, Santa Rosa

CANADA

Judy Chow
University of Guelph, Ontario

COLORADO

J. Philip Coombs
TGM Group, Breckenridge

CONNECTICUT

Irene E. Forssen
GEM Biomedical, Hamden

Roger Mshar
State of Connecticut
Dept. of Health Services, Hartford

Mike Carey
Waterbury Health Dept.
Waterbury

IDAHO

Bonnie Christensen
South Central Health Dept.
Jerome

ILLINOIS

Leisa Hubb
Kolblena Bresse Bleu Inc., Stockton

IOWA

Adelle D. Chan
Iowa State University, Ames

David Hedlund
American Institute of Baking, Ames

MACAU

Mrs. Maria Luisa T.N.V.P. Basilio
Laboratoriu Municipal, Macau

MARYLAND

Patricia Monic
Rosse & Associates, Sparks

MASSACHUSETTS

Nancy McGinty
Millipore Corporation, Bedford

NEW JERSEY

Patrick Boyle
Readington Farms, Inc.
Whitehouse

Lawrence Kurz
Readington Farms, Inc.
Whitehouse

Robert R. Maller Jr.
Thomas J. Lipton Co.
Englewood Cliffs

Teri Ruppenthal
AMPCOR Diagnostics, Inc.
Bridgeport

NEW YORK

Sharon S. Smith
NYS Dept. of Agriculture
& Markets, Gouverneur

OREGON

Charles Flanagan
Mallories Dairy, Inc.
Silverton

William E. Whitehead
Tillamook Cheese, Tillamook

SPAIN

Juan Jose Canet Gasco
Betelgeux S.A., Valencia

TENNESSEE

Ronald D. Smiley
University of Tennessee
Louisville

TEXAS

Capt. Brian Ortman
U.S. Airforce, Brooks AFB

Cliff Warwick
City of Plano, Plano

New IAMFES Sustaining Members

Edward Arnold
R-Tech
P. O. Box 116
Minneapolis, MN 55440-0116

Bruce Phillippi
CHEM Station International
13201 Encrete Lane
Dayton, OH 45439

UpDates

Gene Ward Joins OSi Specialties Foam Control Team

OSi Specialties announced that Eugene Ward has joined its Foam Control Team as technical service specialist. Ward will help customers determine which OSi Specialties foam control agent is appropriate for their application and how to use it in their environment.

"When a customer has a problem with foam, he or she is looking for an immediate solution," explained Brad Larson, marketing manager. "Gene is a valuable resource because he can discuss their application with them, help them determine the source of their problem, and recommend a product for them to try that is both efficient and cost-effective." In addition to working with customers over the phone or at their sites, Ward also conducts laboratory screening tests and is heavily involved in new product development.

Adding Ward to the OSi Specialties Foam Control Team is another way the company is responding to customers' needs for a quick response to their foam control problems. "If you are experiencing a problem with foam in your process or product, time is of the essence," said Larson. "To that end, we have put in place a system where callers can get immediate answers to their questions." To support its foam control products, OSi Specialties introduced a Foam Control Information Center in January. Staffed by trained representatives, the Center provides product and application information, sends out samples, and puts callers in contact with distributors in their area. The telephone number for the Information Center is (800) 295-2392, ext. 3600.

Ward has worked for OSi Specialties for 17 years. Previously he was a master technician developing silicone gels. He has a B.S. in Chemistry and an M.S. in Nutrition. "The range of applications that can benefit from OSi Specialties foam control agents is amazing," he said. "By understanding how our products behave in different foaming environments, I can help guide customers to the right solution with less trial and error." Ward added that, in all cases, matching a foam control agent to a specific application need depends on various factors, including the chemical make-up of the foamant and existing processing conditions.

OSi Specialties is a leading worldwide manufacturer and supplier of specialty chemicals for hundreds of industrial applications. The company, with estimated 1994 sales of $400 million, employs more than 1200 people serving customers in 87 countries.

Richard Gleed Joins Electrol Specialties Company

Richard (Dick) Gleed has joined Electrol Specialties Company as a senior sales engineer, as announced recently by John W. Franks, general manager. Electrol is a leader in the fabrication and supply of processing and CIP (Clean-In-Place) systems and controls, as well as in the application of advanced processing and CIP technology to industries that require a high degree of cleanliness and automation.

Dick completed his undergraduate B.S. degree in Food and Dairy Science at the University of Massachusetts, followed by five years in the U.S. Navy. Since that time, Dick has held several responsible positions – both in the dairy processing industry and with firms that supply equipment and services to the sanitary processing industries. Prior to joining Electrol Specialties Company, he was most recently with Sani-Matic Systems as a Senior Project Engineer. Dick's extensive experience in the dairy, food processing, pharmaceutical, and biotechnology industries qualify him to make a significant contribution toward the achievement of Electrol's market expansion goals and to incorporate the latest technologies into processes and products to provide maximum value to ESC's customers.

Three Join A & B Staff

A & B Process Systems Corporation announces three additions to its professional staff. They are Steven Bartsch, process development engineer; Charles R. Treankler, marketing specialist; and Keith Kleinstick, electrical service technician.

Bartsch is experienced in process equipment specification and operations, particularly in the areas of quality control and final product analysis of flavorings and vitamins. At A & B, he is responsible for product development, design and sales of skidded systems and other process equipment.

Treankler will provide sales and marketing support to the company's sales and engineering teams. He will serve as a direct link to many of the company's distribution channels, including manufacturer's representatives, distributors, engineers, OEMs and end users.

Kleinstick holds a master electrician license and is experienced in panel design and wiring. He will develop a panel shop, and will assist with systems for trouble shooting and automation.

A & B Process Systems Corporation designs and manufactures stainless steel process flow systems for the dairy, food, beverage, cosmetic and pharmaceutical industries. The company has grown rapidly since its founding in 1973 and is now a nationwide supplier to some of the leading consumer products companies in the United States. A & B recently moved into a new office building at 201 S. Wisconsin Ave., Stratford, WI 54484.

Dean Foods Announces International Sales Officer

Dean Foods Company has announced that Roger A. Ragland has been promoted to Group Vice President of International Sales, effective April 1, 1995. Mr. Ragland has served as Vice President, Sales and Marketing of the Food Products Division since 1993.

Mr. Howard M. Dean, Chairman and Chief Executive Officer of Dean Foods Company commented, "Our international sales are currently a small percentage of our total sales. We recognize the importance of the international marketplace and the promotion of Roger Ragland to this new position represents our continuing commitment to international growth."

Mr. Ragland joined Dean Foods as Marketing Manager for the Non-Dairy Products Division, in 1975 was appointed marketing manager of the Food Products Division and in 1993 was elected to Vice President, Sales and Marketing, Food Products. Prior to joining Dean Foods, Mr. Ragland was employed by Quaker Oats Company, following two years of military service with the U.S. Navy.

Mr. Ragland is a graduate of Northwestern University. He and his wife, Joan, reside in Hebron, Illinois and have two children, Alexandra and Andrew.

He currently serves as a member of the Illinois Agriculture Advisory Committee and has been active as a member of the Northwestern University N Club.

Dean Foods is a diversified food processor and distributor, producing a full line of dairy and other food product, including fluid milk, cottage cheese, ice cream and frozen novelties, frozen yogurt and specialty foods such as canned and frozen vegetables, dips, pickles, relishes, powdered coffee creamers, syrups and aseptic products. Products are sold to supermarkets, specialty food stores, food service facilities, other food processors and internationally.

Elgin Dairy Names Gignac Sales & Marketing Manager

Elgin Dairy Foods, Inc. has appointed Jim Gignac Manager of Sales and Marketing, a new post. He was formerly Commercial/Industrial Sales Manager for Elgin, the Chicago-based manufacturer of soft serve, shake and ice cream mixes, dairy and non-dairy whipped toppings, and sour cream and creamers. The new position extends his responsibilities to include supervision of route sales and sale and marketing campaigns.

Gignac joined the company in 1993 after spending 8 years in the telecommunications industry and commercial and industrial sales. Born and raised in Chicago's suburbs, he was educated at DeVry Institute of Technology in Chicago. He now makes his home in Schaumburg, IL.

Elgin sells to food processors and food service operators located within 200 miles of its state-of-the-art Chicago plant. Capable of producing more than 300,000 gallons of dairy products weekly, Elgin sells under its own label as well as private label and co-packed products.

Chr. Hansen Names New Food Ingredients Manager

Chr. Hansen, Inc. of Milwaukee, Wisconsin, announces the appointment of Deana R. Phillips as Marketing Manager, Food Ingredients Division. Her duties include product line market and strategic planning, product line advertising and promotional programs, and account sales support.

Phillips was most recently an account executive with J. Manheimer, Inc., serving national accounts. Her background also includes four years at Fidco, Inc., as a food ingredient sale representative. Phillips has four additional years of food ingredient experience from ConAgra Frozen Foods where she worked as a food technologist. Her thorough working knowledge of both U.S.D.A. and F.D.A. regulations, as well as her experience in food formulating and in new product development, make her a valuable member of the Chr. Hansen Food Ingredient team. Phillips has a B.S. in Food Science & Nutrition from the University of Missouri and holds an MBA from DePaul University, Chicago, Illinois. She is a member of the National Institute of Food Technologists.

Schwan's Freezes Spread of *Salmonella*

It all started when the Minnesota Department of Health noted a marked increase in the number of *Salmonella enteritidis* infections reported in their state. From September 19 to October 10, 1994, 80 confirmed cases of *S. enteritidis* infections were reported. For comparison, a total of 96 cases statewide were reported in the entire year of 1993. The Minnesota Department of Health did a study to determine the source of the *S. enteritidis* outbreak. Schwan's Marshall, Minnesota ice cream production plant was implicated. On October 7 and 9, 1994, after first notifying Schwan's, the Minnesota Department of Health issued a press briefing advising persons who had been ill with diarrhea since September 1, 1994, and had eaten Schwan's ice cream to contact the Health Department. From October 8-11, a total of 2,014 people contacted the Minnesota Department of Health.

Schwan's halted production at the Marshall, Minnesota plant on October 7, 1994, even though at that time the ice cream had not yet been tested to confirm it as the source of the outbreak. Schwan's also halted all sales of ice cream that had been produced at the Marshall plant. A full plant inspection began immediately. By Saturday morning, Schwan's had more than 40 phone lines with 800 numbers established to answer customer questions. On Sunday, still without confirmed test results to link the outbreak to a production code or a specific production run, Schwan's issued a nationwide recall of ice cream produced in the Marshall, Minnesota plant prior to October 7, 1994. On Friday, October 14, 1994, another press release was issued offering reimbursement to customers with symptoms for *Salmonella* diagnostic tests.

On November 7, 1994, exactly one month after ceasing production, it was announced that the

plant would reopen immediately. The source of the contamination was determined to be one or more tanker trucks that were used to carry raw, unpasteurized eggs. These tanker trucks later carried ice cream mix to the plant. Schwan's has implemented measures to prevent this from happening again. Schwan's intends to re-pasteurize every shipment of ingredients that comes into the plant. They have identified and employed a dedicated fleet of tankers that will be sealed to insure that they carry Schwan's product and nothing else. Schwan's will also test all incoming ice cream mix for *Salmonella* and will ship no product until the results of the tests are known.

When all was said and done, a total of 30 states reported culture-confirmed cases of illness associated with the eating of Schwan's ice cream. Eleven additional states reported suspected cases. The 740 confirmed cases included not only several species of *Salmonella* as the culprit, but also other enteric disease-causing organisms. *Salmonella enteritidis* was the most commonly reported. In addition, a total of 3,423 suspected cases were reported.

In a press release dated November 7, 1994, Alfred Schwan, President of Schwan's Sales Enterprises, Inc., stated, "It goes without saying that this last month has been a very trying experience for both our company and for our customers. We are confident that the investigation has correctly identified the likely source of the problem as ice cream mix brought into our plant by a contaminated trailer that had previously been used to transport raw, unpasteurized eggs. We are equally confident that the measures we have now taken, and the plan we have developed in conjunction with the oversight agencies, will address this problem and insure that it can never happen again."

Reprinted from South Dakota Environmental Health Association, Horizons, Spring 1995, Volume 12, Number 1.

A Twist on IPM Protects Pineapple Supply

Pineapple farmers found an unconventional solution to protect Hawaii's pineapple crop from the growing threat of pineapple wilt disease. By controlling ants that roam the pineapple fields, they've indirectly halted the disease – and lowered the use of pesticides.

Pineapple wilt disease is transmitted by mealy bugs, which are protected from attack by natural enemies by big-headed and Argentine ants because the ants feed on a protein produced by mealy bugs. The EPA granted a Section 18 to the Hawaii Department of Agriculture for AMDRO® fire ant bait to control the Argentine and big-headed ants in pineapple fields. As AMDRO controls the ants that protect them, mealy bugs no longer pose a threat to pineapple production; therefore, the incidence of pineapple wilt disease has been reduced.

"Although AMDRO is not labeled for use on food crops, the product was granted an emergency exemption to help pineapple growers solve a potentially costly problem," says Gary D. Curl, senior market manager for American Cyanamid Company, maker of AMDRO.

According to Department of Agriculture officials, the alternative for controlling the mealy bug population was multiple insectide applications. That alternative is not economically viable due to the number of repeat applications needed during the year and a half between the time pineapple slips are transplanted and pineapples are harvested. "Because AMDRO is a bait that kills the ant queen, it can pre-vent the re-treatment often needed with contact insecticides that just kill the workers," explains Curl.

Dairy Research Foundation Joins Dairy Management Inc.

The boards of Dairy Research Foundation (DRF) and National Dairy Board (NDB) have taken action to integrate the activities of DRF into Dairy Management, Inc. (DMI).

"The primary focus of DRF has been to assist in the research and development of dairy products, from concept phase all the way to market reality," said Dan Best, who has headed DRF over the past two years. "As part of Dairy Management, Inc., we will continue to help commercialize technologies that benefit America's dairy producers."

