BBL™ CHROMagar™ Salmonella
Improving Your Laboratory Efficiencies

Uncomplicated.

"... it is feasible to use only BBL CHROMagar Salmonella plate when inoculated from each selective enrichment versus using multiple plated media formulations such as Brilliant Green Sulfa Agar and Double Modified Lysine Agar." ¹

Read the full study on BBL CHROMagar Salmonella at www.bd.com/ds.

While attending the IAFP 2007 94th Annual Meeting, stop by BD Booths 819 & 821.

¹ IAFP 2006, Calgary, Alberta, Canada. Technical Symposium: Detection of Salmonella in Chicken Carcass Rinses Using a Chromogenic Agar Plating Medium. Julian Cox, The University of New South Wales, Sydney, Australia & Stan Bailey, ARS-USDA, Athens, GA.

CHROMagar is a trademark of Dr. A. Rambach; BD, BD Logo and BBL are trademarks of Becton, Dickinson and Company. ©2007 BD.
Advancements in Food Safety

Third European Symposium on Food Safety

International Association for Food Protection

In collaboration with ILSI Europe and the World Health Organization

Presents

the

Third European Symposium on Food Safety

18–19 October 2007
Rome, Italy

Including Exhibits and Technical Posters!

For more information visit our Web site at www.foodprotection.org

6200 Aurora Avenue, Suite 200W • Des Moines, IA 50322-2864, USA
800.369.6337 • 515.276.3344 • Fax 515.276.8655
E-mail: info@foodprotection.org • www.foodprotection.org
ARTICLES

524 Central Nervous System Tissue Contamination of the Circulatory System Following Humane Cattle Stunning Procedures
Pablo J. Rovira, John A. Scanga, Temple Grandin, Kim L. Hassner, Robert S. Yemm, Keith E. Belk, J. Daryl Tatum, John N. Sofos, and Gary C. Smith

530 Consumer Storage Practices for Refrigerated Ready-to-Eat Foods: Results of a Web-enabled Survey
Sheryl C. Cates, Katherine M. Kosa, Shawn A. Karns, Sandria Godwin, and Delores Chambers

544 Critical Control Points for Home Prepared ‘Chicken and Salad’ in Puerto Rican Households
Jigna Morarji Dharod, Rafael Pérez-Escamilla, Stefania Paciello, Kumar Venkitanarayanan, Angela Bermúdez-Millán, and Grace Damio

576 Thoughts on Today’s Food Safety...What’s Your Score, Mate?
Douglas Powell

ASSOCIATION NEWS

517 Sustaining Members
520 Point of View from Your President
522 Commentary from the Executive Director
554 New Members

DEPARTMENTS

557 Updates
559 News
563 Industry Products
567 Coming Events
568 Advertising Index
570 Career Services

EXTRAS

571 Journal of Food Protection Table of Contents
573 Audiovisual Library Order Form
574 Booklet Order Form
575 Membership Application
ARTICLES

524 Central Nervous System Tissue Contamination of the Circulatory System Following Humane Cattle Stunning Procedures

530 Consumer Storage Practices for Refrigerated Ready-to-Eat Foods: Results of a Web-enabled Survey
Sheryl C. Cates, Katherine M. Kosa, Shawn A. Karns, Sandria Godwin, and Delores Chambers

544 Critical Control Points for Home Prepared ‘Chicken and Salad’ in Puerto Rican Households
Jigna Morarji Dharod, Rafael Pérez-Escamilla, Stefania Paciello, Kumar Venkitanarayanan, Angela Bermúdez-Millán, and Grace Damio

576 Thoughts on Today’s Food Safety...What’s Your Score, Mate?
Douglas Powell

ASSOCIATION NEWS

Sustaining Members
Point of View from Your President
Commentary from the Executive Director
New Members

DEPARTMENTS

Updates
News
Industry Products
Coming Events
Advertising Index
Career Services

EXTRAS

Journal of Food Protection Table of Contents
Audiovisual Library Order Form
Booklet Order Form
Membership Application

The publishers do not warrant, either expressly or by implication, the factual accuracy of the articles or descriptions herein, nor do they warrant any views offered by the authors of the articles and descriptions.
control your pathogen detection without compromise

Assurance GDS™ combines the latest innovations in microbiology and molecular science to bring you the most advanced DNA-based pathogen detection system. It offers unprecedented speed without sacrificing accuracy or convenience. In fact, multiple levels of specificity, including highly specific primers, probes and a patent pending sample concentration step, ensure unparalleled accuracy with fewer indeterminates or the need to interpret melt curves.

Learn how Assurance GDS can turn your testing challenges into solutions. Visit www.biocontrolsys.com or contact us at 1.800.245.0113 for more information.

Now available for Listeria spp., Listeria monocytogenes, Salmonella, E. coli O157:H7, and Shiga Toxin genes.
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**

**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 Clotridium 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.

**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.

**Tenderlin L**
Tenderlin 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.
The mission of the Association is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply.
<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diran Aja</td>
<td>Minneapolis, MN</td>
</tr>
<tr>
<td>Julie A. Albrecht</td>
<td>Lincoln, NE</td>
</tr>
<tr>
<td>Kristina Barlow</td>
<td>Washington, D.C.</td>
</tr>
<tr>
<td>Tom G. Boufford</td>
<td>Eagan, MN</td>
</tr>
<tr>
<td>Christine Bruhn</td>
<td>Davis, CA</td>
</tr>
<tr>
<td>Lloyd B. Bullerman</td>
<td>Lincoln, NE</td>
</tr>
<tr>
<td>Warren S. Clark, Jr.</td>
<td>Bloomington, IL</td>
</tr>
<tr>
<td>Margaret Cole</td>
<td>Rustenburg, MD</td>
</tr>
<tr>
<td>William W. Coleman, II</td>
<td>St. Paul, MN</td>
</tr>
<tr>
<td>Pete Cook</td>
<td>Mt. Airy, MD</td>
</tr>
<tr>
<td>Julian M. Cox</td>
<td>Sydney, NSW, Australia</td>
</tr>
<tr>
<td>Carl S. Custer</td>
<td>Bethesda, MD</td>
</tr>
<tr>
<td>Catherine N. Cutter</td>
<td>University Park, PA</td>
</tr>
<tr>
<td>James S. Dickson</td>
<td>Ames, IA</td>
</tr>
<tr>
<td>Francisco Diez-Gonzalez</td>
<td>St. Paul, MN</td>
</tr>
<tr>
<td>Joseph D. Eifert</td>
<td>Blacksburg, VA</td>
</tr>
<tr>
<td>Phyllis Entis</td>
<td>Stowe, VT</td>
</tr>
<tr>
<td>David Gombas</td>
<td>Washington, D.C.</td>
</tr>
<tr>
<td>Robert B. Gravani</td>
<td>Ithaca, NY</td>
</tr>
<tr>
<td>John Holah</td>
<td>Gloucestershire, U.K.</td>
</tr>
<tr>
<td>Scott Hood</td>
<td>Shoreview, MN</td>
</tr>
<tr>
<td>Charles Hurburgh</td>
<td>Ames, IA</td>
</tr>
<tr>
<td>Susan Klein</td>
<td>Des Moines, IA</td>
</tr>
<tr>
<td>Denise Lindsay</td>
<td>Pretoria, South Africa</td>
</tr>
<tr>
<td>Douglas L. Marshall</td>
<td>Mississippi State, MS</td>
</tr>
<tr>
<td>Susan K. McKnight</td>
<td>Northbrook, IL</td>
</tr>
<tr>
<td>Lynne McLandsbourough</td>
<td>Amherst, MA</td>
</tr>
<tr>
<td>Steven C. Murphy</td>
<td>Ithaca, NY</td>
</tr>
<tr>
<td>Ranzell Nickelson, III</td>
<td>Saginaw, TX</td>
</tr>
<tr>
<td>Charles S. Otto, III</td>
<td>Atlanta, GA</td>
</tr>
<tr>
<td>Omar Oyarzabal</td>
<td>Auburn, AL</td>
</tr>
<tr>
<td>Fred Parrish</td>
<td>Ames, IA</td>
</tr>
<tr>
<td>Ruth L. Petran</td>
<td>Eagan, MN</td>
</tr>
<tr>
<td>Michael M. Pullen</td>
<td>White Bear Lake, MN</td>
</tr>
<tr>
<td>Kelly A. Reynolds</td>
<td>Tucson, AZ</td>
</tr>
<tr>
<td>Sarah J. Risch</td>
<td>East Lansing, MI</td>
</tr>
<tr>
<td>Robert L. Sanders</td>
<td>Pensacola, FL</td>
</tr>
<tr>
<td>Kyle Sasahara</td>
<td>Elmhurst, NY</td>
</tr>
<tr>
<td>Ronald H. Schmidt</td>
<td>Gainesville, FL</td>
</tr>
<tr>
<td>Joe Sebranek</td>
<td>Ames, IA</td>
</tr>
<tr>
<td>O. Peter Snyder</td>
<td>St. Paul, MN</td>
</tr>
<tr>
<td>John N. Sofos</td>
<td>Ft. Collins, CO</td>
</tr>
<tr>
<td>Katherine Swanson</td>
<td>St. Paul, MN</td>
</tr>
<tr>
<td>Leo Timms</td>
<td>Ames, IA</td>
</tr>
</tbody>
</table>
SUSTAINING MEMBERSHIP

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
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**

- **BCN Research Laboratories, Inc.**
  - Knoxville, TN
  - 800.236.0505

- **BD Diagnostics**
  - Sparks, MD
  - 410.316.4467

- **bioMérieux, Inc.**
  - Hazelwood, MO
  - 800.638.4835

- **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

- **Microbial-Vac Systems, Inc.**
  - Jerome, ID
  - 208.324.7522

- **PepsiCo**
  - Chicago, IL
  - 312.821.3030

- **Silliker Inc.**
  - Homewood, IL
  - 708.957.7878

- **Universal Sanitizers & Supplies, Inc.**
  - Knoxville, TN
  - 865.584.1936

(Continued on next page)
SUSTAINING MEMBERS

SILVER (Continued)

BSI Management Systems
Reston, VA; 800.862.4977

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

Microbac Laboratories, Inc.
Wexford, PA; 724.934.5078

Orkin Commercial Services
Atlanta, GA; 404.888.2241

Quality Flow Inc.
Northbrook, IL; 847.291.7674

Warnex Diagnostics Inc.
Laval, Quebec, Canada; 450.663.6724

Weber Scientific
Hamilton, NJ; 609.584.7677

SUSTAINING

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

3M Microbiology Products,
St. Paul, MN; 612.733.9558

ABC Research Corporation,
Gainesville, FL; 352.372.0436

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

Bio-Rad Laboratories, Hercules,
CA; 510.741.5653

Biotrace International, Inc.,
Bothell, WA; 425.398.7993

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

ELISA Technologies, Inc., Gainesville,
FL; 352.337.3929

EMD Chemicals Inc., Gibbstown,
NJ; 856.423.6300

Fisher Scientific, Pittsburgh, PA;
412.490.4488

518 FOOD PROTECTION TRENDS | JULY 2007
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

FOSS North America, Inc., Eden Prairie, MN; 800.547.6275


GOJO Industries, Akron, OH; 330.255.6286

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

Hygiena, Camarillo, CA; 805.388.8007

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


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

It's Clean USA, Inc., Chicago, IL; 312.994.2547

Jimmy Buffett's Margaritaville, Orlando, FL; 407.224.3216

Kellogg Company, Battle Creek, MI; 269.961.6235

The Kroger Co., Cincinnati, OH; 513.762.4209

Maxxam Analytics Inc., Mississauga, Ontario, Canada; 905.817.5700

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

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

Penn State University, University Park, PA; 814.865.7535

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

Q Laboratories, Inc., Cincinnati, OH; 513.471.1300

Randolph Associates, Birmingham, AL; 205.595.6455

REMEL, Inc., Lenexa, KS; 800.255.6730

Ross Products, Columbus, OH; 614.624.7040

rtech laboratories, St. Paul, MN; 800.328.9687

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, Davis, CA; 530.756.8900

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

Zep Manufacturing Company, Atlanta, GA; 404.352.1680
The wise prophet who wrote, "To everything there is a season, and a time to every purpose under the heaven," certainly knew what he was talking about. Well, my fellow colleagues and friends, it is with this thought in mind that I inform you that my season as president of IAFP officially comes to an end.

There are no words to adequately express my gratitude for the great honor that you have bestowed upon me. I am humbled to have served you as IAFP's 92nd president and to have my name added to those who have served the association before me in this manner.

During this past year, I have observed firsthand that the greatness of IAFP is much bigger than any one person. Presidents and executive boards come and go, but the ideals that IAFP represents endure over time. It is our rich heritage and the collective efforts of all of our members and staff that truly make IAFP the wonderful association it is.

With this transition, the business of IAFP will continue. However, before we look to the future, I think it is fitting that we spend a moment reviewing a few of our association’s accomplishments during the past year.

Rapid Response Symposium – in October of 2006, IAFP held its first ever Rapid Response Symposium entitled, “Fresh Leafy Greens, Are They Safe Enough?” The symposium was developed in response to the fresh bagged spinach outbreak in the US. Our goal was to bring key leaders and stakeholders together to have a science-based discussion on what happened, lessons learned, and what can be done to prevent similar occurrences in the future. By all accounts, our first Rapid Response Symposium was a great success. The meeting held in Arlington, Virginia only three short weeks after the outbreak was announced, was attended by 119 professionals representing academia, industry, and regulatory. The comments we received were overwhelmingly positive and we remain prepared to hold another Rapid Response Symposium should the need arise.

European Symposium – on November 30 and December 1, 2006, IAFP held its 2nd European Symposium, entitled “Innovations in Food Safety Management,” in Barcelona, Spain. In attendance were over 140 professionals representing academia, industry, and regulatory. This represented a 100% increase in attendance as compared to our 1st European meeting held in Prague, Czech Republic in 2005. While most of the attendees came from various countries within the European Union, some came from as far away as New Zealand and Brazil. Based on our success, plans are already underway for IAFP's 3rd European Symposium to be held in Rome, Italy later this year.

Record-setting Annual Meeting – IAFP’s 2007 Annual Meeting, held at DISNEY’S CONTEMPORARY Resort on July 8–11, turned out to be a smashing success. We had a record number of attendees, exhibitors, and sponsors gather to hear the latest scientific findings, network with leading experts from around the world, and hear first-hand about tomorrow’s food safety solutions. Special thanks to Lee-Ann Jaykus, Program Committee Chairperson, and the entire Committee for organizing an outstanding lineup of symposia, roundtables, technical presentations, and poster sessions. I also would like to thank the Florida Association for Food Protection, and its Local Arrangements Committee, for hosting the 2007 Annual Meeting and for all their hard work in making IAFP 2007 a memorable experience for all attendees.
Membership Dues Restructure — in January, IAFP introduced a restructuring of our annual membership dues and membership categories to offer new and existing members more choice. We also introduced a new, less expensive base membership category that includes an electronic monthly publication called the IAFP Report. Our goal is simple. We are not interested in numbers or simply increasing our membership. However, we are interested in offering our members more choice, meeting our members’ needs, and making IAFP as inclusive as possible to food safety professionals all over the world. Early indications are that the new dues restructuring is making a difference. For the first few months, our membership renewal rates were at a record high level as well as our overall membership.

International Focus — having an international focus has always been part of our heritage. In fact, our very first members’ list of 1912 included members from the USA, Canada, and Australia. This past year, in addition to already well-established international programs, such as the distribution of our journals to 69 different countries around the world and our annual meeting that truly has international attendance, we placed even greater emphasis on our international focus. The Executive Board developed and approved guiding principles for holding international meetings. Our plans are to hold international meetings on a more frequent basis, wherever and whenever they make sense, to allow for even greater regional participation. In addition to our plans for a 3rd European Symposium later this year, IAFP will be part of a fall meeting in Beijing, China and we are planning to hold a meeting in South America next year. More importantly, in everything we do, we have adopted a global mindset in hopes of maximizing our worldwide reach.

Publications — in addition to the continued strong showing of the Journal of Food Protection (which now has a readership exceeding 11,000 scientists in 69 countries) and Food Protection Trends, with the help of Jack Guzewich and Ewen Todd, this year we released the 2007 Revision of Procedures to Investigate Foodborne Illness, Fifth Edition, to include consideration of intentional contamination issues.

Financial Condition — and last, but not least, due to wise stewardship, the financial condition of our Association has never been stronger. Although we are still working towards achieving our long-term financial goals, we now have a positive fund balance and with the continued support from our sponsors and members, we are in a better position to more broadly fulfill our mission.

As you can see, it has been a very busy and productive year for IAFP. And although I am very pleased with what we were able to accomplish, I remain even more excited about what we have yet to do. Under the leadership of Gary Acuff as the Incoming President, a wonderful Executive Board, an outstanding Executive Director (David Tharp), a professional and dedicated office staff, and most importantly— you— our members, our future looks very bright. Never before in history have we, as a profession, been so well suited to advance food safety through innovation, leadership, research, and collaboration.

In closing, I will leave you with the wise words of Margaret Mead, who said, “Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it is the only thing that ever has.”

Working together my colleagues and friends, we are making a difference and...

Advancing Food Safety Worldwide (English);
Promoviendo la seguridad alimentaria a nivel mundial (Spanish);
Faire progresser la sécurité alimentaire dans le monde entier (French);
Promovendo a inocuidade dos alimentos mundo a fora (Portuguese);
Προώθηση της ασφαλείας των ορεκτικών προϊόντων από τον κόσμο (Greek);
食の安全を世界規模で推進する (Japanese);
促進全球食品安全 (Chinese)

Until our paths cross again.
(frank.yiannas@disney.com)
As you might imagine, it has been a busy time for the Board and staff of IAFP. Over the last couple of months, we completed the final stages of planning for the Association’s 94th Annual Meeting held this month at Disney’s Contemporary Resort along with establishing details for the Third European Symposium on Food Safety titled “Advancements in Food Safety.” These plans take place as other “business” of IAFP continues, such as producing two monthly journals and our new Online newsletter, the IAFP Report.

First, let’s talk about the Annual Meeting. There are so many details that need to be planned and confirmed for a meeting like IAFP 2007 that it is sometimes overwhelming. I want to first and foremost commend the IAFP staff for their attention to detail in the planning process. We meet weekly, all year-round, to plan for IAFP’s showcase conference. During each of these meetings, we review the timeline of items that must be completed in order for our Annual Meeting to take place. I am proud of our staff and the enthusiasm in which they approach these tasks at hand.

As the months tick by and the meeting dates come closer, our list grows longer as to what needs to be done. For instance, for each of the meeting rooms we use during the Annual Meeting, specific hours must be provided to the hotel along with what audiovisual equipment is needed and if food or beverage will be provided. We work closely with the hotel to assure they know what our needs are for each room and event.

Communication with presenters, convenors and organizers is ongoing up to the actual start of the Annual Meeting. Scheduling begins months in advance to make our best attempt at placing sessions in the appropriate-sized rooms. With the assistance of the Program Committee, sessions are positioned, speakers are cross-checked and schedules are firmed up for the best program possible. We also need to be assured that we have student volunteers to assist with audiovisual and other issues that may arise in the session rooms. This schedule is coordinated by the Student PDG leaders each year.

When it comes to the social events, we need to be sure we have enough volunteers to assist with moving attendees from the hotel, to busses, to the event site, and back to the hotel. This year, the Florida Association for Food Protection (FAFP) provided the volunteer staff to help at registration, with social events and other essential functions to make IAFP 2007 run smoothly. The hospitality provided by FAFP members was an integral part of IAFP 2007. Thanks to all who helped out!

The exhibit portion of IAFP Annual Meetings has also become a large part of why food safety professionals attend our Annual Meeting. With the opportunity to learn of the latest products and services available to the industry, the IAFP Exhibit Hall attracts leading companies, educational institutions and governmental agencies from around the globe. We are fortunate to have a large number of supporters who are with us year after year providing their products and services for your review. This year, we even recognized five 20-year exhibitors. We truly appreciate the support and participation provided by our exhibitors.

As Frank Yiannas reported in his “Point of View” President’s column, we set new records of attendance for an IAFP Annual Meeting this year. We are still counting for a final number to report, but we are assured it has reached to new heights this year! We are proud to be the leading food safety conference and are elated to have your continued support!

In all the excitement about IAFP 2007, I want to be sure you do not overlook the Third European Symposium on Food
Safety titled “Advancements in Food Safety.” This stimulating symposium will be held October 18–19 in Rome, Italy at the Sheraton Roma Hotel and Conference Center. We distributed registration information in program materials at IAFP 2007. If you were unable to be with us in Florida, we will mail a conference brochure to all IAFP Members or you may review the details on our Web site.

This year’s European Symposium promises to be a great gathering of food safety professionals from Europe and beyond. Presentations will be delivered by speakers from Italy, Germany, France, United Kingdom, Canada, Ireland, United States and Switzerland. This symposium is developing into a “must attend” for not only European Members and food safety professionals, but many of our IAFP Members from around the globe.

We look forward to further developing the European Symposium on Food Safety in the coming years and hope to see you in Rome this October!

I want to conclude with a “thank you” to the organizing committee who helped to form the program for our European Symposium. In addition, back to IAFP 2007, I want to thank all of our speakers, organizers, convenors, exhibitors, sponsors and volunteers. Without help from everyone, we would not be able to produce these high-quality, educational presentations and symposia.

---

ConAgra Foods Supports the I AFP Foundation!!!

Thank you to ConAgra Foods for a most generous contribution to the IAFP Foundation. Through this support the Foundation will be able to expand its current programs and develop new services in pursuit of Advancing Food Safety Worldwide.

ConAgra Foods

$150,000!
Central Nervous System Tissue Contamination of the Circulatory System Following Humane Cattle Stunning Procedures

PABLO J. ROVIRA, JOHN A. SCANGA, TEMPLE GRANDIN, KIM L. HOSSNER, ROBERT S. YEMM, KEITH E. BELK, J. DARYL TATUM, JOHN N. SOFOS, and GARY C. SMITH

SUMMARY

Two studies were conducted to assess the risk of central nervous system (CNS) material dissemination to edible tissues via blood circulation, following stunning of cattle with non-air injecting penetrating captive bolt (PCB) devices. In one study, an electric shock was applied with a heart defibrillator (HD), after rendering cattle insensible by use of a cartridge-fired PCB gun, to stop heart activity and subsequently blood circulation. In a second study, baseline levels of CNS tissue-marker Glial Fibrillary Acidic Protein (GFAP) were established in blood from cattle following pneumatic-PCB stunning and Kosher slaughter (without stunning) in twelve and one commercial beef packing plants, respectively. Electric shock after stunning produced heart fibrillation, which reduced heart rate and therefore blood circulation between stunning and sticking. The marker GFAP was not detected in the blood of cattle before or after stunning with or without HD. GFAP was detected in the blood of 1 (0.28%) and 0 carcasses out of 360 (pneumatic-PCB) and 30 (Kosher) carcasses, respectively. Post-stunning mitigation practices to reduce the likelihood of CNS tissue dissemination in blood would not be necessary, as the risk of CNS tissue being present is low when non-air injecting PCB stunning protocols are employed.


