August 2008

Vol. 28, No. 8
ISSN:1541-9576
Periodicals
6200 Aurora Avenue • Suite 200W
Des Moines, Iowa 50322-2864, USA

Food Protection Trends

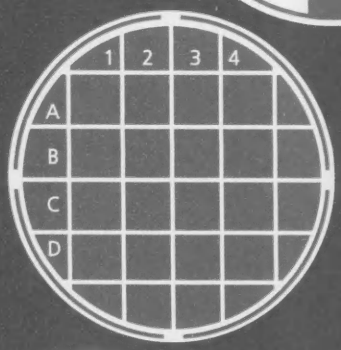
Science and News from the International Association for Food Protection

Hand Hygiene in the Food Industry

Food Safety Awareness

www.foodprotection.org

BD Diagnostics
Microbiology Media Solutions



Microbiology – It's what we do.

With over 100 years of experience in the development and manufacturing of peptones and microbiological culture media, BD Diagnostics is committed to providing you with the most highly responsive and technically relevant solutions, increasing operational efficiency, and elevating quality standards.

BBL™ and Difco™ Culture Media Brands provide you with:

- Consistency in quality
- Consistency in performance
- Assurance in meeting regulatory requirements

Find out what we can do for you. Visit us on the web at www.bd.com/ds or contact your local BD sales representative.

BD

Helping all people live healthy lives

BD Diagnostics
800.638.8663
www.bd.com/ds

ABOUT THE COVER...

Photo courtesy of Photo Researchers, Inc.

Use of the photos does not imply endorsement of any product by the International Association for Food Protection.

International Association for Food Protection.

FOOD PROTECTION TRENDS

VOLUME 28, NO. 7

ARTICLES

ASSOCIATION NEWS

DEPARTMENTS

EXTRAS

International Association for Food Protection®
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
Phone: 800.369.6337 • 515.276.3344
Fax: 515.276.8655
E-mail: info@foodprotection.org
Web site: www.foodprotection.org

FOOD PROTECTION TRENDS
SCIENCE AND NEWS FROM THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

Food Protection Trends (ISSN-1541-9576) is published monthly beginning with the January number by the International Association for Food Protection, 6200 Aurora Avenue, Suite 200W, Des Moines, Iowa 50322-2864, USA. Each volume comprises 12 numbers. Printed by Heuss Printing, Inc., 911 N. Second Street, Ames, Iowa 50010, USA. Periodical Postage paid at Des Moines, Iowa 50318 and additional entry offices.

Manuscripts: Correspondence regarding manuscripts should be addressed to Donna A. Bahun, Production Editor, International Association for Food Protection.

News Releases, Updates, Coming Events and Cover Photos: Correspondence for these materials should be sent to Donna A. Bahun, Production Editor, International Association for Food Protection.

"Instructions for Authors" may be obtained from our Web site at www.foodprotection.org or from Donna A. Bahun, Production Editor, International Association for Food Protection.

Orders for Reprints: All orders should be sent to *Food Protection Trends*, International Association for Food Protection. Note: Single copies of reprints are not available from this address; address single copy reprint requests to principal author.

Reprint Permission: Questions regarding permission to reprint any portion of ***Food Protection Trends*** should be addressed to: Donna A. Bahun, Production Editor, International Association for Food Protection.

Business Matters: Correspondence regarding business matters should be addressed to Lisa K. Hovey, Managing Editor, International Association for Food Protection.

Membership Dues: Membership in the Association is available to individuals. Dues are based on a 12 month period. *Food Protection Trends*, *Journal of Food Protection* and *JFP* Online are optional Member benefits. See the Membership form at the back of this issue for pricing information. Correspondence regarding changes of address and dues must be sent to Julie A. Cattanach, Membership Services, International Association for Food Protection

Sustaining Membership: Three levels of sustaining membership are available to organizations. For more information, contact Julie A. Cattanach, Membership Services, International Association for Food Protection.

Subscription Rates: ***Food Protection Trends*** is available by subscription for $248.00 US, $263.00 Canada/Mexico, and $278.00 International. Single issues are available for $26.00 US and $35.00 all other countries. All rates include shipping and handling. No cancellations accepted. For more information contact Julie A. Cattanach, Membership Services, International Association for Food Protection.

Claims: Notice of failure to receive copies must be reported within 30 days domestic, 90 days outside US.

Postmaster: Send address changes to ***Food Protection Trends,*** 6200 Aurora Avenue, Suite 200W, Des Moines, Iowa 50322-2864, USA.

Food Protection Trends is printed on paper that meets the requirements of ANSI/NISO 239.48-1992.

WTI INC.
WORLD TECHNOLOGY INGREDIENTS

281 Martin Luther King Jr. Ave - Jefferson, GA 30459-1447
800-827-1727 - ph 706-387-5150 - fax 706-387-5159
www.wtiinc.com

WTI – A World Leader in Food Safety and Functional Food Ingredients

World Technology Ingredients Company, Inc. (WTI, Inc) is a specialty ingredients company founded in 1978 to provide ingredients and technology to the meat, poultry and seafood industries. Since 1988, World Technology Ingredients has been issued 12 patents in ingredient and food process technology.

WTI manufactures dry and liquid ingredients for use by food manufacturers to enhance finished product performance and inhibit a broad range of bacteria, yeast and molds. All ingredients manufactured and sold by World Technology Ingredients are approved for use in USDA and FDA regulated products. All WTI ingredients are Generally Recognized As Safe (GRAS), nonallergenic and safe for direct contact.

WTI opened its new state of the art production facility in Jefferson, Georgia in December 2005 with additional capacity to do Custom Blending and Contract Packaging. The facility, carefully designed to exceed all Good Manufacturing Practices (GMP's) requirements received a SUPERIOR rating by the AIB on its very first inspection.

WTI is committed to providing safe, new and innovative solutions for its customers. Through leading edge research and technical initiatives, WTI is able to meet the needs of its customers, both large and small. Our goal is simple – to continuously identify and develop new ingredients/technology which provides our customers the tools to profitably succeed.

WTI Products Portfolio

World Technology Ingredients manufactures five different brands of product, each designed to profitably enhance selected performance attributes of a wide variety of foods. The product lines are: *IONAL, Myosol, MOstatin, TenderIn, Marinal and FlavorIn.*

IONAL Products

The *IONAL* brands of antimicrobials consist of three basic product lines: *IONAL, IONAL Plus* and *IONAL LC* – all based upon blends of buffered citrates alone or in combination with diacetate or acetate. Since it's approval as an antimicrobial for meats and poultry in 1995 extensive research has been conducted into the use of buffered citrates to inhibit the growth of pathogenic and nonpathogenic bacteria in/on raw and ready to eat meats and poultry.

IONAL is straight buffered sodium or potassium citrate. As the name implies it increases ionic strength. In muscle protein systems this equates to increased marinade/brine retention and yield during processing with less moisture migration and purge in the finished package.

IONAL Plus products are buffered citrates with diacetate or acetate. It primarily is used to increase the shelf life of perishable foods, especially raw marinated meats, fish and poultry. Typically incorporation of *IONAL Plus* into a food system will double the products shelf life.

IONAL LC products are buffered citrates with diacetate or acetate which have been specifically formulated to inhibit the growth of pathogenic bacteria such as *Listeria monocytogenes* in/on foods, especially ready to eat meats. Studies have also shown it to be an effective means of inhibiting the outgrowth of *Clostridium perfringens*.

Myosol Products

Myosol branded liquid phosphates; Myosol and *Myosol Plus* are performance enhanced functional ingredients designed to improve product/process yield and meat tenderness. *Myosol* brand phosphates are supersaturated tetrapotassium pyrophosphate solutions which are pH optimized to meet your specific needs. They are readily soluble in cold water and instantaneously reactive in meat systems.

MOstatin Products

MOstatin brand products are all natural, consumer friendly, clean label ingredients designed to enhance the retention qualities of marinades in muscle foods and inhibit the growth of pathogens and spoilage microorganisms in a wide array of food systems. MO for microorganism; statin for stasis or no growth. There are four basic product lines of *MOstatins: MOstatin LV, MOstatin V, MOstatin VE, and MOstatin LVE. MOstatins* have been successfully used as a CCP for *Listeria* in ham. They have also performed successfully against this pathogen of public health significance in refrigerated salads and soups.

MOstatin LV

MOstatin LV is an all natural blend of lemon juice concentrate and vinegar designed to enhance the organoleptic properties of foods while inhibiting a broad spectrum of bacteria, yeast and molds. *MOstatin LV* increases the water holding capacity of muscle protein systems. At low concentrations *MOstatin LV* does not have any flavor impact on the finished product. At higher concentrations, its slight citric taste enhances the natural flavors of meats, fish, poultry and vegetables.

MOstatin V

MOstatin V is a buffered vinegar product designed to inhibit a broad spectrum of bacteria, yeast and molds in foods. At low concentrations *MOstatin V* does not have any flavor impact on the finished product. At higher concentrations it yields a slight vinegar taste and odor.

MOstatin VE

MOstatin VE is a buffered vinegar system with native tapioca or potato starch designed to enhance/increase marinade retention in ready to eat muscle foods while inhibiting a broad spectrum of bacteria, yeast and molds. At low concentrations *MOstatin VE* does not have any flavor impact on the finished product. At higher concentrations it yields a slight vinegar taste and odor.

MOstatin LVE

MOstatin LVE is on all natural blend of lemon juice concentrate, vinegar and native tapioca or potato starch. It is designed to increase cook yield of ready to eat muscle foods while inhibiting pathogen and nonpathogenic bacteria, yeast and molds.

Marinal Products

Marinal brand marinades are customized systems designed to deliver maximum performance at an affordable cost. They are specially formulated to maximize the interactions between substrate, process and packaging in order to achieve the customers' desired performance objectives.

TenderIns

TenderIns are all natural, consumer friendly, clean label alternatives to phosphates for use in muscle foods. *TenderIns* are derived from fruit juices and vegetable bi-products. They are species specific products – each formulated to accommodate the different functional characteristics encountered by different muscle foods: a.k.a. beef, chicken, pork, turkey or fish.

TenderIn L

TenderIn L is the liquid form of *TenderIns*, each custom blended to meet the specific performance requirements of a wide range of food systems.

TenderIn DL

TenderIn DL is processed lemon juice concentrate dried onto a rice flour carrier designed to increase the cook yield of ready to eat meats and overall viscosity of food systems. The rice flour is a specialty blend formulated to deliver the optimum amylose and amylopectin concentrations. Its unique properties in cooked systems make *TenderIns* a viable alternative to phosphates.

FlavorIns

FlavorIns are all natural flavor systems derived from fruit, vegetable and vinegar based ingredients designed to enhance to organoleptic attributes of food systems throughout the shelf life of a product. They are available in both a dry and liquid form depending upon the desired functionality in the finished product.

FUTURE ANNUAL MEETINGS

IAFP 2009

JULY 12–15

Gaylord Texan Resort
Grapevine, Texas

IAFP 2010

AUGUST 1–4

Anaheim Convention Center
Anaheim, California

International Association for Food Protection

FOOD PROTECTION TRENDS

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

FPT EDITORIAL BOARD

SUSTAINING MEMBERSHIP

Membership in the International Association for Food Protection will put you in charge of your career. From quick access to cutting-edge technical and scientific information, becoming a Member is your link to the food safety industry and a clearinghouse of resources. Increase the knowledge and ideas you can implement in your work environment.

Is your organization in pursuit of "Advancing Food Safety Worldwide®"? As a Sustaining Member of the International Association for Food Protection, your organization can help to ensure the safety of the world's food supply.

Sustaining Membership

Sustaining Membership provides organizations and corporations the opportunity to ally themselves with the International Association for Food Protection in pursuit of *Advancing Food Safety Worldwide®*. This partnership entitles companies to become Members of the leading food safety organization in the world while supporting various educational programs through the IAFP Foundation that might not otherwise be possible.

Organizations who lead the way in new technology and development join IAFP as Sustaining Members. Sustaining Members receive all the benefits of IAFP Membership, plus:

- Monthly listing of your organization in *Food Protection Trends* and *Journal of Food Protection*
- Discount on advertising
- Exhibit space discount at the Annual Meeting
- Organization name listed on the Association's Web site
- Link to your organization's Web site from the Association's Web site
- Alliance with the International Association for Food Protection

Gold Sustaining Membership $5,000

- Designation of three individuals from within the organization to receive Memberships with full benefits
- $750 exhibit booth discount at the IAFP Annual Meeting
- $2,000 dedicated to speaker support for educational sessions at the Annual Meeting
- Company profile printed annually in *Food Protection Trends*

Silver Sustaining Membership $2,500

- Designation of two individuals from within the organization to receive Memberships with full benefits
- $500 exhibit booth discount at the IAFP Annual Meeting
- $1,000 dedicated to speaker support for educational sessions at the Annual Meeting

Sustaining Membership $750

- Designation of an individual from within the organization to receive a Membership with full benefits
- $300 exhibit booth discount at the IAFP Annual Meeting

International Association for Food Protection

SUSTAINING MEMBERS

Sustaining Membership provides organizations the opportunity to ally themselves with IAFP in pursuit of *Advancing Food Safety Worldwide*. This partnership entitles companies to become Members of the leading food safety organization in the world while supporting various educational programs that might not otherwise be possible.

GOLD

3M Microbiology Products
St. Paul, MN
612.733.9558

Applied Biosystems
Foster City, CA
650.638.5122

BD Diagnostics
Sparks, MD
410.316.4467

bioMérieux, Inc.
Hazelwood, MO
800.638.4835

Bio-Rad Laboratories
Hercules, CA
510.741.5653

BPI Technology, Inc.
Dakota Dunes, SD
605.217.8000

Cargill
Minneapolis, MN
800.227.4455

The Coca-Cola Company
Atlanta, GA
404.676.2177

ConAgra Foods, Inc.
Omaha, NE
402.595.6983

DuPont Qualicon
Wilmington, DE
302.695.5300

Ecolab Inc.
St. Paul, MN
800.392.3392

JohnsonDiversey
Sharonville, OH
513.956.4869

Kraft Foods
Glenview, IL
847.646.3678

PepsiCo
Chicago, IL
312.821.3030

Silliker Inc.
Homewood, IL
708.957.7878

(Continued on next page)

SUSTAINING MEMBERS

SILVER (Continued)

BSI Management Systems
Reston, VA; 800.862.4977

Chemstar Corporation
Lithia Springs, GA; 800.327.0777

Dubai Municipality
Dubai, United Arab Emirates;
971.4.206.4200

F & H Food Equipment Co.
Springfield, MO; 417.881.6114

Food Safety Net Services, Ltd.
San Antonio, TX; 210.384.3424

MATRIX MicroScience, Inc.
Golden, CO; 303.277.9613

Orkin Commercial Services
Atlanta, GA; 404.888.2241

Quality Flow Inc.
Northbrook, IL; 847.291.7674

Weber Scientific
Hamilton, NJ; 609.584.7677

SUSTAINING

3-A Sanitary Standards, Inc., McLean, VA; 703.790.0295

Abbott Nutrition, Columbus, OH; 614.624.7040

ABC Research Corporation, Gainesville, FL; 352.372.0436

Advanced Instruments, Inc., Norwood, MA; 781.320.9000

AEMTEK, Inc., Fremont, CA; 510.979.1979

ASI Food Safety Consultants, Inc., St. Louis, MO; 800.477.0778

Bentley Instruments, Inc., Chaska, MN; 952.448.7600

BioControl Systems, Inc., Bellevue, WA; 425.603.1123

Biolog, Inc., Hayward, CA; 510.785.2564

Burger King Corp., Miami, FL; 305.378.3410

Charm Sciences, Inc., Lawrence, MA; 978.687.9200

Chestnut Labs, Springfield, MO; 417.829.3724

DARDEN Restaurants, Inc., Orlando, FL; 407.245.5330

Decagon Devices, Inc., Pullman, WA; 509.332.2756

Deibel Laboratories, Inc., Lincolnwood, IL; 847.329.9900

DeLaval Cleaning Solutions, Kansas City, MO; 816.891.1549

Diversified Laboratory Testing, LLC, Mounds View, MN; 763.785.0484

DonLevy Laboratories, Crown Point, IN; 219.226.0001

DSM Food Specialties USA, Inc. Parsippany, NJ; 973.257.8290

Electrol Specialties Co., South Beloit, IL; 815.389.2291

Elena's, Auburn, Hills, MI; 248.373.1100

EMD Chemicals Inc., Gibbstown, NJ; 856.423.6300

Fisher Scientific, Pittsburgh, PA; 412.490.4488

SUSTAINING MEMBERS

SUSTAINING

Food Directorate, Health Canada, Ottawa, Ontario, Canada; 613.957.0880

FoodHandler Inc., Mesa, AZ; 800.338.4433

Food Lion, LLC, Salisbury, NC; 704.633.8250

GOJO Industries, Akron, OH; 330.255.6286

Grocery Manufacturers Association, Washington, D.C.; 202.639.5985

HiMedia Laboratories Pvt. Limited, Mumbai, Maharashtra, India; 91.22.2500.3747

IBA, Inc., Millbury, MA; 508.865.6911

Idaho Technology, Inc., Salt Lake City, UT; 801.736.6354

Institute for Environmental Health, Lake Forest Park, WA; 206.522.5432

International Dairy Foods Association, Washington, D.C.; 202.737.4332

Iowa State University Food Microbiology Group, Ames, IA; 515.294.4733

Jimmy Buffett's Margaritaville, Orlando, FL; 407.224.3216

Kellogg Company, Battle Creek, MI; 269.961.6235

Kim Laboratories, Inc., Champaign, IL; 217.337.6666

The Kroger Co., Cincinnati, OH; 513.762.4209

Michelson Laboratories, Inc., Commerce, CA; 562.928.0553

Michigan State University–ProMS in Food Safety, East Lansing, MI; 517.432.3100

MicroBioLogics, Inc., St. Cloud, MN; 320.253.1640

Micro-Smedt, Herentals, Belgium; 32.14230021

Microbial-Vac Systems, Inc., Bluffdale, UT; 801.523.3962

Mol Industries, Grand Rapids, MI; 800.729.2358

Nasco International, Inc., Fort Atkinson, WI; 920.568.5536

The National Food Laboratory, Inc., Dublin, CA; 925.833.8795

Nelson-Jameson, Inc., Marshfield, WI; 715.387.1151

Neogen Corporation, Lansing, MI; 517.372.9200

Nestlé USA, Inc., Dublin, OH; 614.526.5300

NSF International, Ann Arbor, MI; 734.769.8010

Oxoid Canada, Nepean, Ontario, Canada; 800.567.8378

ParTech, Inc., New Hartford, NY; 315.738.0600

Penn State University, University Park, PA; 814.865.7535

PML Microbiologicals, Inc., Wilsonville, OR; 503.570.2500

Polar Tech Industries, Genoa, IL; 815.784.9000

Process Tek, Des Plaines, IL; 847.296.9312

The Procter & Gamble Co., Cincinnati, OH; 513.983.8349

Publix Super Markets, Inc., Lakeland, FL; 863.688.7407

Q Laboratories, Inc., Cincinnati, OH; 513.471.1300

R&F Laboratories, Downers Grove, IL; 630.969.5300

Randolph Associates, Birmingham, AL; 205.595.6455

REMEL, Inc., Lenexa, KS; 800.255.6730

rtech™ laboratories, St. Paul, MN; 800.328.9687

Rochester Midland Corporation, Rochester, NY; 800.762.4448

Seiberling Associates, Inc., Dublin, OH; 614.764.2817

The Steritech Group, Inc., San Diego, CA; 858.535.2040

Strategic Diagnostics Inc., Newark, DE; 302.456.6789

Texas Agricultural Experiment Station, College Station, TX; 979.862.4384

United Fresh Produce Association, Washington, D.C.; 202.303.3400

Walt Disney World Company, Lake Buena Vista, FL; 407.397.6060

Wegmans Food Markets, Inc., Rochester, NY; 585.429.3623

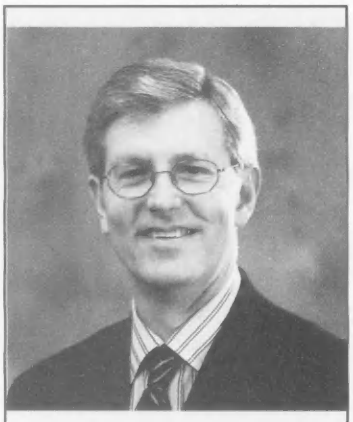
WTI, Inc., Jefferson, GA; 706.387.5150

Zep Manufacturing Company, Atlanta, GA; 404.352.1680

"LONE STAR PERSPECTIVE"
FROM YOUR PRESIDENT

"Advancing Food Safety Worldwide." That is a pretty tall task for an organization of just over 3,000 members. For the last year as your president, however, I have seen IAFP promote food safety activity in a global forum that is nothing short of amazing. In the last 12 months, we have hosted or been directly involved in meetings in Europe, Asia, Latin America and the Middle East. We have added three new international affiliates in Turkey, Spain and the United Arab Emirates. Our Timely Topics Symposium in Washington, D.C. on prepared, but not ready-to-eat foods was a huge success. And, of course, our Annual Meeting in Columbus exceeded all expectations. Our reach and influence is impressive, and we are only getting started. So why are we doing this – just so we can say we are international? Hardly. While the Association has taken the lead in organization, the activity we are seeing is directly linked to the involvement, needs and work of our Members. Our membership is dedicated to our mission, and it is to their credit that our international footprint continues to grow. That is why IAFP is such an active and growing organization with a reputation for serving our Members – it all starts at a grassroots membership level.

Since this is my last column as President, I can't leave without saying a brief word about the people I have served with on the Executive Board. Because the Board is in constant annual rotation, I have had the pleasure of serving with Anna Lammerding, Paul Hall, Kathy Glass, Jeff Farber, Frank Yiannas, Stan Bailey, Vickie Lewandowski, Lee-Ann Jaykus and, now, Isabel Walls. In addition, Affiliate Council Chairpersons have included Steve Murphy, Stephanie Olmsted, Terry Peters, Maria Teresa Destro, Carl Custer and Roger Cook. What an outstanding group of people with whom to have served! I am honored to have been able to work with every one of them and doubly honored to be able to call them colleagues. I have always felt humbled to be in the presence of such great talent, and I thank you for giving me the opportunity to serve. And now the "year of Stan" is here! I can assure you it is going to be fun!



By GARY ACUFF
PRESIDENT

"Our membership is dedicated to our mission, and it is to their credit that our international footprint continues to grow"

Of course, I must spend a few minutes telling you about the great job our staff has done. The IAFP staff members are a joy to work with. They are dedicated and diligent, working in the background to make sure IAFP functions like a well-oiled machine, and that frees up the Association membership to be out there doing what we do best, *Advancing Food Safety Worldwide*. If you have had any dealings at all with David Tharp or Lisa Hovey, you already know this, but we are extremely blessed to have them as our Executive "Dynamic Duo." They are amazingly talented and easy to work with; but even more important is the fact that we can trust them with our Association at every level. I can personally assure you as a member of the Executive Board, David and Lisa do an outstanding job making sure the Board knows what is going on with our budget and finances, and I can't tell you how much weight that takes off being a Board member. David, Lisa, Tamara, Farrah, Donna B., Pam, Donna G., Julie, Didi, Lani, Trinette and Karla – Thank you for all you do for IAFP!

As you read this column, remember just a short time ago, when we were in the middle of the *Salmonella* Saintpaul outbreak associated with produce. Our colleagues in the regulatory agencies

were up to their eyeballs in questions and investigations. IAFP Members in the produce industry were working around the clock to make sure the problem was resolved, and our academic members were already considering future research to help prevent this situation in the future and updating their course notes with new produce safety information for fall classes, and Extension colleagues were promoting the education of consumers and workers. On the surface, all the average consumer saw was a face on television announcing that many people had fallen ill to contaminated tomatoes–or cilantro–or jalapeño peppers, yet the flurry of activity beyond the public perspective was amazing and impressive. Consumers depend heavily on us doing our jobs, and most of them don't even know we exist. Just the same – thanks for all each of you has done to help resolve this outbreak. My family knows you are there, and we are all appreciative.

As always happens with a situation like this, many people were thrust into dealing with an outbreak situation. They didn't train for this sort of thing, and it was never on their professional radar screen. Those folks may now wish they had the help of knowledgeable food safety colleagues in IAFP. We need to make sure they know we are available.

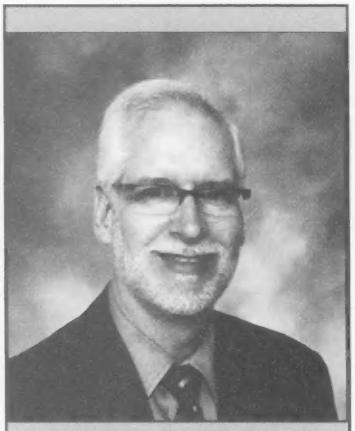
One last note: I had a blast at the Annual Meeting in Ohio, but you all know I am from Texas, and if Texans are known for anything, they are famous for being proud of their state. I can't wait to meet here next year. The Texas Association for Food Protection is already getting ready by making local arrangements for the IAFP 2009, and we are excited to be able to show off our digs. This is going to be a great Annual Meeting. If you are wondering where Grapevine is, just look north of the Dallas-Fort Worth Airport. It won't take you more than 10 minutes to get from the airport to the hotel. The location is perfect, the facility is top-notch, and I think you are going to love attending an IAFP Annual Meeting – *Texas Style*.

In the immortal words of songwriters Porter Howell and Brady Seals in a local favorite called "God Blessed Texas," *If you wanna see heaven, brother, here's your chance.*

It has been an unbelievable experience serving as your president for the last year. Thanks for all you do for food safety and for IAFP. I'll be seeing you in Texas for IAFP 2009.

Start practicing saying "howdy" now so y'all will be ready in July.

"COMMENTARY" FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP, CAE
EXECUTIVE DIRECTOR

"You can work your way onto the IAFP Annual Meeting program"

Many times we are asked in the months leading up to Annual Meeting, "How can we get someone from our company on this year's program?" Because of the way our meeting is structured with scientific presentations, it is very difficult, if not impossible, to find your way onto the program in the four to six months prior to the IAFP Annual Meeting. This is by design though. This month, I want to review how you can work your way onto the IAFP Annual Meeting program.

There are two "styles" of presentations taking place at our conference; symposia and technical presentations. I will discuss each of these separately since they are developed, reviewed and approved for presentation under two very different systems.

First, we will look at symposia. Under this heading, there are regular symposia covering three hours (normally, six 30-minute presentations), there are short sessions extending one and a half hours or two hours and there are roundtables, normally lasting either one and a half hours or two hours. Most often, a symposium is developed through one of our Professional Development Groups (PDGs) that meet at Annual Meeting. PDGs are groups of Members formed around a topic of interest (dairy, applied methods, meat and poultry, retail food safety and quality, etc.) who come together to discuss their specific topic in greater detail, face-to-face.

Some PDGs communicate throughout the year and others do not. It is fairly dependant upon the chairperson or other active (or not so active) members. IAFP does not require a certain number of communications or messages to be sent per year, but we do encourage PDG chairpersons to keep in contact with their members. It is helpful to have some communication take place prior to the PDG meeting at Annual Meeting so the PDG members have an idea of what topics are important to discuss and what topics may make a good symposium for the next Annual Meeting.

Now, back to the PDG meetings at Annual Meeting. So, as previously stated, many of our symposia are developed by our PDGs. If you have an area of interest and expertise in that area; to become a part of the symposium covering that topic, it helps if you are "in the room" when the symposium is being developed! This would be the number one way to be included in a symposium (get actively involved with one or more PDG). Symposia can be developed by an individual and submitted for consideration, but the majority of our symposia do come from the PDG system.

The due date for symposium proposals is on Tuesday of the Annual Meeting. This is a preliminary, but required step to final acceptance (in February). Usually, there are between 50 and 60 symposia submitted for consideration. The Program Committee reviews each submission carefully considering the merits of each, but they can only tentatively accept between 24 and 30 for further development. The organizer typically will receive instructions from the Program Committee on what to do to strengthen their proposal between Annual Meeting and the February meeting of the Program Committee. Many times, proposed symposia carry a common theme and two or more may be asked to combine to form an even stronger session. Let's now shift to technical presentations. For technical papers presented at Annual Meeting, authors must submit an abstract following guidelines set by the Program Committee. These instructions are posted on the IAFP Web site for easy access. Abstracts

must be well written, submitted on or before the deadline (January 20, 2009 for IAFP 2009), and report on original, unpublished research.

This is definitely the easier way to gain a place on the program. In recent years, there are five- to six- hundred technical abstracts submitted for the Program Committee's review. Specific criteria are applied to the submitted abstracts by the review committee; each abstract is individually reviewed by up to six members of the Program Committee. A decision is reached on each abstract whether to accept it for presentation or reject the proposal. Submissions are reviewed in early February in preparation for the Annual Meeting.

There are two forms of technical papers that can be presented; either poster presentations or 15-minute oral presentations. Because of the limited number of rooms we have available for symposia and oral presentations (technical), there are only 70 to 80 oral presentations scheduled. The remaining technical papers are presented in poster format.

So, as you can see, a lot of preplanning enters into the current year's Annual Meeting program. It is nearly impossible to come onto the program other than through the two established systems. Having said that, there is one exception to enter the program after the February Program Committee meeting. That is through a "late breaking session" covering a topic of general, overall interest to a large number of people that developed after the February Program Committee meeting. This year, it was the *Salmonella* outbreak that fit the definition.

Because our Annual Meetings are very "science-based," presentations must be peer-reviewed and accepted to be on the program. This is different than some "industry-driven" or commercially motivated meetings, but ours is a system that works to IAFP's benefit. Through years of implementing this system, we have become the "world's leading food safety meeting" and we are certainly proud of that accomplishment!

ARTICLES

Food Protection Trends, Vol. 28, No. 8, Pages 568–584

6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2864

International Association for Food Protection

Hand Hygiene in the Food Industry: Resolving an Enigma?

HANS REDIERS,[1,2,*] MARIJKE CLAES,[1,3] RITA KINNERK,[4] LUC PEETERS[1,5] and KRIS A. WILLEMS[1,2,6]

[1]iMIK, the Institute for Microbial Control of the Food Chain, Fortsesteenweg 30A, B-2860 Sint-Katelijne-Waver, Belgium; [2] Research Group Process Microbial Ecology and Management, Dept. Microbial and Molecular Systems, Katholieke Universiteit Leuven Association, De Nayer Institute, Jan De Nayerlaan 5, B-2860 Sint-Katelijne-Waver, Belgium; [3]Research Station for Vegetable Production, Duffelsesteenweg 101, B-2860 Sint-Katelijne-Waver, Belgium; [4]Environmental Health Service, Health Service Executive, Sandfield Centre, Ennis, Co. Clare, Ireland; [5]Mechelse Veilingen, Mechelsesteenweg 120, B-2860 Sint-Katelijne-Waver, Belgium; [6]Microbial Ecology and Biorational Control Research Group, Scientia Terrae Research Institute, Fortsesteenweg 30A, B-2860 Sint-Katelijne-Waver, Belgium

SUMMARY

Much experimental evidence points to poor hand hygiene as a likely major contributor to the occurrence of foodborne illnesses. Microorganisms are easily transferred from hands to other surfaces or vice versa, by cross contamination. Cross contamination is therefore an important contamination source of foodborne illness bacteria. In this review, we focused on the most important techniques used to minimize the risk of cross contamination by hands, including washing and disinfecting of hands, and the use of gloves. The efficacy as well as the inherent advantages and disadvantages of each technique are thoroughly discussed. Additional measures that can be taken to minimize the risk of contamination are also referred to. Finally, the legal requirements and the recommendations of relevant voluntary quality systems, such as British Retail Consortium (BRC), International Food Standard (IFS), and ISO 22000, concerning hand hygiene are summarized. With the information provided herein, a well-informed decision can be made to select the appropriate techniques to use in specific circumstances or environments.

A peer-reviewed article

*Author for correspondence: 32(0).15/31.69.44; Fax: 32.(0).15/31.74.53
E-mail: hans.rediers@denayer.wenk.be

NECESSITY OF GOOD HAND HYGIENE

Microorganisms colonize skin surfaces of hands

Healthy skin is colonized by microorganisms in numbers ranging from 100 to 10^6 CFU/cm^2 *(87)*. These include many different species, some of which present a significant food safety risk *(58)*. In evaluating this risk, a clear distinction is made between resident and transient microflora.

Resident microflora, consisting mainly of corynebacteria and staphylococci, are natural inhabitants of the skin. Some aerotolerant anaerobic bacteria, including *Propionibacterium* spp., and facultative anaerobic bacteria, such as *Acinetobacter* spp., and certain members of the *Enterobacteriaceae* family can also be regarded as natural inhabitants of the skin *(37)*. While having the capacity to multiply on the skin surface, microflora can also colonize the deeper layers of the skin. Consequently, they are difficult to control by handwashing techniques. However, the resident microflora rarely cause illness, as most are not patho-

TABLE 1. Representative examples of foodborne illness outbreaks caused by cross contamination or poor hand hygiene according to Reij et al. *(100)*

Pathogen	Food	Probable Contamination Source	Reference
Campylobacter jejuni	Tuna salad	Infected chicken prepared in the same kitchen	103
Cryptosporidium parvum	Various foods	Infected food handler	95
Cryptosporidium parvum	Water	Secondary contamination of potable water	73
Escherichia coli O157:H7	Yogurt	Pump previously used for unpasteurized milk	86
Escherichia coli O157:H7	Minced meat	Improper handling practices	77
Escherichia coli O157:H7	Various foods	Slicing and handling tools	4
Listeria monocytogenes	Butter	Process environment	70
Listeria monocytogenes	Rillettes	Filling and packaging machine	38
Listeria monocytogenes	Cooked meat	Dicing machine	67
Listeria monocytogenes	Hot dogs	Process environment	100
Norwalk-like virus/SRSV	Different foods	Infected food handler	65
Salmonella spp.	Paprika potato chips	Contaminated paprika powder	62
Salmonella agona	Breakfast cereals	Process environment	18
Salmonella Typhimurium	Cooked sliced ham	Containers previously used for curing of raw pork	64
Salmonella Typhimurium	Kebab	Yogurt relish by juice from carcasses dripping into open containers	30
Shigella flexneri	Salads	Infected food handler	26
Salmonella ealing	Infant formulae	Process environment	104
Yersinia enterocolitica	Pasteurized milk	Process environment	1
Salmonella Enteritidis	Ice cream	Tanker used to transport ice cream previously used for raw eggs	42
Salmonella berta	Soft cheese	Buckets for cheese ripening previously used for chicken carcasses	28
Salmonella Enteritidis	Pastry	Mixing bowl, cream piping bags	29

genic. *Staphylococcus aureus*, which causes staphylococcal food poisoning, is the only (opportunistic) pathogen included in the resident microflora group. Moreover, resident microflora are considered essential components of the skin barrier since many are able to act as antagonists against invading microbial pathogens, thereby preventing skin infections and illness *(47, 82)*.

Transient rather than resident microflora are usually the causal agent of foodborne illness *(113)*. These consist mainly of bacteria and fungi that are transferred to the skin surface by contamination. They cannot multiply while residing on the skin surface but occasionally do result in skin pathogenesis. Transient microflora can also include viruses. Although the skin surface is not their natural habitat, they may contaminate and infect the epidermis *(3, 76)*. Examples of transient pathogenic microorganisms are *Escherichia coli*, *Salmonella* spp., *Shigella* spp., *Giardia lamblia*, Norwalk virus or Hepatitis A virus. While transient microflora present a greater food safety risk, they are more easily removed by washing or disinfection measures than the resident microflora *(47)*.