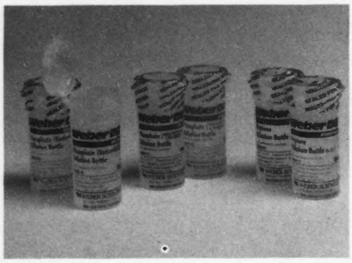
As a result of the new affiliation with DMI, Best and former DRF staff members Amy Skovsende, Kamendu Vasavada and Marykate Ginter have become members of DMI's New Business and Technology Development (NBTD) group.

One of the NBTD group's key objectives is to develop and provide market support for new or improved dairy products, positionings and packages that drive dairy demand.

"Through DMI, national dairy research efforts will involve greater coordination of dairy farmer-funded marketing plans and activities with other dairy industry participants, including dairy processors and food manufacturers," said Dick Schacht, who heads the New Business and Technology Development group. "We look forward to becoming even more involved with the industry to help move along promising research that can help sell more dairy products."

Dairy Management, Inc., is a joint organization formed by United Dairy Industry Association and the National Dairy Promotion and Research Board that conducts an integrated marketing and promotion program for U.S. produced dairy products on behalf of America's dairy farmers.

Industry**Products**



VICAM

VICAM Breaks the Technology Barrier with Its Fast and Accurate Test for DON

VICAM, the industry leader in Rapid Mycotoxin Testing Products, has introduced a fluorescence test product for DON. This test further demonstrates VICAM's leadership and depth in the Mycotoxin Testing marketplace. VICAM prides itself on developing rapid, accurate, easy to use tests which gives precise numerical results. VICAM's mycotoxin tests products also include tests for the detection of Aflatoxin, Fumonisin, Ochratoxin, and Zearalenone. VICAM dedicates itself to producing accurate, rapid tests which are AOAC approved.

As in all of VICAM's mycotoxin tests, DONTest uses antibody affinity columns to isolate DON, which is then quantified as ppm by a fluorometer. All VICAM mycotoxin tests use antibody affinity columns which can be used as clean up columns for HPLC or for direct readout from a fluorometer. This gives the user a battery of mycotoxin tests that are all run the same way. This facilitates training and the utilization of the tests. In addition to its speed, sensitivity and accuracy, DONTest is a welcome addition to what is now a very broad mycotoxin test product line, backed by outstanding customer service and technical support.

DONTest will be available from VICAM as of April 30, 1995.

VICAM–Watertown, MA.

Reader Service No. 380

New Pre-filled Dilution Bottle Enhances Aseptic Handling

The Weber DB™ one-piece bottle features an attached cap with a unique living hinge which stays put and out of the way during use, and is never set down or held, greatly reducing the chance of contamination. This design also promotes the use of two hands for superior ease and control when adding a sample to the diluent.

Microbiologists will also appreciate how the gigantic (45 mm) wide-mouth facilitates weighing of bulky or viscous products. The easy-to-open cap is guaranteed leakproof before and after opening. The sample can be vigorously shaken without fear of leaking.

Three essential pre-measured formulations are available: Foods and Dairy Products (Butterfield's Buffer for APHA, FDA, AOAC or USP methods), Water/Wastewater (Phosphate Buffer with magnesium chloride for EPA or APHA method's), or Pharmaceuticals and Cosmetics (Peptone Water, 0.1% for CTFA, EPA, or APHA methods). All have 150 ml total capacity and are available in either 99 ml fill (1/100 dilution ratio) or 90 ml fill (1/10 dilution ratio), and all are guaranteed sterile and accurately buffered to pH 7.2 ± 0.2. Produced in an ISO 9001 certified facility, this product has been extensively tested and retested with a Certificate of Analysis available.

Solid research has proven real time and cost savings of using a disposable bottle rather than the traditional tedious and lengthy procedure of making your own dilution blanks. A patented manufacturing process allows this new product to significantly be the most economical bottle available.

Weber Scientific–Hamilton, NJ.

Reader Service No. 381

Weber Scientific

Introducing the NEW PRO™ Temperature Recorder

Ryan® Instruments has announced the introduction of its new single channel, digital, temperature recorder, the PRO. This easy-to-use recorder was designed as part of the Ryan Trip Service™ program. It has a temperature range of -39°C to 87°C (-39°F to 189°F). The PRO provides a visual alert system to tell when temperatures are outside the desired temperature parameters. This all happens with just a glance at the instrument, so when you reach your destination, you'll know the exact temperature condition of your shipment. This non-volatile, battery-powered recorder also offers complete ease-of-mind because it will not lose critical data. Plus, it's easy to download information to an independent printer or computer for further analysis. The PRO is ideal for use in any quality control program to meet required regulations such as HACCP. In short, the PRO delivers the accuracy, durability and quality performance you would expect from Ryan instruments, the company that has set the standard in the data logging industry for more than 70 years.

Ryan Instruments–Redmond, WA.

Reader Service No. 382

CheckPoint™ Colony Lift Immunoassay Kits

The CheckPoint™ Colony Lift Immunoassay Kit for Group D *Salmonella* is the first in a new line of rapid and sensitive bacterial assays. This kit employs a colony lift procedure for presumptive detection of Group D Salmonellae (*S. gallinarum*, *S. enteridis*, *S. pullorum* and *S. berta*, etc.) form agar plates. An impression of bacterial colonies is made by lightly resting a protein-binding membrane on either selective or nonselective agar plates. After a simple 20 min assay procedure, blue sites on the membrane clearly mark locations of Group D *Salmonella* colonies for further isolation and testing.

The CheckPoint™ Kit for Group D *Salmonella* is highly specific and more sensitive than conventional random colony pick methods. You can be confident of the *Salmonella* status of a flock up to 48 hours earlier when compared with standard methods–and make critical flock management decisions sooner.

Kirkegaard & Perry Laboratories, Inc., Gaithersburg, MD.

Reader Service No. 383

Neogen Releases New Fumonisin Test

Neogen Corporation has released its newest mycotoxin quantitative test for the detection of fumonisins in food and feedstuffs. These naturally occurring toxins are associated with cancer in humans and death in horses.

The new rapid test, sold under the Veratox trade name, detects the presence of B_1, B_2, and B_3 fumonisins which are of greatest concern to human and animal health. Primarily found in corn based products, fumonisin can now be detected easily and inexpensively using Veratox®. Neogen's new test is the only rapid Enzyme Linked Immunosorbent Assay (ELISA) quantitative test for fumonisin commercially available.

Neogen first began marketing its tests for the detection of mycotoxins in 1986. In addition to fumonisin, Neogen manufactures diagnostic tests for the detection of the five mycotoxins of international interest: aflatoxin, vomitoxin, zearalenone, ochratoxin, and T_2. In total, Neogen markets over 125 different diagnostic tests for the detection of natural toxins, drug residues, pesticides, plant diseases, and microorganisms.

Neogen Corporation–Lansing, MI.

Reader Service No. 384

Microprocessor-Based Digital Counter

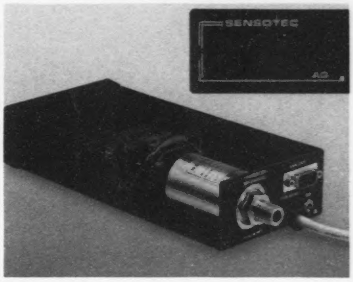
Newport Electronics, Inc., announces the new INF8 6-digit display counter, which is programmable for use as a quadrature counter, up-down counter, or angular counter. This instrument is designed for use with capacitive or optical pickups and ultrasonic sensors.

In quadrature counting mode, the INF8 can be used with linear or rotational encoders. Counting direction is automatically selected by the momentary phase angle of the inputs. The up-down counting mode is designed for fast bidirectional counting applications, while the angular counting mode uses an incremental encoder and counts quadrature pulses bidirectionally between 0 and 360°. The unit can be configured for either 1° or 0.1° resolution.

Absolute code counter models can be used with Grey or Binary code resolvers. Models are available for single or multi-turn serial or parallel inputs. Parallel input models are available with 9 to 14-bit resolution, while serial input models are available with 8 to 19-bit resolution.

Newport Electronics, Inc.–Santa Ana, CA.

Reader Service No. 385



Sensotec, Inc.

Digital Indicator Now Offers 0.035% Accuracy

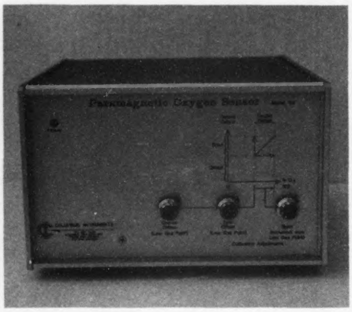
Sensotec proudly offers our Accu-Gage line of precision digital pressure instruments, now with accuracy up to 0.035% F.S. Designed for industrial and laboratory applications, the Accu-Gage family requires no wiring or set-up because the integral pressure transducer and its readout system are housed and calibrated as a unit. The result is a portable, highly accurate replacement for precision dial gages, mercury columns, and quartz barometers.

Housed in a rugged 3/8 DIN-standard black aluminum enclosure, the Accu-Gage provides a durable and low-cost alternative to dial gages. Panel mount adaptors are provided with each instrument.

The Accu-Gage offers gage or pressure ranges from 0-15 psi to 0-30,000 psi, 1-15 psiv, and 16"-32" HgA with accuracies from 0.25% to 0.035% F.S. Accu-Gage has an operating temperature range of 60°F to 130°F and full scale output of +/- 5V. Optional features include tare, auto-zero, dual limits, peak/hold, RS232 interface, and hi/low quad limits.

Sensotec, Inc.–Columbus, OH.

Reader Service No. 386



Columbus Instruments

Paramagnetic Oxygen Analyzer

Highly accurate and stable oxygen analyzer with 0.001% O_2 resolution for environmental and physiological applications operates on principle of magnetic susceptibility of oxygen gas. It has the ability to be calibrated in a narrow or extended oxygen percentage range. The full range extends from 0 to 100% O_2, but Columbus Instruments Paramagnetic Analyzer can be calibrated in any other point (e.g. 20% O_2) at the center with the span ranging from 19.000% O_2 to 21.000% O_2 when high resolution is required.

To eliminate environmental influences, the sensor itself has a built in temperature controlled chamber which is also well shielded from external magnetic fields.

An air sample pump is built in as well as a pressure regulator making Columbus Instruments' Paramagnetic Analyzer immune to both source gas as well as barometric pressure variations.

Sensor features analog 0-5V or +/-5V outputs. An optional digital display of 4-1/2 digits is available.

Current loop 4-20mA for industrial applications as well as A/D card for IBM-PC computers is available where user needs computer interfacing. Companion Infrared CO_2 Analyzer is offered for measuring O_2, CO_2 and CH_4 gases.

Columbus Instruments–Columbus, OH.

Reader Service No. 387

Maximum User Flexibility In New, Multi-purpose Dual Range Digital Pressure Indicator

Dresser Industries Instrument Division announces the unique Ashcroft® Pressure Tester (PT) digital indicators that combine the latest in microprocessor and pressure sensor technology, for an unmatched combination of available ranges, reliability, functionality, performance and ease of use.

The all-new PT digital indicator is available in 56 standard pressure ranges from 0.25 inches H_2O through 7500 psi. A total of 121 different sensor configurations are possible, with the availability of gauge, absolute, compound and differential pressure types, as well as vacuum, plus the availability of many ranges in both isolated and non-isolated configurations. All ranges are offered in accuracies of ±0.25% and ±0.1% of span. And further, a single PT instrument can actually display measurement data from one, or optionally two, installed pressure-sensing units simultaneously.

PT indicators are extremely versatile pressure measurement and test instruments. All come with user-selectable engineering units, min/max recall, tare, programmable damping, display/hold, an operator-configurable RS232 interface and a push-to-print function for use with the RS232 interface. All capabilities are accessible through easy-to-follow keypad functions, as well as over the RS232 interface.

Optional features such as a second sensor assembly, back-lighted display or built-in rechargeable battery pack make these unique PT indicators ideal tools for use in most major pressure measurement applications like test stands, as in-field calibration and test standards, and for general metrology lab activity.

Dresser Industries Instrument Division manufactures the PT Digital Pressure Indicator as an Ashcroft product at the Newtown CT Operation, a facility which has achieved ISO 9001 quality certification for its procedures.

Dresser Industries–Stratford, CT.

Reader Service No. 388

Business**Exchange**

Services/Products

Employment Opportunites

Coming**Events**

JUNE

•5-7, Current Good Manufacturing Practice (cGMP) for the Pharmaceutical and Allied Industries, Fort Lauderdale, FL. Topics covered will include not only the legal requirements for cGMP in the Federal Food, Drug, and Cosmetic Act but primarily the "how tos" of purchasing, manufacturing, packaging, labeling and QA/QC, as well as training production personnel in cGMP. For more information, contact the Center for Professional Advancement, P.O. Box 1052, East Brunswick, NJ 08816-1052; telephone (908) 613-4500; fax (908) 238-9113.

•6-7, AIB Regional Updates in Food Plant Sanitation, Atlanta, GA. The program will include new topics in addition to the basic key elements for any viable sanitation program, as well as sessions on the basic principles of HACCP and sanitary design standards. Tuition fees are $300 per person for members of the American Institute of Baking, and $325 for non-members. For further information, write to the Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502, or call (913) 537-4750 or (800) 633-5137.

•8-9, Writing Standard Operating Procedures to Meet cGMP Requirements, East Brunswick, NJ. During this course, participants will acquire a better understanding of what the FDA is looking for, methods used for compiling information, assignment of responsibility for departmental procedures, instruction on technical writing, new plant start-up, and plant revision, or companies experiencing rapid growth or expansion. For more information, contact the Center for Professional Advancement, P.O. Box 1052, East Brunswick, NJ 08816-1052; telephone (908) 613-4500; fax (908) 238-9113.