FIGURE 1. Experimental blood sampling protocol (WB: Whole Blood; BC: Buffy Coat)

<table>
<thead>
<tr>
<th>Live</th>
<th>Stun (0s)</th>
<th>90s</th>
<th>180s</th>
<th>270s</th>
<th>360s</th>
<th>Exsanguination</th>
</tr>
</thead>
<tbody>
<tr>
<td>4ml</td>
<td>4ml</td>
<td>4ml</td>
<td>4ml</td>
<td>4ml</td>
<td>4ml</td>
<td>2ml</td>
</tr>
<tr>
<td>2ml</td>
<td>2ml</td>
<td>2ml</td>
<td>2ml</td>
<td>2ml</td>
<td>2ml</td>
<td>2ml</td>
</tr>
</tbody>
</table>

WB | BC | WB | BC | WB | BC | WB | BC | WB | BC |

INTRODUCTION

Contamination of edible carcass portions with infectious Bovine Spongiform Encephalopathy (BSE) prions (PrP<sup>Sc</sup>) is suspected to increase the risk of human infection with new variant Creutzfeldt-Jakob disease (vCJD) (11). Although the removal of Specified Risk Materials (SRMs) such as brain and spinal cord, which have been shown to transmit BSE, serves as the single most important food safety intervention to prevent CNS dissemination, there are other possible sources of infectious prions that may reach the human food supply. Brown et al. (3) affirmed that cerebral vascular emboli, created by cranial stunning instruments to immobilize cattle before killing by exsanguination, could result in PrP<sup>Sc</sup> dissemination. These stunning methods may cause clots in blood vessels, that if they remain fixed, are known as thrombi; however, if the clot becomes dislodged and floats freely in the bloodstream, it is known as an embolus (2).

Most cattle within the United States (US) are stunned with pneumatic non-air injection penetrating captive bolt (PCB) devices before exsanguination, and these devices may damage intracranial blood vessels and dislodge central nervous system (CNS) tissue (1). It has been reported that air-injection penetrating captive bolt stunning devices result in CNS tissue entering the blood (1), passing through the right side of the heart (17), and lodging in the lungs (7), potentially entering the arterial circulation (4) even though dissemination throughout the carcass has not been reported. For that reason, the USDA-Food Safety and Inspection Service (FSIS) prohibited the use of penetrating captive bolt (PCB) devices that deliberately inject air into the cranial cavity of cattle (19). Nonetheless, there is international concern about the continual use of non-air injection PCB stunning of cattle based on the evidence that such devices also can result in CNS tissue dissemination in the blood (5).

A reliable analytical test for CNS tissue is essential to ensure consumer confidence of beef and reduce consumer fears of BSE in meat products (17). One of the ways to detect and measure presence and concentration of CNS materials following stunning is by quantifying markers for CNS tissue in the blood of animals. Schmidt et al. (18) developed a simple, sensitive, and specific assay for the detection of CNS tissue in blood and meat products with a Fluorescent-ELISA test based upon the immunological detection of Glial Fibrillary Acidic Protein (GFAP). Glial Fibrillary Acidic Protein is an antigen that is highly, but not completely, restricted to astrocytes in the CNS (18). It thus provides an excellent marker for the presence of CNS tissue in blood and meat products. The objectives of this study were: (1) to determine the necessity for BSE risk mitigation practices associated with stunning or immobilization of slaughter cattle by quantifying the concentration of GFAP in blood from living animals and from animals exsanguinated following non-air injection stunning before exsanguination or from animal slaughter using ritual practices (Kosher), and (2) to evaluate heart fibrillation as a potential post-PCB stunning intervention to prevent CNS dissemination.

MATERIALS AND METHODS

Evaluation of heart fibrillation as an intervention to prevent CNS dissemination

Intravenous catheters were inserted into the jugular veins of 10 market-ready heifers (average weight 505 kg) at the Colorado State University Agricultural Research Development and Educational Center (ARDEC, Fort Collins, CO) (ACUC Protocol Number 05-049A-01). Following a 48-hour withdrawal period for Lidocaine, two defibrillator and three electrocardiogram (ECG) pads were firmly affixed to each heifer externally on the brisket and thoracic wall (2 on the left side and 1 on the right side), respectively. Cattle were then transported and harvested at the Colorado State University Meats Laboratory. Cattle were stunned using a cartridge-fired, non-air injection, penetrating captive bolt (PCB) stunning device (Schermer Model ME) and all were rendered insensible following a single shot. Animals were considered insensible when the head was completely limp, the tongue was fully extended, and the eyes had a blank stare (9). Five of the cattle were immediately shackled, hoisted, and exsanguinated (Treatment 1). The remaining five cattle were shackled and hoisted, after which an electrical shock generated by a commercial hands-free heart defibrillator (Hewlett Packard Code Master XL+) charged to 360 Joules was administered (HD) (Treatment 2). Electrocardiograms of animals were recorded pre- and post-stunning by use of three-wire electrodes. The electrodes were firmly applied such that two electrodes were on the left thoracic wall (black and red leads) and one was positioned on the right thoracic wall (white lead). Amperage (amount of electrical current that reaches the heart) and Impedance (body resistance to the flow of electrical current) were recorded by the defibrillator for each shock. Voltage, which is required to push the electrical current from the defibrillator to the animal, and duration of the shock were calculated based on the following equations:

\[ \text{Voltage} = \text{Amperage} \times \text{Impedance} \]

\[ \text{Duration of the shock} = \frac{\text{Energy}}{\text{Amperage} \times \text{Impedance}} \]

\[ \text{Joules} = \text{Amps} \times \text{Volts} \]

JULY 2007 | FOOD PROTECTION TRENDS 525
Six blood samples were collected from the jugular catheters of each animal \((n = 60)\) to determine if CNS tissue was present in circulatory blood following stunning with and without heart defibrillation. The blood sampling protocol is summarized in Fig. 1. The first blood sample was collected before PCB stunning, and five samples were collected immediately following stunning, at approximately 90-second intervals, during the 6 minutes following stunning. In one instance, all samples were collected during exsanguination because the jugular cannula was damaged during handling and stunning.

At each sampling interval, 4 ml of blood were collected and divided into 2 Vacutainer™ tubes, one containing \(K,\text{EDTA}\) anticoagulant and the other containing Sodium Heparin anticoagulant. Samples were immediately refrigerated at 2°C. Heparinized tubes were centrifuged at 800 \(x\) g for 30 minutes at 4°C to separate the sample into serum, white blood cells (buffy coat) and red blood cell fractions. Buffy coat (cellular fraction) was removed using Pasteur pipettes and transferred to 5 ml capped tubes (BD Falcon). These fractions were collected and analyzed in order to increase the sensitivity of the test, as cells of the CNS will tend to pellet together with the same density of cells in the Buffy coat fraction. Both Buffy coat \((n = 60)\) and whole blood \((n = 60)\) samples were kept refrigerated and transported the following day, in an insulated box with ice packs, to Warren Analytical Laboratories Inc. (Greeley, Colorado) for F-GFAP analysis.

A capture Fluorescent – Enzyme Linked Immunosorbent Assay for Glial Fibrillary Acidic Protein (F-ELISA GFAP) was used to detect CNS tissue contamination in whole blood and Buffy coat. The protocol followed was previously described in detail by Schmidt et al. (18). A standard curve was developed by use of serially diluted commercial Bovine GFAP. Standard curves were utilized to quantify the concentration of GFAP in whole blood and Buffy coat samples. An aliquot of each blood sample, before (whole blood) and after (buffy coat) centrifugation, were analyzed at Warren Analytical Laboratories (Greeley, CO) to detect presence of CNS tissue. Two antibodies were used to detect the presence of GFAP (antigen). The first (polyclonal anti-GFAP) was used to coat the wells and to capture GFAP. The second (monoclonal anti-GFAP) was coupled to a peroxidase enzyme to detect GFAP. Finally, the reaction was detected by the addition of a peroxidase substrate that produced fluorescence upon reaction with the enzyme. The detection limit for this assay was 0.3 ng/well or 0.006 ng/mg for whole blood and Buffy coat, as each well contained 50 microliters (ul) of sample. A result of < 0.006 ng/mg denoted a non-detectable level of GFAP in whole blood or Buffy coat. Inter and intra-assay coefficients of variation were 3.9% (five different assay dates) and 3.3% (12 wells in one assay date), respectively, indicating that this test is repeatable both within and across sample tests.

**Commercial survey of GFAP in circulating blood of cattle stunned in the United States**

Between July and October 2005, blood samples \((N = 390)\) from random cattle in thirteen commercial beef processing facilities were collected as soon as possible following exsanguination. Twelve of the plants utilized a pneumatic non-air injection PCB device. The remaining plant employed ritual (Kosher) slaughter techniques, immediately followed by pneumatic non-air injection PCB stunning. When possible, cattle that required more than one shot to be rendered unconscious were omitted from the study. However, in two plants, blood samples were collected in a location from which the stunning restrainer was not visible, and we were not assured that samples from these facilities were from single-shot stunned cattle. Blood was aseptically collected in large disposable cups (150 ml) and then transferred to two Vacutainer™ tubes, one containing \(K,\text{EDTA}\) (10 ml) and the other containing Sodium Heparin (10 ml) anticoagulant. This resulted in blood samples being collected from 360 pneumatic-PCB stunned cattle and 30 Kosher slaughtered cattle (Fig. 2).

After collection, all samples were refrigerated, placed in coolers with ice packs, and shipped to Warren Analytical Laboratories, Inc. (Greeley, CO) for F-GFAP analysis. After arriving at the Laboratory, heparinized tubes were immediately centrifuged at 800 \(x\) g for 30 minutes at 4°C and the Buffy coat fraction was collected for analysis. Whole blood and Buffy coat samples were analyzed by use of the same F-GFAP ELISA test previously described, again with a detection limit of 0.006 ng/mg.

**Statistical analysis**

Independent two-sample Student’s \(t\)-test was used for comparisons of heart rates between treatments, as samples had been collected independently of one another. For each treatment, a paired Student’s \(t\)-test was performed to determine the significance of difference in heart rate before and after each stunning protocol, as measurements had been taken from the same animal (correlated samples). The prevalence of GFAP was analyzed statis-
cally considering a binomial distribution (GFAP detected or not detected in blood circulation). The two blood fractions, whole blood and buffy coat, were analyzed independently. A 95% one-side upper exact binomial confidence limit for GFAP presence was established.

RESULTS AND DISCUSSION
Evaluation of heart fibrillation as an intervention to prevent CNS dissemination

Results of the ELISA test showed that GFAP was not detectable (< 0.006 ng/mg) in whole blood and buffy coat samples collected before and after PCB stunning with or without HD. Absence of detectable levels of GFAP in the whole blood and buffy coat of animals before stunning confirms that GFAP is a protein highly restricted to the CNS (spinal cord and brain) and not found in the normal blood circulation of live animals. For that reason, GFAP is an appropriate protein marker for CNS tissue dissemination/presence in blood. Tests based on protein markers generally are more sensitive than gross tissue examination or microscopic analysis, because stunning may cause leakage of neural tissue across the blood-brain barrier without actual embolization of intact tissue fragments (14).

Electrocardiogram recordings were successfully obtained from 9 of 10 animals before stunning. Mean heart rate of cattle before stunning was 126 (SD = 32) beats per minute (bpm), ranging between 89 and 188 bpm. Gay and Radostits (8) reported that the mean heart rate for adult cattle ranges between 60 and 80 bpm and that it is not uncommon for resting heart rate to be accelerated because of acute stress or unfamiliar surroundings. Electric shock delivered using the heart defibrillator charged to 360 Joules following insensibility, created by PCB stunning, delivered an average of 32 Amps (SD = 4) and 3,833 Volts (SD = 219) for 3 milliseconds (SD = 0.2). Animal resistance to the flow of current (Impedance) was 120 ohms (SD = 23). Heart defibrillation (HD) did not permanently render the heart electrically silent (Fig. 3a), yet it resulted in a short electrically silent period (0.48 s) with average heart rate following HD returning to 23 bpm (SD = 8), ranging from 16 to 35 bpm (Fig. 3b), which was lower than the heart rate before PCB stunning (P < 0.05). Even though the heart was still beating, cattle were completely insensible because of the PCB stunning applied before HD. Conversely, after PCB stunning without HD (Fig. 3b), animals showed a chaotic heart rhythm (as shown immediately following PCB and HD in Fig. 3a) followed by a tendency to recover and return to a normal heart rate and rhythm. Immediately following PCB stunning, the mean heart rate was 165 bpm (SD = 23); this was higher than the heart rate before PCB stunning (P < 0.05), although the heart rate from 2 animals was not recorded because of a very abnormal ECG output. Heart rate immediately following HD was lower than heart rate following PCB stunning without HD (P < 0.05). Heart rate of one animal measured three minutes after PCB stunning showed a normal heart activity with 85 bpm (Fig. 4), which reflected normal resting heart rate.

Wotton et al. (20) successfully induced ventricular fibrillation and cardiac arrest in adult cattle when >1.51 A sinusoidal AC at 50 Hz was applied for five seconds between the nose and brisket electrodes. According to the description of the defibrillation shock in our study (32 Amps and 3,833 Volts for 3 milliseconds), the limiting factor that did not allow electrical stoppage of the heart with only one discharge was the short duration of the shock. Increasing the duration of the shock will decrease the animal impedance; therefore, more electrical current will reach the heart, increasing the efficiency of the electric discharge. Although heart fibrillation following PCB stunning did not result in permanent electrical silence, heart rate was reduced and heart rhythm was altered, potentially reducing the blood circulation between stunning and sticking (although blood volume flow was not measured). When there is such incoordinate twitching of the heart, the diastolic period is so short that filling of the ventricles is limited, the blood pressure falls precipitously, and the animal dies within a minute or two of onset as the result of failure of blood perfusion into tissues (15). Conversely, heart rate tended to be normal after PCB stunning without heart fibrillation. Thus, if CNS contamination of the blood were to occur during PCB stunning, the interval be-
between stunning and sticking would result in potential CNS dissemination through the circulatory system if CNS tissue is not trapped in the lungs or heart. Although animal unconsciousness may last up to 10 minutes after PCB stunning (6), and CNS contamination of blood occurs at very low frequencies and at extremely low levels, a best practice would be to complete exsanguination as quickly as possible to reduce any potential organ exposure.

**Commercial survey of GFAP in circulating blood of cattle stunned in the United States**

Of the 360 samples collected from commercial processing facilities, one sample contained detectable levels of GFAP following pneumatic-PCB stunning. Gliad Fibrillary Acidic Protein was detected in both whole blood and buffy coat fractions, with a concentration of 0.010 and 0.015 ng/mg of GFAP respectively. These values were equivalent to 5.8 and 17 ng of spinal cord tissue per mg of whole blood and buffy coat, respectively, and to 8.7 and 26 ng of brain tissue per mg of whole blood and buffy coat, respectively, considering the concentration of GFAP in CNS as reported by Schmidt et al. (18) on a wet weight basis as determined by use of a Fluorescent-GFAP ELISA test. These CNS tissue concentrations were very low, especially when compared to the oral infective dose (150 g of BSE-infected CNS) reported by Lasmezas et al. (13). According to these results, prevalence of CNS tissue in circulating blood was 0.28% of the cattle stunned with pneumatic-PCB protocols. In addition, there was a 95% confidence level that prevalence of CNS tissue in the blood of cattle after pneumatic-PCB is less than 1.31% based on an exact binomial confidence limit. Coore et al. (5) reported elevated levels of GFAP in venous blood samples (collected with balloon-catheters) from 4% (95% Confidence Interval: 1.6 to 9.8%) of anesthetized cattle stunned with a cartridge-fired PCB (Cow Puncher™). Limitations of that study included use of anesthetized cattle and balloon catheters, which are inflated to assist in collection of blood, thus blocking venous blood circulation and altering the intracranial pressure. These conditions are not found under commercial stunning protocols and results of that study do not agree with the low GFAP prevalence found in commercial processing facilities in the US in our investigation.

We did not detect GFAP or CNS tissue in the blood of animals following Kosher slaughter protocols (without stunning prior to sticking). In the one plant that we visited, animals were driven to a restraining device that was equipped with a head-catch, and then a shochet (rabbi performing the ritual slaughter) made an incision in the front of the neck of the live animal with a chalaf (knife employed during kosher slaughter). After the shochet had cut the neck of the animal, animals were stunned by use of a pneumatic-PCB device to ensure insensibility of the animals before dressing. Blood samples were collected after pneumatic-PCB stunning, at which time the blood already was flowing because of the previous cut. Although religious slaughter may cause congestion and some microscopic hemorrhages, brain injury is extremely unlikely and of lower risk compared to the PCB-stunning techniques (16), and the circulatory system between the brain and heart are severed before cranial penetration.

**CONCLUSIONS**

This study indicates that the heart activity and function of cattle after PCB stunning is normal. For that reason, the interval between stunning and sticking is the period of highest risk for organ contamination, as blood circulation remains normal. Even though heart activity of the animals was not permanently stopped by applying an electric shock to the heart with a human heart defibrillator, heart activity was reduced between stunning and sticking as a result of heart fibrillation, which reduced the heart rate of the animals and therefore, presumably, blood circulation. We found a very low prevalence of GFAP in the blood of animals after pneumatic non-air inject PCB stunning in 12 commercial beef slaughter plants in the US, and we did not detect brain tissue in the blood of animals after Kosher protocol in one beef slaughter plant.
Results affirmed the safety of non-air inject PCB stunning protocols used in the United States. For that reason, post-stunning mitigation practices to reduce the likelihood of CNS tissue dissemination would not be necessary when penetrating captive bolt protocols are employed. However, further research is needed to quantify the impact of repeat PCB stunning on CNS tissue dissemination.

ACKNOWLEDGMENTS

This project was funded by beef and veal producers and importers through their $1-per-head check off and was produced for the Cattlemen’s Beef Board and state beef councils by the National Cattlemen’s Beef Association.

REFERENCES

Consumer Storage Practices for Refrigerated Ready-to-Eat Foods: Results of a Web-enabled Survey

SHERYL C. CATES, KATHERINE M. KOSA, SHAWN A. KARNS, SANDRIA GODWIN, and DELORES CHAMBERS

1RTI International, 3040 Cornwallis Road, P.O. Box 12194, Research Triangle Park, NC 27709, USA;
2Tennessee State University, 3500 John A. Merritt Blvd., Nashville, TN 37209, USA;
3Kansas State University, 143E Justin Hall, Manhattan, KS 66506, USA

SUMMARY

Proper storage of refrigerated ready-to-eat (RTE) foods by consumers can reduce their risk of listeriosis and other foodborne illnesses. To characterize consumer storage practices for refrigerated RTE foods, we conducted a nationally representative Web-enabled survey of pregnant women, seniors, and the remaining population. The survey collected information on refrigerator storage time for smoked seafood, cooked crustaceans, bagged salads, precut fresh produce, soft cheeses, frankfurters, deli/luncheon meats, and deli salads. We found that improvements are most warranted in consumers' storage practices for soft cheeses, deli/luncheon meats, and deli salads. Relatively less-educated individuals were more likely to follow the recommended storage time guidelines for freshly sliced deli meats and soft cheeses compared with individuals with more education. Also, there were regional differences in storage practices for some foods. Consumers' failure to store some RTE foods safely may be caused by their unawareness of government-recommended storage time guidelines. Educators can use the survey findings to characterize consumers' storage practices for RTE foods and to target educational efforts. Additionally, risk assessors can use the survey data to evaluate the exposure potential and health risks associated with L. monocytogenes.
INTRODUCTION

Consumption of food contaminated with *Listeria monocytogenes* can cause listeriosis, a potentially fatal disease in susceptible populations (17). The US Department of Agriculture (USDA) and the Food and Drug Administration (FDA) have a zero tolerance policy for *L. monocytogenes* in ready-to-eat (RTE) foods (18); however, complete elimination of *L. monocytogenes* remains a challenge (4). In the United States, approximately 2,500 individuals contract listeriosis each year; of these, approximately 500 die from the illness, making *L. monocytogenes* the second most common cause of death among foodborne pathogens (3, 9). Pregnant women, their fetuses, neonates, older adults, and individuals with weakened immune systems are most susceptible to contracting listeriosis (12).

Refrigerated RTE foods, such as frankfurters, deli meats, deli salads, soft cheeses, and smoked salmon, have been associated with human listeriosis, and some products support the growth of *L. monocytogenes* (6, 13, 14, 16). *L. monocytogenes* is more resistant than most foodborne pathogens to the treatments and conditions generally used to control pathogens and can grow in some foods when stored at refrigeration temperatures (14). Additionally, with the exception of frankfurters, many refrigerated RTE foods are frequently consumed without reheating, so there is not a lethality treatment by the consumer. A quantitative risk assessment for foodborne *L. monocytogenes* among selected categories of RTE foods found that keeping refrigerated foods stored at 40°F (4.4°C) or lower and consuming refrigerated RTE foods as soon as possible can reduce the risk of illness from *L. monocytogenes* by more than 50% (24).

USDA and FDA recommend that consumers store refrigerated foods at 40°F or lower for short, but safe, time limits to help keep foods from spoiling or becoming dangerous to eat (22). The government has established recommended storage time guidelines for specific RTE foods; for example, it recommends a storage time of two weeks for unopened packages of frankfurters and one week for opened packages of frankfurters. Likewise, for smoked seafood it recommends a storage time of 14 days from date of purchase. Little research has been conducted to characterize the extent to which consumers adhere to the recommended storage time guidelines for RTE foods (11). Thus, better data are needed to understand consumers’ storage practices for refrigerated RTE foods.

This study was conducted to characterize consumer storage practices for a variety of refrigerated RTE foods among pregnant women and seniors, who are at relatively high risk for listeriosis, and the remaining population. We conducted a nationally representative Web-enabled survey to collect information on home refrigeration storage times for unopened and opened packages of various RTE foods. We estimated the prevalence of consumers storing RTE products within government-recommended storage time guidelines and compared the prevalence estimates for seniors and pregnant women with those for the remaining population. Additionally, we assessed the demographic characteristics of respondents who did not follow government-recommended storage time guidelines for products in which adherence to the guidelines was relatively low.