Poor hygiene increases the risk of foodborne illness

In recent years, several publications have attributed the spread of pathogens and the occurrence of foodborne illnesses to the lack of effective hygiene. Specifically, poor hand hygiene by infected food operators contributes significantly to the transfer of pathogenic bacteria and viruses *(7, 12, 88, 100, 112)*. A European survey carried out in 1995 by the World Health Organization (WHO) indicated that almost 25% of food-related illnesses were caused by food contamination due

to poor hygiene practices in the working environment. This study attributed food-handler contact with food during processing to be the greatest cause of food contamination (9.2%), followed by cross contamination by dirty equipment (5.7%) and/or infected food ingredients (3.4%) *(100)*. It has also been demonstrated that the health risk due to unhygienic food handling is exacerbated when temperature abuse occurs within the food supply chain *(96)*. Research in the United States also identified poor personal hygiene as one of the major factors influencing the incidence of foodborne illnesses *(45)*. This is particularly true for human viruses. Hepatitis A virus infections are frequently caused by the consumption of food contaminated by food operators as a result of poor hand hygiene *(10, 49)*. The rapid spread of pathogens through the consumption of infected food can easily cause severe epidemics of foodborne illnesses *(40)*. Considering the fact that a low infectious dose is sufficient to cause illness, an epidemic can originate from a single pathogen-infected employee in the food supply chain *(10)*.

Poor hand hygiene: A significant source of food contamination

Bacterial and viral pathogens or parasites present on hands can be transferred directly to food and pose a substantial risk, depending on a multiplicity of factors. The microbial species, the number of microorganisms, the microbial population's ability to survive and the hydration condition of the skin all influence the quantity of bacteria that can be transferred to or by hands *(16, 47, 83, 109)*. Diverse microorganisms can exist on the hands of food workers because hands frequently make contact with other parts of the body, miscellaneous objects that may be contaminated, domestic animals, or contaminated food. In addition, fecal contamination of fingertips may occur after toilet use even when toilet paper is used *(81)*. Recent data indicate that contamination of the hands by fecal microorganisms during defecation occurs more frequently than expected *(78)*. People with long natural or artificial nails and people who use an inadequate quality or quantity of toilet paper show an increased risk. If these people fail to disinfect or wash their hands effectively after toilet use, the risk of transmission of fecal microorganisms to food increases considerably *(78, 79)*. Especially when these people suffer from a gastro-enteric disease, human pathogens are spread via the fecal-oral route, potentially resulting in an outbreak of foodborne illness. For instance, large numbers (up to 10^{10} CFU/g) of *Salmonella* can be found in the stool of an infected person and are easily transferred to the hands if no appropriate measures are taken *(33, 105)*.

It has also been shown that transfer of *Enterobacter aerogenes* from contaminated chicken to the worker's hands is substantial during food processing. Cutting up chicken artificially infected with 10^8 CFU/portion results in the transfer of between 10^6 and 10^7 CFU to the hands *(84)*. The average incidence of transfer of bacteria from chicken meat to hands during processing is approximately 4%, which is considered highly significant *(66)*. Like bacteria, viruses present on hands can be transferred easily to food during processing. It was shown that the handling of lettuce by Hepatitis A contaminated hands resulted in a substantial (9%) transfer of the virus to lettuce leaves *(10)*. The Norovirus and Hepatitis A virus are currently major viral vectors of foodborne illnesses in the Western world *(11, 49)*.

In addition to direct food contamination by the food handler's hands, indirect contamination can occur via other sources such as water taps, working surfaces, cutting boards, food equipment, etc. Cross contamination occurs when surfaces contaminated by an original source contaminate other surfaces *(100)*. In the food industry, cross contamination of foodstuffs with pathogenic microorganisms is the primary cause of sporadic as well as periodic epidemics of foodborne illnesses (Table 1). For instance, *Campylobacter* species are known to spread frequently by cross contamination during the preparation or processing of chicken meat *(109)*. Contaminated hands are considered to be a major cause of cross contamination and consequently of foodborne illnesses. Furthermore, most pathogens, such as *Salmonella* spp., *Staphylococcus* spp., and *Escherichia coli*, are able to survive several days on hands, clothing, work surfaces, and equipment, which increases the risk of cross contamination *(8)*. It is important to keep in mind that microorganisms always flow in both directions. For instance, such microorganisms may be transferred from contaminated hands to a water tap, and subsequently from this or other contaminated water taps to clean hands. Numerous researchers have studied the transfer of bacterial pathogens to foods through cross contamination (Table 2).

HAND HYGIENE TECHNIQUES TO REDUCE THE RISK OF FOOD CONTAMINATION

The risk of contracting foodborne illnesses by cross contamination depends mainly on two factors: the ability of microorganisms to transfer from one surface to another, and the microbial load on surfaces in the working environment *(16)*. The transfer of microorganisms from hands to surfaces or vice versa can be reduced in two ways. First, the microbial load on the hands can be reduced by applying good hand hygiene practices. For example, hands can be washed either with regular or with antimicrobial soap (discussed in the next section) or hands can be disinfected, usually by alcohol rubs (discussed in a later section). Second, transfer of microorganisms can be reduced by providing an additional physical barrier that the microorganisms have to cross, for instance by wearing gloves, thereby hampering their transfer to other surfaces. Additional measures that also minimize the risk of cross contamination are discussed later.

Washing hands with soap: simple but effective

Regular soap. Washing of hands with soap is generally regarded as a good measure in reducing the risks associated with poor personal hygiene. Data from several studies indicate that washing hands with soap results in a 50% reduction of diarrhea cases *(12, 23)*. Although regular soaps have little or no antibacterial effect, they are very effective in the physical removal of microorganisms *(27)*. Rubbing hands together and/or using a nail brush, thereby causing friction, is the primary mechanism of removal; a second component is dilution of the microorganisms that are present on the skin by rinsing hands after washing. However, not all microorganisms are

TABLE 2. Representative sampling of data of bacteria transferred between several surfaces, with or without protective measures *(19, 34, 35, 84)*

Pathogen	Protection	Source[a]	Target[b]
E. aerogenes	None	Chicken (8.3)	Hands (6.8)
E. aerogenes	Polyethylene gloves	Hands (6.8)	Salad (3.2)
E. aerogenes	Polyethylene gloves	Chicken (8.3)	Hands (4.2)
E. aerogenes	Polyethylene gloves	Hands (4.2)	Salad (0.9)
E. aerogenes	Polyethylene gloves	Chicken (8.3)	Hands (4.2)
E. aerogenes	None	Hands (3.7)	Salad (2.7)
E. coli	Gloves (after 3 h)	Beef (5)	Hands (2.2)
E. coli	Gloves (after 3 h, change every hour)	Beef (5)	Hands (2.9)
E. aerogenes	None	Chicken (8.4)	Hands (6.6)
E. aerogenes	Washing	Hands (6.6)	Hands (2.6)
E. aerogenes	None	Hands (3.9)	Salad (2.9)
E. aerogenes	None	Hands (6.6)	Water tap (2.6)
E. aerogenes	None	Water tap (4.4)	Hands (2.4)
E. aerogenes	None	Chicken (6.1)	Cutting board (4.9)
E. aerogenes	None	Cutting board (4.9)	Salad (4.3)

[a]average initial inoculum used to infest the source surface expressed between brackets in log CFU;

[b]average of bacteria that are transferred to the target surface expressed between brackets in log CFU

removed when the microbial load on the hand surface is high. Hence, mechanical removal is not absolute *(19, 47)*.

Several publications have reported on the efficacy of different handwashing techniques. However, the available literature is not unequivocal. A possible explanation for the large variation in the experimental data is that the efficacy of washing hands depends on several factors contributing to a good result. The total reduction of microorganisms on hands depends on various factors, such as the initial contamination, the handwashing protocol, the type of soap and the drying procedure *(84, 85)*.

Antibacterial soap. Regular soap has little or no antimicrobial activity; therefore, antimicrobial components are often added. In addition to physically removing microorganisms by friction and dilution, antibacterial soaps may also reduce the level of microorganisms by killing them.

Several reports indicate that the use of such antibacterial soaps is more effective than use of regular soap, and these studies therefore strongly recommended the use of antibacterial soaps, especially when hands are not sufficiently rubbed *(56, 85)*. However, the benefit of antibacterial soaps over regular soaps is debated; microorganisms vary in their susceptibility, and some microorganisms are even insensitive to antimicrobial chemicals added to soap. Therefore, addition of antibacterial components to soap may be inadequate and does not guarantee a safe level of antibacterial activity. Several publications state that plain soap is as effective as antibacterial soap when used properly and frequently (reviewed in 2). To these authors, antibacterial soap has no additional advantage. Furthermore, some authors postulate that, over time, microorganisms might develop resistance to the antibacterial components used in antibacterial soaps *(47, 111)*.

Triclosan and chlorhexidine are antimicrobial components that are frequently added to soap. Triclosan is a phenolic compound, 5-chloro-2-(2,4-dichlorophenoxy) phenol, that is usually added in concentrations of 0.1–0.4% *(2)*. Triclosan shows antimicrobial activity against a broad range of microorganisms. It has some antibacterial, antifungal and antiviral activities but little activity against some Gram-negative bacilli *(9, 106)*. A recent literature review indicated that antibacterial soaps with 0.1–0.4% triclosan have no significant advantage over plain soap regarding removal of microorganisms or reduction of illnesses. However, in most studies in which soaps with triclosan concentrations of 1% or more were used, a significant increase in antimicrobial efficacy was observed *(2)*.

Chlorhexidine, a cationic diguanide, exists in several forms. Chlorhexidine gluconate (CHG) is mostly used in concentrations of 0.5%–1% in aqueous

solutions, or 2–4% in detergents. It is active against enveloped viruses, such as HIV, RSV, influenza virus, or cytomegalovirus, but is less effective for the removal of non-enveloped viruses, such as rotavirus, adenovirus, or enterovirus *(46, 47)*.

Both antimicrobial compounds need at least two minutes contact time for optimal antimicrobial activity. Hence, it is very important that the antibacterial soap is not washed away immediately. Furthermore, the antimicrobial activity of these antimicrobial components is considerably reduced in the presence of organic dirt on the skin surface, or by some hand creams containing anionic emulsifiers. It has also been shown that anionic detergents in lotions that are used to maintain optimal skin health can neutralize the activity of CHG. Therefore, the antibacterial soap has to be chosen with care *(36)*.

Hand drying. Drying hands, in addition to handwashing, considerably reduces the risks associated with contaminated hands. Residual moisture layers present on the skin of hands can act as an interface facilitating the transfer of microorganisms from hands to other surfaces. Moreover, a correlation was demonstrated between the time-span taken for hand drying and the reduction in number of transferred microorganisms. This correlation was observed when either an air dryer or towels were used. Furthermore, a synergetic effect was observed when the air dryer was combined with the use of towels, which resulted in a 99% reduction of the transfer of microorganisms compared to non-dried hands *(89, 114)*. Hands can be dried in four different ways: using a hot air dryer, using cloth towels, using paper towels, or by evaporation. Each technique has its own advantages and disadvantages. Drying by evaporation is obviously time-consuming and is therefore not recommended. Cloth towels not changed after use are a major source of contamination. Residual moisture on the cloth contributes to a suitable niche for the microorganisms to grow in. Repeated use of cloth for drying hands therefore results in extreme accumulation of microorganisms. As a consequence, the use of cloth towels can be recommended only when they are changed after every use. The quality of the paper towels is also found to contribute to the efficacy of microorganism removal; bad paper quality can cause skin damage due to friction or to insufficient drying. Soft and well absorbent paper towels give the best results. The major disadvantage of hot air dryers is that it takes considerable time to dry hands effectively *(41)*.

The available experimental data are not unequivocal regarding the most effective hand drying method. Some authors state that, in comparison with hot air dryers, the use of paper towels results in a greater reduction of microorganisms. The higher efficacy is attributed to the fact that the use of towels also results in the physical removal of microorganisms *(13, 98)*. Moreover, it has been stated that the use of air dryers may result in increased microorganisms on the skin surface because air dryers may blow microorganisms that are present in the washing facility or in the air dryer itself, directly onto the skin. This belief was mentioned in a 1994 University of Westminster study *(98)* and this study's findings were later cited in other reports, thereby spreading this belief *(85)*. Nonetheless, these data were refuted in another study that did not find a statistically significant difference in the efficacy of four different hand drying methods. On the contrary, air dryers were found to be slightly more effective in the reduction of bacteria than other hand drying techniques, although, this difference was not considered significant *(41, 114)*.

What can be deduced from these conflicting data? There is probably no significant difference in the efficacy of the different hand drying techniques, provided that the hands are dried thoroughly. Hence, the important parameter in the reduction of microorganisms is not the applied drying technique itself but rather the extent to which the hands are dried.

Pros and cons of soap. The main advantage of washing hands with soap is the simplicity of the procedure. When the described procedure is carried out properly, washing the hands is a highly effective method of reducing the spread of pathogens by contaminated hands. Washing hands thoroughly results in a 2–3 log reduction in the transfer of microorganisms from hands to food.

However, handwashing techniques also have their disadvantages. Washing hands with soap causes skin damage, particularly when hands are washed frequently over a long period of time. During each handwashing procedure, the water-lipid layer of the skin surface is altered, and protecting components that are essential for maintaining an optimal skin barrier, such as glycerolipids, sterols, or amino acids, are washed away. In addition, natural antimicrobial components, such as some fatty acids with fungicidal and bactericidal activity, that are present in the upper layer of the skin are important in modulating the skin microflora and are also removed by washing procedures *(47, 56, 57)*.

A correlation was observed between the frequency of handwashing and skin damage *(57)*. The skin recovers only to some degree after washing. After three hours, approximately 50% of the barrier function is restored *(55)*. Skin damage is detrimental to good hand hygiene for several reasons: a decrease in skin health results in an increase of microorganisms present on skin; damaged skin also harbors more pathogenic microorganisms than healthy skin; washing damaged skin is far less effective in the removal of microorganisms compared to washing healthy skin; and skin damage can often cause eczema or dermatitis *(56)*. This stresses the importance of healthy skin in the war against the spread of pathogenic microorganisms. Therefore, emollients or other skin-softening additives that reduce skin damage are often added to liquid soaps.

A second disadvantage of washing hands is the risk of contamination during washing. For instance, the sink can be a major source of contamination because the moisture in the sink provides a good habitat for microorganisms. In addition, after long periods of time, the soap dispenser, and the soap itself —particularly solid soap—can become contaminated with microorganisms *(108)*. These surfaces can contribute considerably to cross contamination through contact with dirty or contaminated hands that have not yet been washed. Likewise, conventional water taps can be a source of contamination or recontamination, which can be circumvented by using tissues when turning on or off the tap or by using foot or elbow operated taps. Even better is the use of sensor driven hand-free water taps and dispensers *(85)*.

Montville et al. *(85)* developed a mathematical model based on the avail-

able experimental data and concluded that the combined use of CHG soap, paper towels, and disinfectants in combination with a hand-free water tap, along with a prohibition on wearing rings, resulted in a reduction of the total bacterial count on skin of the hand of 3 log CFU or more in 90% of the cases. However, the total microbial count after use of other soaps or sanitizers is also in this range, provided that the described procedures are properly executed.

Recommended hand washing. Handwashing should be carried out exactly according to approved procedures. The following is an example of such a procedure: Wet hands under running water; Take a 20 mm blob of soap; Rub hands vigorously together for at least 15 seconds, taking care not to overlook wrists, palms, thumbs and fingernails; Rinse hands thoroughly with running water; Dry hands thoroughly, preferably with single-use towels (paper or cloth); and Turn off the water tap, using the elbow or a tissue to prevent recontamination.

Some authors recommend the use of warm water to increase the efficacy of hand washing. However, the effect of using warm water has been investigated thoroughly and it has been shown that water temperature had no significant effect on the efficacy of microorganism reduction *(80)*. On the contrary, the use of hot water increases skin damage, which is detrimental to good hand hygiene.

Thorough washing of the hands with soap takes a long time in comparison with hand disinfection. In practice, the time needed for rubbing the hands with soap (at least 15 s) is seldom fulfilled, which results in a severe decrease of efficacy. Finally, special attention also has to be given to thumbs, because these typically contain the most dirt and are usually not washed properly. Several studies demonstrated that thumbs are often a contamination source, even when hands are washed frequently *(72, 81)*.

Disinfection of hands with alcohol-based sanitizers

Alcohol-based sanitizers: quick and effective. Sanitizers of these are used for hand disinfection and are usually based on ethanol, isopropanol, n-propanol, or a combination of these. n-Propanol is regarded as the most effective alcohol in the removal of microorganisms, followed by isopropanol and ethanol. Alcohols are characterized by a very fast mode of action and by their antimicrobial activity against a wide range of microorganisms. They are active against Gram-negative and Gram-positive bacteria, against mycobacteria, against fungi, and against enveloped viruses. However, alcohol-based sanitizers have little effectiveness against bacterial spores, oocytes, and non-enveloped viruses *(46, 47)*.

The action of alcohol-based sanitizers is based on denaturation of proteins and lysis of the cell membrane. Although hand alcohols are proven to have disinfecting properties, the removal of microorganisms from skin by use of alcohol-based sanitizers is largely attributed to physical removal when the hands are rubbed together, as also occurs with use of soap. Antimicrobial compounds, such as hexachlorophene, triclosan, quaternary ammonia or chlorhexidine gluconate, are therefore often added to alcohol-based disinfectants. In comparison to antibacterial soaps, the additives remain on the hands for a longer period of time, because they are not washed away during rinsing, and they can therefore exert their effect for a longer period of time. In addition, these additives often prolong the antimicrobial effect by slowing down the evaporation of alcohol *(46)*.

The use of the correct concentration is very important. For instance, sanitizers with 60% ethanol concentrations have greatly decreased antimicrobial activity, while those with ethanol concentrations above 95% lose antibacterial activity because such sanitizers contain too little water to denature proteins *(53)*. Hence, an optimal alcohol concentration has to be chosen to give the best results over a wide range of microorganisms. The optimal ethanol concentration to kill and remove bacteria from the skin is 70%, while viruses are best removed by use of 95% ethanol.

Pros and cons of hand alcohol. One of the benefits of alcohol-based disinfection is that the described procedure is simple, takes very little time, and does not need sinks, water taps, or drying equipment such as towels or air dryers. Another advantage of alcohols is their activity against a wide range of microorganisms and their fast mode of action.

A major disadvantage of alcohol-based disinfection is the inability to remove organic material or dirt from the skin surface. Consequently, alcohols are not able to reach the microorganisms that are embedded in the organic matrix so as to exert their antimicrobial activity. Secondly, the frequent use of alcohol-based sanitizers can cause skin irritation, although to a lesser extent than to the use of soap. Alcohols not only dehydrate the skin but also remove skin oils. The total alcohol concentration mainly determines the extent of skin damage. However, ethanol is regarded as more harmful to the skin than, for instance, isopropanol. Combinations of different alcohols (e.g., ethanol and isopropanol) maintain their effectiveness, but with a reduced total alcohol concentration. This is very useful, because lower total alcohol concentrations are less damaging to the skin.

Glycerin is often added at a concentration of 1–4% to reduce skin irritation caused by the use of alcohol-based sanitizers. The addition of skin softeners or emollients to the alcohol rubs slows down skin damage and also ameliorates the antimicrobial effects of the alcohol, probably because the alcohol evaporates more slowly when softeners or emollients are added, so that the alcohols are active for a longer period of time *(56)*.

Alcohol gels are also better for skin health and reduce skin damage, dehydration and irritation. Such disinfecting gels have been shown to be useful in reduction of infections in a clinical environment, but their value in the food industry remains to be investigated. Kramer et al. *(53)* examined the efficacy of several alcohol-based hand gels and concluded that these gels are less effective than liquid alcohol rubs in reducing microorganisms. However, recent developments have improved the efficacy of alcohol gels. With addition of suitable polymers, the gel liquefies faster, enabling better coverage. In addition, the amount of alcohol gel applied is crucial to its efficacy. It was demonstrated that doubling the volume of applied gel significantly improves efficiency of coverage of the hands with the gel, which may result in lower bacterial counts on the hands *(72)*. Considering that alcohol gels are beneficial to the skin and that good skin health is highly important to maintenance of good hand hygiene, alcohol gels may even be the preferred choice for long-term use.

TABLE 3. Comparison of properties of hand hygiene techniques *(47, 118)*

Property	Soap			Disinfectant		
	Regular soap	Antibacterial soap		Ethanol	Isopropanol	n-propanol
		chlorhexidine	triclosan	(60–85%)	(60–80%)	(60–80%)
Removal of debris and dirt	Yes			No		
Time needed	1–2 min			30 s		
Accessibility	Restricted by the presence of sink and water tap			Applicable everywhere		
Location	At sink and water tap			Applicable everywhere		
Drying facility	Necessary			Not necessary		
Risks						
Contamination through						
Water tap	Yes	Yes		No		
Soap/alcohol	Yes	Yes		No		
Inflammable	No	No		Yes		
Development of resistance	-	Moderate	Low	None	None	None
Effect on skin						
Skin hydration	Decreased	Decreased	Decreased	No change	No change	No change
Skin barrier	Impaired	Impaired	Impaired	No change	No change	No change
Skin irritation	Likely	Likely	Possible	Very uncommon	Very uncommon	Very uncommon
Allergy	Uncommon	Possible	Uncommon	Extremely uncommon[a]	None	None

[a] individual cases, possibly caused by impurities

Recommended procedure for the use of hand alcohols. The following procedure can be recommended: Take approximately 3 ml of alcohol disinfectant from a dispenser, and cover all surfaces of the hands and rub hands together thoroughly for at least 15 seconds, preferably until the gel is completely vaporized.

Soap versus alcohols

Each of the different methods of handwashing previously outlined has its own advantages and disadvantages, as summarized in Table 3.

The use of hand alcohol has some benefits over washing with water and soap. It takes less time than washing with soap and, in contrast to washing, use of alcohol is not restricted by the absence of a sink or water tap in the working environment. Alcohols show activity against a wide range of microorganisms (Table 4). However, in the case of some viral infections or contamination with bacterial spores, it is better to use hand washing instead of alcohols, because spores and some non-enveloped viruses show little or no sensitivity to alcohols.

The cost is higher for the use of alcohol-based hand rubs than for the use of antibacterial soap. The cost of antibacterial soap is 1.7 times higher than regular soap, while the cost of alcohol-based disinfectants is 2 times higher *(17)*. However, when the time needed to carry out the respective procedures properly is taken into account, the use of disinfectants is in fact cheaper because little working time is lost *(20)*.

Some resident microorganisms are beneficial for skin health and protect the skin against pathogens. Disinfecting the hands, kills not only transient microflora, but also part of the resident microflora. Washing hands with water and soap removes mainly the transient microflora. When these beneficial microorganisms are killed and/or removed, they can no longer exert their antagonistic effect during the next contact with pathogenic microorganisms.

If the hands are heavily soiled or visibly contaminated with dirt, it is strongly recommended that they be washed with water and soap, because alcohol-based sanitizers cannot remove the dirt and

TABLE 4. The efficacy of hand hygiene techniques in reduction of hand microflora and their activity spectrum *(47, 118)*

Effect on hand microflora[a]	Soap			Disinfectant		
	Regular soap	Antibacterial soap		Ethanol	Isopropanol	n-propanol
		chlorhexidine	triclosan	(60–85%)	(60–80%)	(60–80%)
Transient microflora (≤1 min)	0.5–3.0	2.1–3.0	2.8	2.6–4.5	4.0–6.8	4.3–5.8
Residential microflora (≤ 3 min)	< 0.4	0.4–1.8	0.3–0.8	2.4	1.5–2.4	2.0–2.9
Spectrum of Activity[b]						
Bacteria	-	++	++	+++	+++	+++
Mycobacteria	-	(+)	+	+++	+++	+++
Bacterial spores	-	-	-	-	-	-
Yeasts	-	++	++	+++	+++	+++
Dermatophytes	-	-	+	++	n.k.	n.k.
Enveloped viruses	-	++	n.k.	+++	+++	+++
Non-enveloped viruses	-	+	n.k.	+[c]	(+)[d]	(+)[d]

[a] average $\log_{10}$ reduction in the total microbial count

[b] +++: effective within 30s; ++: effective within 2 min.; +: effective within > 2min; (+): partially effective; -: not effective; n.k. not known

[c] 95% ethanol shows antiviral activity within 2 min

[d] depends on the tested virus

thus are not able to access the microorganisms so as to exert their antimicrobial activity. Therefore, it is strongly advised that the person wash the hands with water and soap, thoroughly dry them, and then apply a facultative alcohol rub, such as a 70% ethanol solution.

Food processing activities typically result in the formation on the skin's surface of a visible or invisible organic film consisting of proteins and/or lipids. This organic film interferes with the antimicrobial activity of alcohols by protecting the microorganisms from the applied alcohol, thereby reducing its efficacy. Conversely, washing hands with water and soap can remove such a film. For this reason, in the food industry it is strongly advised that hands be washed frequently with water and soap, combined with the use of disinfecting alcohol rubs, thus producing a synergetic effect. Moreover, when hands are first washed with water and soap, less alcohol-based disinfectant is needed to reach the same level of microorganism reduction *(79)*.

Automatic hand sanitizers — the way forward?

A new development that should become commercially available in 2008 is the "Automatic Hand Sanitizer" (AHS). As the EU acknowledged that unclean hands are a major cause of hospital infections, and that they cost the world thousands of lives, a project that focused on hospital infections was undertaken by the Community Network for the epidemiological surveillance and control of communicable diseases, established by the European Parliament and Council Decision 2119/98/EC. The main purpose of this project was to develop an Automatic Hand Sanitizer (AHS) that disinfects the hands of nurses, doctors, staff, patients and visitors in hospitals within 5 seconds, in a cost-efficient way, ensuring high-quality hand disinfection.

When hands are inserted into an opening of the AHS, it automatically detects them and subsequently disinfects them by spraying them with a fine aerosol of disinfectant. It also detects rings and other objects, and tells the user to spread fingers to ensure that disinfectant reaches all areas of the hand. An advantage of the AHS is that the hands are disinfected without making physical contact with the device.

The AHS promises to be cost efficient and user-friendly and to ensure replicable quality independent of the

TABLE 5. Comparison of properties of latex, vinyl and nitril gloves *(119)*

Barrier[a]	Tensile	Tear strength	Elasticity strength	Softness[b]	Biodegradability[c]	
Latex	< 5%	30 MPa	22.0 N/mm	800%	1.4	92%
Nitril	< 5%	27 MPa	3.9 N/mm	650%	6.4	6%
Vinyl	50%	11 MPa	4.2 N/mm	400%	3.0	8%

[a]expressed in % gloves that show leakage after intensive use

[b]Modulus M300 expressed in MPa (lower numbers denote softer material)

[c]expressed in loss of weight after 12 months

user's behavior. Furthermore, it is simple and very quick compared to normal handwashing with soap and water. The disinfectant under development for this device, known as MD200, is said to contain no alcohol, chlorine or iodine. Therefore, its use should neither cause discomfort nor irritate the skin, and hence should invite more frequent disinfecting.

Although it is the health sector that is the main target group for the product, the AHS offers huge possibilities for the food sector as well. In fact, the disinfection devices can be placed in any area where bacteria are transferred by human handling, such as in the workplace, airports, bars and restaurants.

Make glove, not war

Protecting hands with gloves. Gloves provide a physical barrier between hands and contaminated surfaces, resulting in the protection of food against contamination by microbial pathogens via food operators. However, the available literature is complicated regarding the efficacy of gloves in preventing food contamination. Most available data originate from the medical sector, and transposing the conclusions to the food industry is not straightforward, for the following reasons. First, gloves used by medical staff are usually of better quality than the gloves used in the food industry. Second, experiments that examine the contribution of gloves to the reduction of the risk of contamination usually focus only on the analysis of glove leakage and do not accurately mimic the reality of food processing. Therefore, the available experimental data should be critically analyzed *(84)*.

Experiments that examine the transfer of microorganisms from contaminated hands to food demonstrate that wearing gloves reduces the translocation of microorganisms significantly. In the retail sector, gloves are especially useful to prevent the transfer of fecal pathogens from fingertips to food when the hands have not been properly washed. However, this reduction is not absolute *(84)*. Several studies show that bacteria are able to pass through the physical barrier of gloves *(24)*. It was demonstrated, for instance, that wearing gloves cannot prevent the transfer of bacteria from contaminated meat to hands but only reduces it by 2 log units, compared to the transfer without the use of gloves. Even the frequent change of gloves (e.g., every hour) could not prevent food contamination *(34, 35)*. Contact time plays an important role in the transfer of microorganisms. Several publications show that the risk of transferring microorganisms through the glove barrier increases with contact time. *(84)*. Even during very short contact periods (5 s) the migration of microorganisms through the gloves was reported *(92)*.

The number of microorganisms transferred from contaminated food to hands is comparable to the number of microorganisms present after handwashing with soap *(19)*. In contrast to bacteria, viruses do not cross the glove barrier very easily. Hence, wearing gloves gives better protection against contamination by viruses, when gloves are used properly *(10, 21)*. However, protection against viruses is not absolute, as the transfer of bacteriophages, Hepatitis B, and Herpes Simplex virus across the glove barrier has been reported *(51, 52, 74, 101)*.

Choice of gloves. Gloves made of natural rubber (latex) are commonly used because of this material superior properties compared with synthetic alternatives such as nitril and vinyl (Table 5). Latex gloves have considerably better strength, elasticity and comfort. Vinyl gloves are characterized by a lower efficacy of the physical barrier, and in addition, more frequent leakage is observed *(50)*; when used intensively, vinyl gloves show approximately 13 times more leakage than latex gloves *(119)*. Nitril gloves provide a physical barrier that is comparable to that of latex gloves, but they tend to break more easily than latex gloves. Despite the fact that nitril gloves are superior in several ways to vinyl gloves, the latter are more frequently used, mainly because of their lower cost than nitril gloves *(22, 99, 119)*.

Some authors have investigated the use of two pairs of gloves, which it was assumed would provide an enhanced physical barrier. Indeed, this has been confirmed in the case of vinyl gloves as the use of two pairs reduced the risk of leakage by one-third, but with latex or nitril gloves, the use of two pairs does not have the same enhanced effect. On the other hand, double-layered gloves of any kind will provide better protection *(119)*.

Gloves with microspheres that release chlorine dioxide, activated by light or moisture, are a recent development in glove technology *(5)*. When chlorine dioxide is dissolved in water, it has antibacterial activity. Such gloves are not harmful to hands and are not uncomfortable. Although some authors are not convinced of their efficacy *(75)*, it is clear that such glove technology shows huge

potential in the reduction of food contamination. However, as is the case with most antimicrobial chemicals, the use of chlorine dioxide is coupled with the risk of development of resistance.

Disadvantages of gloves. Gloves only reduce the transfer of microorganisms (such as fecal microorganisms) from hands to food and are no improvement over bare hands in terms of cross contamination *(69)*. Additionally, wearing gloves can give food operators a false feeling of safety and possibly reduce awareness of food contamination caused by contaminated gloves *(40)*.

As with soaps and disinfectants, the frequent use of gloves is not favorable to maintaining healthy skin. Larson et al. *(57)* observed a correlation between skin damage and the frequency of glove use. Wearing gloves during longer periods of time can also cause eczema, skin irritation, or contact dermatitis. As previously discussed, skin damage results in an increased number of microorganisms on the hands and reduced efficacy of handwashing or hand disinfection.

Another major disadvantage of glove use is the occurrence of latex allergy. The number of people who are allergic to latex is estimated at 1–2%. Only a small percentage of this group of people show a very strong allergic reaction *(61)*. However, frequent use of latex gloves increases the risk of latex allergy. Conversely, allergic reactions to synthetic gloves are reported only sporadically. Direct latex allergy is caused by an immune response that produces specific antibodies (IgE) against enzymes present in natural latex. Latex allergy can be triggered by direct contact with latex gloves but can also be induced by inhaling latex glove powder. Because of immunological cross reactivity, latex allergy can also result in allergies against kiwi, banana and avocado *(15)*. It is worth noting that contamination of food with latex is reported only sporadically. Therefore, latex is rarely identified as a hidden food allergen, and the risk of developing latex allergy by food consumption is virtually nonexistent *(43, 110)*.

Late or attenuated allergy is caused by some chemicals that are added during glove production, such as carbamates, thiuramcompounds, and mercaptans. Presence of such chemical additives can cause contact dermatitis. This phenomenon is not restricted to latex gloves and can also occur with use of synthetic gloves *(116)*.

To prevent latex allergy, the use of nitril gloves, vinyl gloves, latex gloves with low protein content, or latex gloves provided with a synthetic inner layer can be considered. However, the use of vinyl can result in risks that are yet unknown, such as possible migration of chemicals (e.g., phthalates) in food *(43)*. The use of powderless latex gloves can also reduce the risk for latex allergy, but without the moisture-reducing powder there is a higher risk of eczema. These alternative gloves also cost more than latex gloves with powder. In addition, food companies can reduce the risk of latex allergy by reducing the number of people that wear gloves to a minimum and by encouraging employees to maintain good skin health when gloves are worn for long periods of time *(43, 61, 116)*.

Other measures to improve good hand hygiene

Jewelry. The avoidance of wearing jewelry is an essential measure of good personal hygiene practice, for several reasons. First, microorganisms are found in higher amounts on skin covered by rings than elsewhere. It has been demonstrated that the amount of microorganisms increases with the number of rings worn. Second, microorganisms can survive longer under rings, even for a couple of months, because the rings provide a protected environment. Finally, wearing rings considerably reduces the efficacy of handwashing or hand disinfection *(85, 107, 115)*. An increased number of microorganisms is also detected on the skin when other jewelry, such as wrist watches or bracelets, are worn. Because the scientific data concerning the impact of wearing watches or bracelets are scarce, there is not sufficient evidence to warrant prohibiting the wearing of watches or bracelets on the basis of hygienic reasons. Nevertheless, wearing watches or bracelets may still result in the physical contamination of food, and the same holds true for body piercings that are not covered with clothing, e.g., nose or eyebrow piercings. Therefore, bracelets, wrist watches, or piercings should be prohibited *(46)*.

Nails and nail art technology. The highest numbers of microorganisms are found under fingernails. It is therefore strongly recommended that fingernails be kept short. Furthermore, long nails can cause breakage or leakage of gloves, penetrating the physical barrier. The highest reduction of microorganisms under fingernails is obtained when hands are washed with water and soap, using a special fingernail brush. The use of alcohol gels is the least effective method of reducing microorganisms under finger nails *(46, 53, 79, 90)*.

Artificial nails are usually longer and harbor significantly more microorganisms than natural nails. In addition, hand hygiene techniques used to reduce the number of microorganisms are less effective in the case of artificial nails *(63)*. Based on the scientific data available, nail art technology, such as nail piercings, decorative nail stones, artificial nails, nail extensions, and nail polish, should also be prohibited *(46)*.

Improving skin health. Frequent washing, disinfecting and frequent use of gloves dehydrates the skin, which results in skin damage. A healthy skin is essential in maintaining good hand hygiene, for several reasons. Damaged skin is a better environment for the survival and/or proliferation of microorganisms. Furthermore, it has been demonstrated that the efficacy of hand washing and disinfection is reduced. Finally, skin damage also impacts on the structure of the microbial community, which may decrease the natural barrier function of the skin, thereby allowing entry of pathogenic microorganisms. In order to prevent contamination in the food environment, damaged skin should be treated and appropriately covered *(58)*.

Good skin hydration is a prerequisite for healthy skin and a better protection against microbial pathogens. Frequent use of lotions, emollients or hydrating hand creams results in a significant protection against massive colonization of skin by microorganisms. However, oil-based products can have adverse effects on the physical barrier function of latex gloves or the efficacy of antimicrobial agents in soaps *(59)*. It is also worth noting that tattoos do not appear to have an effect on hand hygiene *(46)*.