•14-15, 15th Annual Environmental Resources Expo Set, ERE'95, Florida's largest annual environmental industry trade show and conference, is scheduled for June 14, and 15, 1995, at the Orange County Convention Center in Orlando, Florida. Over 250 companies will be on hand to display the latest environmental technology and discuss their technical capabilities and service offerings. In addition to the ERE Conference, pre-conference workshops will be presented by the University of Florida TREEO Center, the Environmental Resources Center and TEST Institute. For more information, contact Trish Forhane, P. O. Box 2027, Winter Park, FL 32790-2027; telephone (407) 740-7950; fax (407) 740-7957.

•18-20, Dairy-Deli-Baker '95, IDAA's 31st Annual Seminar and Expo, San Jose, CA.; featuring special Bakery Symposium. For people registering for the Bakery Symposium on or before May 20, 1995, Course 1, "Service That Sells" will be provided as a gift to you. For more information, contact IDDA, P.O. Box 5501, Madison, WI 53705; telephone (608) 238-7908; fax (608) 238-6330.

•19-30, Postharvest Technology Short Course, UC Davis Campus. Topics include an overview of harvesting and postharvest handling systems, preparation for market, storage methods and equipment, transport systems and environmental control, energy use in postharvest procedures, and appropriate technology for postharvest handling of horticultural crops in developing countries. The fees are $475 for one week, and $725 for both weeks. For more information or to enroll, call toll free in CA (800) 752-0881; outside CA call (916) 757-8777.

•20-21, Starch: Structure, Properties, and Food Uses, a short course offered by the American Association of Cereal Chemists (AACC) in Heverlee, Belgium. For more information, contact Marie McHenry, Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097; telephone (612) 454-7250; fax (612) 454-0766.

•22-23, Batter and Breading Technology, a short course offered by the American Association of Cereal Chemists (AACC) in Chorleywood (London) UK. For more information, contact Marie McHenry, Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097; telephone (612) 454-7250; fax (612) 454-0766.

•26-27, Chemical Leavening, a short course offered by the American Association of Cereal Chemists (AACC) in Chorleywood (London) UK. For more information, contact Marie McHenry, Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097; telephone (612) 454-7250; fax (612) 454-0766.

JULY

•11-12, AIB Regional Updates in Food Plant Sanitation, Cherry Hill, NJ. The program will include new topics in addition to the basic key elements for any viable sanitation program, as well as sessions on the basic principles of HACCP and sanitary design standards. Tuition fees are $300 per person for members of the American Institute of Baking, and $325 for non-members. For more information, write to the Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66052, or call (913) 537-4750 or (800) 633-5137.

SEPTEMBER

•**20-21, OSMO® RO/UF Equipment Operation and Maintenance Seminar,** "Equipment Operation and Maintenance" is oriented specifically for operators of RO/UF equipment used for water treatment, pollution control and process applications. This seminar will provide operators a complete background necessary to operate and maintain RO/UF equipment at peak performance year-in and year-out. Certificates are sent following course completion. In order to fully meet the objectives of seminar participants, attendance is limited to 25, accepted on a first-come, first-serve basis. For more information, contact Ms. Bette Nelson, Travel & Seminar Coordinator, OSMONICS, INC., 5951 Clearwater Dr., Minnetonka, MN 55343-8990, (612) 933-2277.

•**25-29, The 12th European Symposium on the Quality of Poultry Meat and the 6th European Symposium on the Quality of Eggs and Egg Products,** Zaragoza, Spain., Auditorium/Congress Palace. Working languages will be English, Spanish and French. Simultaneous translations will be organized in plenary sessions. For more information, please contact the Symposia Secretariat, Ricardo Cepero Briz, Veterinary Faculty, Miguel Servet 177, 50013 Zaragoza SPAIN.

•**28-29, Wisconsin 16th Annual Joint Conference, A Dairy, Food and Environmental Health Symposium,** The Wisconsin Association of Milk and Food Sanitarians (WAMFS), Wisconsin Environmental Health Association (WEHA), Wisconsin Association of Dairy Plant Field Representatives (WADPFR), joint conference at the Paper Valley Inn in Appleton, WI. Each group is planning separate programs at the conference that would be of interest of all groups. For more information, please contact Neil Vassau, Dept. of Agriculture, Trade, & Consumer Protection, Bureau of Laboratory Services, PO Box 7883, Madison, WI 53707; phone (608) 267-3504.

NOVEMBER

•**4-6, 6th Egyptian Conference of Dairy Science and Technology,** Cairo, Egypt. Organized by The Egyptian Soc. of Dairy Science. For more information, contact Dr. M. H. Abd El-Salam, National Research Center, Dokki, Cairo, Egypt; telephone (20-2-625 026) or fax (20-2-700 931).

•**5-9, American Association of Cereal Chemists 80th Annual Meeting,** The world's largest gathering of cereal industry professionals will convene their 80th Annual Meeting in San Antonio, Texas at the Henry B. Gonzales Convention Center. AACC Annual Meeting registration materials are available after July 1, 1995, from AACC Headquarters, 3340 Pilot Knob Road, St. Paul, MN 55121-2097 U.S.A.; telephone (612) 454-7250; fax (612) 454-0766.

Advertising Index

IAMFES

Preliminary Program

82nd Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc.

In Cooperation with Pennsylvania Association of Milk, Food and Environmental Sanitarians

Hilton Hotel & Towers, Pittsburgh, PA
July 30 — August 2, 1995

REGISTRATION TIMES

Saturday, July 29 .... 1:00 p.m. - 5:00 p.m.

Sunday, July 30 .... 8:30 a.m. - 7:00 p.m.

Monday, July 31 .... 8:00 a.m. - 4:00 p.m.

Tuesday, August 1 .... 8:00 a.m. - 4:00 p.m.

Wednesday, August 2 .... 8:00 a.m. - 12:00 p.m.

EXHIBITORS HOURS

Sunday, July 30 .... 8:00 p.m. - 10:00 p.m.
(Following the Opening Session)

Monday, July 31 .... 9:30 a.m. - 3:30 p.m.

Tuesday, August 1 .... 9:30 a.m. - 3:30 p.m.

IAMFES BOARD MEETING

Friday, July 28 .... 2:00 p.m. - 6:00 p.m.

Saturday, July 29 .... 8:00 a.m. - 1:00 p.m.

Monday, July 31 .... 7:00 a.m. - 9:00 a.m.

Wednesday, August 2 .... 11:30 a.m. - 2:00 p.m.

Thursday, August 3 .... 8:00 a.m. - 12:00 p.m.

COMMITTEE/PROFESSIONAL DEVELOPMENT GROUP MEETINGS

SUNDAY, JULY 30

7:00 - 10:00 a.m.	Affiliate Council
10:00 - 11:00 a.m.	Dairy Quality & Safety (Farm Section)
9:30 - 11:00 a.m.	Audio Visual Library
10:00 - 11:00 a.m.	Baking Industry Sanitary Standards
10:00 - 11:00 a.m.	Past Presidents Advisory
10:00 - 12:00 p.m.	Poultry Safety and Quality
10:00 - 5:00 p.m.	Communicable Diseases Affecting Man
11:00 - 12:00 p.m.	Dairy Quality and Safety (Plant Section)
11:00 - 12:00 p.m.	Foundation Fund
11:00 - 12:00 p.m.	Nominating
1:30 - 2:30 p.m.	Constitution and By-Laws
1:30 - 2:30 p.m.	Sanitary Procedures
1:30 - 3:30 p.m.	Meat Quality and Safety
1:30 - 3:00 p.m.	Dairy, Food & Environmental Sanitation Management
1:30 - 3:30 p.m.	Seafood Safety and Quality
1:30 - 3:30 p.m.	Applied Laboratory Methods
1:30 - 3:30 p.m.	Food Sanitation
3:00 - 4:00 p.m.	Environmental Issues in Food Safety
3:00 - 4:30 p.m.	Journal of Food Protection Management
3:00 - 5:00 p.m.	Food Safety Network
4:00 - 6:00 p.m.	Program Advisory

WEDNESDAY, AUGUST 2

12:00 - 4:00 p.m.	Program Advisory (members only)

Sunday Evening — July 30, 1995

Opening Session

7:00 **Welcome to the 82nd Annual Meeting** – C. D. Clingman, President of IAMFES and P. Hoge, Chairperson, of the Local Arrangements Committee.

7:15 **Introduction of the Ivan Parkin Lecture** – F. A. Draughon, President-Elect of IAMFES

7:20 **Ivan Parkin Lecture** – James M. Jay, PhD, Wayne State University, Detroit, MI

The Ivan Parkin Lecture is sponsored by the IAMFES Foundation Fund and is supported by the Sustaining Members

8:00 **Cheese and Wine Reception** – Held in the Exhibit Hall. An opportunity to greet old friends, make new ones and view the excellent technical displays.

Monday Morning — July 31, 1995

Practical Approach to Quality Milk — General Session

8:30 NCIMS Update and Structure of NCIMS – D. RACKLEY, Oklahoma Dept. of Agricultural, Oklahoma City, OK

8:55 3-A Sanitary Standards – Now and in the Future – T. GILMORE, Dairy and Food Industries Supply Association, McLean,VA

9:20 Laying the Groundwork for HACCP and ISO 9000 – J. ADAMS, National Milk Producers Federation, Arlington, VA

9:45 Dairy Product Shelf Life Tests for Quality Control and Research and Development – T. GRUETZMACHER, Dean Foods Company, Rockford, IL

10:10 Break

10:30 National Milk Drug Residue Database – J. SMUCKER, FDA, Washington, DC

10:55 Practical Solutions to Pathogens from Milk and Other Animal Products – S. KNABEL, Pennsylvania State University, University Park, PA

11:20 Design, Installation, and Maintenance of Plate Heat Coolers – D. COLE, Alfa Laval Agri., Newbury, PA

Technical Session — Control of Food-borne Microorganisms

8:30 Shelf Life Extension and Safety of Fresh Pork Treated with High Hydrostatic Pressure – V. ANANTH, E. Murano, and J. Dickson, Iowa State University, Ames, IA

8:45 Microbial Monitoring of Irradiated, Commercially-Prepared, Chub-Packed Ground Beef – S. GAMAGE, J. Luchansky, and S. Ingham, University of Wisconsin-Madison, Madison, WI

9:00 Reduction of *Salmonella typhimurium* on Chicken Carcasses Using Pulsed Electricity – Y. LI, H. Xiong, P. Mastler, and M. Slavik, University of Arkansas, Fayetteville, AR

9:15 Isolation and Characterization of Gram-negative Bacteria, Isolated from Ground Beef, that Exhibited Inhibition of *Escherichia coli* O157:H7 – T. BRIDGEMAN and E. Zottola, University of Minnesota, St. Paul, MN

9:30 Inhibition of a Psychrotrophic *Clostridium* Species by Sodium Diacetate and Sodium Lactate in a Cook-in-the-Bag, Refrigerated Turkey Breast Product – J. MEYER, J. Cerveny, and J. Luchansky, University of Wisconsin-Madison, Madison, WI

9:45 Inhibitory Effects of Sucrose Fatty Acid Esters, Alone and in Combination with EDIA and Organic Acids, on *Listeria monocytogenes* and *Staphylococcus aureus* – J. MONK, L. Beuchat, and A. Hathcox, University of Georgia, Griffin, GA

10:00 Break

10:20 Evaluation of Colicins for Inhibition Against Diarrheagenic Verotoxigenic *Escherichia coli* Strains – S. MURINDA and R. Roberts, Pennsylvania State University, University Park, PA

10:35 Inhibition of *Listeria monocytogenes* and *Aeromonas hydrophila* on Cooked Beef by Plant Extracts Combined with Dried Whey Preparations of Antagonistic Bacteria – P. YORK, Y. Hao, R. Brackett, and M. Doyle, University of Georgia, Griffin, GA

10:50 Control of *Listeria monocytogenes* on Catfish Fillets (lctalurus punctatus) Using Food Grade Antimicrobials – A. DEGNAN, M. Tamplin, R. Murphree, C. Kaspar and J. Luchansky, University of Wisconsin-Madison, Madison, WI

11:05 Microbial Decontamination of Fecally Contaminated Carcasses as Affected by Various Temperature Water Sprays and Steam – W. DORSA, C. Cutter, G. Siragusa, and M. Koohmaraie, USDA-ARS, Clay Center, NE

11:20 Disinfection of Cutting Boards by Microwave Energy – P. PARK and D. Cliver, University of Wisconsin-Madison, Madison, WI

International Approaches to Meat Safety and Quality

8:30 Why Should a Food Producer/Processor Become ISO 9000 Certified? – R. RALYEA, U.S. Army, Converse, TX

9:00 Integrated Quality Control in the Pig Sector – B. LAUTHER, National Pork Producers Council, Des Moines, IA

9:30 General Principles of ISO 9000 and ISO 45000: HACCP, TQM and ISO Links – L. PEDROSO, Fricarnes, S. A. Portugal

10:00 Break

10:20 An Integrated System of ISO 9000 and ISO 45000 Certificates in the Control of Food Hygiene – F. VAN ROSSEM, Food Quality Systems, The Netherlands

10:50 Quality Systems in a Canadian Meat Processing Operation – P. DODSWORTH, J.M. Schneiders Inc., Kitchener, Ontario, Canada

11:20 Application of HACCP Principles and Beyond: Beef Slaughter and Fabrication – J. SOFOS, Colorado State University, Ft. Collins, CO

An Introduction to Molecular Typing Methods for the Food Microbiologist (Sponsored by ILSI)

8:30 Introduction to the Hows and Whys of Molecular Typing – J. FARBER, Health Canada, Ottawa, Ontario, Canada

9:00 Riboprint – A Novel Automated Ribotyping Method for Molecular Typing of Food-borne Microorganisms – J. WEBSTER, Dupont, Wilmington, DE

9:30 The Use of PFGE for the Molecular Typing of Food-borne Pathogens – J. LUCHANSKY, University of Wisconsin-Madison, Madison, WI

10:00 Break

10:20 Methods for Data Capture, Analysis, and Interpretation of Electrophoretic Gels – B. SWAMINATHAN, CDC, Atlanta, GA