MATERIALS AND METHODS

A national survey of United States adults was conducted by use of a Web-enabled panel survey approach. RTI International’s (RTI’s) Committee for the Protection of Human Subjects, which serves as RTI’s Institutional Review Board, reviewed and approved the study protocol. The survey data are available through the Exclusions page of the Joint Institute for Food Safety and Applied Nutrition (JIFSAN) Web site at http://www.foodrisk.org/.

Sample

We selected the sample from a Web-enabled panel developed and maintained by Knowledge Networks (Menlo Park, CA), a survey research firm. The panel, constructed by use of a list-assisted, random-digit-dial (RDD) sample selected from all 10-digit telephone numbers in the United States, is designed to be representative of the US population (5). Coverage is not provided for households without telephones (approximately 2.4 percent of US households) (21). Households participating on the panel are provided with free hardware (an Internet appliance that connects to a television) and free Internet access. New panel members complete an initial survey that collects information on demographic characteristics to create a member profile. At the time of sample selection, there were approximately 28,000 panel members.

Samples of the following subpopulations were surveyed:

- pregnant women between the ages of 18 and 40 years,
- seniors aged 60 years or older, and
- the remaining population (i.e., men aged 18 to 59 years, non-pregnant women aged 18 to 40 years, and women aged 41 to 59 years).

We sent an E-mail to the approximately 5,000 female panel members between the ages of 18 and 40 years to collect information on whether they were currently pregnant and took a census of the 296 females who reported they were pregnant. We randomly selected 1,059 seniors and 1,073 adults from the remaining population to participate in our survey, for a total sample of 2,428 adults.

Questionnaire

The questionnaire collected information on storage times for unopened and opened packages of smoked seafood (e.g., hot or cold smoked salmon, trout, clams, oysters); cooked crustaceans (boiled or steamed shrimp or crab legs); bagged salads (precut, prewashed lettuce, spinach, mixed greens, or salads); pre-cut fresh fruit; precut fresh vegetables; soft cheeses (e.g., feta, Brie, Camembert, blue cheese, queso fresco); frankfurters; vacuum-packed luncheon meats; freshly sliced deli meats; and deli salads made with a creamy or mayonnaise-based dressing (e.g., potato salad, chicken salad, or egg salad). These foods were included in the *L. monocytogenes* risk assessment (24). For each product, we collected information on the last time the product was purchased for home consumption; whether the product was still in the refrigerator; whether the product had been opened; the storage time for the
**TABLE 1. Analysis procedures, by type of product**

<table>
<thead>
<tr>
<th>Product</th>
<th>Analysis Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precut fresh fruit, precut fresh vegetables, frankfurters, vacuum-packed luncheon meats, bagged salads</td>
<td>Respondents were included in the analysis if the product was stored in the refrigerator and subsequently opened before the survey (includes product still in the refrigerator at the time of the survey). Bagged salads were excluded from this analysis because a storage time guideline was not available.</td>
</tr>
<tr>
<td>Unopened product</td>
<td></td>
</tr>
<tr>
<td>Opened product</td>
<td>Respondents were included in the analysis if the product was stored in the refrigerator and subsequently opened and consumed and/or discarded before the survey (excludes product still in the refrigerator at the time of the survey because the full storage period could not be evaluated).</td>
</tr>
<tr>
<td>Smoked seafood, cooked crustaceans, soft cheeses, freshly sliced deli meats, deli salads</td>
<td>Respondents were included in the analysis if the product was stored in the refrigerator and subsequently opened and consumed and/or discarded before the survey (excludes product still in the refrigerator at the time of the survey because the full storage period could not be evaluated).</td>
</tr>
<tr>
<td>Total storage time (combined unopened and opened)</td>
<td>Refrigerated storage time was evaluated for respondents who initially stored these foods in the freezer and subsequently moved the entire package to the refrigerator. Additionally, for frankfurters and cooked crustaceans, respondents who initially stored these products in the freezer and removed a portion from the package and left the remaining product in the freezer were considered to be following the recommended storage time guidelines because the product was kept frozen until consumed. We did not ask about this practice for vacuum-packed luncheon meats and freshly sliced deli meats.</td>
</tr>
<tr>
<td>Products that can be frozen—frankfurters, vacuum-packed luncheon meats, freshly sliced deli meats, cooked crustaceans</td>
<td></td>
</tr>
</tbody>
</table>

unopened product; and, for opened items, the storage time for the opened product. To collect information on storage times, we used closed-ended questions in which respondents selected the storage time from a list of responses (more than 28 days, 22 to 28 days, 15 to 21 days, 8 to 14 days, 6 to 7 days, 2 to 5 days, 1 day or less). To encourage respondents to report their actual behavior rather than their usual behavior, the questionnaire asked about respondents’ storage practices for the last time the product was purchased for home consumption. For cooked crustaceans, frankfurters, and deli/luncheon meats, we also collected information on whether the product was initially stored in the freezer as well as unopened and opened storage times for frozen product subsequently moved to the refrigerator. To minimize respondent burden, we developed two versions of the questionnaire. Version 1 collected information on smoked seafood, bagged salads, soft cheeses, frankfurters, and precut fresh fruit. Version 2 collected information on cooked crustaceans, precut fresh vegetables, deli/luncheon meats, and deli salads. Pregnant women received both versions of the questionnaire. Seniors and the remaining population were randomly assigned to receive one of the two versions of the questionnaire. Prior to survey administration, the survey instrument was evaluated by interviewing 12 individuals, using cognitive interviewing techniques (26), and subsequently refined.

**Survey procedures and response**

We e-mailed the questionnaire to selected panel members and sent two e-mail reminders to nonrespondents to
### TABLE 2. Demographic characteristics of respondents

<table>
<thead>
<tr>
<th></th>
<th>Pregnant Women (n = 249)</th>
<th>Older Adults (n = 946)</th>
<th>Remaining Population (n = 865)</th>
<th>All Respondents (n = 2,060)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Respondents</td>
<td>Weighted %</td>
<td>Number of Respondents</td>
<td>Weighted %</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0</td>
<td>0.0</td>
<td>420</td>
<td>44.4</td>
</tr>
<tr>
<td>Female</td>
<td>249</td>
<td>100.0</td>
<td>526</td>
<td>55.6</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>118</td>
<td>62.8</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>30-44</td>
<td>131</td>
<td>37.2</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>45-59</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>60-69</td>
<td>0</td>
<td>0.0</td>
<td>546</td>
<td>48.8</td>
</tr>
<tr>
<td>70+</td>
<td>0</td>
<td>0.0</td>
<td>400</td>
<td>51.2</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>15</td>
<td>14.7</td>
<td>167</td>
<td>22.7</td>
</tr>
<tr>
<td>(HS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS graduate or GED</td>
<td>34</td>
<td>27.2</td>
<td>357</td>
<td>36.3</td>
</tr>
<tr>
<td>Some college</td>
<td>87</td>
<td>29.1</td>
<td>216</td>
<td>19.5</td>
</tr>
<tr>
<td>Bachelor's degree or</td>
<td>113</td>
<td>28.9</td>
<td>206</td>
<td>21.4</td>
</tr>
<tr>
<td>higher</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>199</td>
<td>68.2</td>
<td>627</td>
<td>59.7</td>
</tr>
<tr>
<td>Single</td>
<td>43</td>
<td>30.1</td>
<td>39</td>
<td>4.5</td>
</tr>
<tr>
<td>Divorced</td>
<td>6</td>
<td>1.6</td>
<td>121</td>
<td>12.6</td>
</tr>
<tr>
<td>Widowed</td>
<td>0</td>
<td>0.0</td>
<td>147</td>
<td>20.9</td>
</tr>
<tr>
<td>Separated</td>
<td>1</td>
<td>0.2</td>
<td>12</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Household size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>22</td>
<td>10.6</td>
<td>227</td>
<td>27.8</td>
</tr>
<tr>
<td>Two</td>
<td>88</td>
<td>29.8</td>
<td>598</td>
<td>58.9</td>
</tr>
<tr>
<td></td>
<td>Pregnant Women (n = 249)</td>
<td>Older Adults (n = 946)</td>
<td>Remaining Population (n = 865)</td>
<td>All Respondents (n = 2,060)</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------</td>
<td>------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td></td>
<td>Number of Respondents</td>
<td>Weighted %</td>
<td>Number of Respondents</td>
<td>Weighted %</td>
</tr>
<tr>
<td>Three or four</td>
<td>104</td>
<td>46.0</td>
<td>108</td>
<td>11.3</td>
</tr>
<tr>
<td>Five or more</td>
<td>35</td>
<td>13.7</td>
<td>13</td>
<td>2.0</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>199</td>
<td>61.6</td>
<td>818</td>
<td>80.5</td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>13</td>
<td>7.6</td>
<td>63</td>
<td>8.7</td>
</tr>
<tr>
<td>Other, non-Hispanic</td>
<td>8</td>
<td>3.6</td>
<td>14</td>
<td>2.0</td>
</tr>
<tr>
<td>Hispanic</td>
<td>24</td>
<td>23.6</td>
<td>29</td>
<td>6.4</td>
</tr>
<tr>
<td>Multiracial, non-Hispanic</td>
<td>5</td>
<td>3.5</td>
<td>22</td>
<td>2.4</td>
</tr>
<tr>
<td>Household income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $15,000</td>
<td>27</td>
<td>21.0</td>
<td>135</td>
<td>16.7</td>
</tr>
<tr>
<td>$15,000 to $34,999</td>
<td>46</td>
<td>21.2</td>
<td>298</td>
<td>32.1</td>
</tr>
<tr>
<td>$35,000 to $74,999</td>
<td>110</td>
<td>43.0</td>
<td>379</td>
<td>38.3</td>
</tr>
<tr>
<td>$75,000+</td>
<td>66</td>
<td>14.6</td>
<td>134</td>
<td>12.9</td>
</tr>
<tr>
<td>MSA status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonmetro</td>
<td>28</td>
<td>11.2</td>
<td>193</td>
<td>21.1</td>
</tr>
<tr>
<td>Metro</td>
<td>221</td>
<td>88.8</td>
<td>753</td>
<td>78.9</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>33</td>
<td>13.8</td>
<td>189</td>
<td>20.1</td>
</tr>
<tr>
<td>Midwest</td>
<td>78</td>
<td>20.5</td>
<td>222</td>
<td>22.6</td>
</tr>
<tr>
<td>South</td>
<td>81</td>
<td>42.6</td>
<td>336</td>
<td>36.4</td>
</tr>
<tr>
<td>West</td>
<td>57</td>
<td>23.1</td>
<td>199</td>
<td>20.9</td>
</tr>
<tr>
<td>At-risk individual in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>household</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 years or older</td>
<td>3</td>
<td>2.2</td>
<td>946</td>
<td>100.0</td>
</tr>
<tr>
<td>Pregnant</td>
<td>249</td>
<td>100.0</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Diagnosed with diabetes</td>
<td>16</td>
<td>6.1</td>
<td>195</td>
<td>21.6</td>
</tr>
<tr>
<td>or kidney disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosed with</td>
<td>4</td>
<td>1.4</td>
<td>54</td>
<td>5.0</td>
</tr>
<tr>
<td>condition that</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>weakens immune system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

534 FOOD PROTECTION TRENDS | JULY 2007
TABLE 3. Number and weighted percentage of respondents who purchased each product

<table>
<thead>
<tr>
<th></th>
<th>Pregnant Women (n = 249)</th>
<th>Older Adults (n = 946)</th>
<th>Remaining Population (n = 865)</th>
<th>All Respondents (n = 2,060)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Respondents</td>
<td>Weighted %</td>
<td>Number of Respondents</td>
<td>Weighted %</td>
</tr>
<tr>
<td>Frankfurters</td>
<td>213</td>
<td>89.0</td>
<td>405</td>
<td>86.2</td>
</tr>
<tr>
<td>Bagged salads</td>
<td>234</td>
<td>93.0</td>
<td>379</td>
<td>79.4</td>
</tr>
<tr>
<td>Precut fresh vegetables</td>
<td>175</td>
<td>60.4</td>
<td>354</td>
<td>73.6</td>
</tr>
<tr>
<td>Vacuum-packed luncheon</td>
<td>105</td>
<td>51.4</td>
<td>206</td>
<td>48.9</td>
</tr>
<tr>
<td>meats*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precut fresh fruit</td>
<td>142</td>
<td>57.9</td>
<td>187</td>
<td>39.3</td>
</tr>
<tr>
<td>Deli salads</td>
<td>106</td>
<td>39.8</td>
<td>243</td>
<td>47.9</td>
</tr>
<tr>
<td>Cooked crustaceans</td>
<td>81</td>
<td>33.9</td>
<td>189</td>
<td>37.2</td>
</tr>
<tr>
<td>Freshly sliced deli meats*</td>
<td>115</td>
<td>38.5</td>
<td>218</td>
<td>39.4</td>
</tr>
<tr>
<td>Soft cheeses</td>
<td>101</td>
<td>34.0</td>
<td>138</td>
<td>26.7</td>
</tr>
<tr>
<td>Smoked seafood</td>
<td>65</td>
<td>23.3</td>
<td>114</td>
<td>23.1</td>
</tr>
</tbody>
</table>

*Respondents indicated whether they purchased deli/luncheon meats and then specified the type purchased the last time (vacuum-packed or freshly sliced).

encourage participation. Because of the small sample size, we offered pregnant women a $10 honorarium for completing the survey. We received 249 completed surveys from pregnant women (84% completion rate), 946 surveys from seniors (89% completion rate), and 865 surveys from the remaining population (81% completion rate).

Weighting procedures

Respondents from the three subpopulations were combined and the data were weighted to reflect the selection probabilities of sampled units and to compensate for differential nonresponse and undercoverage (8). The weights were based on the inverses of their overall selection probabilities, with adjustments for undersampling of telephone numbers for which an address was not available during panel recruiting; households with multiple telephone lines; oversampling of certain geographic areas, African American and Hispanic households, and households with computer and Internet access; and households not covered by MSN TV. Using a raking or iterative proportional fitting technique, data on age, gender, race/ethnicity, geographic region, education, Internet access, and metropolitan statistical area (MSA) status were used in a poststratification weighting adjustment to make the sample reflect population benchmarks, controlling for the demographics within the three subpopulations as well as the proportion of the three subpopulations. The benchmarks of pregnant/nonpregnant women and the proportion of pregnant/nonpregnant women among those aged 18 to 40 years came from the e-mail screener. The benchmarks and proportions of the other subpopulations came from the December 2002 Current Population Survey (21). The final weights were trimmed and scaled to sum to the total United States population aged 18 years and older.

Analysis procedures

For precut fresh fruit, precut fresh vegetables, frankfurters, and vacuum-
packed luncheon meats, we estimated the weighted percentage of respondents who stored unopened and opened product by time period (e.g., ≤ 5 days, 6 to 7 days). We then compared respondents' reported storage times for unopened and opened packages with government-recommended storage times (22, 25) to estimate the percentage of respondents who stored the product within the storage time guidelines. For bagged salads, we analyzed opened packages only because a storage time guideline was not available for unopened packages (23).

Separate guidelines were not available for unopened and opened packages for smoked seafood, cooked crustaceans, soft cheeses, freshly sliced deli meats, and deli salads, so for these products we computed the total storage time (combined unopened and opened) for each respondent and estimated the weighted percentage of respondents who stored the product by time period (e.g., ≤ 5 days, 6 to 7 days). We used the midpoint of the unopened storage time and opened storage time to compute the total storage time. We then compared respondents' reported storage times with government-recommended storage times (22, 23, 25) to estimate the percentage of respondents who stored the product within the storage time guidelines. Table 1 provides additional information on our analysis procedures.

We performed a chi-square test for the relationship between adherence to government-recommended storage time guidelines and subpopulation (pregnant women versus remaining population and seniors versus remaining population). Additionally, for products in which adherence to the guidelines was relatively low, we compared the characteristics of respondents who stored the product within government-recommended storage time guidelines with those who did not. We included the following sociodemographic variables in the analysis: gender, age, education, marital status, household size, race/ethnicity, household income, MSA status, and whether a household member is at risk for foodborne illness (aged 60 years or older, pregnant, diagnosed with diabetes or kidney disease, or diagnosed with a condition that weakens the immune system). We conducted all analyses with the Stata release 8.2 software package (20).

## RESULTS

Table 2 provides the demographic characteristics of respondents by subpopulation. Of the 2,060 respondents, 52% were women. The majority of respondents were married (53%), were white, non-Hispanic (70%), and lived in a metropolitan area (83%). About 39% of all respondents reported that at least one individual in the household was at risk for foodborne illness. Table 3 shows the number of respondents by subpopulation that reported purchasing each food product. At least 77% of all respondents purchased

### Table 4. Weighted percentage of respondents who stored an unopened product, by storage time

<table>
<thead>
<tr>
<th>Food/Subpopulation</th>
<th>≤ 5</th>
<th>6–7</th>
<th>8–14</th>
<th>15–21</th>
<th>22+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frankfurters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>77.0</td>
<td>12.4</td>
<td>6.6</td>
<td>1.7</td>
<td>2.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Seniors</td>
<td>83.2</td>
<td>9.6</td>
<td>5.2</td>
<td>1.3</td>
<td>0.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Remaining population</td>
<td>85.8</td>
<td>8.6</td>
<td>4.5</td>
<td>0.7</td>
<td>0.3</td>
<td>100.0</td>
</tr>
<tr>
<td>All respondents</td>
<td>85.0</td>
<td>8.9</td>
<td>4.7</td>
<td>0.9</td>
<td>0.5</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Precut fresh fruit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>86.9</td>
<td>10.4</td>
<td>2.1</td>
<td>0.6</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Seniors</td>
<td>92.6</td>
<td>5.6</td>
<td>0.7</td>
<td>0.8</td>
<td>0.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Remaining population</td>
<td>92.3</td>
<td>5.7</td>
<td>1.5</td>
<td>0.0</td>
<td>0.6</td>
<td>100.0</td>
</tr>
<tr>
<td>All respondents</td>
<td>92.2</td>
<td>5.8</td>
<td>1.3</td>
<td>0.2</td>
<td>0.5</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Precut fresh vegetables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>71.5</td>
<td>13.6</td>
<td>6.7</td>
<td>6.7</td>
<td>1.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Seniors</td>
<td>87.3</td>
<td>6.7</td>
<td>2.9</td>
<td>1.6</td>
<td>1.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Remaining population</td>
<td>82.7</td>
<td>8.0</td>
<td>5.2</td>
<td>2.0</td>
<td>2.1</td>
<td>100.0</td>
</tr>
<tr>
<td>All respondents</td>
<td>83.4</td>
<td>7.8</td>
<td>4.8</td>
<td>2.0</td>
<td>2.0</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Vacuum-packed luncheon meats</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>74.9</td>
<td>15.9</td>
<td>4.2</td>
<td>4.9</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Seniors</td>
<td>86.5</td>
<td>10.7</td>
<td>1.9</td>
<td>0.9</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Remaining population</td>
<td>74.6</td>
<td>14.0</td>
<td>6.6</td>
<td>0.0</td>
<td>4.8</td>
<td>100.0</td>
</tr>
<tr>
<td>All respondents</td>
<td>77.2</td>
<td>13.3</td>
<td>5.5</td>
<td>0.3</td>
<td>3.6</td>
<td>100.0</td>
</tr>
</tbody>
</table>
TABLE 5. Weighted percentage of respondents who stored an opened product, by storage time

<table>
<thead>
<tr>
<th>Food/Subpopulation</th>
<th>Number of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 5</td>
</tr>
<tr>
<td>Frankfurters</td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>69.8</td>
</tr>
<tr>
<td>Seniors</td>
<td>74.2</td>
</tr>
<tr>
<td>Remaining population</td>
<td>76.3</td>
</tr>
<tr>
<td>All respondents</td>
<td>75.6</td>
</tr>
<tr>
<td>Precut fresh fruit</td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>92.8</td>
</tr>
<tr>
<td>Seniors</td>
<td>92.9</td>
</tr>
<tr>
<td>Remaining population</td>
<td>90.3</td>
</tr>
<tr>
<td>All respondents</td>
<td>90.9</td>
</tr>
<tr>
<td>Precut fresh vegetables</td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>71.5</td>
</tr>
<tr>
<td>Seniors</td>
<td>72.9</td>
</tr>
<tr>
<td>Remaining population</td>
<td>69.5</td>
</tr>
<tr>
<td>All respondents</td>
<td>70.2</td>
</tr>
<tr>
<td>Vacuum-packed luncheon meats</td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>59.9</td>
</tr>
<tr>
<td>Seniors</td>
<td>62.2</td>
</tr>
<tr>
<td>Remaining population</td>
<td>54.8</td>
</tr>
<tr>
<td>All respondents</td>
<td>56.6</td>
</tr>
<tr>
<td>Bagged salads</td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>77.5</td>
</tr>
<tr>
<td>Seniors</td>
<td>91.1</td>
</tr>
<tr>
<td>Remaining population</td>
<td>86.7</td>
</tr>
<tr>
<td>All respondents</td>
<td>87.4</td>
</tr>
</tbody>
</table>

bagged salads, precut fresh vegetables, and frankfurters; at least 41% purchased cooked crustaceans, precut fresh fruit, vacuum-packed luncheon meats, freshly sliced deli meats, and deli salads; and less than one-third purchased smoked seafood and soft cheeses.

Tables 4 and 5 present the weighted percentage of respondents who stored unopened and opened packages of frankfurters, precut fresh fruit, precut vegetables, vacuum-packed luncheon meats, and bagged salads (opened packages only), by storage time. Table 6 presents the weighted percentage of respondents who stored smoked seafood, cooked crustaceans, deli salads, freshly sliced deli meats, and soft cheeses, by storage time (combined unopened and opened time). Most respondents stored these products for ≤ 7 days. Few respondents stored these products, with the exception of soft cheeses, for longer than two weeks.

Tables 7 and 8 present the weighted percentage of respondents who stored unopened and opened packages of frankfurters, precut fresh fruit, precut vegetables, vacuum-packed luncheon meats, and bagged salads (opened packages only) within government-recommended storage time guidelines by subpopulation. Most respondents reported storing unopened packages of frankfurters, precut fresh fruit, precut vegetables, vacuum-packed luncheon meats within the storage time guidelines (see Table 7). However, fewer respondents reported storing opened packages of these products within the storage time guidelines (see Table 8). Approximately 70 to 90% of all respondents stored opened packages of precut fresh fruit, bagged salads, frankfurters, and precut fresh vegetables within the storage time guidelines. Fewer respondents followed the storage time guidelines for opened packages of vacuum-packed luncheon meats; 62% of seniors and 60% of pregnant women stored opened packages of vacuum-packed luncheon meats for the recommended time (≤ 5 days).
We compared the storage practices for pregnant women and seniors with the remaining population. The prevalence of storing unopened packages of frankfurters for the recommended time (≤ 14 days) was lower among pregnant women than in the remaining population \((P = 0.0384)\). The prevalence of storing unopened packages of vacuum-packed luncheon meats for the recommended time (≤ 14 days) was higher among seniors than in the remaining population \((P = 0.0092)\).