TABLE 6. Recommendations in voluntary quality systems BRC and IFS to minimize the risk

BRC	IFS	Regulation
3.6.2	3.3.4	Adequate and accessible hand washing facilities should be provided. These should be located at the most appropriate points of the operation.
3.6.3	3.3.5	Water closets should not communicate directly with any food area.
6.2.1	3.2.2.6	Hands should be cleansed at appropriate time intervals.
6.2.2	3.2.2.7	The efficacy of hand hygiene procedures should be monitored.
	3.2.2.2	Company rules for personal hygiene should be defined and should be complied with by food operators, company staff and visitors. The risk of product contamination should be taken into account when defining these rules.
6.2.5	3.2.2.4	All cuts, wounds, and abrasions of uncovered skin must be covered with blue, metal detectable plasters. Administration of such plasters must be systematically monitored. Appropriate gloves should be worn to cover the plasters.
6.2.7		Finger nails should be short, clean and not polished. Synthetic nails should not be allowed.
6.2.8		The organization should have a personal hygiene policy that, while incorporating religious, ethnic or medical considerations, still provides clear defined measures that keep the risk of contamination to a strict minimum.
6.2.9		The wearing of jewelry is not allowed, e.g. watches, nose or eyebrow piercings, exposed body piercings, with the exception of smooth wedding rings, and small earrings.
	3.2.2.3	Jewelry or watches are not allowed.
6.3.1	3.2.3.1	The company should have a procedure whereby all employees shall notify management of all relevant infectious diseases from which they suffer or have been in contact with.
6.3.2		A company upon awareness that a person suffering from, or being a carrier of a disease likely to be transmitted through food, has entered the facility must take appropriate measures necessary to minimize the risk of food contamination.
6.4.8	3.2.1.8	If gloves are used, they should be monitored to minimize food contamination.
	3.2.4.3	The organization must ensure that all employees receive hygiene training commensurate with their work activities and that this training is effective.

Washing facilities. Doorknobs, sinks, water taps, and soap or alcohol dispensers are regularly touched by contaminated hands. Skin surfaces can be recontaminated after washing or disinfecting. Therefore, it is strongly recommended that automatic or hands-free water taps be provided and that soap or alcohols are dispensed without direct contact of the dispenser and the hand. The dispensers should be so designed that the soap in the nozzle cannot become contaminated. In addition, when the reservoir of soap dispensers is changed, the dispenser should also be disinfected thoroughly to minimize the risk of soap contamination *(46)*. The AHS (section 2.4) has the advantage of automatic hand disinfection without physical contact of the hand with the device.

During washing, special attention must be paid to sleeves. When they get wet, sleeves become an excellent niche for microorganisms and consequently a possible source of contamination. Several hand hygiene guidelines therefore recommend that sleeves be rolled up prior to hand washing. In addition, handwashing facilities should be thoroughly cleaned on a regular basis in order to minimize the risks of contamination.

HAND HYGIENE REQUIREMENTS

Reduction of microorganisms on hands: How low should we go?

Safety means an absence of risk. It is clear that hand hygiene techniques never absolutely eliminate the risk of

food contamination. Hence, none of the techniques can provide an assurance of absolute safety. Therefore, in the interest of food safety, an "appropriate level of protection" (ALOP), a term that was introduced by the WTO, must be achieved *(14, 32)*.

Expression of an ALOP should be based on the best knowledge available at the time and on public health goals/targets and should be defined after risk analysis carried out by scientists who are experts both in the topic and in the methodology of risk assessment and after consultations with relevant stakeholders. Based on this information, ALOPs can be expressed in the form of laws, regulations, codes of practice and guidelines, which are primarily the responsibility of legislators *(32, 44)*. In the European Union, for instance, ALOP is mentioned in the Food Hygiene Regulation (EC 852/2004), which is discussed further in a later section.

Nevertheless, the translation of an ALOP into food safety objectives and more specifically into microbiological criteria regarding hand hygiene is extremely complex, and the methodology to do so is still in debate *(102, 117)*. Moreover, because the currently achieved level of consumer health protection may change (for example, new technologies may change the level of a contaminant detected in a food), an ALOP may need to be revised over time.

Legal requirements of the European Union

The "hygiene package" of 5 laws adopted by the EU and in practice since January 1, 2006 aimed to merge, harmonize and simplify very detailed and complex hygiene requirements that were scattered over seventeen EU Directives. The overall aim was to create a single, transparent hygiene policy applicable to all food and all food operators, together with effective instruments to manage food safety and potential future food crises, throughout the food chain.

Regulation (EC) No 852/2004 of the European Parliament and of the Council on the Hygiene of Foodstuffs contains common principles in relation to structural, operational and hygiene requirements for establishments. These principles constitute a common basis for the hygienic production of all food, including products of animal origin. In addition to this common basis, specific hygiene rules are necessary for certain foodstuffs. Regulation (EC) No 853/2004 lays down specific hygiene rules for food of animal origin. The general hygiene requirements for all food business operators, contained in the 12 chapters of Annex II of Regulation (EC) No 852/2004, cover the Prerequisite Programmes (PRPs) and the basic principles of operational and structural hygiene.

Chapter 1, Section 4, which specifically relates to hand hygiene requirements, states: "An adequate number of washbasins is to be available, suitably located and designated for cleaning hands. Washbasins for cleaning hands are to be provided with hot and cold running water, materials for cleaning hands and for hygienic drying. Where necessary, the facilities for washing food are to be separate from the handwashing facility."

Personal hygiene is covered in sections 1 and 2 of chapter 8. Section 1 states: "Every person working in a food-handling area is to maintain a high degree of personal cleanliness and is to wear suitable, clean and, where necessary, protective clothing." Section 2 states: "No person suffering from, or being a carrier of a disease likely to be transmitted through food or afflicted, for example, with infected wounds, skin infections, sores or diarrhea is to be permitted to handle food or enter any food-handling area in any capacity if there is any likelihood of direct or indirect contamination. Any person so affected and employed in a food business and who is likely to come into contact with food is to report immediately the illness or symptoms, and if possible their causes, to the food business operator."

Legislation covers not only hands, but also materials that come in contact with hands. Gloves, similarly to other materials in contact with food, are subjected in some countries to strict regulations, e.g., materials used, limits of migration, and labeling. Manufacturers of gloves are legally required to perform necessary tests to demonstrate compliance with legal requirements. However, this regulation is not widely known to end users *(43)*.

Legal requirements of the United States

Food Safety Regulation in the United States is complicated because it involves federal authorities as well as several local governments. The most important federal agencies that have responsibility for food safety are: The Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA), which is responsible for regulations regarding safety of meat, poultry, and egg-based products; Food and Drug Administration (FDA), responsible for regulations regarding other foodstuffs; Center for Disease Control and Prevention (CDC), responsible for prevention and control of disease outbreaks; and Environmental Protection Agency (EPA), responsible for regulations regarding pesticides. The coordinated action of these authorities results in a coherent and effective policy.

The Food Code is a reference document published by the FDA in collaboration with FSIS and CDC to assure food safety and is implemented in national law in most states. The Food Code contains several regulations concerning hand hygiene specifically, such as regulations specifying that when, how and where hands should be washed; fingernails should be kept short and clean; handwashing facilities should be present in sufficient numbers; handwashing infrastructure cannot be used for other purposes than washing hands; and except for a plain ring, food operators may not wear jewelry.

Voluntary quality management systems

The Codex Alimentarius (Latin, meaning Food Law or Code) is a collection of internationally adopted standards, codes of good practice, guidelines, and recommendations regarding food safety that was developed and is administered by the United Nations' Codex Alimentarius Commission. Its purpose is to protect the health of consumers and to ensure fair practices in the food trade *(31)*. Although the Codex has no legal authority, it gains importance with increasing globalization. For instance, in several countries it is required that imported food is produced and processed in compliance with the Codex *(45)*.

In addition to the Codex Alimentarius, there are also voluntary quality managements systems (QMS), such as BRC (British Retail Consortium), IFS (International Food Standard) or ISO-22000, which incorporate the Codex

Alimentarius, national and international legislation, and sectoral guidelines governed by the principles of HACCP. QMS always include requirements regarding personal hygiene, including hand hygiene.

While BRC and IFS contain specific work instructions (Table 6), ISO 22000 requires implementation of the so-called prerequisite programmes (PRPs). These are standard operating procedures that contain the basic conditions and activities that are necessary to maintain a hygienic environment throughout the food chain. The organization defines PRPs according to the Codex Alimentarius, national and international law, and sectoral guidelines. Examples of equivalent terms are: Good Agricultural Practice (GAP), Good Veterinarian Practice (GVP), Good Manufacturing Practice (GMP), Good Hygienic Practice (GHP), Good Production Practice (GPP), Good Distribution Practice (GDP) and Good Trading Practice (GTP). One such PRP defines the regulations concerning hygiene of employees. ISO 22000 requests the organization to validate and monitor HACCP and the defined PRPs. The organization has to verify and demonstrate compliance with the regulations defined in the PRPs.

COMPLIANCE WITH HAND HYGIENE REGULATIONS

Food operators play a key role in food safety by using safe and hygienic practices during all stages of food production. Good hand hygiene is critical in reducing food contamination *(45)*. However, hand hygiene techniques are effective only if the appropriate procedures are carried out correctly. This is certainly the case with handwashing. For instance, a procedure prescribes that hands be rubbed together thoroughly with water and soap for at least 15 seconds, but, in reality a general lack of compliance has been noted *(39, 81, 97)*. Several medical studies show that improvement of compliance with hand hygiene guidelines coincides with a significant decrease in nosocomial infections and MRSA (Methicillin-resistant *Staphylococcus aureus*) transmission, emphasizing the importance of good compliance *(94)*.

Ease of use and comfort appear to be major factors that determine whether or not hand hygiene procedures are followed correctly. For instance, skin irritation and "being too busy" are regularly reported reasons for not washing hands. However, several other factors also influence the levels of compliance with hand hygiene procedures. The infrastructure necessary to maintain good hand hygiene should be sufficiently available and should be nearby. Social factors, such as gender, cultural factors, education, and religious background, also play a role in the levels of compliance. For instance, it is not recommended that Muslim employees be forced to disinfect hands using hand alcohols, because they often refuse to use alcohol for religious reasons *(39, 46)*. Demanding full compliance with guidelines is often unrealistic and can even negatively influence compliance *(94)*.

Monitoring compliance with procedures is not straightforward. For instance, it is not easy to verify that the prescribed amount of soap or alcohol is used or to monitor whether sufficient time is taken to wash or disinfect hands *(17, 39, 46)*. In the medical sector, it has been suggested that the monitoring of hand hygiene compliance be carried out electronically. This can be achieved by installing electronic readers that can scan employee badges at sinks or dispensers. In this way, the organization can monitor how often a certain employee washes or disinfects his or her hands *(17, 48)*. In a more advanced system, electronic readers may even measure how much soap or alcohol is used and how much time was taken to carry out the hand hygiene procedure. Such a recording device provides feedback about soap or alcohol use for hand hygiene quality improvement, and may improve compliance with hand hygiene procedures *(48)*. In fact, a system for monitoring hygiene appliances was recently patented *(60)*.

In order to obtain better compliance with hand hygiene procedures, management must provide adequate quantities of washing facilities, sinks, alcohol dispensers, and/or gloves. The operators are often not fully aware of the importance of good hand hygiene and as a consequence may be careless in complying with these rules. Therefore, employees should be better trained in proper handwashing techniques. In addition, information campaigns can make employees more conscious of good hygiene. For instance, posters that are displayed in working areas remind employees to carry out the prescribed procedures correctly *(71)*. Compliance is especially enhanced when both employees and management are actively involved in these information campaigns *(93, 94)*.

Routine observation and feedback are most effective measures in improving compliance *(25)*. Rewards, sanctions and active participation in the design of hand hygiene programs may contribute to a positive culture for hand hygiene and result indirectly in an improvement in compliance levels *(39, 46)*.

CONCLUSIONS

Exposure to microbial pathogens via food is increasing because of changing consumption and social habits, resulting in an increase in foodborne illnesses *(6, 68)*. Good hand hygiene during all stages of food production is extremely important to minimize the risk of foodborne illnesses, especially with ready-to-eat foods or fresh cut produce, which require no further cooking or heating steps. Moreover, in a globalized world, foodstuffs travel longer distances between production and consumption, giving microorganisms the opportunity to proliferate in contaminated foodstuffs.

Choosing the optimal hand hygiene technique is not an easy task, as the scientific literature is not unequivocal on this topic; hands hygiene involves complex interactions between several parameters. Neither washing hands nor disinfection nor wearing gloves can completely abolish the risk of cross contamination. A specific hand hygiene technique should be selected based on its inherent advantages and disadvantages, taking into account the specific circumstances and needs of the working environment. Food companies often have to compromise between the desired reduction in the number of microorganisms and the implementation of a hand hygiene technique that is achievable in the specific working environment.

Regardless of the hand hygiene technique chosen, it is of the utmost importance that the basic principles of hand hygiene are strictly adhered to. A very simple and effective technique to remove microorganisms is washing hands with soap. The described washing procedure must be executed correctly, complying with the correct time (at least 15 s) necessary to allow for the effective physical removal of pathogens. Hand drying is another basic component

of effective handwashing. The skin of hands must be dried properly to have an optimal microorganism reducing effect. Provided that hands are not soiled, the quickest method of achieving effective hand hygiene is by using an alcohol-based sanitizer. The advantage of selecting such a method is that it is not limited by unavailability of water and it can be applied everywhere. Moreover, this technique appears to cause less skin damage than other techniques. Nevertheless, regular handwashing is highly recommended, even when disinfectants are used. This is particularly true in the food sector, where food production typically results in formation on skin of an organic film that reduces the antimicrobial efficacy of alcohol. It is also advised that the hands be washed with soap when hands are contaminated with viruses or bacterial spores, as bacterial spores and some viruses are not sensitive to alcohols. The most effective measure in removing microorganisms is a combination of washing the hands with antibacterial soap, followed by disinfection with alcohol-based sanitizers *(91)*.

Wearing gloves is an alternative technique for reducing the transmission of microorganisms from hands to food or vice versa. The efficacy of wearing gloves is comparable to that of handwashing or disinfection *(19)*. However, wearing gloves can induce a false sense of safety, which may result in food operators being negligent. Even when gloves are used properly, it is highly recommended that hands be washed regularly and gloves changed frequently *(54)*. Moreover, glove use is often associated with (latex) allergy or eczema.

All mentioned hand hygiene techniques may cause skin damage when used frequently. Damaged skin is highly susceptible to colonization by microorganisms, and hygiene procedures are less effective when skin is damaged. It is therefore essential to maintain healthy hands by applying emollients, hydrating creams or lotions.

ACKNOWLEDGMENTS

iMIK (http://www.imik.org) is funded by the "Instituut voor bevordering van innovatie door wetenschap en technologie in Vlaanderen (IWT)" (grant TIS020502), LAVA, Freshway, and Legumex Convenience.

REFERENCES

1. Ackers, M. K., S. Schoenfeld, J. Markman, M. G. Smith, M. A. Nicholson, W. DeWitt, D. N. Cameron, P. M. Griffin, and L. Slutsker. 2000. An outbreak of *Yersinia enterocolitica* O:8 infections associated with pasteurized milk. J. Infect. Dis. 181:1834–1837.
2. Aiello, A. E., E. L. Larson, and S. B. Levy. 2007. Consumer antibacterial soaps: Effective or just risky? Clin. Infect. Dis. 45:S137–147.
3. Aly, R., and H. I. Maibach. 1981. Factors controlling skin bacterial flora, p. 29–39. *In* H. I. Maibach and R. Aly (eds.), Skin microbiology, relevance to clinical infection. Springer-Verlag, New York.
4. Banatvala, N., A. R. Magnano, M. L. Cartter, T. J. Barrett, W. F. Bibb, L. L. Vasile, P. Mshar, M. A. Lambert-Fair, J. H. Green, N. H. Bean, and R. V. Tauxe. 1996. Meat grinders and molecular epidemiology: two supermarket outbreaks of *Escherichia coli* O157:H7 infection. J. Infect. Dis. 173:480–483.
5. Barza, M. 2004. Efficacy and tolerability of ClO_2-generating gloves. Clin. Infect. Dis. 38:857–863.
6. Bean, N. H., and P. M. Griffin. 1990. Foodborne disease outbreaks in the United States, 1973–87: pathogens, vehicles, and trends. J. Food Prot. 53: 804–17.
7. Bean, N. H., J. S. Goulding, M. T. Daniels, and F. J. Angelo. 1997. Surveillance for foodborne disease outbreaks – United States, 1988–1992. J. Food Prot. 60:1265–1286.
8. Bhalla, A., N. J. Pultz, D. M. Gries, A. J. Ray, E. C. Eckstein, D. C. Aron, and C. J. Donskey. 2004. Acquisition of nosocomial pathogens on hands after contact with environmental surfaces near hospitalized patients. Infect. Control Hosp. Epidemiol. 25:164–167.
9. Bhargava, H. N., and P. A. Leonard. 1996. Triclosan: applications and safety. Am. J. Infect. Control 24:209–218.
10. Bidawid, S., J. M. Farber, and S. A. Sattar. 2000. Contamination of foods by food handlers: experiments on Hepatitis A virus transfer to food and its interruption. Appl. Environ. Microbiol. 66:2759–2763.
11. Bidawid, S., N. Malik, O. Adegbunrin, S. A. Sattar, and J. M. Farber. 2004. Norovirus cross contamination during food handling and interruption of virus transfer by hand antisepsis: experiments with feline calcivirus as a surrogate. J. Food Prot. 67:103–109.
12. Black, R. E., A. C. Dykes, K. E. Anderson, J. G. Wells, S. P. Sinclair, G. W. Gary, M. H. Hatch, and E. J. Gangarosa. 1981. Handwashing to prevent diarrhea in day-care centers. Am. J. Epidemiol. 113:445–451.
13. Blackmore, M. A. 1989. A comparison of hand drying methods. Cater. Health 1:189–198.
14. Blanchfield, R. 2007. Safety, risk, and the precautionary principle. IUFoST Scientific Bulletin #5, August 2007. (available at www.iufost.org/docs/IUFSIB.Safety,Risk.P.P_1.pdf).
15. Blanco, C., T. Carrillo, R. Castillo, J. Quiralte, and M. Cuevas. 1994. Latex allergy: clinical features and cross-reactivity with fruits. Ann. Allergy 73:309–314.
16. Bloomfield, S. F., and E. Scott. 1997. Cross contamination and infection in the domestic environment and the role of chemical disinfectants. J. Appl. Microbiol. 83:1–9.
17. Boyce, J. M. 2001. Antiseptic technology: access, affordability, and acceptance. Emerg. Infect. Dis. 7:231–233.
18. Breuer, T. 1999. CDC investigations: the May 1998 outbreak of *Salmonella agona* linked to cereal. Cereal Food World 44:185–186.
19. Chen, Y., K. M. Jackson, F. P. Chea, and D. W. Schaffner. 2001. Quantification and variability analysis of bacterial cross contamination rates in common food service tasks. J. Food Prot. 64:72–80.
20. Cimiotti, J. P., P. W. Stone, and E. L. Larson. 2004. A cost comparison of hand hygiene regimens. Nurs Econ. 22:196–199.
21. Cliver, D. O., and K. D. Kostenbader, Jr. 1984. Disinfection of virus on hands for prevention of foodborne disease. Int. J. Food Microbiol. 1:75–87.
22. Creely, K. S., and J. W. Cherrie. 2001. A novel method of assessing the effectiveness of protective gloves – Results from a pilot study. Ann. Occup. Hyg. 45:137–143.
23. Curtis, V., and S. Cairncross. 2003. Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. Lancet Infect. Dis. 3:275–281.

24. Doebbeling, B. N., M. A. Pfaller, A. K. Houston, and R. P. Wenzel. 1988. Removal of nosocomial pathogens from the contaminated glove. Implications for glove reuse and handwashing. Ann. Intern. Med. 109:394–398.
25. Dubbert, P. M., J. Dolce, W. Richter, M. Miller, and S. Chapman. 1990. Increasing ICU staff handwashing: effects of education and group feedback. Infect. Control Hosp. Epidemiol. 11:191–193.
26. Dunn, R. A., W. N. Hall, J. V. Altamirano, S. E. Dietrich, B. Robinson-Dunn, and D. R. Johnson. 1995. Outbreak of *Shigella flexneri* linked to salad prepared at a central commissary. Michigan. Public Health Rep. 110:580–586.
27. Ehrenkranz, N. J., and B. C. Alfonso. 1991. Failure of bland soap handwash to prevent hand transfer of patient bacteria to urethral catheters. Infect. Control Hosp. Epidemiol. 12:654–662.
28. Ellis, A., M. Preston, A. Borczyk, B. Miller, P. Stone, B. Hatton, A. Chagla, and J. Hockin. 1998. A community outbreak of *Salmonella berta* associated with a soft cheese product. Epidemiol. Infect. 120:29–35.
29. Evans, M. R., J. P. Tromans, E. L. Dexter, C. D. Ribeiro, and D. Gardner. 1996. Consecutive *Salmonella* outbreaks traced to the same bakery. Epidemiol. Infect. 116:161–167.
30. Evans, M. R., R. L. Salmon, L. Nehaul, S. Mably, L. Wafford, M. Z. Nolan-Farrell, D. Gardner, and C. D. Ribeiro. 1999. An outbreak of *Salmonella* Typhimurium DT170 associated with kebab meat and yogurt relish. Epidemiol. Infect. 122:377–383.
31. FAO/WHO Food Standards. 2008. About Codex Alimentarius. http://www.codexalimentarius.net/web/index_en.jsp#.
32. FAO/WHO. 2006. Food safety risk analysis: a guide for national food safety authorities. (available at: ftp://ftp.fao.org/docrep/fao/009/a0822e/a0822e00.pdf).
33. Feachem, R. G., D. J. Bardley, H. Garlick, and D. D. Mara. 1983. *Salmonella*, enteric fevers, and salmonelloses, p. 253. *In* Sanitation and disease: health aspects of excreta and wastewater management. John Wiley and Sons, New York.
34. Fendler, E. J., M. J. Dolan, and R. A. Williams. 1998. Handwashing and gloving for food protection. Part I. Examination of the evidence. Dairy Food Environ. Sanit. 18:814–823.
35. Fendler, E. J., M. J. Dolan, R. A. Williams, and D. S. Paulson. 1998. Handwashing and gloving for food protection. Part II. Effectiveness. *Dairy Food Environ. Sanit.* 18, 824–829.
36. Frantz, S. W., K. A. Haines, C. G. Azar, J. I. Ward, S. M. Homan, and R. B. Roberts. 1997. Chlorhexidine gluconate (CHG) activity against clinical isolates of vancomycin-resistant *Enterococcus faecium* (VREF) and the effects of moisturizing agents on CHG residue accumulation on the skin. J. Hosp. Infect. 37:157–164.
37. Garner, J. S., and M. S. Favero. 1986. CDC guidelines for the prevention and control of nosocomial infections. Guideline for hand washing and hospital environmental control. Am. J. Infect. Control 14:110–115.
38. Goulet, V., J. Rocourt, I. Rebiere, C. Jacquet, C. Moyse, P. Dehaumont, G. Salvat, and P. Veit. 1998. Listeriosis outbreak associated with the consumption of rillettes in France in 1993. J. Infect. Dis. 177:155–160.
39. Green, L. R., and C. Selman. 2005. Factors impacting on food worker's and manager's safe food preparation practices: a qualitative study. Food Prot. Trends 25:981–990.
40. Grover, S. 2001. Disposable gloves for foodservice workers? http://www.restaurant.org/healthsafety/sg_article_2001_02_20gloves.pdf.
41. Gustafson, D. R., E. A. Vetter, D. R. Larson, D. M. Ilstrup, M. D. Maker, R. L. Thompson, and F. R. Cockerill. 2000. Effects of 4 hand-drying methods for removing bacteria from washed hands: a randomized trial. Mayo Clin. Proc. 75:705–708.
42. Hennessy, T. W., C. W. Hedberg, L. Slutsker, K. E. White, J. M. Besser Wiek, and M. E. Moen. 1996. A national outbreak of *Salmonella* Enteritidis infections from ice cream. N. Engl. J. Med. 334: 1281–1286.
43. Horion, B. 2004. General overview of the risks related to wearing gloves in the food industry and in particular of the risk of latex allergies. In Dutch. Brochure available at "Directoraat-generaal Dier, Plant en Voeding; afdeling voedingsmiddelen en andere consumptieproducten; R.A.C.; Oratoriënberg 20 bus 3, 1010 Brussel, Belgium".
44. Houghton, J. R., G. Rowea, L. J. Frewer, E. Van Kleef, G. Chryssochoidis, O. Kehagia, S. Korzen-Bohr, J. Lassen, U. Pfenning, and A. Strada. 2008. The quality of food risk management in Europe: Perspectives and priorities. Food Policy 33:13–26.
45. James, J. 2006. Overview of microbial hazards in fresh fruit and vegetables operations, p. 1–36. *In* J. James (ed). Microbial hazard identification in fresh fruit and vegetables. John Wiley & Sons, Inc., West Sussex, U.K.
46. Jumaa, P. A. 2005. Hand hygiene: simple and complex. Int. J. Infect. Dis. 9:3–14.
47. Kampf, G., and A. Kramer. 2004. Epidemiologic background of hand hygiene and evaluation of the most important agents for scrubs and rubs. Clin. Microbiol. Rev. 17:863–893.
48. Kinsella, G., A. N. Thomas, and R. J. Taylor. 2007. Electronic surveillance of wall-mounted soap and alcohol gel dispensers in an intensive care unit. J. Hosp. Infect. 66:34–39.
49. Koopmans, M., and E. Duizer. 2004. Foodborne viruses: an emerging problem. Int. J. Food Microbiol. 90:23–41.
50. Korniciewicz, D. M., B. E. Laughton, A. Butz, and E. Larson. 1989. Integrity of vinyl and latex procedure gloves. Nurs. Res. 39:144–146.
51. Korniewicz, D. M., B. E. Laughton, W. H. Cyr, C. D. Lytle, and E. Larson. 1990. Leakage of virus through used vinyl and latex examination gloves. J. Clin. Microbiol. 28:787–788.
52. Kotilainen, H. R., J. P. Brinker, J. L. Avato, and N. M. Gantz. 1989. Latex and vinyl examination gloves. Quality control procedures and implications for health care workers. Arch. Intern. Med. 149:2749–2753.
53. Kramer, A., P. Rudolph, G. Kampf, and D. Pittet. 2002. Limited efficacy

of alcohol-based hand gels. Lancet, 359:1489–1490.
54. Larson, E. 1989. Handwashing: its essentials – even when you use gloves. Am. J. Nurs. 89:934–939.
55. Larson, E. 1999. Skin hygiene and infection prevention: more of the same or different approaches? Clin. Infect. Dis. 29:1287–1294.
56. Larson, E. 2001. Hygiene of the skin: when is clean too clean? Emerg. Infect. Dis. 7:225–230.
57. Larson, E., C. Friedman, J. Cohran, J. Treston-Aurand, and S. Green. 1997. Prevalence and correlates of skin damage on the hands of nurses. Heart Lung 26:404–412.
58. Larson, E., C. A. Hughes, J. D. Pyrek, S. M. Sparks, E. U. Cagatay, and J. M. Bartkus. 1998. Changes in bacterial flora associated with skin damage on hands of health care personnel. Am. J. Infect. Control 26:513–521.
59. Larson, E., M. Silberger, K. Jakob, S. Whittier, L. Lai, P. DellaLatta, and L. Salman. 2000. Assessment of alternative hand hygiene regimens to improve skin health among neonatal ICU nurses. Heart Lung 29:136–142.
60. LeBlond, C. W., and H. M. Ortiz. 2007. System for monitoring hygiene appliances. U.S. Pat. 7,242,307. Jul. 10.
61. Lee, A., R. Nixon, and K. Frowen. 2001. Reduction of use of latex gloves in food handlers: an intervention study. Contact Dermatitis 44:75–79.
62. Lehmacher, A., J. Bockemühl, S. Aleksic. 1995. Nationwide outbreak of human salmonellosis in Germany due to contaminated paprika and paprika-powdered potato chips. Epidemiol. Infect. 115:501–511.
63. Lin, C. M., F. M. Wu, H. K. Kim, M. P. Doyle, B. S. Michael, and L. K. Williams. 2003. A comparison of hand washing techniques to remove *Escherichia coli* and caliciviruses under natural or artificial fingernails. J. Food Prot. 66:2296–2301. Erratum in: J. Food Prot. 2004. Vol 67.
64. Llewellyn, L. J., M. R. Evans, and S. R. Palmer. 1998. Use of sequential case-control studies to investigate a community *Salmonella* outbreak in Wales. J. Epidemiol. Community Health. 52:272–276.
65. Lo, S. V., A. M. Connolly, S. R. Palmer, D. Wright, P. D. Thomas, and D. Joynson. 1994. The role of the pre-symptomatic food handler in a common source outbreak of foodborne SRSV gastroenteritis in a group of hospitals. Epidemiol. Infect. 113:513–521.
66. Luber, P., S. Brynestad, D. Topsch, K. Scherer, and E. Bartelt. 2006. Quantification of *Campylobacter* species cross contamination during handling of contaminated fresh chicken parts in kitchens. Appl. Environ. Microbiol. 72:66–70.
67. Lunden, J. M., T. J. Autio, and H. J. Korkeala. 2002. Transfer of persistent *Listeria monocytogenes* contamination between food-processing plants associated with a dicing machine. J. Food Prot. 65:1129–1133.
68. Lynch, M., J. Painter, R. Woodruff, and C. Braden. 2006. Surveillance for foodborne-disease outbreaks-United States, 1998–2002. Morbid. Mortal. Wkly. Rpt. 55:1–42.
69. Lynch, R. A., M. L. Phillips, B. L. Elledge, S. Hanumanthaiah, and D. T. Boatright. 2005. A preliminary evaluation of the effect of glove use by food handlers in fast food restaurants. J. Food Prot. 68:187–190.
70. Lyytikäinen, O., T. Autio, and R. Maijala. 2000. An outbreak of *Listeria monocytogenes* serotype 3a infection from butter in Finland. J. Infect. Dis. 181:1838–1841.
71. MacDonald, A., F. Dinah, D. MacKenzie, and A. Wilson. 2004. Performance feedback of hand hygiene, using alcohol gel as the skin decontaminant, reduces the number of inpatients newly affected by MRSA and antibiotic costs. J. Hosp. Infect. 56:56–63.
72. MacDonald, D. J. M., E. C. A. McKillop, S. Trotter, and A. J. R. Gray. 2006. One plunge or two?–hand disinfection with alcohol gel. Int. J. Qual. Health Care 18:120–122.
73. MacKenzie, W. R., N. J. Hoxie, M. E. Proctor, M. S. Gradus, K. A. Blair, D. E. Peterson, J. J. Kazmierczak, D. G. Addiss, K. R. Fox, J. B. Rose, and J. P. Davis. 1994. A massive outbreak in Milwaukee of *Cryptosporidium* infection transmitted through the public water supply. N. Engl. J. Med. 331:161–167.
74. Makulowich, G. S. 1991. FDA establishes standards for gloves. Aids Patient Care 5:143–145.
75. Mattner, F., L. Mattner, and I. F. Chaberny. 2004. No evidence for the effectiveness of ClO_2-generating gloves. Clin. Infect. Dis. 39:874.
76. McEwan, P., and D. Jenkins. 1993. The basis of the skin surface ecosystem, p. 1–32. *In* W. C. Noble (ed.), The skin microflora and microbial skin disease. Cambridge University Press, Cambridge, United Kingdom.
77. Mead, P. S., L. Finelli, M. A. Lambert-Fair, D. Champ, J. Townes, L. Hutwagner, T. Barrett, K. Spitalny, and E. Mintz. 1997. Risk factors for sporadic infection with *Escherichia coli* O157:H7. Arch. Intern. Med. 157:204–208.
78. Michaels, B., C. Keller, M. Blevins, G. Paoli, T. Ruthman, E. Todd, and C. J. Griffith. 2004. Prevention of food worker transmission of foodborne pathogens: risk assessment and evaluation of effective hygiene intervention strategies. Food Service Technology 4:31–49.
79. Michaels, B., M. Celis, T. Ayers, and V. Gangar. 2001. A microbial survey of toilet paper and associated performance variables related to its role in reducing communicable disease transmission. Proceedings of IAFP 88th annual meeting, August 5–8, 2001, Minneapolis, Minnesota.
80. Michaels, B., V. Gangar, C. M. Lin, and M. Doyle. 2003. Use limitations of alcoholic instant hand sanitizer as part of a food service hand hygiene program. Food Service Technology 3:71–80.
81. Michaels, M., V. Gangar, A. Schultz, M. Arenas, M. Curiale, T. Ayers, and D. Paulson. 2002. Water temperature as a factor in handwashing efficacy. Food Service Technology 2:139–149.
82. Montes, L. F., and W. H. Wilborn. 1969. Location of bacterial skin flora. Brit. J. Dermatol. 81:23–26.
83. Montville, R., and D. W. Schaffner. 2003. Inoculum size influences bacterial cross contamination between surfaces. Appl. Environ. Microbiol. 69:7188–7193.
84. Montville, R., Y. Chen, and D. W. Schaffner. 2001. Glove barriers to bacterial cross contamination between hands to food. J. Food Prot. 64:845–849.
85. Montville, R., Y. Chen, and D. W. Schaffner. 2002. Risk assessment of hand washing efficacy using literature and experimental data. Int. J. Food Microbiol. 73:305–313.