10:50 Use of Molecular Typing in Food-borne Outbreak Investigations: Pitfalls and Advantages – J. ROCOURT, Institut Pasteur, Paris, France

11:20 Molecular and Conventional Typing Methods for *Listeria monocytogenes* – the U.K. Approach – J. MCLAUCHLIN, Public Health Laboratory Service, London, United Kingdom

Posters — Growth/Behavior of Food-borne Microorganisms

- Growth of *Listeria monocytogenes* and Listeriolysin O Secretion in Broth Containing Salts of Organic Acids – Y. KOUASSI and L. Shelef, Wayne State University, Detroit, MI
- Heat-resistance of *Listeria monocytogenes* Increases when Production of Osmoprotectants is Induced – Y. LOU and A. Yousef, Ohio State University, Columbus, OH
- The Incidence of Pathogenic Microorganisms in Aquacultured Rainbow Trout (*Oncorhynchus mykiss*) – T. MCADAMS, R. Reinhard, G. Flick, G. Libey, and S. Smith, Virginia Tech, Blacksburg, VA
- A Comparision of Quantitative Levels of *Escherichia coli* O157:H7, *Klebsiella pneumoniae*, *Campylobacter*, and *Salmonella* in Fresh Blue Crab (*Callinectes sapidus*) – R. REINHARD, T. McAdams, G. Flick, A. Diallo, R. Croonenberghs, and R. Whittman, Virginia Tech, Blacksburg, VA
- Survival and Growth of *Escherichia coli* O157:H7 on Produce – K. RICHERT, J. Albrecht, S. Sumner, and L. Bullerman, University of Nebraska, Lincoln, NE
- Competitive Growth of Enterohemorrhagic *Escherichia coli* in Ground Beef at 9.5°C – O. SANTOS, T. Schwach, and E. Zottola, University of Minnesota, St. Paul, MN
- Thermal Resistance of *Aeromonas hydrophila* in Liquid Whole Egg – J. SCHUMAN and B. Sheldon, North Carolina State University, Raleigh, NC
- The Incidence of Pathogens in Aquaculture Recirculation Water Systems and a Comparision of Their Presence to Fish Size and Stocking Densities – D. STREBEL, R. Reinhard, T. McAdams, and G. Flick, Virginia Tech, Blacksburg, VA
- Growth and Survival of *Listeria monocytogenes* in Minimally Processed Green Beans as Influenced by Modified Atmosphere Packaging, NaCl Treatment and Storage Temperature – W. TAN, D. Grinstead, J. Mount and F. Draughon, University of Tennessee, Knoxville, TN
- Radiosensitivity of *Listeria monocytogenes* Following Split-Dose Application of Gamma Radiation – L. ANDREWS, R. Grodner and P. Wilson, Louisiana State University, Baton Rouge, LA
- Growth of *Yersinia enterocolitica* on Osmotically Dehydrated Broccoli Packaged in Modified Atmospheres and Stored at 10°C – P. BODNARUK, F. Draughon, and J. Mount, University of Tennessee, Knoxville, TN
- Survival/Growth of Gram Positive Bacteria in Reconditioned, Potable, and Non-chlorinated Water – J. CALL, S. Palumbo, B. Huynh, J. Fanelli, and P. Jackson, USDA-ARS, ERRC, Philadelphia, PA
- Presence of *Listeria* Species in Market Beef – C. CHUNG, D. Jeong and D. Gu, Kon-Kuk University, Seoul, Korea

- Susceptibility of Pre-evisceration Washed Carcasses to Contamination by *Escherichia coli* O157:H7 and Salmonellae – J. DICKSON, Iowa State University, Ames, IA
- The Potential of Danish Market Cheeses to Support Growth of Food-borne Pathogens – K. JENSEN and S. Knochel, RVAH Centre for Food Research, Frederiksberg, Denmark
- Influence of Temperature Abuse on Growth of *Clostridium perfringens* from Spores in Cooked Turkey – V. JUNEJA and B. Marmer, USDA-ARS, ERRC, Philadelphia, PA
- Effect of High pH on the Survival of *Salmonella typhimurium, Salmonella newport* and *Campylobacter jejuni* in Poultry Scald Water at 55°C – A. MENDONCA and J. Njoroge, North Carolina A&T State University, Greensboro, NC
- Potential for Growth, Injury, and Survival of Food-borne Pathogens in a Model Propylene Glycol Product Cooling System – A. MILLER, C. Paska, and B. Eblen, USDA-ARS, ERRC, Philadelphia, PA
- Growth of *Salmonella* & *Vibrio cholerae* in Reconditioned Water – K. RAJKOWSKI, E. Rice, and B. Huynh, USDA-ARS, ERRC, Philadelphia, PA
- Nebraska Survey of Organic and Coventionally Grown Produce for *Escherichia coli* O157:H7, *Salmonella*, and *Shigella* – S. SUMNER, K. Richert, J. Albrecht, and L. Bullerman, University of Nebraska, Lincoln, NE
- Survival and Injury of Selected Isolates of *Listeria* in Ground Pork Following Electron Beam Irradiation or Heating at 55°C – R. TARTE, E. Murano, and D. Olson, Iowa State University, Ames, IA

Monday Afternoon — July 31, 1995

Practical Approach to Quality Milk — Plant Session

1:30 Basic Technical Challenge in Progressing from Conventional Milk Processing to Aseptic Processing – B. RITSCHARD, Parmalat, Inc., Spring City, PA

2:00 Issues of Using Reclaimed Water – Speaker to be announced

2:30 Crisis Management and Product Recalls – G. PRINCE, Kroger Co., Cincinnati, OH

3:00 Break

3:20 Innovations in Plant Design and Processing – D. SIEBERLING, Sieberling Association, Inc., Roscoe, IL

3:50 Public Health and Regulatory Aspects of Emerging Milk Plant Technology – S. SIMS, FDA, Washington, DC

Practical Approach to Quality Milk — Producer Session

1:30 Dairy Farmstead Evaluation as a Response to Environmental Issues – University Viewpoint – L. LANYON, Pennsylvania State University, University Park, PA

2:00 Environmental Issues – Dairy Producer Viewpoint – L. JONES, Lester C. Jones & Sons, Inc., Massey, MD

2:30 Design Challenges in Modern Milking Equipment – S. SPENCER, Pennsylvania State University, University Park, PA

3:00 Break

3:20 Current Cleaning Chemical Technology & Recommendations for Maximum Cleaning Effectiveness – D. SIMYAK, Diversey Corp., Livonia, MI

3:50 Futuristic Dairy Farm Design – D. WAYBRIGHT, Mason Dixon Farms, Inc., Gettysburg, PA

Technical Session — Detection and Enumeration Methods

1:30 Rapid Multianalyte Immunoassay to Screen for Antibiotic Residues in Milk – A. KUMAR, K. Hara, S. Kharadia, D. Leung, M. Piani, R. Rocco, and C. Yu, Idetek, Inc., Sunnyvale, CA

1:45 The Rapid Charm Phosphatase Test Conforms with USDA Requirements for Cooked Meat and Gauges Microbial Log Reduction – E. ZOMER, J. Scheemaker, and S. Trivedi, Charm Sciences, Inc., Malden, MA

2:00 Specificity of Four Monoclonal Antibodies Produced Against *Salmonella typhimurium* – Z. JARADAT and J. Zawistowski, University of Manitoba, Winnipeg, Manitoba, Canada

2:15 Antigenicity of 35 and 24 kDa Outer Membrane Proteins of *Salmonella* – Z. JARADAT and J. Zawistowski, University of Manitoba, Winnipeg, Manitoba, Canada

2:30 A New Petrifilm™ Method for *Enterobacteriaceae* Testing – P. MACH and G. Sandberg, 3M Company, St. Paul, MN

Quality Assurance

2:45 Ontario's Inspection Protocol for Undrawn Dressed Poultry (UDP): A Model for Standards Development for Ethnic Markets – T. BAKER and P. Johnson, Ontario Ministry of Agriculture, Guelph, Ontario, Canada

3:00 Break

3:20 Re-engineering of Licensing Audit for Ontario Abattoirs – P. JOHNSON and T. Baker, Ontario Ministry of Agriculture, Guelph, Ontario, Canada

3:35 The Application of Risk Assessment and Standard Audit Principles for Compliance Verification in Ontario Inspected Abattoirs – T. BAKER and P. Johnson, Ontario Ministry of Agriculture, Guelph, Ontario, Canada

3:50 Advances in Laboratory Information Managements Systems (LIMS) in Dairy Quality Control Labs – D. BLOMQUIST and R. Bakka, Klenzade, Tampa, FL

4:05 A Computer Program for Managing a Food-borne Disease Surveillance Network & Compiling Surveillance Data – J. GUZEWICH and D. Sackett, New York State Department of Health, Albany, NY

4:20 International Trends in HACCP – I. HIGUERA-CIAPARA, L. Noriega, and G. Arteaga, Research Center for Foods & Development, Hermosillo, Sonora, Mexico

Posters — Control of Food-borne Microorganisms

- Modeling the Effect of Temperature on Growth Rate and Lag Time of *Bacillus Stearothermophilus* Using Vanance Stabilizing Transformations – R. DOGRA and D. Schaffner, Rutgers University, New Brunswick, NJ
- Antimicrobial Action of a Nisin-Based Treatment Against *Salmonella typhimurium* in Fresh Pork Loin – N. LLORCA and B. Sheldon, North Carolina State University, Raleigh, NC
- Effect of Trisodium Phosphate on *Listeria monocytogenes* Attached to Rainbow Trout – D. MU and Y. Huang, University of Georgia, Athens, GA
- *Nannocystis exedens* as a Potential Biocompetitive Agent Against Toxigenic *Aspergillus flavus* and *Aspergillus parasiticus* – W. TAYLOR and F. Draughon, University of Tennessee, Knoxville, TN
- Determination of Purging Rate of *Escherichia coli* O157:H7 Contamination from a Model Meat Grinding System – A. TINDLE, R. Phebus, C. Kastner, J. Marsden, D. Fung, H. Thippareddi, R. Prasai, and K. Karr, Kansas State University, Manhattan, KS
- Reduction of Food-borne Pathogens on Beef Carcass Tissue Using Sodium Bicarbonate and Hydrogen Peroxide – K. YOST and S. Sumner, University of Nebraska, Lincoln, NE
- Efficacy of Trisodium Phosphate for Killing *Salmonella* on Tomatoes – L. BEUCHAT, University of Georgia, Griffin, GA
- Expanded Models for Predicting the Non-Thermal Inactivation of *Listeria monocytogenes* – R. BUCHANAN and M. Golden, US FSIS, Washington, DC
- Effect of Chlorine Dioxide Spray Washes for Reducing Fecal Contamination on Beef – C. CUTTER and W. Dorsa, USDA-ARS, Clay Center, NE
- Antimicrobial Properties of Volatile Horseradish Distillates – P. DELAQUIS, H. Graham, and G. Mazza, Agriculture and Agri-Food Canada, Summerland, British Columbia, Canada
- Effect of Citricidal, Chloride, and Benomyl on *Vibrio Cholerae* Growth in Vitro – M. DIAZ-CINCO, R. Troncoso-Rojas, V. Mata-Haro, and E. Acedo-Felix, CIAD, A.C., Hermosillo, Sonora, Mexico
- Effect of Processing Protocols on the Quality of Aquacultured Fresh Catfish Fillets – C. FERNAUDES, G. Flick, Jr., J. Silva, T. McCaskey, and A. Hood, Virginia Polytechnic Institute and State University, Blacksburg, VA
- A Model for the Effects of Temperature, pH and Lactate on the Survival of *E. coli* O157:H7 – M. GOLDEN and R. Whiting, USDA-ARS, ERRC, Philadelphia, PA
- Intervention Through the Use of Hand-trimming, Chemical Sanitizers, and Hot Water Spray-Washing to Remove Fecal and Microbiological Contamination from Beef Adipose Tissue – B. GORMAN, J. Sofos, J. Morgan, G. Schmidt, and G. Smith, Colorado State University, Ft. Collins, CO
- Influence of Fat Content in Pork Liver Sausage on Growth of *Listeria monocytogenes* and Its Inhibition by Lactate and Sorbate – A. HU and L. Shelef, Wayne State University, Detroit, MI
- Destruction of *Listeria monocytogenes* on Catfish Fillets Using Lactic Acid and Monolaurin – D. MARSHALL, E. Verhaegh, and D. Oh, Mississippi State University, Mississippi State, MS
- Sensitization of *Escherichia coli* to Nisin and Lysozyme by High Hydrostatic Pressure, EDTA and Chitosan – C. MICHIELS, K. Versyck, K. Hauben, and E. Wuytack, Katholieke University, Heverlee, Belgium
- Effects of Lactate, Spice Oil, and pH Levels on the Growth and Survival of *E. coli* O157:H7 at 35 and 4°C – J. PRICE, J. Cherry-Merritt, A. Orta-Ramirez, E. Tindall, and L. Gilbert, Michigan State University, East Lansing, MI
- Comparison of Mathematical Models to Estimate Growth Rate of *Escherichia coli* O157:H7 at Fluctuation Temperatures – K. RAJKOWSKI, USDA-ARS, ERRC, Philadelphia, PA
- A Survey of College Students' Knowledge of Food Safety & Home Food Preparation Practices – M. SALAMANCA, R. Gravani, Cornell University, Ithaca, NY

- Feasibility of Using Food Grade Food Additives to Control the Growth of *Clostridium perfringens* – A. SIKES, U.S. Army, Natick, MA
- Effect of Time of Exposure of Beef Fat Fascia to *Escherichia coli* ATCC 11370 on Its Removal by Spray-Washing with Chemical Solutions and 35° or 74° Water – J. SOFOS, L. Cabedo, J. Morgan, G. Schmidt, and G. Smith, Colorado State University, Ft. Collins, CO
- Radiation Resistance of Pathogenic *Escherichia coli* Serotypes – D. THAYER and G. Boyd, USDA-ARS, ERRC, Philadelphia, PA
- Sensitivity of Six Strains of *Listeria monocytogenes* to Nisin in Broth at pH 5, 6, and 7 – D. UKUKU and L. Shelef, Wayne State University, Detroit, MI
- Ecology and Control of Bread Spoilage by Rope – A. von HOLY, C. Bailey, C. McNaughton, and L. Kirschner, University of the Witwatersrand, South Africa
- Effect of Polyvalent Metal Ions on Growth Inhibition of *Listeria monocytogenes* by Sodium Polyphosphate – L. ZAIKA, O. Scullen, and J. Fanelli, USDA-ARS, ERRC, Philadelphia, PA