Table 9 presents the weighted percentage of respondents, by subpopulation, who stored smoked seafood, cooked crustaceans, deli salads, freshly sliced deli meats, and soft cheeses within government recommended storage time guidelines.

Many respondents (approximately 70% to 90%) stored smoked seafood and cooked crustaceans within the storage time guidelines. Fewer respondents followed the storage time guidelines for deli salads, freshly sliced deli meats, and soft cheeses. About 70% of seniors and 63% of pregnant women stored deli salads for the recommended time (≤ 5 days), and 58% of seniors and 41% of pregnant women

---

**TABLE 6. Weighted percentage of respondents who stored the product, by storage time for combined unopened and opened time**

<table>
<thead>
<tr>
<th>Food/Subpopulation</th>
<th>Number of Days</th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 5</td>
<td>6-7</td>
<td>8-14</td>
<td>15-21</td>
<td>22+</td>
</tr>
<tr>
<td>Smoked seafood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>52.3</td>
<td>14.2</td>
<td>8.2</td>
<td>14.9</td>
<td>10.4</td>
</tr>
<tr>
<td>Seniors</td>
<td>58.2</td>
<td>19.9</td>
<td>8.2</td>
<td>7.6</td>
<td>6.2</td>
</tr>
<tr>
<td>Remaining population</td>
<td>68.0</td>
<td>14.5</td>
<td>12.1</td>
<td>2.3</td>
<td>3.2</td>
</tr>
<tr>
<td>All respondents</td>
<td>65.4</td>
<td>15.6</td>
<td>11.1</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Cooked crustaceans</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>71.7</td>
<td>2.3</td>
<td>14.4</td>
<td>4.8</td>
<td>6.9</td>
</tr>
<tr>
<td>Seniors</td>
<td>85.0</td>
<td>1.4</td>
<td>4.8</td>
<td>1.5</td>
<td>7.3</td>
</tr>
<tr>
<td>Remaining population</td>
<td>78.2</td>
<td>6.4</td>
<td>8.9</td>
<td>3.1</td>
<td>3.4</td>
</tr>
<tr>
<td>All respondents</td>
<td>79.3</td>
<td>5.4</td>
<td>8.2</td>
<td>2.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Deli salads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>63.4</td>
<td>21.1</td>
<td>10.3</td>
<td>4.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Seniors</td>
<td>70.8</td>
<td>15.2</td>
<td>11.5</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Remaining population</td>
<td>61.4</td>
<td>20.0</td>
<td>14.0</td>
<td>1.6</td>
<td>3.0</td>
</tr>
<tr>
<td>All respondents</td>
<td>63.8</td>
<td>18.8</td>
<td>13.3</td>
<td>1.6</td>
<td>2.5</td>
</tr>
<tr>
<td>Freshly sliced deli meats</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>41.2</td>
<td>22.7</td>
<td>23.5</td>
<td>0.8</td>
<td>11.9</td>
</tr>
<tr>
<td>Seniors</td>
<td>57.6</td>
<td>27.9</td>
<td>9.0</td>
<td>5.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Remaining population</td>
<td>48.4</td>
<td>19.3</td>
<td>23.2</td>
<td>6.8</td>
<td>2.4</td>
</tr>
<tr>
<td>All respondents</td>
<td>50.1</td>
<td>21.2</td>
<td>20.2</td>
<td>6.3</td>
<td>2.2</td>
</tr>
<tr>
<td>Soft cheeses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td>14.2</td>
<td>7.2</td>
<td>37.6</td>
<td>11.8</td>
<td>29.2</td>
</tr>
<tr>
<td>Seniors</td>
<td>18.8</td>
<td>12.4</td>
<td>25.3</td>
<td>27.1</td>
<td>16.4</td>
</tr>
<tr>
<td>Remaining population</td>
<td>28.5</td>
<td>23.1</td>
<td>19.5</td>
<td>17.4</td>
<td>11.4</td>
</tr>
<tr>
<td>All respondents</td>
<td>26.7</td>
<td>21.1</td>
<td>20.9</td>
<td>18.7</td>
<td>12.6</td>
</tr>
</tbody>
</table>
### TABLE 7. Weighted percentage of respondents who stored an unopened product within storage time guidelines

<table>
<thead>
<tr>
<th>Food</th>
<th>Storage Time (≤ x days)*</th>
<th>Pregnant Women</th>
<th>Seniors</th>
<th>Remaining Population</th>
<th>All Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frankfurters</td>
<td>14</td>
<td>96.0</td>
<td>97.9</td>
<td>98.9</td>
<td>98.6</td>
</tr>
<tr>
<td>Precut fresh fruit</td>
<td>7</td>
<td>97.3</td>
<td>98.2</td>
<td>98.0</td>
<td>98.0</td>
</tr>
<tr>
<td>Precut fresh vegetables</td>
<td>14</td>
<td>91.8</td>
<td>97.0</td>
<td>95.9</td>
<td>96.0</td>
</tr>
<tr>
<td>Vacuum-packed luncheon meats</td>
<td>14</td>
<td>95.1</td>
<td>99.1</td>
<td>95.2</td>
<td>96.0</td>
</tr>
</tbody>
</table>

*The storage times are based on recommendations from FDA and USDA (22, 23, 25).

### TABLE 8. Weighted percentage of respondents who stored an opened product within storage time guidelines

<table>
<thead>
<tr>
<th>Food</th>
<th>Storage Time (≤ x days)*</th>
<th>Pregnant Women</th>
<th>Seniors</th>
<th>Remaining Population</th>
<th>All Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precut fresh fruit</td>
<td>5</td>
<td>92.8</td>
<td>92.9</td>
<td>90.3</td>
<td>90.9</td>
</tr>
<tr>
<td>Bagged salads</td>
<td>5</td>
<td>77.5</td>
<td>91.1</td>
<td>86.7</td>
<td>87.4</td>
</tr>
<tr>
<td>Frankfurters</td>
<td>7</td>
<td>77.6</td>
<td>85.1</td>
<td>87.6</td>
<td>86.7</td>
</tr>
<tr>
<td>Precut fresh vegetables</td>
<td>5</td>
<td>71.5</td>
<td>72.9</td>
<td>69.5</td>
<td>70.2</td>
</tr>
<tr>
<td>Vacuum-packed luncheon meats</td>
<td>5</td>
<td>59.9</td>
<td>62.2</td>
<td>54.8</td>
<td>56.6</td>
</tr>
</tbody>
</table>

*The storage times are based on recommendations from FDA and USDA (22, 23, 25).

### TABLE 9. Weighted percentage of respondents who stored a product within storage time guidelines (combined unopened and opened storage times)

<table>
<thead>
<tr>
<th>Food</th>
<th>Storage Time (≤ x days)*</th>
<th>Pregnant Women</th>
<th>Seniors</th>
<th>Remaining Population</th>
<th>All Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoked seafood</td>
<td>14</td>
<td>74.7</td>
<td>86.2</td>
<td>94.6</td>
<td>92.2</td>
</tr>
<tr>
<td>Cooked crustaceans</td>
<td>4</td>
<td>56.4</td>
<td>75.2</td>
<td>71.2</td>
<td>71.6</td>
</tr>
<tr>
<td>Deli salads</td>
<td>5</td>
<td>63.4</td>
<td>70.8</td>
<td>61.4</td>
<td>63.8</td>
</tr>
<tr>
<td>Freshly sliced deli meats</td>
<td>5</td>
<td>41.2</td>
<td>57.6</td>
<td>48.4</td>
<td>50.1</td>
</tr>
<tr>
<td>Soft cheeses</td>
<td>7</td>
<td>21.4</td>
<td>31.3</td>
<td>51.7</td>
<td>47.8</td>
</tr>
</tbody>
</table>

*The storage times are based on recommendations from FDA and USDA (22, 23, 25).
stored freshly sliced deli meats for the recommended time (≤ 5 days). Less than one-third of seniors and pregnant women stored soft cheeses for the recommended time (≤ 7 days).

We compared the storage practices for pregnant women and seniors with those for the remaining population. The prevalence of storing smoked seafood for the recommended time (≤ 14 days) was lower among pregnant women (P = 0.0065) than in the remaining population. The prevalence of storing soft cheeses for the recommended time (≤ 7 days) was lower among pregnant women (P = 0.0006) and seniors (P = 0.0324) than in the remaining population.

Table 10 compares the characteristics of respondents who stored opened packages of vacuum-packed deli meats, freshly sliced deli meats, deli salads, and soft cheeses within government-recommended storage time guidelines with the characteristics of those who did not. Individuals who have attended college were more likely than those with a high school education to store freshly sliced deli meats (P = 0.0287) and soft cheeses (P = 0.0127) outside the recommended guidelines. White, non-Hispanics were more likely than individuals of other races/ethnicities to store soft cheeses outside the recommended guidelines (P = 0.0216). Individuals living in the Midwest and West regions were more likely to store freshly sliced deli meats outside the recommended guidelines (P = 0.0480). Although not significant at the P = 0.05 level, the findings suggest that there may be similar regional differences in storage practices for deli salads and soft cheeses. Notably, respondents with an at-risk individual in the household were more likely to store freshly sliced deli meats within the recommended guidelines. Although not significant at the P = 0.05 level, the same finding was observed for vacuum-packed luncheon meats (P = 0.0635).

**DISCUSSION**

USDA and FDA advise consumers to store refrigerated RTE foods at 40°F or lower and to consume refrigerated RTE foods within recommended storage time guidelines to help prevent listeriosis. More than 95% of respondents safely stored unopened packages of frankfurters, precut fresh fruit, precut fresh vegetables, and vacuum-packed luncheon meats. However, fewer respondents safely stored opened packages of the RTE foods included in the analysis. Some consumers may neglect storing some refrigerated RTE foods safely because of unawareness of government-recommended storage time guidelines. We found that improvements are most warranted in consumers' storage practices for opened, vacuum-packed luncheon meats, freshly sliced deli meats, deli salads, and soft cheeses. Of particular concern is the finding that approximately 80% of pregnant women and 70% of seniors stored soft cheeses for longer than recommended times. USDA and FDA advise pregnant women and seniors to avoid consuming soft cheeses made from unpasteurized milk. Thus, because soft cheeses may not be pasteurized, it is important for at-risk consumers to read product labels carefully when purchasing soft cheeses, especially those that are imported or sold at farmers' markets. Furthermore, for several RTE foods we found that the prevalence of following the recommended storage time guidelines was lower among pregnant women than in the remaining population. Thus, pregnant women need more information on recommended storage times for RTE foods to help prevent possible miscarriages and stillbirths caused by listeriosis.

We found that relatively less-educated individuals were more likely than individuals with more education to follow the recommended storage time guidelines for freshly sliced deli meats and soft cheeses. This is consistent with the findings of other researchers that the prevalence of risky food handling and food consumption practices generally increase with education (1, 10). We also observed regional differences in storage practices for some RTE foods. Additional research is needed to understand why storage practices vary based on these demographic characteristics.

For several RTE foods, we found that individuals with an at-risk individual in the household were more likely to store freshly sliced deli meats within the recommended time. It is not known whether this difference is attributable to increased education about food safety or to other factors.

Few data are available on home refrigeration storage times for RTE foods; thus, most risk assessments have relied on expert opinion for data on home refrigeration storage times for RTE foods. Several of the authors for this study had conducted a separate survey on storage, handling, and preparation practices for deli/luncheon meats and frankfurters, also by use of a Web-enabled panel survey (2). With the exception of storage time for freshly sliced deli meats, the earlier survey yielded very similar findings to the current survey. In the current survey, 50% of all respondents stored freshly sliced deli meats within the recommended guidelines; however, more respondents (66%) stored freshly sliced deli meats within the recommended guidelines in the previous survey. We do not know whether this difference is due to sampling error or some other factor.

The strengths of the present study include the large sample size, nationally representative survey design, and results for specific at-risk populations. Limitations of the study include the small number of respondents for foods that are not frequently consumed, such as smoked seafood, soft cheeses, and cooked crustaceans. Also, our study used self-reported behaviors that may not reflect actual practices (11). When completing surveys, people tend to report their usual behavior rather than their exact behavior (7). For example, when reporting dietary intake, people generally report what they think they usually eat, rather than recalling what they actually ate (19). To help minimize self-reporting bias, we asked respondents to consider what they actually did the last time they purchased the product; thus, we were more likely to elicit respondents' actual behavior instead of their knowledge of recommended storage times or their usual practice.

This study identified the need to educate consumers about government-recommended storage times for refrigerated RTE foods. Educators can use the survey findings to characterize consumers' storage practices for refrigerated RTE foods and to target educational efforts on foodborne illness prevention. Because both storage time and temperature control are important, education programs should also include information on the recommended refrigerator temperature (40°F.
<table>
<thead>
<tr>
<th></th>
<th>Vacuum-Packed Luncheon Meats&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Freshly Sliced Deli Meats&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Deli Salads&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Soft Cheeses&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>All Respondents</td>
<td>56.6</td>
<td>43.4</td>
<td>50.1</td>
<td>49.9</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>58.4</td>
<td>41.6</td>
<td>43.3</td>
<td>56.7</td>
</tr>
<tr>
<td>Female</td>
<td>54.8</td>
<td>45.2</td>
<td>58.4</td>
<td>41.6</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>50.6</td>
<td>49.4</td>
<td>34.5</td>
<td>65.5</td>
</tr>
<tr>
<td>30-44</td>
<td>53.3</td>
<td>46.7</td>
<td>54.3</td>
<td>45.7</td>
</tr>
<tr>
<td>45-59</td>
<td>61.1</td>
<td>38.9</td>
<td>53.3</td>
<td>46.7</td>
</tr>
<tr>
<td>60-69</td>
<td>57.5</td>
<td>42.5</td>
<td>54.9</td>
<td>45.1</td>
</tr>
<tr>
<td>70+</td>
<td>66.3</td>
<td>33.7</td>
<td>59.7</td>
<td>40.3</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS graduate or less</td>
<td>61.3</td>
<td>38.7</td>
<td>61.9</td>
<td>38.1</td>
</tr>
<tr>
<td>Some college or</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>college degree</td>
<td>50.7</td>
<td>49.3</td>
<td>41.7</td>
<td>58.3</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>58.4</td>
<td>41.6</td>
<td>51.5</td>
<td>45.8</td>
</tr>
<tr>
<td>Not married</td>
<td>54.6</td>
<td>45.4</td>
<td>48.5</td>
<td>51.5</td>
</tr>
<tr>
<td>Household size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>58.3</td>
<td>41.7</td>
<td>48.9</td>
<td>51.1</td>
</tr>
<tr>
<td>Two or more</td>
<td>56.1</td>
<td>43.9</td>
<td>50.5</td>
<td>49.5</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>57.0</td>
<td>43.0</td>
<td>47.2</td>
<td>52.8</td>
</tr>
<tr>
<td>Other race/ethnicity</td>
<td>55.7</td>
<td>44.3</td>
<td>59.4</td>
<td>40.6</td>
</tr>
<tr>
<td>Household income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $32,500</td>
<td>63.4</td>
<td>36.6</td>
<td>50.9</td>
<td>49.1</td>
</tr>
<tr>
<td>$32,500+</td>
<td>50.0</td>
<td>50.0</td>
<td>49.4</td>
<td>50.6</td>
</tr>
</tbody>
</table>
TABLE 10. Comparison of respondents who stored an opened product within versus outside recommended storage time guidelines (continued)

<table>
<thead>
<tr>
<th></th>
<th>Vacuum-Packed Luncheon</th>
<th>Freshly Sliced Deli Meats</th>
<th>Deli Salads</th>
<th>Soft Cheeses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Within (%)</td>
<td>% Within (%)</td>
<td>% Within (%)</td>
<td>% Within (%)</td>
</tr>
<tr>
<td>MSA status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonmetro</td>
<td>68.1 (31.9)</td>
<td>59.0 (41.0)</td>
<td>75.7 (24.3)</td>
<td>37.2 (62.8)</td>
</tr>
<tr>
<td>Metro</td>
<td>53.8 (46.2)</td>
<td>48.6 (51.4)</td>
<td>61.2 (38.8)</td>
<td>49.5 (50.5)</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>83.3 (16.7)</td>
<td>61.6 (38.4)</td>
<td>79.6 (20.4)</td>
<td>66.2 (33.8)</td>
</tr>
<tr>
<td>Midwest</td>
<td>56.0 (44.0)</td>
<td>40.0 (60.0)</td>
<td>54.4 (45.6)</td>
<td>37.8 (62.2)</td>
</tr>
<tr>
<td>South</td>
<td>54.2 (45.8)</td>
<td>57.1 (42.9)</td>
<td>67.0 (33.0)</td>
<td>53.6 (46.4)</td>
</tr>
<tr>
<td>West</td>
<td>50.6 (49.4)</td>
<td>29.5 (70.5)</td>
<td>57.7 (42.3)</td>
<td>28.3 (71.7)</td>
</tr>
<tr>
<td>At-risk individual in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>household</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>66.2 (33.8)</td>
<td>60.9 (39.1)</td>
<td>65.0 (35.0)</td>
<td>36.3 (63.7)</td>
</tr>
<tr>
<td>No</td>
<td>49.6 (50.4)</td>
<td>41.8 (58.2)</td>
<td>62.8 (37.2)</td>
<td>54.4 (45.6)</td>
</tr>
</tbody>
</table>

*USDA recommends storing opened packages of vacuum-packed luncheon meats for ≤ 5 days.

*USDA recommends storing freshly sliced deli meats for ≤ 5 days (combined unopened and opened storage time).

*USDA recommends storing deli salads for ≤ 5 days (combined unopened and opened storage time).

*FDA recommends storing soft cheeses for ≤ 7 days (combined unopened and opened storage time).

*P of χ² text.
or lower) and the importance of using a refrigerator thermometer to monitor refrigerator temperature. Risk assessors can use the survey data on storage times to evaluate the exposure potential and health risks associated with L. monocytogenes.

ACKNOWLEDGMENTS

This work was funded through a grant from the National Integrated Food Safety Initiative of the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture (Grant No. 2004-51110-02177). We thank J. Michael Dennis and Sergei Rodkin of Knowledge Networks for their assistance with conducting the survey.

REFERENCES

Critical Control Points for Home Prepared ‘Chicken and Salad’ in Puerto Rican Households

JIGNA MORARJI DHAROD, RAFAEL PÉREZ-ESCAMILA, STEFANIA PACIELLO, KUMAR VENKITANARAYAN, ANGELA BERMUDEZ-MILLAN, and GRACE DAMIO

1IPSI, Muskie School of Public Service, University of Southern Maine, Augusta, ME 04330, USA; 2Connecticut NIH Export Center of Excellence for Eliminating Health Disparities among Latinos, and Dept. of Nutritional Sciences, University of Connecticut, 3624 Horsebarn Hill Road, Storrs, CT 06269-4017, USA; 3Celebration Foods Inc./Carvel Ice Cream, 175 Capital Blvd., Rocky Hill, CT 06067-3914, USA; 4University of Connecticut, Dept. of Animal Science, 3636 Horsebarn Hill Road, Storrs, CT 06269, USA; 5University of Connecticut, Dept. of Nutritional Sciences, 3624 Horsebarn Hill Road, Storrs, CT 06269-4017, USA; and 6Center for Community Nutrition, and Center for Women and Children’s Health, Hispanic Health Council, Inc., 175 Main St., Hartford, CT 06106, USA

ABSTRACT

Hazard Analysis and Critical Control Point (HACCP) has been effective in identifying and controlling foodborne hazards at different stages of the consumer food chain. In this study the HACCP model was applied at the household level to identify sanitation and food handling ‘Critical Control Points’ (CCPs) in the preparation of a ‘Chicken and Salad’ (CS) meal. A total of 60 Puerto Rican women were provided spices in addition to the main ingredients such as chicken breasts (CB) and lettuce and tomatoes (LT) to prepare CS in their home kitchens. Food and kitchen surface samples were collected at various stages of food preparation for total and coliform counts and to test for the presence of Listeria, Campylobacter, Salmonella genus and S. aureus. In addition, various food-handling behaviors such as thawing methods, hygiene practices, and use of cutting boards were observed and recorded to: (a) compare with the microbiological testing results, and (b) identify CCPs in the CS meal preparation. Based on the microbiological and observation results, the following stages of meal preparation were identified as CCPs: (1) CB Thawing; (2) Cutting CB; (3) Hand washing after handling CB and before handling LT, and (4) Washing LT. Of the pathogens tested, S. aureus was present most commonly in all the food and surface samples. Five percent of LT samples or prepared salad were found positive for Listeria genus.
INTRODUCTION

Surveillance statistics suggest that the occurrence of foodborne illness of household origin is higher than reported. Sporadic cases or small outbreaks, typical characteristics of home foodborne illness, are often not identified by public health authorities (12). It has been estimated that 20% of reported outbreaks in the United States between 1993 and 1997 were of household origin (17). Consumer surveys have been useful for estimating household food safety practices and for understanding the risk factors and possible causes of foodborne illnesses. Unfortunately, there is a lack of information on kitchen microbiology and of directly observed food-handling practices at home.

Hazard Analysis and Critical Control Point (HACCP) is a systematic preventive approach to the identification, assessment and control of the physical, chemical or biological hazards associated with any particular food production process or practice (13). The application of HACCP at the household level has been recommended by the World Health Organization (WHO), especially in developing countries, where water and foodborne pathogens are the major cause of childhood diarrhea (16). Various studies, particularly in developing countries, have applied HACCP principles in the home environment, on the basis of microbial testing of surfaces, water and food ingredients (4, 5, 9, 15, 22).

In the United States, application of HACCP at the household level has involved consumer interviews or analysis of recipe steps to identify critical control points in the preparation of common meal dishes (3, 24). However, there is a dearth of information concerning the microbiology of the kitchen and food-handling practices in the actual home environment. A kitchen simulation study conducted by Gorman et al. in Ireland documented a 16% cross-contamination rate among different kitchen items and food preparation areas, as well as dish cloth, hands, refrigerator/oven handle and counter (10). Similar results were seen in a study conducted by Redmond et al. in the United Kingdom, where the same Campylobacter strains were found in or on raw chicken, kitchen surfaces, wash cloth and final dish, yielding a cross-contamination rate of 29% (20).

In the United States, the Latino population is growing at a fast rate, among this population, Puerto Ricans experience the highest level of poverty and poor health (1). According to the 2000 US Census Bureau, Hartford is the second poorest medium-size city and Latinos account for 40% of the population, with Puerto Ricans representing the great majority of this ethnic group. Our previous studies have documented risky food safety behaviors in this community. A home observation study conducted with Puerto Rican women (n = 10) preparing a family meal showed that only one (10%) participant washed her hands with soap and water, 80% rinsed their hands with only water, and one participant did not wash or rinse her hands before cooking. Four participants left the uncooked meat sitting at room temperature for one to two hours and, finally, none of the participants used a meat thermometer to check the cooking temperature (2).