86. Morgan, D., C. P. Newman, D. N. Hutchinson, A.M. Walker, B. Rowe, and F. Majid. 1993. Verotoxin producing *Escherichia coli* O157 infections associated with the consumption of yoghurt. Epidemiol. Infect. 111:181–187.
87. Noble, W. C., and D. A. Somerville. 1974. Microbiology of human skin. W. B. Saunders, Philadelphia.
88. Olsen, S. J., L. C. MacKinnon, J. S. Goulding, N. H. Bean, and L. Slutsker. 2000. Surveillance for foodborne-disease outbreaks – United States, 1993–97. Morbid. Mortal. Wkly. Rpt. Surveill. Summ. 49:1–62.
89. Pattrick, D. R., G. Findon, and T. E. Miller. 1997. Residual moisture determines the level of touch-contact-associated bacterial transfer following hand washing. Epidemiol. Infect. 119:319–325.
90. Paulson, D. S. 1992. Evaluation of three handwash modalities commonly employed in the food processing industry. Dairy Food Environ. Sanit. 12:615–618.
91. Paulson, D. S. 1994. A comparative evaluation of different hand cleansers. Dairy Food Environ. Sanit. 14:524–528.
92. Pether, J. V., and R. J. Gilbert. 1971. The survival of salmonellas on finger-tips and transfer of the organisms to foods. J. Hyg. (Lond). 69:673–681.
93. Pittet, D. Improving compliance with hand hygiene in hospitals. Infect. Control Hosp. Epidemiol. 21:382–386.
94. Pittet, D., S. Hugonnet, S. Harbarth, P. Mourouga, V. Sauvan, S. Touveneau, and T. V. Perneger. 2000. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Lancet 356:1307–1312.
95. Quiroz, E. S., C. Bern, J. R. MacArthur, L. Xiao, M. Fletcher, M. J. Arrowood, D. K. Shay, M. E. Levy, R. I. Glass, and A. Lal. 2000. An outbreak of cryptosporidiosis linked to a food-handler. J. Infect. Dis. 181:695–700.
96. Rediers, H., M. Claes, L. Peeters, and K. A. Willems. 2008. Evaluation of the cold chain of ready-to-eat endive from farmer to plate. (Submitted).
97. Redmond, E., and C. Griffith. 2003. Consumer food handling in the home: a review of food safety studies. J. Food Prot. 66:130–161.
98. Redway, K., B. Knights, Z. Bozoky, A. Theobald, and S. Hardcastle. 1994. Hand drying: a study of bacterial types associated with different hand drying methods and with hot air dryers. Applied Ecololgy Research Group, University of Westminster, London, UK.
99. Rego, A., and L. Roley. 1999. In-use barrier integrity of gloves: Latex and nitrile superior to vinyl. Am. J. Infect. Control. 27:405–410.
100. Reij, M. W., E. D. Den Aantrekker, and ILSI Europe Risk Analysis in Microbiology Task Force. 2004. Recontamination as a source of pathogens in processed foods. Int. J. Food Microbiol. 91:1–11.
101. Reingold, A. L., M. A. Kane, and A. W. Hightower. 1988. Failure of gloves and other protective devices to prevent transmission of Hepatitis B virus to oral surgeons. J. Am. Med. Assoc. 259:2558–2560.
102. Rieu, E., K. Duhem, E. Vindel, and M. Sanaa. 2007. Food safety objectives should integrate the variability of the concentration of pathogen. Risk Analysis. 27: 373–386.
103. Roels, T. H., B. Wickus, H. H. Bostrom, J. J. Kazmierczak, M. A. Nicholson, T. A. Kurzynski, and J. P. Davis. 1998. A foodborne outbreak of *Campylobacter jejuni* (O:33) infection associated with tuna salad: a rare strain in an unusual vehicle. Epidemiol. Infect. 121:281–287.
104. Rowe, B., D. N. Hutchinson, R. J. Gilbert, B. H. Hales, N. T. Begg, H. C. Cawkins, M. Jacob, and F. A. Rae. 1987. *Salmonella* ealing infections associated with consumption of infant dried milk. Lancet, 2:900–903.
105. Rusin, P., S. Maxwell, and C. Gerba. 2002. Comparative surface-to-hand and fingertip-to-mouth transfer efficiency of gram-positive bacteria, gram-negative bacteria, and phage. J. Appl. Microbiol. 93:585–592.
106. Russell, A. D. 2004. Whither triclosan? J. Antimicrob. Chemother. 53:693–695.
107. Salisbury, D. M., P. Hutfilz, L. M. Treen, G. E. Bollin, and S. Gautam. 1997. The effect of rings on microbial load of health care workers' hands. Am. J. Infect. Control 25:24–27.
108. Sartor, C., V. Jacomo, C. Duvivier, H. Tissot-Dupont, R. Sambuc, and M. Drancourt. 2000. Nosocomial *Serratia marcescens* infections associated with extrinsic contamination of a liquid nonmedicated soap. Infect. Control Hosp. Epidemiol. 21:196–199.
109. Schaffner, D. W. 2003. Models: what comes after the next generation? p. 303–311. *In* R.C. McKellar and X. Lu (eds.), Modeling microbial responses in foods. CRC Press, Boca Raton.
110. Schwartz, H. J. 1995. Latex: a potential hidden "food" allergen in fast food restaurants. J. Allergy Clin. Immunol. 95:139–140.
111. Sheldon, A.T. Jr. 2005. Antiseptic "resistance": real or perceived threat? Clin. Infect. Dis. 40:1650–1656.
112. Snyder, O. P. 1998. Handwashing for retail food operations – a review. Dairy Food Environ. Sanit. 18:149–162.
113. Stern, N. J. 1982. Foodborne pathogens of lesser notoriety: viruses, *Vibrio*, *Yersinia*, and *Campylobacter*, p. 57–63. *In* ABMS Report No 12. National Academy of Science Press, Washington, D.C.
114. Taylor, J. H., K. L. Brown, J. Toivenen, and J. T. Holah. 2000. A microbiological evaluation of warm air hand driers with respect to hand hygiene and the washroom environment. J. Appl. Microbiol. 89:910–919.
115. Trick, W. E., M. O. Vernon, R. A. Hayes, C. Nathan, T. W. Rice, B. J. Peterson, J. Segreti, S. F. Welbel, S. L. Solomon, and R.A. Weinstein. 2003. Impact of ring wearing on hand contamination and comparison of hand hygiene agents in a hospital. Clin. Infect. Dis. 36:1383–1390.
116. Warshaw, E. M. 2003. Latex allergy. Skinmed. 2:359–366.
117. Whiting, R. C., A. Rainosekb, R. L. Buchanana, M. Miliotisa, D. LaBarrec, W. Longa, A. Rupled, and S. Schaube. 2006. Determining the microbiological criteria for lot rejection from the performance objective or food safety objective. Int. J. Food Microbiol. 110: 263–267.
118. Widmer, F. A. 2000. Replace hand washing with use of a waterless alcohol hand rub? Clin. Infect. Dis. 31:136–141.
119. Yip, E., and M. Roman. 2003. Latex protein allergy and your choice of gloves: a balanced consideration. Medsurg Nurs. 12:20–27.

Food Protection Trends, Vol. 28, No. 7, Pages 585–591

6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2864

Food Safety Awareness: Concerns, Practices, and Openness to Change of College Students with Health and Non-Health Majors

LINDA YARROW,* VALENTINA M. REMIG and MARY MECK HIGGINS
211 Justin Hall, Dept. of Human Nutrition, Kansas State University, Manhattan, KS 66506–1407, USA

SUMMARY

The objective was to determine college students' food safety awareness, including concerns, food practices, and openness to change. Participants were a convenience sample of thirty health and non-health majors who were upperclassmen with an average age of 21, primarily white non-Hispanic females.

Using focused discussion groups, students' food safety knowledge and practices, including food handling, preparation, storage, thermometer use, risky food consumption, and willingness to change undesirable practices, were examined.

Students perceived low risk for foodborne illness, reported that they seldomly used food thermometers, and used color of meat and juices to determine doneness. Non-health majors thawed foods according to undesirable practices observed in the childhood home, most of which are no longer recommended. Perceived and stated barriers to implementing recommended food safety procedures for health and non-health majors included cost, time and convenience.

It is concluded that college students, especially non-health majors, had low food safety awareness and many unsafe food-handling practices. Students were open to economical and time efficient changes in practices.

A peer-reviewed article

*Author for correspondence: 785.532.5508; Fax: 785.532.3132
E-mail: lyarrow@ksu.edu

INTRODUCTION

Foodborne illness is a major health threat in the United States. Although much food safety research has focused on the food industry and the general population *(1, 4, 6, 9, 12)*, little research is available concerning college students' food safety knowledge, practices, and/or risk for foodborne illness. Prior to this study, no investigators had reported use of food safety discussion groups as a method of obtaining information about food safety practices from college students. Previous methods of obtaining food safety information from college students have been through written surveys *(2, 3, 7, 11, 15)*. Within the limited data focusing on college students, food safety researchers concluded that undergraduate students engaged in unsafe food practices, including improper food handling and consumption of high risk foods *(11)*. Unklesbay et al. reported that students with health majors had higher food safety knowledge and more positive food safety attitude scores than non-health majors, but found no difference in self-reported food safety practices scores between the two groups *(15)*. A study by Garayoa et al. also found that students with food safety knowledge nevertheless engaged in

TABLE 1. Demographic characteristics of participants (n = 30)

	Health Majors (n = 13, 43%)				Non-health Majors (n = 17, 57%)			
	Mean	Range	n	%	Mean	Range	n	%
Age, years	21	20–23			21	19–23		
Sex								
Male			1	8%			3	18%
Female			12	92%			14	82%
College Status								
Junior			3	23%			11	65%
Senior			10	77%			6	35%
Residence								
House or condo			6	46%			5	29%
Apartment			5	39%			4	24%
Residence hall			0	0%			2	12%
Fraternity/Sorority			2	15%			6	35%
Ethnicity								
White, non-Hispanic			9	69%			15	88%
Hispanic			2	15%			1	6%
Asian			1	8%			1	6%
African American			1	8%			0	0%

high-risk food behaviors *(7)*. A more recent survey of 4,343 college students confirmed that young adults were consuming risky foods and had less than optimal levels of safe food handling practices *(2, 3)*. These same students indicated confidence in their ability to handle food safely.

The purpose of this study was to confirm results found in the few previous studies with college students and to explore areas not researched in previous studies: openness to change and barriers to change. The three primary objectives of this novel qualitative study were to determine: (1) how concerned selected college students were about food safety and how they protected themselves from foodborne illness; (2) their practices for food handling, food preparation, risky food consumption, sanitation, food cooling and food storage; and (3) how open they were to changing unsafe food handling practices.

MATERIALS AND METHODS

Approval was obtained from the Institutional Review Board for Research Involving Human Subjects before commencing the research. Volunteers were recruited from college students in upper level nutrition classes (representing health majors) and upper level journalism classes (representing non-health majors). Flyers were posted in selected academic buildings and in-class announcements were made. Participants were recruited who represented future professionals who would be responsible for delivery of food safety education messages to the public. Upper level health majors were chosen because they had received food safety education in previous college classes and indicated intent to work as future nutrition and health professionals, such as Registered Dietitians. Journalism majors were chosen because they may be responsible for delivering educational messages, to include food safety, to the public in their future professions. In addition, upper level students were chosen because they were most likely to be living independently and preparing food for themselves. No attempt was made to recruit subjects who represented all college students. Participants completed a consent form prior to participating in a structured food safety discussion group, and all provided information on demographics and previous food safety education and training. After participation, volunteers received $15 compensation for their time.

Structured food safety discussion groups were held during fall 2004 and spring 2005 at a large Midwestern university. The convenience sample of subjects (n = 30) included junior or senior level students, 86 percent of whom were female; mean age was 21 years; and 66% lived in a house, condominium, or apartment rather than a residence hall (Table 1). Forty-three percent were health majors (Human Nutrition and/or Dietetics students), and 57% were non-health majors (Journalism students). Previous food safety training ranged from informal (food server) to formal (food safety certification); 39% of health majors and 35% of non-health majors had some previous training. Because the health majors were upper level students, all had taken at least one academic course in which they had received food safety information. The primary researcher

moderated the four discussion groups, two with health majors and two with non-health majors. Per guidelines, it was determined that four discussion groups were adequate, because new information was not received after the third and fourth sessions *(8)*. Previous literature was used to formulate questions for discussion *(5, 10, 11, 14, 15)*. Following recommendations of experts *(8, 10)*, each session lasted approximately 90 minutes, including time for rapport to be established. Groups included 6–10 participants plus a moderator, a research project observer, and a recorder. All sessions were recorded on audiotape and on paper. Participants discussed fourteen food safety issues, exploring (a) food safety concerns and knowledge and how students protected themselves from foodborne illness, (b) food safety practices, including thawing, how doneness of foods was determined, sanitation practices, and refrigeration of foods, and (c) the extent to which students were open to changing undesirable practices (see Appendix A). Questions were presented orally and were projected onto a screen to encourage focused discussion. Students were free to answer any question they wanted at any time. Students were given name tags and were informed that if they were quiet for a while, they may be called upon to provide a response, but they could also choose to not answer a question. Students were told that the moderator would neither agree nor disagree with any response, and students were encouraged to express their view even if it differed from what other participants might say (see Appendix B). After each discussion of a food safety topic, very brief (one minute or less) education on the recommended food safety guidelines was provided to students before discussion of openness to changing practices ensued.

Responses were analyzed by use of the Long-Table Approach to identify themes and categorize results *(8)*. This method involves rearranging the data to compare and contrast relevant information.

RESULTS AND DISCUSSION

Food safety concerns and protection

Food safety concerns. Two discussion questions dealt with how concerned the participants were about food safety and whether they perceived risk when preparing food for themselves or others in their homes. The students indicated very little concern about home food safety. They were more concerned with food safety issues when eating in restaurants. One student stated, *"You have to put your trust in the cook and the server."* While they didn't specifically look for food safety problems at restaurants, they were more aware of it there than at home. Students indicated that they had control over food safety when they prepared food themselves. One student stated, *"I'm more concerned when others are cooking for me because I know what to do when cooking for myself."* A common thought voiced by health majors was that *"cooking at home is not a concern because of my class knowledge."* Participants stated that students who lived in group housing, such as residence halls and sororities, had very little control over food safety issues and that they believed that their food was safe to eat because they trusted the food preparers. Some students who lived independently were similarly not concerned about food safety issues and they stated no need for food safety control because they cooked very little. One student indicated he was *"Not too concerned about food safety because I eat fast food."*

Food safety protection. Previously, college students had indicated that it was the government's responsibility to protect them from foodborne illness *(15)*, so we asked students how they could protect themselves from foodborne illness. Their strategies for protection included: *"When I go grocery shopping, I don't buy dented cans;" "I check expiration dates on dairy products;" "I try to use by the 'sell by date' depending upon how long it was opened;" "I keep myself healthy to keep my body healthier to prevent catching something;" "I wash my hands really well"* and *"I keep my counter clean."* Other strategies included checking high risk foods with a thermometer, avoiding pink meats, and looking for health inspection signs in restaurants and public food serving establishments. When eating restaurant foods, students based safeness on the cleanliness of the restaurant and on trust in the cooks; they assumed cooks had received food safety training. As stated by a student, *"At a nice restaurant, you may forget about food safety. At other places that aren't as nice, you think more about it."*

Current personal practices

Food handling. Students were asked how they thawed their foods, specifically meats, prior to cooking, since previous research *(15)* showed that college students did not feel a personal responsibility to protect themselves. Techniques for thawing varied from safe to unsafe. Those with previous food safety in-class education, primarily health majors, were more likely to state that they thawed food in the refrigerator in original packaging. Non-health majors more often indicated that they thawed foods the same way their mothers did. Examples from students were, *"Mom would put meat on the counter in the morning"* and *"My mother puts meat in a bowl with water on the counter for the day."* One student stated, *"I let it [meat] set out a couple of hours before going to class."* Many students indicated that they thawed their food items in the microwave, and then cooked the food immediately.

Preparation. When preparing foods, accurate methods for determining doneness, such as use of a thermometer, are important to prevent foodborne illness *(5)*. Instead, most students indicated that they looked at the color of the meat item and color of the meat juices to determine doneness. Comments from students were, *"If it looks done, I cut it open to see if the juices are clear or all one color;" "I use a thermometer only for chicken;" "When cooking chicken, I cut it and look for pink and cook a little past pink"* and *"I cook ground beef until blood doesn't come out, I'm too lazy to use a thermometer and if it still isn't done, I stick it in the microwave."* Very few students reported using a thermometer to check end-point cooking temperatures of meat items. Primary reasons given for non-use were cost of thermometers and lack of knowledge concerning recommended temperatures. One student stated, *"I would use a thermometer if I were given a sheet to tell correct temperatures."* Other reasons stated for thermometer non-use were: *"No, because I've had no problems yet and no risk so far;" "I don't really know which ones [thermometers] to use;" "With hamburgers, it's not real convenient"* and *"If I were cooking beef or fish I would possibly use one."*

Risky food consumption. Students were asked about specific food items known to cause foodborne illness, and

whether or not they consumed those items (eggs without firm yolks, pink hamburger meat, raw or uncooked seafood, homemade cookie dough, and unpasteurized milk or juice). Group discussions were based on previous research indicating which risky foods college students were likely to consume *(11, 15)*. Students were concerned with raw meats and with hamburger meat that was still pink, and they tried to avoid these foods, but they were not as concerned if steaks were still pink. One student stated that pink steak was okay because *"If it is cooked too long, it gets tough."* Another student stated, *"I don't know the temperature to cook it [steak] to."* Most students who ate eggs that did not have firm yolks stated they were unlikely to change this behavior because of their enjoyment of the taste of the food item. One student stated she is, *"Aware of the risks"* with runny eggs but, *"Ignores the risks involved."* Similarly, students also ate raw homemade cookie dough and even after discussion of foodborne illness risk from raw eggs, students indicated that the enjoyment of eating raw homemade cookie dough outweighed the risks and that they were not likely to change this risky behavior. One student stated, *"Taste outweighs risk. Taking a little seems okay."* Other student comments concerning raw cookie dough were, *"A little bit will not hurt;" "I started eating it when I was younger;" "You eat it before you think"* and *"It's the same as eating cookie dough ice cream."* Many students in all majors assumed they were drinking pasteurized juices and were unaware that not all fruit juices are pasteurized. By law, unpasteurized fruit juice must clearly state so on the label *(14)*.

Sanitation. Students were asked to discuss whether hand washing during meal preparation was important. In a previous study *(3)*, it was found that half of college students did not wash their hands. Many of our students reported frequently washing their hands while cooking, but inconvenience was a factor for some. One student stated, *"I'm always in a rush and may not use soap if none is available."* Students indicated they were most likely to wash their hands frequently when handling raw meats. Comments were, *"I wash very often, especially if handling raw meats"* and *"I wash when I begin [cooking] and anytime I touch raw meats."*

Inaccurate perceptions were voiced. Raw vegetables were generally not viewed as high risk. When discussing alfalfa sprouts, a student stated, *"I'm not concerned about eating them"* and another student said, *"I don't think of them as high risk because they are a vegetable."* Students did not consider the possible contaminants from soil or contact with other foods. Washing hands after handling raw vegetables was not viewed as important to many students. One student stated, *"I wash hands whenever I touch something raw but not as much when changing vegetables."* A common thought voiced by students was, *"I don't care about vegetables, just meats"* and *"They are higher risk than raw vegetables."*

Cooling and storage of foods after cooking. Students were asked how they refrigerated and portioned cooked foods. A previous study of food handling after cooking showed that food storage practices of young adults were poor *(3)*. Many of our students with previous food safety training and education (primarily health majors) indicated that they stored foods immediately after cooking, generally in the recommended depth of not more than two inches. One student stated, *"I know to toss [food] after two hours. I don't cook a lot at one time, and if I do, I freeze in small portions."* Non-health majors generally stated that they stored foods in the refrigerator within one hour of cooking, a safe food handling practice. As stated by a student, *"I refrigerate food within 30 minutes because so many people use the kitchen."* Students stated they often stored foods in smaller portions because they needed only single servings for future meals. As stated by one student, *"I portion into individual sizes for storing."*

Openness to change

Willingness to change. After discussion of hand washing and washing of cutting boards during preparation of food items, students indicated they would be open to change if soap and water were readily available. After discussion of the correct way to thaw, cool, and store foods, students stated that they would be willing to make the recommended changes because they were simple and inexpensive. One student stated she would make the changes because *"Safety is better than getting sick."* Students reported that they might be willing to use food thermometers if the thermometer cost was low, if they were shown the correct way to use the thermometer, and if correct cooking temperatures were available for them. Students suggested magnetized cooking temperatures charts. Comments by students were, *"I would use one if I were given a sheet to tell the correct temperature"* and *"It would depend on the cost [of the thermometer]."* Students indicated that they enjoyed learning new information about food safety practices and that the information was important to them. Willingness to change food safety habits had not been previously reported in food safety studies with college students.

Barriers to change. Students were queried regarding barriers that might prevent them from using recommended practices. Many students stated that it was hard to change old habits. Again, cost, time, and convenience were mentioned often. For example, students believed it could be expensive to acquire food and refrigerator/freezer thermometers. A student stated she might not start using thermometers because, *"[Thermometer] cost could prevent it."* One student stated, *"If I had to constantly wash the cutting board between foods, I probably wouldn't because of time."* Other comments were, *"College students like low maintenance food preparation;" "People don't like to make changes so it's hard to get people to change"* and *"Time management could make a difference in learning the new things."* Finally, as noted previously, students stated a resistance to changing behaviors with regard to homemade cookie dough and eggs without firm yolks, preferring taste over food safety concerns. As noted previously, barriers to change have not been previously reported in survey focused food safety studies with college students.

DISCUSSION

Previous research indicated that college students did not feel a personal responsibility for food safety *(15)*. We found similar results. Students were generally not concerned about food safety in their own homes and they trusted their personal practices, despite lapses in hand washing and use of meat thermometers,

Appendix A

Sructured Food Safety Discussion Group Questions

How concerned are you about food safety, and what is your biggest food safety concern?

How much control do you have over the food prepared in your home?

Food Safety Protection

P – How do you protect yourself from foodborne illness?

How do you know that your food is safe to eat?

Food Handling

P – How do you thaw different meats such as turkey, ground beef, or steak?

Preparation

P – When you are cooking food, how do you determine doneness of meat?

Risky Food Consumption

P – How likely are you to eat foods such as runny eggs, pink hamburger meat, raw or uncooked seafood, and unpasteurized milk or fruit juice?

O/B – If you eat them, will you continue to eat them in the future?

Sanitation

O/B – Do you follow the recommended practice to wash in hot water and soap the cutting board, knife, and your hands after cutting meat and before handling other foods?

Handwashing

P – How frequently do you wash your hands when preparing food?

O/B – How important is that to you?

Cooling and Storage of Foods

P – After you cook foods, how quickly do you refrigerate them and in what portions do you refrigerate?

O/B – How do you respond to the recommendations that food be cooled in the refrigerator immediately after cooking or eating and that portions should be divided so that food cools more quickly and thoroughly?

Openness to Change/Barriers to Change

O/B – If you learned of new or different food preparation or storage practices, how likely would you be to make changes to use those practices?

O/B – What would prevent you from using those practices?

O/B – After learning correct thawing principles, would you change any of your thawing practices?

O/B – After learning that temperature is the best measure of doneness, would you use temperature as a determinant?

P = Practice question, O/B = Openness to change/Barriers to change question

for example. In addition, these students were only mildly concerned about food safety when at restaurants.

Previous survey research has shown that college students placed themselves at increased risk for foodborne illness because they were not aware of and/or did not adhere to food safety guidelines, including safe food handling and storage *(2, 3, 7, 11, 15)*. In this study, food safety practices seemed to vary by college major, which reflects previous food safety education differences, primarily through educational coursework. For example, those with previous classroom food safety education were more likely to correctly thaw and store foods. Food safety practices also depended, in part, on practices observed in the students' childhood homes. By mimicking unsafe practices observed in their childhood homes, many students placed themselves at risk for foodborne illness.

In this study, students often inappropriately relied on visual indicators to determine whether foods were safe to eat, particularly in the case of ground meat. Students did not know how to use food thermometers but reported willingness to learn if costs were low and they received accessible information on correct usage. This research agrees with previous work showing that college students consumed high-risk foods *(2, 3, 11, 15)*. We found that students lacked knowledge about which foods were high-risk and about using pasteurized eggs or egg substitutes in cookie dough. They considered raw meats and rare hamburger to be high risk, but not pink meats such as undercooked steaks, which still present a risk, although lower

Appendix B

Focused Discussion Group Guide/Script

Thank you so much for attending today. Please make yourself comfortable and feel free to enjoy the food and drinks as we get started. My name is Linda Yarrow and I will be moderating this session. A graduate student will be taking notes and recording the session using a tape recorder. Dr. Remig will be facilitating and observing.

We've asked you here to learn more from you about your thoughts on food safety and safe food handling. This discussion is part of a larger study funded by the USDA to look at ways to communicate about safe food handling.

What we are doing today is called a focused discussion group and will last approximately 90 minutes. This is one of 4 focus groups that we are conducting. I will summarize the comments from all groups but no individual names will be divulged nor will you be identifiable by your comments. You have the right to stop participating at any time without penalty or hard feelings, but of course, we hope you're here for the duration tonight.

The informed consent that you received and completed describes this portion of the study and provides you with contact information. You may take a copy home with you. By signing, you agree to participate in this research project. Please read the form carefully and sign both copies. You will keep one copy for your own records and return the other to me.

There are a few procedures that will make this focused discussion group go a little smoother. We are recording the session so please speak clearly and keep responses to one at a time. We will start the focus group with one question that everyone will answer. May we begin with you (student name) and work our way around the table? After that, you are free to answer when you want. If you are quiet for a time, I may call on you specifically. If at any time you are uncomfortable with the questions, you may choose to not answer. As the moderator, my job is to ask questions and probe when needed, but I will neither agree nor disagree with your answer. Feel free to say what you think, even if it differs from what others may say. Does anyone have any questions before we begin?

Let's get started with introductions. Please state your name and how many times you have washed your hands today.

than ground meat. Students also incorrectly did not consider raw vegetables to be risky.

While we found differences in food thawing and storing practices between the health and non-health majors, the two groups were similar in the two self-reported practices of "not or rarely using a food thermometer" and "eating high risk foods." More food safety education received in college courses by health majors did not lead to increases in both knowledge and safe self-reported practices. Results similar to these have been reported by others *(7, 15)*. Knowledge did not necessarily lead to improved practices. For instance, health majors indicated they consumed high-risk foods such as raw cookie dough even though they were aware of the food safety risks.

Several theoretical frameworks address why students may not have practiced current recommended behaviors *(13)*. The Stages of Change Model identifies five stages through which people move when making health behavior changes. Students may have been in the Precontemplation Stage and may not have perceived their current behavior as being a problem, thus having no interest in making a change. Or students may have been in the Contemplation Stage, recognizing that current behaviors may be a problem and weighing the benefits and risks of changing their behavior. This consideration may have been demonstrated when students were reluctant to give up eating raw cookie dough because short-term benefits (taste) outweighed possible long-term risks (potential illness).

Limitations. While our findings provide insight on perceptions of food safety practices, a potential weaknesses of the study is that the subjects may not represent all college students. Other potential weaknesses of our discussion groups include moderator influenced discussions, discussions influenced by dominant members, and the desire to conform to acceptable answers *(10)*. To help overcome these potential weaknesses, discussions were structured to focus on pre-determined food safety questions and students were encouraged to volunteer responses. After initial volunteer responses, other students were called upon by name and encouraged but not required to provide responses. Students were encouraged to express viewpoints even if they did not conform to the majority. Students had low inhibition about revealing their personal food safety behaviors, as evidenced by their willingness to comfortably discuss personal food safety behaviors they knew did not fall within recommended guidelines.

Implications. Findings from this study support previous research findings that college students engage in unsafe food practices. The current study also reports data regarding students' willingness to change and barriers to change, results that have not been reported in previous research. Findings from these structured food safety discussion groups are valuable in understanding food safety concerns, practices, and openness to change among college students. Efforts to positively impact college students' food safety practices should include consideration of the monetary costs and the amount of time and effort required to change, because students stated that they would be receptive only to changes that were low cost, quick and easy to implement.

ACKNOWLEDGMENT

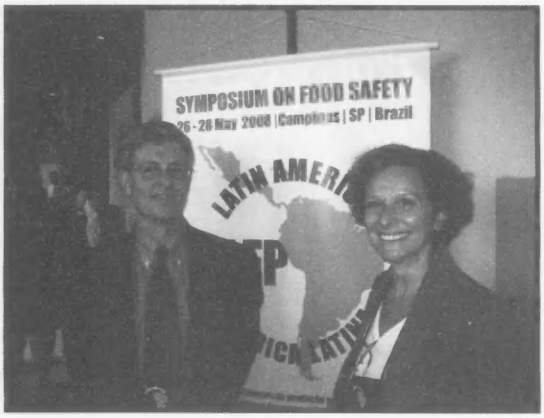
Funding support for this project was provided by the United States Department of Agriculture, Grant 92-977-3554. Data were taken from work submitted in partial fulfillment of a dissertation at Kansas State University.

REFERENCES

1. American Dietetic Association, Position Paper. 2003. Food and Water Safety. J. Am. Dietet. Assoc. 103: 1203–1218.
2. Byrd-Bredbenner, C., J. M. Abbot, V. Wheatley, D. Schaffner, C. Bruhn, and L. Blalock. 2008. Risky eating behaviors of young adults — Implications for food safety education. J. Am. Dietet. Assoc. 108: 549–552.
3. Byrd-Bredbenner, C., J. Mauer, V. Wheatley, D. Schaffner, C. Bruhn, and L. Blalock. 2007. Food safety self-reported behaviors and cognitions of young adults: Results of a national study. J. Food Prot. 70:1917–1926.
4. Cody, M. M., and M. A. Hogue. 2003. Results of the home food safety — It's in your hands 2002 survey: Comparisons to the 1999 benchmark survey and health people 2010 food safety behavior objectives. J. Am. Dietet. Assoc. 103:1115–1125.
5. Food Safety and Inspection Service, US Department of Agriculture. Kitchen thermometers. 3/16/07. Available at: http://www.fsis.usda.gov/Fact_Sheets/Kitchen_Thermometers/index.asp. Accessed 5/17/07.
6. Food Safety and Inspection Service, US Dept. of Agriculture. PR/HACCP rule evaluation report: Changes in consumer knowledge, behavior, and confidence since the 1996 PR/HACCP final rule. 9/03/02. Available at: http://www.fsis.usda.gov/oa/research/behavior_haccp.htm. Accessed 3/15/06.
7. Garayoa, R., M. Cordoba, I. Garcia-Jalon, A. Sanches-Villegas, and A. Vitas. 2005. Relationship between consumer food safety knowledge and reported behavior among students from health sciences in one region of Spain. J. Food Prot. 68:2631–2636.
8. Krueger, R. A., and M. A. Casey. 2000. Focus groups: A practical guide for applied research. Thousand Oaks, CA, Sage Publications.
9. Medeiros, L. C., P. Kendall, V. Hillers, G. Chen, and S. DiMascola. 2001. Identification and classification of consumer food handling behaviors for food safety education. J. Am. Dietet. Assoc. 101:1326–1339.
10. Morgan, D. L. 1997. Focus groups as qualitative research. Thousand Oaks, CA, Sage Publications.
11. Morrone, M., and A. Rathbun. 2003. Health education and food safety behavior in the university setting. J. Environ Health 65(7):9–15.
12. Redmond, E. C., and C. J. Griffith. 2003. Consumer food handling in the home: A review of food safety studies. J. Food Prot. 66:130–161.
13. Rollnick, S., P. Mason, and C. Butler. 2000. Health behavior change: A guide for practitioners. New York, NY, Churchhill Livingstone.
14. US Food and Drug Administration. Letter to State regulatory agencies that produce treated (but not pasteurized) and untreated juice and cider. 9/22/05. Available at: http://www.cfsan.fda.gov/~dms/juicgu14.html. Accessed 04/05/06.
15. Unklesbay, N., J. Sneed, and R. Toma. 1998. College students' attitudes, practices, and knowledge of food safety. J. Food Prot. 61:1175–1180.

IAFP's Latin America Symposium on Food Safety

Campinas, São Paulo, Brazil
May 26–28, 2008



Over the dates of May 26–28 this year, more than 400 food safety professionals gathered in Campinas, one-hour north of São Paulo, Brazil. They came from Latin America, North America, Europe and the Caribbean to learn from recognized authorities on food safety. With the support of the Brazil Association for Food Protection (ABRAPA) and the International Commission on Microbiological Specifications for Food (ICMSF); the conference was organized around multiple topics including: Raw Material Food Safety, Processing Food for Food Safety, Food Safety at the Retail Level, Food Safety for Consumers, Trends in Food Safety Management, and Food Safety Management in Latin America: What are the Challenges?

Robert Brackett, Vice President for Food Safety at the Grocery Manufacturers Association presented the opening talk on day one. Day two was led off by Arthur Liang, Director of Food Safety at the Centers for Disease Control and the third and final day began with an introduction to ICMSF and the Latin America Subcommission (ICMSF-LAS) given by Martin Cole, Chairman of ICMSF and Maria Alina Ratto, Chairman of ICMSF-LAS.

Many networking opportunities were provided at the beautiful Royal Palm Plaza Hotel Resort. The symposium was well supported by more than twelve corporate sponsors and exhibitors. In addition, support was received through grants from official agencies in Brazil. Attendees enjoyed the interaction with exhibitors and sponsors, with speakers and with each other. Over 60 technical papers were presented through poster presentations that attracted delegate's attention over the three-day conference.

PowerPoint presentations from most all of the speakers are available for viewing at the IAFP Web site.


IAFP


3M
Maior
Segurança

How the Audiovisual Library Serves IAFP Members

Purpose ...

The Audiovisual Library offers International Association for Food Protection Members an educational service through a wide variety of quality training videos dealing with various food safety issues. This benefit allows Members free use of these videos.

How It Works ...

(1) Members simply fill out an order form (see page 610 of this issue) and fax or mail it to the IAFP office. Members may also find a Library listing and an order form online at the IAFP Web site at www.foodprotection.org.

(2) Material from the Audiovisual Library is checked out for a maximum of two weeks (three weeks outside of North America) so that all Members can benefit from its use.

(3) Requests are limited to five videos at a time.

How to Contribute to the Audiovisual Library ...

(1) As the IAFP Membership continues to grow, so does the need for additional committee members and materials for the Library. The Audiovisual Committee meets at the IAFP Annual Meeting to discuss the status of the Audiovisual Library and ways to improve the service. New Members are sought to add fresh insight and ideas.

(2) Donations of audiovisual materials are always needed and appreciated. Tapes in foreign languages (including, but not limited to Spanish, French, Chinese [Manderin/Cantonese]), are especially desired for International Members who wish to view tapes in their native language.

(3) Members may also make a financial contribution to the Foundation Fund. The Foundation Fund sponsors worthy causes that enrich the Association. Revenue from the Foundation Fund supports the IAFP Audiovisual Library. Call Lisa Hovey, Assistant Director or Lani McDonald, Association Services at 800.369.6337 or 515.276.3344 if you wish to make a donation.

International Association for Food Protection

AUDIOVISUAL LIBRARY

as of July 7, 2008

A Member Benefit of IAFP

DAIRY

D1010 **The Bulk Milk Hauler: Protocol & Procedures** – (8 minutes). Teaches bulk milk haulers how they contribute to quality milk production. Special emphasis is given to the hauler's role in proper milk sampling, sample care procedures, and understanding test results. (Iowa State University Extension–1990) (Reviewed 1998)

D1030 **Cold Hard Facts** – This video is recommended for training personnel associated with processing, transporting, warehousing, wholesaling, and retailing frozen foods. It contains pertinent information related to good management practices necessary to ensure high quality frozen foods. (National Frozen Food Association–1993) (Reviewed 1998)

D1031 **Dairy Plant** – (28 minutes). Join in on this video as it follows a tour of the University of Wisconsin Dairy Plant. Observe the gleaming machinery and learn the ins and outs of milk processing, packaging, and storage. Watch as workers manufacture butter, cheese, yogurt, sour cream and ice cream, and learn about secondary dairy products. (Chipsbooks Company–2003)

D1040 **Ether Extraction Method for Determination of Raw Milk** – (26 minutes). Describes the ether extraction procedure to measure milk fat in dairy products. Included is an explanation of the chemical reagents used in each step of the process. (CA–1988) (Reviewed 1998)

D1050 **Food Safety: Dairy Details** – (18 minutes). Dairy products are prime targets of contamination because of their high protein and water content, but this presentation shows how to maintain dairy foods. It explores techniques such as selection, handling, preparation and storage for milk, yogurt, cheese and other dairy products. (Chipsbooks Company–2003)

D1060 **Frozen Dairy Products** – (27 minutes). Developed by the California Department of Food and Agriculture. Although it mentions the importance of frozen desserts, safety and checking ingredients, emphasis is on what to look for in a plant inspection. Everything from receiving, through processing, cleaning and sanitizing is outlined, concluded with a quality control program. Directed to plant workers and supervisors, it shows you what should be done. (CA–1987) (Reviewed 1997)

D1070 **The Gerber Butterfat Test** – (7 minutes). Describes the Gerber milk fat test procedure for dairy products and compares it to the Babcock test procedure. (CA–1990) (Reviewed 1998)

D1080 **High–Temperature, Short–Time Pasteurizer** – (59 minutes). Developed to train pasteurizer operators and is well done. There are seven sections with the first covering the twelve components of a pasteurizer and the purpose and operation of each. The tape provides the opportunity for discussion after each section or continuous running of the videotape. Flow diagrams, processing and cleaning are covered. (Borden, Inc.–1986) (Reviewed 1997)

D1090 **Managing Milking Quality** – (33 minutes). This training video is designed to help dairy farmers develop a quality management process and is consistent with ISO 9000 certification and HACCP processes. The first step is to evaluate the strengths and weaknesses of a dairy operation. The video will help you find ways to improve the weaknesses that are identified on your farm.