Tuesday Morning — August 1, 1995

Hurdles to Improve Safety and Quality of Ready-To-Eat (RTE) Meats

8:30 Pretreatment of Meat in the Slaughter Process – J. DICKSON, Iowa State University, Ames, IA

9:00 Food Additives in Processed Meats – R.TOMPKIN, Armour Swift-Eckrich, Inc., Downers Grove, IL

9:30 Packaging and Storage Conditions to Enhance Meat Safety – S. INGHAM, University of Wisconsin, Madison, WI

10:00 Break

10:20 Elimination of Pathogens on Red Meats with Irradiation – D. THAYER, USDA-ARS, ERRC, Philadelphia, PA

10:50 Novel Approaches in Hurdles Technology – C. CUTTER, USDA-ARS, Clay Center, NE

11:20 Hurdles in Getting Hurdle Approval – D. BERNARD, National Food Processing Association, Washington, DC

Technical Session — Growth/Behavior of Food-borne Microorganisms

8:30 Influence of pH and Incubation Temperature on Virulence and Fatty Acids of *Yersinia enterocolitica* – P. BODNARUK and D. Golden, University of Tennessee, Knoxville, TN

8:45 Growth of *Listeria monocytogenes* and *Yersinia enterocolitica* on Cooked Poultry Stored Under Modified Atmosphere at 3.5, 6.5, and 10°C – L. HARRIS and R. Barakat, University of Guelph, Guelph, Ontario, Canada

9:00 Natural Occurrence of *Listeria monocytogenes* in Fresh Blue Crab (*callinectes sapidus*) Meat & Its Growth Characteristics at Refrigeration Temperatures – D. DIEZ de MEDINA, G. Flick, R. Whittman, R. Croonenberghs, and A. Diallo, Virginia Tech, Blacksburg, VA

9:15 The Effect of Iron Levels on Growth, Toxicity and Adherence of Enterohemorrhagic *Escherichia coli* – T. SCHWACH and E. Zottola, University of Minnesota, St. Paul, MN

9:30 Acid Adaptation in *Listeria monocytogenes* Scott A – V. SCOTT, R. Buchanan, and D. Westhoff, National Food Processors Association, Washington, DC

9:45 Stress Protein and Fatty Acid Composition Effects on Heat Resistance of *Escherichia coli* O157:H7 – H. THIPPAREDDI, D. Fung, R. Phebus, I. Jeon, and R. Thakur, Kansas State University, Manhattan, KS

10:00 Break

10:20 Survival Characteristics & Injury of *Escherichia coli* O157:H7 During Conventional & Micro wave Heating at Constant Temperatures –S. CZECHOWICZ and E. Zottola, University of Minnesota, St. Paul, MN

10:35 Comparison of D_{55C} Values of Antibiotic-resistant and Antibiotic-sensitive Strains of *Salmonella* – P. DAVIDSON and T. Henson, University of Idaho, Moscow, ID

10:50 Dose-response of *Salmonella* in Cheese – E. TODD, R. Szabo, J. D'Aoust, A. Sewell, C. McDonald, A. Ellis, B. Miller, and P. Stone, Health Canada, Ottawa, Ontario, Canada

11:05 Biological Characterization of *Enterobacter sakazakii* – M. NAZAROWEC-WHITE and J. Farber, Health Canada, Ottawa, Ontario, Canada

11:20 Spoilage Ecology of Vacuum-Packaged Vienna Sausages – A. von HOLY, C. Franz, M. Papathanasopoulos, and G. Dykes, University of the Witwatersrand, South Africa

Emerging Issues in Microbiological Food Safety (Sponsored by ILSI)

8:30 Bovine Spongiform Encephalopathy – Potential Risk from Foods – H. MOON, U.S. Dept. of Agriculture, Plum Island Animal Disease Center, Greenport, NY

9:00 Viability of *Cryptosporidium parvum* Oocysts in Beverages: Correlation of In Vitro

Excystation with Inclusion or Exclusion of Fluorogenic Vital Dyes – K. PATTEN and J. Rose, University of South Florida, Tampa, FL

9:30 Growing Concerns and Recent Outbreaks of Enterohemorrhagic *Escherichia coli* – non-O157:H7 Serotypes – R. CLARKE, J. Wilson, S. Read, K. Rahn, R. Johnson, D. Alves, M. Karmali, H. Lior, S. McEwen, J. Spika, C. Gyles, Agriculture and Agri-Food Canada, Guelph, Ontario, Canada

10:00 Break

10:20 Staphylococci – Are Non-*S. aureus* Toxigenic Species on the Horizon? – R. BENNETT, U.S. Food and Drug Administration, Washington, D.C.

10:50 *Arcobacter* and *Helicobacter* - Risks for Foods and Beverages – I. WESLEY, National Animal Disease Center, Ames, IA

11:20 Dealing with an Expanding, Global Food Supply – Z. MERICAN, Malaysian Agriculture Research & Development Institute, Kuala Lumpur, Malaysia

Poster Session — Detection and Enumeration Methods

- Transformation of Bacterial Luciferase DNA into *Escherichia coli* O157:H7 for Use as a Marker in a Ground Beef System – R. PANCHEV and S. Sumner, University of Nebraska, Lincoln, NE
- Genomic Fingerprinting of *Bifidobacterium* spp. from an Infant – S. TSAI and J. Luchansky, University of Wisconsin, Madison, WI
- Evaluation of Universal Preenrichment Versus Lactose Broth Plus Various Plating Media for Isolating Salmonellae from Naturally Contaminated Fresh Chicken and Pork Sausage – E. VESTERGAARD and L. Restaino, Northern Illinois University, De Kalb, IL
- Evaluation of an Automated Assay for the Detection of *Listeria monocytogenes* in Food Products – T. ARMSTRONG, L. Brusatti, F. Prost-Gorse, and R. Johnson, bioMérieux Vitek, Inc., Hazelwood, MO
- Optimization of Polymerase Chain Reaction Parameters Utilizing an Experimental Design Approach – J. BASS and G. Tice, R. Jackson, DuPont, Wilmington, DE
- Antibiotics and Sulfonamides in Meat Samples Destined for Human Consumption – M. BERMUDEZ-ALMADA and L. Vazquez-Moreno,Centro de Investigacion en Alimentacion y Desarrollo, Hermosillo, Sonora, Mexico
- Biodegradation of Aflatoxins by *Flavobacterium aurantiacum* in Culture Media – L. BOHRA, R. Phebus, J. Smith, and B. Ioerger, Kansas State University, Manhattan, KS
- Lightning™: Introduction of a Machine-Side Rapid Hygiene Monitoring System – E. EHRENFELD, S. Miller, K. Barber, and C. Carpenter, IDEXX Labs, Westbrook, ME
- Evaluation of Microbial Swabs for Releasing HCMC and Their Viability on Ice Using 3M™ Petrifilm™ – C. FERNANDES, G. Flick, Jr., J. Silva, T. McCaskey, and A. Hood, Virginia Polytechnic Institute & State University, Blacksburg, VA
- A New Rapid Method for the Detection of *Escherichia coli* O157 in Raw Meat – R. FIRSTENBERG-EDEN, M. Averill, S. Allen, and N. Sullivan, Difco Laboratories, Ann Arbor, MI
- The Use of a Single Tablet for Delivery of Critical Reagents to a Polymerase Chain Reaction – G. TICE, O. Rubino, and R. Jackson, DuPont, Wilmington, DE
- A Membrane-lift Method for Rapid Detection of *Escherichia coli* O157:H7 Contaminating Chicken Carcasses – H. TSAI and M. Slavik, University of Arkansas, Fayetteville, AR
- Detection of *Escherichia coli* O157:H7 in Foods by Multiplex PCR – P. FRATAMICO and M. Deng, USDA-ARS, ERRC, Philadelphia, PA
- Determination of Trace Elements in Muscle, Liver & Kidney from Pork Produced in Sonora, Mexico – L. GARCIA-RICO, M. Jara-Marini, and L. Vazquez-Moreno, CIAD, A. C., Hermosiollo, Sonora, Mexico
- Evaluation of a Rapid Screening Kit for the Detection of *Escherichia coli* O157:H7 in Foods – J. GEBLER, and C. Chambers, Murray Goulburn Co-op Co., Yarram, Victoria, Australia
- Chemical and Mineral Analysis of Surimibased Seafood Products – Y. HUANG, A. Aal, and A. Awad, University of Georgia, Athens, GA
- Comparison of ISO-Grid™, DRBC, Petrifilm™, and PDA Pour Plate Methods for Enumerating Yeasts and Molds on Shredded Cheese – S. INGHAM and J. Ryu, University of Wisconsin-Madison, Madison, WI
- Use of Blue Lake as an Indicator of Bacterial Penetration into Eggs – J. KIM, M. Slavik, and J. Walker, University of Arkansas, Fayetteville, AR
- Rapid Estimation of Raw Milk Quality – W. LACHOWSKY, M. Griffiths, L. Harris,

J. Odumeru, and L. Szijarto, Ontario Ministry of Food & Agriculture, Guelph, Ontario, Canada

- Evaluation of a Miniaturized Microbial Inhibition Assay for Screening of Antimicrobial Residues in Animal Tissues – M. MITCHELL, J. Samoluk, and A. Yee, Ontario Ministry of Agriculture, Guelph, Ontario, Canada
- Comparison of Five Media for Enumeration of *Escherichia coli* O157:H7 – A. ORTA-RAMIREZ, J. Price, and J. Cherry-Merritt, Michigan State University, East Lansing, MI
- The Charm Alkaline Phosphatase Test: Rapid Bioluminescence Method for the Determination of Alkaline Phosphatase in Pasteurized Milk and Other Dairy Products – Collaborative Study – G. RUTH, and E. Zomer, Charm Sciences, Inc., Malden, MA
- Charm Cloxacillin Antibody Performance Validated for Bulk Tank Milk – R. SALTER, P. Donahue, J. Cunningham, and S. Charm, Charm Sciences, Inc., Malden, MA
- A New Rapid Method for Detection & Enumeration of *Listeria monocytogenes* in Food Samples – L. SHELEF and G. Eden, Wayne State University, Detroit, MI
- Validation of Predictive Mathematical Models to Demonstrate Applicability to Foods – I. WALLS, V. Scott, and D. Bernard, National Food Processors Association, Washington, DC
- Detection by PCR of *Campylobacter jejuni* in Contaminated Chicken Products – D. WINTERS, A. O'Leary, X. Wang, and M. Slavik, University of Arkansas, Fayetteville, AR
- E*Colite, The New Standard in Monitoring Coliforms & *Escherichia coli* Contamination in Water – E. ZOMER and R. Lifshitz, Charm Sciences, Inc., Malden, MA
- Detection of *Salmonella* in Foods by Transduction of Ice Nucleation Genes – P. WOLBER and R. Green, Idetek, Inc., Sunnyvale, CA

Tuesday, August 1, 1995 – Afternoon

General Session — Equivalency of Inspection — Impact of NAFTA and GATT

1:30 Equivalency of Inspection – Practical Realities in the Real World – I. KIRK, Agriculture and Agrifood Canada, Guelph, Ontario, Canada

2:00 The European Perspective on Equilibrating International Meat and Poultry Inspection Systems – L. PEDROSO, Fricarnes, S.A., Portugal

Wednesday, August 2, 1995 — Morning

Current Issues in Food Services: A Practical Symposium — Part 1

8:30 Food Code – A Practical Approach – E. JULIAN, Rhode Island Department of Health, Providence, RI

9:00 Food Service Plan Review – Standardization for Efficiency – F. PETERSEN, City of Stamford, Stamford, CT

9:30 Integrated Pest Management (IPM) in Food Facilities – R. GARDNER, Cornell University, Ithaca, NY

10:00 Break

10:20 Equipment Cleaning and Sanitization – C. PARKER, Ecco Lab., Inc., Mendota Heights, MN

10:50 Overcoming the "All or Nothing Approach" to HACCP Implementation at the Retail Level – J. MARCELLO, The Educational Foundation of the National Restaurant Association, Chicago, IL

Fresh-Cut Packaged Vegetables

8:30 Fresh Produce Processing – A Global Industry Perspective – K. OLSON, Dole Foods, San Jose, CA

8:55 The Effect of Farm Management Practices on the Microbial Condition of Fresh Minimally-Processed Vegetables – Speaker to be announced

9:20 Fresh Produce Processing – Retail Industry Perspective – Speaker to be announced

9:45 Factors Important in Determining Shelf Life of Minimally-Processed Vegetables – Speaker to be announced

10:10 Break

10:30 What's New in Modified-Atmosphere Packaging of Fresh Cut Packaged Vegetables – D. ZAGORY, Postharvest Technology Consultants, Davis, CA

10:55 Presence and Public Health Implications of Food-borne Pathogens on Minimally-Processed Packaged Vegetables – J. FARBER, Health Canada, Ottawa, Ontario, Canada

11:20 Present and Emerging Control Measures for Minimally-Processed Packaged Vegetables – L. BEUCHAT, University of Georgia, Griffin, GA

Alternative Processing Strategies for Pasteurization of Foods

8:30 Radurization – The Pasteurization of Foods by Ionizing Radiation – J. DICKSON, Iowa State University, Ames, IA

9:00 High Pressure Processing as an Intervention Strategy for Food Safety – E. MURANO, Iowa State University, Ames, IA

9:30 Chemical Treatments for Decontamination of Poultry – A. WALDRUP, University of Arkansas, Fayetteville, AR

10:00 Break

10:20 Electrical Properties of Foods and the Application of High Voltage Pulsed Electric Fields Technology – H. ZHANG, The Ohio State University, Columbus, OH

10:50 Oscillating Magnetic Field Stabilization of Foods – B. SWANSON, Washington State University, Pullman, WA

11:20 Product Development Considerations for Ohmic Processing – P. SWEARINGEN, Land O'Lakes, Arden Hills, MN

New Emerging Food-borne Disease Agents — Are They for Real?