From July to October 2000, a post FightBAC! Campaign survey was conducted in 250 Latino households in inner city areas of Hartford. In a self-reported survey, 14% reported thawing meat in the refrigerator and 10% reported using the same plate to place meat before and after cooking. Furthermore, only 30% reported being aware of the term cross contamination (7). A comparison of food safety practices by socio-demographic variables indicated that food safety behavioral risks were higher among Latinos than among whites, and among those with lower levels of education (6).

The HACCP approach developed for the food industry tests for physical, chemical and biological hazards. This study applied HACCP principles at the household level to identify critical control points for common microbial contamination. The household kitchen is unregulated and, unlike the industrial setting, where sanitation and production processes can be tightly regulated and monitored, it does not lend itself to the inclusion of precise and continuous monitoring systems, especially among low-income households. Hence, this study at the household level defines 'Critical Control Points' (CCPs) as key meal preparation steps where inadequate meal preparer(s) food safety behaviors can increase the risk of microbial contamination of the foods consumed. The main objective of this study was to apply HACCP principles and identify CCPs for home prepared 'Chicken and Salad' using objective measurements such as direct observations and microbiological indicators.

MATERIALS AND METHODS

This study was approved by the Institutional Review Boards of the University of Connecticut and the Hispanic Health Council, Inc. (Hartford, Connecticut). The study's inclusion criteria were: (1) Puerto Rican female, (2) main meal preparer of the household, and (3) living in Hartford. After the study consent form had been signed, the dates for the household visits and observation were decided in full consultation with the study participant. A bilingual (English/Spanish) and bicultural community outreach worker was trained by a Puerto Rican research staff member with expertise in food safety on how to recruit the participants and conduct the household observation.

Pilot study

In order to test, streamline, and standardize the microbiological testing and sample collection procedures, a pilot study (18) was conducted in ten households prior to collecting the data for the main study. The pilot study was also used to develop a household observation checklist and for testing the protocols and procedures for the eight-month-long main study. In addition, during the pilot study, ten simulation studies were conducted to rule out secondary microbial contamination during the delivery of ingredients (Chicken Breasts, Lettuce, Tomatoes) to the household and collection of samples from households to microbiology laboratory.

Main study

A total of sixty Puerto Rican women, none of whom had participated in the pilot study, were recruited through local schools, grocery stores, the Food Supplementary Program for Women, Infants and Children (WIC) offices, and neighborhoods of inner city Hartford, Connecticut.
For each household, two visits were conducted in three days to deliver the food ingredients, observe food preparation and collect the food and surface samples for microbial testing.

First visit (First day): A pack of chicken breasts (CB) with skin and bones, one head of iceberg lettuce and tomatoes (LT), oil, salad dressing and common Puerto Rican spices (adobo, sazón, sofrito) were purchased at the local grocery store to be delivered to each participant. From purchasing to household delivery, spices were kept at room temperature while food ingredients (CB/LT) were maintained at ≤ 4°C in ice coolers. After purchase, food ingredients were taken to the microbiology laboratory and sampled (CB/LT = 25 g) to determine the presence of any pathogenic species and establish baseline total and coliform counts. After removing the sample for microbial testing, the CB and LT were re-packed and returned to the ice coolers to be delivered to the participant.

Once the foods had arrived at the household, the refrigerator and freezer temperatures were measured by use of calibrated mercury thermometers (Fisher Scientific, Fairlawn, NJ). On delivery of the food ingredients, participants were asked to freeze the CB and refrigerate the LT. Participants were also asked to have the CB defrosted for the dinner preparation two days after delivery of ingredients.

Second visit (Third day): On the second visit, participants were asked to follow their own recipe but to use only the food ingredients and spices provided by the study. The kitchen counter, refrigerator/freezer handles, knife and cutting board surface were sampled before meal preparation. The whole surface of the refrigerator/freezer handles and knife and 30 cm² (template area 6.5 x 4.5 cm) surface areas of the counter and cutting board were swabbed, using sterile templates and prepackaged sterile swabs (Difco) dipped in Tryptic Soy Broth (TSB, Difco) + 0.6% Yeast Extract (YE, Difco). A defrosted CB sample was collected after the participant had handled the CB (i.e., cutting, removing skin and bones and washing), or just before the participant started cooking the CB. Knives and cutting surfaces (i.e., counter or cutting board) were swabbed after they were used to cut/clean the CB. A LT sample was obtained once the vegetables were washed (if done) and cut or once they were ready to serve. Sterilized tongs were used to collect the food samples (two samples of CB/Lettuce/Tomato - 25 g each). An extensive household observation was also conducted during the participants’ preparation of the ‘Chicken and Salad’ meal. The pre-coded checklist was used to record the participant food safety practices. In addition, once the participant declared that the CB was cooked, the CB temperature was measured by inserting a digital thermometer (AccuTuff 340, Atkins, USA) sideways into the CB, without touching the bottom of the cooking pan. A cooked CB sample was taken for microbiological analyses only if the temperature measured was ≤ 165°F, or 75°C. The refrigerator and freezer temperatures were also measured at the end of meal preparation. As had been done in the delivery of ingredients, collected household samples were transported in ice coolers maintained at ≤ 4°C.

**Microbiological testing**

All the collected food and counter/cutting board samples were tested for total bacterial and coliform counts, and for the presence of Campylobacter, Salmonella, Listeria genus, and S. aureus. Microbial procedures were performed using standard procedures (11). Refrigerator/freezer handles and knife samples were tested only for the presence of pathogenic genus.

For total bacterial and coliform counts, food samples (~ 25 g) were placed in 100 ml TSB + 0.6% YE and homogenized in a stomacher (Tekmar, OH) for one min. For surface samples (50 cm²), swabs were placed in fifty ml TSB + 0.6% YE. The samples were then serially diluted in 0.1% Peptone Buffer, spread plated (Trichloroacetic Acid for total bacterial load; Violet Red Bile agar for coliforms) and incubated (37°C) for twenty-four hours. The remaining samples, placed in TSB + 0.6% YE, were enriched by incubating at 37°C for twenty-four hours and streaked on the respective agar to identify the presence of Salmonella (Xylose Lactose Trypticose Agar, Difco), Listeria (Oxford Agar, Difco), and S. aureus (Mannitol Salt Agar, Difco).

To detect the presence of Campylobacter, food samples were placed in Brucella broth + 0.5% sheep’s blood, after which they were incubated at 42°C under microaerophilic conditions (85% N₂, 10% CO₂, 5% O₂) for forty-eight hours in an anaerobic incubator (Nuaire, MA). After incubation, the broth with sample was streaked on Karmali agar (Oxoid) to be incubated at similar microaerophilic condition as before. If positive colonies were observed, the following confirmatory tests were conducted for each species: Salmonella: Agglutination test (Oxoid, NY), API-20 E test (bioMérieux, MO); Listeria: Gram staining, hemolysis test on blood agar; and Campylobacter: microscopic motility test, Gram staining, API Campy (bioMérieux, MO).

**STATISTICAL ANALYSES**

The 12.0 version of SPSS (Chicago, IL) was used to enter and analyze the microbiological and direct observation data. Descriptive statistics and frequencies were used to assess percentage of samples testing positive for pathogenic species. Analysis of Covariance (ANCOVA) was used to determine the changes in total and coliform counts by various food-handling practices. A cross-contamination model was developed based on significant Pearson Correlation coefficient between different stages of meal preparation. The non-parametric MacNemar test was conducted to estimate the statistical significance of the difference in the presence of pathogenic species in food at the retail level and after participants’ handling.

**RESULTS**

In all the main study households (n = 60), chicken preparation preceded salad preparation. Participants handled the CB first and started preparing the salad while the CB was being cooked or once the CB was cooked.

**HOUSEHOLD OBSERVATION**

**Storage**

The refrigerator and freezer temperatures measured at the household were compared with the USDA-Food Safety Inspection Service recommended temperatures (Refrigerator: 4°C; Freezer: -18°C). The minimum refrigerator tem-
TABLE 1. Association between participants’ behavior and total bacterial and coliform counts in chicken breast* (CB) sample collected in the household (n = 60)

<table>
<thead>
<tr>
<th>Participants’ Behavior</th>
<th>Total Counts (log CFU/g)</th>
<th>p*</th>
<th>Coliform Counts (log CFU/g)</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thawing Method</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In refrigerator</td>
<td>3.71 ± .89</td>
<td>.500</td>
<td>1.92 ± 1.56</td>
<td>.681</td>
</tr>
<tr>
<td>On counter</td>
<td>4.01 ± .99</td>
<td>.532</td>
<td>2.16 ± 1.65</td>
<td>.869</td>
</tr>
<tr>
<td>In cold/hot water</td>
<td>4.32 ± .83</td>
<td>.500</td>
<td>2.64 ± 1.24</td>
<td>.667</td>
</tr>
<tr>
<td>Combination</td>
<td>3.87 ± .67</td>
<td>.901</td>
<td>1.96 ± 1.22</td>
<td>.637</td>
</tr>
<tr>
<td><strong>Hand Washing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not wash hands</td>
<td>4.06 ± .85</td>
<td>.532</td>
<td>2.16 ± 1.65</td>
<td>.869</td>
</tr>
<tr>
<td>Water only</td>
<td>3.99 ± 1.09</td>
<td>.500</td>
<td>2.16 ± 1.50</td>
<td>.681</td>
</tr>
<tr>
<td>Water and soap</td>
<td>3.74 ± .07</td>
<td>.500</td>
<td>2.09 ± 1.33</td>
<td>.791</td>
</tr>
<tr>
<td><strong>Use of Cutting Surface</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutting board</td>
<td>3.85 ± .88</td>
<td>.015</td>
<td>1.74 ± .90</td>
<td>.051</td>
</tr>
<tr>
<td>Counter</td>
<td>4.81 ± 84</td>
<td>.500</td>
<td>3.22 ± .80</td>
<td>.681</td>
</tr>
<tr>
<td>Plate</td>
<td>3.34 ± 1.15</td>
<td>.500</td>
<td>1.71 ± .68</td>
<td>.681</td>
</tr>
<tr>
<td>Package itself</td>
<td>3.43 ± .79</td>
<td>.500</td>
<td>1.91 ± 1.05</td>
<td>.791</td>
</tr>
<tr>
<td><strong>Washing of Cutting Surface</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not wash</td>
<td>4.14 ± .97</td>
<td>.089</td>
<td>2.30 ± 1.42</td>
<td>.654</td>
</tr>
<tr>
<td>Wipe it</td>
<td>4.55 ± 1.04</td>
<td>.004</td>
<td>2.26 ± 2.23</td>
<td>.482</td>
</tr>
<tr>
<td>Wash with water only</td>
<td>3.80 ± .68</td>
<td>.001</td>
<td>1.81 ± 1.48</td>
<td>.587</td>
</tr>
<tr>
<td>Wash with soap and water</td>
<td>3.23 ± 1.00</td>
<td>.001</td>
<td>1.74 ± 1.89</td>
<td>.587</td>
</tr>
<tr>
<td><strong>Washing of Knife</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not wash</td>
<td>4.00 ± .72</td>
<td>.400</td>
<td>1.89 ± 1.57</td>
<td>.777</td>
</tr>
<tr>
<td>Wash with water only</td>
<td>3.99 ± 1.03</td>
<td>.001</td>
<td>2.18 ± 1.41</td>
<td>.587</td>
</tr>
<tr>
<td>Wash with soap and water</td>
<td>3.69 ± .70</td>
<td>.001</td>
<td>1.93 ± 1.86</td>
<td>.587</td>
</tr>
</tbody>
</table>

*ANCOVA - Total bacterial counts or coliform counts at the retail/baseline level as covariate, total bacterial counts or coliform counts after participant handling as a dependent variable and observed participants’ behavior as an independent variable; log CFU/g- Logarithmic colony forming unit per gram

CB sample collected after: freezing, thawing, washing (if done), removing skin and bones (if done) and cutting

Washing hands before handling chicken or before starting meal preparation since all participants handled chicken first.

Washing cutting surfaces/knife before using to cut chicken

Thawing

Our direct observations showed that the CB was thawed mostly (43%) on the counter (5 h on average). For the remaining households, 28% thawed CB in the refrigerator, 15% in water, and 14% using a combination of methods (i.e., initially in the refrigerator and later in cold/hot water or on the counter). Among participants who thawed the CB in water, 46% kept the CB in stagnant water and did not change the water for more than two hours.

Handling

Before handling the CB, 25% washed their hands with soap and water. A cutting board was used by the majority (72%), although kitchen counters (13%) were the second most common surfaces used to cut CB. After handling the CB and before handling the vegetables, most (75%) of the participants did not wash their hands or washed them with water only. Thirteen percent of the participants did not wash the LT. Seventy-six percent used a cutting board, 7% used the counter, and 17% used a plate to cut the LT. Among those who used the same cutting board to cut CB and LT, only 55% washed the cutting board with soap and water in between use. Similarly, we observed that 13% of households used the same knife for cutting CB and LT without washing it in between, thus increasing the risk of cross contamination.

Cooking

None of the participants used a thermometer to check whether the CB was adequately cooked. The most common methods used by the participants for determining doneness were the cooking time and visual checking of the change in texture and color of the meat. Some participants (20%) tasted the meat to determine if it was done or not. Temperature measurements on the CB by

Temperature noted was 1°C while the maximum was 14°C. Fifty-three percent of the refrigerator temperatures ranged from 0 to 4°C; 42% from 5 to 10°C, and 5% from 11 to 14°C. The freezer temperature ranged from -4 to -20°C with 65% of the freezers having sub-optimal or higher-than-recommended temperature.
TABLE 2. Association between participants' behavior and total bacterial and coliform counts in lettuce/tomato (LT) sample collected in the household (n = 60)

<table>
<thead>
<tr>
<th>Participants' behavior</th>
<th>Total Count (log CFU/g)</th>
<th>p*</th>
<th>Coliform Count (log CFU/g)</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hand Washing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not wash hands</td>
<td>4.35 ± .58</td>
<td>.042</td>
<td>2.96 ± .43</td>
<td>.054</td>
</tr>
<tr>
<td>Water only</td>
<td>4.12 ± .99</td>
<td></td>
<td>2.32 ± .30</td>
<td></td>
</tr>
<tr>
<td>Water and soap</td>
<td>3.57 ± .60</td>
<td></td>
<td>2.18 ± .35</td>
<td></td>
</tr>
<tr>
<td><strong>LT Washing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not wash</td>
<td>4.72 ± 1.15</td>
<td>.029</td>
<td>3.40 ± 1.15</td>
<td>.003</td>
</tr>
<tr>
<td>Wash whole in water</td>
<td>4.19 ± .66</td>
<td></td>
<td>2.93 ± 1.06</td>
<td></td>
</tr>
<tr>
<td>After cutting washing</td>
<td>3.88 ± .75</td>
<td></td>
<td>2.47 ± 1.32</td>
<td></td>
</tr>
<tr>
<td><em>Use of Cutting Surface</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counter/dining table</td>
<td>4.32 ± 1.31</td>
<td>.421</td>
<td>2.92 ± 1.00</td>
<td>.233</td>
</tr>
<tr>
<td>Plate</td>
<td>4.25 ± .73</td>
<td></td>
<td>3.06 ± .84</td>
<td></td>
</tr>
<tr>
<td>Cutting board</td>
<td>4.01 ± .81</td>
<td></td>
<td>2.28 ± 1.44</td>
<td></td>
</tr>
<tr>
<td><em>Washing of Cutting Surface</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not wash</td>
<td>4.61 ± .68</td>
<td>.108</td>
<td>2.97 ± .80</td>
<td>.426</td>
</tr>
<tr>
<td>Wipe it</td>
<td>4.79 ± .76</td>
<td></td>
<td>2.63 ± .18</td>
<td></td>
</tr>
<tr>
<td>Wash with water only</td>
<td>4.05 ± .92</td>
<td></td>
<td>1.24 ± 1.51</td>
<td></td>
</tr>
<tr>
<td>Wash with soap and water</td>
<td>3.96 ± .72</td>
<td></td>
<td>2.64 ± 1.26</td>
<td></td>
</tr>
<tr>
<td><em>Washing of Knife</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not wash</td>
<td>4.25 ± 1.31</td>
<td>.751</td>
<td>2.74 ± 1.58</td>
<td>.871</td>
</tr>
<tr>
<td>Wash with water only</td>
<td>4.17 ± .72</td>
<td></td>
<td>2.49 ± 1.11</td>
<td></td>
</tr>
<tr>
<td>Wash with soap and water</td>
<td>3.93 ± .75</td>
<td></td>
<td>2.36 ± 1.50</td>
<td></td>
</tr>
</tbody>
</table>

* ANCOVA—Total bacterial counts or coliform counts at the retail/baseline level as covariate, total bacterial counts or coliform counts after participant handling as a dependent variable and observed participants' behavior as an independent variable; log CFU/g—Logarithmic colony forming unit per gram

LT sample collected after refrigeration, washing (if done) and cutting

*Observation on washing hands after handling chicken and before handling LT since all participants handled chicken first

*Washing cutting surfaces/knife before using it to cut LT

Research staff showed that 93% of the participants cooked the CB to an adequate temperature (≥ 165° F, or 75°C). The lowest temperature of the cooked CB noted was 150°F, or 65°C.

Comparison between observation and microbiological results

The participants' food-handling behaviors were compared with the total and coliform counts of CB and LT samples. Total bacterial and coliform counts of CB were significantly higher if the participant had used the counter as a cutting surface. Total bacterial count of CB was also significantly higher when the CB was thawed on the counter rather than with other thawing methods (Table 1).

For LT, a difference in total bacterial and coliform count was seen with differences in hand washing. The total and coliform count was significantly higher if hands were not washed before handling LT or after handling 'CB' and before handling LT. A significant difference was also seen by LT washing behavior. The total and coliform counts were significantly higher for unwashed LT (whole or after cutting) than for the washed samples (Table 2).
FIGURE 1. Total coliform counts cross-contamination model for home prepared 'Chicken and Salad'

Cross-contamination model

Correlation analyses, across stages of meal preparation, identified possible routes of cross contamination (Fig. 1). We developed a cross-contamination model based on the sampling protocol and on the observed sequence of meal preparation stages (i.e., all participants handled CB before handling LT). There was a significant positive correlation in coliform count between: (1) the cutting board sample collected before meal preparation and the CB sample taken after participant handling (thawing/cutting/washing (if done)); (2) CB sample after participant handling and cutting board sample taken once it was used to cut the CB; (3) Cutting board sample after its use and LT sample collected after handling (cutting/washing (if done) (Fig. 1). This correlation strongly suggests that during meal preparation there was transfer of coliforms, especially from one food to another.

Presence of tested pathogen genus in food and surface samples

Among the tested pathogens, S. aureus was found most commonly in tested food and surface samples. MacNemar's test results showed that there was no significant decrease in the incidence of S. aureus in any food samples as a result of participants' handling (Table 3).

The incidence of CB Listeria decreased significantly at the household level in relation to the retail level ($P < 0.05$), while it remained almost the same in the LT samples. With regard to kitchen surfaces, 9% of cutting board and knife samples collected after the CB had been cut tested positive for Listeria (Table 3). At the household level, Listeria monocytogenes (L. monocytogenes) was found on 5% of CB, 2% of LT, and 5% of cutting board or counter samples. All the household CB samples that tested positive for L. monocytogenes were also positive at the retail level. The following were the instances in which LT samples were found positive for L. monocytogenes: (1) CB at baseline and after handling by participants; (2) Same cutting board was used to cut CB and LT without washing in between, and; (3) LT was not washed. The cutting board or counter was positive for L. monocytogenes when a positive CB was either cut or kept

---

$r$: Pearson Correlation coefficient

Diagram represents flow of the meal preparation and microbial sample collection protocol; all participants handled vegetables after chicken was cooked or was placed in the oven.

Microbiological sampling Protocol:

*aSamples were taken before participants handled food or started the meal preparation (Cutting board $n = 45$)

*bCutting board sample was taken immediately after it was used to cut chicken; sample taken only if participant used same cutting board to cut lettuce and tomatoes, $n = 37$
TABLE 3. Presence of tested pathogenic genus in food and food preparation surfaces at different stages of meal preparation

<table>
<thead>
<tr>
<th>Pathogens</th>
<th>Chicken Breasts (CB)</th>
<th>Lettuce/Tomatoes (LT)</th>
<th>Refrigerator/Freezer</th>
<th>Counter</th>
<th>Cutting Board</th>
<th>Knife</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>BE</td>
<td>AF</td>
<td>n</td>
<td>BE</td>
<td>AF</td>
</tr>
<tr>
<td>Salmonella</td>
<td>60</td>
<td>8</td>
<td>5</td>
<td>60</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Campylobacter</td>
<td>7</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Listeria</td>
<td>28</td>
<td>10</td>
<td>8</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

**MacNemar's test: significant decrease in incidence of Listeria genus was seen at the household level**

Note: MacNemar's test was conducted for all the food and surface samples; however, only significant results are reported.

For Food Samples – BE: at retail level; AF: after participant handling.

For Surface Samples – BE: before meal preparation; AF: after first use or after cutting CB.

*Counter sample was taken if cutting board was not seen and if there was an empty surface on the kitchen counter, n = 48.

*Counter sample taken was analyzed if same surface used to cut CB and LT, n = 5.

*45 participants used cutting board to cut CB or LT.

*Cutting board sample taken was analyzed if same cutting board was used to cut CB and LT, n = 37.

*Knife sample taken was analyzed only if same knife was used to cut CB and LT.

The application of HACCP principles at the household level based on microbiological indicators and direct observation was useful in understanding the impact of various food handling practices. In this study, the following stages of meal preparation were identified as CCPs: (1) CB thawing; (2) Cutting CB; (3) Hand washing after handling CB and before handling LT; and (4) Washing of LT or fresh produce. Consistent with our findings, previous studies conducted in developing countries have identified washing practices of hands and cooking containers as CCPs (4, 5, 9, 15, 22). However, contrary to the findings of previous studies, in our study, which as far as we know is the first one examining CCPs in low-income United States households, the food safety risk factors were associated not with lack of key amenities (e.g., refrigerator, cooking devices) but perhaps with lack of knowledge or negative attitudes toward food safety risks.

Our cross-contamination model showed that inadequate washing of hands and cutting surfaces increases the risk of cross contamination. Similar to the results of the study conducted by Gorman et al. (10), pathogenic species found on the CB were also recovered from the refrigerator/freezer handles at the end of meal preparation. This shows that the risk of cross contamination may extend to meals prepared later. The previous observational study in this community (2) found that using a counter to cut food items and inadequate washing of cutting surface were common practices. Most of the participants cooked the CB adequately; however, universal lack of thermometer use indicates that consumers are not benefiting from the use of this tool.