D1100 **Mastitis Prevention and Control** – (Two 45-minute tapes). This video is ideal for one-on-one or small group presentations. Section titles include: Mastitis Pathogens, Host Defense, Monitoring Mastitis, Mastitis Therapy, Recommended Milking Procedures, Post milking Teat Dip Protocols, Milk Quality, and Milking Systems. (Nasco–1993)

D1105 **Milk Hauling Training** – (35 minutes). This video covers the procedures and duties of the milk hauler from the time of arrival at the dairy farm, to the delivery of the milk at the processing plant. It also provides the viewer with a general understanding of the quality control issues involved in milk production and distribution. Topics include milk composition breakdown, milk fat content measurement, testing for added water, antibiotic and pesticide residues, somatic cell and bacteria counts, sediment, and aflatoxins. (Avalon Mediaworks LLC–2003)

D1110 **Milk Plant Sanitation: Chemical Solution** – (13 minutes). This explains the proper procedure required of laboratory or plant personnel when performing chemical titration in a dairy plant. Five major titrations are reviewed... alkaline wash, presence of chlorine and iodophor, caustic wash and an acid wash in a HTST system. Emphasis is also placed on record keeping and employee safety. (1989)

D1120 **Milk Processing Plant Inspection Procedures** – (15 minutes). Developed by the California Department of Food and Agriculture. It covers pre- and post-inspection meetings with management, but emphasis is on inspection of all manual and cleaned in place equipment in the receiving, processing and filling rooms. CIP systems are checked along with recording charts and employee lockers and restrooms. Recommended for showing to plant workers and supervisors. (CA–1986)

D1125 **Ohio Bulk Milk Hauling Video** – (15 minutes). Milk haulers, weighers, and samplers are the most constant link between the producer, the producer cooperative,

and the milk processor. This video shows their complete understanding of all aspects of farm milk collection and handling, milk quality and quality tests, and sanitation and sanitary requirements that contribute to the trust between the producer and the dairy plant. The video educates prospective haulers, weighers, and samplers throughout Ohio. (Ohio State University–2001)

D1130 **Pasteurizer: Design and Regulation** – (16 minutes). This tape provides a summary of the public health reasons for pasteurization and a nonlegal definition of pasteurization. The components of an HTST pasteurizer, elements of design, flow-through diagram and legal controls are discussed. (Kraft General Foods–1990) (Reviewed 1998)

D1140 **Pasteurizer: Operation** – (11 minutes). This tape provides a summary of the operation of an HTST pasteurizer from start-up with hot water sanitization to product pasteurization and shut-down. There is an emphasis on the legal documentation required. (Kraft General Foods–1990) (Reviewed 1998)

D1150 **Processing Fluid Milk** – (30 minutes). This slide set was developed to train processing plant personnel on preventing food poisoning and spoilage bacteria in fluid dairy products. Emphasis is on processing procedures to meet federal regulations and standards. Processing procedures, pasteurization times and temperatures, purposes of equipment, composition standards, and cleaning and sanitizing are covered. Primary emphasis is on facilities such as drains and floors, and filling equipment to prevent post-pasteurization contamination with spoilage or food poisoning bacteria. It was reviewed by many industry plant operators and regulatory agents and is directed to plant workers and management. (Penn State-1987) (Reviewed 1998)

D1180 **10 Points to Dairy Quality** – (10 minutes). Provides in-depth explanation of a critical control point in the residue prevention protocol. Illustrated with on-farm, packing plant, and milk–receiving plant scenes as well as interviews of producers, practicing veterinarians, regulatory officials and others. (Dairy Quality Assurance–1992) (Reviewed 1998)

ENVIRONMENTAL

E2012 **Better TEDs for Better Fisheries** – (42 minutes). Introduces the usefulness of turtle excluder devices (TEDs) and demonstrates the working nature of the devices. It covers the major sea turtles and the specific TEDs needed for each. It precedes two segments on installation of appropriate TEDs in shrimp trawl nets. (MS Dept. of Marine Resources–2003)

E3010 **The ABC's of Clean – A Handwashing and Cleanliness Program for Early Childhood Programs** – For early childhood program employees. This tape illustrates how proper hand washing and clean hands can contribute to the infection control program in daycare centers and other early childhood programs. (The Soap & Detergent Association–1991)

E3020 **Acceptable Risks?** – (16 minutes). Accidents, deliberate misinformation, and the rapid proliferation of nuclear power plants have created increased fears of improper nuclear waste disposal, accidents during the transportation of waste, and the release of radioactive effluents from plants. The program shows the occurrence of statistically anomalous leukemia clusters; governmental testing of marine organisms and how they absorb radiation; charts the kinds and amounts of natural and man-made radiation to which man is subject; and suggests there is no easy solution to balancing our fears to nuclear power and our need for it. (Films for the Humanities & Sciences, Inc.–1993) (Reviewed 1998)

E3030 **Air Pollution: Indoor** – (26 minutes). Indoor air pollution is in many ways a self-induced problem...which makes it no easier to solve. Painting and other home improvements have introduced pollutants, thermal insulation and other energy-saving and water-proofing devices have trapped the pollutants inside. The result is that air pollution inside a modern home can be worse than inside a chemical plant. (Films for the Humanities & Sciences, Inc.) (Reviewed 1998)

E3031 **Allergy Beware** – (15 minutes). Designed to educate food and beverage company employees about their role in preventing an accidental allergic reaction caused by a product their company produces. Recommended for product development, production, labeling, scheduling and cleaning. Everyone has an important role to prevent cross contamination and mislabeling issues. (Food and Consumer Products Manufacturers of Canada–2003)

E3040 **Asbestos Awareness** – (20 minutes). This videotape discusses the major types of asbestos and their current and past uses. Emphasis is given to the health risks associated with asbestos exposure and approved asbestos removal abatement techniques. (Industrial Training, Inc.–1988) (Reviewed 1998)

E3055 **Effective Handwashing – Preventing Cross–Contamination in the Food Service Industry** – (3.5 minutes). It is critical that all food service workers wash their hands often and correctly. This video discusses the double wash method and the single wash method, and when to use each method. (Zep Manufacturing Company–1993)

E3060 **EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)** – (22 minutes). Demonstrates the Ceriodaphnia Seven–day Survival and Reproduction Toxicity Test and how it is used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. The tape covers the general procedures for the test including how it is set up, started, monitored, renewed and terminated. (1989) (Reviewed 1998)

E3070 **EPA Test Methods for Freshwater Toxicity Tests (Using Fathead Minnow Larva)** – (15 minutes). A training tape that teaches environmental professionals about the Fathead Minnow Larva Survival and Growth Toxicity Test. The method described is found in an EPA document entitled, "Short Term Methods for Estimating the Chronic Toxicity of Effluents & Receiving Waters to Freshwater Organisms." The tape demonstrates how fathead minnow toxicity tests can be used to

monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. (1989) (Reviewed 1998)

E3075 **EPA: This is Super Fund** – (12 minutes). Produced by the United States Environmental Protection Agency (EPA) in Washington, D.C., this videotape focuses on reporting and handling hazardous waste sites in our environment. The agency emphasizes community involvement in identifying chemical waste sites and reporting contaminated areas to the authorities. The primary goal of the "Super Fund Site Process" is to protect human health and to prevent and eliminate hazardous chemicals in communities. The film outlines how communities can participate in the process of cleaning up hazardous sites. The program also explains how federal, state and local governments, industry and residents can work together to develop and implement local emergency preparedness/response plans in case chemical waste is discovered in a community.

E3080 **Fit to Drink** – (20 minutes). This program traces the water cycle, beginning with the collection of rain-water in rivers and lakes, in great detail through a waer treatment plant, to some of the places where water is used, and finally back into the atmosphere. Treatment of the water begins with the use of chlorine to destroy organisms; the water is then filtered through various sedimentation tanks to remove solid matter. Other treatments employ ozone, which oxidizes contaminants and makes them easier to remove; hydrated lime, which reduces the acidity of the water; sulfur dioxide, which removes any excess chlorine; and floculation, a process in which aluminum sulfate causes small particles to clump together and precipitate out. Throughout various stages of purification, the water is continuously tested for smell, taste, titration, and by fish. The treatment plant also monitors less common contaminants with the use of up-to-date techniques like flame spectrometers and gas liquefaction. (Films for the Humanities & Sciences, Inc.–1987)

E3110 **Garbage: The Movie** – (25 minutes). A fascinating look at the solid waste problem and its impact on the environment. Viewers are introduced to landfills, incinerators, recycling plants, and composting operations as solid waste management solutions. Problems associated with modern landfills are identified and low-impact alternatives such as recycling, reuse, and source reduction are examined. (Churchill Films) (Reviewed 1998)

E3120 **Global Warming: Hot Times Ahead** – (23 minutes). An informative videotape program that explores the global warming phenomenon and some of the devastating changes it may cause. This program identifies greenhouse gases and how they are produced by human activities. Considered are: energy use in transportation, industry and home; and effects of deforestation, planting of trees and recycling as means of slowing the build-up of greenhouse gases. (Churchill Films–1995)

E3125 **Good Pest Exclusion Practices** – (28 minutes). Most pests you find inside come from outside your food plant. This video covers numerous tactics of keeping pests out of food processing and distribution operations. Tactics include grounds, landscaping and building design; inbound trailer and bulk transportation materials inspection; and key employee actions. Learn how to defend your perimeter with one of the best weapons in the battle against pests – exclusion. (CTI Publications–2004)

E3128 **Integrated Pest Management (IPM)** – (28 minutes). This video develops the IPM concept into a comprehensive 12-point program. To emphasize this concept, computer-animated, digital graphics are used to piece together the IPM puzzle. This dramatic effect assists participants in visualizing and retaining key points of the video. To paint the complete picture, each of the 12 points is discussed providing an IPM overview. (CTI Publications–2004)

E3130 **Kentucky Public Swimming Pool and Bathing Facilities** – (38 minutes). Developed by the Lincoln Trail District Health Department in Kentucky and includes all of their state regulations which may be different from other states, provinces, and countries. This tape can be used to train those responsible for operating pools and waterfront bath facilities. All aspects are included of which we are aware, including checking water conditions and filtration methods. (1987) (Reviewed 1998)

E3131 **Key Pests of the Food Industry** – (28 minutes). Many types of pests can cause waste and loss of profits. Keeping food processing operations free of pest problems is a challenge. This video will assist food plant employees in the review of basic identification, biology, habits and control options of three key groups of pests frequently associated with food processing operations: birds, insects, and rodents. (CTI Publications–2004)

E3133 **Physical Pest Management Practices** – (28 minutes). Do you feel that you cannot do your job without pesticides? There are solutions. Many of them are what we call physical controls. This video will provide you with some of the things which can help you manipulate the physical environment in a manner that will prevent the growth of the pest population, causing them to leave or die. (CTI Publications–2004)

E3135 **Plastics Recycling Today: A Growing Resource** – (26 minutes). Recycling is a growing segment of our nation's solid waste management program. It shows how plastics are handled from curbside pickup through the recycling process to end-use by consumers. This video provides a basic understanding of recycling programs and how communities, companies and others can benefit from recycling. (The Society of the Plastics Industry, Inc.–1988)

E3140 **Putting Aside Pesticides** – (26 minutes). This program probes the long-term effects of pesticides and explores alternative pest-control efforts, biological pesticides, genetically engineered microbes that kill objectionable insects, the use of natural insect predators, and the cross-breeding and genetic engineering of new plant strains that produce their own anti-pest toxins. (Films for the Humanities & Sciences, Inc.) (Reviewed 1999)

E3150 **Radon** – (26 minutes). This videotape explains the danger associated with hazardous chemical handling and discusses the major hazardous waste handling requirements presented in the Resource Conservation and Recovery Act.

E3160 **RCRA–Hazardous Waste** – (19 minutes). This videotape explains the dangers associated with hazardous chemical handling and discusses the major hazardous waste handling requirements presented in the Resource Conservation and Recovery Act. (Industrial Training, Inc.)

E3161 **The Kitchen Uncovered: Orkin Sanitized EMP** – (13 minutes). This video teaches restaurant workers what they can do to prevent pest infestation, and what health inspectors look for. An excellent training tool for food service workers that can be used in conjunction with HACCP instruction. (Orkin–1997)

The New Superfund: What It Is and How It Works – A six-hour national video conference sponsored by the EPA. Target audiences include the general public, private industry, emergency responders and public interest groups. The series features six videotapes that review and highlight the following issues:

E3170 **Tape 1 – Changes in the Remedial Process: Clean–up Standards and State Involvement Requirements** – (62 minutes). A general overview of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the challenge of its implementation. The remedy process – long-term and permanent clean-up – is illustrated step-by-step, with emphasis on the new mandatory clean-up schedules, preliminary site assessment petition procedures and the hazard ranking system/National Priority List revisions. The major role of state and local government involvement and responsibility is stressed.

E3180 **Tape 2 – Changes in the Removal Process: Removal and Additional Program Requirements** – (48 minutes). The removal process is a short-term action and usually an immediate response to accidents, fires, and illegal dumped hazardous substances. This program explains the changes that expand removal authority and require procedures consistent with the goals of remedial action.

E3190 **Tape 3 – Enforcement & Federal Facilities** – (52 minutes). Who is responsible for SARA clean-up costs? Principles of responsible party liability; the difference between strict, joint, and several liability; and the issue of the innocent land owner are discussed. Superfund enforcement tools-mixed funding, De Minimis settlements and the new nonbinding preliminary allocations of responsibility (NBARs) are explained.

E3210 **Tape 4 – Emergency Preparedness & Community Right–to–Know** – (48 minutes). A major part of SARA is a free-standing act known as Title III: the Emergency Planning and community Right-to-Know Act of 1986, requiring federal, state, and local governments and industry to work together in developing local emergency preparedness/response plans. This program discusses local emergency planning committee requirements, emergency notification procedures, and specifications on community right-to-know reporting requirements such as using OSHA Material Safety Data Sheets, the emergency and hazardous chemical inventory and the toxic chemical release inventory.

E3220 **Tape 5 – Underground Storage Tank Trust Fund & Response Program** – (48 minutes). Another additional to SARA is the Leaking Underground Storage Tank (LUST) Trust Fund. One half of the US population depends on ground water for drinking – and EPA estimates that as many as 200,000 underground storage tanks are corroding and leaking into our ground water. This program discusses how the LUST Trust Fund will be used by EPA and the states in responding quickly to contain and clean-up LUST releases. Also covered is state enforcement and action requirements, and owner/operator responsibility.

E3230 **Tape 6 – Research & Development/ Closing Remarks** – (33 minutes). An important new mandate of the new Superfund are the technical provisions for research and development to create more permanent methods in the handling and disposing of hazardous wastes and managing hazardous substances. This segment discusses the SITE (Superfund Innovative Technology Evaluation) program, the University Hazardous Substance Research Centers, hazardous substance health research and the DOD research, development and demonstration management of DOD wastes.

E3235 **Regulatory and Good Manufacturing Practices** – (42 minutes). This video comes in two parts. Part one is a professional, 20-minute drama using real actors emphasizing the importance of food safety and GMPs. This dramatization will focus your emotions on the importance of cleanliness. Part two is a comprehensive 22-minute video introducing your employees to basic GMP elements. This training video uses numerous split screens of "good" and "bad" practices, and will help viewers understand GMPs and basic food safety. (CTI Publications–2004)

E3236 **Rodent Control Strategies** – (22 minutes). Pest control is a vital part of food safety, and leading pest-control specialist Dr. Bobby Corrigan shows you how to design and maintain a rodent-control program at food processing establishments. (J.J. Keller–2004)

E3240 **Sink a Germ** – (10 minutes). A presentation on the rationale and techniques for effective hand washing in health care institutions. Uses strong imagery to educate hospital personnel that hand washing is the single most important means of preventing the spread of infection. (The Brevis Corp.–1986) (Reviewed 1998)

E3245 **WashYour Hands** – (5 minutes). Hand washing is the single most important means of preventing the spread of infection. This video presents why hand washing is important and the correct way to wash your hands. (LWB company–1995)

E3250 **Waste Not: Reducing Hazardous Waste** – (35 minutes). This tape looks at the progress and promise of efforts to reduce the generation of hazardous waste at the source. In a series of company profiles, it shows activities and programs within industry to minimize hazardous waste in the production process. "Waste Not" also looks at the obstacles to waste reduction, both within and outside of industry, and considers how society might further encourage the adoption of pollution prevention, rather than pollution control, as the primary approach to the problems posed by hazardous waste. (Umbrella Films)

E3251 **Would Your Restaurant Kitchen Pass Inspection?** – (29 minutes). Help ensure a perfect score on any health inspection with this video by addressing safe food-handling techniques in the food service industry. Learn how foodborne illness is spread and how it can be prevented. Dramatizations display specific techniques students and employees can use to help any restaurant kitchen meet the highest standards. (Chipsbooks Company–2003)

E3260 **Swabbing Techniques for Sampling the Environment and Equipment –** (DVD) (60 minutes). This training program is designed to assist in providing effective training to technicians that collect environmental samples for APC and *Listeria*. It will help assure that technicians understand the basic principles and best practices, and can demonstrate good sample collection techniques. (Silliker Labs–2005)

FOOD

F2005 **A Lot on the Line** – (25 minutes). Through a riveting dramatization, "A Lot on the Line" is a powerful training tool for food manufacturing and food service employees. In the video, a food plant supervisor and his pregnant wife are eagerly awaiting the birth of their first child. Across town, a deli manager is taking his wife and young daughter away for a relaxing weekend. Both families, in a devastating twist of fate, will experience the pain, fear, and disruption caused by foodborne illness. This emotionally charged video will enthrall new and old employees alike and strongly reinforce the importance of incorporating GMPs into everyday work routines. Without question, "A Lot on the Line" will become an indispensable part of your company's training efforts. (Silliker Laboratories–2000)

F2007 **The Amazing World of Microorganisms** – (12 minutes). This training video provides your employees with an overview of how microorganisms affect their everyday lives and the foods they produce. The video explores how microscopic creatures are crucial in producing foods, fighting disease, and protecting the environment. In addition, certain microorganisms – when given the proper time and conditions to grow – are responsible for food spoilage, illness, and even death. Equipped with this knowledge, your employees will be better able to protect your brand. (Silliker Laboratories Group, Inc.–2001)

F2008 **A Recipe for Food Safety Success** – (30 minutes). This video helps food-industry employees understand their obligations in the areas of safety and cleanliness... what the requirements are, why they exist, and the consequences for all involved if they're not adhered to consistently. Critical information covered includes the role of the FDA and USDA; HACCP systems; sanitation and pest control; time and temperature controls that fight bacteria growth; and the causes and effects of pathogens. (J. J. Keller–2002)

F2009 **Basic Personnel Practices** – (18 minutes). This training video covers the practical GMPs from the growing field to the grocery store with a common sense approach. Employees learn the necessary training to help them understand the basic principles of food safety. (AIB International–2003)

F2010 **Close Encounters of the Bird Kind** – (18 minutes). A humorous but in-depth look at *Salmonella* bacteria, their sources, and their role in foodborne disease. A modern poultry processing plant is visited, and the primary processing steps and equipment are examined. Potential sources of *Salmonella* contamination are identified at the different stages of production along with the control techniques that are employed to insure safe poultry products. (Topek Products, Inc.) (Reviewed 1998)

F2011 **Available Post Harvest Processing Technologies for Oysters** – (8 minutes). This video explains three currently available post-harvest processing (PHP) technologies for oysters that continue to be developed to provide safer oysters to consumers. The Gulf oyster industry increasingly adopts solutions offered by modern technology in its efforts to continue to promote quality, food safety and extended shelf life of oysters. (MS Dept. of Marine Resources–2003)

F2012 **Control of *Listeria monocytogenes* in Retail Establishments** – (45 minutes). English and Spanish) (DVD) – Retail establishments play a key role in the control of *Listeria monocytogenes* in foods they sell. In this program, you will learn the sources and factors that contribute to *Listeria monocytogenes* in the retail environment. This dvd will also explore the design, implementation and maintenance of a *Listeria monocytogenes* control program. (Penn State University–2006)

F2013 **Control of *Listeria monocytogenes* in Small Meat and Poultry Establishments** – (26 minutes). (English and Spanish) – This video addresses a variety of issues facing meat processors who must meet revised regulations concerning *Listeria monocytogenes* in ready-to-eat meats. Topics covered include personal hygiene, sanitation, biofilms, cross contaminations, in plant sampling, and microbiological testing. (Penn State college of Ag Sciences–2003)

F2014 **Controlling Food Allergens in the Plant** – (16 minutes). This training video covers key practices to ensure effective control in food plants and delivers

current industry knowledge to help companies enhance in-plant allergen training. Visually communicates allergen-specific Good Manufacturing Practices, from checking raw material to sanitation, to prevent serious, costly problems. (Silliker Laboratories, Inc.–2004)

F2015 **Controlling *Listeria*: A Team Approach** – (16 minutes). In this video, a small food company voluntarily shuts down following the implication of one of its products in a devastating outbreak of *Listeria monocytogenes*. This recall dramatization is followed by actual in-plant footage highlighting key practices in controlling *Listeria*. This video provides workers with an overview of the organism, as well as practical steps that can be taken to control its growth in plant environments. Finally, the video leaves plant personnel with a powerful, resounding message: Teamwork and commitment are crucial in the production of safe, quality foods. (Silliker Laboratories–2000)

F2016 **Bloodborne Pathogens: What Employees Must Know** – (English) – (DVD) (20 minutes). This program provides an overview of the hazards and controls for worker exposure to bloodborne pathogens. Specifically, the program covers the basic requirements of the standard; definitions of key terms (including AIDS, contaminated sharps, and occupational exposure); engineering controls and work practices; housekeeping techniques; Hepatitis B and more. (J.J. Keller–2005)

F2017 **Building a Better Burger – Improving Food Safety in the Food Supply Chain** – (29 minutes). From ground beef to spinach to adulterated ingredients, the food industry has seen the huge downside of supply chain safety and quality failures. In addition to audits, many processors now mandate that suppliers implement Statistical Process Control (SPC) programs. Since 2003, the USDA National School Lunch Program ground beef purchasing has demonstrated the success of process-based supply chain management. This video demonstrates how the program has improved quality while reducing safety risks to show the way to get the food safety job done right. (Northwest Analytical, Inc.–2007)

F2020 **Egg Handling and Safety** – (11 minutes). Provides basic guidelines for handling fresh eggs which could be useful in training regulatory and industry personnel. (American Egg Board–1997)

F2021 **Egg Production** – (46 minutes). Live action footage of a completely automated operation follows the egg from the chicken to the carton. Watch the eggs as they roll down onto the main line, are washed, "candled," sorted by weight, placed into their packing containers, and prepared for shipment. Sanitation and health concerns are addressed. (Chipsbooks Company–2003)

F2025 **"The Special of the Day: The Eggceptional Egg"** – (DVD – 10 minutes). This DVD has been developed to train foodservice workers on today's standards for the expert care, handling, and preparation of "The incredible edible egg™. (American Egg Board–2007)

F2030 **"Eggs Games" Foodservice Egg Handling & Safety** – (18 minutes). Develop an effective egg handling and safety program that is right for your operation. Ideal for manager training and foodservice educational programs, this video provides step-by-step information in an entertaining, visually exciting format. (American Egg Board–1999)

F2035 **Fabrication and Curing of Meat and Poultry Products** – (2 tapes – 165 minutes). (See Part 2 Tape F2036 and Part 3 F2037) This is session one of three-part meat and poultry teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon viewing, the sanitarian will be able to (1) identify typical equipment used for meat and poultry fabrication at retail and understand their uses; (2) define specific terms used in fabrication of meat and poultry products in retail establishments, and (3) identify specific food safety hazards associated with fabrication and their controls. (AFDO/USDA–1997)

F2036 **Emerging Pathogens and Grinding and Cooking Comminuted Beef** – (2 tapes – 165 minutes). (See Part 1 Tape F2035 and Part 2 Tape F2037) This is session two of a three-part meat and poultry teleconference co-sponsored by AFDO and the USDA Food Safety Inspection Service. These videotapes present an action plan for federal, state, and local authorities, industry, and trade associations in a foodborne outbreak. (AFDO/USDA–1998)

F2037 **Cooking and Cooling of Meat and Poultry Products** – (2 tapes – 176 minutes). (See Part 1 Tape F2035 and Part 2 Tape F2036) This is session three of a three-part meat and poultry teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon completion of viewing these videotapes, the viewer will be able to (1) recognize inadequate processes associated with the cooking and cooling of meat and poultry at the retail level; (2) discuss the hazards associated with foods and the cooking and cooling processes with management at the retail level; (3) determine the adequacy of control methods to prevent microbiological hazards in cooking and cooling at the retail level; and (4) understand the principle for determining temperature with various temperature measuring devices. (AFDO/USDA–1999)

F2039 **Food for Thought – The GMP Quiz Show** – (16 minutes). In the grand tradition of television quiz shows, three food industry workers test their knowledge of GMP principles. As the contestants jockey to answer questions, the video provides a thorough and timely review of GMP principles. This video is a cost-effective tool to train new hires or sharpen the knowledge of veteran employees. Topics covered include employee practices – proper attire, contamination, stock rotation, pest control, conditions for microbial growth, and employee traffic patterns. Food safety terms such as HACCP, microbial growth niche, temperature danger zone, FIFO, and cross contamination, are also defined. (Silliker Laboratories–2000)

F2040 **Food Irradiation** – (30 minutes). Introduces viewers to food irradiation as a new preservation technique. Illustrates how food irradiation can be used to prevent spoilage by microorganisms, destruction by insects, over-ripening, and to reduce the need for chemical food additives. The food irradiation process is explained

and benefits of the process are highlighted. (Turnelle Productions, Inc.) (Reviewed 1998)

F2045 **Food Microbiological Control** – (6 tapes – 12 hours). Designed to provide information and demonstrate the application of basic microbiology, the Good Manufacturing Practices (GMPs), retail Food Code, and sanitation practices when conducting food inspections at the processing and retail levels. Viewers will enhance their ability to identify potential food hazards and evaluate the adequacy of proper control methods for these hazards. (FDA–1998)

F2050 **Food Safe–Food Smart – HACCP and Its Application to the Food Industry (Parts 1 & 2)** – (2 tapes – 16 minutes each). (1) Introduces the seven principles of HACCP and their application to the food industry. Viewers will learn about the HACCP system and how it is used in the food industry to provide a safe food supply. (2) Provides guidance on how to design and implement a HACCP system. It is intended for individuals with the responsibility of setting up a HACCP system. (Alberta Agriculture, Food and Rural Development) (Reviewed 1998)

F2060 **Food Safe Series I** (4 videos) – (4 tapes – 10 minutes each). (1) "Receiving and Storing Food Safely" details for food service workers the procedures for performing sight inspections for the general conditions of food, including a discussion of food labeling and government approval stamps. (2) "Food service Facility and Equipment" outlines the requirements for the proper cleaning and sanitizing of equipment used in food preparation areas. Describes the type of materials, design, and proper maintenance of this equipment. (3) "Microbiology for Foodservice Workers" provides a basic understanding of the microorganisms which cause food spoilage and foodborne illness. This program describes bacteria, viruses, protozoa, and parasites and the conditions which support their growth. (4) "Foodservice Housekeeping and Pest Control" emphasizes cleanliness as the basis for all pest control. Viewers learn the habits and life cycles of flies, cockroaches, rats, and mice. (Perennial Education–1991) (Reviewed 1998)

F2070 **Food Safe Series II** (4 videos) – (4 tapes – 10 minutes each). Presents case histories of foodborne disease involving (1) *Staphylococcus aureus*, (sauces) (2) *Salmonella*, (eggs) (3) *Campylobacter*, and (4) *Clostridium botulinum*. Each tape demonstrates errors in preparation, holding or serving food; describes the consequences of those actions; reviews the procedures to reveal the cause of the illness; and illustrates the correct practices in a step-by-step demonstration. These are excellent tapes to use in conjunction with hazard analysis critical control point training programs. (Perennial Education–1991) (Reviewed 1998)

F2080 **Food Safe Series III** (4 videos) – (4 tapes – 10 minutes each). More case histories of foodborne disease. This set includes (1) Hepatitis "A"; (2) *Staphylococcus aureus* (meats); (3) *Bacillus cereus*; and (4) *Salmonella* (meat). Viewers will learn typical errors in the preparation, holding and serving of food. Also included are examples of correct procedures which will reduce the risk of food contamination. (Perennial Education–1991) (Reviewed 1998)

F2081 **Food Safety Begins on the Farm** (DVD) – (15 minutes). From planting to consumption, there are many opportunities to contaminate produce. This is an excellent resource for training fruit and vegetable growers Good Agricultural Practices (GAPs). It includes seven PowerPoint presentations that deal with all aspects of food safety relative to growing, harvesting, and packing fresh fruits and vegetables. (Cornell Good Agricultural Practices Program–2000)

F2090 **Food Safety: An Educational Video for Institutional Food Service Workers** – (10 minutes). Provides a general discussion on food safety principles with special emphasis on pathogen reductions in an institutional setting from child care centers to nursing homes. (US Dept of Health & Human Services–1997)

F2095 **Now You're Cooking** – (DVD and video) (15 minutes). Using a food thermometer can improve the quality and safety of meat. This 15-minute video describes the why and how of using a food thermometer when cooking small cuts of meat like meat patties, chicken breasts, and pork chops. Topics include: why color is not a good indicator of doneness; how to choose an appropriate food thermometer for small cuts of meat; quick and easy steps for using an instant-read thermometer; how to calibrate an instant-read thermometer; and the most effective cooking methods for reducing *E. coli* O157:H7 in hamburger patties. (University of Idaho–2005) (Reviewed–2005)

Food Safety for Food Service Series I – An employee video series containing quick, 10-minute videos that teach food service employees how to prevent foodborne illness. This four video series examines sources of foodborne illness, plus explores prevention through awareness and recommendations for best practices for food safety. It also looks at how food safety affects the food service employee's job. (J.J. Keller & Associates–2000)

F2100 **Tape 1 – Food Safety for Food Service: Cross Contamination** – (10 minutes). Provides the basic information needed to ensure integrity and safety in foodservice operations. Explains proper practices and procedures to prevent, detect and eliminate cross contamination.

F2101 **Tape 2 – Food Safety for Food Service: HACCP** – (10 minutes). This video takes the mystery out of HACCP for your employees, and explains the importance of HACCP procedures in their work. Employees will come away feeling confident, knowing how to make HACCP work. The seven steps of HACCP and how HACCP is used in foodservice are some of the topics discussed.

F2102 **Tape 3 – Food Safety for Food Service: Personal Hygiene** – (10 minutes). This video establishes clear, understandable ground rules for good personal hygiene in the foodservice workplace and explains why personal hygiene is so important. Topics include: personal cleanliness; proper

protective equipment; correct hand washing procedures; when to wash hands; hygiene with respect to cross contamination; and prohibited practices and habits.

F2103 **Tape 4 – Food Safety for Food Service: Time and Temperature Controls**– (10 minutes). This video examines storage and handling of raw and cooked ingredients, and explains how to ensure their safety. Employees learn how to spot potential problems and what to do when they find them. Topics include: correct thermometer use, cooling, thawing and heating procedures, food storage procedures, holding temperature requirements, and handling leftovers.

Food Safety for Food Service Series II – An employee video series containing quick, 10-minute videos that boost safety awareness for food service employees and teach them how to avoid foodborne illness. (J.J. Keller & Associates–2002)

F2104 **Tape 1 – Basic Microbiology and Foodborne Illness** – (10 minutes). Covers four common microorganisms in food, how they get into food, and simple ways to prevent contamination. Stresses the importance of keeping food at the right temperature, having proper personal hygiene, and cleaning and sanitizing work surfaces.

F2105 **Tape 2 – Handling Knives, Cuts, and Burns** – (10 minutes). Explains why sharp knives are safer than dull ones, provides tips for selecting a good knife, and gives techniques for cutting food safely. Also explains first aid for cuts and burns and the most common causes of burns.

F2106 **Tape 3 – Working Safely to Prevent Injury** – (10 minutes). Discusses common lifting hazards and how back injuries can happen. Gives proper lifting and carrying techniques to prevent soreness and injury. Also covers how to prevent slips, trips, and falls.

F2107 **Tape 4 – Sanitation** – (10 minutes). Provides tips for good personal hygiene habits, including the proper way to wash your hands, dress, and prepare for work. Also covers cleaning and sanitizing equipment; storing chemicals and cleaning supplies; and controlling pests that can contaminate work areas and food.

F2110 **Food Safety is No Mystery** – (34 minutes). This is an excellent training visual for foodservice workers. It shows the proper ways to prepare, handle, serve and store food in actual restaurant, school and hospital situations. A policeman sick from food poisoning, a health department sanitarian, and a foodservice worker with all the bad habits are featured. The latest recommendations on personal hygiene, temperatures, cross contamination, and storage of foods are included. (USDA–1987) (Reviewed 1998)

F2111 **Controlling *Salmonella*: Strategies That Work** – (16 minutes). This training video provides practical guidelines to prevent the growth of *Salmonella* in dry environments and avoid costly product recalls. Using this video as a discussion tool, supervisors can help employees learn about water and how it fosters conditions for the growth of *Salmonella* in dry processing plants with potentially devastating consequences. (Silliker Laboratories–2002)

F2120 **Food Safety: For Goodness Sake Keep Food Safe** – (15 minutes). Teaches food handlers the fundamentals of safe food handling. The tape features the key elements of cleanliness and sanitation, including: good personal hygiene, maintaining proper food product temperature, preventing time abuse, and potential sources of food contamination. (Iowa State University Extention–1990) (Reviewed 1998)

F2121 **Food Safety the HACCP Way** – (11.5 minutes). Introduces managers and line-level staff to HACCP, or the Hazard Analysis Critical Control Point food safety system. The HACCP system is a seven-step process to control food safety, and can be applied to any size and type of food establishment.

Food Safety Zone Video Series – A one-of-a kind series that helps get your employees to take food safety issues seriously. These short, to-the-point videos can help make your employees aware of various food hazards, and how they can help promote food safety. The four topics are: Basic Microbiology, Cross Contamination, Personal Hygiene, and Sanitation. (J.J. Keller & Associates–1999)

F2125 **Tape 1 – Basic Microbiology and Foodborne Illness** – (10 minutes). Covers four common microorganisms in food, how they get into food, and simple ways to prevent contamination. Stresses the importance of keeping food at the right temperature, having proper personal hygiene, and cleaning and sanitizing work surfaces.

F2126 **Tape 2 – Food Safety Zone: Cross Contamination** – (10 minutes). Quickly teach your employees how they can help prevent cross contamination. Employees are educated on why contaminants can be extremely dangerous, cause serious injury and even death, to consumers of their food products. This fast-paced video will give your employees a deeper understanding of the different types of cross contamination, how to prevent it, and how to detect it through visual inspections and equipment. The emphasis is that prevention is the key to eliminating cross contamination.

F2127 **Tape 3 – Food Safety Zone: Personal Hygiene** (English and Spanish) – (10 minutes). After watching this video, your employees will understand why their personal hygiene is critical to the success of your business. This video teaches employees about four basic good personal hygiene practices: keeping themselves clean, wearing clean clothes, following specific hand washing procedures, and complying with all

related work practices. Personnel are also taught that personal hygiene practices are designed to prevent them from accidentally introducing bacteria to food products, and are so important that there are federal laws that all food handlers must obey.