8:30 The *Campylobacter* Family *(Arcobacter, Campylobacter, and Helicobacter)* – R. GRAVANI, Cornell University, Ithaca, NY

9:00 The Mycobacteria Group (*Mycobacterium Avium, Paratuberculosis and Tuberculosis*) – A. LAMMERDING, Agriculture Canada, Guelph, Ontario, Canada

9:30 New Issues in Food and Environmental Virology – D. CLIVER, University of Wisconsin-Madison, Madison, WI

10:00 Break

10:20 Food and Waterborne Parasites in the 90's – D. JURANEK, CDC, Atlanta, GA

10:50 What's new in Food-borne Diease Around the World – E. TODD, Health Canada, Ottawa, Ontario, Canada, and M. POTTER, CDC, Atlanta, GA

Wednesday, August 2, 1995 — Afternoon

Current Issues in Food Services
A Practical Symposium — Part 2

1:30 Current Food-borne Pathogen: *Escherichia coli* O157:H7 – A Current Review – J. SCHRADE, FDA, Brooklyn, NY

2:00 Communicable Diseases - Bare Hand Contact With Food "Why Isn't Hand Washing Good Enough?" – J. GUZEWICH, New York State Department of Health, Albany, NY

2:30 Microbiological Concerns with Vacuum Packaging – E. RHODEHAMEL and L. Jackson, FDA, Washington, DC

3:00 Break

3:20 OSHA in the Foodservice Industry – R. HARRINGTON, National Restaurant Assciation, Washington, DC

Seafood Symposium

1:30 Update on Seafood HACCP and Current Regulations – Speaker to be announced

2:00 HACCP Training for Seafood Processors – G. FLICK, Virginia Polytech Institute University, Blacksburg, VA

2:30 Microbiological Seafood Safety: What's New – C. HACKNEY, Virginia Polytech Institute University, Blacksburg, VA

3:00 Break

3:20 The Seafood Hotline: What Questions Do Consumers Ask? – R. WELCH, FDA, RFPD, Washington, DC

3:50 The Safety of Mail Order Seafood – T. SCHWARZ, FDA, Washington, DC

ILSI N.A. — Sponsored Research Update

1:30 Use of Carrot Extract to Control *Listeria monocytogenes* – L. BEUCHAT, R. Brackett, M. Doyle, University of Georgia, Griffin, GA

1:50 A Reduced-Time Procedure for Detecting Heat-Injured *Listeria monocytogenes* in Foods – M. DOYLE, J. Patel, C. Hwang, L. Beuchat, R. Brackett, University of Georgia, Griffin, GA

2:10 Establishment of a Bovine Surveillance Program for *Escherichia coli* O157:H7 in Washington State – D. HANCOCK, Washington State University, Pullman, WA

2:30 Lipid Compounds as Novel Barriers for Control of *Listeria monocytogenes* – E. JOHNSON, University of Wisconsin, Madison, WI

2:50 Break

3:10 Application of Novel Bacteriocins as Biocontrol Agents Towards *Listeria monocytogenes* in Foods: Properties and Inhibitory Effectiveness – P. MURIANA, Purdue University, West Lafayette, IN

3:30 Evaluation of Penicillin-binding Proteins for Subtyping *Listeria monocytogenes* and Examination of Current Trends in Antimicrobial Resistance in Clinical and Food Isolates – – M. REEVES and D. Rheinhardt, CDC, Atlanta, GA

3:50 Insertion Sequence Finger-Printing: A New Subtyping System for *Escherichia coli* O157:H7 Strains – T. WHITTAM, The Pennsylvania State University, University Park, PA

4:10 Discussion

The Workshops

Workshop 1 — Applications and Development of Microbiological Criteria for Foods

Workshop Instructors

John H. Silliker
Russell S. Flowers

Fees

Member: $375; After June 30, 1995: $405
Non-member: $440; After June 30, 1995: $470

Workshop Agenda

Saturday, July 29, 1995
8:00 am - 5:00 pm

Sunday, July 30, 1995
8:30 am - 12:00 pm

Workshop Overview

The workshop begins with a series of presentations relating to various aspects of microbiological criteria. Each of these will be approximately 45 minutes in length, with 15 minutes allowed for questions and discussion following the formal presentation. The topics are as follows:

1. **Introduction to Microbiological Criteria:** This will include a definition of microbiological criterion with a definition of its elements. The various types of criteria will be delineated. The relationship between risk, product use and sampling plan will be discussed.

2. **Attributes vs. Variables—Sampling Plans:** This will include a description of the two types of sampling plans. Consideration will be given as to purpose, i.e., whether for regulatory or process control, raw material evaluation, in-process control or finished product analysis. Under what circumstances are variables, plans and attributes most appropriate?

3. **Development of Indicator and Utility Criteria:** Under what circumstances are tests for indicator organisms useful in monitoring processing effectiveness? To what degree do tests for indicator organisms give reliable information relative to produce safety, e.g., as substitute for direct tests for pathogens? What types of criteria may be used to access the utility of a finished product or raw material for a particular purpose, e.g., the analysis of starch for thermophilic spores, the testing of beds from which shellfish are harvested for fecal coliforms? How are the criteria for these purposes developed?

4. **Development of Microbiological Criteria for Pathogens:** Where are criteria involving direct tests for pathogens warranted, e.g., the testing of raw materials and finished product for salmonellae using the sampling plans recommended by the Committee on *Salmonella* of the National Research Council? Under what circumstances are their use probably not cost effective, e.g., the routine testing meat for *Escherichia coli* O157:H7? How are such criteria developed?

5. **The Relationship of Microbiological Criteria to GMPs and HACCP:** To what extent are criteria useful in accessing conformance to GMPs? What are the limitations of criteria for this purpose? How are such criteria developed? To what extent are microbiological criteria useful in the development of HACCP programs? Where are they useful in monitoring CCPs? What role do they play in verification?

Following the above presentations, the participants will be divided into working groups, one of the presenters being assigned to each group as a facilitator. Each of the groups will be given a flow sheet in connection with the steps involved in the manufacture of a particular product. The groups will study the process and determine where criteria are appropriate. They will determine how the criteria would be developed and how applied.

The work groups will be assembled with the class as a whole. A member of each group will then present to the class the results of its deliberations, including justification for its findings.

Each participant will receive a workbook with detailed outlines of the presentations, copies of overheads presented, and references to pertinent reading material.

The workshop will conclude with a short wrap-up session.

About the Instructors

Dr. John H. Silliker is the founder of Silliker Laboratories Group, Inc., one of the nation's leading independent food testing and consulting laboratories, and a widely respected food industry consultant.

In a food science career spanning five decades, Dr. Silliker has made valuable contributions to the food industry as an educator, researcher, writer, and private entrepreneur. Prior to founding Silliker Laboratories in 1961, he served as Chief Microbiologist and Associate Director of Research for Swift & Company in Chicago, IL. During the early 1960s, Dr. Silliker gained national and international acclaim for his groundbreaking research studies on *Salmonella*.

Dr. Russell S. Flowers is president of Silliker Laboratories Group, Inc., and a leading researcher, lecturer, and writer on the development of rapid methods for the detection of food-borne pathogens.

Dr. Flowers received his Ph.D. in food science and microbiology from the University of Illinois and joined the Silliker organization in 1979. Prior to joining Silliker Laboratories, he served as an Assistant Professor of Microbiology at the University of Arizona. Dr. Flowers has authored or co-authored over 30 scientific refereed research articles, presented over 100 seminars and scientific presentations to professional associations, and participated in a number of collaborative studies.

Workshop 2 — Microbial Food Safety Risk Assessment Workshop

Workshop Agenda

Saturday, July 29, 1995
8:00 am - 5:00 pm

Fees

Member: $180; After June 30, 1995: $210
Non-Member: $245; After June 30, 1995: $275

Workshop Instructors

Charles N. Haas
Christopher Crockett
Anna M. Lammerding

The application of risk assessment principles in microbial food safety provides a systematic, objective framework for the compilation and evaluation of data to describe and quantify the risks associated with foods and food manufacturing processes.

Risk assessment is an applied discipline based on scientific principles, and a new approach in microbial food safety. The process can facilitate consistent and uniform decisions on the safety of foods in determining optimal intervention strategies, establishing critical control points in a HACCP Program, and defining priorities for resource allocation. Microbial risk assessment is needed to achieve the goals of the Codex Alimentarius Commission and international food trade agreements.

This workshop will present an overview of the risk analysis process, encompassing risk assessment, risk management, and risk communication, and introduce participants to the elements of risk assessment: hazard identification, dose-response assessment, exposure assessment, and risk characterization. Topics will include: a description of dose-response models and curves and how to use them; an introduction to the Maximum Likelihood Estimation method: identifying and understanding sources of uncertainty and variability in data sets and quantitative microbial risk assessment models; techniques of pooling and separating data to evaluate statistical differences within and between data sets; growth modeling applications; the use of Monte Carlo analysis to integrate uncertainty of multiple inputs in dose-response and exposure estimates. Supporting computer programs will be demonstrated, and case studies of waterborne and food-borne outbreaks presented for discussion. Participants will be provided with a comprehensive workshop manual.

About the Instructors

Charles N. Haas is LD Betz Professor of Environmental Engineering at Drexel University. He received his BS and MS degrees at Illinois Institute of Technology and his Ph.D. at the University of Illinois at Urbana-Champaign. He has been involved in quantitative microbial risk assessment work since 1982, and also has interests in water and waste treatment and disinfection.

Christopher Crockett received his M.S. at Drexel University, and is currently an Assistant Engineer for McLaren Hart Environmental Engineering ChemRisk Division in Warren, NJ. He also received his B.S. from Drexel University. His graduate research emphasized microbial occurrence and risk in water and food, including fitting, development and verification of dose-response models.

Anna M. Lammerding is Chief, Food Safety Risk Assessment (FSRA) Unit, Agriculture and Agri-Food Canada (AAFC). She received her B.Sc. and M.S. at the University of Guelph, and her Ph.D. at the University of Wisconsin-Madison.

82nd IAMFES Annual Meeting Spouse/Companion

Tours and Special Events

A Day of Discovery
Monday, July 31 - 9:00 a.m. — 3:00 p.m.
Cost: $30 ($35 on-site) Lunch on your own

Our tour begins atop Mt. Washington, where the spectacular view of the whole Pittsburgh scene unfolds, a view that prompted Frank Lloyd Wright to call this the world's most beautiful setting for a city. Tourgoers may ride down the hill in an incline, a veritable museum on wheels, and be picked up by the coach at the base.

The Strip, center of the wholesale produce market in Pittsburgh, offers a true potpourri of scents, sights, and sounds. The Society for Art in Crafts, recently moved to The Strip, exhibits an international array of crafts in clay, fiber, metal, wood and a variety of other materials, all created since 1985.

The North Side of Pittsburgh was originally platted as Depreciation Land Grant settlement. Later, in 1848, a group of streets was laid out and named to commemorate battles and personalities of the Mexican War of 1846...Taylor, Resaca, Palo Alto, Buena Vista, Monterey, Sherman and the like. Known as the MEXICAN WAR STREETS, the area was a pleasant, middle-class, residential area with distinctive row-like homes reflecting Italienate, Second Empire, Queen Anne, Richardsonian Romanesque and other Victorian architectural styles. A major decline within the area was reversed in the 1960s to the point that this intriguing neighborhood was placed on the National Register of Historic Places by 1975.

Before returning to the Hilton, one further stop is made: at THE AVIARY, the world's largest birdhouse, where free flying feathered friends in brilliant hues present a dazzling display. Now, whoever said Pittsburgh was for the birds is proven to be correct!

Amish Country
Tuesday, August 1 - 9:00 a.m. - 5:00 p.m.
Cost: $30 ($35 on-site) Lunch on your own

The Amish is one of the most distinctive societies in America today. In 1693 Jacob Amman, their founder, brought these gentle people to this country from Switzerland. By the mid-18th century, hundreds had settled in Pennsylvania. The rolling countryside of this area of the state attracted the Amish with its fertile land. They befriended the Lenape Indians who had long ago settled here, and today you can witness their still-thriving existence.

This visit among the Amish includes shopping at an Amish home where quilts made by the Amish from as far away as Wisconsin are displayed to tempt the discriminating buyer. In nearby Volant, a 19th Century mill now serves as a country store containing toys, gifts, Amish quilts and furniture sharing space with old mill machinery. In addition to the mill there are over 80 shops and small restaurants that will meet anyone's needs.

Five miles south, the holidays come early at the Country House Christmas Shop, a restored Victorian home brimming with enough ornaments, gifts and decorations to make one forget December is several months away. A cool drink is served on the return trip to Pittsburgh.

A Day at the Carnegie & Station Square
Wednesday, August 2 - 9:00 a.m. - 3:00 p.m.
Cost: $30 ($35 on-site) Lunch on your own

Andrew Carnegie's gift to the people of Pittsburgh, THE CARNEGIE, houses four cultural centers under one roof. The MUSEUM OF ART is highly regarded for its permanent collection ranging from the old masters to the contemporary, with a fine representation of The Impressionists. A specially-arranged one hour tour, conducted by a trained museum docent, gives insight and enhancement to the fabulous works of renowned artistic masters. With time to explore on one's own (one-half hour) following the tour, a wealth of treasures await at The Carnegie. The Hillman Hall of Minerals and Gems displays over 2000 dazzling specimens and the world famous dinosaur collection is but a short walk away.

Then it's All Aboard for STATION SQUARE, the lively riverfront restoration of the former P. & L.E. Railroad, now a complex of exciting shops, boutiques, historic memorabilia and fine restaurants.