Results also showed that the populations of coliforms and tested pathogenic species increased more on the unwashed than on washed fresh produce. Thus, the washing practice at the household level may not avoid but can at least reduce the risk of foodborne illness that occurs with use of ready-to-eat vegetables. Hence, in addition to the recommendations provided by Medeiros et al. (14), this study also identifies as a priority the need for consumer education regarding the
proper washing of fresh produce before consumption.

Comparison of this study's results with those of consumer food safety surveys shows that there is a wide gap between self-reported and observed practices (8). The results of consumer food safety surveys show that hand washing with soap and water is a common practice (>50%) (21). In our previous food safety knowledge, attitudes and behavior (KAB) survey in the target community, the majority (97%) reported washing hands with soap and water before cooking (7). In contrast, in this study only 25% were observed washing hands adequately (soap and water). In a food safety survey by Wenrich et al., participants were asked to report food safety practices in a range from 1 as 'Never' to 4 as 'Always' (23). Results showed that the practice of washing cutting board/plate with soap and water between uses was more frequently performed (Mean: 3.6 + 0.8) than other food safety practices. Inter and intra comparisons of food safety studies by Redmond et al. identified inconsistencies between food safety knowledge, attitudes and behaviors. Indeed, there were two to three fold differences between food safety knowledge and reported food safety practices (21).

Besides identifying the CCPs, this study opens the path for developing and testing educational materials targeting the consumers' microenvironment through the formulation of recipes with instructions on CCPs. Future studies should involve designing and testing recipes with adequate food safety information for the consumer. Substantial differences between reported and observed food safety practices indicate the need for home-based observational studies to estimate the true food safety risks at the household level, which are likely to have been strongly underestimated thus far.

ACKNOWLEDGMENTS

This study was a collaboration between the University of Connecticut’s Department of Nutritional Sciences, Animal Science and the Hispanic Health Council, in Hartford, Connecticut. This study was funded through a grant awarded to Dr. Rafael Pérez-Escamilla by the U.S. Department of Agriculture Integrated Research, Education, and Extension Com-
Now Available

2007 Revision of Procedures to Investigate Foodborne Illness

The Committee on the Control of Foodborne Illness has completed revisions to Procedures to Investigate Foodborne Illness, with the inclusion of intentional contamination issues. The revised Fifth Edition booklet is available to purchase online at www.foodprotection.org or by calling the IAFP office.


Gale Prince Retires
After 40 Years

Thanks...

After 40 years in the retail food industry, I have decided to retire at the end of July. The day that I was given the assignment for product safety at Jewel Companies in 1967, I can't say I recognized that I was a pioneer in the area of retail product safety. I look back at the past 40 years with special pride and joy. I am indebted to The Kroger Co. for giving me the opportunity and support over the past 28 years to practice my profession and love for food safety. Working for a top company like Kroger has also given me the privilege of getting to know many of the best and brightest in food safety – ranging from dedicated public servants in government agencies to talented staff in industry associations to hard working colleagues in private industry and the researchers in academia who have provided us with the science.

My greatest regret about retirement is leaving these wonderful people who have been so much more than just colleagues and friends over our many years of working together. Your dedication and hard work have always inspired me to live up to your examples. Together, I think we made a real difference in food safety programs in this country and beyond and most importantly for the benefit of the consumer. I struggle to find words that can express how much I appreciate all you have done to help me over the years. I will forever be in debt for that help and guidance.

Thank you for your support over these 40 years and for allowing me to be a part of your life. Thanks for your support of IAFP and the IAFP Foundation as this organization is key to meeting food safety challenges not only today but also in the future.

Gale Prince
Director of Regulatory Affairs
The Kroger Co.
1014 Vine Street
Cincinnati, OH 45202
### NEW MEMBERS

#### BRAZIL
- Jacques E. Dieu  
  Gehaka Ltd.  
  São Paulo
- Christian C. Kaufmann  
  Gehaka Ltd.  
  São Paulo
- Renato Santos  
  Jacareí, São Paulo

#### CANADA
- Michael Bernardo  
  Cargill Foods  
  High River, Alberta
- Elsie M. Friesen  
  Fraser Health Authority  
  Hope, British Columbia
- Martin Galan  
  Canadian Contract Cleaning Specialists  
  Calgary, Alberta
- Amardeep S. Kambo  
  Fraser Health Authority  
  Surrey, British Columbia
- Mia Desiree M. Lumitao  
  Fraser Health Authority  
  Abbotsford, British Columbia
- Timothy Millard  
  Fraser Health Authority  
  Surrey, British Columbia
- Elizabeth Postnikoff  
  Fraser Health Authority  
  Chilliwack, British Columbia
- Michele D. Radnidge  
  Richmond Health Dept.  
  Richmond, British Columbia
- Susan Schleicher  
  Fraser Health Authority  
  Abbotsford, British Columbia

#### CHINA
- Oonagh Tyson  
  Fraser Health Authority  
  Port Moody, British Columbia
- Baoyan Wang  
  Lilydale Inc.  
  Edmonton, Alberta
- Chengchu Liu  
  Agricultural Resource Management  
  Shanghai

#### GERMANY
- Ciaran Conway  
  Kraft Foods  
  Munich
- Walther H. Heeschen  
  University of Kiel  
  Kiel
- Jan W. Kretzer  
  Profos AG  
  Regensburg, Bavaria

#### GREECE
- Panagiotis Georgakopoulos  
  Agricultural University of Athens Botanikos, Athens
- Antonia S. Goundaki  
  Agricultural University of Athens Kallithea, Athens
- Stavros G. Manios  
  Agricultural University of Athens Athens

#### IRELAND
- Cathriona M. O’Neill  
  Bord Iascaigh Mhara Dun Laoghaire, Co. Dublin

#### JAPAN
- Hidemi Izumi  
  Kinki University  
  Kinokawa, Wakayama

#### NEW ZEALAND
- Scott K. Crerar  
  New Zealand Food Safety Authority  
  Wellington

#### PORTUGAL
- Oscar L. S. Ramos  
  Escola Superior De Biotecnologia  
  Sandim, Porto

#### SOUTH KOREA
- Hyunho Jin  
  Namyangju-si  
  Gyeonggi-do
- Minsoo Jung  
  Seoul Weiseo Inc  
  Seoul
- Yun-Ji Kim  
  Korea Food Research Institute  
  Seongnan-si, Kyunggi-do
- Yong Suk Nam  
  Kogene Biotech Co., LTD  
  Geumcheon-gu, Seoul

#### SPAIN
- Itziar Olea  
  Oxoid S.A.  
  Madrid

#### UNITED KINGDOM
- Nancy Acosta  
  University of Birmingham  
  Birmingham
NEW MEMBERS

ROY BETTS
Campden & Chorleywood Food Research Association
Gloucestershire

CHERYL M. MOONEY
Oxoid
Basingstoke, Hants

UNITED STATES

ALABAMA
Jessica C. Butler
Auburn University
Auburn

Dena Roberts
Alabama A&M University
Huntsville

ARIZONA
Tom Dominick
Bashas’, Inc.
Chandler

COLORADO
Jeremy Adler
Colorado State University
Ault

DELAWARE
Barbara Robleto
DuPont Wilmington

DISTRICT OF COLUMBIA
Steve Germani
DuPont Qualicon
Wilmington

CALIFORNIA
Troy Bonata
Jack in the Box Inc.
San Diego

Nadia Bybee
VNL RUS Inc.
Long Beach

COLORADO
Jeremy Adler
Colorado State University
Ault

Chee Xiong
BSK Food & Dairy Laboratories
Fresno

Arkansas
David J. Harris
Simmons Foods, Inc.
Siloam Springs

COLORADO
Brenda L. Brown
GuaranTek Analytical Laboratories
Denver

Delaware
Barbara Robleto
DuPont-Wilmington

DISTRICT OF COLUMBIA
Shivani Gupta
Fort Collins

FLORIDA
Joanne M. Cook
Florida Department of Agriculture
& Consumer Services
Tallahassee

Alfred Malak
Ocean Mist Farms
Castroville

Michael Menes
BSK Food & Dairy Laboratories
Fresno

JULY 2007 | FOOD PROTECTION TRENDS 555

Maria De Lurdes
Campi
Miami Beach

Michael Menes
BSK Food & Dairy Laboratories
Fresno

COLORADO
Brenda L. Brown
GuaranTek Analytical Laboratories
Denver

Shivani Gupta
Fort Collins

Florida
Joanne M. Cook
Florida Department of Agriculture
& Consumer Services
Tallahassee

Arkansas
David J. Harris
Simmons Foods, Inc.
Siloam Springs

Shivani Gupta
Fort Collins

COLORADO
Brenda L. Brown
GuaranTek Analytical Laboratories
Denver

Janet Butler
Auburn University
Auburn

Florida
Joanne M. Cook
Florida Department of Agriculture
& Consumer Services
Tallahassee

Arkansas
David J. Harris
Simmons Foods, Inc.
Siloam Springs

FLORIDA
Joanne M. Cook
Florida Department of Agriculture
& Consumer Services
Tallahassee

Arkansas
David J. Harris
Simmons Foods, Inc.
Siloam Springs

Georgia
Margaret D. Livesay
Rich Products Corporation
St. Simmons Island

ALABAMA
Jessica C. Butler
Auburn University
Auburn

Dena Roberts
Alabama A&M University
Huntsville

ARIZONA
Tom Dominick
Bashas’, Inc.
Chandler

COLORADO
Jeremy Adler
Colorado State University
Ault

DELAWARE
Barbara Robleto
DuPont-Wilmington

DISTRICT OF COLUMBIA
Steve Germani
DuPont Qualicon
Wilmington

CALIFORNIA
Troy Bonata
Jack in the Box Inc.
San Diego

Nadia Bybee
VNL RUS Inc.
Long Beach

COLORADO
Brenda L. Brown
GuaranTek Analytical Laboratories
Denver

Delaware
Barbara Robleto
DuPont-Wilmington

DISTRICT OF COLUMBIA
Shivani Gupta
Fort Collins

FLORIDA
Joanne M. Cook
Florida Department of Agriculture
& Consumer Services
Tallahassee

Alfred Malak
Ocean Mist Farms
Castroville

Michael Menes
BSK Food & Dairy Laboratories
Fresno

COLORADO
Brenda L. Brown
GuaranTek Analytical Laboratories
Denver

Shivani Gupta
Fort Collins

Florida
Joanne M. Cook
Florida Department of Agriculture
& Consumer Services
Tallahassee

Arkansas
David J. Harris
Simmons Foods, Inc.
Siloam Springs

FLORIDA
Joanne M. Cook
Florida Department of Agriculture
& Consumer Services
Tallahassee

Arkansas
David J. Harris
Simmons Foods, Inc.
Siloam Springs

GEORGIA
Margaret D. Livesay
Rich Products Corporation
St. Simmons Island
# NEW MEMBERS

**ILLINOIS**
- Fadwa Al-Taheer
  - National Center for Food Safety Technology
  - Summit-Argo
- Ramamoorthi Lakshmanan
  - University of Illinois at Urbana-Champaign
  - Urbana
- Howard O. Popoola
  - US Foodservice
  - Rosemont

**INDIANA**
- Kiev S. Gracias
  - Ball State University
  - Muncie

**IOWA**
- Lisa Pool
  - New Hampton
- Carmily N. Stone
  - Iowa Department of Public Health
  - Des Moines

**KANSAS**
- Launa D. Osbourn
  - Johnson County Environmental Dept.
  - Olathe

**LOUISIANA**
- Amrish S. Chawla
  - Louisiana State University
  - Baton Rouge
- Catherine L. Viator
  - RTI International
  - Houma

**MARYLAND**
- Alice E. Hayford
  - ORISE-FDA
  - Laurel

**MICHIGAN**
- Jake Knickerbocker
  - Neogen Corporation
  - Lansing
- Laima Z. Dingley
  - City of Bloomington
  - Bloomington

**MINNESOTA**
- John A. Hoffman
  - The Solae Company, LLC
  - St. Louis
- Virginia D. Shortridge
  - bioMérieux, Inc.
  - Hazelwood
- Steve L. Sikes
  - Jefferson County Health Dept.
  - Hillsboro

**MISSOURI**
- Ace F. VanDeWalle
  - University of Nebraska-Lincoln
  - Lincoln

**NEBRASKA**
- Joe Lally
  - Degussa Corporation
  - Parsippany

**NEW JERSEY**
- Paphapat Ungkuraphinunt
  - North Carolina State University
  - Raleigh

**NEW MEXICO**
- Joseph Beckel
  - Sears Holdings
  - Lewis Center

**NEW YORK**
- Scott M. Kruger
  - Benton County
  - Corvallis

**PENNSYLVANIA**
- Julie Pettit
  - Giuseppe’s Finer Foods
  - Du Bois
- Mark N. Sampson
  - Sterilox Food Safety
  - Malvern

**TEXAS**
- Shane Calhoun
  - Pilgrim’s Pride
  - Pittsburgh
- Travis D. Holmes
  - Surlean Foods
  - San Antonio
- Laura L. Lemons
  - Texas Tech University
  - Lubbock
- Corri L. Rekow
  - Texas Tech University
  - Lubbock
- Colista A. Yates
  - Carlson Restaurants Worldwide
  - Carrollton

**VIRGINIA**
- Jacqulyn F. Poon
  - Performance Food Group
  - Richmond

**WASHINGTON**
- Karla Celada
  - BioControl Systems, Inc.
  - Bellevue
- Andrea Johnson-Ross
  - BioControl Systems, Inc.
  - Bellevue

---

**NEW SILVER SUSTAINING MEMBER**

**Mary C. Nowinski**
- BSI Management Systems
- Reston, Virginia
Sargento Promotes Three in Consumer Products Division

Sargento Foods Inc. has announced three promotions in the consumer products division to help position the family-owned company for sustained long-term growth.

Steve Foerstner, Ed Finnie and Brad Deckard have been promoted to divisional sales managers and will report to John Bottomley, director of sales for Sargento.

"The changes will enable us to capitalize on the strengths and skill sets of our sales team," said Louie Gentine, president of the consumer products division at Sargento. "It also allows us to continue to meet the needs of our customers with a greater focus on national accounts."

Mr. Foerstner has been elevated to divisional sales manager in the Midwest region. Since joining Sargento in 1991, the resident of Westlake, OH has held the following positions — national accounts sales manager and national customer business manager. The married father of three earned a bachelor’s degree in marketing from Xavier University.

Mr. Finnie has been promoted to divisional sales manager for the Northeast and Eastern Great Lakes regions. Previously, Mr. Finnie has held the positions of regional sales manager — Boston, national accounts sales manager and national customer business manager. Mr. Finnie earned his bachelor’s degree in marketing from Western New England College.

Mr. Deckard will now assume the role of divisional sales manager, and is responsible for sales management of the Southeastern region.

Prior to this move, he held the title of national customer business manager. Mr. Deckard earned a bachelor’s degree in advertising from the University of Florida. He also holds a master’s degree in business administration from Florida Metropolitan University.

Food Safety 'Icon' New Chair of Food Safety Information Council

Dr. Michael Eyles is the new chair of the Food Safety Information Council.

In announcing Dr. Eyles’ election to the position, immediate past council chair, Professor Tom McMeekin, of the University of Tasmania’s Australian Food Safety Centre of Excellence, said: "It is a coup to have a scientist, administrator and a person of Michael’s calibre to take on the role of leading the Council into its second decade."

"Michael is an icon in the food-safety world both through his outstanding scientific contribution and his ability to translate his and others’ findings into messages easily adaptable to the food industry, as well as the home kitchen," he said.

The Food Safety Information Council’s charter is to promote key food safety messages to consumers in order to counteract the 5.4 million cases of foodborne disease suffered in Australia each year.

Dr. Eyles is currently director, leadership and cross-organization development with CSIRO. Previous CSIRO positions have included group executive for agribusiness and health, chief executive of Food Science Australia, and chief of the division of food science and technology.

He is a fellow of the Australian Academy of Technological Sciences and Engineering, the Australian Society for Microbiology, and the Australian Institute of Food Science and Technology.

Professor McMeekin said, "Michael’s scientific credentials are outstanding, as is his experience in improving the quality of Australia’s food products and responding to new and emerging threats to food safety which began when he did his Ph.D. in the early ’70s on viruses in oysters following a large Norovirus outbreak in Sydney. His later research in food microbiology ranged from trouble-shooting food industry problems, to investigations into growth of bacteria in vacuum packed foods."

"Added to this is his approach to leadership which is underpinned by a belief in the importance of teams and partnerships within the scientific community and strong engagement with its stakeholders."

"His promotion of food safety has included a range of innovations including as a member of the Australian Institute of Food Science and Technology’s Food Microbiology Group, devising courses in food hygiene for retailers and restaurateurs in local councils. These were the first attempts in Australia, outside of TAFE colleges, to train such people in food hygiene. Later, he was a key player in the production of a video kit called ‘Don’t Poison Your Patrons’ targeted at the restaurant industry — again a breakthrough activity."

"He will be a tremendous asset to the Food Safety Information Council," Professor McMeekin said.
**FMI Appoints Christina Kelly to the SQF Institute Team**

Christina Kelly will be responsible for the technical aspects of the SQF Program, which will include supporting the SQFI Technical Committees, servicing and supporting SQF Training Centers and Certification Bodies, overseeing the registration of SQF Auditors and Consultants, and coordinating reviews of all SQF training courses and other program documents.

Ms. Kelly comes to us from Kellogg's and prior to that Tyson Foods, Inc. She has had extensive experience in the development of prerequisite and HACCP-based food safety programs for a wide range of product types.

**Dr. Trevor Ames Appointed Interim Dean at University of Minnesota College of Veterinary Medicine**

Dr. Trevor R. Ames has been appointed interim dean of the University of Minnesota College of Veterinary Medicine by Dr. Frank Cerra, senior vice president for health sciences, effective June 18. Dr. Ames will take over for Dr. Jeffrey S. Klausner, who has resigned to become president and chief executive officer of the Animal Medical Center in New York City.

Dr. Ames joined the college faculty in 1981 and has been the chair of Veterinary Population Medicine Department for the past 10 years. A diplomate of the American College of Veterinary Internal Medicine, Dr. Ames received his D.V.M. in 1978 from the Western College of Veterinary Medicine at the University of Saskatchewan and his master of science degree in 1981 from the University of Minnesota. His research interests include infectious diseases of horses and cattle, bovine respiratory disease complex, and equine and bovine vaccines. His clinical interests include large animal internal medicine diseases, and his teaching responsibilities include lectures in virology, large animal multisystemic diseases, and large animal respiratory diseases.

“Interim Dean Ames will provide outstanding leadership for the College as it pursues its strategic goals and directions and is a proven leader in veterinary medicine,” said Dr. Cerra. He will serve us well in representing the college inside and outside the University.

During his tenure as interim dean, Dr. Ames will serve with all the rights, privileges, responsibilities, and authority of the permanent dean. He will serve in this position for nine to twelve months until a permanent dean has been appointed and begun work. Interim Dean Ames will be eligible to be considered for the permanent dean position.

**Nilfisk-Advance America Promotes Kim Kanis to Eastern Region Sales Manager**

Nilfisk-Advance America, has promoted district manager Kim Kanis to Eastern region sales manager. In his new position, Ms. Kanis will be responsible for the management of nine Eastern Region District Sales Managers and all sales and business development activities within the Eastern Region of the United States.

Prior to this promotion, Ms. Kanis served as district sales manager for New York and New Jersey, where for 7 years she oversaw direct sales to a variety of dust-sensitive industries, including many pharmaceutical industry leaders such as OrthoVita and Bristol-Meyers Squib.

During his time at Nilfisk-Advance America, Ms. Kanis has been recognized for his many accomplishments and is the recipient of the Million Dollar Year Award and the Salesman of the Year Award.

**Kaye Tillman Trains for Computerway Food Systems**

Kaye Tillman has been promoted to project management and training at Computerway Food Systems.

In her role, she uses her extensive computer systems experience and skill as a trainer while assisting with project management. Most recently, Ms. Tillman headed up a major customer implementation of the Computerway R5z system in Texas. She now is heading up implementation of the new Computerway Process Management application at a customer site in North Carolina.

Ms. Tillman works closely with the CFS Help Desk in troubleshooting. She also works closely with CFS programmers on new developments and is actively involved in maintaining documentation for all Computerway system manuals.
No Crumbine Award Winner for 2007

For the fourth time in its fifty-two year history, a jury of leading environmental health officials and public health sanitarians has decided not to select a recipient for the 2007 Samuel J. Crumbine Consumer Protection Award.

The Crumbine Award, named for one of the most renowned public health sanitarians, is usually presented each year to a local public health unit that demonstrates excellence in food protection. Crumbine winners serve as models for other public health and safety programs across the nation. Among environmental and public health circles, the Crumbine Award is the most prestigious recognition that a public health unit can receive.

"The jury was faced with a very difficult decision this year," said Tony Hiller, senior consumer health specialist at the Fort Worth Public Health Dept., Consumer Health Division, and chair of the 2007 Crumbine Jury. "We only received one application this year and felt that while it was a good program, it did not meet — or exceed — the four key criteria required of a Crumbine Award winner. We concluded that the integrity of the award would be better served if no recipient was chosen this year."

Trevor Hayes, executive director of the Conference for Food Protection and one of the sponsors of the Crumbine Award, explained that the lone application was not the problem — applications are not judged against each other but against the criteria. "For several years, the number of applications has decreased. We will take this opportunity to make changes to the criteria and increase our outreach to local public health units."

New Food Imports Program for New Zealand

Government this week approved the release of information on the New Zealand Food Safety Authority's (NZFSA) new imported food program.

The new program will be implemented over the next two years and brings the process of importing food more into line with the proposed new domestic food regime. The changes, which will give consumers more assurance about the food they are eating, follow on from an extensive review into New Zealand's food and food-related products' importing system. That review recommended NZFSA update controls on imported foods.

Since then, NZFSA has been developing options and working with representatives from the importing industry to design the new imports program.

The principles of the new program's design are to manage risks at the appropriate point in the food chain, to be flexible, and to ensure adequate, scientific-based controls on imported food and food related products.

The new imports program will group foods into one of three levels of regulatory interest, each of which will have differing import requirements related to the product's potential risk.

Part of the new Food Bill being developed as a response to the Domestic Food Review will include requirements relating to imports. Importers will need to comply with general obligations as well as specific requirements applying to higher risk foods, register with NZFSA, keep records and, on request, report this information to NZFSA.