F2128 **Tape 4 – Food Safety Zone: Sanitation** – (10 minutes). Don't just tell your employees why sanitation is important, show them! This training video teaches employees about the sanitation procedures that cover all practices to keep workplaces clean, and the food produced free of contaminants and harmful bacteria. Four areas covered include personal hygiene, equipment and work areas, use and storage of cleaning chemicals and equipment, and pest control.

F2129 **FoodTechnology: Irradiation** – (29 minutes). Video covers the following issues: history and details of the irradiation process; effects of irradiation on treated products; and consumer concerns and acceptance trends. Other important concerns addressed include how food irradiation affects food cost, the nutritional food industry, food science and research, and irradiation regulatory industries (such as the Nuclear Regulatory Commission) add insight into the process of irradiation. (Chipsbooks–2001)

F2130 **Food Safety: You Make the Difference** – (28 minutes). Through five food workers from differing backgrounds, this engaging and inspirational documentary style video illustrates the four basic food safety concepts: hand washing, preventing cross contamination, moving foods quickly through the danger zone, and hot/cold holding. (Seattle–King County Health Dept.–1995)

F2131 **Fruits, Vegetables, and Food Safety: Health and Hygiene on the Farm** (DVD and video) – (15 minutes). This presentation shows ways to prevent contamination of fruits and vegetables while you work. It was filmed in real production fields and packinghouses in the United States. Organisms of concern in fruits and vegetables are discussed, along with proper hygiene practices when handling and harvesting fruits and vegetables. (Cornell University–2004)

F2133 **Food Safety First** (English and Spanish) (DVD and Video) – (50 minutes). Presents causes of foodborne illness in foodservice and ways to prevent foodborne illness. Individual segments include personal hygiene and hand washing, cleaning, and sanitizing, preventing cross contamination, and avoiding time and temperature abuse. Food handling principles are presented through scenarios in a restaurant kitchen. (GloGerm–1998)

F2134 **Food Safety: Fish and Shellfish Safety** – (21 minutes). Seafood tops the list for foods that can become contaminated with bacteria–causing foodborne illness. This video shows how to protect yourself from fish and shellfish contamination by learning proper selection, storage, preparation and safe consumption. (Chipsbooks Company–2003)

F2135 **Get with a Safe Food Attitude** – (40 minutes). Consisting of nine short segments which can be viewed individually or as a group, this video presents safe food handling for moms-to-be. Any illness a pregnant women contracts can affect her unborn child whose immune system is too immature to fight back. The video follows four pregnant women as they learn about food safety and preventing foodborne illness. (US Dept. of Agriculture–1999)

F2136 **GLP Basics: Safety in the Food Micro Lab** – (16 minutes). This video is designed to teach laboratory technicians basic safety fundamentals and how to protect themselves from inherent workplace dangers. Special sections on general laboratory rules, personal protective equipment, microbiological, chemical, and physical hazards, autoclave safety, and spill containment are featured. (Silliker Laboratories–2001)

F2137 **GMP Basics: Avoiding Microbial Cross-Contamination** – (15 minutes). This video takes a closer look at how harmful microorganisms, such as *Listeria*, can be transferred to finished products. Employees see numerous examples of how microbial cross contamination can occur from improper traffic patterns, poor personal hygiene, soiled clothing, unsanitized tools and equipment. Employees need specific knowledge and practical training to avoid microbial cross contamination in plants. This video aids in that training. (Silliker Laboratories–2000)

F2140 **GMP Basics: Employee Hygiene Practices** – (20 minutes). Through real-life examples and dramatization, this video demonstrates good manufacturing practices that relate to employee hygiene, particularly hand washing. This video includes a unique test section to help assess participants' understanding of common GMP violations. (Silliker Laboratories–1997)

F2143 **GMP Basics: Guidelines for Maintenance Personnel** – (21 minutes). Developed specifically for maintenance personnel working in a food processing environment, this video depicts a plant-wide training initiative following a product recall announcement. Maintenance personnel will learn how GMPs relate to their daily activities and how important their roles are in the production of safe food products. (Silliker Laboratories–1999)

F2147 **GMP Basics: Process Control Practices** – (16 minutes). In actual food processing environments, an on-camera host takes employees through a typical food plant as they learn the importance of monitoring and controlling key points in the manufacturing process. Beginning with receiving and storing, through production and ending with packaging and distribution, control measures are introduced, demonstrated and reviewed. Employees will see how their everyday activites in the plant have an impact on product safety. (Silliker laboratories–1999)

F2148 **GMP – GSP Employee** – (38 minutes). This video was developed to teach food plant employees the importance of "Good Manufacturing Practices" and "Good Sanitation Practices." Law dictates that food must be clean and safe to eat. This video emphasizes the significance of each employee's role in protecting food against contamination. Tips on personal cleanliness and hygiene are also presented. (L.J. Bianco & Associates)

F2150 **GMP: Personal Hygiene and Practices in Food Manufacturing** (English, Spanish, and Vietnamese) – (14 minutes). This video focuses on the personal hygiene of food-manufacturing workers, and explores how poor hygiene habits can be responsible for the contamination of food in the manufacturing process. This is an instructional tool for new food-manufacturing line employees and supervisors. It was produced with "real" people in actual plant situations, with only one line of text included in the videotape. (Penn State–1993)

A GMP Food Safety Video Series – This five–part video series begins with an introduction to GMPs and definitions, then goes on to review specific sections of the GMPs: personnel, plant and grounds, sanitary operations, equipment and utensils, process and controls, warehousing, and distribution. Developed to assist food processors in training employees on personnel policies and Good Manufacturing Practices (CMPs), the series includes different types of facilities, including dairy plants, canning factories, pasta plants, bakeries, and frozen food manufacturing facilities. (J.J. Keller–2003)

F2151 **Tape 1 – Definitions** – (12 minutes). Provides the definitions necessary to understand the meaning of the CMPs.

F2152 **Tape 2 – Personnel and Personnel Facilities** – (11 minutes). Covers selection of personnel, delegation of responsibilities, development of plant policies for employees, and operational practices.

F2153 **Tape 3 – Building and Facilities** – (16 minutes). Discusses guidelines for the construction and maintenance of the manufacturing plant and grounds around the plant.

F2154 **Tape 4 – Equipment and Utensils** – (12.5 minutes). Provides guidelines for the construction, installation, and maintenance of processing equipment.

F2155 **Tape 5 – Production and Process Controls** – (20 minutes). Covers establishing a food safety committee, in-house inspections, analysis of raw materials and ingredients, cleaning schedules and procedures, and more.

F2160 **GMP: Sources and Control of Contamination during Processing** – (20 minutes). This program, designed as an instructional tool for new employees and for refresher training for current or reassigned workers, focuses on the sources and control of contamination in the food-manufacturing process. It was produced in actual food plant situations. A concise description of microbial contamination and growth and cross contamination, a demonstration of food storage, and a review of aerosol contaminants are also included. (Penn State –1995)

GMPs for Food Plant Employees: Five-Volume Video Series Based on European Standards and Regulations – Developed to assist food processors in training employees in the Good Manufacturing Practices. Examples are drawn from a variety of processing facilities including dairy plants, canning facilities, pasta plants, bakeries, frozen food facilities, etc. (AIB International–2003)

F2161 **Tape 1 – Definitions** – (13 minutes). Begins with an introduction to the GMPs and traces a basic history of food laws in Europe, ending with the EC Directive 93/43/EEC of June 1993 on the hygiene of foodstuffs.

F2162 **Tape 2 – Personnel and Personnel Practices** – (13 minutes). Selecting personnel, delegating responsibilities, developing plant policies for employees and visitors, and establishing operational practices.

F2163 **Tape 3 – Building and Facilities** – (17 minutes). Guidelines for the construction and maintenance of the manufacturing facility and grounds around the factory.

F2164 **Tape 4 – Equipment and Utensils** – (13 minutes). Guidelines for construction, installation, and maintenance of processing equipment.

F2165 **Tape 5 – Production/Process Controls** – (22 minutes). Covers production and process controls, establishing a food safety committee, conducting in-house inspections, analyzing raw materials and ingredients, developing operational methods, establishing cleaning schedules and procedures, creating pest control programs and record keeping.

F2168 **HACCP Advantage – Good Manufacturing Practices** – (English and Spanish) – (DVD) (40 minutes). The HACCP Advantage is based on HACCP principles and was developed by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMARFA). HACCP Advantage was designed to be a practical, cost-effective and preventative food safety system for all nonfederally registered food processing facilities, regardless of size, commodity or volume processed. OMAFRA has developed a 3-step approach to food safety management that makes it easier for small and medium-sized food processors to adopt a HACCP food safety program that meets their requirements. These three components – GMP Advantage, HACCP Advantage and HACCP Advantage Plus+ – collectively encompass all the elements of the original HACCP Advantage program as well as new elements to meet the evolving needs of modern food safety systems. (OMARFA–2006)

F2169 **HACCP: Training for Employees – USDA Awareness** – (15 minutes). This video is a detailed training outline provided for the employee program. Included in the video is a synopsis of general federal regulations; HACCP plan development; incorporation of HACCP's seven principals; HACCP plan checklist; and an HACCP employee training program. (J.J. Keller & Associates–1999)

F2170 **The Heart of HACCP** – (22 minutes). A training video designed to give plant personnel a clear understanding of the seven HACCP principles and practical guidance on how to apply these principles to their own work

environment. This video emphasizes the principles of primary concern to plant personnel such a critical limits, monitoring systems, and corrective actions that are vital to the success of a HACCP plan. (Silliker Laboratoraies–1994)

F2172 **HACCP: Training for Managers** – (17 minutes). Through industry-specific examples and case studies, this video addresses the seven HACCP steps, identifying critical control points, record keeping and documentation, auditing, and monitoring. It also explains how HACCP relates to other programs such as Good Manufacturing Practices and plant sanitation. (J.J. Keller & Associates–2000)

F2173 **Inside HACCP: Principles, Practices and Results** (English and Spanish) – (15 minutes). This video is designed to help you build a more knowledgeable work-force and meet safety standards through a comprehensive overview of HACCP principles. Employees are provided with details of prerequisite programs and a clear overview of the seven HACCP principles. "Inside HACCP" provides short, succinct explanations of how HACCP works and places special emphasis on the four principles – monitoring, verification, corrective action, and recordkeeping – in which employees actively participate. (Silliker Laboratories–2001)

F2175 **Inspecting for Food Safety – Kentucky's Food Code** – (100 minutes). Kentucky's Food Code is patterned after the Federal Food Code. The concepts, definitions, procedures, and regulatory standards included in the code are based on the most current information about how to prevent foodborne diseases. This video is designed to prepare food safety inspectors to effectively use the new food code in the performance of their duties. (Dept. of Public Health Commonwealth of Kentucky–1997) (Reviewed 1999)

F2180 **HACCP: Safe Food Handling Techniques** – (22 minutes). The video highlights the primary causes of food poisoning and emphasizes the importance of self inspection. An explanation of potentially hazardous foods, cross contamination, and temperature control is provided. The main focus is a detailed description of how to implement a Hazard Analysis Critical Control Point (HACCP) program in a food service operation. A leader's guide is provided as an adjunct to the tape. (The Canadian Restaurant & Foodservices Assoc.–1990) (Reviewed 1998)

F2190 **Is What You Order What You Get? Seafood Integrity** – (18 minutes). Teaches seafood department employees about seafood safety and how they can help insure the integrity of seafood sold by retail food markets. Key points of interest are cross-contamination control, methods and criteria for receiving seafood and determining product quality, and knowing how to identify fish and seafood when unapproved substitutions have been made. (The Food Marketing Institute) (Reviewed 1998)

F2191 **Microbial Food Safety: Awareness to Action** (DVD PowerPoint presentation) – (90 minutes). An overview of GAPs and resources by the United Fresh Fruits and Vegetables Association, a hazard identification self-audit, a sample farm investigative questionnaire, copies of relevant California state information, and US federal regulations. Contains numerous commodity flow charts and photos for more than 30 fruits and vegetables, one dozen PowerPoint presentations containing more than 400 slides, including may in Spanish and two dozen supplemental documents on a variety of food safety topics. (UC Davis–2002)

F2210 **Northern Delight – From Canada to the World** – (13 minutes). A promotional video that explores the wide variety of foods and beverages produced by the Canadian food industry. General in nature, this tape presents an overview of Canada's food industry and its contribution to the world's food supply. (Ternelle Production, Ltd.) (Reviewed 1998)

F2220 **Proper Handling of Peracidic Acid** – (15 minutes). Introduces peracidic acid as a chemical sanitizer and features the various precautions needed to use the product safely in the food industry.

F2230 **Purely Coincidental** – (20 minutes). A parody that shows how foodborne illness can adversely affect the lives of families that are involved. The movie compares improper handling of dog food in a manufacturing plant that causes the death of a family pet with improper handling of human food in a manufacturing plant that causes a child to become ill. Both cases illustrate how handling errors in food production can produce devastating outcomes. (The Quaker Oats company–1993) (Reviewed 1998)

F2240 **On the Front Line** – (18 minutes). A training video pertaining to sanitation fundamentals for vending service personnel. Standard cleaning and serving procedures for cold food, hot beverage and cup drink vending machines are presented. The video emphasizes specific cleaning and serving practices which are important to food and beverage vending operations. (National Automatic Merchandising Association–1993) (Reviewed 1998)

F2250 **On the Line** (English and Spanish) – (30 minutes). This was developed by the Food Processors Institute for Training food processing plant employees. It creates an awareness of quality control and regulations. Emphasis is on personal hygiene, equipment cleanliness and good housekeeping in a food plant. It is recommended for showing to both new and experienced workers. (The Food Processors Institute–1993) (Reviewed 1998)

F2260 **100 Degrees of Doom...The Time and Temperature Caper** – (14 minutes). Video portraying a private eye tracking down the cause of a *Salmonella* poisoning. Temperature control is emphasized as a key factor in preventing foodborne illness. (Educational Communications, Inc.–1987) (Reviewed 1998)

F2265 **A Day in the Deli: Service, Selection, and Good Safety** – (22 minutes). This training video provides basic orientation for new deli department employees and highlights skills and sales techniques that will build department traffic and increased sales. The focus will be on the priorities of the deli department freshness, strong customer service, professionalism, and food safety. By understanding the most important issues for their position(s), employees can comprehend their contribution to the financial interests of the store. (Food Marketing Institute–2003)

F2266 **HACCP: A Basic Understanding** – (32 minutes). Explore applications for Hazard Analysis Critical Control Points (HACCP), a system of process controls required by federal and state governments for most areas of the food service industry. Learn to minimize the risk of chemical, microbiological and physical food contamination while focusing on the seven principles of HACCP and the chain of responsibility. (Chipsbooks company–2003)

F2270 **Pest Control in Seafood Processing Plants** – (26 minutes). Covers procedures to control flies, roaches, mice, rats, and other common pests associated with food processing operations. The tape will familiarize plant personnel with the basic characteristics of these pests and the potential hazards associated with their presence in food operations.

F2271 **Preventing Foodborne Illness** – (10 minutes). This narrated video is for food service workers, with emphasis on insuring food safety by washing one's hands before handling food, after using the bathroom, sneezing, touching raw meats and poultry, and before and after handling foods such as salads and sandwiches. Safe food temperatures and cross contamination are also explained. (Colorado Dept. of Public Health and Environment–1999)

F2280 **Principles of Warehouse Sanitation** – (33 minutes). This videotape gives a clear, concise and complete illustration of the principles set down in the Food, Drug and Cosmetic Act and in the Good Manufacturing Practices, as well as supporting legislation by individual states. (American Institute of Baking–1993)

F2290 **Product Safety and Shelf Life** – (40 minutes). This videotape was done in three sections with opportunity for review. Emphasis is on providing consumers with good products. One section covers off-flavors, another product problem caused by plant conditions, and a third the need to keep products cold and fresh. Procedures to assure this are outlined, as shown in a plant. Well done and directed to plant workers and supervisors. (Borden, Inc.–1987) (Reviewed 1997)

F2310 **Safe Food: You Can Make a Difference** – (25 minutes). A training video for food service workers which covers the fundamentals of food safety. An explanation of proper food temperature, food storage, cross-contamination control, cleaning and sanitizing, and hand washing as methods of foodborne illness control is provided. The video provides an orientation to food safety for professional food handlers. (Tacoma–Pierce County Health Dept.–1990) (Reviewed 1998)

F2320 **Safe Handwashing** – (15 minutes). Twenty-five percent of all foodborne illnesses are traced to improper hand washing. The problem is not just that hand washing is not done, the problem is that it's not done properly. This training video demonstrates the "double wash" technique developed by Dr. O. Peter Snyder of the Hospitality Institute for Technology and Management. Dr. Snyder demonstrates the procedure while reinforcing the microbiological reasons for keeping hands clean. (Hospitality Institute for Technology & Management–1991) (Reviewed 1998)

F2321 **All Hands On Deck** – (12 minutes) Germ Tells All. A Benedict Arnold of the germ world comes clean by teaching the audience to "think like a germ" when it comes to hand washing. The reasons for hand washing are outlined and proper technique is demonstrated along with suggestions for avoiding immediate recontamination before even leaving the rest room. Interesting, informative, humorous and appropriate for virtually any age group. (Brevis Corporation – 2005)

F2322 **The Why, The When and The How Video** – (5 minutes) An excellent tool for motivating good hand hygiene behavior with existing and new employees. Fast paced. Three modules train the why, when, and how of hand washing. (Brevis Corporation-2005)

F2325 **Safe Practices for Sausage Production** – (180 minutes). This videotape is based on a series of educational broadcasts on meat and poultry inspections at retail food establishments produced by the Association of Food and Drug Officials (AFDO) and USDA's Food Safety and Inspection Service (FSIS), along with FDA's Center for Food Safety and Applied Nutrition. The purpose of the broadcast was to provide training to state, local, and tribal sanitarians on processes and procedures that are being utilized by retail stores and restaurants, especially those that were usually seen in USDA-inspected facilities. The program will cover the main production steps of sausage products, such as the processes of grinding, stuffing, and smoking, and typical equipment used will be depicted. Characteristics of different types of sausage (fresh, cooked, and smoked, and dry/semi-dry) will be explained. Pathogens of concern and outbreaks associated with sausage will be discussed. The written manual for the program is available at www.fsis.usda.gov/ofo/hrds/STATE/RETAIL/manual. htm(1999)

F2330 **Sanitation for Seafood Processing Personnel** – (20 minutes). A training video suited for professional food handlers working in any type of food manufacturing plant. The film highlights Good Manufacturing Practices and their role in assuring food safety. The professional food handler is introduced to a variety of sanitation topics including: (1) food handlers as a source of food contamination, (2) personal hygiene as a means of preventing food contamination, (3) approved food storage techniques including safe storage temperatures, (4) sources of cross contamination, (5) contamination of food by insects and rodents, (6) garbage handling and pest control, and (7) design and location of equipment and physical facilities to facilitate cleaning. (Reviewed 1998)

F2340 **Sanitizing for Safety** – (17 minutes). Provides an introduction to basic food safety for professional food handlers. A training pamphlet and quiz accompany the tape. Although produced by a chemical supplier, the tape contains minimal commercialism and may be a valuable tool for training new employees in the food industry. (Clorox–1990) (Reviewed 1998)

F2341 **Science and Our Food Supply** – (45 minutes). Becoming food safety savvy is as easy as A–B–C! This video includes a step-by-step journey as food travels from the farm to the table; the FightBAC®! Campaign's four simple steps to food safety, clean,

cook, separate (combat cross contamination), and chill, and the latest in food safety careers. Other topics covered include understanding bacteria, food processing and day Alliance training courses. There are 12 training modules in the course that cover all of the information on HACCP principles, their application to seafood products, and the FDA regulation. Experience has shown that HACCP implementation can be more effective when a number of key people in the operation have a good understanding of the system and its requirements. (Cornell University–2004)

F2350 **ServSafe Steps to Food Safety** (DVD and Video) (English and Spanish) – The ServSafe food safety series consists of six videos that illustrate and reinforce important food safety practices in an informative and entertaining manner. The videos provide realistic scenarios in multiple industry segments. (National Restaurant Association Education Foundation–2000)

Tape 1 **Step One: Starting Out with Food Safety** – (12 minutes). Defines what foodborne illness is and how it occurs; how foods become unsafe; and what safety practices to follow during the flow of food.

Tape 2 **Step Two: Ensuring Proper Personal Hygiene** – (10 minutes). Introduces employees to ways they might contaminate food; personal cleanliness practices that help protect food; and the procedure for thorough hand washing.

Tape 3 **Step Three: Purchasing, Receiving and Storage** – (12 minutes). Explains how to choose a supplier; calibrate and use a thermometer properly; accept or reject a delivery; and store food safely.

Tape 4 **Step Four: Preparing, Cooking and Serving** – (11 minutes). Identifies proper practices for thawing, cooking, holding, serving, cooling, and reheating food.

Tape 5 **Step Five: Cleaning and Sanitizing** – (11 minutes). Describes the difference between cleaning and sanitizing; manual and machine warewashing; how sanitizers work; how to store clean items and cleaning supplies; and how to set up a cleaning program.

Tape 6 **Step Six: Take the Food Safety Challenge: Good Practices, Bad Practices – You Make the Call** – (35 minutes). Challenges viewers to identify good and bad practices presented in five short scenarios from different industry segments.

F2370 **Supermarket Sanitation Program – Cleaning and Sanitizing** – (13 minutes). Contains a full range of cleaning and sanitizing information with minimal emphasis on product. Designed as a basic training program for supermarket managers and employees (1989) (Reviewed 1998)

F2380 **Supermarket Sanitation Program: Food Safety** – (11 minutes). Contains a full range of basic sanitation information with minimal emphasis on product. Filmed in a supermarket, the video is designated as a basic program for manager training and a program to be used by managers to train employees. (1998) (Reviewed 1998)

F2390 **Take Aim at Sanitation** (English and Spanish) – (8 minutes). Produced by the Foodservice & Packaging Institute in cooperation with the US Food and Drug Administration, this video demonstrates how to properly store and handle foodservice disposables so customers are using safe, clean products. This video demonstrates: the problem of foodborne illness; how foodservice disposables are manufactured for cleanliness; tips for storing foodservice disposables; tips to help your customers in self-serve areas; guidelines for serving meals and maintaining proper sanitation; and tips for cleaning up after meals. Throughout the program a roving microscope "takes aim" at common mistakes made by workers to help audiences identify unsanitary handling and storage practices. (Foodservice & Packaging Institute, Inc.)

F2391 **Understanding Foodborne Pathogens** – (40 minutes). Explore the major causes of foodborne illness and review the practices used to minimize the risk of contracting or spreading a foodborne disease. Learn about microorganisms associated with foodborne illness such as parasites, viruses, fungi and bacteria. Study ways to reduce harmful pathogens through proper handling, storage, and cooking. (Chipsbooks Company–2003)

F2410 **Wide World of Food Service Brushes** – (18 minutes). Discusses the importance of cleaning and sanitizing as a means to prevent and control foodborne illness. Special emphasis is given to proper cleaning and sanitizing procedures and the importance of having properly designed and constructed equipment (brushes) for food preparation and equipment cleaning operations. (1989)

F2420 **Your Health in Our Hands, Our Health in Yours** – (8 minutes). For professional food handlers, the tape covers the do's and don'ts of food handling as they relate to personal hygiene, temperature control, safe storage, and proper sanitation. (Jupiter Video Production–1993) (Reviewed 1998)

F2430 **Smart Sanitation: Principles and Practices for Effectively Cleaning Your Food Plant** – (20 minutes). A practical training tool for new sanitation employees or as a refresher for veterans. Employees will understand the food safety impact of their day-to-day cleaning and sanitation activities and recognize the importance of their role in your company's food safety program. (Silliker Laborabories–1996)

F2440 **Cleaning and Sanitizing in Vegetable Processing Plants: Do It Well, Do It Safely!** (English and Spanish) – (16 minutes). This training video shows how to safely and effectively clean and sanitize in a vegetable processing plant. It teaches how it is the same for a processing plant as it is for washing dishes at home. (University of Wisconsin Extension–1996)

F2450 **A Guide to Making Safe Smoked Fish** – (21 minutes). Smoked fish can be a profitable product for aquaculturalists, but it can be lethal if not done

correctly. This video guides you through the steps necessary to make safe smoked fish. It provides directions for brining, smoking, cooling, packaging, and labeling, and cold storage to ensure safety. The video features footage of fish smoking being done using both traditional and modern equipment. (University of Wisconsin–Madison–1999)

F2451 **A HACCP–Based Plan Ensuring Food Safety in Retail Establishments** (DVD) – (11 minutes). This is an educational DVD that provides a brief summary of HACCP. It explains the purpose and execution of each of the seven principles. Can be used as part of a wide range of HACCP training programs beyond retail establishments. The major emphasis is on proper documentation and validation. (Ohio State University–2004)

F2460 **Safer Processing of Sprouts** – (82 minutes). Sprouts are enjoyed by many consumers for their taste and nutritional value. However, recent outbreaks of illnesses associated with sprouts have demonstrated a potentially serious human health risk posed by this food. FDA and other public health officials are working with industry to identify and implement production practices that will assure that seed and sprouted seed are produced under safe conditions. This training video covers safe processing practices of sprouts including growing, harvesting, milling, transportation, storage, seed treatment, cleaning and sanitizing, sampling and microbiological testing. (CA Dept. of Health Service, Food & Drug Branch–2000)

Fast Track Restaurant Video Kit – These five short, direct videos can help make your employees more aware of various food hazards and how they can promote food safety. (Diversey Lever–1994)

F2500 **Tape 1 – Food Safety Essentials** – (23 minutes). This video provides an overview of food safety. All food service employees learn six crucial guidelines for combating foodborne illness. Prepares employees for further position-specific training to apply the six food safety principles to specific jobs.

F2501 **Tape 2 – Receiving and Storage** – (22 minutes). Make sure only safe food enters your doors! Receiving and storage staff learn what to look for and how to prevent spoilage with proper storage with this video.

F2502 **Tape 3 – Service** – (22 minutes). Servers are your last safety checkpoint before guests receive food. This video helps you make sure they know the danger signs.

F2503 **Tape 4 – Food Production** – (24 minutes). Food production tasks cause most food safety problems. Attack dangerous practices at this critical stage with this video training tool.

F2504 **Tape 5 – Warewashing** – (21 minutes). Proper sanitation starts with clean dishes! With this video, warewashers will learn how to ensure safe tableware for guests and safe kitchenware for co-workers.

Worker Health and Hygiene Program for the Produce Industry

F2505 **Manager Guide to Worker Health and Hygiene: Your Company's Success May Depend on It!** (English) – (18 minutes). Covers the importance of foodborne illness as related to the produce industry and provides practical hands-on information of managers/operators on teaching health and hygiene to the workers in their operations (University of Florida/IFAS–2006)

F2506 **Worker Health and Hygiene: Your Job Depends On It!** (English and Spanish) – (11 minutes). Covers the importance of personal health and hygiene and simple hands-on information on foodborne illness and how produce handlers could spread disease if proper personal hygiene is not practiced. Also provides stepwise handwashing procedures for produce handlers in any situation (University of Florida/IFAS–2006)

F2600 **Food Industry Security Awareness: The First Line of Defense** – (24 minutes) (Video and DVD). This video reinforces the importance of security awareness in all phases of product handling, from receiving ingredients to processing and shipping. With this program, you can have an immediate impact on plant security with very little time or resources, all while helping maximize the effectiveness of your overall security investment. Everything you need to turn your biggest security challenge into your biggest security asset is covered. (J. J. Keller–2006)

OTHER

M4010 **Diet, Nutrition and Cancer** – (20 minutes). Investigates the relationship between a person's diet and the risk of developing cancer. The film describes the cancer development process and identifies various types of food believed to promote and/or inhibit cancer. The film also provides recommended dietary guidelines to prevent or greatly reduce the risk of certain types of cancer.

M4020 **Eating Defensively: Food Safety Advice for Persons with AIDS** – (15 minutes). While HIV infection and AIDS are not acquired by eating foods or drinking liquids, persons infected with the AIDS virus need to be concerned about what they eat. Foods can transmit bacteria and viruses capable of causing life-threatening illness to persons infected with AIDS. This video provides information for persons with AIDS on what foods to avoid and how to better handle and prepare foods. (FDA/CDC–1989)

M4030 **Ice: The Forgotten Food** – (14 minutes). This training video describes how ice is made and where the critical control points are in its manufacture, both in ice plants and in on-premises locations (convenience stores, etc.). It documents the potential for illness from contaminated ice and calls on government to enforce good manufacturing practices, especially in on-premises operations where sanitation deficiencies are common. (Packaged Ice Association–1993)

M4050 **Personal Hygiene and Sanitation for Food Processing Employees** – (15 minutes). Illustrates and describes the importance of good personal hygiene and sanitary practices for people working in a food processing plant. (Iowa State University–1993)

M4060 **Psychiatric Aspects of Product Tampering** – (25 minutes). This was presented by Emanuel Tanay, M.D. from Detroit, at the Fall 1986 conference of CSAFDA. He reviewed a few cases and then indicated that abnormal behavior is like a contagious disease. Media stories lead up to 1,000 similar alleged cases, nearly all of which are false. Tamper-proof packaging and recalls are essential. Tampering and poisoning are characterized by variable motivation, fraud and greed. Law enforcement agencies have the final responsibilities. Tamper-proof containers are not the ultimate answer. (1987)

M4070 **Tampering: The Issue Examined** – (37 minutes). Developed by Culbro Machine Systems, this videotape is well done. It is directed to food processors and not regulatory sanitarians or consumers. A number of industry and regulatory agency management explain why food and drug containers should be made tamper evident. (Culbro–1987)

M4071 **Understanding Nutritional Labeling** – (39 minutes). Learn why the government initiated a standardized food labeling system and which foods are exempt. Explore each component listed on the label including cholesterol, carbohydrates, protein, fat, health or nutritional claims, service size, percentage of daily value, and standard calorie reference/comparison. (Chipsboosk Company–2003)

AUDIOVISUAL LIBRARY ORDER FORM

The use of the Audiovisual Library is a benefit for **Association-Members only.** Limit your requests to five videos. Material from the Audiovisual Library can be checked out for 2 weeks only so that all Members can benefit from its use.

International Association for Food Protection®
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
Phone: 800.369.6337; 515.276.3344;
Fax: 515.276.8655
E-Mail: info@foodprotection.org
Web Site: www.foodprotection.org

Member # _____

First Name _____ M.I. _____ Last Name _____

Company _____ Job Title _____

Mailing Address _____

Please specify: ❒ Home ❒ Work

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

E-Mail _____ Date Needed _____

PLEASE CHECK BOX NEXT TO YOUR VIDEO CHOICE

(Allow 4 weeks minimum from date of request.)