Following this delightful respite, guests will enjoy shopping on their own in the Freight House Shops before returning to the Hilton.

Children's Activity Room
July 31 - August 2 - 8:30 a.m. - 4:00 p.m.
Cost: Free

A children's activity room will be available for children ages 4 - 12. The children's room will consist of adult supervision and structured activities.

Monday Night Social Event
An Ethnic Evening on the Three Rivers
July 31 - 6:00 p.m. - Cruise until 10:30 p.m.
Cost: $45 ($50 on-site)

The ethnic variety of Pittsburgh's people contributes to its cultural richness. Influenced by the more than seventy distinct nationality groups that have claimed Pittsburgh as their home, an unforgettable dinner cruise has been created to combine the music and food representing a selection of the countries that have so enhanced this area.

At the Hilton, we will escort you through Point State Park to board the magnificent sternwheeler, the Gateway Clipper Fleet's Party Liner. Pittsburgh's three rivers set the stage for an unforgettable event, as the evening sun, glistening on the waters and reflecting on the majestic buildings of this vital city, creates a rare backdrop for this festive evening.

Following dinner, guests will be entertained by Don Brockett's Company, an action packed frolicking family variety show that everyone is sure to enjoy?

The evening draws to a close as guests view the spectacular evening lights of the city and are returned to Point State Park for the guided walk back to the Hilton.

Traditional IAMFES Gatherings
Ivan Parkin Lectureship
Sunday, July 30 - 7:00 p.m.

Followed by the Cheese and Wine Reception for the Opening of the Education Exhibits. An opportunity to greet old friends, make new ones and view the excellent technical displays.

IAMFES Annual Awards Reception and Banquet Wednesday, August 2
Reception: 6:00 p.m. Banquet: 7:00 p.m.
Cost: $30 ($35 on-site)

IAMFES Kids Pizza Banquet
Wednesday, August 2 - 6:30 p.m. - 9:30 p.m.
Cost: $15 ($20 on-site)

Adult supervised for children ages 4 and up. Pizza, pop and activities will be provided.

82nd IAMFES Annual Meeting Registration Form

Hilton Hotel & Towers — Pittsburgh, PA — July 30 - August 2, 1995
(Use photocopies for extra registrations)

FOR OFFICE USE
Date Rec'd. ______ First initial ______ Last name
Registration # ______

First Name (will appear on badge) **(please print)** **Last Name**

Title **Employer**

Mailing Address (Please specify: Home or Work)

City **State** **Country** **Postal/Zip Code**

Telephone # ( ) **Fax #** ( )

Please check where applicable:

- ___ IAMFES Member
- ___ Non-Member
- ___ Local Arrangements
- ___ 30 Yr. Member
- ___ 50 Yr. Member
- ___ Past President
- ___ Executive Board
- ___ Speaker
- ___ Honorary Life Member
- ___ Exhibitor
- ___ IAMFES Sustaining Member
- ___ IAMFES Program Advisory Committee

Credit Card payments may be sent via Fax today!
515-276-8655

Sign up to become a NEW member
and take advantage of the member discount.

REGISTRATION:	**MEMBERS**	**NON-MEMBERS**	**AMOUNT**
Registration (Banquet included)	$170 ($205 on-site)	$250 ($285 on-site)	______
Student Member	$ 20 ($ 25 on-site)	Not Available	______
One Day Registration (Circle: Mon/Tues/Wed)	$ 90 ($110 on-site)	$120 ($140 on-site)	______
Spouse/Companion (Name): ______	$ 25 ($ 25 on-site)	$ 25 ($ 25 on-site)	______
Children (14 & Under), Name: ______	FREE	FREE	______

NEW MEMBERSHIP FEES:			
Membership with *Dairy, Food & Environmental Sanitation*	$ 60		______
Membership with *Dairy, Food & Env. Sanitation* & *Journal of Food Protection*	$ 90		______
•Student Membership ❑ *Dairy, Food & Env. San.* or ❑ *Journal of Food Protection*	$ 30		______
•Student Membership with *Dairy, Food & Env. San.* & *Journal of Food Protection*	$ 45		______
•Full-time student verification required.			
SHIPPING CHARGES: OUTSIDE THE U.S. - SURFACE RATE	$ 22.50 per journal		______
AIRMAIL	$ 95.00 per journal		______

OTHER FEES:	**PER PERSON**		
Cheese and Wine Reception (Sun., 7/30)	FREE	______	______
An Ethnic Evening on the Three Rivers (Mon., 7/31)	$ 45 ($ 50 on-site)	______	______
IAMFES Awards Banquet (Wed., 8/2)	$ 30 ($ 35 on-site)	______	______
Children's Banquet (Wed., 8/2)	$ 15 ($ 20 on-site)	______	______

SPOUSE/COMPANION EVENTS:	**PER PERSON**		
A Day of Discovery (Mon., 7/31)	$ 30 ($ 35 on-site)	______	______
Amish Country (Tues., 8/1)	$ 30 ($ 35 on-site)	______	______
A Day at the Carnegie & Station Square (Wed., 8/2)	$ 30 ($ 35 on-site)	______	______

❑ Please indicate here if you have a disability requiring special accommodations.

Credit Card Payments: Please Circle: VISA/MASTERCARD/AMERICAN EXPRESS

Card # ______ Exp. Date ______

Name on Card ______ Signature ______

Total Amount Enclosed $______
U.S. FUNDS DRAWN ON U.S. BANK

Registration Information

Send payment with registration to IAMFES, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2838. Make checks payable to IAMFES. Pre-registration must be post-marked by June 30, 1995. The pre-registration deadline will be strictly observed. For additional information contact Julie Heim at 1-800-369-6337.

Refund/Cancellation Policy

The IAMFES policy on refunds and/or cancellations is as follows: Registration fees, minus a $35 processing fee, will be refunded for written cancellations post-marked by July 15, 1995. No refunds will be made for cancellations post-marked after July 15, 1995, however, the registration may be transferred to a colleague with written notification to IAMFES.

Exhibitor Information

An exhibition of products and consulting services will be at Hilton Hotel & Towers. For more information on exhibiting the conference, please contact Rick McAtee at 1-800-369-63

1995 IAMFES Workshops
· Registration Form ·

☐ **WORKSHOP 1: Applications and Development of Microbiological Criteria for Foods**
Hilton Hotel and Towers, Pittsburgh, PA — Saturday, July 29, and Sunday July 30, 1995

First Name (will appear on badge) PLEASE PRINT Last Name

Title Employer

City State/Province ZIP/Postal Code

Area Code & Telephone # FAX #

Charge Card Payments: VISA • MASTERCARD • AMERICAN EXPRESS

Account #: __________

Name on Card: __________

Expiration Date: __________

Signature: __________

For further information, please contact IAMFES at (800) 369-6337 (U.S. and Canada), (515) 276-3344, FAX (515) 276-8655.

☐ **WORKSHOP 2: Microbial Food Safety Risk Assessment Workshop**
Hilton Hotel and Towers, Pittsburgh, PA — Saturday, July 29, 1995

First Name (will appear on badge) PLEASE PRINT Last Name

Title Employer

City State/Province ZIP/Postal Code

Area Code & Telephone # FAX #

Charge Card Payments: VISA • MASTERCARD • AMERICAN EXPRESS

Account #: __________

Name on Card: __________

Expiration Date: __________

Signature: __________

Refund/Cancellation Policy

The IAMFES policy on refunds and/or cancellations is as follows: Registration fees, minus a $35 processing fee, will be refunded for written cancellations post-marked by July 15, 1995. **No refunds will be made for cancellations post-marked after July 15, 1995**, however, the registration may be transferred to a colleague with written notification to IAMFES.

• REGISTRATION •

WORKSHOP 1: Applications and Development of Microbiological Criteria for Foods

	Before 6/30/95	After 6/30/95
IAMFES Member	$375	$405
Non-Member	$440	$470

WORKSHOP 2: Microbial Food Safety Risk Assessment Workshop

	Before 6/30/95	After 6/30/95
IAMFES Member	$180	$210
Non-Member	$245	$275

NOTE: IAMFES reserves the right to cancel workshops if minimum enrollment is not met by **June 30, 1995.**

TOTAL AMOUNT ENCLOSED: $
(U.S. Funds on U.S. Bank)

HOTEL RESERVATIONS
IAMFES

82nd Annual Meeting
July 30-August 2, 1995
Hilton Hotel & Towers
Pittsburgh, PA

Guest Room Commitment
GOOD UNTIL JUNE 30, 1995
Make Your Reservation Now

IAMFES
82ND ANNUAL MEETING
PITTSBURGH, PENNSYLVANIA
JULY 30 - AUGUST 2, 1995

Please check accommodation requested:

- ❑ Single (1 person)
- ❑ Double (2 persons)
- ❑ Triple (3 persons)
- ❑ Quad (4 persons)

Bed type:

- ❑ King Bed
- ❑ 2 Queen Beds

Special Requests ____________________

❑ Please indicate here if you have a disability requiring special accommodations.
All room rates are subject to prevailing taxes.
Reservations must be received by hotel prior to arrival.

NAME ____________________

SHARING WITH (Name) ____________________

COMPANY NAME ____________________

ADDRESS ____________________

____________________ CITY __________

STATE/PROVINCE __________ COUNTRY __________ ZIP __________

TELEPHONE ____________________

ARRIVAL DATE __________ (Check-In Time is after 3 p.m.) DEPARTURE DATE __________ (Check-out Time is 12 p.m.)

SPECIAL REQUESTS ____________________

After June 30, 1995 reservations will be accepted on a space availability basis only. Reservations will be held until 6:00 p.m. on the date of arrival, unless guaranteed by one night advance deposit, payable by certified check or a Major Credit Card.

CREDIT CARD # __________ CREDIT CARD __________

EXPIRATION DATE ____________________

CARD HOLDERS SIGNATURE ____________________

SPECIAL ROOM RATES for this convention:
$99 per night, plus tax
Single, Double, Triple or Quad Occupancy

For Reservations Call:1(800) Hiltons or (412)391-4600
Or FAX: (412)594-5161

MAIL DIRECTLY TO:

HILTON HOTEL
& TOWERS
C/O RESERVATIONS
GATEWAY CENTER
PITTSBURGH, PA 15222

IAMFES Offers the Dairy Practices Council
"Guidelines for the Dairy Industry"

IAMFES has agreed with the Dairy Practice Council to distribute their *"Guidelines for the Dairy Industry."* DPC is a non-profit organization of education, industry and regulatory personnel concerned with milk quality and sanitation throughout 15 north-eastern/mid-Atlantic states. However, its membership and subscriber rosters list individuals and organizations throughout the United States, Canada and Japan.

For the past 25 years, DPC's primary mission has been the development and distribution of educational guidelines directed to proper and improved sanitation practices in the production, processing, and distribution of high quality fluid milk and manufactured dairy products.

The DPC Guidelines are written by professionals who comprise five permanent Task Forces. Prior to distribution, every Guideline is submitted for approval to the key milk control sanitarian in each of the 15 states which are now active participants in the DPC process. Should any official have an exception to a section of a proposed guideline, that exception is noted in the final document.

The Guidelines are renown for their common sense and useful approach to proper and improved sanitation practices. We think that they will be a valuable addition to your professional reading library.

The entire set consists of 48 guidelines including:

1 Dairy Cow Free Stall Housing
2 Effective Installation, Cleaning and Sanitizing of Milking Systems
3 Selected Personnel in Milk Sanitation
7 Sampling Fluid Milk
8 NE Ext. Publ., Conferences, Short Courses, Correspondence Courses and Visual Aids in Dairying
9 Fundamentals of Cleaning and Sanitizing Farm Milk Handling Equipment
10 Fluid Milk Shelf-Life
11 Sediment Testing and Producing Clean Milk
13 Environmental Air Control & Quality for Dairy Food Plants
14 Clean Room Technology
16 Handling Dairy Products From Processing to Consumption
17 Causes of Added Water in Milk
18 Abnormal Milk--Fieldman's Approach
21 Raw Milk Quality Tests
22 Control of Antibacterial Drugs and Growth Inhibitors in Milk and Milk Products
23 Preventing Rancid Flavors in Milk
24 Troubleshooting High Bacteria Counts of Raw Milk
25 Cleaning and Sanitizing Bulk Pickup and Transport Tankers
28 Troubleshooting Residual Films on Dairy Farm Milk Handling Equipment
29 Cleaning and Sanitizing in Fluid Milk Processing Plants
30 Potable Water on Dairy Farms
31 Composition and Nutritive Value of Dairy Products
32 Fat Test Variations in Raw Milk
33 Brucellosis and Some Other Milkborne Diseases
34 Butterfat Determinations of Various Dairy Products
35 Dairy Plant Waste Management
36 Dairy Farm Inspection
37 Planning Dairy Stall Barns
38 Preventing Off-flavors in Milk
39 Grade A Fluid Milk Plant Inspection
40 Controlling Fluid Milk Volume and Fat Losses
41 Milkrooms and Bulk Tank Installation
42 Stray Voltage on Dairy Farms
43 Farm Tank Calibrating and Checking
44 Troubleshooting Dairy Barn Ventilation Systems
45 Gravity Flow Gutters for Manure Removal in Milking Barns
46 Dairy Odor Control
47 Naturally Ventilated Dairy Cattle Housing
48 Cooling Milk on the Farm
49 Postmilking Teat Dips
50 Farm Bulk Milk Collection Procedures
51 Controlling the Accuracy of Electronic Testing Instruments for Milk Components
52 Emergency Action Plan for Outbreak of Milkborne Illness in the Northeast
53 Vitamin Fortification of Fluid Milk Products
54 Selection and Construction of Herringbone Milking Parlors
56 Dairy Product Safety (Relating to Pathogenic Bacteria)
57 Dairy Plant Sanitation
58 Sizing Dairy Farm Water Heater Systems

If purchased individually, the entire set would cost $174. We are offering the set, packaged in three loose leaf binders for $125 plus $9 shipping and handling (outside the U.S., $21 for shipping and handling).
Information on how to receive new and updated Guidelines will be included with your order.
To purchase this important source of information, complete the order form below and mail or FAX (515-276-8655) to IAMFES.