It is expected that importers will use some of the same tools, such as Food Control Plans, proposed for local food operators under the new Bill. Local operators who also import foods will be able to cover both their domestic and importing operations under one Food Control Plan.

Once implemented, the new imports program will provide greater confidence that imported food is safe and suitable, and complies with the relevant standards.

Joint FAO/WHO Project to Assess the Benefits and Risks of the Use of “Active Chlorine” in Food Production and Food Processing

The Codex Alimentarius Commission has requested FAO and WHO for scientific advice on the assessment of the benefits and risks of the use of “active chlorine” in food production and food processing. The advice will be elaborated through the implementation of an expert meeting during 2007. At WHO, the Departments of Food Safety, Foodborne Diseases and Zoonoses; and of Public Health and the Environment are collaborating on this project, together with the FAO Departments of Agriculture and Consumer Protection, Fisheries and Aquaculture.
The main goals of this project are to consider the risk of chemical residues in products (excluding environmental impact), following the use of active chlorine for disinfection purposes in food production versus the benefit of lowering the risk of microbial hazards. The efficacy of active chlorine treatment needs to be considered, taking into account different treatment scenarios, different chlorine-containing substances and different pathogens and pathogen/food combinations. These considerations need to be based on current practices, as well as take into account proposed new practices, including the relevance and feasibility of potential alternative approaches.

The term 'active chlorine' as it is used here includes aqueous solutions of hypochlorous acid and its conjugate base, hypochlorite ion, chlorous acid and its conjugate base, chlorite ion, chlorine gas or chlorine dioxide. Chloramine and dichloroisocyanurate may be included if of relevance in the food processing industry. Although technically not fully correct, this term 'active chlorine' is used throughout for ease of reference.

The main areas to be considered relate to the treatment of irrigation water (only as it relates to hydroponic production systems and production of sprouts but not for agricultural field use), processing water, food-contact surfaces as well as direct treatment of foods, with fresh produce, fish and seafood, meat and poultry as main food categories.

The effects of various treatments on the nutritional components of foods as well as organoleptic and quality changes will be reviewed.

The impact of the use of active chlorine in the different steps in the food chain, in accordance with nationally authorized practices, in the control of microbiological hazards will be considered as well as the level of chemical residues in or on the foods.

The work that has been carried out at international level in the framework of WHO Drinking-water Quality Guidelines will be taken into account. Previous evaluations by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) and by the Joint FAO/WHO Expert Meeting on Microbial Risk Assessment (JEMRA) will also be considered.

FMI Consumer Trends 2007: Confidence in Food Safety Down, Energy Costs Changing How People Shop

Foodborne illness outbreaks and high energy costs are significantly changing consumer shopping behavior and attitudes, according to the Food Marketing Institute (FMI) U.S. Grocery Shopper Trends, 2007. The number of consumers “completely” or “somewhat confident” in the safety of supermarket food declined from 82 percent in 2006 to 66 percent — the lowest point since 1989 when the issues of pesticides in apples and contaminated grapes were widely reported. Consumer confidence in restaurant food is even lower at 43 percent. “These findings send a strong message to the entire food industry,” said FMI President and CEO Tim Hammonds. “All of us need to work together to be sure our consumers continue to receive the high quality, affordable food they have every right to expect.”

The Trends survey found that safety concerns prompted 38 percent of consumers to stop purchasing certain foods in the past 12 months — up from 9 percent in 2006. Among those who stopped buying products, the items most often mentioned were spinach (71 percent), lettuce (16 percent), bagged salad (9 percent) and beef (8 percent). The survey was conducted in January 2007, when the outbreak linked to spinach was still in the news and illnesses associated with other foods were starting to make headlines. In fact, the impact extends beyond shopping to cooking and dining. For example, consumers:

- Cook more and eat out less, cited by 69 percent of those surveyed.
- Eat more leftovers or use leftovers to make other meals, 62 percent.
- Purchase more grocery store brand items as opposed to national brand items, 56 percent.
- Purchase fewer food items overall, 40 percent.
- Buy more canned, frozen or boxed food as opposed to fresh food, 30 percent.
- Purchase more prepared meals from the grocery store rather than going out, 21 percent.

Prevention of Foodborne Disease: Five Keys to Safer Food

Each day millions of people become ill and thousands die from a preventable foodborne disease. Proper food preparation can prevent many foodborne diseases. WHO has developed a global food hygiene message with five key steps that promote health, the Five Keys to Safer Food.

The Five Keys to safer food

- Keep clean
- Separate raw and cooked
- Cook thoroughly
Keep food at safe temperatures
Use safe water and raw materials

Five Keys to safer food poster:
- Introduced in 2001, the poster is made of simple headings, specific suggestions for improvement and reasons behind the suggested measures. Now available in more than 40 languages.

Five Keys to safer food manual:
- The manual elaborates the food safety information provided in the WHO Five Keys to safety food poster and suggest ways to communicate the message.

Implementation of the Five Keys:
- WHO has long been aware of the need to educate all food handlers, including professionals and ordinary consumers, about their responsibility for food safety. After nearly a year of consultations with food safety experts and risk communicators, WHO introduced in 2001 the Five Keys, simple rules elaborated to promote safer food handling and preparation practices.
- WHO actively promotes the adaptation of the Five Keys food hygiene message to the local level. Educational projects for high-risk groups, including children and women and others involved in food preparation and handling, such as street-food vendors, are being implemented at the local level in countries.
- WHO adapted the Five Keys messages to specifically address the health concerns associated with handling and preparation of poultry and poultry products potentially infected with highly pathogenic Avian influenza (HPIQ) virus and also to healthy market settings.

WHO continues to seek partners and collaborators to continue this important work.

WHO already collaborates with a wide range of partners in different fields of activities (national and international organizations, NGOs, public health institutions, the tourism sector, consumers associations, local communities, industries and academia). However, lowering the burden of foodborne disease requires a renewed effort on the part of governments, scientists, food industry and consumers. WHO offers materials, expertise, technical support and the credibility of an internally recognized public health organization.

Individuals and groups interested in working with WHO to disseminate this important food hygiene message should contact Françoise Fontannaz: fontannazf@who.int. For regional food safety contacts please go to our contact us page.

Who Has Time to Cook? How Family Resources Influence Food Preparation

Households participating in the Food Stamp Program are increasingly headed by a single parent or two working parents. As this trend continues, more low-income households may find it difficult to allocate the time needed to prepare meals that fit within a limited budget and meet dietary requirements. Using Tobit analysis of the 2003–04 American Time Use Survey (ATUS), this study finds that household time resources significantly affect how much time is allocated to preparing food. In fact, working full-time and being a single parent appear to have a larger impact on time allocated to food preparation than an individual's earnings or household income do. The results are relevant for the design of food assistance programs as well as for improving our understanding of how different family time resources affect consumption behavior. The entire report can be found at http://www.ers.usda.gov/publications/ERR40/err40.pdf.

Herpes Infection May Be Symbiotic, Help Beat Back Some Bacteria

Mice with chronic herpes virus infections can better resist the bacterium that causes plague and a bacterium that causes one kind of food poisoning, researchers report in this week's Nature.

Scientists at Washington University School of Medicine in St. Louis attributed the surprising finding to changes in the immune system triggered by the long-term presence of a latent herpes virus infection. In latent viral infections, the virus is present for the lifetime of the host in a relatively quiescent form that does not cause overt symptoms.

While presenting their results, researchers stressed that they did not want to minimize or in any way disregard the human suffering and health risks caused by disease-causing herpes infections. But they noted that several strains of herpes viruses found in much of the human population remain symptom-free throughout the host's lifetime.

"Our results suggest that we should look at whether humans receive similar advantages from these and other chronic infections that do not cause active disease," says senior author Herbert W. "Skip" Virgin, M.D., Ph.D., head of the...
Department of Pathology and Immunology. "If so, that has public health implications because we would want to very carefully weigh the risks and benefits of eliminating a virus that our bodies have established a symbiotic relationship with."

Scientists previously used vaccination to eliminate the deadly and highly contagious smallpox virus. Vaccines are currently in use or in clinical trials for several disease-causing strains of herpes.

Human herpes viruses include oral and genital herpes, the chickenpox virus, cytomegalovirus, Epstein-Barr virus and Kaposi’s sarcoma-associated herpes virus. During an initial period of acute infection, many of these viruses cause symptoms, such as fever, cold sores or blisters. They then enter periods of latency. Sometimes symptoms never recur; sometimes they flare up periodically before becoming quiescent again. In addition, less infamous herpes viruses like HHV6 and HHV7 permanently infect most humans without ever producing any significant symptoms.

The results have potentially wide-reaching implications for immune research. Humans and other mammals have spent millions of years living and evolving with latent viral infections, Dr. Virgin notes, and the new results imply that infections may have altered our immune systems at a fundamental level. This could mean the virus-free animal models scientists use to study vaccines, autoimmune diseases, and other immune system issues have the potential to produce misleading results.

“Chronic virus infections may in part define what a normal human immune response is,” says Dr. Virgin, who is the Edward Mallinckrodt Professor of Pathology and Immunology. “We may need to think about that as we consider the implications animal model results hold for human diseases.”

Scientists have recognized for years that many types of bacteria and other microorganisms live in the human gut to the advantage of both the microbes and their human hosts. The results from Dr. Virgin’s lab are among the first to suggest the potential for symbiotic benefits from viral infections that live in areas beyond epithelial surfaces like the skin, throat or intestines.

For the new research, Dr. Virgin’s group worked with strains of mouse herpes virus closely related to human Epstein-Barr virus, Kaposi’s sarcoma-associated herpes virus and cytomegalovirus. During studies of how mouse herpes viruses transition from acute to latent infections, Dr. Virgin made a discovery that piqued his interest in the possibility that latent infections might confer unrecognized benefits.

“We found evidence that the mouse immune system controls latent herpes infections in part by increasing production of a protein hormone called interferon gamma,” Dr. Virgin says. “This is a signaling hormone that in effect puts some immune system soldiers on yellow alert, causing them to patrol for invaders with their eyes wide open and defense weapons ready.”

www.foodprotection.org
Eriez Magnetics introduces its ProGrade™ series of Magnetic Separators. The ProGrade line features high quality magnetic plates, grates, traps and tubes that are expertly designed and affordably priced for sanitary applications in the food, pharmaceutical and chemical industries.

“By embracing a singular brand for this range of products, consumers can better understand where the brand fits in the market. Additionally, utilizing the ProGrade brand enables Eriez to establish a new price position in the commodity end of the market by offering superior products at a low-end price,” explains Charlie Ingram, Eriez’ vice president of sales and marketing.

The ProGrade line includes professional grade magnets and assemblies at three different degrees of magnetic strength, allowing customers to choose the level of protection that is right for their particular application.

ProGrade Rare Earth series is designed for sanitary-grade assemblies. These products prevent contamination and tramp metal damage. Assemblies are designed with demanding attention to welds and finish and feature stainless steel construction and high power magnets.

ProGrade Xtreme™ series is designed for pharmaceutical-grade assemblies. These products offer the ultimate in process purity, the finest materials and construction techniques and the industry’s most powerful magnetic circuits.

Eriez Magnetics
888.300.ERIEZ
Erie, PA
www.eriez.com

IDEXX Supports US Beef Industry with a BSE/Mad Cow Testing Solution

IDEXX Laboratories, Inc. announced that it is prepared to support the country’s meatpackers in response to a recent federal court decision that could change meat industry BSE-testing protocols. On March 26, 2007, the US District Court for the District of Columbia ruled that the United States Department of Agriculture (USDA) does not have authority to regulate testing for bovine spongiform encephalopathy (BSE, or mad cow disease). The USDA had until June 1 to appeal the ruling.

IDEXX Laboratories is working with industry leaders to determine the potential impact of this ruling.

“If the ruling stands, US meat processors will have the option of testing in private laboratories, and we want to make sure they’re aware of the testing options available to them,” said IDEXX Corporate Vice President Quentin Tonelli, Ph.D. “IDEXX has been working to provide the US livestock industry with high-quality diagnostic products for many years. Our BSE-testing method, used worldwide for identifying at-risk cattle, will provide an important solution for US meatpackers if the ruling stands.”

IDEXX is prepared to support a potential increase in US BSE testing with its IDEXX HerdChek® BSE Antigen Test Kit. IDEXX can provide the kits, equipment and technical support required to establish a private laboratory capable of meeting the throughput needs of any customer. “This test is the fastest growing BSE test in the world,” said Tom Mikulka, director of production animal commercial operations, Americas. “In Europe, the IDEXX test has been used with millions of cattle. The largest BSE lab in Europe — running over 300,000 tests per year — selected the IDEXX BSE kit because of its ease of use and speed to results, and IDEXX’s quality of service.”

The IDEXX BSE test takes less than two and one-half hours from sample preparation to result, making it the fastest USDA-licensed kit available. This is an important advantage when speed and accuracy of results are critical for smooth operations in packing facilities.

IDEXX Laboratories, Inc.
800.548.9997
Westbrook, ME
www.idexx.com
E-Control Systems Inc. releases its new Software Development Kit (SDK) for its IntelliProbe™ Wireless Temperature Probe at the National Restaurant Association (NRA) show in Chicago, IL.

The SDK allows easy customization of the IntelliProbe™ for your own applications. The SDK utilizes Microsoft.NET Compact Framework and is immediately available.

The IntelliProbe™, E-Control Systems' new Bluetooth Wireless Temperature Probe, is the only completely wireless temperature logging solution on the market. The IntelliProbe™ is a wireless Bluetooth® temperature acquisition device designed for applications requiring quick and accurate temperature recording. It features a Bluetooth 2.0 radio with support for Serial Port Profiles (SPP) and a 12 bit A/D converter for accurate measurements.

The IntelliProbe™ can communicate with a PDA or any other Bluetooth® enabled device for a significant range. Low power requirements and a Lithium Ion battery combine to provide several days of use without recharging.

The IntelliProbe™ makes taking temperatures easy with one-touch temperature acquisition and convenient unit status LED alerts.

The IntelliProbe™ also features an iButton™ reader at its base for reading compatible iButton™ ID tags and data loggers. The iButton™ coin-sized ID tags can be easily installed at any station requiring inspection.

Operators checking that station simply touch the base of the IntelliProbe™ to the iButton™ to upload the station's data to the application. The iButton™ gives you unmatched efficiency and assurance that your operators are performing their functions at the right station and time.

The IntelliProbe™ can be used by OEMs in the Food Processing and Food Service Industry for implementation of HACCP and food inventory control.

The IntelliProbe™ is part of a complete family of products for all your temperature monitoring needs, including IntelliCheck™ Intelli PDA HACCP Inspection System and IntelliSense™ temperature monitoring and wireless sensors.

Control Systems, Inc.
888.384.3274
Chatsworth, CA
www.eControlSystems.com

Strategic Diagnostics announces success in demonstrating utility of its proprietary Genomic Antibodies® reagents

Strategic Diagnostics Inc. has announced the successful use of a number of its antibody reagents on clinical samples in studies being conducted by the Swedish Human Protein Atlas (HPA) program of the Human Proteome Resource (HPR) Center located in Stockholm, Sweden. The reagents, produced using SDI's proprietary Genomic Antibodies® technology, specifically target a selection of cancer-associated proteins. The antibodies were studied in the HPA's tissue-profiling program and generated high-resolution immunohistochemistry images across a wide spectrum of normal and cancerous tissues. Analyses of immunohistochemistry images are standard tests performed by pathology laboratories to diagnose disease. For each antibody, 576 spots of human tissue from 360 different individuals were treated and stained.

Images created in the analysis clearly demonstrated the ability of antibodies generated by SDI's high throughput Genomic Antibodies® technology to differentially stain cancer-associated proteins in patient tissue samples. The antibodies are created by using a proprietary system that produces recombinant protein inside the host animal, thereby activating an immune response to the encoded protein. This allows the production of antibodies generated against the protein's native structure, rather than traditional methods that produce antibodies to synthesized surrogates. Among the advantages of the Genomic Antibodies® technology is its ability to enable the development of reagents against traditionally difficult cellular targets, such as highly conserved and transmembrane proteins. The system is highly scalable, allowing the generation of custom libraries consisting of hundreds of antibodies for use in the drug discovery, diagnostic, and research markets. SDI is currently developing a significant number of these innovative reagents to be offered via a web-based catalog.

Matthew H. Knight, the company's president and chief executive
officer, commented, "The demonstrated advantages of our Genomic Antibodies® technology continue to produce real-world data to differentiate our antibody reagents from antibody reagents generated by traditional means. The HPA data is more evidence that our antibodies can perform under rigorous study conditions."

Strategic Diagnostics offers custom-service access to its Genomic Antibodies® technology for polyclonal and monoclonal products.

Redefine Spring Cleaning with Nilfisk-Advance America's 08 Series Vacuums: The Ultimate Workhorse

When it comes to the food industry, hygiene and sanitation are of paramount importance. QA and plant managers need a dependable solution for keeping contaminants out of their plants and products, and in 2005 Nilfisk-Advance America gave food manufacturers the ultimate workhorse—the 08 Series vacuum, a high-performance, durable, easy-to-maintain vacuum, engineered to make the food manufacturing process more productive.

The three-phase 08 series, which includes the CFM 3308, CFM 3508, CFM 3508W, and CFM 3558, gives users the cleaning muscle they need for continuous duty applications, effectively collecting and retaining contaminants such as dust, bacteria, food scraps, and more. Designed to meet customers' needs, the 08 vacs are ideal for process-integration systems, central systems or for general maintenance, and are more accessible, adaptable, transportable and comfortable to operate, with the following features:

- Nilfisk's efficient graduated filtration system with HEPA and optional ULPA filters that trap up to 99.999% of all ultra-fine particles, preventing cross contamination and improving employee health concerns. Optional downstream (after the motor) HEPA/ULPA filter can also be strategically positioned in the exhaust chamber preventing dust and debris from being released back into the environment.
- An ergonomic filter shake that allows the user to safely purge filters to prevent clogging and downtime. Reverse purge and electric filter shakers are also available.
- Despite being the ultimate workhorse, all of the 08 vacs have a portable design; equipped with extra-large wheels and a wrap-around handle; users can push, pull, or maneuver the vacuum with ease.
- The 08 series is quieter than ever, with a sound suppressor that reduces the speed of the exhaust air and muffles the sounds for increased worker comfort and safety.

In addition, the modular CFM 08 Series vacuums can be customized based on the type of materials being collected (i.e., fine dust/powders, debris, toxic materials, liquids, etc.) using hundreds of interchangeable CFM accessories, hoses, and filters — including those for overhead cleaning. The modular attachments are compatible with all CFM vacuums, allowing users to swap in what they need without searching for the attachments that match a particular vacuum — or investing in multiple sets of tools.

Onset Computer Corporation Introduces New Software Tool for HOBO® Data Loggers

Onset Computer Corporation has announced the alarm and readout tool, a plug-in software module for use with HOBOware Pro® software.

The new alarm and readout tool automatically notifies users via cell phone text messages or email when temperature, humidity and other conditions exceed user-defined limits. It also enables data from networked HOBO data loggers to be automatically offloaded and stored onto a centralized computer. This is particularly useful in applications where numerous locations are being monitored throughout a facility.

The alarm and readout tool is a plug-in to Onset's HOBOware Pro software package. HOBOware Pro, which runs on PC and Macintosh computers, features easy data-logger launch and readout functions, powerful data-plotting capabilities, and an intuitive graphical-user interface.
New AccuFill™ Bagging/Bulking Systems from Gainco Provide Enhanced Safety, Accuracy and Efficiency

New AccuFill™ bagging/bulking systems from Gainco, Inc. deliver heightened accuracy, versatility and cost-saving performance due to their special hygienic design. Completely engineered and built in the USA, these systems are ideal for the full range of poultry, meat and seafood applications including filets, drumsticks, tenders, wings and other products.

In contrast to conventional tubing designs for these systems, the open-frame design of Gainco's AccuFill™ bagging/bulking equipment promotes better food safety and ease of cleaning, making them perfectly suited for the food processing environment.

Beyond better cleanliness, the many productivity-enhancing features of AccuFill™ bagging/bulking systems include the ability to accommodate each user's specific wicketed bag requirements, such as adjusting weight set-points and lower/upper limits. A "quick change" wicket holder facilitates the rapid reloading of bags, while a checkweighing feature guards against overpacking.

Versatile controllers provide easy flexibility in program setup and operation, and a battery-backed memory has been designed into the system for recording the total number of bags, total weight, plus all setup parameters. A host PC can be connected to multiple bagging systems for centralized reporting, setup control, and yield analysis. The incorporation of "auto-zero" software automatically adjusts for any product accumulation on the hopper surfaces to ensure better weighing accuracy.

AccuFill™ bagging/bulking systems are engineered to operate in a variety of configurations, such as manual loading with either automatic or operator-selected product discharge, or conveyor loading with either automatic or operator-selected discharge. They are also ideal for positioning at the end of YieldPlus™ breast portioning or debone line operations.

Multiple system configurations are available. Dual-stage systems are particularly well-suited for conveyor-fed, high-volume product applications where varying customer requirements or floor space considerations are key factors. The bi-directional buffer hopper controls the flow of product to two weigh stations, thereby doubling the capacity and speed for a single product stream. Flexibility is enhanced with dual-station bagging/bulking systems by alternately filling different order specs, according to individual customer requirements.

All AccuFill™ bagging/bulking systems from Gainco feature rugged, sanitary stainless steel construction for long-life performance.

Gainco, Inc.
770.534.0703
Gainesville, GA
www.gainco.com

Milliken & Company Introduces New Packaging for Food Service Market

Milliken & Company has introduced two new paper-based tetrahedral packaging products for the portion-controlled liquid market, Nu-Twist™ and M-Pak® Plus.

The Nu-Twist package offers a pull-tab opening and straw insertion for easy consumption of 4 ounces of liquid. Designed for dispensing juice, Nu-Twist presents a fun-shaped package that helps drive juice consumption through enjoyment and ensures portion control for a healthy lifestyle.

M-Pak Plus is designed to contain liquids and provide barrier properties for sauces and condiments, salad dressings, and oil-based products. The package can also be used for non-food products such as lotions, shampoos, and other personal care products. M-Pak Plus is available in 1/3 ounce to 4 ounces providing convenient portions.

These two package options provide a portion controlled serving of products that work well with today's "on-the-go" lifestyles. Both Nu-Twist and M-Pak Plus minimize end-user waste because the package shape is the most efficient use of material per unit of volume and allows for complete dispensing of the product.

The paper-based packages utilize a renewable resource and Milliken can coat the packages with PLA to create a 100 percent renewable package for sustainability.