DAIRY

- ❒ D1010 The Bulk Milk Hauler: Protocol & Procedures
- ❒ D1030 Cold Hard Facts
- ❒ D1031 Dairy Plant
- ❒ D1040 Ether Extraction Method for Determination of Raw Milk
- ❒ D1050 Food Safety: Dairy Details
- ❒ D1060 Frozen Dairy Products
- ❒ D1070 The Gerber Butterfat Test
- ❒ D1080 High-Temperature, Short-Time Pasteurizer
- ❒ D1090 Managing Milking Quality
- ❒ D1100 Mastitis Prevention and Control
- ❒ D1105 Milk Hauling Training
- ❒ D1110 Milk Plant Sanitation: Chemical Solution
- ❒ D1120 Milk Processing Plant Inspection Procedures
- ❒ D1125 Ohio Bulk Milk Hauling Video
- ❒ D1130 Pasteurizer: Design and Regulation
- ❒ D1140 Pasteurizer: Operation
- ❒ D1150 Processing Fluid Milk
- ❒ D1180 10 Points to Dairy Quality

ENVIRONMENTAL

- ❒ E2012 Better FEDs for Better Fisheries
- ❒ E3010 The ABC's of Clean – A Handwashing and Cleanliness Program for Early Childhood Programs
- ❒ E3020 Acceptable Risks?
- ❒ E3030 Air Pollution: Indoor
- ❒ E3031 Allergy Beware
- ❒ E3040 Asbestos Awareness
- ❒ E3055 Effective Handwashing – Preventing Cross-Contamination in the Food Service Industry
- ❒ E3060 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)
- ❒ E3070 EPA Test Methods for Freshwater Toxicity Tests (Using Fathead Minnow Larva)
- ❒ E3075 EPA: This is Super Fund
- ❒ E3080 Fit to Drink
- ❒ E3110 Garbage: The Movie
- ❒ E3120 Global Warming: Hot Times Ahead
- ❒ E3125 Good Pest Exclusion Practices
- ❒ E3128 Integrated Pest Management (IPM)
- ❒ E3130 Kentucky Public Swimming Pool and Bathing Facilities
- ❒ E3131 Key Pests of the Food Industry
- ❒ E3133 Physical Pest Management Practices
- ❒ E3135 Plastics Recycling Today: A Growing Resource
- ❒ E3140 Putting Aside Pesticides
- ❒ E3150 Radon
- ❒ E3160 RCRA-Hazardous Waste
- ❒ E3161 The Kitchen Uncovered: Orkin Sanitized EMP The New Superfund: What It Is and How It Works
- ❒ E3170 Tape 1 – Changes in the Remedial Process Clean-up Standards and State Involvement Requirements
- ❒ E3180 Tape 2 – Changes in the Removal Process: Removal and Additional Program Requirements
- ❒ E3190 Tape 3 – Enforcement & Federal Facilities
- ❒ E3210 Tape 4 – Emergency Preparedness & Community Right-to-Know
- ❒ E3220 Tape 5 – Underground Storage Tank Trust Fund & Response Program
- ❒ E3230 Tape 6 – Research & Development/Closing Remarks
- ❒ E3235 Regulatory and Good Manufacturing Practices
- ❒ E3236 Rodent Control Strategies
- ❒ E3240 Sink a Germ
- ❒ E3245 Wash Your Hands
- ❒ E3250 Waste Not, Reducing Hazardous Waste
- ❒ E3251 Would Your Restaurant Kitchen Pass Inspection?
- ❒ E3260 Swabbing Techniques for Sampling the Environment and Equipment

FOOD

- ❒ F2005 A Lot on the Line
- ❒ F2007 The Amazing World of Microorganisms
- ❒ F2008 A Recipe for Food Safety Success
- ❒ F2009 Basic Personnel Practices
- ❒ F2010 Close Encounters of the Bird Kind
- ❒ F2011 Available Post Harvest Processing Technologies for Oysters
- ❒ F2012 Control of *Listeria monocytogenes* in Retail Establishments
- ❒ F2013 Control of *Listeria monocytogenes* in Small Meat and Poultry Establishments
- ❒ F2014 Controlling Food Allergens in the Plant
- ❒ F2015 Controlling *Listeria*: A Team Approach
- ❒ F2016 Bloodborne Pathogens What Employees Must
- ❒ F2017 Building a Better Burger – Improving Food Safety in the Food Supply Chain
- ❒ F2020 Egg Handling and Safety
- ❒ F2021 Egg Production
- ❒ F2025 The Special of the Day: The Eggceptional Egg
- ❒ F2030 "Egg Games" Foodservice Egg Handling & Safety
- ❒ F2035 Fabrication and Curing of Meat and Poultry Products
- ❒ F2036 Emerging Pathogens and Grinding and Cooking Comminuted Beef
- ❒ F2037 Cooking and Cooling of Meat and Poultry Products
- ❒ F2039 Food for Thought – The GMP Quiz Show
- ❒ F2040 Food Irradiation
- ❒ F2045 Food Microbiological Control
- ❒ F2050 Food Safe-Food Smart – HACCP and Its Application to the Food Industry (Part 1 & 2)
- ❒ F2060 Food Safe Series I (4 videos)
- ❒ F2070 Food Safe Series II (4 videos)
- ❒ F2080 Food Safe Series III (4 videos)
- ❒ F2081 Food Safety Begins on the Farm
- ❒ F2090 Food Safety: An Educational Video for Institutional Food Service Workers
- ❒ F2095 Food Safety for Food Service Series I
- ❒ F2100 Now You're Cooking
- ❒ F2101 Tape 1 – Food Safety for Food Service: Cross Contamination
- ❒ F2102 Tape 2 – Food Safety for Food Service: HACCP
- ❒ F2103 Tape 3 – Food Safety for Food Service: Personal Hygiene
- ❒ F2104 Tape 4 – Food Safety for Food Service: Time and Temperature Controls
- ❒ F2105 Food Safety for Food Service Series II
- ❒ F2106 Tape 1 – Basic Microbiology and Foodborne Illness
- ❒ F2107 Tape 2 – Handling Knives, Cuts, and Burns
- ❒ F2110 Tape 3 – Working Safely to Prevent Injury
- ❒ F2111 Tape 4 – Sanitation
- ❒ F2120 Food Safety is No Mystery
- ❒ F2121 Controlling *Salmonella*: Strategies That Work
- ❒ F2125 Food Safety: For Goodness Sake: Keep Food Safe
- ❒ F2126 Food Safety the HACCP Way
- ❒ F2127 Food Safety Zone Video Series
- ❒ F2128 Tape 1 – Food Safety Zone: Basic Microbiology
- ❒ F2129 Tape 2 – Food Safety Zone: Cross Contamination
- ❒ F2130 Tape 3 – Food Safety Zone: Personal Hygiene
- ❒ F2131 Tape 4 – Food Safety Zone: Sanitation
- ❒ F2133 Food Technology: Irradiation
- ❒ F2134 Food Safety: You Make the Difference
- ❒ F2135 Fruits, Vegetables, and Food Safety: Health and Hygiene on the Farm
- ❒ F2136 Food Safety First
- ❒ F2137 Food Safety: Fish and Shellfish Safety
- ❒ F2140 Get with a Safe Food Attitude
- ❒ F2145 GLP Basics: Safety in the Food Micro Lab
- ❒ GMP Basics: Avoiding Microbial Cross-Contamination
- ❒ GMP Basics: Employee Hygiene Practices
- ❒ GMP Basics: Guidelines for Maintenance Personnel
- ❒ GMP Basics: Process Control Practices
- ❒ GMP – GSP Employee
- ❒ GMP: Personal Hygiene and Practices in Food Manufacturing
- ❒ GMP Food Safety Video Series
- ❒ F2151 Tape 1 – Definitions
- ❒ F2152 Tape 2 – Personnel and Personnel Facilities
- ❒ F2153 Tape 3 – Building and Facilities
- ❒ F2154 Tape 4 – Equipment and Utensils
- ❒ F2155 Tape 5 – Production and Process Controls
- ❒ F2160 GMP: Sources and Control of Contamination during Processing
- GMPs for Food Plant Employees: Five-volume Video Series Based on European Standards and Regulations
- ❒ F2161 Tape 1 – Definitions
- ❒ F2162 Tape 2 – Personnel and Personnel Practices
- ❒ F2163 Tape 3 – Building and Facilities
- ❒ F2164 Tape 4 – Equipment and Utensils
- ❒ F2165 Tape 5 – Production/Process Controls
- ❒ F2168 HACCP Advantage – Good Manufacturing Practices
- ❒ F2169 HACCP Training for Employees – USDA Awareness
- ❒ F2170 The Heart of HACCP
- ❒ F2172 HACCP Training for Managers
- ❒ F2173 Inside HACCP: Principles, Practices and Results
- ❒ F2175 Inspecting for Food Safety – Kentucky's Food Code
- ❒ F2180 HACCP: Safe Food Handling Techniques
- ❒ F2190 Is What You Order What You Get? Seafood Integrity
- ❒ F2191 Microbial Food Safety Awareness to Action
- ❒ F2210 Northern Delight – From Canada to the World
- ❒ F2220 Proper Handling of Peracidic Acid
- ❒ F2230 Purely Coincidental
- ❒ F2240 On the Front Line
- ❒ F2250 On the Line
- ❒ F2260 100 Degrees of Doom ... The Time and Temperature Caper
- ❒ F2265 A Day in the Deli: Service, Selection, and Good Safety
- ❒ F2266 HACCP: A Basic Understanding
- ❒ F2270 Pest Control in Seafood Processing Plants
- ❒ F2271 Preventing Foodborne Illness
- ❒ F2280 Principles of Warehouse Sanitation
- ❒ F2290 Product Safety and Shelf Life
- ❒ F2310 Safe Food: You Can Make a Difference
- ❒ F2320 Safe Handwashing
- ❒ F2321 All Hands on Deck
- ❒ F2322 The Why, The When, and The How Video
- ❒ F2325 Safe Practices for Sausage Production
- ❒ F2330 Sanitation for Seafood Processing Personnel
- ❒ F2340 Sanitizing for Safety
- ❒ F2341 Science and Our Food Supply
- ❒ F2342 Seafood HACCP Alliance Internet Training Course
- ❒ F2350 ServSafe: Steps to Food Safety
- ❒ F2350-1 Step One: Starting Out with Food Safety
- ❒ F2350-2 Step Two: Ensuring Proper Personal Hygiene
- ❒ F2350-3 Step Three: Purchasing, Receiving and Storage
- ❒ F2350-4 Step Four: Preparing, Cooking and Serving
- ❒ F2350-5 Step Five: Cleaning and Sanitizing
- ❒ F2350-6 Step Six: Take the Food Safety Challenge: Good Practices, Bad Practices – You Make the Call
- ❒ F2370 Supermarket Sanitation Program – Cleaning and Sanitizing
- ❒ F2380 Supermarket Sanitation Program: Food Safety
- ❒ F2390 Take Aim at Sanitation
- ❒ F2391 Understanding Foodborne Pathogens
- ❒ F2410 Wide World of Food Service Brushes
- ❒ F2420 Your Health in Our Hands, Our Health in Yours
- ❒ F2430 Smart Sanitation: Principles and Practices for Effectively Cleaning Your Food Plant
- ❒ F2440 Cleaning and Sanitizing in Vegetable Processing Plants: Do It Well, Do It Safely!
- ❒ F2450 A Guide to Making Safe Smoked Fish
- ❒ F2451 A HACCP-based Plan Ensuring Food Safety in Retail Establishments
- ❒ F2460 Safer Processing of Sprouts
- Fast Track Restaurant Video Kit
- ❒ F2500 Tape 1 – Food Safety Essentials
- ❒ F2501 Tape 2 – Receiving and Storage
- ❒ F2502 Tape 3 – Service
- ❒ F2503 Tape 4 – Food Production
- ❒ F2504 Tape 5 – Warewashing
- Worker Health and Hygiene Program for the Produce Industry
- ❒ F2505 Manager Guide to Worker Health and Hygiene: Your Company's Success May Depend on It!
- ❒ F2506 Worker Health and Hygiene: Your Job Depends on It!
- ❒ F2600 Food Industry Security Awareness: The First Line of Defense

OTHER

- ❒ M4010 Diet, Nutrition and Cancer
- ❒ M4020 Eating Defensively: Food Safety Advice for Persons with AIDS
- ❒ M4030 Ice: The Forgotten Food
- ❒ M4050 Personal Hygiene and Sanitation for Food Processing Employees
- ❒ M4060 Psychiatric Aspects of Product Tampering
- ❒ M4070 Tampering: The Issue Examined
- ❒ M4071 Understanding Nutritional Labeling Processing Employees

IAFP FOUNDATION

Everyone Benefits When You Support **The IAFP Foundation**

We live in a global economy and the way food is grown, processed, and handled can impact people around the world. Combine these issues with the complexity of protecting the food supply from food security threats and the challenges to food safety professionals seem overwhelming. However, with your support the IAFP Foundation can make an impact on these issues.

Funds from the Foundation help to sponsor travel for deserving scientists from developing countries to our Annual Meeting, sponsor international workshops, distribute *JFP* and *FPT* journals to developing countries through FAO in Rome, and supports the future of food scientists through scholarships for students or funding for students to attend IAFP Annual Meetings.

It is the goal of the Association to grow the IAFP Foundation to a self-sustaining level of greater than $1.0 million by 2010. With your generous support we can achieve that goal and provide additional programs in pursuit of our goal of *Advancing Food Safety Worldwide*®.

Contribute today by calling 515.276.3344 or visiting www.foodprotection.org

IAFP FOUNDATION

NEW MEMBERS

AUSTRALIA

Frances A. Warnock
Consultant Food Safety Education & Risk Communication
Mona Vale, New South Wales

BRAZIL

Miriam T. Santos
Universidade Federal de Vicosa
Vicosa, Minas Gerais

CANADA

Kate Abraham
Canadian Fishing Company
Vancouver, British Columbia

Connie Hy Au
Lilydale Inc.
Edmonton, Alberta

Sandra Cistrone
Archer Daniels Midland Company
Halton Hills, Ontario

Helene Couture
Health Canada
Dunrobin, Ontario

Tina Y. Girard
McCain Foods (Canada)
Florenceville, New Brunswick

Benny Jung
Fraser Health Authority
Vancouver, British Columbia

Francois Malouin
Universite de Sherbrooke
Sherbrooke, Quebec

Michelle M. Payne
Loblaw Companies Limited West
Calgary, Alberta

CHINA

Xiao L. Chen
XiyueKouwanxiang Restaurant
Zhengzhou, Henan Province

Jie Liu
XiyueKouwanxiang Restaurant
Zhengzhou, Henan Province

FRANCE

Aurelien Costa
bioMérieux
La Balme Les Grottes

Sylvie Hallier-Soulier
GeneSystems
Bruz

ITALY

Antonio Bevilacqua
Foggia University
Foggia

Sara Lomonaco
Universita de Torino
Grugliasco

Valentina Trinetta
Universita de Milano
Milano

JAPAN

Keiichi Goto
Mitsui Norin Co., Ltd.
Fujieda

Hisato Ikemoto
Suntory Ltd.
Kawasaki-shi

Kohei Matsumoto
Mitsui Norin Co., Ltd.
Fujieda

Miki Sato
Q. P. Corporation
Fuchu-shi, Tokyo

Tatsuya Tominaga
Saitama Industrial Technology Center North Institute
Saitama

Kobayashi Yasuyuki
Suntory Limited
Kawasaki, Kanagawa

Taro Yonekita
Nippon Meat Packers, Inc.
Tsukuba, Ibaraki

JORDAN

Akram R. Alaboudi
Jordan University Science Technology
Irbid

MALAYSIA

Charles Chan
Arachem (M) Sdn. Bhd.
Kuala Lumpur

Luck Peng Lim
All Eights (M) Sdn. Bhd.
Subang Jaya, Selangor Darul Ehsan

MEXICO

Javier Castro-Rosas
Universidad Autonoma del Estado de Hidalgo
Mineral de la Reforma, Hidalgo

Violeta T. Pardio
Universidad Veracruzana
Boca de Rio, Veracruz

Rodrigo Zapata Alvarez
DuPont Qualicon
Mexico, Federal District

NEW MEMBERS

THE NETHERLANDS

Ine H. J. Van Der Fels-Klerx
RIKILT-Institute of Food Safety
Wageningen, Gelderland

NEW ZEALAND

Philippa Ross-James
New Zealand Food Safety Authority
Wellington

PERU

Carmen Velezmoro
Universidad Nacional Agraria la Molina
Lima

Doris Zuniga
Universidad Nacional Agraria la Molina
Lima

SINGAPORE

Yi Tee Lim
All Eights (S) Pte. Ltd.
Singapore

SOUTH KOREA

Mikyoung An
Dong-guk University
Seoul

Jae-Kwan Hwang
Yonsei University
Seoul

Jeongmok Kim
Mokpo National University
Muan-Gun, Jeonnam

Yu-Si Lee
Chung-Ang University
Ansung

Sangryeol Ryu
Seoul National University
Seoul

SPAIN

Maria I. Gil
CEBAS-CSIC
Espinardo, Murcia

TAIWAN

Yung-Hsiang Tsai
National Kaohsiung Marine University
Kaohsiung City

THAILAND

Amara Chinaphuti
Postharvest & Processing Research & Development Office
Chatuchark, Bangkok

UNITED ARAB EMIRATES

Abdul Muthalif Kader Maideen
Geoscience Testing Laboratory
Abu Dhabi

UNITED KINGDOM

Pam Edwards
British Airways
Addlestone, Surrey

Deb Smith
Campden & Chorleywood Food Research Association
Gloucestershire

Laurence Tisi
Lumora
Ely

UNITED STATES

ALABAMA

Michelle Hayden
Auburn University
Auburn

ARKANSAS

Lisa M. Cooney
University of Arkansas
Fayetteville

CALIFORNIA

Tim Birmingham
Almond Board of California
Modesto

Alicia Enriquez
Sacramento County Environmental Management Dept.
Sacramento

Anne-Laure Moyne
University of California
Davis

Stacy K. Stoltenberg
PrimusLabs.Com
Santa Maria

Elaine Yan
Advanced Fresh Concepts Corp.
Rancho Dominguez

COLORADO

Rick Moore
Deep Rock Water Co.
Denver

DELAWARE

Elaine Black
University of Delaware
Newark

Julie Bunville
DuPont Qualicon
Wilmington

DISTRICT OF COLUMBIA

Erin D. Bongard
Georgetown University
Washington

NEW MEMBERS

Catherine Chesnutt
USDA
Washington

Sandra Eskin
Produce Safety Project
Washington

FLORIDA

Gillian F. Dagan
ABC Research Corporation
Gainesville

Juan A. Perez
Starbucks Coffee
Hollywood

GEORGIA

Sarah B. Johnson
USDA-ARS
Buford

Olamide T. Oyetunji
University of Georgia
Athens

Ida Rosenblum
Atlanta Research & Education Foundation/CDC
Atlanta

Cathy Webb
University of Georgia
Griffin

HAWAII

Yong Li
University of Hawaii at Manoa
Honolulu

ILLINOIS

Ahmad M. Fakhoury
Southern Illinois University
Carbondale

Linda M. Long
Ogle County Health Dept.
Oregon

Justin R. Ransom
OSI Industries, LLC
Aurora

INDIANA

Bonnie Co
Purdue University
West Lafayette

Lisa Harrison
Indiana State Dept. of Health
Cloverdale

IOWA

Kohl D. Schrader
Iowa State University
Ames

Buffy A. Stohs
Kansas State University
Cedar Rapids

KANSAS

Pamela Henry
Johnson County Environmental Dept.
Olathe

Ryan A. Mass
Lallemand Specialities
Arlington

KENTUCKY

Brenda Haydon
Kentucky Assn. of Milk, Food & Environmental Sanitarians
Waddy

MARYLAND

Jeff Berresford
Sterilex Corporation
Owings Mills

Ken Goldscher
Strasburger & Siegel, Inc.
Hanover

Yaguang Luo
USDA
Beltsville

Alison L. St. John
Walden University
Frederick

MICHIGAN

Ralph Basile
Healthmark Industries Company, Inc.
Fraser

Rodney D. Blanchard
Monroe County Health Dept.
Monroe

Danilo T. Campos
Michigan State University
East Lansing

Scott R. Moosekian
Michigan State University
Lansing

Gene Paez
Shiawassee County Environmental Health Division
Corunna

Travis Powers
Neogen Corporation
Lansing

Douglas H. Siegel
Price, Heneveld, Cooper, DeWitt & Litton, LLP
Grand Rapids

Michael E. Wendorf
Neogen Corporation
Lansing

MINNESOTA

Bobbi Pritt
Mayo Clinic
Rochester

MISSISSIPPI

Yvonne Vizzier Thaxton
Mississippi State University
Mississippi State

NEW MEMBERS

MISSOURI

Elizabeth M. Ewers
Missouri Dept. of Agriculture
Jefferson City

Brandi N. Moritz
Platte County Health Dept.
Platte City

NEBRASKA

Norma A. Chance
ConAgra Foods, Inc.
Omaha

Christie M. Hancock
ConAgra Foods, Inc.
Omaha

Mel Mann
ConAgra Foods, Inc.
Omaha

NEW JERSEY

Nancy R. Bontempo
Kraft Foods
East Hanover

Jean M. Campbell
Campbell Soup Co.
Camden

Kevin S. Edwards
SGS
Mountain Lakes

Jie Li
PFG/AFI Food Service
Elizabeth

Phillip S. Saunders
MARS Snackfood US
Hackettstown

George Tice
DuPont
Thorofare

NEW MEXICO

Ruben Zapata
New Mexico State University
Las Cruces

NEW YORK

Michline Brice
Delaware State University
Spring Valley

Nicole H. Woodcock
Cornell University
Ithaca

NORTH CAROLINA

Iryna Sybirtseva
North Carolina State University
Raleigh

NORTH DAKOTA

James Oloya
North Dakota State University
Fargo

OHIO

Melanie Abley
The Ohio State University
Columbus

Janet Buffer
The Ohio State University
Columbus

Cynthia Decker
Richter International, Inc.
Columbus

Kelli R. Dodd
Columbus Public Health
Galloway

Jennifer L. Johns
Tuscarawas County Health Dept.
Dover

Chiew Hui Kaw
Nestle Quality Assurance Center
Dublin

Keith L. Krinn
Columbus Public Health
Columbus

James Lawrenz
State of Ohio
Marysville

David J. Mahan
AVI Foodsystems, Inc.
Warren

Lydia C. Medeiros
The Ohio State University
Columbus

Loc T. Nguyen
The Ohio State University
Columbus

Alexander Rodriguez-Palacios
The Ohio State University
Wooster

Robert L. Scharff
The Ohio State University
Columbus

Lu Zhang
The Ohio State University
Columbus

PENNSYLVANIA

Marjorie L. Davis
Virginia Tech
Avondale

Jeff S. Wilson
Silliker Inc.
Allentown

Rhyannon R. Witzel
Mars Snackfood US
Easton

SOUTH CAROLINA

Spencer Heringa
Clemson University
Seneca

NEW MEMBERS

TENNESSEE

Emily Rotich
Tennessee State University – Agricultural Sciences
Nashville

Cindy Thompson
Tennessee State University
Nashville

TEXAS

Gloria T. Anderson
VETCOM Food Analysis & Diagnostic Laboratories
Fort Sam Houston

Emily T. Chlebowski
VETCOM Food Analysis & Diagnostic Laboratories
Fort Sam Houston

Thomas M. Foegle
Brinker International
Dallas

Yen Te Liao
Texas Tech University
Lubbock

Claudia A. Narvaez Bravo
Texas Tech University
Lubbock

Cynthia Sheffield
USDA
College Station

Praveena Sunkara
Texas Tech University
Lubbock

UTAH

Michelle Cooke
Weber – Morgan Health Dept.
Ogden

Bart Weimer
Utah State University
Logan

VIRGINIA

Stephanie E. Cunningham
Unilever – Lipton Tea
Suffolk

Tom J. Kuntz
Virginia Tech
Alexandria

Jessica Maitland
Virginia Tech
Blacksburg

Yuanyuan Wang
Costco Wholesale Corporation
Issaquah

WASHINGTON

Stacey D. Willson
Sodexo
Seattle

WISCONSIN

Amy Bender
Richland Center

Erin M. Headley
Schreiber Foods, Inc.
Green Bay

Christopher T. Mahoney
A & B Process Systems
Stratford

Crystal Rakestraw
University of Wisconsin – River Falls
River Falls

NEW GOLD SUSTAINING MEMBER

This membership was previously a Sustaining Membership

3M Microbiology Products
Kevin A. Habas
St. Paul, Minnesota

NEW SUSTAINING MEMBER

Kim Laboratories
Myung L. Kim
Champaign, Illinois

UPDATES

Anthony Vagnino Named V.P. Sales and Marketing at Diversified Laboratories

Peter Kendrick, CEO of Diversified Laboratories, Inc. has announced that Anthony Vagnino has joined the company as vice president of sales and marketing. "Anthony brings tremendous knowledge and experience across the entire spectrum of food safety, especially the analytical food testing industry. I am looking forward as he takes our company into new areas that will accelerate our growth and expand our expertise across new industries."

Gainco Makes New Senior-Level Appointments

Gainco, Inc., announces three new senior-level appointments within the company's marketing and sales functional areas.

James A. 'Jim' Petersen has been appointed director of marketing and business development. Mr. Petersen will be responsible for managing Gainco's domestic and international marketing activities, as well as the identification, exploration and cultivation of new markets and new product opportunities. Prior to taking on these responsibilities, Mr. Petersen served as sales director for Gainco. Before joining the company in 2000, he held sales and managerial positions at Bettcher Industries as well as several food processing companies – Lykes Brothers and Sunnyland, Inc.

Jim Hipple has joined Gainco as director of sales. In this position, Mr. Hipple will direct all domestic and international sales activities, including the company's field sales organization. Mr. Hipple has more than 20 years of sales and managerial experience in the poultry industry. Before joining Gainco, he served in divisional and regional sales manager positions at Meyn America and Prime Equipment Group. He has also held field sales positions with Dapec, Breuil Automation and Stork Gamco which included account management responsibilities for leading processors such as Perdue, Gold Kist, ConAgra, Gold'n Plump and Wayne Farms. Mr. Hipple holds a B.S. degree in agricultural mechanization technology from the University of Georgia.

Gainco also announces the appointment of Brian E. Porter as the company's manager of sales engineering, with responsibilities for managing sales engineering as well as the development of systems and equipment that fully satisfy customer needs. Mr. Porter served as manager of customer project development at Gainco as well as at Weigh Systems South prior to that company's acquisition by Gainco – where he was responsible for managing all aspects of domestic and international projects including quotations, project management and equipment installation. He has served on Gainco's new product development team since 2003.

Exosect Appoints Robert Hend as Regulatory Affairs Manager

Exosect has announced the appointment of Robert Hend as its regulatory affairs manager within the company's research and development team. With over 20 years experience in the agrochemical and speciality chemicals sectors, Mr. Hend has previously worked for several leading edge, global, research-based companies and brings with him strong knowledge of the crop protection sector.

As regulatory affairs manager, Mr. Hend's responsibilities will include the effective management and compilation of regulatory dossiers as well as the production of robust study summaries and appropriate risk assessments. He will also continue Exosect's development of relationships with regulatory personnel within the ranks of suppliers, external contractors and competent authorities.

Prior to his appointment, Mr. Hend was regulatory affairs manager for a range of insecticides and fungicides at Syngenta.

Mr. Hend holds a BSc Hons in zoology with a post-graduate diploma in information science.

Food Safety Partnership Announces New Members and Expanded Board

The Partnership for Food Safety Education, a non-profit organization dedicated to improving public health through research-based, actionable consumer food safety education, has announced an expanded Board of Directors and the addition of two leading food industry organizations as new contributing members.

The Grocery Manufacturers Association (GMA) and the American Frozen Food Institute (AFFI) join the Partnership at a time of increased attention to consumer outreach through activation of retailers and food and consumer product companies.

GMA and AFFI join industry, consumer, health and scientific professional organizations, and federal agency liaisons, that for ten years have led development and dissemination of the FightBAC!® campaign and, now, *Be Food Safe*, a new campaign designed to bring the basic consumer safe food handling messages of Clean, Separate, Cook and Chill to places where people shop for food.

Newly appointed to the Partnership's Board of Directors are Robert E. Brackett, Ph.D., senior vice president and chief science and regulatory affairs officer, Grocery Manufacturers Association, Washington, D.C., and Leslie G. Sarasin, CAE, president and CEO, American Frozen Food Institute, McLean, VA.

"The Partnership Board will benefit tremendously from the engagement of these two food industry leaders and their associations," said Partnership Board Chairman Bryan Silbermann, president of the Produce Marketing Association. "To have an impact on foodborne illness we must engage all food and consumer product associations and their member companies in consumer education."

"Our membership with the Partnership for Food Safety Education is consistent with GMA's leadership role in promoting industry solutions that help consumers achieve and maintain good health and wellness," said GMA's Dr. Brackett. "Communicating basic safe food handling and hygiene to consumers is an important extension of the food safety work of our member companies. Developing dialogue with consumers through participation in Partnership programming is an absolute priority of GMA."

Said AFFI CEO Bryan Sarasin, "The frozen food industry looks forward to helping shape and extend the Partnership's national messaging to bring clarity to consumers on the safe handling of frozen foods. We are excited about the new channels offered through the *Be Food Safe* retailer program to bring consumers important information on handling and cooking frozen products to ensure quality and safety."

The Partnership recently announced that nearly 40 retailers, representing approximately 6,000 supermarkets and an estimated 81 million consumers, have volunteered to bring *Be Food Safe* messages to customers through in-store and external communications programs.

Said Partnership Executive Director, Shelley Feist, "The Partnership is a truly unique forum through which GMA and AFFI can be active in developing the messages and delivery systems to elevate Americans' awareness of the importance to health of consistently following basic safe food handling."

Michelman Personnel Moves Span the Globe, Strengthen Worldwide Presence

Michelman is pleased to announce a number of key personnel additions and promotions.

Mr. Luc Vanderstappen has been promoted to European business manager, chemical specialties. In his new position, Mr. Vanderstappen will be responsible for European new business development for Michelman's Chemical Specialties business unit. Mr. Vanderstappen most recently held the position of senior account manager at Michelman.

Mr. David Williams has been tapped as Michelman's new senior account manager, Europe, and is responsible for servicing all U.K. Flexible Packaging and Chemical Specialties accounts. Additionally, he will be responsible for implementing new sales strategies at OMYA U.K. Ltd., Michelman's official UK distributor. With over 20 years of experience in the chemical industry, Mr. Williams will focus on expanding existing business, and developing new opportunities.

Yves De Smet, Ph.D., has been appointed global marketing manager, fibers and composites for Michelman's fibers and composites business. His responsibilities will include identifying and analyzing new growth opportunities, including idea generation, screening, business analysis and development; competitive analysis and market intelligence; as well as coordination of global accounts. Dr. De Smet's experience includes key positions with Celanese and ICI, in the Fibers and Composites and Seed Coatings businesses.

Mr. Linus Yoong has been hired as new business development manager, Asia, and will be based out of Michelman's Singapore office. Mr. Yoong will support the existing Asian sales team, with a focus on new business development and specific market opportunities. Mr. Yoong has over 15 years of experience in the chemical industry, with the bulk of his experience in distribution, providing functional additives to the coatings industry.

NEWS

3-A Symbol Holder Announces Plan for Corrective Actions

3-A Sanitary Standards, Inc. (3-A SSI) has announced that one of its 3-A Symbol licensees will undertake corrective actions for equipment manufactured under 3-A Sanitary Standard #58-00, Vacuum Breakers and Check Valves. The notice of corrective actions was sent by Chiang Sung Enterprise Co., Ltd. (CSE) to its customers concerning check valves covered in 3-A Symbol authorization #1324.

The CSE notice to customers was made in accordance with provisions of the 3-A SSI requirements for 3-A Symbol authorization. The check valves subject to the corrective actions by CSE bear the 3-A Symbol and are sold under the model designations Series NR and CC and the 3-A Sanitary Standard #58-00.

The actions announced by CSE apply only to equipment listed in the 3-A Symbol authorization for 3-A Sanitary Standard #58-00. CSE maintains 3-A Symbol authorizations for three other 3-A Sanitary Standards, including #65-00, Sight and/or Light Windows and Sight Indicators in Contact with Product, # 68-00, Ball-type Valves, and #63-03, Sanitary Fittings.

3-A SSI issues certificates of 3-A Symbol authorization to licensees that agree to meet specific conditions for use of the 3-A Symbol. Voluntary use of the 3-A Symbol on dairy and food equipment assures processors that equipment meets sanitary standards, provides accepted criteria to equipment manufacturers for sanitary design, and establishes guidelines for uniform evaluation and compliance by sanitarians.

3-A SSI maintains a list of 3-A Symbol holders, both current and discontinued, on the 3-A SSI web site at http://www.3-a.org/symbol/holders.htm.

Protecting Romaine Lettuce from Pathogens

Knowing the preferences of foodborne pathogens such as *Escherichia coli* O157:H7 is essential to a successful counterattack on these microbes. That's why Agricultural Research Service (ARS) microbiologist Maria T. Brandl and University of California-Berkeley colleague Ronald G. Amundson are scrutinizing the little-understood ability of *E. coli* O157:H7 and *Salmonella enterica* to contaminate romaine lettuce.

Ms. Brandl is with the ARS Produce Safety and Microbiology Research Unit, part of the agency's Western Regional Research Center in Albany, CA. In experiments, the scientists exposed romaine lettuce leaves to *E. coli* O157:H7 and found that, after 24 hours, populations of the microbe were 10 times higher on young leaves than on middle ones.

One explanation: The young leaves offer more nutrition for *E. coli*. They exude about three times more nitrogen and about 1.5 times more carbon than do the middle leaves, Brandl and Amundson reported.

Scientists have known for decades that plants exude compounds–from leaves and roots–that bacteria and fungi can use as food. But the romaine lettuce study, published earlier this year in *Applied and Environmental Microbiology*, is the first to document the different exudate levels in romaine lettuce leaves of the two age classes. It's also the first to show that *E. coli* can do more than simply bind to the leaves; it also can multiply.

Adding nitrogen to the middle leaves boosted *E. coli* growth and further pointed to a key role of nitrogen in helping this pathogen. For that reason, a strategy that decreases nitrogen fertilizer use in romaine lettuce fields may be worth investigating, Ms. Brandl noted.

According to James A. Lindsay, ARS national program leader for food safety research, commodity-specific food safety guidelines for producing and harvesting leafy greens such as lettuce have been developed. That was done through industry, government and academic collaboration, in an effort to support Good Agricultural Practices, or GAPs.

Food Standards Agency Warns about Food Fraud Activity

The Food Standards Agency and police are warning food companies to be on the alert to a fraud that may have affected a number of food businesses across the country. The fraud, which involves identity theft, could result in unsafe food being offered for sale.

The fraudsters are alleged to have targeted small legitimate wholesale food businesses that supply meat, seafood and fruit and vegetables. The alleged offenders work by acquiring authentic letter heads of the legitimate company and changing the telephone, email and fax details. They then contact a genuine wholesaler/importer and place a food order with them. This business, after completing credit checks,

agrees to supply the food; however, before the delivery is made, the driver is contacted and the location switched – usually to the roadside or a car park. The fraudsters then make off with the goods and attempt to sell them on elsewhere.

West Yorkshire Police's Economic Crime Unit is leading the investigation into the fraud, which has affected a number of businesses in West Yorkshire as well as other firms across the country.

Detective Sergeant Peter McBay, of West Yorkshire Police's Economic Crime Unit said, "This fraudulent activity has cost a number of legitimate food companies many thousands of pounds and has also raised questions about the safety of the food that is stolen from the delivery vehicles. Some of the food has cropped up for sale in locations around the country but we do not know how it has been stored in the meantime."

"We would urge all food businesses to be on the lookout for this sort of fraud and urge them to:

- always check who you are doing business with
- as well as doing credit checks, make a call to the business too
- get your delivery drivers to ring if they are asked to make changes to their schedule
- if you are suspicious at any stage call your local police."

Officers have arrested seven men, aged between 19 and 44, from Dewsbury, Bradford, Wakefield and Brighton, on suspicion of conspiracy to defraud and money laundering. They have all been released on police bail pending further enquiries.

Colin Houston, deputy head of enforcement support division at the FSA said, "This alleged scam could be a matter of concern for consumers. If food is not stored or handled correctly it can become a breeding ground for germs and eating it could cause food poisoning. We would urge people to be on the lookout for food that might not appear to be fresh and/or is being sold very cheap. Remember if the offer looks too good to be true, it probably has a hidden catch. In this case it could be the safety of the produce. If you see anything that makes you concerned you should contact your local authority."

Why Does Antibiotic-Resistant *Campylobacter* Persist in Poultry?

One of the most common foodborne pathogens, *Campylobacter*, sickens more than two million people in the United States every year. With funding from USDA's Cooperative State Research, Education, and Extension Service (CSREES), scientists in Iowa are examining how this pathogen develops resistance to antibiotics and is transferred to humans via the food chain causing foodborne illness.

The results of this study will help improve the safety, quality, and value of the nation's food supply, particularly through pre-harvest intervention strategies.

Campylobacter jejuni is a species associated mainly with poultry. The pathogen developed resistance to fluroquinolone antibiotics, such as Cipro, after antibiotic treatment of animals. Although the poultry industry banned these antibiotics in 2005, the presence of antibiotic-resistant strains of *C. jejuni* remained high.

Qijing Zhang and colleagues at Iowa State University found that the antibiotic-resistant strains grow more successfully in the intestinal track of poultry than the non-resistant strain, even in the absence of antibiotics. The persistence of antibiotic-resistant *C. jejuni* in poultry highlights the need for new strategies to control it.

To prevent emergence and transmission of the antibiotic-resistant organisms, researchers are targeting the genes involved in the development and persistence.

"We will continue our efforts to understand the antibiotic resistance mechanisms and ecology of antibiotic-resistant *Campylobacter*," Mr. Zhang said. "We are also interested in developing intervention strategies to prevent the transmission and colonization."

Researchers tested fecal samples from both poultry and swine farms to isolate *Campylobacter*. They examined the isolates for susceptibility to various antibiotics and used molecular techniques to analyze the resistance-associated genetic mutations.

Antibiotic-resistant *Campylobacter* can infect humans through contaminated poultry meat, water, or raw milk, resulting in an infection called campylobacteriosis. *C. jejuni* is responsible for 95 percent of *Campylobacter* infections in humans.

Although the consumption of pork is not a major mode of *Campylobacter* transfer, the presence of antibiotic-resistant *Campylobacter* on pig farms makes pork a potential source of horizontal transfer across production systems.

CSREES funded this research project through the National Research Initiative's Food Safety program. Through federal funding and leadership for research, education and extension programs, CSREES focuses on investing in science and solving critical issues impacting people's daily lives and the nation's future. For more information, visit www.csrees.usda.gov.

Kaarin Goodburn Awarded MBE for Services to the Food Industry

Kaarin Goodburn, CFA secretary general, has been awarded an MBE for services to the food industry in the Queen's 2008 Birthday Honours List published.

With a background in biochemistry, applied molecular biology and food science, Ms. Goodburn has worked with CFA since its launch in 1989, much of the time as a consultant to the Association. She is responsible for the development of CFA, its policies, activities and relationships with members, government and the media.

Ms. Goodburn is a member of numerous expert working groups and committees in the UK and internationally, and a board member of a wide range of research projects and organizations.

Commenting on her award, Ms. Goodburn said: "This award is quite a surprise and a great honor recognising not only my work personally but also the standing and positive contribution of CFA in public life."

Investigation of Outbreak of Infections caused by *Salmonella* Saintpaul

CDC is collaborating with public health officials in many states, the Indian Health Service, and the US Food and Drug Administration (FDA) to investigate an ongoing multi-state outbreak of human *Salmonella* serotype Saintpaul infections. An initial epidemiologic investigation comparing foods eaten by ill and well persons identified consumption of raw tomatoes as strongly linked to illness. Recently, many clusters of illnesses have been identified in Texas and other states among persons who ate at restaurants. These clusters have led us to broaden the investigation to be sure that it encompasses food items that are commonly consumed with tomatoes.

Since April, 851 persons infected with *Salmonella* Saintpaul with the same genetic fingerprint have been identified in 36 states and the District of Columbia. These were identified because clinical laboratories in all states send *Salmonella* strains from ill persons to their state public health laboratory for characterization.

Among the 581 persons with information available, illnesses began between April 10 and June 20, 2008, including 173 who became ill on June 1 or later. Many steps must occur between a person becoming ill and the determination that the illness was caused by the outbreak strain of *Salmonella*; these steps take an average of 2–3 weeks. Therefore, an illness reported today may have begun 2–3 weeks ago. Patients range in age from <1 to 99 years; 49% are female. The number of illnesses is highest among persons 20 to 29 years old; the number of illnesses is lowest in children 10 to 19 years old and persons greater than 60 years old. At least 105 persons were hospitalized. No deaths have been officially attributed to this outbreak. However, a man in his sixties who died in Texas from cancer had an infection with the outbreak strain of *Salmonella* Saintpaul at the time of his death. The infection may have contributed to his death.