Please enclose $125 plus $9 shipping and handling for each set of Guidelines. Shipments outside the U.S. are $125 plus $21 shipping and handling.

Payment in U.S. $ drawn on a U.S. Bank or by credit card.

Name: ______________________ Phone No. ______________________
Company: ______________________
Street Address: ______________________
City, State/Province, Code: ______________________
VISA/MC/AE No.: ______________________ Exp. Date: ______________________

This is Your Personal Invitation to Join

The International Association of Milk, Food and Environmental Sanitarians, founded in 1911, is a non-profit educational association of food protection professionals. The IAMFES is dedicated to the education and service of its members, specifically, as well as industry personnel in general. Through membership in the Association, IAMFES members are able to keep informed of the latest scientific, technical and practical developments in food protection. IAMFES provides its members with an information network and forum for professional improvement through its two scientific journals, educational annual meeting and interaction with other food safety professionals.

Who are IAMFES Members?

The Association is comprised of a diverse membership of over 3,500 from 75 nations. IAMFES members belong to all facets of the food protection arena. The main groups of Association members fall into three categories: Industry Personnel, Government Officials and Academia.

Why are They IAMFES Members?

The diversity of its membership indicates that IAMFES has something to offer everyone involved in food protection and public health.

Your Benefits as an IAMFES Member

Dairy, Food and Environmental Sanitation — Published monthly, this is the official journal of IAMFES. Its purpose is the disseminating of current information of interest to the general IAMFES membership. Each issue contains three to five informational applied research or general interest articles, industry news and events, association news, columns on food safety and environmental hazards to health, a food and dairy industry related products section, and a calendar of upcoming meetings, seminars and workshops. All regular IAMFES members receive this publication as part of their membership.

Journal of Food Protection — A refereed monthly publication of scientific research and authoritative review articles. Each issue contains 12 to 15 technical research manuscripts and one to five articles reporting a wide variety of microbiological research pertaining to food safety and quality. The *Journal of Food Protection* is internationally recognized as the leading publication in the food and dairy microbiology field. This journal is available to all individuals with the Member *Plus* option.

The IAMFES Annual Meeting — Held in a different city each year, the IAMFES Annual Meeting is a unique educational event. Three days of technical sessions, scientific symposia and commercial exhibits provide members and other industry personnel with over 200 presentations on the most current topics in food protection. It offers the opportunity to discuss new technologies and innovations with leading authorities in various fields concerned with food safety. IAMFES members receive a substantially reduced registration fee.

To Find Out More...

To learn more about IAMFES and the **many** other benefits and opportunities available to you as a member, please call (515) 276-3344.

"The mission of IAMFES is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply"

MEMBERSHIP APPLICATION

IAMFES
INDUSTRY GOVERNMENT EDUCATION RESEARCH

International Association of Milk, Food and Environmental Sanitarians

6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2838 • (515) 276-3344 OR (800) 369-6337

MEMBERSHIP

☐ Membership with JFP and DFES $90
(12 issues of the *Journal of Food Protection* and *Dairy, Food and Environmental Sanitation*) ◀ **BEST VALUE**

☐ Membership with DFES $60
(12 issues of *Dairy, Food and Environmental Sanitation*)

☐ Check here if you are interested in information on joining your state/province chapter of IAMFES

SUSTAINING MEMBERSHIP

☐ Membership with BOTH journals $450
(Includes exhibit discount, July advertising discount, company monthly listing in both journals and more)

STUDENT MEMBERSHIP

☐ Membership PLUS including both journals $45

☐ Membership with *Journal of Food Protection* $30

☐ Membership with *Dairy, Food and Environmental Sanitation* $30

***FULL-TIME** STUDENT VERIFICATION MUST ACCOMPANY THIS FORM

Shipping Charges: Outside U.S. ______ Surface ($22.50 per journal) ______ AIRMAIL ($95.00 per journal)

PRINT OR TYPE...ALL AREAS MUST BE COMPLETED IN ORDER TO BE PROCESSED

Name______________________ Company Name______________________

Job Title______________________ Office Phone #______________________

Address______________________ FAX #______________________

City__________ State/Province__________ Country__________ Postal Code__________

Membership: ___ New ___ Renewal

Mail Entire Form to:
IAMFES
6200 Aurora Ave, Suite 200W
Des Moines, IA 50322-2838
USA

OR Use Your Charge Card:
(800) 369-6337 (U.S. & Canada)
(515) 276-3344
FAX (515) 276-8655

_____ Check or Money Order
_____ Master Card
_____ VISA
_____ American Express

U.S. FUNDS on U.S. BANK

Card #______________________

Exp. Date______________________

Signature______________________

International Association of Milk, Food and Environmental Sanitarians, Inc.

IAMFES Booklets

Quantity		Total $
______	Procedures to Investigate Waterborne Illness $6.00 member or government; $9.00 non-member	______
______	Procedures to Investigate Foodborne Illness - 4th Edition $6.00 member or government; $9.00 non-member	______
______	Procedures to Investigate Arthropod-borne and Rodent-borne Illness $6.00 member or government; $9.00 non-member	______
______	Procedures to Implement the Hazard Analysis Critical Control Point System $6.00 member or government; $9.00 non-member	______
______	Pocket Guide To Dairy Sanitation $.50/member or government; $.75/non-member (minimum order of 10) ($2.50 shipping for each order of 10)	______

Multiple copies available at reduced prices.
Phone our order desk for pricing information on quantities of 25 or more.

Shipping/Handling
U.S. $2.00 for first item. $1.00 for each additional item
Outside U.S. $4.00 for first item. $1.00 for each additional item ______

Booklet Total ______

3-A Sanitary Standards

Quantity		Total $
______	Complete set 3-A Dairy Standards $48.00 member or government; $72.00 non-member	______
______	Complete set 3-A Dairy & Egg Standards $70.00 member or government; $105.00 non-member	______
______	3-A Egg Standards $40.00 member or government; $60.00 non-member	______
______	Five-year Update Service on 3-A Sanitary Standards 3-A Dairy & Egg Standards $62.00 member or government; $93.00 non-member	______

Shipping/Handling
U.S. $6.25 each item
Outside U.S. $10.25 each item ______
3-A Sanitary Standards Total ______

Total Order Amount ______

PRINT OR TYPE . . . ALL AREAS MUST BE COMPLETED IN ORDER TO BE PROCESSED

Name ______ FIRST MI LAST   Company Name ______

Job Title ______   Office Phone # ______

Address ______   FAX # ______

City ______   State/Province ______   Country ______   Postal Code ______

MAIL ENTIRE FORM TO:

IAMFES
6200 AURORA AVENUE, STE 200W
DES MOINES, IA 50322-2838

U.S. FUNDS on U.S. BANK

PAYMENT MUST BE ENCLOSED FOR ORDER TO BE PROCESSED

___ CHECK OR MONEY ORDER
___ MASTERCARD
___ VISA
___ AMERICAN EXPRESS   EXP. ______

OR USE YOUR CHARGE CARD
515-276-3344
800-369-6337 (US)
800-284-6336 (Canada)
FAX 515-276-8655

CARD # ______

YOUR SIGNATURE ______

For information on membership with IAMFES,
Circle #100 on this card. ▼

Reader Service Card — DFES May '95

Expires: July 31, 1995 (International expiration: October 31, 1995)

IAMFES

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

Mail or FAX to (515) 276-8655

Name ____________________ Title ____________

Company ____________________

Address ____________________

City ____________________ State/Prov. ____________

Country ____________ Zip/Postal Code ____________

Phone Number ____________________

100	115	130	145	161	175	190	205	220	235	250	265	280	295	310	325	340	355	370	385
101	116	131	146	162	176	191	206	221	236	251	266	281	296	311	326	341	356	371	386
102	117	132	147	163	177	192	207	222	237	252	267	282	297	312	327	342	357	372	387
103	118	133	148	164	178	193	208	223	238	253	268	283	298	313	328	343	358	373	388
104	119	134	149	165	179	194	209	224	239	254	269	284	299	314	329	344	359	374	389
105	120	135	150	166	180	195	210	225	240	255	270	285	300	315	330	345	360	375	390
106	121	136	151	167	181	196	211	226	241	256	271	286	301	316	331	346	361	376	391
107	122	137	152	168	182	197	212	227	242	257	272	287	302	317	332	347	362	377	392
108	123	138	153	169	183	198	213	228	243	258	273	288	303	318	333	348	363	378	393
109	124	139	154	170	184	199	214	229	244	259	274	289	304	319	334	349	364	379	394
110	125	140	155	171	185	200	215	230	245	260	275	290	305	320	335	350	365	380	395
111	126	141	156	172	186	201	216	231	246	261	276	291	306	321	336	351	366	381	396
112	127	142	157	172	187	202	217	232	247	262	277	292	307	322	337	352	367	382	397
113	128	143	158	173	188	203	218	233	248	263	278	293	308	323	338	353	368	383	398
114	129	144	160	174	189	204	219	234	249	264	279	294	309	324	339	354	369	384	399

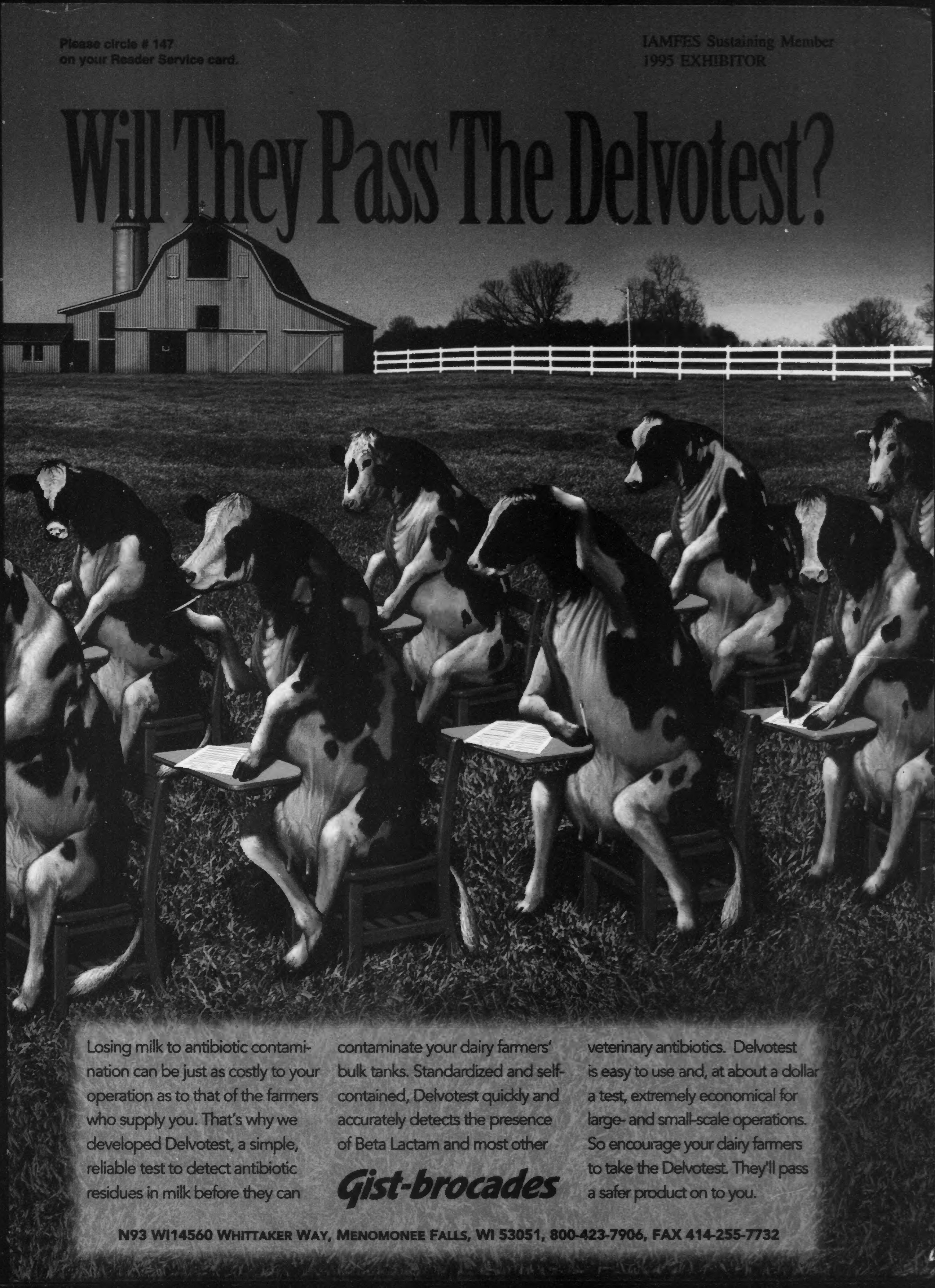
First
Class
Postage
Required

IAMFES

INDUSTRY GOVERNMENT EDUCATION RESEARCH

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

6200 Aurora Avenue, Suite 200 W
Des Moines, Iowa 50322-2838


Please circle # 147
on your Reader Service card.
IAMFES Sustaining Member
1995 EXHIBITOR
Will They Pass The Delvotest?
Losing milk to antibiotic contamination can be just as costly to your operation as to that of the farmers who supply you. That's why we developed Delvotest, a simple, reliable test to detect antibiotic residues in milk before they can contaminate your dairy farmers' bulk tanks. Standardized and self-contained, Delvotest quickly and accurately detects the presence of Beta Lactam and most other veterinary antibiotics. Delvotest is easy to use and, at about a dollar a test, extremely economical for large- and small-scale operations. So encourage your dairy farmers to take the Delvotest. They'll pass a safer product on to you.
Gist-brocades
N93 W14560 Whittaker Way, Menomonee Falls, WI 53051, 800-423-7906, FAX 414-255-7732