Milliken & Company
864.503.6503
Spartanburg, SC
www.millikenchemical.com
COMING EVENTS

AUGUST
- 7-9, Using SPC for HACCP Verification in Poultry and Food Industry, University of Georgia Food Science, UGA Campus, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.
- 13-17, Introduction to Food Microbiology Short Course, Boise State University, Boise, ID. For more information, contact Paula Peterman at 208.364.6188; E-mail: paulap@uidaho.edu.
- 21-23, Developing & Implementing Food Safety Programs, Atlanta, GA. For more information, contact AIB International at 800.633.5137 or go to www.aibonline.org.

SEPTEMBER
- 11-12, GMA/FPA Advanced HACCP: Verification and Validation Workshop, GMA/FPA Conference Center, Washington, D.C. For more information, contact Jenny Scott at 202.639.5985 or go to http://www.fpa-food.org/content/FSW.asp.
- 11-12, Meat & Poultry HACCP Accredited Workshop, University of Georgia Food Science, UGA Campus, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.
- 12, Ohio Association for Food and Environmental Sanitarians Annual Meeting, Ohio Dept. of Agriculture, Reynoldsburg, OH. For more information, contact Gloria Swick-Brown at 614.466.7760; E-mail: gloria.swick-brown@odh.ohio.gov.
- 12-13, China International Food Safety and Quality Conference and Expo, The Landmark Tower Hotel, Beijing, China. Program assistance provided by IAFP. For more information, go to www.chinafoodsafety.com.
- 16-20, 121st AOAC Annual Meeting and Exposition, Anaheim, CA. For more information, call 301.924.7077 ext 112, 124, and 146 or go to www.aocac.org/meetings.
- 18-20, New York State Association for Food Protection 84th Annual Conference, E. Syracuse, NY. For more information, contact Janine Lucia at 607.255.2892; E-mail: jlg3@cornell.edu.
- 19-21, Washington Association for Food Protection Annual Meeting, Campbell's Resort and Conference Center, Lake Chelan, WA. For more information, contact Stephanie Olmsted at 206.660.4594; E-mail: Stephanie.Olmsted@safeway.com.
- 24-26, Indiana Environmental Health Association Fall Conference, Radisson Hotel, Merrillville, IN. For more information, contact Pat Minnick at 765.483.4458; E-mail: pmnick@co.boone.in.us.

OCTOBER
- 3-4, Advanced HACCP for Meat & Poultry Processors Workshop, University of Georgia Food Science, UGA Campus, Athens, GA. For more information, contact Marian at 706.542.2574; E-mail: marianw@uga.edu.
- 7-10, AACC International Annual Meeting, San Antonio Convention Center, San Antonio, TX. For more information, go to http://meeting.aacconet.org.
- 9-11, North Dakota Environmental Health Association Educational Conference, Bismarck, ND. For more information, contact Debra Larson at 701.328.1291; E-mail: djlarson@state.nd.us.
- 10-11, Associated Illinois Milk, Food and Environmental Sanitarians Annual Meeting, Stoney Creek Inn, East Peoria, IL. For more information, contact Steve DiVincenzo at 217.785.2439; E-mail: steve.divincenzo@illinois.gov.
- 11-12, GMA/FPA HACCP for Juice and Other Beverages Workshop, GMA/FPA Conference Center, Washington, D.C. For more information, contact Jenny Scott at 202.639.5985 or go to http://www.fpa-food.org/content/FSW.asp.
- 15-17, GMA/FPA Prerequisite Programs and Sanitary Design Workshop, Cornell University’s Statler Hotel, Ithaca, NY. A workshop to formalize your HACCP foundation, For more information, contact Bob Gravani at 607.255.3262; or go to http://www.fpa-food.org/content/FSW.asp.
- 15-17, 2nd Food Processing Suppliers Association, Las Vegas Convention Center, Las Vegas, NV. For more information, call 703.761.2600 or go to www.fpsa.com.
- 18-19, IAFP 3rd European Symposium, Sheraton Roma Hotel & Conference Center, Rome, Italy. For more information, call 800.369.6337 or go to www.foodprotection.org.
- 21-24, UWRF 27th Food Microbiology Symposium and Workshop, Current Concepts in Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology, University of Wisconsin-River Falls, River Falls, WI. For more information, contact Steve DiVincenzo at 217.785.2439; E-mail: steve.divincenzo@illinois.gov.

IAFP UPCOMING MEETINGS

AUGUST 3-6, 2008 Columbus, Ohio

JULY 12-15, 2009 Grapevine, Texas
more information, call 715.425.3704 or go to www.uwrf.edu/foodscience, click on workshops, then the link to the food microbiology symposium.

- **24-27, Worldwide Food Expo**, McCormick Place, Chicago, IL. For more information, call 703.934.5514 or go to www.worldwidefoodexpo.com.

**NOVEMBER**

- **3-7, APHA 135th Annual Meeting and Expo**, Washington, D.C. For more information, call 202.777.APHA (2742) or go to www.apha.org.
- **8, Ontario Food Protection Association 49th Annual Meeting**, Mississauga Convention Centre, Mississauga, Ontario. For more information, contact Gail Seed at 519.463.5674; E-mail: seed@golden.net.

**DECEMBER**

- **3-5, HTST Workshop**, Randolph Associates, Inc., Murfreesboro, TN. For more information, call 205.595.6455; E-mail: Henry.Randolph@raiconsult.com.

---

**ADVERTISING INDEX**

- **BD Diagnostics**.................. Inside Back Cover
- **BioControl Systems, Inc.**.................. 511
- **Nasco**.................. 552
- **Universal Sanitizers and Supplies, Inc.**.......................... Inside Front Cover
- **World Technology Ingredients, Inc.**.......................... 513
- **Worldwide Food Expo**.................. 569

---

Search, Order, Download 3-A Sanitary Standards

Get the latest 3-A Sanitary Standards and 3-A Accepted Practices and see how the 3-A Symbol program benefits equipment manufacturers, food and dairy processors and product sanitarians.

Order online at www.3-a.org
Get the greatest new ideas and applied solutions for your food and beverage operations at Worldwide Food Expo.

- See **1,000 exhibits**—the premier showcase of processing, packaging, equipment, ingredients and services.
- Explore **Super Sessions** and in-depth **Plant Operations** workshops on leading trends and applications.
- Enjoy **unparalleled networking opportunities** with global leaders from 100 countries worldwide.

ASSOCIATE/FULL PROFESSOR OF FOOD SAFETY

Salary dependent on qualifications and experience. PhD required with research expertise in food safety, especially of foods of animal origin. DVM or equivalent preferred. Demonstrated aptitude/experience or potential in teaching required. Documented research program in food safety. In order to complement the department’s existing strength in pre-harvest food safety and epidemiology, the successful candidate will possess strength in food safety beyond the pre-harvest stage (e.g., animal transport, slaughter, processing, product handling or distribution). Demonstrated record or evidence of potential in acquisition of extramural funding. Familiarity with food animal production and processing systems. Knowledge of use of applied epidemiological methods is desirable. Must possess excellent interpersonal and communication skills and a demonstrated ability to work with others in a collegial team atmosphere. Evidence of leadership and initiative is required. Teaching responsibilities include: (1) participation in lectures, laboratories and discussions in the DVM professional curriculum and graduate professional curricula (MPVM, MPH, and planned MEH), and (2) participation in the graduate academic programs (MS and PhD) of the campus.

Research responsibilities include the development of a creative, independent and productive research program in microbial food safety is a fundamental and indispensable requirement of the position, including publication of results in professional/scientific journals. The successful candidate will be expected to develop an on-going research program in food-borne pathogens at the molecular, organismal or host-population level. Individual will provide leadership in directing research projects of graduate students.

Service: The successful candidate is expected to work with state agencies and campus groups in identifying research needs in food safety and to be a consultative resource for those agencies. University and public service through committee work, participation in professional organizations, continuing education and other appropriate means is required. To receive fullest consideration, applications must be received by August 31, 2007; position open until filled. Interested applicants should submit (1) a letter of intent outlining special interest in the position, overall related qualifications and experience and career goals; (2) curriculum vitae; and (3) the names and addresses of four professional references to: Dr. P.H. Kass, Chair, Attn: Debra Amundson, MSO, Department of Population Health and Reproduction, School of Veterinary Medicine, University of California, Davis, CA 95616.

The University of California is an Affirmative Action/Equal Opportunity Employer.
The Table of Contents from the Journal of Food Protection is being provided as a Member benefit. If you do not receive JFP, but would like to add it to your Membership contact the Association office.

Journal of Food Protection

Vol. 70 June 2007 No. 6

Antibiotic Resistance and Virulence Genes in Commissarial Escherichia coli and Salmonella Isolates from Commercial Broiler Chicken Farms

Genotypes, Serotypes, and Antibiotic Resistance Profiles of Salmonella Isolated from Commercial North Carolina Turkey Farms

Antimicrobial Susceptibility of Salmonella isolated from Various Products, from 1999 to 2003

Influence of Curl Expression by Enterohemorrhagic E. coli O157:H7 on the Cell’s Overall Hydrophobicity, Charge, and Ability To Attach to Lettuce

Distribution of Escherichia coli O157 and Salmonella on Hole Surfaces, the Oral Cavity, and in Paws of Commercial Broiler Chickens

Prevalence and Risk Factors for Salmonella and Campylobacter spp. Carcass Contamination in Turkeys

Distribution of E. coli O157 and Salmonella on Commercial Broiler Chicken Farms

Antimicrobial Susceptibility of Salmonella isolated from Various Products, from 1999 to 2003

Preservation and Risk Factors for Salmonella and Campylobacter spp. Carcass Contamination in Turkeys

Seafood in Uncooked Retail Meals in New Zealand

Rapid and Simultaneous Quantification of Enterohemorrhagic Escherichia coli O157:H7, Salmonella, and Shigella on Ground Beef

Quantitative Detection of Campylobacter jejuni on Fresh Chicken Carcasses by Real-Time PCR

Culture and Detection of Campylobacter jejuni within Mixed Microbial Populations of Biofilms on Stainless Steel

Bacteriophage-Based Bioluminescent Biosensor for the Detection of Enterohemorrhagic E. coli O157:H7

Validation of Individual and Multiple-Sequential Interventions for Reduction of Microbial Populations during Processing of Poultry Carcasses and Parts

Inactivation of Salmonella Enteritidis and Salmonella Serovars in Liquid Whole Egg Using Generally Recognized as Safe Additives, Ionizing Radiation, and Heat

Survival and Growth of Enterococci isolated in Infant Cereal as Affiliated by Composition, Reconstitution, and Storage Temperature

Effects of Inoculation Level, Material Hydration, and Stainless Steel Surface Roughness on the Transfer of Listeria monocytogenes from Inoculated Beigene to Stainless Steel and High-Density Polyethylene

Comparison of Chemical and Biophysical Methods for the Detection of Listeria monocytogenes in Food Samples

Potassium Sorbate, and Methyl p-Hydroxybenzoate on Mold Growth Rate

Detection of Verocytotoxin-Producing Escherichia coli Serogroups O157 and 026 in the Cecal Content and Lymphatic Tissue of Cattle at Slaughter in Italy

Outbreak of Escherichia coli O157:H7 Infections Associated with Consumption of Beef Donair


Detection of Vero cytotoxin-Producing Escherichia coli Serogroups O157 and O26 in the Cecal Content and Lymphatic Tissue of Cattle at Slaughter in Italy

Assessment of Poultry-Hurricane Katrina Recovery in Poultry Slaughter Establishments

Assessment of Poul-Hurricane Katrina Recovery in Poultry Slaughter Establishments

Serotyping and Antibacterial Resistance of Salmonella Brauns isolated from Slaughtered Pigs in Spain

Low Prevalence of Listeria monocytogenes in Frosted Brauns from Italy

Inactivation of Calcium-Dependent Lactic Acid Bacteria Phage by Phosphates

Molecular-Related Identification of Sarcozystis Cystoisospora in Belgian Minced Beef

Quantitative Determination of Campylobacter jejuni on Fresh Chicken Carcasses by Real-Time PCR

A Sensitive and Reliable Reverse Transcriptional PCR-Endonuclease-Linked Unexpected Assay for the Detection of Human Pathogenic Viruses in Blurred Milk

Research Notes

Outbreak of Escherichia coli O157:H7 Infections Associated with Consumption of Beef Bratwurst

Seafood in Uncooked Retail Meals in New Zealand

Inactivity of Sodium Chlorate, Potassium Chlorate, and their Mixture in Combination with Phosphates

Inactivation of Calcium-Dependent Lactic Acid Bacteria Phage by Phosphates

Molecular-Related Identification of Sarcozystis Cystoisospora in Belgian Minced Beef

A Sensitive and Reliable Reverse Transcriptional PCR-Endonuclease-Linked Unexpected Assay for the Detection of Human Pathogenic Viruses in Blurred Milk

Research Notes
The China International Food Safety & Quality 2007 comes at THE right time to address the many food safety and quality issues, challenges and opportunities facing China’s expanding food industry. By attending you’ll have access to unparalleled information, knowledge, experts and technology, which the event will provide to trade visitors from China and Asia. For more information about attending, speaking and exhibiting, log on to: www.chinafoodsafety.com

Message from Wu Yi, Vice Premier, People’s Republic of China

“The Chinese government will remain dedicated to the improvement of international cooperation and exchanges on food safety, borrow and share experiences from the international community, and make contribution to the establishment of an effective and harmonious worldwide food safety system.”
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.

Member #
First Name ____________________________ Last Name ____________________________
Company ____________________________ Job Title ____________________________
Mailing Address
Please specify: □ Home □ Work ____________________________
City ____________________________ State or Province ____________________________
Postal Code/Zip + 4 □ Home □ Work ____________
Telephone # ____________________________ Fax # ____________________________
E-Mail ____________________________ Date Needed ____________

PLEASE CHECK BOX NEXT TO YOUR VIDEO CHOICE

DAIRY
□ 2005 Control of Entzwein microorganisms in Small Dairy Meat and Poultry Establishment
□ 2006 Controlling Entzwein A Year Approach
□ 2006 Controlling Entzwein: What Employees Must Know
□ 2007 Egg Processing
□ 2007 Egg Production

ENVIRONMENTAL
□ 2012 Better TBS for Better Facilities
□ 2013 Air Pollution: Inside
□ 2013 Air Pollution: Outside
□ 2013 Air Pollution: ICAQ

FOOD
□ 2004 Food Safety - Dairy Details
□ 2004 Food Safety - Producer's Guide
□ 2004 Food Safety - The Farmer's Role
□ 2004 Food Safety - The Time Parameter
□ 2004 Food Safety - Waste and Water

FOOD PROCESSING
□ 2005 Milk Handling: Sanitation
□ 2005 Milk Handling: Storage
□ 2005 Milk Sanitation: Chemical Solutions
□ 2005 Milk Processing/Plant Inspection Procedures
□ 2005 Milk Processing/Plant Inspection Procedures

FOOD PROCESSING MANAGEMENT
□ 2005 Nutrient Processing
□ 2005 Processing Fluid Milk

MATERIAL FOOD PROTECTION
□ 2008 Food for Thought: The GRAP Quiz Show
□ 2008 Food Irradiation
□ 2008 Food Microbiology - HACCP and beyond Application to the Food Industry (Part 1 & 2)
□ 2008 Food Safety Series II (4 videos)
□ 2008 Food Safety Series III (4 videos)

MEMBER
□ 2008 Food Safety: An Educational Valley for Intersectoral Food Service Workers
□ 2008 Food Safety for Service Series I

OTHER
□ 2007 See our Web site at www.foodprotection.org for detailed tape descriptions

(Available 4 weeks minimum from date of request.)

Other
□ 2007 HACCP: A Basic Understanding
□ 2007 Food Control in Food Processing Plants
□ 2007 Preventing Foodborne Illness

THANK YOU FOR YOUR ORDER

International Association for Food Protection
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
Phone: 800.369.6337; 515.276.3334
Fax: 515.276.8655
E-Mail: info@foodprotection.org
Web Site: www.foodprotection.org

Visit our Web site at www.foodprotection.org for detailed tape descriptions

JULY 2007 | FOOD PROTECTION TRENDS 573
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:

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>MEMBER OR GOVT PRICE</th>
<th>NON-MEMBER PRICE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Procedures to Investigate Waterborne Illness—2nd Edition</td>
<td>$12.00</td>
<td>$24.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Procedures to Investigate Foodborne Illness—5th Edition</td>
<td>12.00</td>
<td>24.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SHIPPING AND HANDLING — $3.00 (US)  $5.00 (Outside US)</td>
<td>Each additional booklet $1.50</td>
<td>Shipping/Handling Booklets Total</td>
<td></td>
</tr>
</tbody>
</table>

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

OTHER PUBLICATIONS:

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>MEMBER OR GOVT PRICE</th>
<th>NON-MEMBER PRICE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>*International Food Safety Icons CD</td>
<td>$25.00</td>
<td>$25.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pocket Guide to Dairy Sanitation (minimum order of 10)</td>
<td>$75.00</td>
<td>$150.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Before Disaster Strikes... A Guide to Food Safety in the Home (minimum order of 10)</td>
<td>.75</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Before Disaster Strikes... Spanish language version — (minimum order of 10)</td>
<td>.75</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food Safety at Temporary Events (minimum order of 10)</td>
<td>.75</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food Safety at Temporary Events – Spanish language version — (minimum order of 10)</td>
<td>.75</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Annual Meeting Abstract Book Supplement (year requested )</td>
<td>25.00</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*IAFP History 1911-2000</td>
<td>25.00</td>
<td>25.00</td>
<td></td>
</tr>
</tbody>
</table>

SHIPPING AND HANDLING — per 10 — $2.50 (US)  $3.50 (Outside US)
*Includes shipping and handling

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
<th>MEMBER OR GOVT PRICE</th>
<th>NON-MEMBER PRICE</th>
<th>TOTAL</th>
</tr>
</thead>
</table>

SHIPPING AND HANDLING

TOTAL ORDER AMOUNT
Prices effective through August 31, 2007

PAYMENT:

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

☐ Check or Money Order Enclosed ☐ Credit Card
☐ Visa ☐ MasterCard ☐ American Express ☐ Discover

CREDIT CARD # __________
EXP. DATE __________
SIGNATURE __________

4 EASY WAYS TO ORDER

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

MEMBERSHIPS

□ IAFP Membership

(Member dues are based on a 12-month period and includes the IAFP Report)

Optional Benefits:

□ Food Protection Trends
□ Journal of Food Protection
□ Journal of Food Protection Online
□ All Optional Benefits — BEST VALUE!

□ Student Membership

(Full-time student verification required)

Optional Benefits:

□ Student Membership with FPT
□ Student Membership with JFP
□ Student Membership with JFP Online
□ All Optional Benefits — BEST VALUE!

SUSTAINING MEMBERSHIPS

Recognition for your organization and many other benefits.

□ GOLD $5,000.00
□ SILVER $2,500.00
□ SUSTAINING $750.00

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

□ Check Enclosed □ VISA □ MASTERCARD □ AMERICAN EXPRESS

TOTAL MEMBERSHIP PAYMENT $ ____________________

All prices include shipping and handling
Prices effective through August 31, 2007

International Association for Food Protection®

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

4 EASY WAYS TO JOIN

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

JULY 2007 | FOOD PROTECTION TRENDS 575
What’s Your Score, Mate?
Douglas Powell
Kansas State University
Manhattan, Kansas

Sydney, Australia is a great city. And it’d be even better if restaurants and regulators provided the public with information about the safety of the city’s restaurants.

Restaurants and food service establishments are a significant source of the foodborne illness that strikes up to 30 per cent of citizens in so-called developed countries each and every year.

Sydney officials are now being pressured to release information about the safety of local restaurants and bolster restaurant safety in general.

After watching the mish-mash of federal, state and local approaches to restaurant inspection in a number of western countries for the past decade, I can draw two broad conclusions:

- Anyone who serves, prepares or handles food, in a restaurant, nursing home, day care center, supermarket or local market needs some basic food safety training; and,
- the results of restaurant and other food service inspections must be made public.

Here’s why,

Parenting and preparing food are about the only two activities that no longer require some kind of certification in Western countries. For example, to coach little girls playing ice hockey in Canada requires 16 hours of training. To coach kids on a travel team requires an additional 24 hours of training.

It’s unclear how many illnesses can be traced to restaurants, but every week there is at least one restaurant-related outbreak reported in the news media somewhere. Cross contamination, lack of handwashing and improper cooking or holding temperatures are all common themes in these outbreaks — the very same infractions that restaurant operators and employees should be reminded of during training sessions, and are judged on during inspections. Some jurisdictions — such as the city of Fort Worth, Texas — place so much importance on teaching these lessons they require mandatory food-handler licenses and have invested in an infrastructure of training that demonstrates the city’s commitment to public health. Other cities and states have no training requirement.

There should be mandatory food-handler training, for say, three hours, that could happen in school, on the job, whatever. But training is only a beginning. Just because you tell someone to wash the poop off their hands before they prepare salad for 100 people doesn’t mean it is going to happen; weekly outbreaks of hepatitis A confirm this. There are a number of additional carrots and sticks that can be used to create a culture that values microbiologically safe food and a work environment that rewards hygienic behavior. But mandating basic training is a start.

Next is to verify that training is being translated into safe food-handling practices through inspection. And those inspection results should be publicly available.

A philosophy of transparency and openness underlies the efforts of many local health units across North America in seeking to make available the results of restaurant inspections. In the absence of regular media exposes, or a reality TV show where camera crews follow an inspector into a restaurant unannounced, how do consumers — diners — know which of their favorite restaurants are safe?

Cities, countries and states are using a blend of Web sites, letter or numerical grades on doors, and providing disclosure upon request. In Denmark, smiley or sad faces are affixed to restaurant windows.

Publicly available grading systems rapidly communicate to diners the potential risk in dining at a particular establishment and restaurants given a lower grade may be more likely to comply with health regulations in the future to prevent lost business.

More importantly, such public displays of information help bolster overall awareness of food safety amongst staff and the public — people routinely talk about this stuff. The interested public can handle more, not less, information about food safety.

Lots of cities still do not disclose restaurant inspection results, worried about the effect on business, but they aren’t great cities.

Sydney is.

And instead of waiting for politicians to take the lead, the best restaurants, those with nothing to hide and everything to be proud of, will go ahead and make their inspection scores available — today.

Douglas Powell is scientific director of the International Food Safety Network at Kansas State University, foodsafety.ksu.edu; Phone: 785.317.0560; dpowell@ksu.edu.
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®.
Universal Sanitizers and Supplies, Inc. (USS) is a food and beverage sanitation company that has offered high quality products and unparalleled service since 1994. USS staffs food microbiologists and mycologists that can develop the right sanitation program for each company needs. USS offers contract cleaning and specialty services: silo cleaning, in-depth plant cleaning, fogging, passivation of new equipment, etc. No job is too small or too big. Call us for a quote on these services.

USS is a certified women-owned business (WBE) by the Women Business Enterprises National Council (WBENC).