Only 3 persons infected with this strain of *Salmonella* Saintpaul were identified in the country during the same period in 2007. The previous rarity of this strain and the distribution of illnesses in all US regions suggest that the implicated food is distributed throughout much of the country. Because many persons with *Salmonella* illness do not have a stool specimen tested, it is likely that many more illnesses have occurred than those reported.

Most persons infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12–72 hours after infection. Infection is usually diagnosed by culture of a stool sample. The illness usually lasts 4–7 days. Although most people recover without treatment, severe infections may occur. Infants, elderly persons, and those with impaired immune systems are more likely than others to develop severe illness. When severe infection occurs, *Salmonella* may spread from the intestines to the bloodstream and then to other body sites, and can cause death. In these severe cases, antibiotic treatment may be necessary.

At this time, FDA is advising US consumers to limit their tomato consumption to those that are not the likely source of this outbreak. These include cherry tomatoes; grape tomatoes; tomatoes sold with the vine still attached; tomatoes grown at home; and red plum, red Roma, and round red tomatoes from specific sources listed at: http://www.fda.gov/oc/opacom/hottopics/tomatoes.html*. Consumers should be aware that raw tomatoes are often used in the preparation of fresh salsa, guacamole, and pico de gallo, are part of fillings for tortillas, and are used in many other dishes.

Consumers everywhere are advised to:

- Refrigerate within 2 hours or discard cut, peeled, or cooked tomatoes.
- Avoid purchasing bruised or damaged tomatoes and discard any that appear spoiled.
- Thoroughly wash all tomatoes under running water.

- Keep tomatoes that will be consumed raw separate from raw meats, raw seafood, and raw produce items.
- Wash cutting boards, dishes, utensils, and counter tops with hot water and soap when switching between types of food products.

FDA recommends that US retail outlets, restaurants, and food service operators offer only fresh and fresh cut red plum, red Roma, and round red tomatoes and food products made from these tomatoes from specific sources listed at: http://www.fda.gov/oc/opacom/hottopics/tomatoes.html#retailers*. Cherry tomatoes, grape tomatoes, and tomatoes sold with the vine still attached from any source may be offered.

FDA information on this investigation can be found at: http://www.fda.gov/oc/opacom/hottopics/tomatoes.html*.

ARS Research Program on Food Safety of Leafy Greens and Other Fresh Produce

ARS research to improve the safety of leafy greens and other fresh produce—such as spring onions and tomatoes—is part of the overall ARS national program for Food Safety (#108), described on the Web at www.nps.ars.usda.gov. This is a cross-cutting program that looks at all aspects of the food safety continuum, from plant and microbial genetics to food-production techniques. The program develops tools and information for understanding the sources and transfer of microbes through the food supply.

ARS coordinates its research program in this area with other US Department of Agriculture agencies, including the Cooperative State Research, Education, and Extension Service; Economic Research Service; and National Agricultural Statistics Service.

The agency also works closely with commodity organizations such as United Fresh, industry producers and processors, universities, and other federal organizations, such the US Food and Drug Administration.

Such extensive coordination ensures that ARS is addressing the most critical needs and priorities with its research. It also helps make sure that research programs funded by federal dollars are integrated without being duplicative and takes advantage of each agency's unique abilities and expertise.

Most recently, the priorities on which ARS is concentrating include:

- identifying genetic and biochemical factors involved in the colonization of produce by human pathogens
- developing and implementing science-based strategies to prevent on-farm contamination of produce with enteric pathogens
- determining the role of harvesting methods, postharvest processing, and storage in contamination
- developing comprehensive postharvest systems for eliminating or controlling growth of human pathogenic microorganisms
- developing accurate, high-speed tests for inspecting foods and sanitation conditions during processing by very small to very large commercial processors
- inventing new or improved intervention technologies for significantly reducing contamination by human pathogens while maintaining quality of fresh and minimally processed produce.

Preparing Ground Beef for Safe Consumption

Wash hands with warm, soapy water for at least 20 seconds before and after handling raw meat and poultry. Wash cutting boards, dishes and utensils with hot, soapy water. Immediately clean spills.

Keep raw meat, fish and poultry away from other food that will not be cooked. Use separate cutting boards for raw meat, poultry and egg products and cooked foods.

Consumers should only eat ground beef or ground beef patties that have been cooked to a safe internal temperature of 160°F.

Color is NOT a reliable indicator that ground beef or ground beef patties have been cooked to a temperature high enough to kill harmful bacteria such as *E. coli* O157:H7.

The only way to be sure ground beef is cooked to a high enough temperature to kill harmful bacteria is to use a thermometer to measure the internal temperature.

Refrigerate raw meat and poultry within two hours after purchase or one hour if temperatures exceed 90°F. Refrigerate cooked meat and poultry within two hours after cooking.

Bacteriophages as Novel Antimicrobials for Food Safety

Houseguests sometime overstay their welcome to the point that their hosts are just dying for them to leave. Now, this is actually happening to foodborne bacteria after viruses called "bacteriophages" take up residence inside them and begin replicating. The progeny of these bacteriophages literally kill their bacterial hosts on their way out the cellular door.

The bacteriophage research is being conducted by microbiologist Manan Sharma, with the ARS Food Safety Laboratory, Beltsville, MD, in collaboration with researchers at Intralytix, Inc., based in Baltimore, MD. Intralytix isolates environmental phage viruses and selects candidates for further study. Mr. Sharma tests their ability to infect and kill bacteria.

The word "bacteriophage" was coined much earlier by researchers in Europe to mean "bacteria eater." These phages are environmentally ubiquitous and only attack bacteria. They do not have known adverse effects on humans, animals, or the environment.

Interest in bacteriophages is ramping up with the emergence of antibiotic-resistant organisms. Every day, we consume small amounts of insignificant, nonpathogenic viruses that adhere to our food. While human friendly, the heavily researched, purified viruses that Mr. Sharma is testing can wreak havoc on deadly bacteria, such as *E. coli* O157:H7, that sicken consumers.

Such novel antimicrobials could eventually become an asset to the fast-growing fresh-cut produce industry, which provides packaged sliced fruits and bagged salads.

Phages reproduce by insinuating themselves into bacteria. The viral DNA is injected into the cells of the bacterial hosts, where it directs the production of progeny phages. These phages burst from bacterial-host cells, killing them along the way, and then move on to infect more bacterial cells.

Mr. Sharma has completed testing a cocktail of phages (ECP-100) on refrigerated samples of fresh-cut cantaloupe. These trials indicated that the phage treatments could be effective in killing *E. coli* O157:H7 in a produce commodity. "The treatments reduced pathogens on the samples of fresh-cut cantaloupe by 100-fold over untreated controls," says Sharma.

He has also tested the phages on their prime target: refrigerated fresh-cut lettuce. The results indicate that bacteriophage treatments can kill *E. coli* O157:H7 on the surface of leafy greens at the same levels as on the fresh-cut cantaloupe.

The laboratory's researchers assess the prevalence, diversity, and quantity of enteric bacteria associated with produce. They also assess how these pathogens interact with fresh produce in growing environments to learn how problems can be managed to prevent foodborne illnesses. The new findings increase understanding of ways that bacteriophages might further improve food safety.

www.foodprotection.org

INDUSTRY PRODUCTS

Biohit Inc.

New Biohit Proline® Plus: The Classic Reborn!

Biohit continues their 20 years of innovation with the newly designed Proline Plus mechanical pipettors.

With Proline Plus pipettors, the Biohit engineers have combined 20 years of innovation, design, and manufacturing expertise to deliver a highly ergonomic pipettor that is a pleasure to use.

Proline Plus is fully autoclavable, and available in single-channel, multi-channel, and fixed volume models to cover all applications across a wide volume range from 0.1ul to 10 mL.

These pipettors exceed today's laboratory requirements for safe, accurate, and precise pipetting. The multichannel units provide the uniquely Biohit Optiload design feature for easy, tip loading and ejection.

Biohit Inc.
800.922.0784
Neptune NJ
www.biohit.com

Mettler–Toledo Hi-Speed Develops New Value-Priced Checkweigher

Mettler-Toledo Hi-Speed announces the introduction of its value-priced checkweigher for mild to moderate washdown applications; the A300. Designed specifically for smaller packaging lines where space is at a premium, it can accommodate a variety of packages in a compact 30" of line space. The A300 is economically priced and delivers a rate of up to 165 ppm (packages per minute).

The stainless steel construction of the A300 features an open design that allows easy cleaning and sanitizing in food processing applications in washdown environments; while "no tools" belt removal minimizes maintenance. A hermetically sealed load cell ensures superior long term accuracy and weighing performance.

The XC 5.7-inch QVGA touch-screen dashboard-style display provides intuitive, menu-driven access to basic checkweigher functions. Simple menus provide fast access to important checkweigher set up screens and production information. Browser-like navigation gives users fast access to important controls and read-outs, while allowing them to drill down easily into machine and line performance measures and statistics.

Mettler-Toledo
607.257.6000
Ithaca, NY
www.mt.com/hi-speed

Eriez® High Speed Feeders Provide Superbly Fast, Efficient Feeding of a Wide Range of Materials

Eriez® introduces a new series of AC-operated high speed feeders that are designed specifically for exceptionally high speed feeding of light, bulky materials. These rugged and powerful feeders are ideal for scales and other applications that require higher throughput and advanced control.

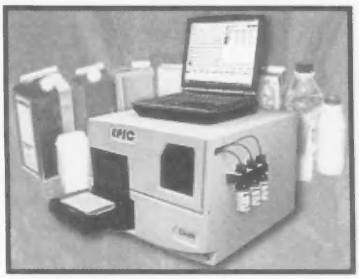
In addition to advanced high speed feed rates, Eriez's high speed feeders feature a quick-stopping characteristic to assure accurate handling of materials for economy and efficiency in mixing, weighing, batching packaging and bagging operations.

Eriez's high speed feeders are available in eight models. Each model has unique feed-rate capabilities ranging from 40 cubic feet to 600 cubic feet per hour. Feed-rate is easily adjusted by Eriez's variable transformer or solid-state type controllers to enable trouble-free handling of bulk materials from a few ounces to several tons per hour.

All Eriez high speed feeders units are light and functional and can be installed easily in a minimum amount of space and integrate well with other equipment.

Eriez
888.300.3743
Erie, PA
www.eriez.com

Be sure to mention, "I read about it in *Food Protection Trends*"!



Charm Sciences, Inc.

Charm New Microplate Luminescence System

The Charm EPIC™ is a new generation microplate luminescence system that rapidly predicts spoilage in shelf stable, and extended shelf life (ESL) beverage products. EPIC sets new standards in sterility and shelf life testing on UHT, ESL, and aseptic products such as dairy (fluid whites, flavored milks, ice cream mix, shake mix, half & half, creamers, non dairy creamers, etc.), and soy milk. Fusing speed and sensitivity, the EPIC positively impacts the bottom line compared to conventional microbiological methods with faster product release from warehouse, reducing process line downtime, and providing more time for remediation.

Spoilage organisms of concern detected by the EPIC include yeast, molds, *Pseudomonas fluorescens*, *Listeria innocua*, *Bacillus cereus*, *Bacillus licheniformis* and other post process recontaminating flora. Dedicated dynamic software, EPIC link™, informs the operator of test status, and captures test results for customized analysis by sample type, sample source, manufacturing identifiers, thresholds, code dates, and pass/ fail statistics. The EPIC system complements the Charm ATP (adenosine triphosphate) hygiene product line (PocketSwab® Plus, AllerGiene®, and WaterGiene™) which rapidly predicts the hygiene status of surfaces, and rinse waters in seconds.

Charm Sciences, Inc
978.687.9200
Lawrence, MA
www.charm.com

Hardy Diagnostic's – Colitag™

Colitag™, by CPI International, is ready-to-use ONPG/MUG-based test, which can be added directly to a liquid or semi-liquid sample. If coliforms are present, ONPG will produce a distinct yellow color. If *E. coli* is present, the sample will fluoresce a bright blue color under long-wave (366 nm) UV light. Incubation of the test is performed at 35°C for 22–26 hours.

Colitag™ is capable of resuscitating and detecting even single cells of severely injured *E. coli* and coliforms. In March of 2004, Colitag™ earned US EPA approval for use as a presence-absence test in drinking water and approval for use as an enumerative test in MPN format in May 2005. Colitag™ is available for use in municipal and bottled water testing, beverage waters and other QC coliform monitoring testing. Preliminary testing has also shown promising results for monitoring shellfish meats and shellfish-growing waters, as well as for waters growing alfalfa sprouts. Coliforms are a group of closely related bacteria that are (with a few exceptions) generally not harmful to humans. However, they include species present in the intestines of warm-blooded animals, and thus are often associated with disease outbreaks. For this reason, they are considered "indicator organisms" and their presence is used as a sign of the potential risk of illness from disease causing organisms associated with sewage or animal wastes. In order to prevent food and waterborne illnesses, the FDA and EPA regulate the testing of many foods and waters for the presence of coliforms, fecal contamination and potentially pathogenic microorganisms. Foods need to be free of hazardous microbes, or within a specified safe low level. Water for human consumption has a maximum contaminant level of zero allowable coliforms and fecal indicators such as *Escherichia coli*.

Hardy Diagnostics
800.266.2222
Santa Maria, CA
www.hardydiagnostics.com

Nilfisk CFM Launches New Hazardous Location Line of Industrial Vacuums

Over the years, plants across the United States have experienced tragedies directly related to poor maintenance plans. From the recent sugar dust-related explosion in Savannah, GA to the Spooner, WI chemical plant where 2 workers were critically injured, explosion-proof vacuums could have played a key role in prevention. Nilfisk CFM's new line of explosion-proof vacuums strive to do just that, protecting manufacturers' most valuable assets – their employees. The line is composed of 2 electric models, the CFM 118 EXP and 118 EXPW, and 2 intrinsically-safe pneumatic models, the A15 EXP and A15 EXPW.

The CFM 118 EXP-series is available in two electric models. The 118 EXP is for pick up of dry materials, while the 118 EXPW is equipped for picking up liquids and other wet hazardous materials. They are composed entirely of 304

stainless steel and equipped with conductive accessories to eliminate percussion arcing and static charge. In addition, the 118 EXP-series has undergone extensive testing and is CSA approved for use in Class I, Group D, and Class II, Groups E, F, and G environments.

For use in environments where electricity is undesirable or unavailable, the pneumatic A15 EXP-series also consists of 2 separate models for dry or wet pick up. Like the 118 EXPs, both the A15 EXP and A15 EXPW are composed of stainless steel, and although testing agencies do not currently exist for air-operated machines, the pneumatic A15 EXP-series meets the requirements for us use in Class I, Group D and Class II, Groups E, F, and G environments. With no electrical components and few moving parts, these vacuums are easy to use and maintain. To further protect workers, the machines also come equipped with a conductive, 50-foot air supply hose.

All vacuums in the new explosion-proof line feature:

- Ergonomic design, including a wheeled collection container that is easy to remove, lift, carry, and empty.
- Anti-static filter with large surface area in the dry models guarantee high filtration efficiency and prevents premature clogging.
- Optional downstream HEPA/ULPA filtration available on all units; Upstream HEPA available for dry models only. (HEPA filter retains 99.97% of particles, down to and including 0.3 microns. ULPA retains 99.999% down to and including 0.12 microns.)

In response to the new line of explosion-proof vacuums, the company has also made available a four-page, four-color, "Industrial Vacuums for Hazardous Locations" brochure that provides valuable information regarding hazardous locations and explosion prevention. The brochure features both machine and application images, as well as a list of explosive materials the machines are capable of collecting.

Nilfisk CFM
610.232.5469
Malvern, PA
www.nilfiskcfm.com

FKI Logistex Introduces Multilingual Interface for BOSS® PC-Based Control System

FKI Logistex® announces the release of a multilingual interface for its BOSS® PC-based control system. The new interface, which easily adapts to multiple languages and dialects, enables companies to address the needs of an increasingly multicultural workforce.

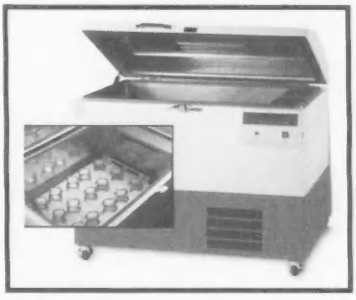
The FKI Logistex BOSS system is a PC-based control solution for automated material handling applications. BOSS combines machine control, data collection, system diagnostics, host integration, material flow management and HMI (Human Machine Interface) into a single software package that includes extensive diagnostics, data collection, system configuration and productivity monitoring tools.

The new interface allows users to log in to BOSS and view system status, alarms and performance information in their native language, reducing support complexity and training needs. Users can select a language preference when logging on, or switch dynamically between languages without having to log off. The multilingual interface automatically accounts for language-specific variables, such as units of measurement, date and time format, and numeric formats, enabling accurate interpretation of information.

"As we talk to customers, we find they are faced with more and more linguistically diverse workforces," said Jerry Koch, product director of software and controls for FKI Logistex. "The BOSS multilingual interface is a very valuable tool for companies seeking increased DC efficiency and accuracy. The BOSS system was already innovative in its approach to system control, allowing all the necessary software to be integrated to provide peak efficiency. Now, with its multilingual capabilities, operations with multicultural workforces can enjoy the benefits of such integration."

The multilingual interface can be used with all new BOSS systems and can support a virtually unlimited number of translations simultaneously. BOSS can be implemented with required languages and easily reconfigured in the future to support additional languages as the workforce changes. In addition to US English, UK English, German, Spanish and French, BOSS also supports languages such as Chinese, Japanese, Korean and others that require multibyte encoding of character sets.

FKI Logistex
513.881.5239
St. Louis, MO
www. fkilogistex.com



Jeio Tech, Inc.

New Incubated and Refrigerated Floor Model Shakers from Jeio Tech, Inc.

The new IS-971 Floor Model Shaker Series from Lab Companion features high capacity capabilities! Up to 4 × 6 liter flasks can be handled by the SI-971.

The series consists of 3 models. The IS-971 has a temperature range of 5°C above room temperature to 60°C. The IS-971R and IS-971RF (lighting control capability) have temperature ranges from 4°C to 60°C. The temperature uniformity is ±1.0°C at 38°C (based on various conditions).

The shaking motion includes a choice of orbital or reciprocating action with a speed range from 10 to 300 cycles per minute and a maximum orbit size of 70 mm diameter.

Run time can be programmed from 1.0 seconds up to 1,000 hours. Many temperature programs can be entered including 9 steps of temperature profiles programmable and repeatable up to 200 cycles.

A complete assortment of platforms and clamps allows the use of flasks, beakers, separatory funnels, test tubes and microplates.

Jeio Tech, Inc.
781.376.0700
Woburn, MA
www.jeiotech.com

Computrac® MAX® 5000XL Moisture/Solids/Ash Analyzer from Arizona Instrument

Arizona Instrument has announced the release of the next generation of bench top moisture and ash analyzers, the Computrac MAX® 5000XL. The MAX® 5000XL advances the state of the art in rapid moisture and ash analysis with a new temperature-controlled balance and high temperature lift compensation algorithm that provides users with more stable and accurate measurements. The new instrument also features a temperature ramp control feature that allows the MAX® 5000XL to be used for qualitative analyses that were previously only possible using a thermogravimetric analyzer (TGA).

The new MAX® 5000XL features the same intuitive user interface and rugged design as its predecessor the MAX® 5000. Improvements to the design and high temperature performance of the balance system of the MAX® 5000XL now make it possible to accurately analyze materials with ash concentrations of as little as 0.5%. The calibrated, instrument specific, high temperature lift compensation algorithm replaces the static lift compensation factor of previous models, resulting in more precise readings during ash / L.O.I. analyses.

The new temperature ramp control feature of the MAX® 5000XL allows the user to capture the weight loss of a sample during a precisely controlled temperature change.

Information gained from this test is similar to a scan performed by a more expensive thermogravimetric analyzer. This new feature effectively transforms the MAX® 5000XL into a dual use instrument capable of quantitatively testing for moisture and ash and qualitatively testing for the presence of certain organic or inorganic ingredients, and the degradation temperature of the material under test.

Arizona Instrument LLC
800.290.1414
Tempe, AZ
www.azic.com

COMING EVENTS

SEPTEMBER

- **1–4, Food Micro 2008 – The 21st International ICFMH Symposium,** Aberdeen Exhibition and Conference Centre, Aberdeen, Scotland. For more information, go to www.foodmicro2008.org/.
- **4–5, ASI Food Safety Consultants Bioterrorism and Food Safety Seminar,** Las Vegas, NV. For more information, contact Vicki Bodrow at 800.477.0778; E-mail: vbodrow@asifood.com.
- **7–9, 5th International Whey Conference,** Paris, France. For more information, go to www.iwc-2008.org/home.asp.
- **9–12,ASTHO – NACCHO Joint 2008 Conference,** Sacramento Convention Center, Sacramento, CA. For more information call 703.964.1240 or go to www.naccho.org.
- **14–17, 2008 TAPPI PLACE Conference,** Renaissance Portsmouth Hotel, Portsmouth, VA. For more information, call 800.332.8686 or go to www.tappi.org/08place.
- **15, ASIS International – 54th Annual Seminar and Exhibits,** Atlanta, GA. For more information, call 800.465.3717 or go to www.qmi.com.
- **16, Georgia Association for Food Protection Annual Meeting,** Publix Atlanta Division, Atlanta, GA. For more information, go to www.gaafp.org.
- **16, Managing Food Chain Security Effectively Workshop,** CCFRA Chipping Campden, Gloucestershire, United Kingdom. For more information, go to www.campden.co.uk/training/training.htm.
- **16–17, Upper Midwest Dairy Industry Association Annual Meeting,** Holiday Inn, St. Cloud, MN. For more information, E-mail Gene Watnass at saantaw@prtel.com.
- **16–18, Microbiological Laboratory Logistics and Fundamentals Workshop,** University of Arkansas, Fayetteville, AR. For more information, go to http://www.uark.edu/ua/foodpro/Workshops/.
- **16–18, New York State Association for Food Protection's 85th Annual Conference,** Doubletree Hotel, East Syracuse, NY. For more information, contact Janene Lucia at 607.255.2892; E-mail: jgg3@cornell.edu.
- **18, Nutritional Quality of Produce Conference,** CCFRA Chipping Campden, Gloucestershire, United Kingdom. For more information, go to www.campden.co.uk/training/agric10.htm.
- **21–24, AACC International Annual Meeting,** Hawaii Convention Center, Honolulu. For more information, call 651.454.7250 or go to http://meeting.aaccnet.org.
- **21–24, 122nd AOAC International Annual Meeting,** Dallas TX. For more information, go to www.aoac.org.
- **24–25, 2nd Annual China International Food Safety and Quality Conference and Expo,** The Landmark Hotel & Towers, Beijing, China. For more information, go to www.chinafoodsafety.com.
- **24–25, Molecular Biology and Biotechnology; Workshop for Beginners,** University of Arkansas, Fayetteville, AR. For more information, go to http://www.uark.edu/ua/foodpro/Workshops/.
- **24–25, Wisconsin Association for Food Protection Joint Educational Conference,** Holiday Inn, Manitowoc, WI. For more information, go to www.wafp-wi.org.
- **24–26, Washington Association for Food Protection Annual Conference,** Campbell's Resort, Chelan, WA. For more information, contact Stephanie Olmsted at 425.201.6471 or go to www.waffp.org.
- **29–1 Oct., Indiana Environmental Health Association Fall Educational Conference,** Belterra Hotel and Conference Center, Belterra, IN. For more information, contact Kelli Whiting at 317.221.2256; E-mail: kwhiting@hhcorp.org.

OCTOBER

- **1–2, Mexico Association for Food Protection with State University of Puebla International Congress of Food Safety,** Puebla, Mexico. For more information, contact Fausto Tejeda Trujillo at 52.222.455.9601; E-mail: ftejada@siu.buap.mx.
- **7–8, Advanced HACCP Training for Meat and Poultry Producers,** Athens, GA. For more information, contact University of Georgia Food Science Extension Outreach Program at 706.542.2574 or go to www.EFSonline.uga.edu.
- **9–11, Current Developments in Food and Environmental Virology Symposium,** Pisa, Italy. For more information, call 39.050.2213644 or go to www.cost929-environet.org.
- **12–16, 2nd ASM Conference on Beneficial Microbes: Beneficial Host-Microbial Interactions,** San Diego, CA. For more information, call ASM at 202.737.3600 or go to www.asm.org.
- **19–22, 8th Joint Meeting of the Seafood Science and Technology Society and the Atlantic Fisheries Technology Conference,** Wrightsville Beach, NC. For more information, call 252.222.6334 or go to www.seafoodlab.cmast.ncsu.edu/sst_aft2008/.
- **19–22, 28th Food Microbiology Symposium "Current Concepts in Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology,"** University of Wisconsin-River Falls, River Falls, WI. For more information, call 715.425.3704 or go to www.uwrf.edu/food-science.
- **25–28, American Society for Microbiology's Annual Interscience Conference on Antimicrobial Agents and Chemotherapy,** Washington, D.C. For more information, go to www.icaac.org.

IAFP UPCOMING MEETINGS

JULY 12-15, 2009
Grapevine, Texas

AUGUST 1-4, 2010
Anaheim, California

COMING EVENTS

- **25–29, American Public Health Association Annual Meeting,** San Diego, CA. For more information, go to www.apha.org.
- **27–30, Dairy Technology Workshop,** Birmingham, AL. For more information, call 205.595.6455; E-mail: henry.randolph@raiconsult.com.
- **28–29, AIB International's Principles of Inspecting and Auditing Food Plants,** Atlanta, GA. For more information, call 785.537.4740 or go to www.aibonline.org.
- **28–30, North Dakota Environmental Health Association Annual Conference,** Radisson Inn, Bismarck, ND. For more information, go to www.ndeha.org/conference.

NOVEMBER

- **3–6, Better Process Control School,** University of Arkansas, Fayetteville, AR. For more information, go to http://www.uark.edu/depts/ifse/bpcsrev1.html.
- **5–6, Alabama Association for Food Protection Annual Meeting,** Birmingham, AL. For more information, contact G. M. Gallaspy at 334.206.5375; E-mail: ggallaspy@adph.state.al.us.
- **9–13, Process Expo 2008,** McCormick Place, West Hall, Chicago, IL. For more information, go to www.fpsa.org.
- **11–14, FIL–IDF World Dairy Summit and Exhibition,** Mexico City. For more information, go to www.fil-idf.org; E-mail: MLebeau@fil-idf.org.
- **13–14, 2008 Sino-American Flexible Packaging and Film Development Symposium Call for Papers,** Hua Ting Hotel and Towers, Shanghai, China. For more information, go to www.tappia.org/s_tappi/doc_events.asp.
- **18–21, New Zealand Association for Food Protection with New Zealand Microbiology Society Annual Meeting,** Christchurch, New Zealand. For more information, contact Lynn McIntyre at 64.3.351.0015.
- **19–21, IAFP's 4th European International Symposium on Food Safety,** Lisbon, Portugal. For more information, contact the Association at 800.369.6337 or go to www.foodprotection.org.
- **19–21, The ILSI Europe International Symposium on Food Packaging,** Prague, Czech Republic. For more information, call 32.2.771.00.14 or go to http://europe.ilsi.org/events/upcoming/4thfoodpckg.htm.
- **20, Ontario Association for Food Protection's 50th Annual Meeting,** Mississauga Convention Centre, Mississauga, Ontario, Canada. For more information, contact Gail Seed at 519.463.6320 or go to www.ofpa.on.ca.

ADVERTISING INDEX

Journal of Food Protection®

ISSN: 0362-028X
Official Publication

International Association for Food Protection®

Reg. U.S. Pat. Off.

Vol. 71 **July 2008** **No. 7**

*Author address author for correspondence.

BOOKLET ORDER FORM

SHIP TO:

Member # _____

First Name _____ M.I. ____ Last Name _____

Company _____ Job Title _____

Mailing Address _____

Please specify: Home Work

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

E-Mail _____

BOOKLETS:

QUANTITY	DESCRIPTION	MEMBER OR GOV'T PRICE	NON-MEMBER PRICE	TOTAL
	Procedures to Investigate Waterborne Illness—2nd Edition	$12.00	$24.00	
	Procedures to Investigate Foodborne Illness—5th Edition	12.00	24.00	

SHIPPING AND HANDLING – $3.00 (US) $5.00 (Outside US) Each additional booklet $1.50 Shipping/Handling

Multiple copies available at reduced prices.
Phone our office for pricing information on quantities of 25 or more. Booklets Total

OTHER PUBLICATIONS:

QUANTITY	DESCRIPTION	MEMBER OR GOV'T PRICE	NON-MEMBER PRICE	TOTAL
	**JFP* Memory Stick – September 1966 through December 2000	$295.00	$325.00	
	*International Food Safety Icons and International Food Allergen Icons CD	25.00	25.00	
	Pocket Guide to Dairy Sanitation (minimum order of 10)	.75	1.50	
	Before Disaster Strikes…A Guide to Food Safety in the Home (minimum order of 10)	.75	1.50	
	Before Disaster Strikes…*Spanish language version* – (minimum order of 10)	.75	1.50	
	Food Safety at Temporary Events (minimum order of 10)	.75	1.50	
	Food Safety at Temporary Events – *Spanish language version* – (minimum order of 10)	.75	1.50	
	*Annual Meeting Abstract Book Supplement (year requested _____)	25.00	25.00	
	*IAFP History 1911-2000	25.00	25.00	

SHIPPING AND HANDLING – per 10 – $2.50 (US) $3.50 (Outside US) Shipping/Handling

*Includes shipping and handling Other Publications Total

TOTAL ORDER AMOUNT

Prices effective through August 31, 2009

PAYMENT:

Payment must be enclosed for order to be processed • US FUNDS on US BANK

❑ Check Enclosed ❑ Visa ❑ Mastercard ❑ American Express ❑ Discover

CREDIT CARD # _____

CARD ID #* _____ EXP. DATE _____

SIGNATURE _____

*Visa, Mastercard and Discover: See 3-digit Card ID number on the back of the card after account number.
American Express: See 4-digit, non-embossed number printed above your account number on the face of your card.

International Association for Food Protection.

4 EASY WAYS TO ORDER

PHONE	FAX	MAIL	WEB SITE
800.369.6337; 515.276.3344	515.276.8655	6200 Aurora Ave., Suite 200W Des Moines, IA 50322-2864, USA	www.foodprotection.org

MEMBERSHIP APPLICATION

Prefix (❑ Prof. ❑ Dr. ❑ Mr. ❑ Ms.)

First Name _____ M.I. ____ Last Name _____

Company _____ Job Title _____

Mailing Address _____

Please specify: ❑ Home ❑ Work

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

E-Mail _____

❑ IAFP occasionally provides Members' addresses (excluding phone and E-mail) to vendors supplying products and services for the food safety industry. If you prefer NOT to be included in these lists, please check the box.

MEMBERSHIPS		US	Canada/Mexico	International
❑ **IAFP Membership** (Member dues are based on a 12-month period and includes the *IAFP Report*)		**$ 50.00**	**$ 50.00**	**$ 50.00**
Optional Benefits:				
❑ *Food Protection Trends*	Add	$ 60.00	$ 75.00	$ 90.00
❑ *Journal of Food Protection*	Add	$150.00	$170.00	$200.00
❑ *Journal of Food Protection* Online	Add	$ 36.00	$ 36.00	$ 36.00
❑ All Optional Benefits – ***BEST VALUE!***	Add	$200.00	$235.00	$280.00
❑ **Student Membership** (Full-time student verification required)		**$ 25.00**	**$ 25.00**	**$ 25.00**
Optional Benefits:				
❑ Student Membership with *FPT*	Add	$ 30.00	$ 45.00	$ 60.00
❑ Student Membership with *JFP*	Add	$ 75.00	$ 95.00	$125.00
❑ Student Membership with *JFP* Online	Add	$ 18.00	$ 18.00	$ 18.00
❑ All Optional Benefits – ***BEST VALUE!***	Add	$100.00	$135.00	$180.00

SUSTAINING MEMBERSHIPS

Recognition for your organization and many other benefits.

❑ **GOLD**	$5,000.00
❑ **SILVER**	$2,500.00
❑ **SUSTAINING**	$ 750.00

Contact the IAFP office for more information on the Sustaining Membership Program.

Payment must be enclosed for order to be processed • US FUNDS on US BANK

❑ Check Enclosed ❑ Visa ❑ Mastercard ❑ American Express ❑ Discover **TOTAL MEMBERSHIP PAYMENT $** _____

CREDIT CARD # _____

CARD ID # * _____ EXP. DATE _____

SIGNATURE _____

*Visa, Mastercard and Discover: See 3-digit Card ID number on the back of the card after account number.
American Express: See 4-digit, non-embossed number printed above your account number on the face of your card.

All prices include shipping and handling
Prices effective through August 31, 2009

International Association for Food Protection®

4 EASY WAYS TO JOIN

PHONE	FAX	MAIL	WEB SITE
800.369.6337; 515.276.3344	515.276.8655	6200 Aurora Ave., Suite 200W Des Moines, IA 50322-2864, USA	www.foodprotection.org

International Association for Food Protection®

Advancements in Food Safety

Lisbon, Portugal
19-21 November 2008

Government, academia, and industry speakers from Europe and beyond will present their experiences and views during eight critical sessions specific to food safety issues in European countries.

Register Online at www.foodprotection.org

In collaboration with ILSI Europe, the Society for Applied Microbiology and the World Health Organization. With the technical cooperation of the Food and Agricultural Organization of the United Nations.

IAFP's Fourth Lisbon, Portugal † 19-21 November 2008

EUROPEAN Symposium on Food Safety

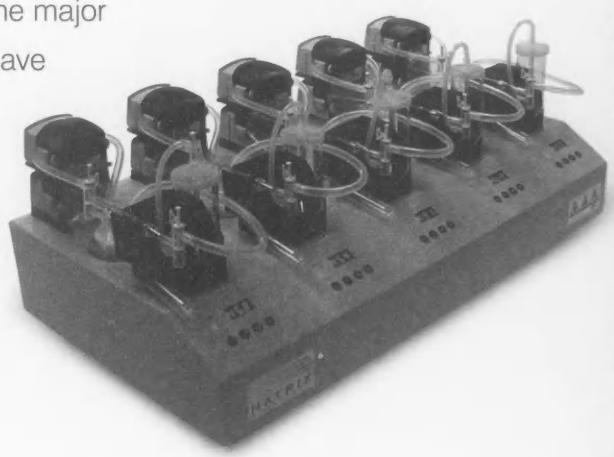
CURRENT PCR USER?
OR WANT TO BE A PCR USER?
YOU CAN SAVE 60% OF COSTS IMMEDIATELY!

If you're an existing user of PCR or want to be, but just cannot afford it, Matrix has developed the perfect solution for you. The PATHATRIX-***ULTRA*** system is widely used and approved by multi-national companies.

Using the **AOAC approved** Pooling Strategy that Matrix has developed you can save up to **60% of your PCR testing** costs without compromising sensitivity at all!

In fact many customers have reported the **elimination of "false positives"** and **increased** specificity and sensitivity.

We have customers using a wide variety of PCR systems from all of the major manufacturers and have successfully delivered the benefits of PATHATRIX Pooling to all of them.



MATRIX
MICROSCIENCE

If you want to know more...
Contact us at:

sales@matrixmsci.com
US Tel: 303 277 9613
UK Tel: +44 1638 723110
www.matrixmsci.com